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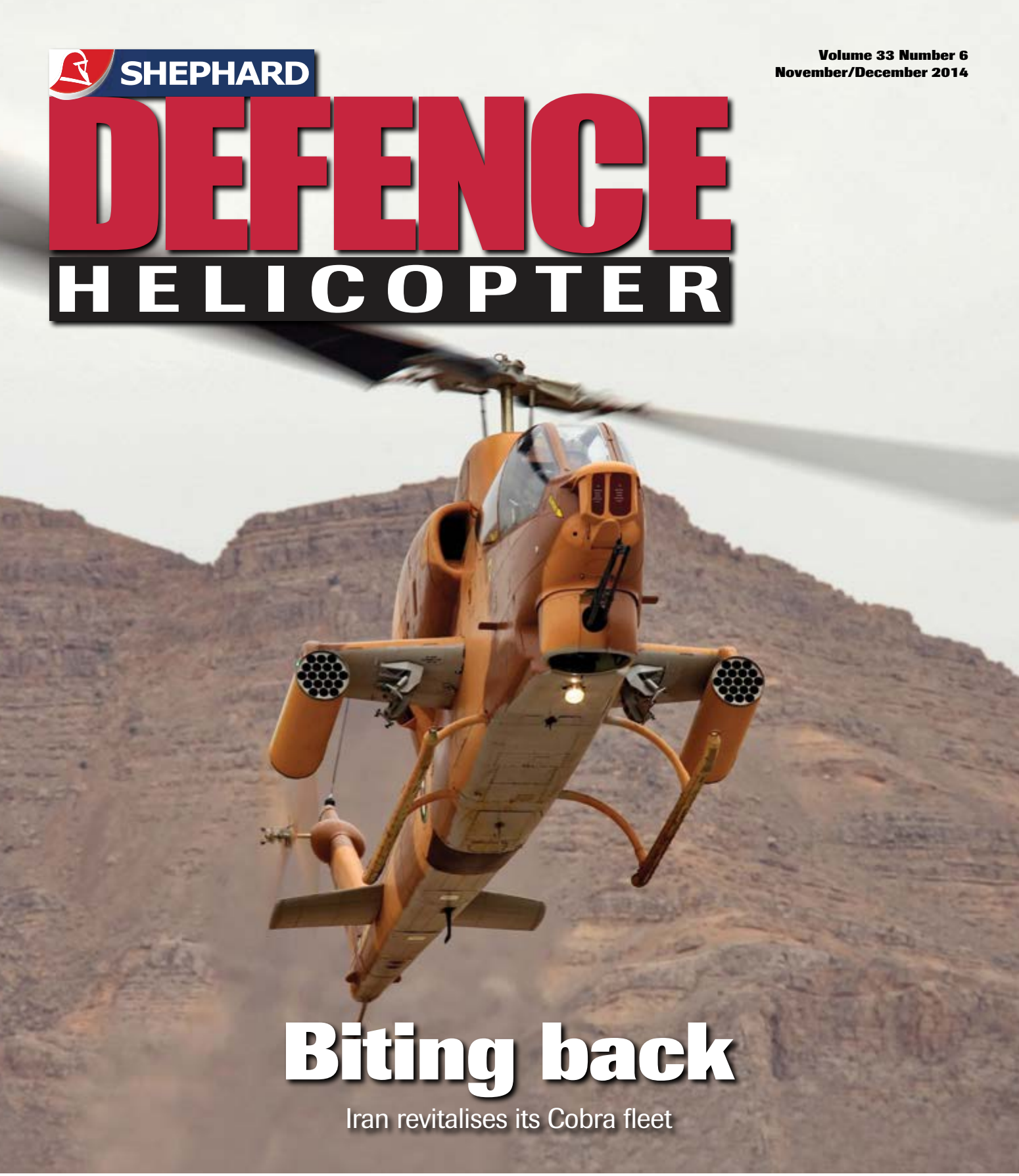
DEFENCE HELICOPTER



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DEFENCE HELICOPTER

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Front cover: Iran has returned a number of AH-1Js damaged in combat in the 1980s to service. (Photo: VRA)

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- Naval rotorcraft
- Scout/light attack helicopters
- Guided rockets

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Sanctions take effect,
but Russian industry stays strong

RUSSIA'S ANNEXATION OF THE CRIMEA and its ongoing involvement in southeastern regions of Ukraine has prompted a tidal wave of global condemnation. However, the subsequent flurry of sanctions imposed by Western nations aimed at bringing the Kremlin to its knees has seemingly failed to make a significant impact.

In fact, Russian arms exports appear to be at an all-time high. Despite the US and EU-led sanctions, Russia's state-owned defence equipment export company Rosoboronexport recently reported record sales of $38.7 billion worth of military equipment in 2013-2014.

During this period, Russian Helicopters, a subsidiary of Rostec, itself the state-owned parent company of Rosoboronexport, delivered 275 helicopters of nine types to recipients in ten countries.

According to company documents, deliveries to China and Europe doubled in 2013, with demand remaining constant across its traditional customer base in Africa, Latin America, the Middle East and Asia-Pacific.

Somewhat surprisingly, Rostec is still actively targeting operators in Europe and North America. While the company concedes that the current sanctions 'complicate the process' of entering new markets, it regards any difficulties as 'more of psychological rather than objective nature', and unlikely to impact either production or the fulfilment of orders in those regions.

DEFIANT STANCE

Rostec has struck a defiant stance in the face of vanishing business partners and potential creditors, and claims that sanctions will only 'stimulate the processes of substituting foreign parts with domestic equivalents, including adopting newest Russian technologies'.

In a similar fit of apparent self-reliance, Russian Helicopters severed ties with Ukraine in the manufacture of the Mi-8AMTSh-V tactical transport helicopters currently being built for the Russia's Army Aviation branch (see p6).

Speaking to the press in November, company CEO Alexander Mikheev said that achieving full independence from imported equipment was a directive the company had received from Russia's political leadership, in light of the break of the relationship with Ukraine in the spring.

The embargo on rotorcraft engine exports from Ukraine to Russia had no impact on one significant contract – the delivery of 63 Mi-17V-5 tactical transport helicopters for the Afghan armed forces ordered by the US for some $1.33 billion – which was completed in October.

EXIT STRATEGY

The Pentagon's decision to use US taxpayer dollars to purchase Russian Mi-17s for Afghan forces was always controversial, despite the platform's obvious suitability for the region.

The type copes well with Afghanistan's challenging environmental conditions, and, due to its low technical complexity, is considered relatively easy for the Afghans to operate, making the rotorcraft a key part of the US exit strategy.

In an awkward twist of the knife, the Pentagon's plans to reduce the size of the US force in Afghanistan to 9,800 personnel by the end of this year now appears to depend on the continued support of the Kremlin.

The Afghans will need the operational reach of the Mi-17 to provide adequate security for the remaining coalition forces. Inevitably, this will require some kind of deal with Rosoboronexport to safeguard the supply of spare parts needed to maintain the aircraft and keep them operational.

For its part, Rosoboronexport has acknowledged that it has 'an obligation to service these helicopters under warranty,' and states 'the decision regarding servicing them beyond warranty limitations will be made separately by the buyer'.

Meanwhile, the company is making a big drive into Africa, and is currently considering 16 proposals from countries across the region.

With a number of nations, such as Angola and Mozambique, still using military

equipment procured from the Soviet Union, the Kremlin clearly sees the continent as rich in sales opportunities, and its plan is to use South Africa as a base from where this equipment can be serviced and maintained.

Nigeria has placed a large order for Russian military rotorcraft, including the Mi-171Sh and Mi-35M, and Mozambique has also expressed interest in the latter type.

SERVICING RIGHTS

Another significant development in the Kremlin's strategy to expand the international presence of Russian helicopters is Rostec's decision to grant servicing rights for rotorcraft sold to foreign customers, meaning the aircraft will no longer need to be shipped back to Russia for repairs.

The move is evidence that Russia is aiming to dramatically increase the level of service response for its helicopters, something it is not currently renowned for, and, regardless of the alienating consequences of any military actions, become a competitive commercial player in the international marketplace.

Jonathan Tringham, Staff Reporter

US Army explores manned/ unmanned teaming for UH-60

Photo: US Army

THE US MILITARY IS EXPLORING THE application of manned/unmanned teaming capabilities for its fleet of UH-60 utility helicopters.

According to an Rfl released on 13 November, the US Army's Utility Helicopters Project Office 'is seeking potential sources that possess the expertise, capabilities and experience to develop a manned/unmanned-operations (MUM-O) capability' for the UH/HH-60A/L/M fleet.

According to the Rfl, the army is seeking 'input from industry to assist in the design and development of a Black Hawk helicopter-mounted system that is capable of receiving full motion video (FMV) from UAS, manned intelligence, surveillance [and] reconnaissance platforms, and other MUM-equipped aerial platforms in the army inventory'.

Components of the notional MUM design are to include 'a two-antenna configuration with a forward antenna for receiving video feeds in front of the aircraft and an aft-mounted antenna for receiving video feeds from sources to the rear of the aircraft', with the forward antenna possessing 'maximised range performance'.

Additional requirements include FMV receivers 'with an emphasis on minimising size, weight and power', the announcement added, noting that 'transmit capability is not an initial requirement of the system'.

Industry responses are not required to offer a complete solution to the Rfl but may also include 'component-only solutions (ie antenna, receiver) to be further integrated by Black Hawk with additional supplier equipment'. The document adds that components 'should be interoperable with platforms using the latest Tactical Common Data Link waveform as well as a variety of legacy waveforms still in use by army assets'.

Frequency bands supported should include but are not limited to Ku, C, L and S.

In addition to showing live FMV feed, the system should also display received metadata in a format such as a moving map with icons indicating video source position – latitude/ longitude, heading and altitude – relative to the Black Hawk as well as sensor field of view and pointing angle.

Interested parties were invited to provide a written response to the Rfl within 30 days of the 13 November posting, with responses to include information on system/component capabilities and attributes, performance and schedule/cost.

The Rfl authors emphasised that the request is 'part of a continuous process for obtaining the latest industry information' and is only designed to support market research at this time.

By Scott R Gourley, California

Apache radar gets maritime mode

LONGBOW LLC, THE JOINT VENTURE that manufactures the AN/APG-78 fire control radar, is to upgrade the sets equipping the US Army's AH-64E helicopters with a maritime mode enhancement.

Plans to add maritime surveillance capabilities were announced by Col Jeffrey Hager, project manager for the Apache, in mid-October during the AUSA exhibition in Washington, DC.

According to Lockheed Martin business development manager Wade Griswold, the maritime upgrade for the AN/APG-78 'is both a software and hardware enhancement'.

The cornerstone of the initiative is the Radar Electronics Unit (REU) that equips the AN/APG-78. This is a key part of the AH-64E upgrade from the 'Delta' configuration, providing increased output power and improvements to the radar's processing capability.

