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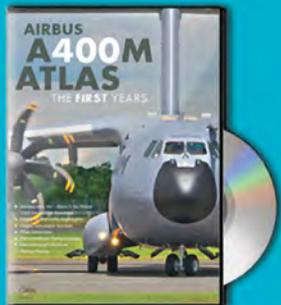
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**Cover:** Tornado GR4 from 15 (R) Squadron over the Scottish Highlands on June 3. *Jamie Hunter*





# Next-Generation Gripen E Rolled Out



The first Gripen E development airframe, 39-8, with a representative full weapons load, seen during its roll-out at Linköping, Sweden, on May 18. For a full report of this significant event, see *Enter the Gripen E*, p10-11. Saab

## Pakistan F-16 Deal Falls Apart

PAKISTAN'S PLANNED acquisition of a further eight F-16 Block 52s looks unlikely to go ahead, after the US withdrew Foreign Military Financing for the deal. This means Islamabad could have to fund the entire acquisition with its own money. During the annual meeting of the Pakistani-American Congress in Washington on June 2, David Rantz from the US State Department said the term of the US offer had expired on May 24.

As previously reported in *AFM*, the US Defense Security Cooperation Agency (DSCA) had announced on February 12 that US State Department approval for the proposed sale had been granted – see *US Approves F-16 Sale to Pakistan*, April, p5. The DSCA said the deal would be worth an estimated \$699.04m and comprise two F-16C Block 52s plus six F-16D Block 52s, plus associated equipment.

These would have joined 18 Block 52 F-16C/Ds already in Pakistan Air Force (PAF) service.

Since then, key members of US Congress have objected to US tax payers' money being used to partially finance the deal. Their resistance is primarily due to Pakistan not having taken any significant action against the Haqqani Network insurgent group, as detailed in the US State Department Country Reports on

Terrorism 2015, released on June 2. Such action was a condition for the F-16 deal to go ahead.

Pakistan's displeasure at the US Congressional opposition to the deal has led directly to its decision to buy SAR AW139s for the PAF (see *Pakistan Orders SAR AW139s*, p28), rather than the planned acquisition of UH-60s for the role. The controversy is also now likely to prompt Pakistan to look elsewhere for new fighters. ■

## Algeria's First Four Mi-28NEs Delivered



One of the first four Algerian Air Force Mi-28NEs, SC-11, in a hangar at an unspecified air base. A second example is visible behind and a third and fourth were parked to the left and right, out of shot in this image.

RUSSIAN HELICOPTERS has delivered Algeria's first four Mi-28NE attack helicopters. The first two were transported on board an An-124 to an unspecified air base in the southern central area of the country, where they arrived on May 26. They were then due to be re-assembled and have additional equipment installed prior to test flying. A further two arrived soon afterwards on a separate flight.

These helicopters have dual controls, similar to the recently developed Mi-28UB variant. Algeria has ordered a total of 42 under a contract first revealed by Russian news agencies on February 28, 2014, but reported to have been signed in December 2013. ■

## New Nigerian Alpha Jet Delivery

ANOTHER SECOND-HAND Alpha Jet has been delivered to the Nigerian Air Force (NAF) from the USA. The aircraft, NAF478, passed through Iqaluit Airport, Canada, on June 2, then flew on the Reykjavik, Iceland, before arriving in the UK on June 3. It made a brief fuel stop at Manchester Airport before continuing on its journey.

As previously reported in *AFM*, the NAF took delivery of two

other Alpha Jets in March and May last year, both of which were acquired from Air USA Inc – see ‘New’ Nigerian Air Force Alpha Jets, May 2015, p24 and Second Nigerian Alpha Jet Delivered, July 2015, p27. The NAF bought four of the type from the company last year and it is assumed that this third example is one of these, although this is unconfirmed. As the three known deliveries are

NAF475, NAF477 and NAF478, this suggests the fourth aircraft is likely to be NAF476 – it is not known if it has been delivered.

Although these aircraft have been sold to Nigeria in a demilitarised configuration, on January 26, the NAF announced it had successfully modified the first two Alpha Jets to carry weapons. They had previously only been used for training, but have been

weaponised to meet an urgent operational requirement for more strike aircraft to support Operation Lafiya Dole counter-insurgency missions against Boko Haram in the northeast of the country. Although the NAF did not state what weapons have been integrated, a photograph released of one of the aircraft, NAF475, showed what appeared to be a 68mm SNEB rocket pod and 250kg unguided bomb under the port wing.

The NAF said it had earlier sought overseas help to arm the Alpha Jets, but several vendors said they believed it would be difficult to undertake the project. Others apparently gave initial estimates of \$20,000-\$30,000 to modify each aircraft, which Nigeria felt was prohibitively expensive. In the end, the NAF assembled its own team of technicians and devised a way of achieving its aim. After testing feasibility on the ground, successful air tests were completed with the weaponised aircraft. The NAF estimates that the programme cost around 4 million naira (\$20,200). ■



Above: New Nigerian Air Force Alpha Jet NAF478 on the apron at Manchester Airport on June 3 during its delivery flight from the USA. Chris Batty



## DO Systems DA42MPP Operating Out of Malta

DO Systems Diamond Aircraft DA42MPP Multi-Purpose Platform G-DOSC takes off from Malta International Airport on May 11. The aircraft had been operating out of the airport for several weeks, but this was one of the rare occasions it had been flown in daylight. It is

speculated that it may be operating under a UK Ministry of Defence contract for ISR missions off the Libyan coast. The aircraft has been regularly operated under contract to the MOD since 2009, but details of its missions have not been made public. Paul Spiteri Lucas ■

## Another USAF European B-52H Deployment

THREE US Air Force B-52H Stratofortresses from Minot Air Force Base, North Dakota, have deployed to the UK to participate in bilateral training exercises. The first two, 60-0044 ‘MT’ (callsign

‘Mighty 51’) and 60-0037 ‘MT’ (‘Mighty 52’), arrived at RAF Fairford, Gloucestershire, on June 2. Both were from the 5th Bomb Wing’s 23rd Bomb Squadron ‘Bomber Barons’

at Minot. A third aircraft from the unit, 60-0007 ‘MT’ (‘Icer 01’) joined them on June 4.

This marks the third year in a row the bombers have deployed to RAF Fairford for training. They will integrate with allied military forces through US European Command’s exercises Baltops 16

and Saber Strike 16, as well as US Africa Command’s exercise Just Hammer. They are scheduled to conduct training flights with ground and naval forces around the region and will be involved in air intercept training, mining operations, inert ordnance drops and close-air support. ■

Right: US Air Force B-52H Stratofortress 60-0044 ‘MT’ arriving at RAF Fairford from Minot Air Force Base, North Dakota, on June 2 for a short-term deployment. US Air Force/Senior Airman Sahara L. Faies





## UK Rotary-Wing Training Contract

ASCENT FLIGHT Training has been awarded a £1.1bn contract by the UK Ministry of Defence (MOD) to deliver the rotary-wing training element of the UK Military Flying Training System (UKMFTS) programme. The contract, announced on May 20, will involve delivery of 29 H135s and three H145s, by Airbus Helicopters. It will see 286 students trained annually by 161 instructors: 102 military and 59 from Ascent.

It will include installation of new infrastructure and ground-based equipment at RAF Shawbury, Shropshire. The deal brings the value of MOD contracts with Ascent Flight Training, to deliver the four core elements of future military flying training, to £2.8bn.

It will deliver a military rotary-wing aircrew training service until 2033. The announcement followed the award of a contract in February for fixed wing training (see *Fixed-Wing MFTS £1.1bn Contract Signed*, March, p5).

The award means that all core training elements within the UKMFTS programme are now under contract. Aircrew across the three Services will continue to conduct their basic and advanced rotary-wing training at RAF Shawbury and Army Air Corps Middle Wallop, Hampshire. Mountain and maritime rotary-wing aircrew training will take place at RAF Valley, Anglesey.

Ascent will place sub-contracts with Airbus for aircraft and integrated support, and with Babcock and Lockheed Martin for ground-based training equipment, infrastructure, ICT assets and integrated support.

Airbus Helicopters says its contract will be worth £500m over 17 years. It will deliver an integrated support solution over a period of 18 months, ready to begin training in April 2018. This will include developing all of the necessary support infrastructure and also training initial crews and maintenance personnel.

The H135s and H145s will deliver the 28,000 flying hours per year required to meet the training requirement. Britain will also be the first country to receive the newly updated H135 Helionix, the European manufacturer's new advanced avionics kit that is designed to both increase performance and improve safety. ■

## Royal Air Force 47 Sqn 100th Anniversary Hercules



**Above: RAF/47 Squadron Hercules C5 ZH880 in its new markings that celebrate the 100th anniversary of the Squadron.**  
MOD Crown Copyright/RAF Brize Norton

ROYAL AIR Force Hercules C5 ZH880 has been painted in new special colours to mark the 100th anniversary of 47 Squadron. The tail features a much enlarged crane's head, taken from the unit badge, on a red, yellow and blue background with '100th Anniversary' titles. Just behind the cockpit is the Squadron badge, with 47 Squadron titles

on the forward fuselage and the unit's unofficial badge of the sun rising over a pyramid applied just forward of the wings.

The unit was formed at Beverley, North Yorkshire, on March 1, 1916, as a Home Defence squadron equipped with BE2s, BE12s and FK3s.

It began Hercules operations after being re-formed at RAF Fairford,

Gloucestershire, in February 1968. It has continued to operate variants of the Hercules ever since and moved to RAF Lyneham, Wiltshire, in 1971, where it remained until moving to its current home at RAF Brize Norton, Oxfordshire, when Lyneham closed in 2012. It is due to become the second operational RAF squadron with the new A400M Atlas C1. ■

## Final Army Lynx Depart from Dishforth

FOUR ARMY Air Corps Lynx AH9As performed their final flight from Dishforth Air Base, North Yorkshire, on May 12. Comprising ZE375, ZG884, ZG887 and ZG915 from 9 Regiment, they flew in formation around a number of local landmarks. This included flights over Boroughbridge, Harrogate, Leyburn, Pateley Bridge, Ripon and York, as well as landmarks including the Kilburn White Horse and York Minister.

Military sites including the Army

Foundation College in Harrogate, Catterick Garrison, RAF Leeming, RAF Linton-on-Ouse and RAF Topcliffe were also flown over.

After refuelling back at Dishforth, they headed south via London to the AAC Centre at Middle Wallop, Hampshire. The formation was led by Lt Col Jeremy Cook, 9 Regiment's commanding officer.

A ceremony, including a parade and flypast, was held at Dishforth on April 23 to mark the end of 80 years' flying from the base

(see *Army Flying Ends at Dishforth*, June, p7), but May 12 marked departure of the final helicopters.

On June 30, 9 Regiment will be officially merged into 1 Regiment at Royal Naval Air Station Yeovilton, Somerset, to operate the AAC's new Wildcat battlefield utility helicopter.

Dishforth airfield and camp will be taken over by 6 Regiment Royal Logistic Corps when it returns to the UK from Germany later this summer. ■



**The final four Army Air Corps/9 Regiment Lynx AH9As taxi out at Dishforth for their farewell flight on May 12.** AAC/Sgt Jamie Peters

## Eighth RAF A400M Atlas C1 Delivered

ANOTHER A400M Atlas C1 has been delivered to the RAF. The aircraft, ZM407 (c/n 0026), callsign 'RRR4557', landed at 2212hrs on May 11, at RAF Brize Norton, Oxfordshire, after being ferried from the factory in Seville, Spain.

This now brings total RAF A400M deliveries to eight, comprising ZM400, ZM401, ZM402, ZM403, ZM404, ZM405, ZM406 and ZM407. The most recent arrivals prior to ZM407 were ZM401 and ZM404, which both flew in to Brize Norton on February 5 – see *Two More RAF A400Ms Delivered*, April, p7.

A total of 22 aircraft are being acquired for operation by the RAF, the first of which was delivered to Brize Norton on November 17, 2014 – see *Atlas Arrives at Brize Norton*, January 2015, p8. ■

## RAF Chinook Training in Paris



Above: A Royal Air Force/18 Squadron Chinook flies over Paris in formation with Armée de l'Air (French Air Force) AS555AN 5511 'WC' from Escadron d'Hélicoptères 3/67 'Paris' on May 12. The pair operated out of the heliport at Issy-les-Moulineaux in Paris for a joint tactical training exercise. The Chinook also transported French commandos from the Escadron de Protection at Base Aérienne 107 Villacoublay, enabling them to train with a different helicopter not operated by the French armed forces. Armée de l'Air/J Fechter

## Dutch Deploy to UK Again for Tac Blaze 2016

NINE ROYAL Netherlands Air Force (RNLAf) helicopters were recently deployed to Carlisle, Cumbria, from their base at Gilze-Rijen in the Netherlands for Tac Blaze 2016. With two CH-47D Chinooks (D-662 and D-667) and one CH47F (D-892) from 298 Squadron, two AS532 Cougars (S-458 and S-459) from 300Sqn and four AH-64D Apaches (Q-01, Q-05, Q-08 and Q-30) from 301 Squadron involved, along with 200 personnel, this was the largest such deployment to date. Two of the three Apaches involved had recently been upgraded to Block II standard – eventually all of the RNLAf examples will be modernized to this configuration.

The exercise got under way on May 16, after all support facilities and equipment were in place. Although previously a biennial event, held in the spring and autumn, as a result of a recent defence review, it will be cut back henceforth to an annual event to cut costs. During the autumn training period, it incorporated a Helicopter Weapons Instructor Course, but this aspect of their training now takes place within Europe. To maximize the number of crew able to train, a rotation from the Netherlands took place



Above: Royal Netherlands Air Force CH-47D Chinook D-667 flies at low level over Spadeadam during Tac Blaze 2016. Gunners are positioned at the open forward doors and on the rear ramp. Alan Worsley

mid-way through the exercise.

TacBlaze 2016 saw the return of the AS532 to the exercise. This comes after it was almost retired from the RNLAf's fleet. It was relieved to undertake the SAR role and shortly afterwards it was seen to be ideal for the anti piracy role working with marines and operating from ships. Because of the time spent in their maritime duties, crews from the AS532's

were sent to Tac Blaze to refresh their electronic warfare skills.

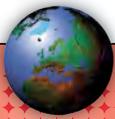
All flying was conducted within Low Flying Area 13 and on the Spadeadam Range. In addition to working with electronic threats at Spadeadam, the RNLAf had put together several tactical scenarios for the crews' training purposes.

Some of these scenarios were aided by the Dutch 11th Air Mobile Brigade, which had deployed 90

personnel to provide support for the exercise. Amongst these scenarios were insertion and extraction, vehicle interception, surveillance and lifting.

At the conclusion, all of the helicopters departed for home on June 1. The exercise again fulfilled all of its objectives and looks likely to be conducted here for sometime to come.

Alan Worsley ■



## Last French Navy Falcon 50MS Delivered

DELIVERY OF the last of four former Armée de l'Air (French Air Force) VIP Falcon 50s that have been converted to Falcon 50MS maritime surveillance aircraft to the Aéronautique Navale (French Naval Aviation) has been completed. The aircraft, No 34, was handed over during a ceremony on May 20 at Base Aéronavale Lann-Bihoué, near Lorient.

Dassault completed this conversion in January (see *News Briefs*, March, p11). Since then it had been undergoing flight testing of its new equipment prior to delivery to Flottille 24F.

The other three Falcon 50MS conversions, 5, 27 and 78, are already in operational service with the unit. Delivery of the final aircraft brings the fleet to eight, as the four new conversions add to the four Falcon 50M-2 SURMAR variants that have been in service since the early 2000s.

The work on the additional aircraft was carried out in association with Thales, which supplied the mission system, comprising an Ocean Master 1000 radar installed in the nose, together with a retractable infrared optronics turret and operator console. Large observation windows have also been fitted.

Sabena, which is contracted to undertake maintenance on the aircraft, was responsible for the ViaSat satellite communications modification, under the responsibility of the defence ministry's SIMMAD aerospace workshops. The four aircraft will also be later modified with a hatch giving them a lifeboat air-drop capability, as already fitted to the original four aircraft.

During 2015, the Falcon 50MSs logged a total of 3,200 flight hours in a variety of operations. These included missions against drug-trafficking in the Caribbean, evacuation of French nationals from Yemen, the fight against illegal migration networks in the Mediterranean and counter-piracy operations in the Indian Ocean. ■

## Replacement Hungarian Gripen Completed



Hungarian Air Force personnel stand in front of their new replacement JAS39D Gripen at the factory in Linköping. Saab

HUNGARIAN AIR Force (HAF) officials inspected a new two-seat JAS39D Gripen at the Saab factory in Linköping, Sweden, on May 17. The aircraft, currently carrying serial '842', is a replacement for HAF JAS39D '42', which was written-off on May 19, 2015, when it overshot the runway on landing at Čáslav Air Base in the Czech Republic during Exercise Lion Effort – see *Attrition*, July 2015, p94. Its replacement is expected to take up HAF serial '44' on delivery, following on from the serial of the last JAS39D currently in HAF service, '43'. In the meantime, as the crash left the HAF with only one two-seat aircraft, it has been operating Swedish Air Force JAS39D 39823 '823' on loan pending delivery of the replacement aircraft. ■

## Maiden Flight of Diamond DART-450 Trainer



Above: The DART-450 tandem, two-seat trainer prototype, OE-VDA, taking off for its maiden flight from Wiener Neustadt. Diamond Aircraft

DIAMOND AIRCRAFT carried out the maiden flight of its new turbine-powered DART-450 (Diamond Aircraft Reconnaissance Trainer-450) tandem two-seat military and civilian trainer prototype, OE-VDA, on May 17 from Wiener Neustadt, Austria. During the one-hour flight, speeds between 60-200kts (111-370km/h) indicated air speed were tested at various altitudes. Expected top speed is 250kts (463km/h) true air speed. Diamond Aircraft Chief

Designer Clemens Knappert noted: "We achieved our target from the first drawings to the first flight in one year."

The all carbon-fibre aircraft features a sidestick and pneumatic ejection seats. It is a +7/-5G aerobatic aircraft with a maximum take-off power of 500hp (373kW), is equipped with an Ivchenko-Progress/Motor Sich AI-450S turboprop engine, a five-blade MT propeller and a Garmin avionics system. Maximum endurance is eight hours plus reserves. ■

### NEWS IN BRIEFS

#### ITALIAN AIR Force pilots have completed 1,000 flying hours on the new T-346 Master.

The milestone was reached on May 23 during a flight by T Col Alessandro O, commander of 212° Gruppo Volo of 61° Stormo at Lecce-Galatina.

#### ITALY'S KC-767A tanker detachment in Kuwait at Abdullah al-Mubarak Air Base has completed 2,000 flying hours on air refuelling missions in theatre supporting Operation Inherent Resolve. This was reached on May 4 after being deployed since October 2014.

#### TORNADO AIRCRAFT of the Italian Air Force have completed 3,000 flight hours of intelligence, surveillance and reconnaissance (ISR) missions operating with Task Force Devil in Kuwait. The achievement, announced on May 23, was reached the previous week. They have been operating for the past 18 months from Ahmed al-Jaber Air Base to support Operation Inherent Resolve.

## Oregon F-15s Deploy to Finland

A DETACHMENT of six Oregon Air National Guard F-15 Eagles has been deployed to Finland for combined exercises with the Finnish Air Force. The Eagles, from the 173rd Fighter Wing's 114th Fighter Squadron 'Eager Beavers' at Klamath Falls International Airport-Kingsley Field, arrived at Karelia Air Command's Kuopio-Rissala Air Base on May 6.

They were hosted by the Finnish Air Force's resident F-18C/D Hornet-equipped Hävittäjälentolaivue 31 (31 Fighter Squadron) during their stay, which came to an end on May 20. Support was provided by a KC-135 Stratotanker from the Washington Air National Guard's 141st Air Refueling Wing at Fairchild AFB. ■

## Denmark's First Three MH-60Rs Delivered



Above: The first three Royal Danish Air Force MH-60Rs await loading on to C-17A aircraft at Sikorsky Aircraft's William P Gwinn Airfield, Jupiter, Florida. Lockheed Martin

DENMARK HAS taken delivery of its first three Sikorsky MH-60R Seahawks. They departed on May 10 on board two C-17As from Sikorsky Aircraft's William P Gwinn Airfield, Jupiter, Florida, for Karup Air Base, Denmark, where they will be flown by the

Royal Danish Air Force's Eskadrille 723. They will replace the unit's current Super Lynx Mk 90Bs.

Denmark, the second foreign military sales (FMS) customer for the MH-60R, had signed a letter of offer and acceptance for nine MH-60Rs in December 2012.

After completion by Lockheed Martin at its facility in Owego, New York, the first was handed over there on October 22, 2015 to the US Navy – see *Denmark's First MH-60R Handed Over*, December 2015, p16. Deliveries are due to be completed by 2018. ■

## Luxembourg Merlin IVCs on Mediterranean Patrols

TWO SA227AT Merlin IVCs have arrived at Malta International Airport to carry out maritime patrols on behalf of Luxembourg as part of EUNAVFOR MED's Operation Sophia. The aircraft, N577MX (c/n AT-577) and N919CK (c/n AT-585B), are owned by Luxembourg-based CAE Aviation, which has already been operating the smaller SA227TT Merlin III N75X (c/n TT-421) on similar intelligence, surveillance and reconnaissance (ISR) missions for the Luxembourg

Government for several years.

The two Merlin IVCs arrived in Malta on May 23 and immediately began operating local maritime patrol missions. EUNAVFOR MED was launched on June 22 last year as a military operation to carry out systematic efforts to identify, capture and dispose of vessels as well as enabling assets used or suspected of being used by migrant smugglers or traffickers.