At the same time, it reduces maintenance and operating costs, along with providing size and weight reductions. It also enables the AH-64E's crew to control UAVs.

'The REU provides more processing power, capacity and memory for the Longbow fire control radar, which allows the capability insertion of a maritime mode,' Griswold explained to *Defence Helicopter*.

Equipping the AH-64E with a maritime radar mode will provide the aircraft with the ability to prosecute targets in littoral environments and on the open seas.

NATO combat operations in Libya in 2011 underscored the importance of being able to operate attack helicopters from the sea.

However, the maritime environment poses its own challenges to radar with small targets such as jetskis and skiffs used by pirates being difficult to detect amid the clutter caused by wave crests. The addition of a maritime mode should help the Longbow deal with such issues.

In terms of architecture, the AN/APG-78 is a Ka-band (33.4-36GHz) radar with a range of around 8km.

Griswold stated that currently 'testing of the maritime mode is ongoing'.

As regards timescales, the maritime mode will be ready for insertion into the AN/APG-78 from the Lot 6 production run for the AH-64E, which is expected to commence later this decade. It is expected that the mode will also be retrofitted into AH-64Es that have already been delivered to the US Army once the enhancement becomes available.

By Tom Withington, Toulouse

Netherlands examines SOF aviation concept


Photo: DHC

THE NETHERLANDS DEFENCE HELICOPTER Command (DHC) has begun working up plans to establish a special operations forces (SOF) air capability, officials have revealed to *Defence Helicopter*.

The decision to develop such a concept follows recent operations in Afghanistan, Iraq and Mali where the DHC was only capable of responding to 80% of SOF requests, according to Col Harold Boekholt, head of operations at the command. The new wing is expected to reach an initial operating capability by 2016.

'DHC didn't have SOF-trained pilots, but on the other hand, they were certified to conduct air assault operations. However, 20% of [SOF] mission requests were deemed too hazardous for aircrew and platforms,' Boekholt explained to *DH*.

The Dutch MoD's move sees it follow the likes of the UK and US which have long-established pilots, aircrew and platforms dedicated to the support of SOF units.

The new wing will be required to support the Netherlands' existing SOF capability, which currently includes the Korps Commandotroepen, Maritime Special Operations Forces and Brigade Speciale Beveiligingsopdrachten, with operations ranging from direct action and counter-terrorism through to surveillance and reconnaissance.

According to Boekholt, the 'building blocks are already in place' but the DHC continues to gather information from NATO SOF Headquarters in Belgium as well as the US and other countries with SOF air assets already in place.

'We have recognised that SOF is a growing business and that rotary-wing assets need to be a part of it. Currently, we are studying this subject to fully understand what the incorporation of rotary-wing SOF will mean to our organisation, our resources and the way we have to divide our assets between conventional and SOF tasking,' Boekholt explained.

'Both [Iraq/Afghanistan] and more recently... Mali have involved Dutch SOF units. Furthermore, the Dutch MoD acknowledges that the world is changing and we see more of a demand for smaller, specialised forces than larger brigades moving into an area. Lots of countries are doing this too,' he continued.

It is understood that an initial study period will be completed within the next six months, after which the MoD will assess whether to progress further with the concept.

Organic SOF air wings are mainly built around transport platforms with the US Army's 160th Special Operations Aviation Regiment, for example, operating aircraft including the MH/AH-6M Little Bird, MH-60M Black Hawk and MH-47G Chinook.

Currently, the DHC operates the CH-47D Chinook, AS532 U2 Cougar Mk II and AH-64D Apache out of Gilze-Rijen Air Base. However, the command said it had not been confirmed yet where the SOF air element would be based.

Furthermore, the DHC also operates Agusta-Bell 412SPs for SAR out of Leeuwarden Air Base and Vlieland heliport.

'Bringing the SOF operator into the battle zone has driven this development,' Boekholt stressed, admitting that the wing will also likely include fixed-wing platforms such as the C-130 Hercules, another traditional insertion platform for SOF units.

However, it is not envisaged that other supporting assets such as UAVs, attack helicopters or fixed-wing fast movers will be included in the SOF air command: 'Such aircraft are undeniably required for conducting SOF operations but are not considered SOF air.

'We are trying to build a modular concept so all enablers will be able to support SOF air when needed; we don't have the resources available to give the SOF their own dedicated assets. That will be the challenge for all small countries, in my opinion,' Boekholt concluded.

By Andrew White, London

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Australia signs HATS contract

Image: Airbus Helicopters

FUTURE PILOTS WITH THE AUSTRALIAN Defence Force (ADF) can look forward to an easier transition to advanced helicopters such as the ARH Tiger and MRH90 after a new training contract was signed on 14 November.

At a ceremony at HMAS Albatross, Nowra, the Australian government signed an agreement with Boeing Defence Australia for AIR 9000 Phase 7 – Helicopter Aircrew Training System (HATS), which covers the training of Royal Australian Navy and Australian Army helicopter pilots for the next 25 years.

Under the A$600 million programme, which saw the Boeing/Thales team named as preferred bidder in October, Thales will provide three full flight simulators while pilot training will be carried out using 15 EC135 T2+ aircraft.

Part of the reason for introducing a newer type such as the EC135 T2+, with its glass cockpit, multi-axis autopilot and twin-engine performance, was to make it easier for students to transition to the more sophisticated helicopters now in service with the ADF.

The joint service approach is also expected to benefit the ADF by reducing the training burden on operational aircraft, and enhancing navy and army operations from Australia's new amphibious ships.

'This contract will introduce a modern helicopter training system that will support the next generation of army and navy aircrew transitioning to our modern combat helicopter,' stated RAdm Tony Dalton, head of helicopters, tactical UAS and guided weapons within the Defence Materiel Organisation.

As well as the three flight simulators, the programme will provide a suite of other synthetic training devices, Thales Meghas avionics suites for the helicopters themselves and the addition of a flight deck to the navy's new sea-going training vessel.

Being based at HMAS Albatross will provide the added advantage of aircrew being able to train in realistic conditions at sea, including ship deck landing and SAR skills.

The Boeing/Thales partnership was originally named as preferred tenderer in December 2013, after beating competing proposals by Australian Aerospace, also bidding with the EC135, and a Bell Helicopter/Raytheon partnership offering a Bell 429 solution.

Initial operating capability for HATS is slated for late 2018, although the programme will begin to receive students before then.

By Tony Skinner, London

Mi-8AMTSh-Vs built without Ukrainian content

Photo: Russian Helicopters

RUSSIAN HELICOPTERS HAS SEVERED ties with Ukraine in the manufacture of Mi-8AMTSh-V tactical transport helicopters currently being built for the Russian Air Force's Army Aviation Branch.

CEO Alexander Mikheev told reporters that achieving full independence from imported equipment was a directive Russian Helicopters had received from the Moscow political leadership in light of the break in the relationship with Ukraine this spring.

Mikheev argued that in many cases new Russian-made equipment replacing Ukrainian- and Western-supplied counterparts was better and allowed for performance enhancements.

In the recent past, Russian Helicopters was over-reliant on deliveries of Ukrainian-made VK-2500 and TV3-117VMA turboshaft engines and AI-9V auxiliary power units (APUs) for the helicopters it delivered to the Russian armed forces.

It now uses Russian-made Klimov VK-2500s and Aerosila TA-14 APUs, and has introduced increased-capacity batteries allowing for prolonged avionics checks on the ground.

The new APU boasts higher output power and longer operating time in generator mode, and also has a better start-up and operational altitude – up to 19,700ft compared to 13,100ft for the AI-9V – making the helicopter more suitable for high-altitude operations.

The first batch of these entirely Russian-made Mi-8AMTSh-V helicopters was due to be ready for delivery to the Russian Air Force by the end of November.

By Alexander Mladenov, Sofia

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CLARION EVENTS

DoD seeks V-22 engine alternative


Photo: USMC

THE PENTAGON HAS LAUNCHED AN effort to find a drop-in replacement engine for all variants of the US military's V-22 Ospreys, as it seeks to rein in costs and expand the platform's operational capabilities.

In August, US Naval Air Systems Command (NAVAIR) issued an RfI seeking input from industry on 'alternate powerplant solutions' capable of powering all models of the V-22 Osprey operated by the USMC and USAF.

Allison (now Rolls-Royce) developed the AE 1107C Liberty engine for the V-22, which was awarded certification in 1998. However, questions over the reliability of the powerplant contributed to the DoD Inspector General's decision to conduct an audit into the maintenance requirements of the Osprey in 2013.

In 2012, the company had been awarded a contract to supply 268 AE 1107C engines for USMC and USAF V-22s, with a follow-on deal for an additional 40 engines for USMC aircraft awarded in February.

Rolls-Royce spokesman Nick Britton said the question of why the US military was seeking an alternative engine was better put to NAVAIR. 'We are confident that the proven AE 1107C can continue to provide the V-22 with the power and capability that NAVAIR requires,' he told *Defence Helicopter*.

USMC public affairs officer Kelly Burdick dismissed industry speculation that the RfI was issued as a result of concerns regarding the operational performance of the existing V-22 engine.

'The RfI was issued because the V-22 programme is continually investigating ways to reduce the life cycle costs of the aircraft,' she said.

'Knowing that more than 90% of the operational use of the V-22 is in the future, coupled with budget pressures, it is prudent to investigate alternatives to existing systems, and the engine is no exception.'

BUSINESS CASE

Burdick noted that the RfI was expected to produce responses that would demonstrate a business case for developing a second source for the V-22's powerplant with 'improved performance'.

While the RfI may result in responses offering engines with greater overall power than the current unit, especially at high altitude and in hotter climates, improved performance could take various forms.

'It might mean longer average time on wing, greater ease in maintaining an engine, fuel consumption efficiency, or the ability to work in extremely dirty environments. We seek to learn more about what industry could accomplish,' Burdick concluded.

Teal Group analyst Richard Aboulafia said the re-engining initiative was probably more performance-driven than cost-driven, although he noted that both factors would play a role.

'Beyond that, everything is coloured by the fact that the V-22 isn't a [US DoD] machine, it's a USMC machine. They get what they want, and the V-22 is at the core of their fleet plans,' Aboulafia observed.

'They also need more lift, particularly as the CH-53K keeps getting pushed out. Thus, they will likely be able to secure funding for this project. On a broader level, remember that the DoD's next big priority for rotorcraft is more power. The UH-60 and AH-64 are scheduled to benefit from new engines too, [so] this is clearly a secular trend.'

The RfI calls for submissions that outline a powerplant capable of being manufactured and retrofitted into 'all fielded V-22 aircraft', including the MV-22B, MV-22C and CV-22C models, with minimal impact to aircraft operation and physical systems.

'Proposed engines shall fit into the current V-22 nacelles with minimal structural or external modification. [However], options for modification of current inlet and exhaust conditioning systems will be considered,' the document states.

The performance requirements of the new engine include a maximum continuous power rating of no less than 6,100shp at 15,000rpm, with the ability to operate at altitudes of up to 25,000ft and temperatures of 130°F (54°C).

Currently, USAF CV-22s are deployed for special operations missions, while USMC's MV-22s are principally used for transportation of troops and equipment.

The US military wants its V-22 operators to have full engine capability at 6,000ft with an air temperature of 95°F. To date, the platforms have struggled to carry heavy loads in these conditions.

In 2013, Rolls-Royce increased the power output of the AE 1107C by 17% by implementing a Block 3 turbine upgrade. The increased power elevated the platform's maximum payload limitations from 6,000 to 8,000ft, improving its hot-and-high performance and reliability.

The company is said to be considering a Block 4 upgrade which would further increase power by up to 26%, producing close to 10,000hp with improved fuel consumption.

By Jonathan Tringham, London

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The M-DSA test aircraft that made its first flight at Redstone in February. (All photos: author)

Visual impact

Helicopter-mounted imaging and targeting systems play a fundamental role in ensuring mission success during military operations. **Scott R Gourley** examines recent developments in the US and the impact of manned-unmanned teaming.

Nearly a generation of lessons learned from continuous war, combined with myriad technological advances, has helped frame the past decade as a dynamic era for helicopter sensor payload developments.

This is evident in the introduction of expanded capabilities across multiple US and Western manned helicopter platforms. These include Boeing's selection of L-3 Wescam to supply MX-15 EO/IR imaging sensors for the Royal Canadian Air Force's new Chinooks; Bell Helicopter's selection of the Raytheon AN/AAS-53 Common Sensor Payload on the OH-58F Cockpit and Sensor Upgrade Program design; and the selection of FLIR Systems' Talon for installation on selected Black Hawks.

BROADER PRIORITIES

However, other investigations and demonstrations now under way are causing some to wonder if the US is reaching a 'tipping point' in the development of dedicated manned aircraft sensors.

According to Lt Col Steven Van Riper, Apache sensors product manager in the US Army's Program Executive Office (PEO) Aviation, recent modernisation efforts have reflected the broader priorities identified within the aviation community.

To illustrate his point, he offered the example of the Modernized Target Acquisition Designation Sight/Pilot Night Vision Sensor (M-TADS/PNVS), Lockheed Martin's precision targeting and pilotage system mounted on the nose of AH-64D/E Apaches.

Referring to the recent upgrade of the FLIR element, he said that the 'night side assembly' was selected for initial upgrade 'because of the types of engagements our aircrews were in'.

'Back then, following cancellation of Comanche, the army and the DoD made some very serious decisions about how to reallocate funding,' he explained. 'When PEO Aviation and then [programme manager for] Apache received that reallocation of funding, we believed the most urgent need was modernisation of the [Apache] night side assembly, which contained the FLIR and which the aircrews were using a lot back then in engagements and pilotage and other critical tasks on the battlefield.'

First fielded in 2005, the new M-TADS/PNVS FLIR sensors provide enhanced image resolution, enabling Apache aircrews to query targets and provide situation awareness in support of ground troops outside detection ranges.

'All of our resources at that time went toward completing that [FLIR upgrade] activity and getting that fielded,' Van Riper continued. 'Now we've completed that fielding and have received additional funding that we have had to prioritise in the same way we did with the original funding. And we have prioritised that now against the day sensor assembly.'

REACHING MILESTONES

The day sensor assembly effort encompasses a two-phase activity called the Modernized Day Sensor Assembly (M-DSA). A significant milestone in this programme occurred in late February 2014 when the US Army's 'Team Apache' conducted the first test flight of the system on an AH-64E at Redstone Arsenal in Huntsville, Alabama.

The full M-DSA upgrade not only enables Apache pilots to see high-resolution, high-definition near-IR and colour imagery on cockpit displays, but increases M-TADS/PNVS designation and ranging capabilities to fully accommodate current weapons and those planned for the future. It provides an additional field of view that allows image blending with the M-TADS FLIR, and enables pilots to see civilian and military lighting on a single display more clearly.

M-DSA also provides a new laser pointer/marker that improves coordination with ground troops and an updated multi-mode laser with eye-safe lasing capability that supports flight in urban environments and critical training exercises.

'The day sensor portion of the M-TADS/PNVS system is 30-year-old technology,' explained Matt Hoffman, M-TADS/PNVS product director at Lockheed Martin Missiles and Fire Control. 'As you would guess, over the years there has been a lot of wear and tear, with a lot of obsolescence issues that are becoming increasingly difficult to overcome. So it was time to upgrade that portion of the system.

'We sit in on all of the customer reviews with units that return from deployments. And the M-DSA was really the weak link, if you will, that wasn't able to be upgraded back in the 2005 time frame when we upgraded the FLIRs and the PNVS in the night sensor portion of the targeting pod.'

BREAKING TRADITION

Noting that M-DSA began as an obsolescence mitigation activity, Hoffman said: 'It was not your traditional RDT&E [research, development, test and evaluation] effort. It was unfunded and therefore we went through obsolescence mitigation, with the army working capital funds to modernise through spares. While we were modernising the system, we decided to upgrade many of the performance parameters as well.'

He also pointed to the resulting introduction of the high-definition colour imagery and near-IR noted by Van Riper, as well as: the addition of a third field of view and ability to blend with FLIR imagery; replacement of the old 'high cost-driver'-rate gyros; introduction of a new inertial measurement unit that provides greater stability at longer range; extended range algorithms for current and future weapon systems; the addition of an eye-safe laser rangefinder/designator; and movement of a new laser pointer from the gun to the gimbal.

Elaborating on the laser pointer upgrade, he offered: 'The old laser pointer/marker would point wherever the gun slewed. As you might guess, if it's pointing to friendly troops, you have to aim your weapon system at them. And that's not such a good thing.

'It also had a tendency to move around after gun firing and during flight, moving off the target

A Shadow UAS shares the ramp with an OH-58D Kiowa Warrior – the area of manned/unmanned teaming has seen rapid acceleration in recent years.

Current efforts can be traced back to the MUSIC demonstrations conducted in 2011.

line of sight. But now, with the laser pointer/marker being mounted on a gimbal it actually stays fixed in the field of view you are looking at.'

He continued: 'As part of the obsolescence mitigation effort we have also added two-level maintenance, so now at the flightline you can repair and replace the line-replaceable modules. But the real key to understand here is that we have overcome obsolescence and improved operational capability at the same time.'

TWO PHASES

The M-DSA effort was developed in two phases. Phase 1 included development of the new laser rangefinder kit and electronics modifications, and was completed in 2011, with Lockheed Martin under contract to deliver 680 kits through the end of 2015.

Phase 2 was a four-year development programme slated for completion in the second half of 2014. Van Riper said that the army's goal is to award a production contract in the FY2015 time frame, with fielding in FY2017.

While M-DSA provides several examples of dedicated sensor enhancements taking place on manned helicopter platforms, other activities now under way could signal a new paradigm in sensor developments.

Specifically, the recent acceleration of efforts in the area of manned/unmanned teaming (MUM-T) emphasise the exploitation of sensors mounted on unmanned aircraft to provide information into manned helicopter cockpits.

The bulk of the US Army's current efforts are traceable to the service's Manned Unmanned Systems Integration Capabilities (MUSIC) demonstrations conducted at Dugway Proving Ground in 2011.

'When we did MUSIC we proved the concept,' explained Ed Gozdur, deputy product manager for common systems integration in PEO Aviation. 'Now we're actually proving that this is the software that we are going to field. In MUSIC, we showed that it was possible to do the things that we did at the time.

'But now this is where we are actually looking at software that will be fielded, and we are validating and verifying that it is in fact capable of doing LOI [Level of Interoperability]-3, which is moving the payload from various platforms, as well as LOI-4, with the Apache crew actually flying both the [MQ-1C] Gray Eagle and the [RQ-7B] Shadow. So it's pretty exciting. In our field things sometimes move glacially, but we've moved pretty quickly down this path.'

FAMILY VALUES

The path noted by Gozdur included a series of summer 2014 demonstrations titled the 'Family of Systems' test event.

Doug Wolfe, chief of the interoperability branch in PEO Aviation, has been leading much of this effort. 'About three years ago, we did an initial interoperability demonstration/test called MUSIC,' he said. 'And since that time we've done a lot of work to improve the performance and capabilities of MUM-T between both Apache and our UAS, and the One System Remote Video Terminal [OSRVT] and our UAS. We're at the point now where we're doing verification and we plan on fielding these capabilities beginning in the FY2015 time frame.'

Wolfe said that in the late August/early September time frame PEO Aviation had focused on field testing the Gray Eagle UAS, with OSRVT controlling its sensors.

'We've also done testing between an Apache and Gray Eagle,' he noted. 'Over the next two weeks [late September] we're actually going to do a flight test where hopefully we'll be flying, and both the Gray Eagle sensors and UAS itself will be controlled by the Apache.

'And [in mid-September] we'll be doing Apache and OSRVT testing with a Shadow UAS,' he continued. 'Yesterday [10 September] we had an Apache take control of the sensors on a Shadow while the [UAS] was in flight.'

He said that weather permitting, the next logical demonstration step would involve the transfer of Shadow UAS flight control to the Apache.

NEW POSSIBILITIES

Asked whether the MUM-T demonstrations open the possibility of bringing new sensor data into the manned aircraft from unmanned aircraft, Gozdur responded: 'That's exactly right,' adding that current army plans call for the Family of Systems test to be an annual event. 'We plan on this being the way we ensure that this capability remains up to date in the field, making sure that we can still do it and that nothing has occurred during the development that would interfere with its operations.'

Gozdur was quick to attribute the acceleration of MUM-T achievements to the time and efforts that have been directed from across both the manned and unmanned communities towards the development of inter-operability profiles (IOPs).

'We prepare IOPs of the requirements that these airplanes and payload developers have to follow to make sure that they can talk to each other,' he said. 'And the IOPs are transferred into real working scenarios and platforms that can support interoperability. So it stems from the IOPs and now it's providing a real "no-kidding" warfighter advantage.'

Gozdur noted that current coordination of sensor platforms focused on currently fielded UAS payloads.

'Right now we're looking at EO/IR and HD EO sensors,' Wolfe echoed. 'That's the only thing we're going to be providing to the Apache through our initial fielding. But we're having conversations about what else could be provided sensor-wise down the road.'

Offering his own thoughts to warfighters about the significance of full MUM-T fielding in the near future, Lt Col Bill Venable, product manager for common systems integration in PEO Aviation, explained: 'Think of an Apache sitting on a FARP [forward area refuelling point] somewhere preparing to go into a hot LZ and attack the enemy. With MUM-T, he's got eyes in the sky that, if he wants to, can overlook the area; he can control what he's looking at; or he can control the flight as well as what he's looking at. MUM-T is a force multiplier for manned aviation [exploiting] what UAS brings to the fight.'

Reliance on UAS sensors by manned helicopters would be a capability that fits well within the army's ongoing Aviation Restructuring Initiative.