Current air assets deployed for the mission comprise one Spanish Navy AB212 ASW, one Spanish Air

Force CN235 VIGMA, two Italian Navy EH101s, one French Navy Falcon 50M, one Portuguese Air Force P-3C CUP+ and the already mentioned Luxembourg Merlin III. The latter, deployed to Sigonella, Italy, since July 18 last year, was temporarily redeployed on a trial basis to a forward operating base on the small island of Pantelleria, Italy, halfway between Sicily and Tunisia, last December. ■



CAE Aviation Merlin IVC N919CK shortly after arrival in Malta on May 23 to operate maritime patrol missions on behalf of the Luxembourg Government. Brendon Attard

## Belgium Extends Strikes into Syria

BELGIAN PRIME Minister Charles Michel and Defence Minister Steven Vandeput announced on May 13 that Belgian F-16s are to begin carrying out air strikes within Syria as part of the coalition air campaign against Daesh. Belgian aircraft had previously conducted similar operations over Iraq between October 2014 and June 2015.

During that deployment for air strikes in Iraq, six Belgian F-16AMs operated from Azraq-Muwaffaq Salti Air Base in Jordan. They returned home to Florennes on July 2, 2015 (see *Return of the Falcons*, September 2015, p74-75, primarily because Belgium did not have sufficient budget to continue missions beyond the end of June.

They will return to support the US-led Operation Inherent Resolve as part of an already scheduled rotation along with Royal Netherlands Air Force F-16s. They will conduct air strikes in both Iraq and Syria. ■

## German P-3C Upgrade Contract

LOCKHEED MARTIN is to upgrade the German Navy's eight P-3C-CUP Orion aircraft under a deal valued at almost \$55m. The Foreign Military Sales contract was awarded on May 18 by the US Naval Air

Warfare Center Aircraft Division. Under the P-3C Mission System Refresh Program, the company will upgrade the mission computer, acoustic equipment, armament/ordnance system, and displays

and controls of the aircraft. This will include long lead items, non-recurring engineering, design, integration, planning, build and software development. Contract completion is anticipated in March

2017. Germany's P-3Cs are flown by Marinefliegergeschwader 3 (Naval Air Wing 3) 'Graf Zeppelin' at Nordholz. All are former Dutch Navy examples delivered to Germany from May 2006. ■



# Enter the Gripen E

Alan Warnes reflects on the spectacular launch of Saab's new JAS 39E Gripen held in Linköping, Sweden.

## The Swedish Defence Minister on Gripen E

SPEAKING AT the roll-out, Swedish Defence Minister, Peter Hultqvist was keen to see the jet in service. "In the light of recent developments, the need for a strong competitive air force has become increasingly evident as tension over the Baltic Sea has increased in the last year. With the Russians acting inappropriately with their military exercises and inappropriate behaviour around our borders, we need to boost our operational capability to meet the new security demands and technological achievements of our opponents.

"The introduction of Gripen E is part of that. We are reinforcing our military capabilities and deepening our ties with partners and forming more military alliances.

"The co-operation between Sweden and Finland builds upon that intention. Together with the European Union, with the NATO partnership and transatlantic link to USA, we are building a deterrence to reinforce our military needs and deepening co-operation.

The Gripen E can act in coordinated operations with other advanced systems of our own or with our partners in the air, at sea and on the ground. When Gripen E is operational in 2020, it will give Sweden considerable leverage in the air-to-air campaign." ■

NEW FIGHTERS don't come along very often. So when they do, it is worth banging the drum and shouting about it. And that's just what Saab did on May 18, when it revealed the new generation JAS 39E, or Gripen E, as it's more commonly known.

This was the slickest roll-out I have ever witnessed: a three-course lunch and an air display served up between speeches from key members of Saab and the Swedish Defence Minister, Peter Hultqvist.

The star of the show was unveiled at 4pm, several hours into the event.

The Gripen E is Saab's third version of their modern fighter, coming after the 90s' JAS 39A/B and the 2000s' JAS 39C/D.

There are several advantages over the JAS 39C/D. It has a bigger General Electric F414

engine - and not just to provide more thrust of up to Mach 2. It enables a bigger air frame to carry more weapons (maximum take-off weight 16,500kg), and more air to cool the Gripen E's sophisticated avionics systems. The new jet also has a bigger internal fuel load (3,400kg) providing it with a longer range.

Marcus Wandt, a Gripen E test pilot who is working on the new systems, said of the jet's design: "We wanted a perfect fighter, with more sensors and weapons, which meant more computers and avionics. Increased awareness will come with integration of a new active electronically scanned array [AESA]."

AESA radars provide fighters with multiple simultaneous tracking of enemy aircraft and the Selex (now Finmeccanica) ES-05 Raven has been selected for the Gripen

E. With its longer range it can track and update the new Meteor beyond visual range (BVR) missile once its fired from the launch rail. Other new sensors integrated on board the Gripen E will include the infrared search and track (IRST), electronic warfare suite (EWS) and missile airborne warning system (MAWS). Wandt added: "We want to manage [the air battle] without turning and burning."

## Test Aircraft

Saab were keen to stress that the Gripen E that was rolled out, No 39-8, is a test aircraft rather than a prototype. It will be handed over to the Flight Test Department during the summer before making its first flight before year end. Verifying the airframe will be Saab's top priority as its brand new aircraft.

New MS21 software, enhancing the jet's capabilities will be deliv-

*The screens are drawn and the star finally takes centre stage at Saab's Linköping facility on May 18. All photos, Alan Warnes*



ered to Gripen E in 2021. Two more test jets 39-9 and 39-10 will join the test programme - one next year and the second in 2018. While a dedicated, single-seat test aircraft (6001) will be built for Brazil and due to be flying by the end of 2018. It will remain in Sweden with Flight Test for at least a year. Brazil's two-seat Gripen F is expected to make its first flight in 2020/21.

## Customers

Sweden's FMV (Defence Materiel Administration) was impressed enough to order 60 new single-seat Gripen Es for the Swedish Air Force (SAF) in 2012. Like most countries today, the national air force and its procurement agency have a significant input in the evolution of a manufacturer's new fighter. This means everyone involved is aware of the jet's capabilities and characteristics, enabling the air force to revise its tactics for the new fighter.

Undoubtedly, with its new strengths, the Gripen E will be a bigger force in the export market than its predecessors. Saab already has an order for 36 Gripen E/Fs (28 single-seat Gripen Es and eight two-seat

Gripen Fs) from Brazil, with the likelihood of another 72 to come.

The Brazilians have their own weapons requirements. According to the Brazilian Air Force's Brigadier General José Crepala, who was at the ceremony as part of his country's defence ministry delegation, the BAF wants to integrate its own weapons on the jet. These include the fifth-generation A-Darter short range air-to-air/anti-radiation missile jointly developed by Brazil and South Africa; the Diehl BGT infrared IRIS-T short range air-to-air missile, Rafael Spice guided glide bombs [-250 and -1000] as well as Rafael RecceLite and Litening G4 targeting pod. He also said the BAF has a requirement for the Meteor BVR but doesn't yet have the funding. The jets will also house the Selex ES Sky Shadow electronic countemeasures system.

Sweden is not expected to order the dual seater. Saab is now in collaboration with Boeing on a new jet trainer in a bid to win the USAF's advanced trainer T-X programme. It is aimed at finding a replacement for the USAF's large fleet of ageing T-38s and might yet yield something similar to a two-seat Gripen F.



The GBU-39 Small Diameter Bomb (left) and Meteor BVR will be part of the Gripen E's armoury when it enters service. Both are being integrated on to the Gripen C/D, thanks to the MS 20 software upgrade the fleet is now going through.

## Swedish Air Force Chief on Gripen



The Swedish Air Force Chief, Major General Mats Helgesson.

SWEDEN'S DAILY air defence includes protection of its air space by reconnaissance and fighter assets. Major General Mats Helgesson, the Swedish Air Force Chief discussed the Gripen's role in Sweden on the eve of the roll-out.

"The Swedish Air Force has flown four Gripen squadrons on Quick Reaction Alert [QRA] since 2004, however on January 1 this year, the two squadrons of F7 wing at S aten as joined them on January 1. We now use all our fighter squadrons to rotate the QRA, they are standing QRA at Ronneby, Lule a-Kallax and S aten as as well as reserve bases at Uppsala and Visby."

"Each base takes its turn when required. The highest number of Gripen QRA launches in recent years, 400, occurred in 2013 due to the increased presence of Russian fighters, which Maj Gen Helgesson said often act unprofessionally and he accused them of poor airmanship. The biggest number of air space violations was in 2010 with 19 and there were 11 last year. "The number of violations, remains similar, and are due to navigation and admin errors, you cannot point out a single country," he said.

"We are introducing the MS 20 version software to the JAS 39C/D fleet [see *Sweden, European Fighter Survey*, page 84]. The most obvious advantage this brings is integration of Meteor BVR - which is a game changer. It has capacities and capabilities needed to defend our airspace. We are also introducing

the GBU 39 Small Diameter Bomb (SDB), RecceLite pod, digital Close Air Support and upgrades related to logistics. MS 20 is being phased in now and by autumn this year will all have the capabilities. We are the first air force to operate the Meteor, which will be used for QRA by end of the year.

"Co-operation with Finland is important, and when it comes to air ops we are working on different tracks securing our possibilities to communicate and be sure we can use our bases. We will alternate the bases in both countries and carry out joint surveillance and more combined air operations.

"Exercises play a vital part in keeping vigilant. This year the Swedish Air Force will host manoeuvres with the Finnish Air Force in early September. Main operational areas will be south/middle of Sweden and the FAF will send their F-18s. We will take part in the Finnish exercise *Ruska* too, later this year, while based at Lule a-Kallax

"Next year Arctic Challenge (ACE 2017) will take place with Finland as lead. It will cover the upper third of Sweden into Norway and Finland, with up to 100 aircraft operational.

While in 2018, we are planning to take Gripens to Red Flag.

"The security bill last year was trend breaking, as it didn't decrease funding for the armed forces, which is giving us possibilities to develop in more areas. While it is not as much as we need, it's a first step to moving in the right direction." ■





## KC-46A Programme Delay Confirmed

BOEING AND the US Air Force have confirmed the KC-46A Pegasus will miss its contractual goal of 18 certified tanker aircraft in service by August 2017.

In a statement on May 27, the USAF said the initial deliveries – to the first formal training unit at Altus Air Force Base, Oklahoma, and the first active duty main operating base at McConnell AFB, Kansas – will not now be until August 2017, some five months later previously planned. The last of the 18 jets for the so-called Required Assets Available (RAA) juncture will not now be delivered until January 2018.

The USAF is also moving its formal production decision on the KC-46 programme – known as Milestone C – from June to August 2016 to allow time to implement a solution to a refuelling boom loads issue identified during flight testing earlier this year while tanking a C-17A Globemaster III.

The delay is due to ongoing complexities associated with qualification and certification of the aircraft's centreline drogue and wing-aerial refuelling pod (WARP) systems, plus the previously announced higher volume of change incorporation to bring the first 18 aircraft up to the certification configuration.

Boeing says the underlying production system remains on track and that it will have more than 18 aircraft through the factory line and in various stages of final change incorporation and certification by August next year.

The first 18 will be equipped with refuelling boom and centreline drogue refuelling capabilities and all other contract-required capability except WARPs, which will be delivered separately in October 2018.

The manufacturer currently has five aircraft in test (including the first production aircraft), seven in final production build and eight in the supply chain – up to tail number 20. Following a successful Milestone C decision, the USAF will award Boeing a contract for the first two production lots, followed by Lot 3 in January 2017. ■

## Last Deployment for 914th AW C-130Hs



**A C-130H Hercules from the 914th Airlift Wing over Niagara Falls International Airport as it departs for Qatar to support Operation Inherent Resolve.** USAF/Tech Sgt Stephanie Sawyer

FOUR C-130H Hercules from US Air Force Reserve Command's 914th Airlift Wing/328th Airlift Squadron have begun the unit's final deployment before conversion to the KC-135R Stratotanker.

They left Niagara Falls International Airport, New York, on May 9, heading for Qatar. The aircraft will operate in support of Operation Inherent Resolve as part of

the 379th Air Expeditionary Squadron. Their return home in the autumn will mark the end of 40 years of military Hercules operations at Niagara Falls International Airport. ■

## Wing-Fuselage Mating on Bell V-280 Valor



**Above: Bell's V-280 Joint Multi Role Technology Demonstrator prototype, N280BH, following mating of the wing to the fuselage.** Bell Helicopter

BELL HELICOPTER has successfully joined the V-280 Joint Multi Role Technology Demonstrator (JMR-TD) wing and nacelles to the aircraft's fuselage. The achievement, announced on May 4, occurred the previous week at the company's assembly centre in Amarillo, Texas.

Once the aircraft makes a successful first flight, scheduled for September 2017, the company is confident it will have the data required to go into the full-scale engineering, manufacturing and development (EMD) phase.

Lisa Atherton, executive VP of Military Business Development for Bell Helicopter, said: "The V-280 tiltrotor is designed with technology advancements that significantly reduce risk and cost, allowing the Department of Defense to field Future Vertical Lift (FVL) to the warfighter far earlier than previously anticipated.

"We have improved the manufacturing processes to arrive at a revolutionary aircraft with reduced sustainment costs and simplified maintenance procedures."

Progress on the V-280 will involve verification work leading to a tethered power-up in the first half of 2017. Development continues in the company's flight control systems lab in Fort Worth, integrating pilot inputs with flight control computers and flight controls and providing data for software that works with the hardware controlling flight loads and hydraulic performance.

The T64-GE-419 engines and gearboxes are expected to be installed in the nacelles this November. ■

## US Army Orders Eight More UH-60Ms

**SIKORSKY AIRCRAFT** has received an order from US Army Contracting Command exercising an option for eight more UH-60M Black Hawks, a modification to an \$8.5 billion contract signed on

July 11, 2012 for up to 916 Black Hawk and Seahawk helicopters.

The additional contract, awarded on May 18 and valued at more than \$88m, has an estimated completion date

of June 30, 2017. Finance comes from Fiscal Year 2016 other procurement funds.

The 2012 contract comprised 653 firm orders, with options on 263 more. ■

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## 'Dragonslayers' Retire Final US Navy SH-60F

HELICOPTER ANTISUBMARINE Squadron 11 (HS-11)

'Dragonslayers' has retired its last SH-60F, marking the end of US Navy operations with this variant of the Seahawk.

The final helicopter, 164615 'AB-612', left the unit's base at NAS Jacksonville, Florida, on May 11 for Coast Guard Air Station Elizabeth City, North Carolina, where it will be converted to MH-60T configuration before entering US Coast Guard service.

The Dragonslayers also operated the HH-60H combat rescue variant, the last of which, 165120 'AB-616', left the unit on May 6 for storage with the 309th Aerospace Maintenance and Regeneration Group at Davis-Monthan Air Force Base, Arizona.

This just leaves Helicopter Sea Combat Squadron 85 (HSC-85) 'Firehawks' at NAS North Island, California, as the last unit flying the HH-60H, which it will continue to operate in support of Special Operations forces.

A sundown ceremony for HS-11 on May 9 at the unit's new base, Chambers Field, NAS Norfolk, Virginia, marked the retirement of the SH-60F and the unit's redesignation as HSC-11. It will now begin transition to the MH-60S and join the rest of the US Navy's East Coast HSC squadrons at Norfolk. ■

## Reserve F-16s Deployed to Afghanistan

A NEW ROTATION of USAF F-16 Fighting Falcons has deployed to Afghanistan. The jets, from Air Force Reserve Command's 301st Fighter Wing/457th Expeditionary Fighter Squadron 'Spads' at Naval Air Station Fort Worth Joint Reserve Base, Texas, arrived at Bagram

Airfield on April 27 to support Operation Freedom's Sentinel.

The 'rainbow' deployment includes aircraft from AFRC's 482nd Fighter Wing/93rd Fighter Squadron 'Makos' at Homestead Air Reserve Base, Florida.

The aircraft form the only dedicated fighter unit operating in

Afghanistan and replace F-16s of the 388th Fighter Wing's 421st Expeditionary Fighter Squadron 'Black Widows' from Hill Air Force Base, Utah, which had been deployed to Bagram for the past six months – see separate story. ■



USAF/457th EFS 'Spads' F-16C 86-0227 'TX' arrives at Bagram Airfield on April 27. USAF/Capt Corey Fratini

## 'Black Widows' Return from Afghanistan

AIRMEN FROM the US Air Force/388th Fighter Wing's 421st Expeditionary Fighter Squadron 'Black Widows' returned home to Hill Air Force Base, Utah, on May 10 after almost eight months supporting Operation Freedom's Sentinel in Afghanistan.

As the 388th FW begins transition to the F-35A Lightning II, it was probably the last combat operation for Hill's F-16C/Ds after nearly 40 years of operations.

During the deployment to

Bagram Airfield, the 421st FS flew more than 2,800 sorties, spending more than 10,000 hours in the air and dropping 100-plus guided bombs.

Their missions primarily supported coalition troops on the ground with close air support.

They have been replaced by F-16s from Air Force Reserve Command's 301st Fighter Wing/457th Expeditionary Fighter Squadron 'Spads' – see separate story. ■

## MV-22B Aerial Refuelling Development Contract

PLANS TO add an aerial tanker capability to the USMC MV-22B Osprey have progressed with the award of an initial contract by US Naval Air Systems Command.

The Bell-Boeing Joint Project Office was awarded the \$59m deal on May 26 for engineering and logistics support in the development of the V-22 aerial refuelling system (VARS).

An initial \$10.4 million in Fiscal Year 2016 research, development, test and evaluation (Navy) funds was released at the time of the award.

In 2013, Bell-Boeing undertook a self-funded test of a V-22 fitted with a prototype VARS and trials were conducted with an F/A-18C and F/A-18D Hornet.

VARS, a roll-on/roll-off capability, can carry 10,000lbs of fuel. Deployed with a Marine Expeditionary Unit (MEU), the MV-22B would act as a tanker to top up F-35B Lightning IIs and CH-53E helicopters deployed with the unit to extend its range from a carrier.

When not in use as a tanker, the VARS can be removed from the MV-22B and used for normal transport missions. The USMC aims to have the VARS capability ready to deploy in FY 2018. ■

## New CAG Colours on Black Eagles Hawkeye



US Navy E-2C Hawkeye 165819 'NE-600' from Carrier Airborne Early Warning Squadron 113 (VAW-113) 'Black Eagles' on approach to Naval Air Station Fallon, Nevada, on April 20. The Black Eagles are shore-based at NAS Point Mugu, California, but were deployed to Fallon while working up prior to embarking with Carrier Air Wing 2 (CVW-2) on the USS Carl Vinson (CVN 70) for an upcoming deployment. The aircraft wears a smart new CAG scheme, including a 'Liberty Eagle' on the nose and silhouette of the carrier's island on the rear fuselage, plus various squadron and CVW markings.

Steve Matterface

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## Denmark Selects F-35A

DANISH PRIME Minister Lars Løkke Rasmussen has confirmed the F-35A Lightning II's selection to replace for the Royal Danish Air Force (RDAF) F-16 fighter fleet. At a joint press conference with Minister of Defence Peter Christensen on May 12, he said his government will recommend buying 27 F-35As for the RDAF.

The purchase is expected to cost around 20 billion Danish krone (\$3.06 billion) – each jet costing around 740 million Danish krone (\$113m) – and deliveries are scheduled to begin in 2021 and be complete by 2027. After the announcement, there was a 30-day period for public comment, while parliament will also have to review the recommendation before making a final decision.

Selection of the type had been made during a meeting of top government officials on May 10, following the conclusion the previous month by defence ministry experts that the F-35A was the most suitable option for the RDAF. It beat competition from the Boeing F/A-18E/F Super Hornet and Eurofighter Typhoon.

The country's participation in the F-35 development programme since 2002 as a Tier 3 partner, however, had already led many to believe the F-35A was likely to be the leading contender.

Denmark originally intended to buy 48, but reduced the number due to budget cuts. When it later sought bids, competitors were asked to submit alternative offers for 24, 30 and 36 aircraft. Although bids from the three shortlisted contenders were submitted on July 21, 2014, since then a decision has been continually deferred over funding concerns and changes in oversight of the programme, with three different defence ministers having come and gone over the past two years. ■

## Dutch F-35As Deploy to the Netherlands



**Above: RNLAf F-35A Lightning IIs F-001 'OT' and F-002 'OT' with Gulfstream IV V-11 and KDC-10 T-235 heading towards the Netherlands on their historic first visit to Europe.** USAF/Frank Crébas

THE TWO F-35A Lightning IIs in service with the Royal Netherlands Air Force (RNLAf) – F-001 'OT' (AN-01) and F-002 'OT' (AN-02) – deployed to the Netherlands in late May for a three-week visit.

Operated by 323 Test & Evaluation Squadron (TES), they are based at Edwards AFB, California, and until 2019 will be involved in the multinational F-35 Operational Test and Evaluation (OT&E) programme.

Arriving at Leeuwarden Air Base in the evening of May 23, F-001 was the first F-35 ever to touch down on Dutch soil. Flown by Col Bert de Smit, head of the Dutch F-35 OT&E Team, it landed on runway 05 at 2117hrs. Ten minutes later, F-002 followed, piloted by Maj Pascal Smaal. Their deployment is also for Europe, as this was the first-ever west-to-east crossing of the Atlantic by the type.

The main reason for the visit to was to carry out noise comparison tests with the F-16. Last year, Dutch Minister of Defence

Jeanine Hennis-Plasschaert announced plans to bring the F-35 over for local residents around Leeuwarden and Volkel to compare the sound of both jets.

The so-called 'perception flights' took place in the afternoon and early evening of May 26 at Volkel and Leeuwarden, using F-15A F-002 'OT' and F-16AM J-511 (afternoon) and F-16BM J-065 (evening). The deployment's timing also enabled the RNLAf to show the F-35 to the public for the first time during open days at Leeuwarden on June 10 and 11, the first appearance of an

F-35 at an airshow in Europe.

They flew from Edwards to NAS Patuxent River, Maryland, on May 21. They crossed the Atlantic on May 23, supported by RNLAf/334 Sqn KDC-10s T-235 and T-264 and C-17A 03 from the European Heavy Airlift Wing (HAW).

Over Scotland, they were met by 334 Sqn's Gulfstream IV V-11, with Jeanine Hennis-Plasschaert and the outgoing RNLAf commander, Lt Gen Alexander Schnitger, on board.