'Based on our employment guidelines we're going to be employing these systems together – Apaches, Gray Eagles and Shadows living in the same organisation,' Gozdur concluded.

'So all of a sudden you are extending the Apache's sphere of influence, and instead of just "seeing what he can see", he can actually see a whole bunch more by taking advantage of the payloads on those platforms.' ***DH***

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Service status

Due to a lack of airworthy AS332 C1s, the TNI-AU is operating the single-engined EC120 Colibri in the SAR role. (All photos: author)

The Indonesian armed forces are currently running a number of helicopter acquisition and upgrade programmes that will significantly enhance their ageing fleets. **Alan Warnes** visited Air Squadron 7 of the Indonesian Air Force in Kalijati, Subang, to find out more.

It is not surprising that Indonesia has one of the largest fleets of military helicopters in Southeast Asia. The country is the biggest archipelago in the world, with vast expanses of sea, tough jungle-like terrain and remote outlying areas, making rotorcraft a good solution. Such aircraft are also ideal for operations in the country's mountainous regions, where runways are scarce.

Indeed, both the Indonesian Air Force (TNI-AU) and Indonesian Army (TNI-AD) currently have ongoing helicopter procurement programmes. The latter will soon become the first air arm to operate both the Mi-35 and AH-64 Apache attack helicopters when the latter are delivered in what is believed to be late 2015.

The military operates most of the helicopters in-country for training, SAR, counter-insurgency, counter-piracy, tactical support and VIP purposes.

Much of the fleet is built and supported by Indonesia's aerospace giant PT Dirgantara Indonesia (PTDI), which has industrial cooperation agreements with Airbus Helicopters and, until recently, Bell Helicopter.

TRAINING PHASES

After graduating from the TNI-AU Flying Academy at Yogyakarta – first on the FFA AS 202 Bravo (60 hours) and then the Beechcraft T-34C (120 hours) – new pilots streamed to fly helicopters will head to Kalijati airfield in Subang about 120km southeast of Jakarta to join Air Squadron 7 (Skadron Udara 7/SkU 7).

In the first of the unit's hangars sits a line of 11 elderly ex-Royal Australian Army Bell 47G Sioux, a sight unlikely to be seen anywhere else in the world. First delivered between August 1965 and January 1969, eight are now back in service despite initially being retired when the EC120 Colibris were delivered.

The aircraft originally entered TNI-AU service in July 1978, but were returned to Australia for a Soloy conversion to boost their performance in 1984.

A shortage of SAR helicopters in recent years has meant they are back in the air, providing new pilots with a mount to learn basic flying skills. With spares secured and their original engines replaced with a newer variant of the Rolls-Royce M250 turboshaft, the Soloys are likely to be snapped up on the civil market when they finally retire.

Around 20 pilots a year complete the 50-hour basic handling/flying course, which lasts around six months and teaches helicopter manoeuvres, such as hovering, taxiing and emergency procedures.

TYPE TRANSITION

After the delights of flying a basic helicopter, the new rotary-wing pilot heads across the ramp to operate the EC120 Colibri. The fleet of 12 single-engined five-seaters was purchased from Eurocopter (now Airbus Helicopters) in 2001, to fulfil a training role that would allow the Soloys to go into well-earned retirement.

'After flying 30 hours learning the fundamentals of the EC120, you qualify as a co-pilot,' Capt Oktav Iounis, one Colibri pilot, told *Defence Helicopter*. 'To become a captain, you will need to fly 500 hours; and an instructor, 800 hours.'

In 2010, SkU 7 formed the only helicopter aerobatic team in Asia, known as 'Dynamic Pegasus', flying five EC120s. The team usually performs at military events, but every other year can be found at the Indo Defence exhibition in Jakarta.

Technical issues with the TNI-AU Super Puma/Puma fleet mean the EC120s are being used to cover SAR responsibilities at Yogyakarta, Madiun-Iswahyudi, Pekanbaru and Pontianak. Cover for the first two is provided from Kalijati, but there are detachments at Pekanbaru (Sumatra) and Pontianak (West Kalimantan).

While *DH* was at Kalijati, a Colibri complete with floats and a life raft inside was dispatched across the sea to Pekanbaru to replace another example. The two-man crew were due to stay there for a month before being replaced by another crew.

With the EC120 being used for tactical work rather than instruction, there are aspirations to acquire a small fleet of EC135s to cover SAR requirements. This would allow the Colibris to get back to flight training and the Soloys to retire.

ORIGINAL REQUIREMENTS

In 1976, Indonesian aerospace company Nurtanio (later IPTN, and now PTDI) commenced assembly of the SA 330 Puma to fulfil a much needed medium-lift helicopter requirement for the military. This ultimately led to 18 being delivered to the TNI-AU, with the first arriving in 1979. Unfortunately, eight have been lost in accidents, while several have been transferred to the Ministry of Security.

Today, there are seven NSA 330J/L Pumas on charge with SkU 8 at Atang Senjaya in Bogor, working with ground troops and special forces (Koopsau). Unfortunately, things have not been going well for the unit which specialises in troop transportation. One SA 330J has not flown since 2004 and is now with the TNI-AU maintenance facility at Bandung. Of the four SA 330Ls, one is

PTDI has been working with Bell Helicopter since 1984, supplying over 60 Bell 412s. This example is one of the last three 412EPs to be assembled at Bandung.

Also one of the last to come off the Bandung assembly line, this AS332 C1 is much needed by the TNI-AU.

flying with SkU 8 and the other three are at Bandung. A total of three Turbomeca Makila-powered SA 330SMs were also in service, although only two remain after one crashed, allegedly due to an electronics problem that has grounded the others.

The TNI-AU NAS332 L Super Puma fleet has led a chequered career as well. Of 18 ordered, only seven have so far been delivered. The problem, according to one source, is that if PTDI receives an export order, 'they divert the TNI-AU aircraft to the customer'.

SkU 45, a VIP helicopter unit based at Halim Perdanakusuma, operates three PTDI-assembled NAS332 L1s, alongside two Airbus Helicopters-built AS332 L2s. The latter can be recognised by their four rotor blades and sponsons.

Meanwhile, SkU 6 at Atang Senjaya is the TNI-AU's only NAS332 C1 tactical unit, tasked to man the SAR detachments at the fighter and training bases.

Having only four of these medium-lift helicopters has been made worse by just two apparently being airworthy. One is detached to Makassar (South Sulawesi) as SAR cover for the based Su-30s, and the other is flying after overhaul at Bandung. The remaining pair are suffering from gearbox problems and are still believed to be grounded, although *DH* could not confirm this.

INDUSTRY RESPONSE

In late 2013, *DH* contacted Eurocopter about these issues. The company responded: 'Eurocopter has been a partner of Indonesia's aviation industry, working closely with PTDI for over 35 years. The Indonesia Air Force has a fleet of six Pumas and ten Super Pumas, as well as 12 EC120 Colibris. There are two Super Puma units yet to be delivered by PTDI, which is producing the Super Puma under licence.

'We are not aware of any technical issues associated with their fleet. The helicopters are either flying or undergoing maintenance works. The Indonesia Air Force and PTDI have been kept informed every step of the way and are well aware of the processes to keep their helicopters flying, during the occurrence of the Super Puma main gearbox shaft issues. That being said, none of their helicopters have been impacted by the shaft issues in fact.'

With all these problems with the NSA 330/NAS332 fleet, it is no wonder the TNI-AU has ordered six EC725s. They should be delivered in 2014/15 for the special forces/CSAR role, with a new unit, SkU 9, to be established at Kalijati. It is unclear if they are taking the place of the eight Super Pumas that were never delivered.

Most of the helicopters in service with Indonesia's military have been assembled at PTDI's Bandung facility in cooperation with Airbus Helicopters and its predecessors. The agreement allows the local company to market helicopters and subsequently build them for customers in the Asia-Pacific region.

LONG-TERM PARTNERSHIP

In a partnership that goes back to 1976, PTDI has licence-built 123 Bö 105s, 11 SA 330s and 19 AS332s. Today, an assembly line for the EC225/725 is operational after a $42 million contract was signed in October 2008, which is expected to see production continue for at least ten years.

It led to an initial batch of tail booms being completed in March 2010 and assembly work for the first EC225/725 fuselage commencing on 15 November 2011. A further teaming agreement was signed on 1 July 2011 to cover industrial cooperation and the marketing of Eurocopter products to Indonesia's government departments.

Henri Stell, deputy VP of sales for Asia-Pacific at the company, said at the time that both companies could capitalise on each other's

An NSA 330L Puma hovers over Atang Senjaya while an injured special forces operative is pulled up. Six EC725s on order will replace the Puma in this role.

strengths. 'PTDI's strong local insights, network and solid infrastructure, and Eurocopter's global strategy and network coupled with having the world's widest helicopter product range [will] secure upcoming local procurement programmes and grow the business together.'

The deal has indeed reaped dividends, with Indonesia's military ordering more than 40 helicopters.

These include 12 AS350/AS355 variants (one AS350 B3, six AS355 NPs and five AS550 C3 armed scouts for the army); and six EC725s, along with a requirement for up to 12 EC145s for the air force.

In mid-2014, the first three EC725s and a sixth fuselage were seen on the production line at Airbus Helicopters' Marignane factory in France. As part of the deal, signed on 5 April 2012, the rotorcraft will be shipped to PTDI's Bandung facility for re-assembly and fitting out before delivery to the TNI-AU in 2015.

SHARED VOICE

While Airbus Helicopters has played a significant part in co-production at PTDI over the years, it has not had it all its own way. Since 1984, the latter company has been manufacturing under licence the Bell 412SP/HP, and when it signed an MoU with Bell Helicopter in August 2009 – to collaborate on supplying helicopters to the Indonesian government – there were already 31 locally assembled Bell 412SP/HPs in country.

This latest deal led to 30 412EPs being ordered by the Indonesian military, with 24 destined for the TNI-AD. Deliveries commenced in 2011 and the last three examples are now on the assembly line.

The TNI-AD focuses much of its attention on militants in Aceh and Kalimantan as well as regular humanitarian crises that Indonesia faces most years. Last summer saw extensive flooding in Jakarta, where army helicopters were called in to rescue hundreds of stranded people.

The service now has the bulk of the helicopters operated by Indonesia's military, based at two facilities: Pondok Cabe on the outskirts of Jakarta; and Achmad Yani in Semarang. Army Aviation Squadron 11 (Skadron Udara Angkatan Darat 11/SkUAD 11) at the former location concentrates its operations on supporting the needs of the army in and around the capital, with Bö 105CBs used for scouting and liaison and 412EPs for troop transportation.

The main flying facility is Achmad Yani which has three based units. SkUAD 11 operates Bell 205s, Bö 105s and NB 412s, while SkUAD 31 uses the Mi-35P gunship, Mi-17-V5s and NB 412s.

Meanwhile, helicopter training is carried out by the Training Squadron (Sekolah Penerbang) with Bell 205s, Bö 105CBs, NB 412s and Schweizer S-300Cs.

SkUAD 31 has taken delivery of 12 Kazan Mi-17-V5s in two batches of six – in July 2008 and August 2011, although one was written off on 13 November 2013 when it crashed in the jungle of North Kalimantan. The helicopter was transporting workers and building materials for the construction of a border security post when it came down, killing 13 of the 19 on board. Working alongside the Mi-17-V5s are seven Mi-35Ps with the final pair arriving on 20 March 2013.

SPARES SOLUTION

According to an Indonesian source, spares are a problem with the Russian helicopters, and this goes some way to explaining why the TNI-AD is set to receive eight AH-64E Guardians, as announced by US Defense Secretary Chuck Hagel in August 2013.

The FMS deal, made via the US Army, is worth around $500 million. However, the original Defense Security Cooperation Agency notification was valued at around $1.42 billion in associated weapons (including 32 Hellfire missile launchers and 140 AGM-114R3 rounds), support and other equipment.

'The AH-64Es will defend borders, conduct counter-terrorism and counter-piracy operations, to ensure the free flow of shipping through the Strait of Malacca,' the US government announced at the time.

Half of the aircraft will be based on the Natuna Islands, off the northwest coast of Borneo, to protect Indonesian interests in the South China Sea, while the others will be stationed at Pondok Cabe.

Up to 20 S-70s are also expected to be ordered, but again no formal announcement of this has been made. With the acquisition of so many new helicopters, the TNI-AD has stepped up its training requirements for around 100 additional rotary-wing pilots over the next few years. As a result, two S-300Cs were ordered in April 2012, with four on option.

Meanwhile, all the Indonesian Navy's fleet of helicopters, just like its fixed-wing platforms, are based at Lanudal Juanda at Surabaya. Pilot training is carried out on three EC120 Colibris with Skadron Udara (RON) 200 before progressing to the other rotary-wing units – RON 400 flying NB 412EP/SPs and NB 105CBs; or RON 800 operating the NAS332 F. The Bö 105s and NAS332 Fs can operate from the navy's *Ahmad Yani*-class frigates. ***DH***

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A cold snap

The new-generation Ka-52 Alligator is now in widespread operation across Russian forces. **Alexander Mladenov** looks at the current status and future development prospects of what is the country's most important attack helicopter programme.

The Ka-52 is easier to produce and support than its predecessor due to high automation and built-in test equipment. (Photo: author)

The new-generation Kamov Ka-52 Alligator attack helicopter has now been delivered to approximately one third of Russian Air Force Army Aviation (RAA) frontline units.

The aviation plant at Arsenyev in Russia's far east, officially known as AAC Progress, is currently busy with production of the baseline model at an annual rate of between 15 and 20 units. It is also completing a batch of four pre-series examples of the shipborne Ka-52K derivative, scheduled for full-rate production by 2015.

The two-seat design of the baseline Ka-52 has ample scope for further development and modification to new roles. However, Sergey V Mikheev, Kamov's designer general, told *Defence Helicopter* that he does not rule out the resurrection of the original single-seat concept for anti-helicopter and -UAV applications.

EARLY YEARS

The Ka-50/52 family originated in the late 1970s when the Soviet military sought a more or less direct counterpart to the Boeing (then Hughes) AH-64 Apache, ordering parallel development and comparative trials of two all-new heavily armoured, highly agile designs.

All engine and system information for both crew members is displayed in the centre of the instrument panel on two screens. (Photo: author)

The Kamov Experimental Design Bureau, led by Mikheev, offered a rather unorthodox solution, while its competitor Mil proposed a design closely resembling the Apache, albeit with better armour protection and higher take-off weight.

The single-seat Ka-50 was conceived as an anti-tank helicopter with co-axial rotors, equipped with a powerful and automated day-only targeting suite and integrated with long-range anti-tank guided missiles (ATGMs).

The first prototype conducted its maiden flight in June 1982, and following a prolonged head-to-head two-phase competition with Mil's Mi-28, the Ka-50 was eventually declared the winner and put forward for full-scale development.

The first production-standard machine, built at AAC Progress, followed suit in 1991. The type, dubbed 'Black Shark' in Russia and 'Hokum' by NATO, was formally commissioned with the RAA in August 1995 – four years after

the demise of the Soviet Union. However, its production was terminated shortly afterwards due to funding shortages.

VERSATILE ALLIGATOR

The two-seat Ka-52 was a follow-on development of the baseline model, retaining 85% design commonality. It introduced a new two-seat front section and avionics suite, while the rest of the fuselage and rotor system remained virtually unchanged.

In contrast to its predecessor, which was optimised for anti-armour battlefield operations, the Ka-52 was intended for a wider range of missions, such as armed reconnaissance, attack and C2 in both linear and non-linear warfare.

Produced by converting a pre-series Ka-50 airframe, the Alligator's first prototype conducted its maiden flight in June 1997. Initially, development was as a company-funded venture by Kamov, although government support was granted in the early 2000s.

The first four production-standard Alligators were completed by AAC Progress in the second half of 2010, and in December that year the machines were handed over to the RAA's 34th Combat Training and Aircrew Conversion Centre at Torzhok, where they undertook field trials and were used to train an initial instructor cadre. New round-the-clock combat tactics, techniques and procedures were also developed.

Some six months later, the RAA's first frontline unit received its initial Ka-52 batch. By mid-2014, 53 examples were reported to have been taken on strength by the RAA, although one crashed in March 2012. A dozen new Alligators were also reported to have been completed and tested at AAC Progress, with handover to the service expected in late November or early December.

Another six examples are slated to be delivered by year-end, bringing the total figure to 71. Unit price of the Ka-52s manufactured in 2012 and 2013 is reported to be around $25 million.

BATCH PROCESSING

The Ka-52 will eventually see service-wide operation within the RAA. A total of three batches have so far been ordered in an effort to recapitalise the majority of the branch's

Ka-52 specifications

DIMENSIONS

Fuselage length: 13.53m
Length with rotors turning: 16m
Stub wingspan: 7.3m
Height: 4.95m
Main rotor diameter: 14.5m

WEIGHTS

Empty weight: 7,800kg
Normal take-off weight: 10,400kg
Max payload: 2,300kg
Internal fuel: 1,487kg
External fuel: 17,320kg*

PERFORMANCE

Max speed: 167kt
Max cruising speed: 145kt
Max rate of climb at sea level: 15m/s
G-limits: +3.5/-1.3
Service ceiling: 17,000ft
OGE hover ceiling in ISA conditions: 12,800ft
IGE hover ceiling in ISA conditions: 14,250ft
Combat radius: 200-250km**
Ferry range: 1,080km

** in four underwing tanks*
*** on internal fuel with 5% reserve*

By mid-2014, the AAC Progress plant had rolled out 65 production Ka-52s, plus five prototypes and pre-series examples. (Photo: author)

worn-out attack rotorcraft fleet. The first of these, originally ordered by the Russian MoD in 2008, comprised 12 examples; the second one called for 36, with the final aircraft delivered in 2013; and the third batch includes 146 under a RUB120 billion ($3 billion) contract signed in 2011 – deliveries will be made between 2014 and 2020.

The Ka-52 is slated to equip between ten and 12 attack units in most if not all frontline RAA squadrons, which will each operate between 16 and 21 of the machines. For instance, the 575th Air Base at Chernigovka now has 20 Alligators, the 393rd Air Base at Korennovsk has 16, the Combat Training Centre at Torzhok operates seven more, and the newly established 15th Army Aviation Brigade at Ostrov will eventually receive 21.

The Ka-52 has been praised by RAA aircrews for its relatively easy controls, excess power availability and lack of performance degradation, even in demanding hot-and-high conditions. System reliability has also reportedly been improved.

SYSTEMS AND WEAPONS

The side-by-side cockpit of the Ka-52 features dual controls. The left-hand seat is occupied by the pilot, who has an ILS-31 head-up display used for control and aiming the forward-firing weapons.

The right-hand seat is occupied by a navigator/operator, who controls the sensors and fires the ATGMs, although he is also able to fly the helicopter if needed. This seat can also be occupied by an instructor for conversion-to-type training and proficiency check rides.

Meanwhile, the open-architecture BREO-52 integrated avionics suite provides future growth capability, employs dual Baget-53-17 high-speed processors and is based on a GOST R 52070-2004 digital databus, equivalent to MIL-STD-1553B.

The mission suite includes the BKS-40 communication system with secure VHF/UHF and HF radios as well as a data link for sharing tactical information with other helicopters or ground/airborne C2 centres. The Briz wideband data link enables exchange of information such as video and radar images, targeting/positional data and images from the cockpit.

MISSION CORE

The UOMZ GOES-451 optronic payload, which is 640mm in diameter and weighs 220kg, is the core of the Alligator's mission avionics suite, providing daylight target detection and targeting of laser beam-riding missiles.

The large turret assembly is installed under the nose and houses: a gyro-stabilised platform

The GOES-451 multi-sensor payload is used for both targeting and night flying/navigation. (Photo: author)

with dual TV cameras (one narrow field of view, the other wide); thermal imager; laser rangefinder/designator; laser spot tracker; and ATGM laser-beam riding guidance system.

It is claimed to facilitate detection of tank-sized targets at night within a 5-6km range, and identification at 3-4km. During the day, the TV sensor package (provided with x4 and x10 optical magnification) has useful ranges of up to 10km.

The GOES-451 is also integrated with the SOVI image enhancement system, which improves the quality of imagery supplied by both the IR sensor and the TV camera, aiding target classification and identification capabilities. The latest production derivative of the GOES-451 also supports low-level navigation at night by introducing an additional sensor package with a TV camera and an uncooled thermal imager.

X FACTOR

The targeting suite incorporates the X-band FH01 Arbalet-52 radar set (8mm wavelength), with a large parabolic antenna scanning a 120° sector in front of the helicopter – 60° left and right. Developed by Phazotron-NIIR, it is claimed to be the first attack helicopter radar fielded in service in Russia, and is useful for night and adverse weather operations, provides target detection and obstacle avoidance data to facilitate ultra-low altitude flying as well as mapping underlying terrain. The radar also features a moving target indication mode.

Shipborne Ka-52K

The first prototype of the Ka-52 during ship suitability trials on board the ASW ship *Admiral Kulakov* in the Barents Sea in 2011. (Photo: Kamov)

THE REQUIREMENT FOR DEVELOPING a dedicated landing deck-capable derivative of the Alligator in the late 2000s was an unexpected turn for the Ka-52 programme, although Sergey Mikheev asserted that during the design phase of the Ka-50 in the early 1980s, the team had already worked up a set of solutions making it suitable for such operations.

The first prototype Ka-52 carried out evaluation of the suitability and strength of the existing undercarriage design, operating off the small deck of the Russian Northern Fleet's large ASW ship *Admiral Kulakov* in the Barents Sea in 2011.