The F-35s were due to fly back to the US on June 14.

**Kees van der Mark ■**



**Above: The first RNLAf F-35A Lightning II to touch down in the Netherlands, F-001 'OT', is given a traditional water cannon salute by the base fire brigade as it arrives at Leeuwarden.** Kees van der Mark

## New \$1.27bn Contract for 13 F-35s

LOCKHEED MARTIN has received a contract worth more than \$1.27bn for 13 additional F-35 Lightning IIs. The award on May 2 by US Naval Air Systems

Command modifies the previously awarded low-rate initial production Lot 11 advance acquisition contract and covers aircraft added by the US services in Fiscal Year

2016 budget deliberations and by Congress in the Consolidated Appropriations Act, 2016. The order is for six F-35Bs for the US Marine Corps, four F-35Cs for the

US Navy and three F-35As for the US Air Force. An initial \$312m was released at the time of the contract award, and work is expected to be completed by December 2019. ■

## Spear 3 F-35B Development Contract

MBDA HAS been awarded a £411m contract by the UK's Ministry of Defence for the weapon development phase of the Spear 3 air-to-surface precision strike missile for Britain's F-35B Lightning II.

Announced on May 18, the contract covers design and development work over the next four years to tailor the weapon for launch from the internal weapons bay of the F-35B. It builds on a successful series of technical milestones during a £150m assessment phase.

The missile is being developed to meet the UK's Selective Precision Effects at Range Capability 3 (SPEAR 3) requirement for the F-35, with the option to also equip the Typhoon with the weapon.

Spear 3 is from the same family as Brimstone, currently being used by the RAF to combat Daesh in Syria and Iraq, but it packs a bigger punch and has a significantly increased range.

It is being designed to engage long-range, mobile, fleeting and relocatable targets in all weathers, day or night, in the presence of countermeasures, obscurants and camouflage, while ensuring a safe stand-off range between aircrew and threat air defences.

The weapon, successfully test-fired from an MOD Typhoon in March at a range in West Wales, is expected to enter service in the mid-2020s. ■

## Voyager in F-35B Refuelling Trials

*An RAF Voyager KC2 refuels US Marine Corps development F-35B BF-04 during the recent trials at Patuxent River. MOD Crown Copyright*



UK MINISTRY of Defence officials announced on May 18 that an RAF Voyager has been deployed to Naval Air Station Patuxent River, Maryland, to support F-35B Lightning II air-to-air refueling trials. The Voyager arrived at Pax River on April 15.

Approximately 20 flights were scheduled during the

test period, of which five had been successfully completed by May 18. The final flight was scheduled for mid-June.

The tests were due to include a number of AAR flights to assess both the wing pods and the fuselage central refueling point. After initial dry contacts, testing was to continue with

fuel passing at various points through the flight envelope.

Data collected will allow certification of both types for refueling, which is expected by the year-end. This will support UK initial operational capability with the Lightning II and the re-location of 617 Squadron to RAF Marham, Norfolk, in 2018. ■

## Two More Italian F-35As Flown to the US

TWO ITALIAN Air Force Lockheed Martin F-35A Lightning IIs left the Final Assembly and Check-Out (FACO) facility at Cameri Air Base, Italy, on May 18 for Luke Air Force Base, Arizona, making an initial stop en route at Lajes Field in the Azores. Support was provided by two tanker aircraft for their crossing of the Atlantic.

This, the second transatlantic flight by AML aircraft, followed delivery of the first Italian F-35A via a similar route in February - see *Second Italian-Built F-35 Flown*, March, p8. All three become part of the international fleet of F-35s stationed at Luke for the multi-national JSF training programme. ■

## News Briefs

LOCKHEED MARTIN has received a **contract for eight low-rate initial production Lot 12 F-35As for the Netherlands**. The \$31.1m award on May 12 by US Naval Air Systems Command is for long lead-time materials and effort required to maintain the planned production schedule for the aircraft. Work should be completed in March 2021.

US Naval Air Systems Command has awarded a **contract to Lockheed Martin for 61 retrofit kits to correct deficiencies that preclude aircraft mission readiness in the US Marine Corps F-35B** initial operating capabilities. Work on the deal, valued at more than \$10.6m, is due to be completed in January 2019.

BAE SYSTEMS announced on May 13 that their test pilot, **Peter 'Wizzer' Wilson, has completed the 1,000th vertical landing in the F-35**. The milestone was reached at NAS Patuxent River, Maryland.

## First F-35A QF-16 Engagement



**Above: US Air Force F-35A Lightning II 13-5073 '07' from the 422nd Test and Evaluation Squadron takes off from Eglin Air Force Base, Florida, on May 18 armed with AIM-120 air-to-air missiles to engage a QF-16 Full-Scale Aerial Target. This was the JSF's first test firing at a full-scale target and another step towards declaration of initial operational capability later this year. USAF/Team Eglin**

# Info-Gathering Gulf

**Tom Kaminski** provides an overview of the recently ordered Range Support Aircraft (RSA) for the US Navy.

**I**N JANUARY 2013, the US Navy Office of Naval Research's Director, Innovation, Test and Evaluation and Technology Requirements (OPNAV N84) identified the need to replace the NP-3D 'Billboard' Range Support Aircraft (RSA) aircraft operated by Air Test and Evaluation Squadron VX-30 'Bloodhounds' at Naval Air Station (NAS) Point Mugu, California.

The Navy originally operated three Orions in this role and a single NP-3D Telemetry Range Support Aircraft (TRSA) is currently in service with VX-30. Then designated EP-3A and later RP-3A, the first

of three NP-3Ds was delivered to the Pacific Missile Test Center at Point Mugu in 1979. The first of those platforms was placed in storage the 309th Aerospace Maintenance and Regeneration Group at Davis-Monthan AFB, Arizona, in April 2006 and a second NP-3D was retired in July 2015.

Due to its age and configuration the surviving NP-3D, which originally entered service in July 1963, has become increasingly difficult to sustain. Although the aircraft has seen a significant number of upgrades, it is actually the last

P-3A-based variant still in service with the US Navy. Additionally, due to the planned phase-out of the Orion fleet in 2019, the US Navy Fleet Readiness Center Southeast at NAS Jacksonville, Florida, will conduct the final P-3 Planned Maintenance Interval (PMI) in 2018.

The NP-3D is equipped with the Extended Area Test System (EATS) phase array telemetry system that enables the aircraft to conduct over-the-horizon tracking and data collection from weapon systems during tests over the Naval Air Warfare Center Weapons Division's (NAWCWD) Pacific Sea Range. Concerns with the telemetry system, which is nearing the end of its useful life, also drove the plans to develop a replacement platform. In fact, the system cannot meet future programme requirements. Now nearing the end of its useful life the system is expected to suffer a major failure during Fiscal Year 2018.

The RSA supports several

Research, Development, Test and Evaluation (RDT&E) mission areas conducted on the 36,000sq miles (93,240km<sup>2</sup>) sea range adjacent to Point Mugu. During a typical telemetry mission, the aircraft collects data from the system undergoing test, this is recorded, accessed and relayed back to ground stations for further analysis via line-of-sight or INMARSAT satellite communication (SATCOM) links.

The NP-3D is only capable of receiving telemetry data on S-Band. The replacement aircraft will feature a digitally steerable airborne telemetry system that will be capable of utilising C- and L-band enabling it to track aircraft, weapons and targets on up to 11 tracks simultaneously. The NP-3D is limited to just five tracks.

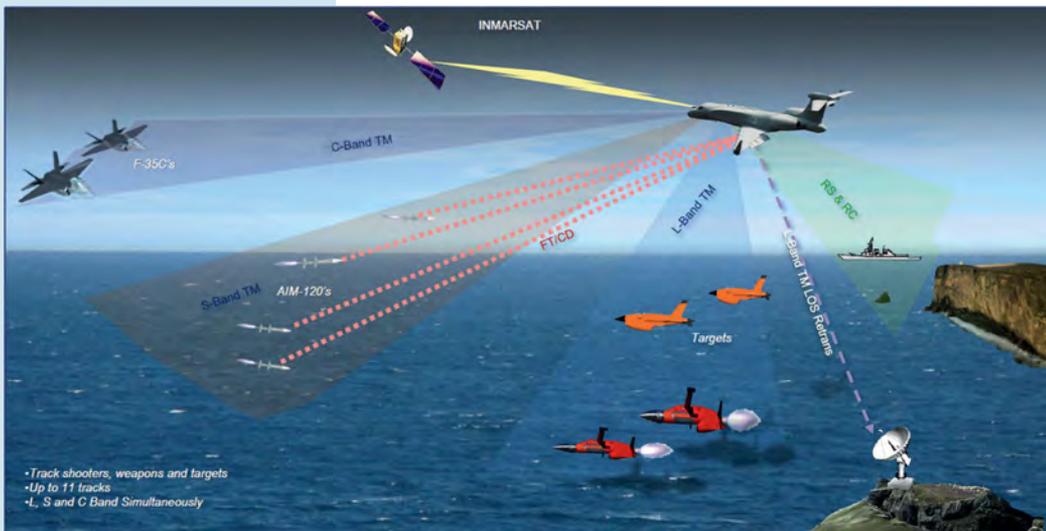
The RSA replacement project was divided into two phases comprising aircraft procurement and systems development/integration. The Naval Air Systems Command



*Above: One of the three NP-3D Orions that served with VX-30. The Orions became increasingly difficult to support in terms of spares and maintenance. Tom Kaminski*



*An artist's impression of how the US Navy G550 will look in operational service with VX-30 'Bloodhounds' at Naval Air Station (NAS) Point Mugu, California. US Navy*



**Above: The new RSA will be able to record data across a much wider range of bandwidths including those used by fifth-generation aircraft.** US Navy

(NAVAIR) had determined that a modified Gulfstream G550 was the only airframe that met its needs for the RSA. The Gulfstream was chosen because several 'outer mould line' airframe modifications that were developed for the Israel Aircraft Industries Conformal Airborne Early Warning (CAEW) aircraft would lend themselves to the installation of the required systems. In October 2014 the command revealed plans to acquire a single

aircraft from Gulfstream Aerospace.

Some of the aircraft modifications will include a nose sensor pod, aft tail cone radome, enlarged tail bullet, external wiring conduits, increased electrical power and a modified flight management system. Additional systems will include the Automatic Identification System (AIS), a common display system and Acquisition Control & Tracking System (ACTS).

The port side fuselage fairing will contain the antenna for the Commercial Derivative Aircraft Based Instrumentation Telemetry System (CBITS) antenna. The starboard side fuselage fairing will be retained for aerodynamic and weight and balance purposes. Six operator consoles will be installed in the aft part of the main cabin.

A nose-mounted Telephonics AN/APS-143C(v)3 surface search radar

will be installed and the antenna for the Flight Termination/Command Destruct (FT/CD) system will be fitted in the tail radome. A satellite communications (SATCOM) antenna will be installed in a bullet fairing on the tail. A request for information associated with the RSA was initially released in March 2013, and the G550 was selected after the determination was made that no other aircraft would meet the Navy's requirements.

On March 18, 2016 the Naval Air Systems Command's Tactical Airlift Program Office (PMA-207) awarded Gulfstream Aerospace a US\$91.9m contract cover for the procurement of one 'green' G550 aircraft with AEW air vehicle modifications. Delivery of the aircraft is expected by July 2018.

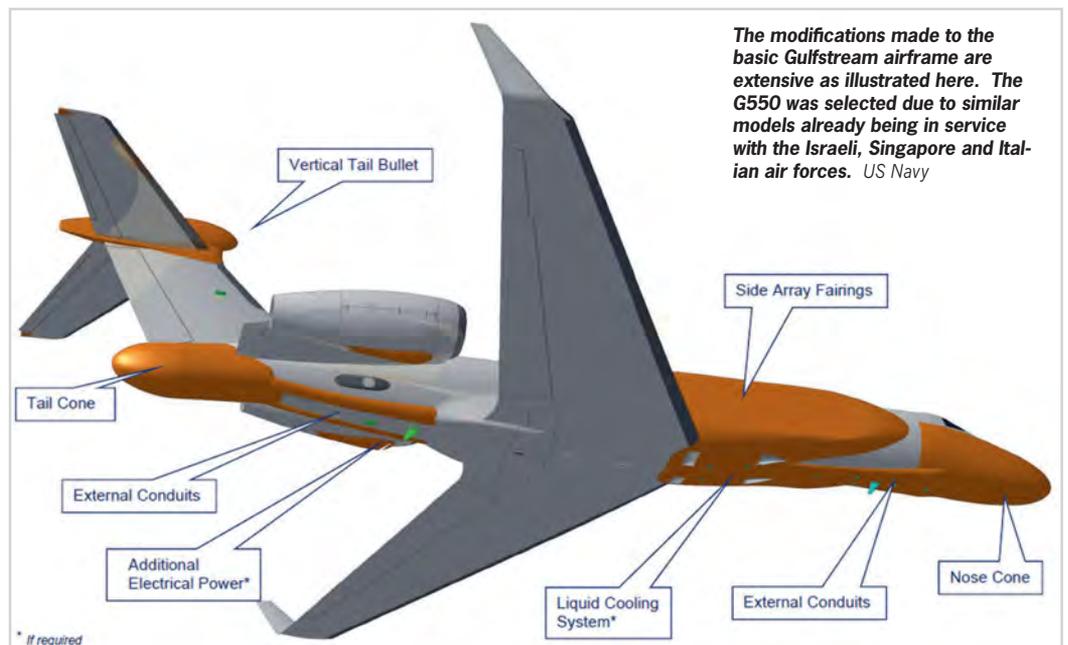
NAVAIR plans to conduct a full competition of the Phase II aircraft

integration effort and a request for proposals (RFP) will be released in the autumn and work will begin during Fiscal Year 2017. The G550 will be provided to the integrator as Government Furnished Equipment and will enter service in 2018.

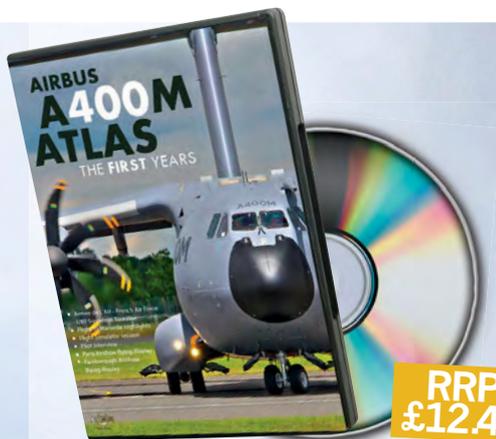
Plans call for the RSA to fly 450 to 500 hours annually and its missions will typically last 5.5hrs but could range from 2.5hrs to 11.5hrs in length. Its 4,500nm (8,334km) range will, however, enable it to be deployed to other test ranges and sites around the world. The RSA will be tasked with several primary missions.

- Range Surveillance/Range Clearance (RS) – Locate, identify and contact surface contacts within the designated hazard area in all-weather and sea states and co-ordinate their movement out of the area.
- Multi-Band Range Communications Relay and Recording - Provide over-the-horizon communications in support of test and evaluation missions.
- Airborne Telemetry (L, S and C-Bands) – Receive, record, process, and retransmit telemetry data from events beyond the range of land-based stations.
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Since 2006 Gulfstream has produced six G550 CAEW airframes comprising two for Israel and four for the Republic of Singapore. In 2015 it delivered the first of two airframes for the Italian Air Force to Israel Aerospace Industries (IAI) for integration of the Elta EL/W-2085 radar and associated systems. ■



**The modifications made to the basic Gulfstream airframe are extensive as illustrated here. The G550 was selected due to similar models already being in service with the Israeli, Singapore and Italian air forces.** US Navy



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## Bolivia Orders Nine Zlin Z242Ls

BOLIVIA HAS ordered nine Zlin Z242L Guru basic training aircraft for the Fuerza Aérea Boliviana's (FAB – Bolivian Air Force) Colegio Militar de Aviación (Military Aviation School) at Santa Cruz de la Sierra. Minister of Defence Reymí Ferreira announced plans for the purchase on May 12. The \$2.7m acquisition was approved at a Cabinet meeting on May 25 and a formal contract was signed on May 31 with representatives of the manufacturer, Moravan Oktrokovic during a ceremony held to mark the anniversary of the Colegio at Santa Cruz.

He said deliveries are due within two months, noting there had been little funding for defence projects recently as social and economic programmes had been given priority. But he added that, with a low unit cost of \$300,000 per aircraft, financing had been found to meet an urgent FAB need for new training aircraft.

According to Mr Ferreira, only two training aircraft remained operational in FAB service, one of which was due to be retired in June.

He also highlighted the need for new aircraft for the fight against drug trafficking and smuggling, but noted that there was no funding in the 2016 budget to meet the requirement. He hopes purchases can be financed in 2017, with the A-29 Super Tucano a likely candidate. ■

## Former US Navy KC-130R Delivered to Chilean Air Force



**Above: New Chilean Air Force KC-130R Hercules 991 arriving in Chile on May 5 at the end of its delivery flight from NAS Patuxent River, from where it had departed on May 2. US Navy**

US NAVAL Air Systems Command's Tactical Airlift Program (PMA-207) Foreign Military Sales (FMS) team delivered an ex-US Navy KC-130R Hercules to the Fuerza Aérea de Chile (FACH – Chilean Air Force) on May 2.

The aircraft, FACH serial 991 – formerly US Navy serial 160625 (c/n 4768) – entered US Marine Corps service in 1977 with Marine Aerial Refueler Transport Squadron 252 (VMGR-252) 'Heavy Haulers' at MCAS Cherry Point, North Carolina.

Retiring in 2008, it was put in storage with the 309th Aerospace Maintenance and Regeneration Group (AMARG) at Davis-Monthan Air Force Base, Arizona,

but returned to service three years later with the US Navy's Test and Evaluation Squadron 20 (VX-20) at Naval Air Station Patuxent River, Maryland, for test evaluation/range support.

The Hercules was again due to be retired in 2015 when the FACH contacted the PMA-207 FMS indicating an interest in buying it. A sale was agreed in September 2015. In the past year it has gone through a series of de-modifications co-ordinated by PMA-207 and executed by VX-20 and industry partners DynCorp and Wyle at Patuxent River.

Tom Benedik, C/KC-130 deputy programme manager at PMA-207, said: "FMS sale from stock

purchase modifications to remove Navy proprietary instrumentation are not normally performed by the unit retiring the aircraft. Typically de-modifications of this type are done by AMARG or at Hill Air Force Base [Utah]. We're very thankful for the teamwork and support we received to get this job done."

This is the second KC-130R the FACH has acquired from the US in recent years. Another, ex-USMC aircraft, 160628 (c/n 4776), was prepared by the ALC at Tinker AFB, Oklahoma, entering service with Grupo 10 at Arturo Benítez International Airport, Santiago, as serial number 990 in April 2015. The unit will also fly the second Hercules. ■

## Third Bolivian AS332C1e Flight Testing



**The third Bolivian Air Force AS332C1e, FAB783/F-ZWDO on a test flight from Marseille-Marignane, France, on April 29. The helicopter is one of six on order under a contract signed in September 2013. Brendon Attard**

## UH-60M Retrofit for Mexico

SIKORSKY AIRCRAFT has taken on a US Army Contracting Command contract to retrofit an unspecified number of UH-60M Black Hawks up to their full operational capability for Mexico.

The \$85m deal modifies an earlier Foreign Military Sales contract, and is assumed to relate to an order for seven UH-60Ms for Mexico announced on April 11, 2016 – see *Mexico Orders Seven more UH-60Ms*, June, p20.

The company's facility in West Palm Beach, Florida, is due to complete work on the UH-60Ms by April 30, 2019. An initial \$25m in funding was released at the time of the award. ■

# Not all fast computers reach Mach 2





# Jordanian AT-802U Deliveries Completed

A FURTHER four Air Tractor AT-802Us have recently entered service in Jordan. They have joined six examples, which were donated by the UAE in 2013, already in operation. L-3 Communications Integrated Systems was awarded a contract on September 28 last year for these four additional aircraft in an unarmed, intelligence, surveillance and reconnaissance (ISR) configuration – see *Jordanian ISR AT-802U Order*, November 2015, p27. The company had initially been contracted to deliver them to Yemen, but the changed political situation there led to the aircraft being reconfigured for Jordan under a new contract.

The first pair, 2557/N30694 (c/n 802-4027) and 2558/N30698 (c/n 802-4028), arrived at Halifax International Airport, Canada, from Bangor, Maine, on April 6 during their delivery flight (see *Jordan's First ISR AT-802Us Delivered*, May, p26), then arrived at Ibiza Airport, Spain, from Santa Maria in the Azores on April 9 as they continued their journey. The remaining two, 2556/N30678 (c/n 802-4026) and 2559/N30701 (c/n 802-4029), routed



**Above:** New Jordanian Joint Special Operations Command Air Tractor AT-802U 2556/N30678 landing at Ibiza Airport, Spain, on April 9 after arriving from Santa Maria in the Azores on its delivery flight. Seen retracted under the nose is a Wescam MX-15 electro-optical infrared sensor turret. Also of note are the windows on the sides of the cockpit, which have been considerably reduced in size, presumably to allow installation of additional ballistic protection for the pilot. Alexander Portas

from Bangor to St John's, Canada, on May 10, before continuing to Santa Maria the next day.

The earlier, ex-UAE aircraft are all operated by 15 Squadron. Serials of the four new AT-802Us indicate they are allocated to 25 Special Operations Squadron as

part of Joint Special Operations Command's (SOCOM's) Prince Hashem Bin Abdullah II 5th Aviation Brigade at Al Zarqa/King Abdullah II Air Base. SOCOM is not part of the RJAF but is a separate element of the Jordanian Armed Forces. ■

## New Jordanian AT-802Us

Serial	US Regn	Con No
2556	N30678	802-4026
2557	N30694	802-4027
2558	N30698	802-4028
2559	N30701	802-4029

## Sale of 4,000 Hellfires to UAE Approved

US STATE Department approval has been given for a possible Foreign Military Sale to the United Arab Emirates of 4,000 AGM-114 R/K Hellfire Category III missiles. The estimated cost, including equipment, training, technical assistance and support is \$476m.

The US Defense Security Cooperation Agency confirmed in an announcement on May 13 that approval had been given and it had notified Congress of this possible sale on May 11.

The UAE has requested the sale to be spread over the next three years in separate annual increments of 1,000 to 1,500 missiles. The total estimated value of Major Defense Equipment involved in the deal comprises \$468m of the overall total value.

The prime contractor for the proposed contract will be Lockheed Martin Missile and Fire Control in Dallas, Texas. ■

## Two More Saudi Typhoon Deliveries



TWO MORE Eurofighter Typhoons have been delivered to the Royal Saudi Air Force (RSAF) from BAE Systems' factory in Warton, Lancashire. Both single-seaters, 8012/ZK611 (CS042) and 8014/ZK613 (CS044), they departed on May 17 from Warton to Bologna Guglielmo Marconi Airport, Italy. These aircraft made their first flights at Warton on February 12 and March 1, respectively.

Since AFM's last report (see *New Saudi Typhoon Unit Gains First Aircraft*, August 2015, p4), other RSAF Typhoon deliveries are shown in the adjacent table. ■

**Above:** Royal Saudi Air Force Typhoon 8014/ZK613 on approach to land at Bologna Guglielmo Marconi Airport, Italy, on May 17 after arriving from Warton on its delivery flight. Fabrizio Berni

## Recent Saudi Typhoon Deliveries

RSAF serial	UK serial	Delivery date	First Flight
1024 (CS030)	ZK395	March 14, 2016	November 16, 2015
8003 (CS033)	ZK602	July 14, 2015	April 20, 2015
8005 (CS034)	ZK604	October 22, 2015	May 19, 2015
8006 (CS035)	ZK605	October 22, 2015	July 28, 2015
8007 (CS037)	ZK606	November 24, 2015	August 26, 2015
8008 (CS038)	ZK607	November 24, 2015	September 18, 2015
8009 (CS039)	ZK608	December 17, 2015	October 12, 2015
8010 (CS040)	ZK609	December 17, 2015	October 29, 2015
8011 (CS041)	ZK610	March 14, 2016	November 24, 2015



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## H225s and AS350s in Service in Uzbekistan

AIRBUS HELICOPTERS has delivered a batch of H225 Super Puma and AS350 Ecureuil helicopters to the Uzbekistan Air Force. While their delivery has not been publicised, a February 22 video of an Uzbek Armed Forces exercise showed both types are now in operational service.

At least two H225s, serial numbers 201 and 202, and three or possibly more AS350s, including serial number 102, were identified as being used during the training.

Uzbekistan signed an €180m euro contract with what was then Eurocopter in 2013 for eight AS332s (now designated H225s) and eight AS350s, all for its Air Force in military configuration. But the deal stalled after Germany refused to grant an export licence on political grounds, considering Uzbekistan to be an undemocratic state.

The impasse was partially overcome in summer 2014 when the first two AS350s were delivered as purely civilian-configured versions. However, it was not until March last year that Germany finally gave approval for delivery of the remaining 14. It is thought deliveries of both types were completed by the beginning of 2016. ■

## First Taganrog-Assembled Be-200ES Rolled Out



**Above:** The first Beriev Be-200ES to be assembled at Taganrog at its roll-out ceremony on May 30. It will be delivered to Russia's Ministry of Emergencies. UAC

A ROLL-OUT ceremony at Beriev's factory in Taganrog on May 30 unveiled the first Be-200ES amphibian to be assembled at the facility. The aircraft is due for delivery to Emercom, the Russian Ministry of Emergencies.

Previously, manufacture of the Be-200 had been completed at the Irkutsk Aviation Plant. To enable it to start at Taganrog, Beriev has established high-tech production facilities, bought new equipment, upgraded production lines, workshops and composite

structure production facilities and recruiting new personnel.

Yuri Slyusar, President of United Aircraft Corporation, said: "We're witnessing a second birth of this much needed aircraft after its successful operations and use in emergencies in Russia and abroad in Greece, Portugal or France. Keen interest in the aircraft has also been shown in Indonesia."

The Head of the Southern Regional Centre of the Ministry of Emergencies, Igor Oder, added that his department has operated the

Be-200ES for more than a decade.

Director General and General Designer of Beriev Aircraft PJSC, Yuri Grudin, noted that the new version which is now being built at Taganrog has incorporated a number of significant upgrades: more than 50% of its equipment has been modernised together with up to 70% of the airframe.

The company is currently in the process of working on production contracts for the Be-200 for Russia's defence and emergencies ministries. ■

## Third New An-140-100 for Russian Navy

**ANOTHER ANTONOV An-140-100 has joined the Russian Navy. It was handed over on May 24 at the JSC Aviacor Aviation Plant in Samara. The aircraft, ordered under a state contract with**

**Russia's Ministry of Defence, is in a 52-passenger configuration but can be converted for cargo operations. The Russian Navy took on its first An-140-100 on April 17, 2013, a week before Aviacor announced**

**a contract for three more – the first of which was delivered on December 21 that year. A second followed on December 25, 2014 and this latest should be the third from that order. ■**

## Russian Former An-12PPS Intercepted by Belgian F-16s



**Above:** Russian Air Force Antonov An-12PPS '19 Red'/RF-90787 (c/n 01347709) while being intercepted by Belgian F-16AMs during their Baltic Air Policing rotation in April. Only a handful of PPS electronic countermeasures aircraft are operated by the Russian Air Force, but this example was de-converted in 2001 and now operates as a standard transport. It still, however, retains the bulbous tail fairing that replaced the tail gunner's turret in order to house the SPS-100 Rezeda self-protection equipment. Belgian Defence

## More Russian Su-34 Deliveries

FOUR Sukhoi Su-34 Fullback fighter-bombers have joined the Russian Air Force's 6983rd Air Base at Komsomolsk-on-Amur/Khurba. The aircraft, '01 Red', '02 Red', '03 Red' and '04 Red' – contracted for as part of the 2016 State Defence Order – arrived on May 31 from the V P Chkalov Novosibirsk Aircraft Plant.

They are the first of the type to join a Russian Air Force and Air Defence unit in the Eastern Military Division and will begin replacing Su-24/24M2 Fencer-Ds in what was formerly the 277th Fighter Bomber Regiment at Khurba. ■

VACANCY



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## HAL HTT-40 Basic Trainer Aircraft Flown



**The HAL HTT-40 Basic Trainer Aircraft prototype, TSR 001, lifts off from Bangalore for its maiden flight.** Sanjay Simha

HINDUSTAN AERONAUTICS Ltd (HAL) has completed the maiden flight of its indigenous HTT-40 Basic Trainer Aircraft prototype, TSR 001, which took off from Runway 09 at HAL's Bangalore Airport at around 0820hrs local time on 31 May and flew for around 30 minutes before landing back on Runway 27.

It was flown by Gp Capt Subramaniam (ret'd), HAL's chief

test pilot, and Gp Capt (ret'd) Venugopal. Acting as a chase aircraft was an HJT-16 Kiran Mk IA.

There has been no official announcement by HAL about the achievement – apparently because an 'official' first flight will take place at a later date, attended by high-ranking officials.

The aircraft had been rolled out of the Aircraft Research and Design Centre (ARDC)

hangar in Bangalore on February 2 – see *HAL Unveils HTT-40 Trainer*, March, p5.

The Indian Air Force is scheduled to acquire 68 HTT-40s as partial replacements for its outdated HPT-32 Deepak basic trainers. To meet an urgent requirement to replace them, however, the IAF has already bought 75 Pilatus PC-7 Mk IIs and has options on 38 more. ■

## Thai Air Force Acquires ex-Thai Airways A340-500

A SECOND-HAND Airbus A340-541, HS-TLC (c/n 698), is being bought for the Royal Thai Air Force (RTAF) from Thai Airways International. Details were revealed by the airline on May 17 as part of a financial disclosure to the Bangkok stock exchange.

As part of a THB1.745 billion (\$49m) package, the RTAF will take on the airliner along with a spare Rolls-Royce Trent 553-61 engine and a spares holding. Painting the jet will also be included in the deal, along with pilot, mechanic and cabin crew training.

Payment will be made in nine tranches from June 2016 to September 2017.

The A340, one of four retired by Thai Airways in 2012 and 2013, has been stored at Bangkok-Don Muang International Airport since June 29, 2012. The national airline has been trying to sell them ever since, but asking prices are said to have put off other potential buyers. ■

## Pakistan Orders SAR AW139s

PAKISTAN'S GOVERNMENT has placed an order for an undisclosed number of search and rescue (SAR)-configured AgustaWestland AW139s for operation by the Pakistan Air Force. The new contract, revealed on May 24 by Leonardo-Finmeccanica, was signed in Islamabad in the presence of Italian Ambassador Stefano Pontecorvo.

The order, part of a fleet renewal programme to be spread over several batches. It includes a logistic support and training package. Deliveries are due in 2017 and the helicopters will undertake SAR missions throughout the country.

Eleven AW139s already operate in Pakistan. These include five with the Army Aviation Corps' 6 Army Aviation Squadron at Islamabad Army Air Base used for transport and humanitarian relief; two are also configured for the VIP/VVIP role. The other six are with civilian operators. ■



**The first ROKA AH-64E, 30601, prepares to lift off from the dockside at Busan on May 25 after arriving from the US.** ROK Ministry of National Defense

## First Four Korean Army AH-64Es Delivered

SOUTH KOREA has received the first four of a batch of 36 Boeing AH-64E Apache Guardians for Republic of Korea Army (ROKA) service. The helicopters were unloaded at the port of Busan on May 25

from the ro-ro cargo vessel *Grand Eagle* before being reassembled.

Boeing was awarded a Foreign Military Sales contract for them by US Army Contracting Command on August 23, 2013 (see *News Briefs*, October 2013, p27) after

selection for the requirement on April 17, 2013 by South Korea's Defense Acquisition Program Administration. The type beat off two competitors - Bell which offered the AH-1Z Viper and TAL with the T-129. ■



## Australian P-8A Poseidon First Flight

FINAL COMPLETION of Australia's first Boeing P-8A Poseidon is under way at Boeing Defense, Space and Security at Boeing Field, Seattle, after delivery from Renton, Washington. The Australian Department of Defence confirmed the move in a statement on May 24.

The aircraft, A47-001/N940DS (c/n 62288), was rolled out of the paint shop on April 28 after being painted in full Royal Australian Air Force (RAAF) colours, with 11 Squadron markings on the tail. The short hop from Renton to Boeing Field followed on May 6. After post-production checks and acceptance, it is due to be ferried to Australia

towards the end of this this year.

The Australian Government announced on February 21, 2014, that it had approved purchase of eight P-8As. An order for the first four was placed on August 27 last year while the remaining four were ordered under a contract placed on January 28, 2016 – see *Four More RAAF P-8A Poseidons Ordered*, March, p29.

The Defence White Paper that was published on February 26 this year confirmed plans to add seven more, the first four of which will be conversions of options already held as part of the earlier deals – see *Australian Defence White Paper Unveiled*, April, p29. An order will be placed later for the other three to create a fleet of 15 Poseidons by the late 2020s. ■



The first Royal Australian Air Force P-8A Poseidon departs from Renton for Boeing Field on May 6. Commonwealth of Australia/Mathew B Thompson

## Operation Okra Milestone for KC-30A



Above: Royal Australian Air Force/2 Squadron E-7A Wedgetail A30-005 approaches an RAAF KC-30A over the Middle East on April 30 during an Operation Okra sortie. The RAAF KC-30A deployed to the region has offloaded of 50 million pounds of fuel since commencing these missions. Commonwealth of Australia/Cpl Nicci Freeman

A TOTAL of 50 million pounds of fuel has been offloaded by the Royal Australian Air Force (RAAF) KC-30A Multi-Role Tanker Transport deployed for Operation Okra, the Australian element of Operation Inherent Resolve. The figure equates to 22,679 tonnes of fuel or more than 28 million litres, offloaded for RAAF and Coalition aircraft in the Middle East region since September 2014.

The milestone, announced by the Australian Department of Defence on May 31, was reached on April 27 during a sortie with a pair of RAAF F/A-18 Hornets while flying as part of Air Task Group 630. As of May, the ATG630 Air Mobility Element had carried out 631 sorties with the KC-30A and flown more than 5,000 hours. ■

### Military Aircraft Contracts

Air Force	Company	No and Type	Date	Delivery Date and Notes
Bolivian Air Force	Moravan	9 x Z242L	May 31	During 2016
French Army	Sagem	14 x Patroller	April 5	From 2018
Royal Netherlands AF	Lockheed Martin	8 x F-35A	May 12	By March 2021. Long-lead items only
Pakistan Air Force	Leonardo	? x AW139	May 24	2017
Russian Air Force	Russian Helicopters	24 x Mi-28UB	April 24	By end of 2018
Russian Air Force	Irkut	36 x Su-30SM	April 4	By end of 2018
Russian Air Force	Irkut	30 x Yak-130	April 17	By end of 2018
US Army	Sikorsky	8 x UH-60M	May 18	By June 30, 2017
US Marine Corps/Navy	Insitu	30 x RQ-21A	May 31	By October 2017

The RAF's Voyager Force has now been flying for four years. **Alan Warnes** visited RAF Brize Norton, where AirTanker is based, to find out how industry is providing an airborne refuelling service.

# Voy



## Two types

OF THE eight military registered aircraft, two Voyagers are currently configured as KC2s, with two Cobham 905 under-wing pods, which are used for refuelling fast jets. Six are configured as KC3s, fitted with the Cobham Fuselage-Refuelling Unit (FRU) to create a centreline refuelling capability, primarily to give fuel to large aircraft. All of the military registered aircraft have the ability to be configured as either a KC2 or KC3.

Having the ability to refuel two receiver aircraft from its wing pods simultaneously, Voyager gives the RAF a large capacity two-point tanking capability for the first time. The maximum flow from each wing pod is just over a ton (1,200kg) a minute and nearly two tons (1,800kg) a minute on the centreline.

Meanwhile, the five Voyagers that are being made available in the charter market have to be demilitarised. They will have their AAR equipment, including the under-wing pods and the Cobham FRUs, removed at RAF Brize Norton and the aircraft reverting to A330-243s. One has so far been chartered to Thomas Cook. ■

# Yagers

## In Full Swing



An RAF Typhoon FGR4 and a French Air Force Rafale sit off the starboard wing of an RAF Voyager during Exercise Griffin Strike in March. Crown Copyright

**A**IR-TO-AIR REFUELLING (AAR) aircraft, or tankers as they are generally called by the military, are worth their weight in gold. They enable receiver aircraft to fly further without the inconvenience of landing. Or, as has been in the case over Iraq, Afghanistan and more recently during anti-Daesh operations, refuelling fighters to enable them to stay longer on station in case of time-sensitive missions. Tankers are a vital lifeline for the air forces that operate them.

### Revolutionary AAR

In Britain, the RAF has adopted a revolutionary method of using air-to-air refuellers: by buying the service from industry under what was known as a private finance initiative (PFI). Unable to afford the big-ticket capital investment for a new tanker fleet, the MOD put its Future Strategic Tanker Aircraft (FSTA) project out to tender in 2000.

The competition between AirTanker, offering A330MRTTs (Multi-Role Tanker Transports), and Tanker Transport Services Consortium

(TTSC) with its converted Boeing 767s, lasted around four years. It resulted in AirTanker being selected to enter into contract negotiations on January 26, 2004 and on March 27, 2008 the deal was done (*RAF Tanker Deal Finally Signed*, May 2008, p4).

AirTanker, a consortium of Airbus Group, Rolls-Royce, Thales, Cobham and Babcock, was awarded the £13 billion (\$25.8bn) PFI contract on March 27, 2008 (*RAF Tanker Deal Finally Signed*, May 2008, p4) to run for 27 years.

According to AirTanker, the consortium brings unparalleled expertise to its front-line operations, which includes a full CAA Part M and Part 145 approved engineering and maintenance facility at RAF Brize Norton, Oxfordshire, where the fleet is based.

The company also holds its own Air Operator Certificate, employing a team of civilian pilots and cabin crews drawn from leading global airline operators. Operating within the Voyager programme, these pilots also step across into a Sponsored Reservist role to deliver military air transport, air-to-air refuelling and training as part of AirTanker's military programme. It all adds up to provide the RAF with a 'trailblazing' while optimising costs. Many air forces globally are keeping a keen eye on the progress.

However, the RAF isn't getting just an AAR service. The A330MRTT aircraft, known as the Voyager, are also taking on their fair share of air mobility work by transporting military personnel or freight all over the world. ▶



## Defence Gateway to the World

RAF Brize Norton is the RAF's largest station, with the sign at the main gate proclaiming it as Air Mobility's Defence Gateway to the World. Behind the fencing, the RAF is going about its business in such a way that is different from any other air force.

The base has gone through considerable change over the past decade. Gone are the elderly VC-10s (last operational sortie on September 20, 2013), which served an amazing 47 years and Tristars (last operational flight on March 24, 2014), which chalked up 30 years. Both were breaking down as they headed towards the end of their careers. That wasn't surprising given the age of the airframes and technologies as well as their tireless AAR/air mobility work during the wars in Iraq, Afghanistan and Libya.

The Oxfordshire base has also seen the number of C-17As increase, the 20+ strong C-130J fleet has moved in from RAF Lyneham, Wiltshire, eight A400M Atlases have been delivered by Airbus Defence and Space to date and the Voyager Force has stood up. The latter has grasped a completely new way of working, with industry and the military as one. Now, four years after the first operational RAF Voyager flight departed the base on April 8, 2012, all but one of the 14 aircraft have been delivered. ■



**Above:** The modern look of the flight deck with a glass cockpit. The pilot sits on the left and co-pilot on the right. The latter came to Voyager Force via the ab initio route rather than arriving from the VC10, Tristar or C-130, as have most aircrew.

AirTanker will eventually have a fleet of 14 brand new Airbus A330MRTTs, comprising nine aircraft for air-to-air refuelling and air transport with an additional five making up the 'surge' fleet. These would be made available to the RAF at its request, or potentially to allies in future.

Until that time the 'surge' aircraft can be leased by AirTanker to the civil market, with Thomas Cook already taking up one of the A330s in a three-year deal.

## Interoperable

Stepping into the brand new AirTanker building, traditionalists will be surprised to see both RAF and civilians going through the same doors, into the same offices and ultimately sharing the same workload. This is the way Voyager Force works. It comprises civilians, sponsored reservists and RAF personnel working as a united force to deliver a much-needed capability.

The Voyagers are being flown by two squadrons - 10 Squadron and 101 Squadron - which, although separate entities, are interoperable. Both share the same tasks and fly together, unimaginable within many air forces. The only difference between the two units is the management duties.

Sharing the workload has seen the manning levels decrease dramatically. In the VC-10/Tristar days there were 550 personnel on one squadron, but today there are 350 personnel with the two squadrons. The Officer Commanding 10 Sqn, Wg Cdr Si Blackwell said: "It goes to show how efficient in personnel and manpower the new system is."

The enthusiastic OC 10 Sqn calls it "trailblazing" saying: "The capacity and capability of the Voyager is something else."

Having flown 101 Sqn VC-10s in the air-to-air refuelling role (AAR) and served as an AAR co-ordinator - planning tanker



**Above:** Parked on the ramp at RAF Brize Norton, where the Voyager fleet is based, is A330-243 G-VYGL. This example is part of the 'surge' fleet. It is one of the five that can be sub-contracted and has been de-converted from a military airframe. It has no refuelling equipment, no missile warning system and no national insignia. All photos, Alan Warnes unless stated **Below:** The Voyager Force was used to transport military personnel back to the UK as Operation Herrick edged to a close last year. A Voyager arrives at Camp Bastion, Afghanistan, for the first time in February 2015. Crown Copyright





The RAF's new air-to-air refueller is also playing a major role in Operation Shader, flying out of RAF Akrotiri in Cyprus. Crown Copyright

missions in the UK and overseas – he knew the VC-10/Tristar fleet well.

“There is such a huge difference between the Voyager and the VC-10/Tristar. From the serviceability, to the way it’s supported, to the regulations and the interoperability.”

While it’s a complex set up, the operational targets being achieved by AirTanker are a significantly marked improvement on the legacy fleet.

While initial crews comprised VC10, Tristar and C-130 personnel, ab initio pilots have been joining the Voyager Force for a while now.

Wg Cdr Blackwell continued: “We have been taking on ab initio pilots for two-and-a-half to three years now. We brought co-pilots in from 45(R) Sqn where the multi-engine pilot training is done, quite quickly. We should have our first ab initio captain soon – they start their course before the end of the year. The new generation of pilots adapt very well and the pipeline is very well configured. Pilots train on the glass cockpit before they come here.”

## In Together

While the global transport and air-to-air refuelling role remain the same, the Voyager Force is a step change. With the Force’s RAF personnel built predominantly from people who worked on the VC-10 and Tristar – their knowledge is vast and indispensable. While they work for the squadron, the engineers are employed by AirTanker. One-third are serving service personnel in uniform, another third are sponsored reserves and the remainder are AirTanker staff.

With two-thirds of the engineers capable of supporting military operations, it enables the Voyager to go on deployed ops with a complement of uniformed, experienced RAF and AirTanker staff.

Wg Cdr Blackwell said: “Since civilians cannot be deployed to war, sponsored reserves provide a manpower-efficient way to get around that.”

Although the military engineers, along with other personnel fulfilling flight ops, logistics and admin roles, work for AirTanker, they report to the RAF for admin/discipline purposes.

Each aircraft has a pilot and co-pilot with a Mission Systems Operator (MSO), responsible for operating the air-to-air refuelling equipment. Additionally, more than 120 cabin crew support the Air Transport (AT) role and, unlike their civilian counterparts in the airline world, wear flying suits.

When Operation Herrick ended in late 2014/early 2015 the Voyager Force was fulfilling its AT role to get the troops home and the refuelling element of its work dipped. During that time the MSOs usually performed purser duties.