The shipborne Ka-52K, dubbed Katran (spiny dogfish), retains the targeting suite and weapons mix of the baseline model. However, its navalised airframe features: enhanced corrosion resistance; an all-new life support system for crew members flying in immersion suites; and new navigation aids for deck landings. The stub wings and rotors can also be folded in order to reduce the footprint when stored inside a ship's hangar.

The Ka-52K development contract was signed in 2012, and in 2013 AAC Progress commenced production of four prototypes, the first three of which are slated to take to the air for the first time in late 2014. Following this, a batch of 32 production-standard Ka-52Ks will be delivered to the Russian Navy's aviation service from 2015 onwards. These will operate from the deck of the two *Vladivostok*-class amphibious assault, command and power projection ships.

According to Mikheev, Kamov is well suited to develop follow-on Ka-50 and Ka-52 derivatives for naval use. One of his proposals, for example, calls for an airborne early warning version, utilising an array of conformal radar antenna panels for 360° coverage and electronic boxes housed in external pods.

He claimed that such a design will be better than the current Ka-31 – designed in the late 1980s – that features a large rotating antenna under the fuselage that creates huge stability and control problems and requires the use of a sophisticated automatic flight control system.

With the Ka-52 operating at between 130 and 460ft, railway bridge detection range of the Arbalet-52 is 32km, while air targets can be detected at between 11 and 15km, main battle tanks at 12km and power lines at 20km.

The cockpit lighting is NVG-friendly and pilots are issued with Geophizika-NV GEO-ONV-1-01K NVGs, which are tailor-made for the Ka-52. The goggles feature a pyrotechnic device for rapid decoupling of the power supply cable in case of crew ejection, and are claimed to work sufficiently at low altitudes, helping crew detect obstacles out to a distance of 1km in average night lighting conditions.

The GEO-ONV-1-01K also enables the Ka-52 pilot to perform take-off, hovering and level flight at altitudes between 50 and 200m at night, as well as approaches and landings onto unprepared and unlit areas.

INTEGRATED SUITE

The Ka-52 is reportedly the first Russian helicopter to contain an integrated self-protection suite, the L370V52 Vitebsk-52, which was commissioned in November 2011. It integrates L370-2-01 Reagent missile approach warning sensors for 360° coverage in azimuth, L140 Otklik laser warning sensors, UV-26 chaff/flare dispensers (four units with 120 rounds), as well as a new-generation IR jammer system with two L370-5 downwards-pointing jammer heads located side by side beneath the fuselage to cover 360° in azimuth and 90° in elevation. The SPO140 Pastel radar warning receiver is an optional system that current production Ka-52s can accommodate.

The expanded weapons suite is housed on six hardpoints under the short stub wings. Guided weapons include: the 9M120-1 Ataka-1 (AT-9) ATGM; the 9A4172K Vikhr-1 (AT-16) long-range ATGM, which was already integrated on the Ka-50; and the 9M342 Igla air-to-air missile.

The Ataka-1 ATGM, carried on one or two six-round launchers, is modified by addition of a laser beam-riding guidance mode, allowing it to be integrated with the Ka-52's UOMZ GOES-451 optronic payload and receive steering commands after launch. Maximum range is 6km, while minimum engagement range is 1km. It is also capable of perforating 850mm of rolled homogenous armour after defeating reactive armour.

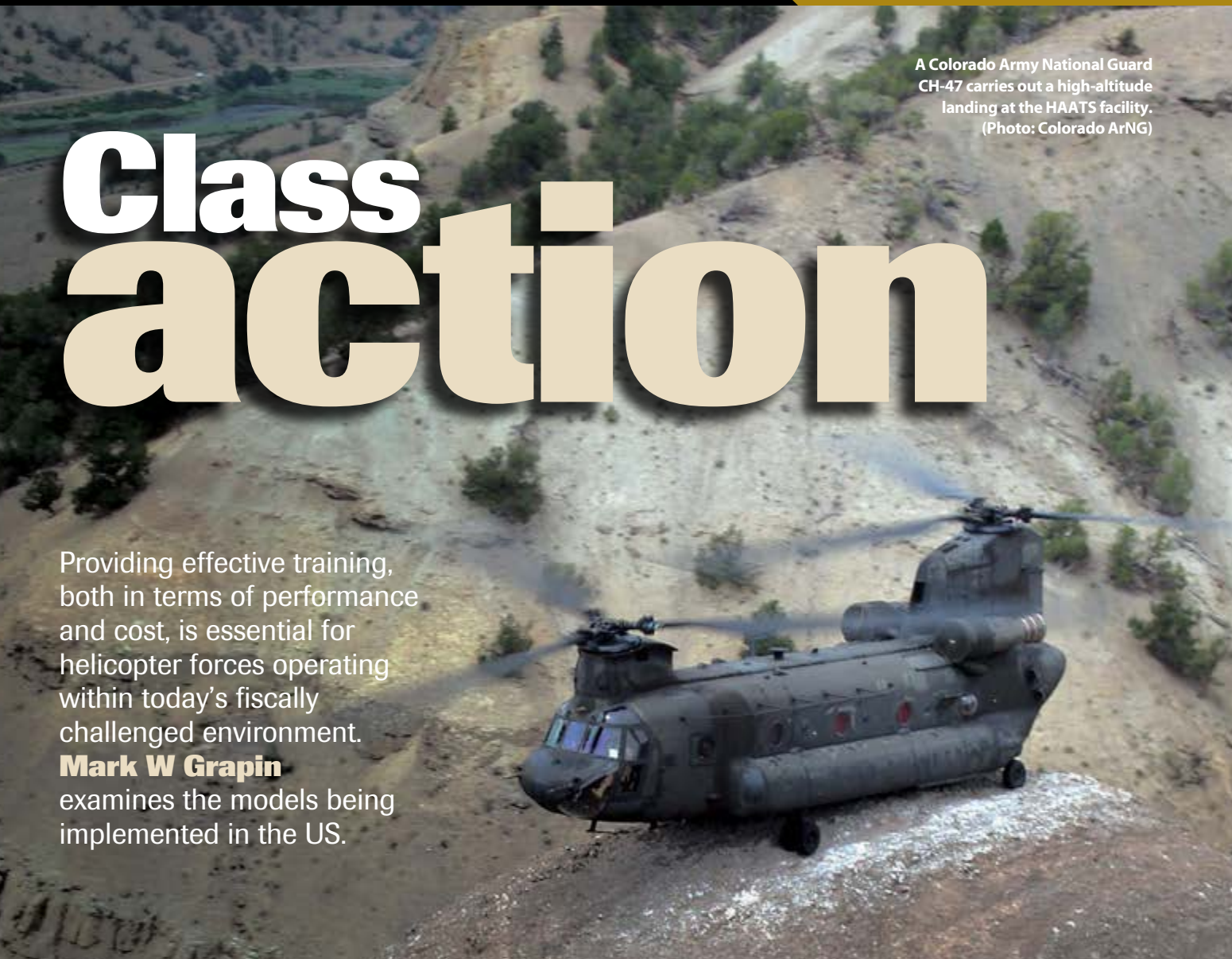
The 9A4172K Vikhr-1 is claimed to be one of the most modern and powerful helicopter-launched ATGMs in Russia today, and it resumed full-scale production in the second half of 2013. The missile employs laser beam guidance and the Ka-52 can carry up to 12. It has a maximum range of 10km in clear weather during the day, and armour penetration capability is between 800 and 1,000mm of reactive armour after dealing with dynamic protection.

UNIQUE APPROACH

Both crew members sit on Zvezda K-37-800 ejection seats, allowing simultaneous bail-out through the canopy after jettisoning the rotor blades. They are, in fact, dragged out by a rocket with a subsequent rapid parachute deployment during the sequence, while the seat remains inside the helicopter. The ejection system is cleared for use at speeds up to 216kt and from ground level up to 13,000ft.

In case of emergency landing, survival of the crew is enhanced through a rugged and energy-absorbing landing gear and crashworthy seats.

The production-standard Ka-52 is powered by two Klimov VK-2500 tuboshafts each producing 2,400shp, with emergency rating in one engine inoperative conditions of 2,700shp that can be maintained at temperatures of up to 45°C for five minutes. ***DH***



A Colorado Army National Guard CH-47 carries out a high-altitude landing at the HAATS facility. (Photo: Colorado ArNG)

Class action

Providing effective training, both in terms of performance and cost, is essential for helicopter forces operating within today's fiscally challenged environment. **Mark W Grapin** examines the models being implemented in the US.

With innumerable influences and interests pushing into the space immediately behind the cyclic, the management of training for each seat is subject to change on a moment's notice.

'In only a generation, we have seen a dramatic shift from airmanship-based competencies to systems-based expertise, steeped in aircrew coordination techniques,' stated Brig Gen Benjamin F Adams III, deputy commanding general of the US Army Aviation Center of Excellence at Fort Rucker, Alabama.

Standardisation of such training between allies has become nearly impossible, resulting in reliance upon the talent sets of liaison officers and battlefield frequency management.

Broad generalisations may be made with regard to the influential factors behind the training of today's military helicopter flight crews: the necessary qualifications and conditions of the pilots themselves; the equipment they are to operate; the environment they are to operate within; the body of regulations under which they are to operate; mishap history; and the funds available to train each of the skills required to execute these mission sets.

Adams also offered the perpetual wild card of contingency operations – training for missions not clearly defined, and the development of new tactics, techniques and procedures (TTPs).

CONTEMPORARY COCKPITS

While old films provide a stereotypical impression of how armies select and train their flight crews, little of that paradigm survives into the digital generation. Where perfect vision and hearing were once mandates – and many remain – fewer are able to meet these rigorous standards at service entry stations.

Even subtle changes in vision requirements compel a shift in how NVGs, on-helmet and windscreen-projection FLIR systems are manufactured and installed, and how the effective use of each of these devices is taught.

Conversely, with the introduction of new systems comes the opportunity to tap the electrons flowing through each for real-time monitoring and recording of each flight in every aircraft from half a world away.

This ability to 'see' into the cockpit from the commander's desktop also affords real-time, real-world feedback as to the effectiveness of training conducted only an hour or so earlier.

The axiom that every vendor offers a better mousetrap proves true in everything purchased, from lighter – yet more robust – airframes, to better uniforms and sharper data link images.

Funding aside, the largest consideration behind hardware and software acquisitions is usability for the selecting service, as well as relevance to its missions. What may work well for a sea-level-centric force in the Americas may be of very little use in the rarer air of the Alps.

Standardisation of each suite or fleet of equipment remains in a constant state of flux, which directly triggers training in every spare moment of non-operational flying.

On that point, Adams offered: 'The US Army has had to shift their approach to training in the last few years from "train as you fight" to "train while you fight".

'Many of our combatant commanders have made it clear there simply isn't time in the combat zone to cease operations to train, so many have adopted innovative methods of embedding training within their operational missions.'