Wg Cdr Blackwell said: “There is an annual tasking of just over 16,000 flying hours, but the work ebbs and flows to meet demand. In the wake of completing ops in Afghanistan in late-2014/2015 it was very AT heavy, but due to Operation Shader [the UK’s operations over Iraq/Syria] we are now AAR heavy to meet the demands as necessary, demonstrating the inherent flexibility in this new force.”

Although there are eight military aircraft, there are nine Voyagers used for military ▶



# AIRTANKER FOUR YEARS ON

tasking. The ninth has no under-wing pods, no RAF roundels and carries a civil registration. It is used for the Falkland Islands airbridge flown by AirTanker crews. This enables military pilots to give their full attention to more demanding operational roles.

## Current ops

The Voyager Force flew more than 3,000 hours in the last financial year (2015/16) in Operation Shader. The aircraft are usually airborne for between five and seven hours with an average offload of around five tons. The aircrews generally stay in RAF Akrotiri, Cyprus, where Voyager is based for about a week.

“They use their regulatory maximum flying hours limit very quickly there, so they don’t stay long. That is unlike most overseas deployments, but working this way doesn’t affect their currencies.”

Apart from their usual RAF Tornado, Typhoon, C-130J Hercules and E-3D Sentry traffic, the Voyagers are also refuelling multinational F/A-18s (Royal Australian Air Force and US), French Air Force Rafales and Mirage 2000s as well as USMC AV-8Bs. While no formal clearance exists, it works due to the operational imperative and a risk balance of other military users’ data.

Wg Cdr Blackwell added: “The RAAF F/A-18s already work with their own A330 tankers, so it makes sense.”

Recently the Eurofighters of Germany, Italy and Spain have been released to fuel from the RAF Voyager, as have Tornados of the three partner nations.

The biggest offload of fuel during one sortie, of just over 52 tons took place in late March.

Wg Cdr Blackwell explained: “We always want to take on trade. We train them to be flexible, because it is very easy to be a ‘tanker man’, flying around the track waiting for the receiver to find you. So we try to focus on flexibility. In Afghanistan we were probably over-flexible [by straying into areas where the tankers should not have been to help the receiver], which could be classed as extreme bravery or stupidity!”

“We are all about maximising fuel, if that means offloading more so they are closer to their target area, that’s great.

“It’s a very busy air space during Op Shader sorties, so we stay in Blocks and they come to us – we don’t wander!”

There is always one Voyager in the Falklands, which can provide support to the 1435 Flight Typhoons on Quick Reaction Alert (QRA) there and provides an aero-med standby. The passenger cabin can be configured to provide a 40-stretcher aeromedical evacuation capability. It also includes two rapidly configurable stretchers and three critical-care patient facilities.

There is also a Voyager on alert at Brize Norton to support Typhoons if called into QRA action

## AirTanker Voyager KC2/KC3 Fleet

RAF Serial	Variant+	Airbus c/n	Remarks
ZZ330	KC2/3	c/n 1046	Ex G-VYGA
ZZ331	KC2/3	c/n 1248	Ex G-VYGB
ZZ332	KC3/2	c/n 1275	Ex G-VYGC
ZZ333	KC3/2	c/n 1312	Ex G-VYGD
ZZ334	KC3/2	c/n 1033	Ex G-VYGE
ZZ335	KC3/2	c/n 1334	Ex G-VYGF
ZZ336	KC3/2	c/n 1363	Ex G-VYGG
ZZ337	KC3/2	c/n 1390	Ex G-VYGH
ZZ338	A330-243	c/n 1419	To G-VYGI
ZZ339	A330-243	c/n 1439	To G-VYJ Falklands AT
ZZ340	A330-243	c/n 1498	To G-VYK/ Thomas Cook
ZZ341	A330-243	c/n 1555	To G-VYGL
ZZ342	A330-243	c/n 1601	To G-VYGM – To be cvtd
ZZ343	A330-243	c/n 1610	To G-VYGN – Not delivered

+ The variants can be subject to being re-rolled

from RAF Lossiemouth in Moray, Scotland, or RAF Coningsby, Lincolnshire, which is a regular occurrence due to Russian Air Force activity.

## On board

There are two pilots and an MSO in the cockpit. While the MSOs operate the refuelling systems, they can also take on the purser’s role if needed. That doesn’t happen too often, but was a regular requirement during the post Op Herrick days in early 2015, when there were many flights returning UK personnel from Afghanistan and air mobility was the predominant task.

In the cabin/passenger capacity there are 291 single Economy Class seats in an eight abreast 2-4-2 configuration, which is the standard Airbus civilian seating, featuring a 34in pitch. The aircraft also have an in-flight entertainment system. There is also the capacity to carry 43 tons of freight, which is accommodated below deck. However, this does restrict the number of passengers to fewer than the 291. An automated cargo handling system is capable of loading military and civilian cargo containers.



**Above:** Two Mission Systems Operators sit in front of the airborne refuelling monitors, watching the fighters taking on more fuel. One is calculating the amount being offloaded, as his colleague on his right, an instructor, watches over. **Below:** The penultimate RAF Voyager, FSTA13/ZZ342 was delivered to RAF Brize Norton on February 24 this year. The refuelling equipment will be taken off so it can become part of the ‘surge’ fleet. AirTanker



# On a mission



**D**URING THE 'Tartan 41' flight, on which AFM was invited on April 6, an MSO instructor – one of two on the Voyager Force – was checking out a fellow MSO, while a purser looked after the personnel on board.

During the four-hour mission, which saw the Voyager KC3 ZZ332 depart RAF Brize Norton with 99 tons of fuel (capacity is 111 tons) it was set to refuel three Tornado GR4s from RAF Lossiemouth-based 15(R) Sqn and seven Typhoon T3s of 29(R) Sqn from RAF Coningsby. While the Tornados were undergoing operational conversion unit, the Typhoons' instructors were keeping proficient in AAR.

We transited for an hour up to north-east England where we refuelled the three Tornados, offloading around 11 tons over 15 minutes. The jets joined us on the left wing before dropping behind the refuelling pods and moving in, taking on the fuel, before heading over to the starboard wing.

We then flew down over the Lincolnshire coast to meet two formations of Typhoons: one a three-ship and then later a four-ship. The three-ship returned to top up again just before we headed home after offloading around 40 tons over the ten Typhoon refuels. The MSOs supervised the off-loading of the fuel and worked the two hose/drogue systems. ■



**1:** After heading northeast, 'Tartan 41' refuelled three 15(R) Sqn Tornado GR4s. **2:** The back-seater of this 29(R) Sqn Typhoon T3 watches as the pilot plugs into the drogue just off the UK's east coast. **3:** A Tornado GR4 takes on fuel from the Voyager, which can offload just over a ton of fuel a minute from the wing pods. **4:** Having taken on fuel, this 29(R) Sqn pilot manoeuvres his Typhoon to the starboard wing and awaits the other jets in his formation. Photos, Alan Warnes

# Persian Providers



Iran's Hercules fleet is undergoing a much-needed overhaul and upgrade programme, now that the aircraft are heavily engaged in the war in Syria, as **Babak Taghvaei** explains.



**T**HE ISLAMIC Republic of Iran Air Force (IRIAF) is among the major Lockheed C-130 Hercules operators in western Asia. Almost half its 35-aircraft fleet is mission-ready at any one time, distributed between three transport squadrons (TTSs) at two independent airlift bases.

Their missions include tactical transport; troop and equipment airdrop; aeromedical resupply; medical evacuation; disaster relief; and signals and electronic intelligence across Iran, Iraq and Syria in the war against terrorism.

In February 2008, IRIAF HQ finalised a contact with the Iranian Ministry

of Defence for the Iranian Aircraft Industries Company (IACI) to upgrade its C-130s under project Sattari. The work included installation of HF and U/VHF radios manufactured under licence by Iranian Electronic Industries, a Russian-made moving map and multifunction display (MFD) and a radar altimeter.

The programme's first aircraft, C-130E 5-8514, from the 11th TTS, was rolled out again almost two years later on September 26, 2010 at a ceremony attended by the IRIAF commander-in-chief and Iranian Minister of Defence.

The new radios were installed as additional equipment in accordance with pilot requests, while the MFD is configured to display engine data and temporarily installed above the instrument panel.

An Indonesian company, contracted by IACI, was responsible for the interface between engines and one MFD. Another MFD was also ▶



2

3

**'They transferred hundreds of Iranian-backed Iraqi Badr fighters from Damascus to Aleppo, where they fought in the successful offensive from October to December'**



**1:** This March 2016 shot of IACI's Plant No 2 at Mehrabad International Airport shows two C-130s performing engine runs to the left of the main facility in the delivery area. Six elderly C-130E/Hs are stored outside awaiting overhaul. **Tim Bowrey** **2:** Iraqi Badr fighters crammed into the hold of C-130H 5-8552 during a night flight from Abadan, Iran to Latakia, Syria. All images Babak Taghvaei unless stated **3:** This C-130H 5-8538 was grounded in 2011 having reached the end of its maintenance schedule. Delivered to IACI, the aircraft was stored for two years prior to being overhauled in 2013. It was upgraded to Phase II Sattari standard and is seen here in March outside a maintenance facility. **Tim Bowrey**

## Airborne workhorse

THE IRANIAN C-130 fleet has always worked hand-in-hand with Iranian army airborne special forces. The Shiraz-based C-130s originally flew alongside the 301st and 302nd Airborne Battalions, merged and reorganised as the 5th Airborne Special Forces Brigade in 1976, while the 23rd Airborne Special Forces Brigade used the C-130s based in Tehran.

After Sardar Mohammed Daoud Khan, a former prime minister of Afghanistan, overthrew his cousin King Mohammed Zahir Shah in a bloodless coup in the country during 1973 and declared himself president, Iran's Shah became concerned about the possibility of coups within the royal families of Saudi Arabia and Kuwait.

Soon the IRIGF's Airborne Special Forces Brigades had been prepared for possible deployment to the capitals of both countries to prevent any such overthrow.

The Airborne Special Forces Brigades and C-130s were involved in counter-insurgency operations during the Dhofar war in Oman between 1972 and 1978, but remained on alert for operations in Asia, the Middle East and North Africa.

An example of their readiness came after an Iranian ally, President Zulfikar Ali Bhutto, was ousted from power in Pakistan by chief of the army staff General Zia-ul-Haq in 1977.

Bhutto was imprisoned, but the Iranian central intelligence service learned of his planned execution and the Shah ordered the 23rd Airborne Special Forces unit to extract him.

The Iranian troops trained for the operation at Kushk-i-Nusrat airfield near the Manzariyeh salt lake in late 1978, but the Iranian revolution brought planning to a halt and Bhutto was executed in 1979.

After the revolution, the 55th and 23rd Airborne Brigades were involved in the failed Neqab coup, which attempted to occupy the headquarters of the IRGC and Islamic Revolution Committees and the house of dictator Ayatollah Khomeini. The bid quickly failed and many personnel were arrested and executed in July 1980.

Both units were reorganised and restored to strength during the Iran-Iraq war, the 55th deploying to Syria and Lebanon – but it was soon ordered to return to Iran and concentrate only on the war with Iraq.

After the conflict, both units – including the 23rd Division (formerly the 23rd Brigade), which was later reorganised as the 65th Airborne Special Forces Brigade – carried out counter-terrorism operations against the Party of Free Life Kurdistan (PJAK), Taliban and Iranian Jondollah militants, using 11th, 12th and 72nd TTS C-130s.

Since the end of the Iran-Iraq war, the 55th and 65th Airborne Special Forces Brigades have remained combat-ready through participation in annual exercises. On December 25, 2014, for example, the 65th took part in a hostage release exercise.

Troops were moved from Tehran to Jask for the training, one group parachuting from a C-130 while another was helicoptered into position as the 'enemy'.

Flying with the 12th TTS, C-130H 5-8537 dropped the paratroops over a desert road blocked by cars placed by troops delivered via Islamic Republic of Iran Army Aviation (IRIAA) Bell 214As 6-4893 and 6-4898. After the exercise, the helicopters carried all the troops back to the air base at Jask. ■



installed for the navigator, displaying a GPS-supported moving map along with a colour display for the new digital weather radar.

On September 13, 2008, 72nd TTS C-130H 5-8544 arrived at IACI and was selected as the second aircraft for upgrade under this first phase of Sattari. It was redelivered on December 13, 2011 after a successful functional check flight two days earlier.

IACI continued with the upgrade of at least one C-130 and the overhaul of two others each year. The C-130 maintenance centres at

the 1st and 7th Tactical Fighter Bases (TFBs) also overhauled two aircraft per annum.

In September 2012, the third upgraded Hercules, 11th TTS C-130E 5-8517, was completed and the fourth, C-130H 5-8541, followed for the 12th TTS in December 2013. In November 2014, IACI completed work on 12th TTS's C-130H 5-8552.

In March 2015, IACI redelivered 5-8513, a C-130E and the second 72nd TTS aircraft upgraded. Later that year, following Iran's intervention in the war against terrorism in



**Above:** The flight deck of 5-8517 which has been upgraded to Sattari standard. Note the new engine instrumentation MFD which was installed on top of the main panel during testing. **Bahram Sadegh**  
**Below:** The main ramp at the 7th Tactical Air Base with four C-130E/Hs awaiting their next mission. Left to right are: 5-8550, 5-8526, 5-8539 and 5-8524.



## 'A battalion of the 65th Airborne Special Forces Brigade deployed to Syria on eight 1st and 7th TAB C-130s'



**Above:** One of two RC-130Hs operated by the IRIAF. This example 5-8554 was quickly overhauled at IACI between September 2015 and March this year. **Left:** Despite the upgrades, Iranian C-130s still require a crew of three on the flight deck, unlike the latest variants in the West. This view of 5-8548's cockpit shows that it is lacking the weather radar repeater that's normally positioned on top of the instrument panel.

Syria, IACI speeded up its work on two more aircraft, 11th TTS C-130E 5-8507 and 12th TTS C-130H 5-8538, which were redelivered in October 2015 and April 2016 respectively.

A C-130 pilot at the IRIAF's 1st Tactical Air Base (TAB) described flying 5-8514 after its upgrade: "Its acceleration is greatly improved thanks to the zero-timed engines. It's especially evident at low speeds and during final approach [and] pretty helpful for tactical landings and take-offs from short strips.

"We're not satisfied with the digital engine

instrumentation though, and would prefer an attitude data indicator [ADI]. Of the two ADIs currently installed, one is always unserviceable and the other inaccurate; I don't know why the IRIAF paid \$2 million for the MFD.

"Like all the modified C-130s, 5-8514 suffered technical failures during its initial post-upgrade flights. We once used it on the long flight from Tehran to Kharg Island in the Persian Gulf. When we were ready to depart for the return leg, our No. 4 engine showed a technical problem at start-up. We had to

wait for a second C-130 to bring spare parts. It took 15 hours to arrive from Tehran.

"I don't have any problems with the new radio systems, but some pilots don't trust them and still use the old systems."

Based on Sattari's success, IACI was contracted in 2011 to overhaul and upgrade three Sudanese Air Force C-130Hs, serialised 1102, 1103 and 1105.

The work was carried out in Khartoum, although the aircraft's T56-A-15 engines were removed and zero-timed at IACI's Plant No 2 in Tehran.

Islamic Revolutionary Guards Corps Air and Space Force (IRGCASF) Il-76s later returned the engines and ground equipment to Sudan. All three C-130s were redelivered between September 2012 and May 2013, but the political ties between Iran and Sudan subsequently became strained and Sudan refused to pay for the work.

In late 2014 and into 2015, the aircraft flew secret missions from Khartoum to Tripoli, transferring weapons and supplies from Qatar to al Qaeda-linked Ansar al Sharia.

Since 2011, IACI has also been converting two C-130s into KC-130 tankers. But budget cuts have delayed the project, which aims to fit each Hercules with two upgraded Beech Model 1080 aerial refuelling pod systems compatible with F-14As and probe-equipped F-4Es. ▶

**The oldest Hercules still operating with the IRIAF is 5-8501, a C-130E serving with the 11th TTS at the 1st TAB. It is seen here on final approach to Mehrabad International Airport.**



## War against terrorism

When Daesh occupied a large portion of Iraq's al Anbar province and threatened Baghdad in June 2014, Iran's was among the first foreign governments to help the country in its war against the terrorist group.

Two months later Kurdistan's regional government asked Tehran for support after the terrorist group occupied Kurdish villages near Irbil and threatened the city.

The IRIAF was rapidly tasked to transfer relief supplies with its Boeing 747-2J9F and 747-131F, while the Hercules flew a secret mission – a pair of 11th TTS C-130s airlifted a unit of the Islamic Republic of Iran Ground Force's (IRIGF's) 65th Airborne Special Forces Brigade to Irbil, where they joined Kurdish Peshmerga and Iraqi special forces in the Battle for the Mosul dam, between August 16 and 19, 2014.

In October 2014 the 1st TAB's C-130s mobilised a 65th Airborne Special Forces Brigade unit into Iraq. The troops fought shoulder-to-shoulder with Iraqi army soldiers and militias in the battle of Baiji, retaking the city and its oil refinery from Daesh in early November 2014.

In 2015, following a series of victories, Syrian rebel groups, including Daesh and the al Nusra Front on the northern and northwestern fronts, threatened to occupy Latakia and Tartus, Syria's primary coastal cities. With Russian naval facilities in the cities, Iran, Syria and Russia planned to force the terrorists back with the first of a series of joint offensives.

The Russian Air Force deployed fixed-wing combat aircraft and helicopters to Syria in support of a combined operation with IRGC-QF, IRGC-Fatemiyyoon, Iraqi Shia Militias, Hezbollah and Syrian army troops against anti-Assad Jihadists and Daesh.

Between October 13 and 15, almost 3,500 Iranian, Iraqi and Afghan troops were transported from Tehran to Syria in an IRIAF II-76TD, two IRGCASF II-76TDs and two Russian Air Force II-76MDs.

The IRIAF's 1st Independent Transport Base meanwhile forward-deployed two C-130s to Syria for tactical transport support. They transferred hundreds of Iranian-backed Iraqi Badr fighters from Damascus to Aleppo, where they fought in the successful offensive from October to December.

The IRIAF assigned further aircraft to Syria missions, including a 72nd TTS C-130H flown beside two other Hercules to airdrop humanitarian aid – including food, medicine and fuel – to the 200,000 residents of Deir Ezzor, besieged by Daesh between



**Above: Every year, a 7th TAB C-130 delivers ground equipment and technicians to support the Su-24MK Fencer during the Dezful military exhibition. In March 2014, C-130H 5-8529 performed the role.** *Danial D J*

January 29 and February 5 this year. Conducted under the UN World Food Programme. The Hercules also dropped weapon and ammunition supplies to Syrian army units besieged at Foaa and Kfria in the Idlib countryside.

## In action in Syria

In October 2015 the IRIAF's 1st TAB forward-deployed traffic collision avoidance system- and ground proximity warning system-equipped C-130s 5-8517 and 5-8552 to Damascus. Later, 72nd TTS C-130H 5-8547 joined them for humanitarian airdrop missions.

On April 3 this year, a battalion of the 65th Airborne Special Forces Brigade deployed to Syria on eight 1st and 7th TAB C-130s and a 71st TTS II-76TD. The troops were

transferred to Aleppo for the attack on the city, which had begun on April 1 when the al Qaeda-linked al Nusra Front launched an incursion to the south in an attempt to recapture territories liberated by a Syrian Arab Army offensive in 2015.

On April 5, a unit of Iranian airborne troops supported by Syrian soldiers attacked Tel el-Ais, which was under the control of al Qaeda. Another Iranian unit was standing by in reserve, ready to deploy to the front line by C-130 in an emergency.

In total, five 1st TAB C-130s – 5-8507, 5-8517, 5-8537, 5-8541 and 5-8552 – and three 7th TAB Hercules – 5-8512, 5-8513 and 5-8547 – were supporting the 65th Airborne Commando Brigade in Syria in April and May.



## Service until 2030

THE NUMBER of IRIAF C-130s awaiting programmed depot maintenance with IACI rose in February and March 2016 owing to the air force's inability to pay their overhaul costs. Instead, IACI serviced a handful of BAe 146s and Avro RJ100 airliners for Mahan Air. Legislation by the Iranian Islamic Council Parliament on April 18 then obliged the Iranian Government to fund the overhaul of the Hercules and the IRIAA's helicopters: it provided \$27m for the C-130 and Bell 214A work, enabling the IRIAF to have six more C-130s overhauled and upgraded by the end of 2016. Aircraft 5-8503, 5-8506, 5-8539, 5-8544 5-8548 and 5-8550 had all been delivered to IACI in 2015. The IRIAF currently has a fleet of around 35 C-130E/Hs and two RC-130E/Hs in service with its three TTSS. Eight aircraft have been

modernised to Phase II Sattari standard and several more are undergoing conversion. The IRIAF intends to keep its C-130s in service until 2030 through all three phases of project Sattari. For many years Phase III – to equip all the C-130s with self-defence systems, including a radar warning receiver, domestically-designed IR missile jammers and chaff/flare dispensers – had been on hold. Now, their extensive use in the war in Syria has seen them equipped to counter the danger of man-portable air defence systems.

With the al Nusra-Front recently receiving such weapons, the IRIAF's Self-Sufficiency Jihad and Industrial Research branch in Mehrabad has begun the hasty equipment of C-130s with self-defence systems procured from Russia in January this year. ■

**Below: A view of the 1st TAB C-130 ramp at Mehrabad International Airport in August 2013, with five airworthy C-130s on show.**



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# RUSSIAN

**Alexander Mladenov** examines the Black Sea Air Policing mission in NATO-controlled airspace, maintained by the Bulgarian, Romanian and Turkish air arms.

# Roulette



**W**HILE THE Baltic Air Policing mission attracts a great deal of media attention, the Black Sea is also experiencing intensifying NATO fighter operations, driven by increased Russian military activity. The trend became evident in 2013, while the tempo of air operations further rose through 2014 and 2015 as tensions between Russia and NATO heightened before and subsequent to the Ukrainian crisis of February 2014.