RIGOROUS POLICIES

In response, and to stem a glut of 'non-standard' equipment being purchased locally, US Army Aviation and Missile Command found it necessary to implement more rigorous policies governing such practices.

Being pressed to do more with less is one aspect of the push for more simulation in nearly every nation's military helicopter training – this is certainly less expensive than fuelling and flying the live aircraft equivalent. And, while there are clear advantages in being able to program a simulator to train in diminished conditions with compromised aircraft capabilities, there are two immediate downsides.

First, according to Adams, a simulator is a simulator, not a replicator. There is always a brief lag between what is seen and what is felt in any such device, and only so much reality can be programmed into the software. Those who train in full-motion simulators will attest there is a certain amount of gamesmanship that is not inherent in the live aircraft.

Despite being described as 'mobile', systems such as AVCATT require a degree of effort to relocate from one site to another. (Photo: US Army)

While frequent training in emergency procedures and diminished capability operations has its advantages, this comes with a trade-off in a perceived sense by the aircrews that they are indeed flying something other than the real aircraft.

This sense has a deleterious effect in usage rates of motion and non-motion simulation devices – so much so that the US Army Chief of Staff issued guidance mandating fuller usage of current simulation devices.

PRIMARY CONCERNS

One of the chief complaints from users of such devices is the perceived lack of availability – each 'mobile' device, such as the Aviation Combined Arms Tactical Trainer (AVCATT), requires extensive coordination and substantial effort to relocate.

Secondly, devices such as AVCATT have no proprioceptive motion capability – the flight crew simply watches the results of its primary control manipulations on LED screens and interchangeable cockpit dashboards and consoles. Within this general category of funding, even the best perceived simulation device is of little use unless it is actually used.

Between aircraft on the same flight ramp, and between aircraft and the servicing simulator, there is a constant challenge in maintaining system parity.

A Doppler/GPS control head in a simulator is of no value to the training flight crew if it reflects an obsolete component that was replaced in the line aircraft a year or more earlier.

However, the issue of component compatibility ties directly to funding concerns, and the value of the time in both the simulation device and live aircraft – with the potential downside of a negative habit transfer between the two.

Even between 'identical' aircraft belonging to the same military unit, it seems many offer different control heads, annunciator lights and gauges/dials in different locations.

UNIFORM APPROACH

Muscle memory becomes moot among such disparities, which amplifies the likelihood of human-error-induced mishaps. From a fiscal and logistical standpoint, every change to a live aircraft cockpit compels the same change to the employed simulation device, and programmes of instruction for training must correspondingly be modified for both environments.

In the wake of mishaps, shoot-downs, equipment purchases and changes in the environment, a common denominator involves the changes required to a unit's TTPs.

A cascading effect of training becomes warranted nearly every time such changes are introduced – from an aircraft or component manufacturer's representatives to the service's chief standardisation and training officers, down to instructor pilots and maintenance bosses, to line pilots and supporting crews.

While platform instruction or simulation sidesteps the costs incurred for fuel and time-based component replacement, it does come at the price of flight crews being away from their operational cockpits.

Often, this training alters subtly each time it changes hands between echelons of units and instructors. To that end, many services have come to heavily rely on the defined roles of their standardisation staffs – those charged with instructing the instructors, and maintaining the consistency of this instruction.

While some aspects of training and aircraft operations are well-standardised, at least one highly visible mission appears surprisingly so, even between nations – helicopter rescue hoist operations.

UP TO STANDARDS

A number of factors influence standardisation during these missions: similarity of the situation, regardless of location and type of aircraft flown; core competencies of the crews operating such equipment; same general characteristics of the hoist equipment; and the likely catastrophic outcome from for mishandling or misusing the equipment.

These major considerations seem to simplify standardisation concerns from unit to unit and service to service, but amplify the imperative by which such training is conducted. Consider the oscillation induced in more than 35m of cable splayed in an out-of-ground-effect hover. Unless such an oscillation is proactively abated, a whipsaw effect is likely to thrust the cable and hook into a main or tail rotor, and doom the aircraft.

While simulation devices clearly have their limitations – even when using 100% of their available time – there are distinct advantages offered in the inherent ability to

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Simulation instructors often use the full range of a system's capabilities to record and replay scenarios, breaking down tasks to their essential elements and critiquing implementation.

While intimidating to some pilots, this data-streaming capability gives commanders and instructors real-time feedback on how to develop the next training scenario.

TECHNOLOGICAL ENHANCEMENTS

Simulation training and scenario-based aircrew coordination have also expanded beyond the cockpit with recent simulator enhancements to include HD graphics, HMDs and comparably equipped crew chief and door gunner stations.

Aviators often attribute more realistic training scenarios to the inclusion of all members of the flight crew within the simulator – some aviation safety professionals even cite a downward trend in human-error induced mishaps as a result of such enhancements.

Although not widely applied, specialised hot, high and heavy operations instruction appears to be chiefly conducted in live aircraft. The High Altitude Army Aviation Training Site (HAATS) in Gypsum, Colorado, is one such site, and has found its techniques for such operations translate into nearly every aircraft – regardless of which direction the main rotor spins.

This type of specialised training builds upon the academic, simulator and basic aircraft training provided, and prepares military aircrew to operate safely at the top end of the altitude and weight performance envelopes.

In only a generation, military aircrew training has shifted from a focus on understanding every fold of the earth beneath the skids to how every electron services the cockpit.

Aviation mishaps and shoot-downs – some of them quite renowned – have shaped the TTPs employed in combat theatres and homeland defence and support missions, while changes in aircraft hardware and software have spurred the imperative with which such training is provided.

Whether conducted in a live aircraft or a simulator, a common denominator in the type and frequency of the training is the funding available for its development and conveyance.

The concept of a flight crew has likewise grown from merely those beside the collectives, to those at each station serving the aircraft, and this is not to say that logically extends to those supporting the mission beyond the aircraft doors.

Simulation devices provide invaluable platforms upon which training can be developed and refined, but they must be used to be genuinely cost-effective.

Even formal defence research studies have validated what many in uniform at the flight controls have expressed for nearly an entire generation – even high-fidelity devices appear to have a finite level at which they will be embraced by aircrews when compared to converting real jet fuel to noise. ***DH***

Seen during a ceremony at Shahin-Shahr in May 2009, the lead helicopter, serialled 3-4600, is one of the TOW Cobras that received an upgraded TSU under the Toufan I modernisation programme. (Photo: VRA)

Biting back

Over the past decade, Iranian Army Aviation's fleet of AH-1Js has been subject to numerous modernisation efforts to achieve relevance on the contemporary battlefield. **Babak Taghvaee** charts the aircraft's history and its effectiveness today.

The AH-1J International Cobra, a specially developed variant of the Bell 209 attack helicopter, was developed for the Islamic Republic of Iran Army Aviation (IRIAA) in the 1970s. The service received 202 machines before the Islamic Revolution of 1979, and around 90 are still soldiering on in service.

A total of 18 examples serve with the 1st Combat Support Air Base at Kermanshah; 16 with the 2nd Combat Support Air Base at Kerman; six with the 3rd Combat Support Air Base at Majid-Suleiman; 20, including 8 TOW variants, with the 4th General Support Air Base at Isfahan; eight with the 6th Combat Support Air Base at Mashhad; and 16 are in service with the Vatan-Poor training centre (formerly Prince Reza Pahlavi) at Isfahan.

The technical groups and units stationed at these bases are capable of undertaking depot-level maintenance of their helicopter fleets beyond organisational-type overhauls.

MODERNISATION PROCESS

For years, IRIAA Cobra combat readiness was significantly reduced following US sanctions. However, since 2002 the Iranian Helicopter Support and Renewal Company (IHSRC), Iranian Aircraft Manufacturing Industries (IAMI), Iranian Electronics Industries (IEI) and Isfahan Optics Industries (IOI) together with IRIAA maintenance groups have started the refurbishment, overhaul and modernisation of a large group of stored AH-1Js.

The Tiztak 2091, Toufan 1 and Toufan 2 upgrade programmes took place between 1999 and 2012, with five attack squadrons and one training squadron now operating Non-TOW and TOW versions of the International Cobra.

In 2002, Iran's Defence Industries Organisation (DIO) was tasked to address combat readiness concerns about the IRIAA's AH-1J fleet, with IHSRC, IAMI and IOI all being involved in the programme. IHSRC increased the amount of AH-1 spare parts availability through contractors in Israel, Malaysia, Singapore, Spain and the US, among other countries.

More than 15 AH-1Js that had previously been cannibalised between 1999 and 2001 were returned to service after depot-level maintenance at IRIAA air bases. Meanwhile, IHSRC was also performing programmed depot maintenance of double the amount of Cobras at its well-equipped installation north of Mehrabad International Airport in Tehran.

INDUSTRY INSIGHT

In addition to these programmes, IOI was tasked with refurbishing inactive M65 Telescopic Sight Units (TSUs) of Iranian TOW Cobras between 2002 and 2010. IAMI was also tasked with modernising the platforms themselves as part of the first phase of Toufan.

During the project, all the TSUs were restored, and even upgraded by IOI and IEI. They were also modified to aim and launch IEI-produced Toufan 2 and Toufan 3 TOWs (domestic versions of the BGM-71G and BGM-71H missiles) with greater range and more accuracy. New IEI U/VHF radio sets were also provided.

Another important project was Ghodrat ('Power'), which saw IHSRC update AH-1J engines. Under this programme, the company delivered two examples with 'improved' powerplants in the early 1990s. After several weeks, pilots reportedly realised that the engines had not been renewed at all – IHSRC had simply manipulated their power indicators to show false readings of increased shaft horsepower.

The project was subsequently cancelled, but restarted again in the early 2000s. The IHSRC procured a number of spare parts and even some second-hand Pratt & Whitney T400-WV-402 engines on the black market for installation on the overhauled Cobras.

DIGITAL DOMAIN

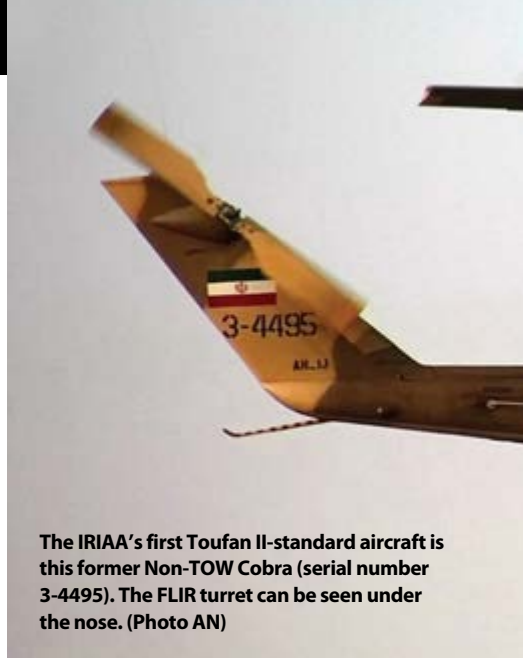
IAMI and IOI also initiated a joint project in the early 2000s to digitise the Cobra's targeting system, particularly on TOW variants, similar to the work undertaken on AH-1Js under Project Tiztak 2091 from 1999 and 2003.