In something of a return to a Cold War scenario, Bulgaria, Romania and Turkey launched no less than 100 Alpha scrambles to escort Russian aircraft in the Black Sea region during 2015, and many more are expected in 2016. The three NATO members co-operate closely, ensuring Russian aircraft are constantly shadowed and that responsibility for them is handed from one national air defence system to another as they pass through controlled airspace.

Recent intercepts have increasingly been against bomber and intelligence-gathering aircraft, often escorted by long-range fighters. The latest spike in activity was reported in early April, when Bulgarian and Romanian quick reaction alert (QRA) interceptors flew multiple Alpha scrambles against what were described as Russian Navy Il-38 May maritime patrol and intelligence-gathering aircraft shadowing NATO ships on exercise in the western area of the Black Sea.

It was a Standing NATO Maritime Group 2 (SNMGM2) Task Unit 02 training event, led by HMCS *Fredericton* and described as a recurring naval operation within NATO's assurance measures intended to demonstrate solidar-

ity towards allied and partner nations.

The Black Sea, a closed, relatively small basin, is regarded as a critical crossroads for international commerce and the transfer of hydrocarbons between Central Asia and Europe. A clear competition is ongoing between NATO and Russia for control over the Black Sea, both sides continuing with high-end maritime exercises employing integral air support.

Russia has voiced its ambitions to become a permanent leading power in the Black Sea, while an overstretched NATO has maintained a generally defensive posture in the region and will likely continue to do so in ▶



**Above:** A core group of Bulgarian fighter pilots have accumulated vast experience of intercepting and shadowing Russian aircraft. Both sides follow strict protocols during these rendezvous within international airspace. All images author unless stated

**Below:** Fully armed BuAF Fulcrums in close formation with USAF F-16s of the 52nd Fighter Wing from Spangdahlem Air Base during an exercise. Bulgarian Air Force MiG-29s are heavily engaged in the air policing role and are frequently scrambled to intercept and provide visual identification of Russian aircraft within international airspace over the Black Sea. Lyubomir Slavov via author



### Trans-border cooperation

IN 2013, the BuAF and RoAF agreed that during air policing missions each country's QRA fighters could enter the AoR of the other. Once there they can be employed according to the standard NATIAMDS engagement procedures. At the same time, the national CRCs are also co-operating. The agreement has been put to good use – BuAF MiG-29s are known to have shadowed Russian aircraft in Romanian-controlled airspace and Romanian LanceRs have entered Bulgarian airspace many times, following Russian aircraft on westerly and southerly headings.

In 2014, Bulgaria and Greece came to a similar agreement and work is under way to establish a similar relationship with Turkey, but such an arrangement will take some time to complete. ■

**“Russia has voiced its ambitions to become a permanent leading power in the Black Sea, while an overstretched NATO has maintained a generally defensive posture in the region and will likely continue to do so in the foreseeable future.”**

## Russian View

RuAF COMMAND authorities have claimed on many occasions that all flights outside Russia are conducted in international airspace and in full compliance with International Civil Aviation Organization (ICAO) rules and procedures, without violating other countries' sovereignty.

Flying in international airspace without a transponder or filing a flight plan, and without contacting civilian ATC authorities, is not considered illegal. Such behaviour, however, is considered risky, since it potentially endangers civilian traffic. It is a major concern for civilian ATC over the international waters around Europe, where Russian military aircraft fly at will.

These ATC services mostly rely on secondary radars, which require aircraft transponders to be on for them to see and track a target; the same is true for the traffic collision avoidance systems (TCAS) installed on civilian aircraft. Thus NATO fighters scrambled to VID Russian aircraft and shadow them within the national AoRs have an important role in helping prevent conflicts between military aircraft and civilian air traffic.

Pilots who have launched on Alpha scrambles over the Black Sea note that the closest Russian flights have been 16nm (30km) from the coast, well outside territorial waters, which extend out 12nm (22km) from the coastline. Most Russian operations remain 32 to 38nm (60 to 70km) out.

It is interesting to note that Russian flights in the Turkish-controlled region of the Black Sea ceased after the November 24, 2015 incident when a RuAF Su-24M bombing anti-Assad insurgents was shot down by a TuAF F-16 adjacent to Turkey's Syrian border. In late April this year they resumed, while the scrambled TuAF fighters were restricted to radar ID from stand-off ranges. ■



the foreseeable future. This is in stark contrast to the Baltic region, where NATO has engaged extensively since the mid-2000s.

Russia's annexation of the Crimean peninsula in April 2014 led to an immediate heavy militarisation of its newly gained territory, which the establishment of a vast anti-access/area denial zone in the adjacent airspace and over the water, reaching out 54nm (100km) from the coast. In addition, Russia maintains a significant fighter and strike aviation presence in the region and its military forces are regarded as more than capable of projecting air and sea power over the entire Black Sea basin.

Furthermore, Russia has repeatedly accused NATO of using the Ukrainian crisis as justification to move closer to its borders, openly referring to the process as "aggressive intention". Thus, NATO exercises held in the Black Sea and involving Canadian, French, Royal Navy and US Navy ships are closely followed by Russian intelligence-gathering aircraft and ships.

## Russian Air Activity

Some Russian activity over the Black Sea takes place in the international airspace controlled by the Bulgarian, Romanian and Turkish civilian air traffic control (ATC) authorities. They

provide continuous air traffic services under a regional agreement. The affected airspace is designated as an area of responsibility (AoR) for the NATO air-policing mission.

Russia's activity in the international airspace over the Black Sea falls roughly into three categories, including so-called long-range 'power projection' patrols, flown by Russian Air Force (RuAF) Long-Range Aviation (LRA) bombers. These are usually flown by the Tu-22M3 *Backfire-C* and sometimes the Tu-95MS *Bear-H*, often with Su-27SM and Su-30M2 fighter escort and generally following anti-clockwise routes.

The second category of frequent activity involves tactical and strategic intelligence-gathering aircraft, shadowing NATO ships to record communications and radar emissions. The third involves long-range RuAF intelligence-gathering aircraft, including the Il-20M *Coot*, conducting what NATO officials call 'aggressive probing'. This aims to monitor and assess the response of the national components of the NATO Integrated Air and Missile Defence System (NATIAMDS).

It examines how long it takes the national air defence systems of the three NATO countries to detect an intelligence-gathering aircraft entering





Backfire Cs from Shailovka Air Base, south of Moscow, occasionally fly power-projection missions over the Black Sea escorted by Su-27s and Su-30M2s. Andrey Zinchuk via author



their AoR, how they exchange data with the NATIAMDS command and control authorities, how quickly the QRA fighters are scrambled and how ground controllers handle the intercept.

It also looks at the fighter pilots' tactics as they perform radar and visual identification (VID) and their escort techniques, as well as target handover from one nation to another when the 'probing' aircraft crosses the national AoRs.

As a rule, the QRA fighters are scrambled by Combined Air Operations Centre Torrejón (CAOC-T) located near Madrid, Spain, or by their respective national control and reporting centre (CRC), with prior permission from the CAOC-T. The latter orchestrates NATO-wide response by exercising operational control over the air defence assets of the NATIAMDS in its AoR.

The QRA pilots are required to be airborne within 15 minutes of receiving the scramble order. Just prior to or soon after take-

off they receive limited information on the type of target and area they are heading to. After the QRA fighters of one country perform a VID of a Russian aircraft – under orders from the CAOC-T – fighters scrambled by the other air arms usually shadow the Russians from beyond visual range.

### Bulgaria's contribution

The increasing number of Alpha scrambles has placed a serious burden on the tiny and ageing fighter fleets of Bulgaria and Romania. After the NATO Summit Wales 2014, the organisation advised both countries to make provision in their national legislation for joint policing missions in their airspace, enabling reinforcement of their QRA assets at times of increased demand.

In addition, since 2015 the USAF has placed Theatre Security Packages (TSPs) in Bulgaria and Romania, under Operation Atlantic Resolve, conducting joint training alongside NATO allies and demonstrating a forward

presence. In addition, assistance has been furnished from other NATO countries, including Canada and Portugal, which deployed fighters to Romania for joint training and QRA operations, but did not fly Alpha scrambles.

The Bulgarian Air Force (BuAF) QRA is maintained by a pair of 3rd Aviobasa (air base) MiG-29s (plus one or two back-up aircraft) at Graf Ignatievo, near the large city of Plovdiv, in the centre of the country. The BuAF operates a single MiG-29 squadron, which has suffered badly from a lack of maintenance funding since 2013.

By late March 2016, information released by the Bulgarian defence minister, Nikolay Nenchev, revealed that only seven out of the country's 12 single-seat and three two-seat MiGs were airworthy. In April, however, the Bulgarian defence ministry made an emergency allocation of €23 million (US\$25.9 million) for the urgent procurement of engines, accessory gearboxes and other important spare parts to bring the number of airworthy *Fulcrums* up to ten. This should enable regular training to ensure sufficient qualified pilots are available for QRA.

The BuAF's QRA MiG-29s launch with pairs of R-73 (AA-11 *Archer*) short-range, heat-seeking air-to-air missiles and a 1,500-litre underfuselage tank, for an endurance of up to 1.5 hours. Since 2015, Bulgarian QRA pilots have routinely mounted GoPro cameras on their ZSh-5 or ZSh-7 helmets to record their missions and take photographs of intercepted aircraft when tasked to perform a VID. ▶



Above: This Turkish Air Force F-16C Block 50 belongs to the 161 Filo Yarasa (Bat), a squadron assigned to the QRA force that patrols airspace over the Turkish-controlled area of the Black Sea. Chris Lofting Right: Short-range LanceR-Cs of the Romanian Air Force routinely fly long-range intercept sorties to identify Russian aircraft as far as 43nm (80km) from the coastline. Chris Lofting





Above: The Il-20M Coot, the main Russian Air and Space Force aircraft used for signals and electronic intelligence-gathering missions within the strategically important Black Sea basin. *Andrey Zinchuk via author*

## Romania's LanceR

The Romanian Air Force (RoAF) manages its QRA fighters at Baza 71 Aeriană (71st Air Base) at Câmpia Turzii to the west, and on the fringes of the Black Sea at Baza 86 Aeriană, Borcea-Fetesti. The latter flies its QRA operation out of Mihail Kogălniceanu airfield, near Constanta on the coast. From here the short-legged MiG-21 LanceR is better able to cover the Romanian AoR, with visual ID usually performed 43nm (80km) off the coast.

The LanceR is near the end of its service career, with about 24 aircraft operational across the two main air bases. Approximately half are radar-equipped LanceR Cs, the primary type on QRA duty over the eastern part of the country. Standard QRA fit is a pair of Magic 2 air-to-air missiles and two 490-litre underwing tanks.

In 2013 Romania agreed to purchase nine upgraded ex-Portuguese Air Force F-16MLU and three former USAF aircraft. Delivery of the first batch of ex-Portuguese jets is expected in the second half of 2016 and initial operational capability is planned for 2017. The F-16 will supersede the aged LanceR C in the Black Sea QRA role, offering much greater range and endurance.

## Turkish Vipers

The Turkish Air Force (TuAF) covers the country's Black Sea AoR with F-16 Vipers. Merzifon, home of the 5th Ana Jet Üs (Air Wing), has two F-16 squadrons and covers the eastern segment of the AoR, bordering Georgia.

The second QRA base is the 6th Ana Jet Üs at Bandirma, again with two F-16 squadrons, responsible for the western sector bordering Bulgaria. Using their targeting pods in air-to-air mode, the Turkish F-16s are capable of longer-range visual ID than the BuAF and RoAF fighters.

**Radar coverage for Turkey over the region can be enhanced when necessary by four E-7T Peace Eagle AEW&C aircraft from 131 Filo, which can be forward-deployed from their main operating base at Konya.**

*Alan Warnes*

## Early warning

The air surveillance network covering the western part of the Black Sea relies on several types of long-range early warning radar, feeding data into national air defence systems.

These send the recognised radar picture to the CAOC-T. Activated in January 2013, the CAOC-T staff manages NATO's Southern Air Policing Region, covering Europe south of the Alps, on a 24/7 basis. It is responsible for all air operations in NATO airspace in the southern part of Europe and adjacent airspace over international waters, from the Canary Islands to Hungary and from the Azores to Turkey.

Romania's early warning network employs modern Lockheed Martin AN/FPS-117 3D long-range radars, an installation near the coastal city of Constanta covering the Black Sea. Its detection range against high-altitude targets to the east extends out to 250nm (470km).

Radar information used to form the recognised air picture (RAP) is fed to the RoAF CRC in the air operations centre in Balotesti on the outskirts of Bucharest. The RAP is also distributed to the CAOC-T and the Hungarian and Bulgarian CRCs through Link 1. It is further shared with all the National Air Command and Control System (NACCS) components, including air bases, the jamming centre, missile brigade command posts and surface-to-air missile battalion command posts. The national CRC also maintains Link 11 connection with Airborne Warning And Control System (AWACS) assets for expanded coverage against low and ultra-low level targets.

In March 2014 NATO agreed to begin air surveillance missions over Poland and Romania using a NATO AWACS E-3A. The decision was made in immediate response to the 2014 events in Ukraine, although NATO has said flights are restricted to Alliance territory.

Bulgaria still employs Soviet-era radars. They were commissioned in the 1970s and 1980s yet still provide reliable coverage of the country's Black Sea AoR. The P-37MB1 (reporting name *Bar Lock*) is an upgraded 3D radar set. Its digitised output is fed to a Sofia CRC where the RAP is formed. Its high-altitude detection range against large targets extends to 162nm (300km).

The P-37MB1 is augmented by the P-14 *Tall King*, a 2D VHF radar with a maximum range of 216nm (400km). Radars of both types look over the Black Sea from Balchik on the coast close to the border with Romania and from another site situated to the west of the coastal city of Bourgas. The BuAF uses EADS MSR-2000I identification friend-or-foe (IFF) interrogators, integrated with its Russian radars, for electronic ID.

Turkey's early warning radar inventory comprises the AN/FPS-117 and Hughes HR-3000 3D units, the latter with a 310nm (575km) instrumented range (the maximum range at which full radar performance is maintained).

Radar stations near Luleburgaz, Bartin, Merzifon and Pazar monitor the Black Sea and the TuAF further enhances its radar surveillance in particular areas of interest using four Peace Eagle airborne early warning and control (AEW&C) aircraft.

Based on the Boeing 737, the aircraft are equipped with a Northrop Grumman multi-role electronically scanned array antenna, with integrated IFF capabilities. Overall control of the ground and air elements of Turkey's air defence system is through a CRC at Ahlatlabel, near Ankara.

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# Waging Peace

**Joe Copalman** examines how Marine aviators prepared for humanitarian missions at MCAS Yuma, Arizona during WTI 2-16.



*'One of the hallmarks of WTI is the emphasis on realism, borne of a 'train as you fight' ethos that permeates everything MAWTS-1 does'*

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**S**HORTLY AFTER back-to-back earthquakes rocked Japan's Kumamoto Prefecture in mid-April 2016, the US Marine Corps committed four MV-22B Ospreys to the Japanese-led relief effort. The Ospreys were from VMM-265, currently part of the Aviation Combat Element of the 31st Marine Expeditionary Unit (MEU), and were used to transport Marines, relief workers and supplies throughout the region.

Though popularly associated with ground combat in the most dangerous parts of the world, Marines regularly carry out humanitarian assistance missions in the wake of natural disasters or civil unrest.

Aside from Kumamoto, Marines have conducted relief operations in the aftermath of Hurricane Sandy in New York and New Jersey in 2012, Typhoon Haiyan in the Philippines in 2013, and a massive earthquake that struck Nepal in 2015. For each of these efforts, Marine Weapons and Tactics Instructors (WTIs) planned and oversaw the aviation components in accordance with tactics, techniques and procedures (TTPs) learned while attending the WTI course at Marine Corps Air Station (MCAS) Yuma in southwest Arizona.

**1:** With their weapons at the ready, infantrymen from the 3rd Battalion/6th Marines assess the threat posed by an unruly mob during the exercise. **2:** A Navy corpsman triages a simulated patient during AST-3. Role-players represented a number of realistic casualties. **3:** A UH-1Y arrives at LZ Kiwanis during the humanitarian assistance event as part of Assault Support Tactics 3 (AST-3). The scenario is devised to prepare WTI graduate to plan and execute relief mission – the tactics they will use here have already been proven during 'real-world' operations.

All images by author

## WTI – Training the Trainers

Since 1978, WTI has been run twice a year by Marine Aviation Weapons and Tactics Squadron One (MAWTS-1). The seven-week course is equally divided into an academics phase and a flying phase. In addition to running WTI, MAWTS-1 writes and revises the TTPs for all marine aviation units, as well as granting instructor certifications for such things as low-altitude tactics or night systems instruction. Aviators and aircrew with enough of these instructor certifications are often chosen by their units to attend WTI to become instructors. Colonel James 'Rainman' Adams, MAWTS-1's outgoing Commanding Officer explained: "Those individuals come, there's 250 to 260 each class, they get training, and then they go back to their units. They will serve in that unit for a period of 12-18 months as a WTI to help that commander to train the unit and bring their readiness up to the level it needs to be at. Train the trainers, that's our methodology."

Additionally, WTIs serve as aviation integrators, able to assist in operational planning by informing planners about what their platforms are capable of, what the limitations are, and how they can ▶



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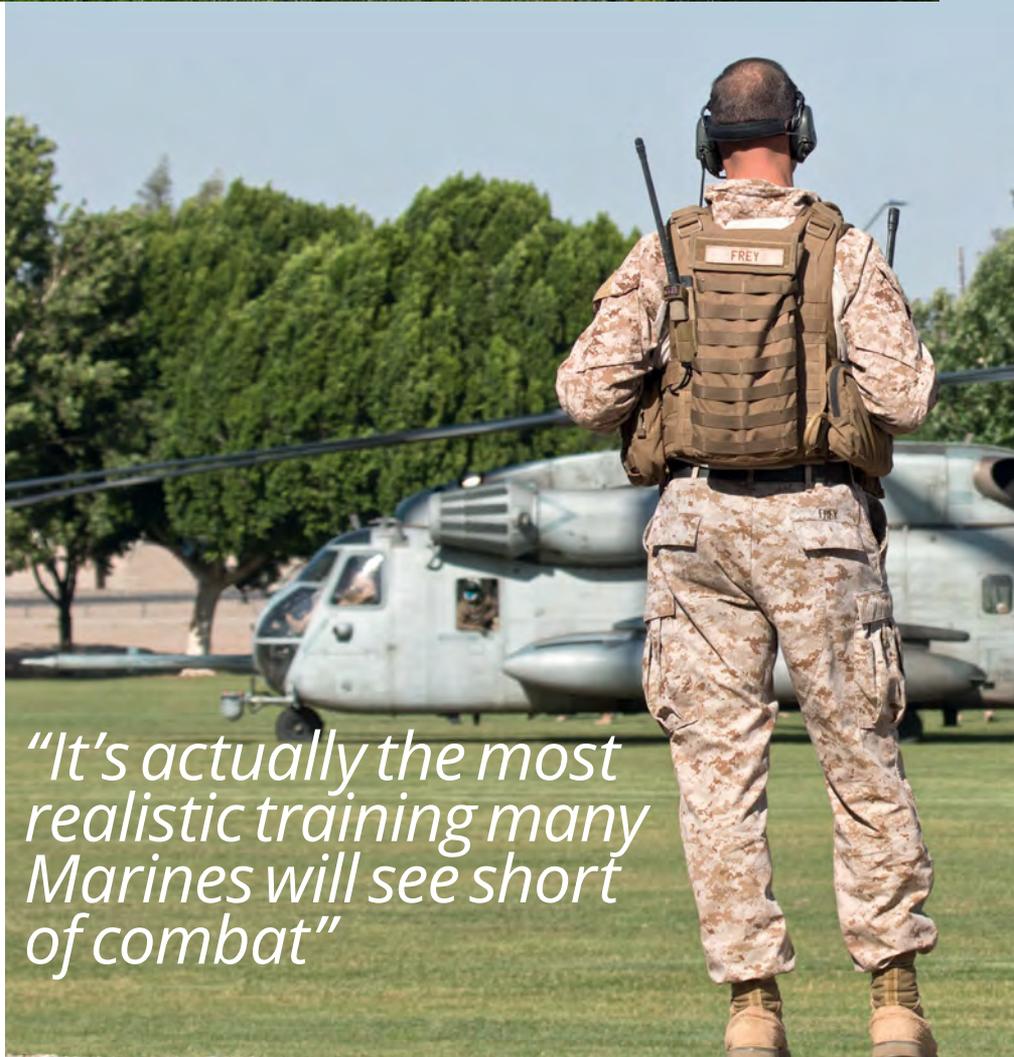


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work with other assets to achieve the ground commander's desired outcomes. One of the hallmarks of WTI is the emphasis on realism, borne of a 'train as you fight' ethos that permeates everything MAWTS-1 does. Col Adams said: "It's actually the most realistic training many Marines will see short of combat. We make the scenarios very realistic and very difficult. It ranges across the spectrum from humanitarian assistance and disaster relief on the low end of the conflict scale, all the way up to advanced penetration of enemy air defences and very high-end threat scenarios. It's done 24 hours a day, six days a week. It's very tiring, but it's very realistic, and it contributes a great deal to the readiness of the Marine Corps."

WTI 2-16 ran from early March through to late April and produced 252 new WTIs. In addition to the students, more than 4,000 Marines

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*"It's actually the most realistic training many Marines will see short of combat"*



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## Electronic Attack Evolves

MAWTS-1 is also playing an active role in the Marine Corps' transition from the EA-6B Prowler as its primary electronic warfare platform to a new construct, called Marine Air-Ground Task Force – Electronic Warfare (MAGTF-EW). Instead of relying on a low-density, high-demand asset – such as the Prowler – to meet the Corps' EW needs, MAGTF-EW distributes that capability across a variety of air and ground platforms to provide scalable, flexible and more extensive EW coverage across the fleet. As the source of TTPs for marine aviation, MAWTS-1 is playing a critical role in this transition.

Though the specifics of MAGTF-EW are understandably classified, Col Adams gave AFM an overview: "We've been working with MAGTF-EW concepts for several years in conjunction with every WTI. There are a number of pieces – airborne and ground-based – that we utilize. We are very much engaged in implementing the plan for MAGTF-EW, we get direction from our higher headquarters and also our advocate back in DC on pieces of equipment and tactics, techniques and procedures to try out during WTI."

With several scenario-based large-force events, WTI offers one of the most realistic and demanding environments in which to test the equipment and TTPs needed to make MAGTF-EW successful, with Col Adams affirming: "In this class we have a number of things we're utilizing to test the viability of that concept." ■



**1:** Marines exit an Osprey with its rotors still turning. The air assets left their engines running throughout the loading and unloading phases to simulate the need for a rapid departure. **2:** A CH-53E Super Stallion waits to evacuate simulated casualties from LZ Kiwanis during one of the night-time scenarios. Crews had to learn how to operate in dense urban areas at all times of the day. **3:** Forward Air Controllers (FACs) from MAWTS-1's Air Officer Course observe 3rd Battalion Marines disembarking from a CH-53E at the landing zone. The troops were sent in to provide additional security at the LZ. **4:** Colonel James 'Rainman' Adams, MAWTS-1's outgoing commanding officer. **5:** Every WTI course is supported by a five-ship EA-6B Prowler squadron, VMAQ-2 'Deadly Jesters' backed WTI 2-16.

support the course, with around 2,000 of those being maintainers for the 100+ aircraft needed for student, Blue Air and adversary support. Full units from the combat logistics, wing support and infantry communities participate as well, effectively giving students an expeditionary air wing and reinforced infantry battalion to work with throughout WTI's flight phase.

## AST-3 – Humanitarian Assistance

One of the major evolutions WTI students participate in during the course is Assault Support Tactics Three (AST-3), a two-pronged event with a Foreign Humanitarian Assistance (FHA) mission inside the city of Yuma, and a Non-combatant Evacuation Operation (NEO) at the Marine Corps Air-Ground Combat Center at Twentynine Palms, California. Both elements are tied to a scenario involving two fictitious nations – 'Wasabi', a friendly country south of the Interstate 10 in Arizona and California, and 'Chipotle', an unfriendly nation north of the I-10 that gets even more unfriendly as the scenarios progress.

Col Adams told AFM about the NEO portion of AST-3: "The problem is that the threat country that's up north, they get angry because we have finally captured some of their key individuals. The people up in Twentynine Palms that are American citizens need to be evacuated, that's the non-combatant evacuation, and that will be happening simultaneously with the activities here in Yuma. There will be ▶



V-22s, UH-1s, AV-8s and other aircraft going long-range up into what we consider 'hostile territory' up in Twentynine Palms, and there will be role players up there as well that they have to account for and that they have to transport back to the friendly country down here." Adams continued: "Because the hostilities commenced, there was a simulated migration of refugees from up north down into Yuma. So there are people from the threat country who are tired of being treated poorly, they're emigrating down to Yuma, and we're providing some assistance to them in the form of humanitarian aid and medical treatment."

MAWTS-1 secured four locations within Yuma city limits for the Marines to use during AST-3: a school, a church, Yuma Regional Medical Center and the primary landing zone at Kiwanis Park, known as 'LZ Kiwanis' during the event. Use of urban sites for military aviation training is rare, and is only made possible through the support and goodwill of Yuma's citizens and elected officials. Col Adams described this valuable opportunity: "There is no other training – not just in the Marine Corps, but in the Defense Department – where a community allows the helicopters and the personnel to operate out in the town. They really open their doors and it's a unique and special relationship that we cherish here as Marines are stationed as a part



## First Class – MAWTS-1 and the F-35

THE WTI 2-16 represented another milestone for the F-35 Lightning II, as it was the first WTI course to have a full F-35 class with actual F-35 WTI students going through. This represents a maturing of the F-35 in Marine service with dedicated weapons officers needed by the fleet squadrons to ensure that F-35 pilots are current on the latest TTPs for the type. As Col Adams explained: "It's the first class where we've had students from the fleet. Last year, we did a full F-35 class, but the students were instructors from here in the building, and it was to make sure that we had the academics right and we had the F-35 as a platform plugged into all the evolutions in the right place. So we did a test run. With this class we have three F-35 students going through."

After graduation, each of the three new F-35 'patch-wearers' will go to one of the USMC's

three F-35 squadrons – VMFA-121 'Green Knights' at Yuma, VMFAT-501 'Warlords' (the training squadron at MCAS Beaufort) and VMFA-211 'Avengers' (which is transitioning from the AV-8B to the F-35 this summer at Yuma).

Beyond providing the F-35 community with WTIs, integrating the F-35 into WTI benefits the broader Marine aviation community, from FACs to command and control personnel to helicopter and fixed-wing pilots and beyond. Being exposed to its capabilities is preparing these new WTIs to work with the Lightning II, which will begin deploying in the fleet next year. As such, the WTI curriculum is set up to integrate the F-35 into most of the types of missions it is expected to participate in, though Col Adams admits this is currently a bit of a moving target. He explained: "The F-35 is woven into all the places where we anticipate we'll need the capabilities that that platform brings. It flies in support of fixed-wing missions, rotary missions, it flies in support of missions that simulate MEU operations. Right now, we don't know the answer to when we field the F-35, where exactly we're going to plug it in." ■

of the community in Yuma. From the mayor to the city council to the individual citizens of Yuma, they have always been very supportive."

The FHA component of AST-3 involved five aircraft – two CH-53E Super Stallions for heavy lift and troop transport, two UH-1Y Venoms for CASEVAC and general support operations, and a third UH-1Y for Tactical Air Controller (Airborne) support. Also participating were over 100 Marines, with Forward Air Controllers (FACs) from MAWTS-1's Air Officer course managing the flow of aircraft in and out of the landing zones, Humvees manned by Marines from the 3rd Low-Altitude Air Defense (LAAD) Battalion providing security, troops from Combat Logistics Battalion 24, and crash/fire teams at each of the four exercise locations. About two dozen Marines in civilian clothes were at Kiwanis Park as well playing the role of refugees throughout the duration of the exercise.

## Down in the Park – Delivering Hope to LZ Kiwanis

The mission in Yuma began with the 'refugees' becoming irate and unruly, causing reinforcements to be requested. These personnel, infantrymen from 3rd Battalion, 6th Marines (3/6), arrived at LZ Kiwanis on an H-53 and promptly assisted the 3rd LAAD to maintain control of the growing mob. Further H-53 landings delivered a medical team comprising Navy physicians and corpsmen from 3/6, as well as truck tyres on pallets representing loads of humanitarian aid. While this was occurring, a scenario a few miles away at Trinity Christian Center involved a critically-wounded role-player requiring immediate CASEVAC to Yuma Regional Medical Center.

As night fell, the most demanding phase of the FHA mission occurred when a simulated explosion allowed more than two-dozen role-players to breach the perimeter of LZ Kiwanis seeking medical treatment. Several of the 'refugees' were given fake wounds, ranging from minor cuts and scrapes to compound fractures and massive head injuries, courtesy of a local college's theatre department. Though WTI is first and foremost an aviation course, plan-



The exercise saw three F-35 WTI students participate in the newly developed Joint Strike Fighter course – MAWTS-1 placed the F-35 into several operational scenarios during which the jet demonstrated its fifth-generation intelligence gathering capabilities to the USMC.



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**1:** Yuma-based Marines donned civilian clothes to play the role of a troublesome mob intent on disrupting the relief mission. The WTI trainees have to learn the additional skills of crowd control and relief site management in order to graduate. **2:** A Marine Corps Osprey from Medium Tilt-Rotor Squadron VMM-365 'Blue Knights', transitions to forward flight as it departs the LZ. **3:** Supporting the exercise was an E-3G AWACS of the 552nd Air Control Wing Squadron from Tinker AFB, Oklahoma.



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ners try to ensure that those supporting the course get good training as well. The mass-casualty event challenged the infantrymen, who needed to search and clear every refuge inside the perimeter, and the medics from 3/6 by presenting them with a sudden influx of patients who needed to be quickly triaged, treated and transported out of LZ Kiwanis.

Col Adams explained: "They have to decide, can this patient be handled here with the level of aid we have in the zone, do they need to be transported to the hospital, or do they need an even higher level of care?" The remainder of the FHA mission saw the most critically wounded of the role-players being evacuated from the LZ on H-53s, with the UH-1Ys picking up several Marines on the final flight of the evening.



## A Two-Way Street

JUST AS the WTIs, who guided relief missions in Japan, learned how to conduct FHA operations during AST-3, the lessons they learned will impact how future WTI students are taught to apply aviation assets to humanitarian missions. As Col Adams elaborated: "Our curriculum is very agile. At the end of each WTI, we have a full week where we go through each event and we apply into the events new lessons learned from actual real-world operations. There are graduates from this course who will go back to their squadrons and be the training officers for their unit, then they will deploy, and they may experience these types of missions. With those WTIs, we have a constant and very open communication network. We keep conversations open from us to them, and from them to us."

For as complex and realistic as AST-3 was, WTI comprises of dozens of similar scenarios, all designed to provide realistic and challenging training for the WTI students and the Marines supporting the course. Col Adams summarised the importance of this realism: "You can read about things like these activities in a book, you can study lessons learned, but there's no training like actually doing something. So when we're landing out into a park in the middle of the city and we have active role-players manoeuvring around like a live, breathing scenario, that's training that you can't get in a simulator, you can't get it on a training range, it's very rare." ■

*"You can read about things like these activities in a book, you can study lessons learned, but there's no training like actually doing something"*



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## Aeronautica Militare

FIVE AERONAUTICA Militare (AM; Italian Air Force) Gruppi (squadrons) belonging to three Stormi (wings) fly the Eurofighter F-2000 Typhoon from three main operating bases. They routinely operate together, integrating through standardised procedures and training, although 4° Stormo, based at Grosseto, is the AM's most experienced Typhoon wing and a reference unit for the Eurofighter partner nations. Since its first Typhoon was taken on charge on March 16, 2004, 4° Stormo's two squadrons, 9° Gruppo and 20° Gruppo (the Italian Typhoon operational conversion unit [OCU]), have garnered valuable knowledge in the air superiority role, and the Stormo is recognised for its lead in weapon system optimisation.

# Air S



*"you don't intercept an armed Russian Air Force Su-27 Flanker escorting Tu-22 Backfire bombers too often..."*

# Superiority & Beyond

David Cenciotti visited Grosseto to fly in the Eurofighter Typhoon during a complex air-to-air training mission with 4° Stormo.



COL ENRICO Pederzoli, 4° Stormo commander, says: "Although its organisational structure is similar to that of other flying units, the wing is unique." Our main distinction is that we're the only Italian base to mount a round-the-clock QRA [quick reaction alert]."

Two F-2000As (as the single-seat Typhoon is dubbed in the Italian Mission Design Series) sit alert 24 hours per day, 365 days per year. Each is armed with one AIM-9L/M and one AIM-120B/C air-to-air missile, and 150 rounds for its cannon, and carries a 1,000kg centreline drop tank. The jets are held ready to launch from shelters on the northern part of the base, covering the wing's area of responsibility (AOR), which is central and northern Italy, and Slovenia.

The wing was first among the Typhoon operators to mount QRA, standing up its first pair of alert jets on December 16, 2005. It subsequently became the first to achieve NATO Quick Response Force certification, and has flown 100 alert scrambles and supported NATO operations in Iceland and the Baltic states. It has also enforced no-fly zones dur-

ing security-sensitive events, including the 2006 Turin Olympic Winter Games and Davos World Economic Forums, and taken part in Operation Unified Protector, flying sweep and escort missions over Libya in 2011.

Pederzoli says: "Since the end of the Cold War, a long series of real operations has helped improve our ability to co-operate with other air arms in out-of-area scenarios. The latest of such operations was last year's BAP [Baltic Air Policing] rotation. We operated in Lithuania for eight months, mostly under challenging weather conditions, launching multiple daily sorties to perform VIDs [visual identifications] on unknown aircraft.

"BAP has helped refine our skills and enhance our integration with allied weapon systems. It also provided great memories – you don't intercept an armed Russian Air Force Su-27 Flanker escorting Tu-22 Backfire bombers too often..." Four 4°, 36° and 37° Stormo F-2000s logged about 900 flying hours as part of the Task Force Air based at Šiauliai, Lithuania between January 1 and August 27, 2015. They accomplished 40 alert scrambles and more than 160 training scrambles. ▶



**Above:** Federico, 9th Gruppo Commander, in the front cockpit of the TF-2000A MM55132/4-35, ready to taxi from the squadron's apron to lead the Red Air formation. Giovanni Maduli via Author

**Main image:** Based at Grosseto, on the Tyrrhenian coast, 110 miles to the northwest of Rome, 4° Stormo and its two squadrons, 9th Gruppo and 20th OCU, operate a mixed fleet of F-2000A and TF-2000A aircraft. All images author unless stated.



**Above:** The pilot of 'Dardo 3' scans the horizon to check the position of the other two Typhoons playing the aggressor role in a 4 vs 3 scenario inside D115's training area.

## Advanced Training

Pederzoli goes on to explain: "Along with the primary task of policing a large chunk of Italy's national airspace, 4<sup>o</sup> Stormo trains all Italy's Eurofighter pilots, on 20<sup>o</sup> Gruppo, the Typhoon OCU."

Minor course modifications have been made over the years in light of operational experience and better tailor OCU training to the knowledge and skills of pilots arriving from advanced flying training, but the most impor-

tant syllabus update was introduced last year.

Pederzoli says: "The latest version of the course leverages the experience we've gained during the first decade of Typhoon operations and features twice as many simulator sessions than before. Furthermore, in the second half of 2015 we started co-operating with 212<sup>o</sup> Gruppo, which is responsible for the LIFT [lead-in fighter training] course and has begun employing its new T-346A Master advanced jet trainers in the aggressor role.

"The aim is to optimise available resources. With the T-346 replacing the Typhoon as an adversary we've offloaded a significant number of sorties to a cheaper, yet quite high-performing aircraft, without affecting the quality of training. Working with the T-346 also enables the effective transfer of knowledge and expertise between the Eurofighter OCU and 212<sup>o</sup> Gruppo, enhancing standardisation and the overall quality of training offered by 61<sup>o</sup> Stormo, 212<sup>o</sup> Gruppo's parent unit at Lecce."

The OCU had worked with only one syllabus since the F-2000 entered AM service, but in early 2015 it introduced a new Istruttore Tiri e Tattiche (ITT; equivalent to a weapons instructor) course for flight leaders. Inspired by the USAF Weapons School, the ITT syllabus delivers advanced training in weapons and tactics to experienced pilots. It lasts about five months, and comprises ground and flying segments, both focused on specific sensors and capabilities.

Pederzoli reports: "Last year's course focused on the HMSS [Helmet Mounted Symbology System], the new helmet that allows the pilot to 'see' through the aircraft by projecting critical flying and aiming parameters onto the visor. In-depth knowledge, gained through a dedicated course, is required for HMSS to be fully exploited in combat."

Meanwhile, the Typhoon continues to evolve. Software releases unlocking new capabilities regularly arrive on the operational squadrons. As a consequence, 4<sup>o</sup> Stormo operates a mixed fleet of F-2000A and TF-2000A (two-seater) aircraft to several configuration standards within Tranche 1 and 2, Batch 2 and 3, and software Blocks 2, 2B, 5, 8B, 9, 10, 11 and 15. ▶

**The standard flight helmet worn by the Typhoon pilots is the lightweight Gentex ACS with the EFA/ACS oxygen mask which incorporates an inflatable bladder system that prevents black-outs. Pilots also use the HMSS Mk2, the new helmet that projects the flying and aiming parameters onto the pilot's visor.**

*Iolanda Frisina via author*



## FLYING THE TYPHOON

**I**T'S JANUARY 28, 2016 and I'm sitting in on the briefing for Dardo 02-03, the mission I'll be observing from the backseat of 9<sup>o</sup> Gruppo TF-2000A MM55132/4-35. It's the final full combat readiness (FCR) check for two of the squadron's pilots. For this reason, it's going to be long, difficult and busy, since it will involve as many as seven Typhoons in a 4v3 scenario.

Federico, a 9<sup>o</sup> Gruppo commander and my pilot in the only two-seater involved in today's mission, says: "This is the pinnacle of squadron training. It's the most complex training sortie we fly since it determines whether an LCR [limited combat readiness] pilot is ready for combat.

"It includes multiple scenarios that require the two LCR pilots to successfully conduct BVR [beyond visual range] intercepts, visual identifications on the 'bogeys' and WVR [within visual range] air combat against three Typhoons emulating the flying characteristics and tactics of the 'super-manoeuverable' Su-30 Flanker."

We'll play the role of one of the Red Air Flankers (callsign Dardo 03). The LCR pilots will fly as wingmen (numbers 2 and 4) to two experienced pilots in the four-ship Blue Air formation (Dardo 02). We'll operate in D115, a large exercise area over the Tyrrhenian Sea that's suitable for supersonic flight and the use of chaff and flares, and we'll remain under positive radio and radar control from a ground controlled intercept (GCI) site. The Red Air section will depart first and wait for the Blues inside D115.

The 'good guys' are wearing the HMSS Mk 2, a futuristic helmet presenting essential flight and weapon aiming information through line-of-sight imagery. Information imagery (including airspace, altitude, weapons status and targeting) are projected on the Helmet Equipment Assembly (HEA) visor, enabling the pilot to look in any direction while the data always remains in his field of vision.

After a common briefing covering the basic flight details (weather, launch and recovery procedures, emergencies, radio channels, transponder codes, etc), the Blue and Red teams split for the classified tactical briefing, while I'm introduced to the Typhoon's peculiar mix of British and American-style flying gear.

I'll be wearing a Gentex Aircrew Combat System (ACS) helmet, a lightweight, dual visor HGU-53/P unit, with the EFA/ACS oxygen mask and the typical inflatable bladder system that acts on the nape and helps prevent G-induced loss of consciousness (GLOC). I'm also given a survival jacket, anti-g pants and, since the water temperature is 13°C, I'm assigned a Tacconi neoprene watertight suit. I'm ready.

I join the rest of Red Air as we step to the aircraft, parked on the apron adjacent to 9<sup>o</sup> Gruppo's headquarters. In a few minutes I'm strapped in, with Federico copying the ATC clearance on

**"Let's rock and roll! The throttle jerks to the full afterburner position and the Typhoon starts rolling. In spite of the two heavy drop tanks on the underwing pylons, in less than ten seconds we reach 120kts and rotate."**



**Above:** The briefing for the final FCR check for two pilots of the squadron involving 7 Typhoons, in a 4 vs 3 scenario. This kind of mission marks the pinnacle of the training schedule. It includes multiple real-life scenarios that require the trainees to complete all their air combat engagements successfully. *Iolanda Frisina via author*

the radio while taxiing to the active runway. The plan is to perform a high-performance take-off followed by a radar-assisted trail and subsequent southbound navigation towards D115.

We enter runway 03 and line up, waiting for the other 'bad guys' to join us for a sequence take-off with 10 seconds' separation. The three Typhoons align on the runway and final engine checks confirm that we're ready to go.

"Tower, Dardo 03, ready for take-off," Federico calls. The answer is immediate: "Dardo 03, Grosseto tower, you are cleared for a high-performance take-off, wind is calm."

Let's rock and roll! The throttle jerks to the full afterburner position and the Typhoon starts rolling. In spite of the two heavy drop tanks on the underwing pylons, in less than ten seconds we reach 120kts and rotate.

"Number 1 is airborne!" Federico retracts the landing gear while gradually pulling back on the stick.

With a pitch attitude of 50° above the horizon, we continue to accelerate and report FL310 (31,000ft) inside the Grosseto control zone, following the assigned standard instrument departure that soon brings us over Giglio Island. The rate of climb is impressive.

As we ascend with the other two Typhoons in radar trail, I take the opportunity to accustom myself with the glass cockpit. The TF-2000's rear cockpit is quite large and comfortable. Its most obvious feature is the green-hued wide-angle head-up display (HUD). Fed by a camera in the forward cockpit, the HUD shows identical symbology to that seen by the pilot, plus a video of the view forwards, which is otherwise obstructed by the pilot's ejection seat.

The instrument panel features three full colour multi-function head-down displays that can be arranged to show system status, the navigation menu, weapons selection and the moving map, as required.

We climb to FL360 in a fighting wing formation and after about 30 minutes reach D115. As planned, we proceed towards its southern area. It's time to perform the g check, during which the low-breathing resistance of the mask and the helmet's inflatable bladder prove particularly effective. We accelerate to 480kts and make a 90° turn to starboard, pulling 5g, followed by a

90° left turn back on course, pulling another 5g. I coped, so we're ready to start the BVR exercise.

Approaching D115's southern border we turn north to meet Blue Air, which just entered the area. Our formation splits, spacing the aircraft apart by several miles, at altitudes between 5,000 and 50,000ft. We fly head-on towards Blue, while the GCI controller reports their position, speed and altitude. The engagement is over in just a few minutes. The students use the Typhoon's powerful Captor radar and simulate the use of three radar-guided missiles before we move on to the second phase.

Once again we proceed south, while Blue Air heads north to achieve the required separation. Before reaching D115's boundary we turn back towards the fight. Climbing to FL460 we accelerate past Mach 1. Thanks to the Typhoon's

supercruise capability we continue to maintain supersonic speed without using reheat.

This time the engagement includes WVR combat, during which the students exploit the HMSS Mk 2 to achieve kills in accordance with the mission's rules of engagement. Federico had already explained: "Although future scenarios envisage stealth fighters engaging hostile aircraft from long ranges, the real operations we've taken part in require interceptors to come within visual range of the 'enemy' for a VID. This means that close-range air combat remains a possibility and we train to fully exploit the aircraft and its sensors in WVR engagements."

With the WVR over we prepare for the final exercise, in which Red Air 'pops up' as if it had just launched from a QRA base to engage the Blue Air Typhoons at higher altitude. With another dogfight finished, it's time to head home.