Following an IRIAA request, another project covered the installation of a FLIR device on Non-TOW Cobras. Initially, IHSRC installed a Sagem system under the fuselage of an AH-1J Non-TOW (serial 3-4474) during its overhaul in 2008. IOI had a contract with Sagem for tens of these systems, which was finalised in 2002, however this was cancelled in 2003 due to pressure from the US.

Only a handful of FLIR systems were delivered to the DIO for test and development purposes. These were installed on two CH-47Cs, one Bell 214A and AH-1J 3-4474 as part of several modernisation programmes between 2004 and 2008.

The IRIAA does not have a sufficient budget to invest in FLIR development and reverse-engineering of these at IOI for its fleet. However, due to a lack of TOW Cobras, it persisted in the installation of such cameras on Non-TOW Cobras in order to make BGM-71 missiles compatible with them.

In 2007-8, IHSRC developed a FLIR turret, based on a Sagem design, for under-fuselage installation on the AH-1J. (Photo: author)



The IRIAA's first Toufan II-standard aircraft is this former Non-TOW Cobra (serial number 3-4495). The FLIR turret can be seen under the nose. (Photo AN)

Aircraft 3-4474 was delivered to the IRIAA's 4th General Support Air Base in April 2009 and six months of in-service testing was initiated by the sole attack squadron at the base.

The best AH-1J test pilots and instructors on the squadron performed numerous attack missions over the Shahin-Shahr gunnery range near to evaluate the system.

Nearly all of the IRIAA's Cobras have received minor avionics upgrades during their overhauls since 2006. This includes new U/VHF radio sets, GPS antennas and a TACAN system (on 11 AH-1Js only) as well as other navigation aids.

FLIGHT SIMULATOR

Elsewhere, the IRIAA's Deputy of Industrial Research and Self-Sufficiency began construction of the service's first helicopter flight simulator in 2001. The same year, it ran a project named Afaq, which after two years led to six early Bell 205 and 206 fixed flight simulators being manufactured for the Vatan-Poor training centre. Mass production of the latter started in 2003 under Project Mansoor.

During the same period, the first Bell 206 motion simulator with six degrees of freedom was completed under Project Qader-1. In 2005, a programme was set up for the design and manufacture of an AH-1J pilot and gunner flight simulator under the name Shahid Shemshadian.

A year later, the first fixed AH-1J simulator was completed and passed the necessary tests. Mass production subsequently began at the IRIAA's Ya-Ali refurbishment and modernisation centre.

A total of nine simulators were manufactured and unveiled to the public during a ceremony held at the 4th General Support Group's Self-Sufficiency Group hangar in Badr Airport in February 2008. However, only two had actually

been fully completed, with seven still under construction by February 2008.

Each of the IRIAA's combat or general groups (except the 5th General Support Group at Qaleh-Morghi) had a requirement for at least one AH-1J simulator – three were also shared with the Vatan-Poor training centre.

Installation and preparation of two simulators for the 1st Combat Support Group at Kermanshah ended in 2010, with the training devices being unveiled during a ceremony on 3 August that year.

Subsequently, a single AH-1J fixed simulator became operational with 2nd Combat Support Group on 13 August, and the following day systems were also established for the 4th General Support Group and Vatan-Poor. Finally, on 25 September and 19 October 2010, the 3rd and 5th Combat Support Group simulators entered operational service respectively.

HIGH HOPES

In the early 2000s, IRIAA pilots chalked up a total of 9,000 annual flying hours at the 4th General Support Base, with 1,400 of these coming from AH-1J pilots.

According to a programme conducted by the IRIAA's Research and Studies office in 1999 – later approved by the Commander in Chief and then notified to the Deputy of Operations – fixed and motion flight simulators installed in all IRIAA air bases could constitute half of IRIAA flying hours by 2010 (4,500 hours), increasing pilot readiness.

However, while the training devices were manufactured and delivered by this date, the technology used in their production and design was rather restricted and there were unexpected delays. Consequently, the project was put on hold in order to iron out bugs and weaknesses.

While the IRIAA's retired simulator experts and engineers were still working on improvements, an AH-1J crashed on 30 May 2011 and its pilots were killed. This accident caused significant reduction of the service's AH-1J pilot flight hours, and as a result the fixed simulators were used to compensate for a lack of desired hours.

OUT OF SORTIES

Before the accident, the 4th General Support Group flew 12 weekly AH-1J sorties for navigation, flight and gunnery training, however this was reduced to five in December 2011.

The decline in flying hours has not had any negative effect on AH-1J flight instructor readiness, but younger pilots, especially those who graduated from Vatan-Poor, have suffered from lack of flight experience since 2010. In 2013, with the exception of April and August, the 4th General Support Base only made four routine AH-1J flights per week.

Previously, in 2007, due to the limitations of the fixed AH-1J simulator, the IRIAA's Commander in Chief approved another project for design and manufacture of a motion AH-1J simulator under the name of Qader-5.

The project was hampered by a lack of required parts by 2010 and cancellation was threatened, however the crash demonstrated the necessity of a motion simulator. A $9 million budget was subsequently approved, and a series of parts were acquired for completion of the systems.

The first Qader-5 motion simulator, with six degrees of freedom, is scheduled to be delivered to the Vatan-Poor training centre in February 2015. Meanwhile, the first TOW Cobra flight and gunnery simulator was manufactured and delivered to the 4th General Support Group in 2013.

As a result of IHSRC's track record in the upgrade of IRIAA Cobras, IAMI was tasked to continue mass modernisation of the AH-1Js over a ten-year period from 2009.

Among the systems being installed on Toufan 2 Cobras during their modernisation at IAMI are: Oghab-series Sino-Iranian FLIR systems (based on Sagem sensors); IOI/IEI-developed MFDs used for GPS integrated moving map, engine data, compass and altitude indicator; new Motorola U/VHF radio sets; an RWR; and HUD and helmet-mounted sights similar to those installed under Tiztak 2091.

IAMI is also manufacturing panels and structural parts during the airframe upgrade phase of Toufan 2 beyond its avionics modernisation activity.

FOLLOWING YOUR NOSE

The first IRIAA helicopter (serial 3-4495) from the 4th General Support Air Base was allocated to the programme and delivered to IAMI in 2010. The example was equipped with a nose-mounted targeting FLIR, which was compatible with BGM-71As and IEI-manufactured BGM-71G/Hs.

The modernisation process of the helicopter lasted around two years and it was finally ready for the first test flight in September 2012. It passed all the assessments, and three BGM-71As were fired against ground targets, including an M60 tank during combat trials.

The platform was unveiled to the public during an official ceremony at Shahin-Shahr airport by IAMI on 2 January 2013.

The modernisation of more AH-1Js is now under way at Shahin-Shahr, while all of the Non-TOW Cobras will be modernised to Toufan 2 level by 2020. ***DH***

True colours

Marking the occasion of the first demonstration flight for the Apache Modernized – Day Sensor Assembly, **Lt Col Steven Van Riper** spoke to Scott R Gourley about his thoughts on the upgrade programme.

According to Van Riper, the milestone Apache Modernized – Day Sensor Assembly (M-DSA) demonstration flight earlier this year successfully showcased some of the capabilities of the sensor, including HD colour video and near-IR and visible TV.

'These capabilities will really enhance the current performance of the M-TADS/PNVS [Pilot Night Vision Sensor] system… [which is] the assembly on the nose of the helicopter that provides both our pilotage and target acquisition/designation capabilities. What's significant about this particular programme is that it brings colour into the cockpit.

'So now our aircrews and commanders will be able to see things like we see things as human beings… like the red car versus the blue car, or the yellow building versus the green building, whereas before we were totally reliant on being able to communicate either verbally or through tactical text message.'

BALANCING ACT

Van Riper noted that the timing of the M-DSA upgrade reflected a combination of available funding and 'the priorities of our aviation community', and balancing the two had led to the initial upgrade of the Apache FLIR system on the night side assembly of the sensor.

He added that the subsequent release of additional funding provided the foundation for M-DSA day-side upgrades, with 'the team working as quickly as we can to bring this capability to the field'.

In terms of specific capabilities incorporated in the upgrade, Van Riper related: 'As part of our acquisition decision-making, the government team looked out and did our market research to make the best decisions that we could, given our timeline, our funding availability and all of the other factors that we took into consideration.'

FINAL DECISIONS

He acknowledged that the process looked at other capabilities, noting: 'It's no secret that there are other companies – L-3 Wescam, Raytheon, FLIR – there are plenty of other companies out there.

'But when we looked at the needed fidelity, resolution and targeting capability, what we had on the aircraft in terms of existing technology and how we could make a programme work within the constraints I described, we arrived at the M-DSA solution.'

Van Riper explained that the decision to sole-source M-DSA to Lockheed Martin was based in part on a competition conducted in the 2000-2002 time frame for the M-TADS/PNVS upgrade.

The company, OEM of the subsystem, won that upgrade competition with the 'Arrowhead' avionics and FLIR upgrade kit. Since that kit modernised an estimated 70% of the sensors, adding the day-side modernisation was seen as a 'low-risk' sole-source follow-on decision that was also influenced by 'sources of funding' for the upgrade.

Returning to the operational impacts of the upgrade, Van Riper said: 'You can tell by the level of enthusiasm of our [developmental test] flight crew that they believe this capability will enable an evolution of our TTPs. And I concur with their assessment that this will enable some of those changes.'

He credited the enhanced M-DSA capabilities as providing the only rotary-wing aircraft in the conventional army with this capability.

'Special operations aviation – the 160th Aviation Regiment – has other capabilities that are similar… But in the conventional army aircraft fleet our Chinooks currently do not carry any FLIR apparatus. They rely on their wearable night vision devices for pilotage.

Asked whether the new M-DSA capabilities paved the way for true 'image fusion', Van Riper made a 'definition set distinction' between fusion and image blending.

'Right now, we believe we are achieving a blending [of images] and we are satisfied with the definition. But we're not into fusion yet. We look at fusion as a pixel-per-pixel comparison – but right now we believe we are satisfying the definition of blending.'

POTENTIAL UPGRADES

He went on to describe fusion as 'a potential upgrade' that could be accomplished by using some software changes and possibly hardware upgrades in terms of additional circuit card assemblies in the black boxes that run the system.

'But we believe that we have it as a possible growth opportunity, and in the next iteration of modernisation we could include that capability. We believe we have designed the hardware in a way that it is upgradeable and, of course, the software is upgradeable as well.'

Van Riper noted that other future upgrades could be directed toward subsystems like the fire control radar that is common to both AH-64D and E models as well as the Unmanned Aerial System Tactical Common Data Link Assembly unique to the latter variant. *DH*

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