The aggressors return to base first. We have less fuel, but we also need to vacate the runway in time for Blue Air to practise some emergencies. We enter the Grosseto Control Zone (CTR) at FL360 and descend in close formation under instrumental meteorological conditions (IMC). "Although we don't fly IMC as a matter of course, this kind of approach is useful in case of electrical failure," Federico says, as we break through the overcast and gain sight of the ground.

We cancel the instrument flight rules plan and continue our approach, to the initial point of the visual pattern for runway 21, under visual flight rules. The downwind leg, base turn and landing are extremely smooth. Maintaining the aircraft's nose-up attitude after touchdown, Federico demonstrates the jet's efficient aerodynamic braking capability.

We clear the runway and return to the 9° Gruppo apron after 1 hour 50 minutes in the air. As the ground crew help me out of the cockpit after my first Typhoon hop, the Blue Air four-ship arrives overhead. Among them are two newly qualified FCR pilots. ■



**Above:** The author in the backseat of MM55132/4-35 pulling some hard Gs in a descending right-hand turn from FL460 at supersonic speed during a BVR engagement.

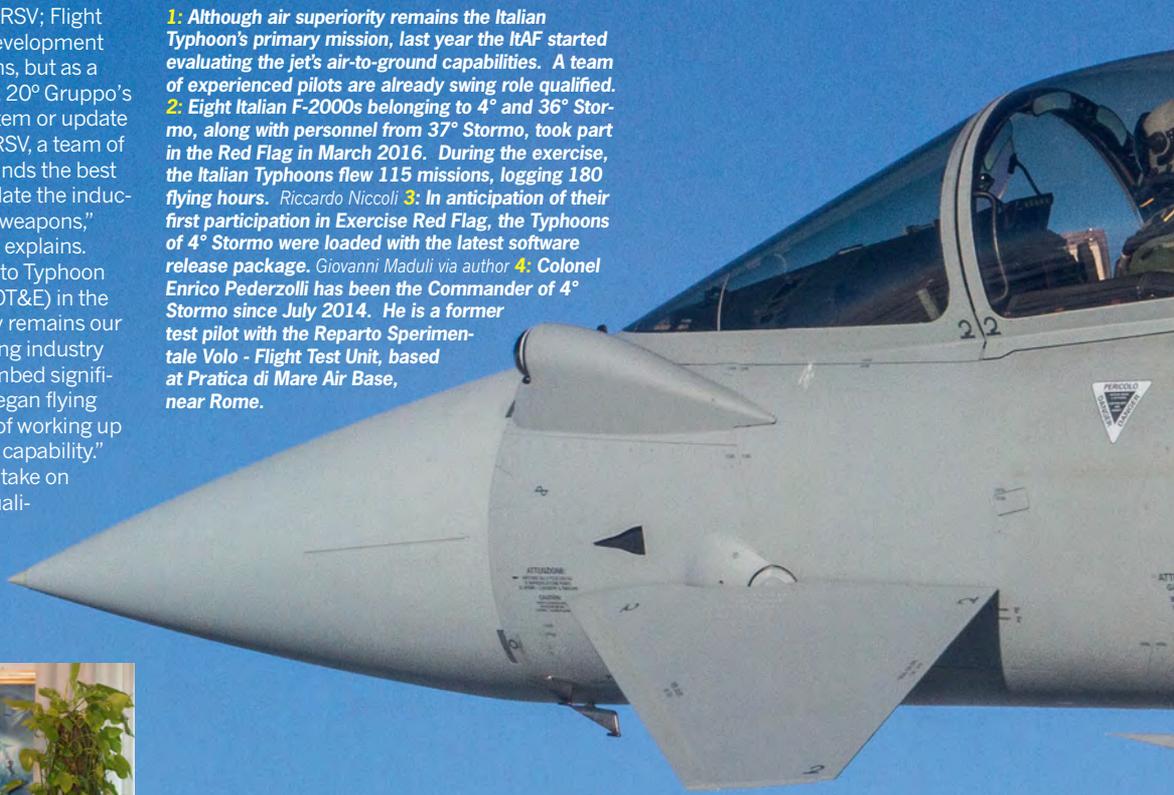


**1** The Reparto Sperimentale Volo (RSV; Flight Test Unit) performs continuous development work on the aircraft and its systems, but as a new capability becomes available, 20° Gruppo's input is crucial. "When a new system or update arrives at the squadron from the RSV, a team of expert pilots, led by 20° Gruppo, finds the best way to exploit it. It's a way to regulate the induction of new software, sensors and weapons," Pederzoli, a former RSV test pilot, explains.

In 2015 the Stormo contributed to Typhoon Operational Test and Evaluation (OT&E) in the air-to-ground role. "Air superiority remains our primary mission, but last year, using industry software releases [P1E(B)] that embed significant air-to-surface potential, we began flying swing-role missions with the aim of working up a limited secondary air-to-ground capability."

A team of experienced pilots will take on the new role. Already dual-role qualified, they recently took part in a Tactical Leadership Programme exercise at Albacete, Spain, undertaking swing-role sorties. Nonetheless, the AM does

**1:** Although air superiority remains the Italian Typhoon's primary mission, last year the ItAF started evaluating the jet's air-to-ground capabilities. A team of experienced pilots are already swing role qualified. **2:** Eight Italian F-2000s belonging to 4° and 36° Stormo, along with personnel from 37° Stormo, took part in the Red Flag in March 2016. During the exercise, the Italian Typhoons flew 115 missions, logging 180 flying hours. Riccardo Niccoli **3:** In anticipation of their first participation in Exercise Red Flag, the Typhoons of 4° Stormo were loaded with the latest software release package. Giovanni Maduli via author **4:** Colonel Enrico Pederzoli has been the Commander of 4° Stormo since July 2014. He is a former test pilot with the Reparto Sperimentale Volo - Flight Test Unit, based at Pratica di Mare Air Base, near Rome.



*"Exercise Red Flag is something different, however. It simulates the first days of a real war against a really challenging and very well-equipped enemy."*

not plan to employ the Typhoon in the air-to-surface role except in particular scenarios; the swing role is primarily being developed to support exports and help industry promote the aircraft in particular regions, including Kuwait.

## Red Flag 16-2

Between February 29 and March 11 this year, eight Typhoons and personnel from 4<sup>o</sup>, 36<sup>o</sup> and 37<sup>o</sup> Stormos took part in the AM's first F-2000 detachment to a Red Flag exercise at Nellis Air Force Base, Nevada.

"Our involvement in the BAP mission was just the latest in several operations over recent years," Pederzoli says. "They've all contributed to our experience, but featured low-lethality threats. Exercise Red Flag is something different, however. It simulates the first days of a real war against a really challenging and very well-equipped enemy.

"It's the worst-case scenario, in which weapons systems are pushed to the edge of their envelopes and stressed to their limits. We believed this year was the right time for us to take part in Red Flag, because we've got the knowledge and now we have a mature aircraft."

Seven F-2000As left Grosseto on February 19 to join a two-seater that was already in the US having supported the first transatlantic F-35 flight, by the initial Italian F-35A Lightning

II. The Typhoons deployed in two sections, accompanied by two 14<sup>o</sup> Stormo KC-767A tankers out of Pratica di Mare and a pair of 46<sup>a</sup> Brigata Aerea (Air Brigade) C-130Js from Pisa.

During the Red Flag 16-2 (RF 16-2) detachment, the Italians focused on the air-to-air role, typically flying with the HMSS, and carrying pairs of 750kg wing tanks and an airborne instrumentation pod for air combat manoeuvring instrumentation compatibil-

ity. Nonetheless, the complex RF 16-2 scenarios also provided an opportunity to further develop the type's swing-role capability.

Three of the deployed Typhoons were Tranche 2 aircraft to P1E(B) standard, loaded with the latest software release package. They employed pairs of inert GBU-16 Paveway II laser-guided bombs and the Litening targeting pod to validate tactics developed since swing-role OT&E began in 2015.

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# Rising Star in Greece

**Stephan van Geem, Patrick Smitshoek and Remco Stalenhoef** report from Andravida on the Hellenic Air Force's increasingly international Exercise Iniohos.

**T**HE HELLENIC Air Force (HAF) Air Tactics Centre, the Kentro Aeropirikis Taktikis (KEAT), is based at Andravida in the northwestern region of the Peloponnesian peninsula. Between April 4 and 14 it hosted its annual Iniohos exercise. Established in the late 1980s as small-scale HAF-only air exer-

cise, a late 2013 announcement transformed Iniohos. It was revised in light of HAF experience gained overseas in exercises including Red Flag in the USA, and on the Tactical Leadership Programme (TLP) in Europe.

Iniohos became a medium-size 'invite exercise', in which foreign nations could participate. Also, all exercise assets were now expected to operate from Andravida under

the so-called 'single base' concept.

Colonel Dimitrios Panagiotopoulos, KEAT's commander and exercise director, explained: "By implementing these changes the HAF provided improved training, with participants briefing, de-briefing

and planning together, as well as building social contacts.

It improves the learning experience significantly

and therefore provides a higher pay-off for all involved."

As was the case in 2015, this year's Iniohos coincided with the Hellenic Navy's Exercise Astrapi, while Hellenic Army assets, including the AH-64D, also participated. Last year saw foreign involvement for the first time, when 12 Israeli Air Force (IAF) F-16I Sufa (Storm) jets and United States Air Forces Europe (USAFE) joint terminal air controllers (JTACs) took part. Pleased with the



*"With the Army and Navy involved, mixed force operations are executed with large formations of aircraft attacking and defending."*





results, the IAF returned with aircraft from all three F-16C/D squadrons based at Ramat David. Twelve 492nd Fighter Squadron F-15E Strike Eagles from RAF Lakenheath accompanied the USAFE JTACs this time around.

Colonel Novotny, 48th Fighter Wing commander, told *AFM* why the unit was in attendance: "First of all, Greece is an important strategic partner for stability in the Mediterranean area. USAFE units rotate to Greece annually for training in order to be interoperable should that need arise.

"For our unit it's also a great work-up for our summer deployment to the USA where we'll participate in Combat Hammer and Red Flag. Also, it gives me the opportunity to qualify some pilots to mission commander status using the multiple combined air operations flown during the exercise."

## Operational possibilities

Iniohos offers a wide variety of mission types. The Chief of Tactical Air Force commands the exercise units, but operational control falls to the KEAT commander. Colonel Panagiotopoulos commented on the operational possibilities: "With the Army and Navy involved, mixed force operations are executed with large formations of aircraft attacking and defending.

"Land targets include command and control installations, while naval forces are attacked at sea. Air-to-air activity includes the defence of high-value airborne assets, such as the E-3 AWACS. Simultaneously, defensive counter air operations are executed to protect our own forces and secure strategic facilities."

Colonel Novotny, a 2,000+ hours F-15E pilot, elaborated: ▶

**1:** A rarely seen Erieye EMB145H AEW&C of 380 Mira ASEPE was a welcome participant in Iniohos 2016. **2:** A 492nd FS F-15E landing at Andravida after another mission. The F-15Es were used in various roles during Iniohos, including Close Air Support (CAS). **3:** A two-ship of Mirage 2000s from 331 Mira wait for departure during Iniohos. **4:** During the Iniohos press day a fly past was executed including all participating fighter types.





1 “Yesterday I flew a mission as force protection leader. First I did some offensive counter air work, followed by low-level close air support, during which an American JTAC helped me to my first target and a Greek JTAC to my second. In my opinion this shows the versatility of what exercise Iniohos offers.”

Other air arms are also showing interest in Iniohos. A high-ranking French Air Force officer was present as an observer during Iniohos 2016, suggesting that French participation is a possibility for the future.

The HAF is keen to promote the exercise, as HAF commander Lieutenant General Vaitsis confirmed: “Iniohos is the HAF’s most

### Air Assets participating in Iniohos 2016

No.	Type	Force	Unit
20	F-16C/D	Hellenic Air Force (HAF)	All combat units
8	F-4E (AUP)	Hellenic Air Force (HAF)	117 Combat WG
4	Mirage 2000-5/EG/BG	Hellenic Air Force (HAF)	331 and 332 Mira
1	EMB145H AEW&C	Hellenic Air Force (HAF)	380 Mira ASEPE
Unknown	AH-64	Hellenic Army (HAR)	Unknown
1	E-3A AWACS	NATO	NATO
12	F-15E	United States Air Force Europe (USAFE)	492nd FS/USAFE
12	F-16C/D	Israeli Air Force (IAF)	109, 110 and 117 Sqn / Ramat David Air Base
1	G550	Israeli Air Force (IAF)	122 The Dakota Sqn

**Note:** All aircraft participated from Andravida Air Base except the E-3A AWACS which operated from Preveza/Aktion Air Base.

important exercise. It offers high-level training in a demanding and realistic environment. With the introduction of foreign participants, the quality of HAF personnel will rise to an even higher level.”

Colonel Panagiotopoulos confirmed that Egypt is a possible participant in 2017, after HAF Mirage 2000s from 331 Mira visited Egypt’s Tanta Air Force Base for Exercise Houras 2015. Iniohos is developing into a demanding international exercise in which day and night flying takes place with few operational restrictions, delivering training opportunities many air forces struggle to realise at home.



1: Over 20 Fighting Falcons, such as this one from 347 Mira, took part in what is considered to be the most important HAF exercise.  
 2: Rarest of all the participants was this G550 Nanchshon Aitam of 122 'The Dakota' Squadron, based at Nevatim Air Base.  
 3: The Israeli Air Force (IAF) brought 12 F-16s from three squadrons, all based at Ramon David Air Base, to Iniohos.





# SU-32



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# Growing

**Alexander Mladenov** looks at Russian Naval Aviation's recent gradual increase in anti-submarine warfare, maritime patrol and SAR capability.

**R**USSIAN NAVAL Aviation (RNA) began a slow growth in capability in the early 2010s. Additional funding, which has enabled a sharp rise in training and deliveries of new and upgraded aircraft, reflects the fact the RNA has frequently been called on to support Russia's foreign policy and military initiatives.

While the introduction of upgraded fixed- and rotary-wing anti-submarine warfare (ASW) aircraft has gradually improved its core capabilities, the RNA still faces the challenges of operating

a rather aged ASW and maritime patrol fleet, with no prospect of procuring new-build types in the near to medium term.

The average age of its legacy Il-38s and upgraded Il-38Ns, workhorses of the ASW and maritime patrol business, is around 45 years. Likewise, the Tu-142MZ/MK and Ka-27PL/PS/M fleets exceed an average age of 25 years.

## Organisation and structure

Aviation assets are assigned to the Northern, Pacific, Baltic and Black Sea fleets in addition to two direct reporting air units. A directorate of naval aviation within each fleet's HQ structure is responsible for the day-to-day operational training, logistics support and flight safety of its component air units.

The RNA's primary peacetime mission is to perform high-

profile demonstrations and support foreign policy actions and initiatives, particularly in the Arctic and Pacific Oceans.

In this regard, high political significance has been placed on the frequent patrol missions flown in the Arctic region, including the North Pole area, where the RNA's long-range maritime patrol aircraft are tasked with monitoring the environment and the activities of foreign military and research ships.

A significant proportion of the Northern Fleet's long-range maritime patrol missions are dedicated to ice field surveillance in support of the commercial shipping that passes through the Northern Sea Route.

The operations also ensure security and safe passage along the route, which has become increasingly important. It runs along the Russian Arctic coast from

Murmansk on the Barents Sea, then along Siberia to the Bering Strait and on to the Far East, representing the shortest route between Europe and the latter.

## Reorganisation and restoration

Since late 2009, the flying units of each fleet have been organised at air bases, established in place of the Soviet-era structure of aviation regiments and independent aviation squadrons.

The bases control aviation squadrons and detachments, grouped together with relevant ground navigation aids/communications, air-field servicing/security and logistic support companies and battalions.

In mid-2014 the RNA launched an initiative calling for a return to the apparently better performing older style of regiment/squadron organisation which, it was thought,

# Pains



**Above:** The Tu-142MZ fleet serves with two squadrons of the Russian naval air arm – one assigned to the Northern Fleet and the other to the Pacific Fleet. The aircraft are little used and have plenty of hours left for future upgrades. All images Andrey Zinchuk via Alexander Mladenov unless stated

could also improve flight safety.

The Black Sea Fleet was first to adopt the restored structure, as an experimental measure, and the other fleets are expected to complete the 'counter-reform' later this year. The change will return regimental and independent squadron number plates and regalia lost in the 2009 reform.

The 859th Tsentralnyy Boevoy Podgotovki i Pereuchivaniya Lyotnogo Sostava (TsBPIPLS – ►



**Above:** Just a handful of Ka-29s remain in airworthy condition serving with the naval aviation units, but the figure will slowly increase due to an overhaul programme for the type. Kamov via Alexander Mladenov

## Primary RNA missions

PROTECTION OF Russia's state borders at sea, below the surface and in the adjacent airspace; Airspace control; Maritime reconnaissance/patrol to monitor the movement of potential enemy ships and submarines; Providing security and safety for Russian maritime traffic around the world, and supporting all forms of maritime economic activity and Russia's foreign policy at sea; search and rescue (SAR).



**Above:** The Il-38 is a classic anti-submarine turboprop from the 1970s, which proved difficult to replace with a modern jet type. As a result, it will continue in service for many years yet in the form of the upgraded Il-38N. Five have already been delivered and a further five are on order.

Combat Training and Aircrew Conversion Centre) reports directly to RNA headquarters in Moscow. Established in 2011, it is based in Yeisk on the Azov Sea coast in southern Russia.

It is tasked with type conversion, advanced weapons employment and tactics training for most of the naval air arm's sub-branches, as well as with ground crew training and requalification.

The RNA's other direct-reporting air unit is the 7055th Air Base (formerly known as the 46th Otdel'nyi Transportnyi Aviatsionnyi Polk (OTAP – independent air transport regiment) at Ostafyevo airfield near Moscow, which provides air transportation services to Russian Navy command authorities across the country.

In 2014 and 2015, average RNA aircrew flight time was about 80

hours, although ASW/maritime patrol crews accumulated between 100 and 120 hours, and Il-38 squadrons as many as 180 hours.

The figures are close to the levels attained during Soviet times, enabling crews to maintain and gradually improve on their combat-ready status – and are a huge improvement on the mid- and late 2000s, when the average annual flying time was

between 30 and 50 hours. NATO pilots require an average of 300 hours to remain qualified.

## ASW and maritime patrol

The RNA's maritime patrol and ASW branch operates two primary fixed-wing types, the Il-38 *May* and Tu-142MZ/MK *Bear-F*. These turboprop aircraft serve only with the two so-called 'big

## Fixed-wing upgrades

THE RNA is currently progressing two major upgrade aircraft programmes. The Il-38 is receiving an all-new mission suite to become the Il-38N. Primary contractor for the upgrade is OAO Ilyushin, with Myasishev and Leninets acting as sub-contractors, while the 20th Aviaremontny Zavod (ARZ; aircraft maintenance) plant at Pushkin, near St Petersburg, is overhauling the airframes and powerplants.

The initial prototype upgrade flew again for the first time in 2001, the second following in 2009. It completed state trials in 2010 and the Northern Fleet officially took it on strength in March 2012.

The Il-38N's all-new Leninets Novella P-38 integrated mission

suite was developed in a bid to transform the 1970s-vintage *May* into an effective multi-role maritime patrol and reconnaissance platform for the 21st century.

According to Maj Gen Alexey Serdyk, commanding officer of the 859th TsBPIPLS, the Il-38N can search an area four times larger than the legacy aircraft in a typical mission.

As well as its primary maritime patrol and ASW taskings, the aircraft is said to be capable of SAR, minelaying, sea pollution monitoring and electronic and signals intelligence.

A 3.45 billion rouble (\$100m) upgrade contract for five Il-38Ns, signed in May 2012, called for final delivery within three years,

but unspecified technical problems have caused serious delays.

The first production-standard Il-38N, modified from the prototype upgrade, rolled out in its definitive guise in early 2014 before being handed over to the 859th TsBPIPLS at Yeisk for conversion training. The second aircraft from the 2012 contract also went to Yeisk, but was soon transferred to the 7062nd Air Base at Nikolaevka.

The third, completed in late 2014, flew conversion training at Yeisk before passing to the Pacific Fleet's 7060th Air Base at Yelizovo in March 2015. The final contracted aircraft were delivered in 2015, one going to the ASW squadron at Yelizovo and the other to the

Nikolaevka-based *May* squadron.

The RNA intends to upgrade its entire 28-aircraft fleet by 2020. A follow-on contract for five more was publicly announced in July 2015, but no details were revealed.

The second RNA fixed-wing upgrade programme covers the Tu-142MZ ASW aircraft. Still in its initial phase, little information has been released about it.

According to the Russian news agency RIA Novosti, the 20-aircraft fleet is earmarked for a deep upgrade, to be completed by 2020. Most significant will be the installation of a new and very powerful search radar supplied by AO Zaslou, based on that developed for the Il-38N. ■



Serving in the long-endurance maritime patrol and reconnaissance as well as ELINT and SIGINT missions is the Il-38N multi-role anti-submarine warfare naval aircraft.

fleets' – the Northern and Pacific – with five frontline squadrons.

Their ASW role also calls for the execution of a significant proportion of real world 'combat duty' operational sorties in peacetime. The missions call for systematic searches for foreign submarines and their subsequent tracking in international – and occasionally Russian territorial – waters.

Combat duty patrols are 'offensive' and 'defensive', the former covering the expected areas of patrol of foreign ballistic missile-armed submarines. During the Cold War and since, most vessels encountered during *May* and *Bear-F* combat duty patrols have been US Navy submarines.

Defensive patrols cover the areas of deployment of Russia's own ballistic missile submarines, which perform extended underwater patrols for the execution of their nuclear deterrence mission. On such sorties the ASW aircraft search for submarines that could represent a threat to Russia's underwater assets on nuclear alert.

The Il-38 is the ASW and maritime patrol workhorse, designed for operations in the so-called 'medium-range' oceanic zone, up to 2,200km (1,187nm) from base, where it has a patrol endurance of up to four hours.

The *May* entered Soviet service in 1968 and the surviving examples, built between 1967 and 1972, are grouped in three frontline squadrons and one composite training squadron. One frontline unit is assigned to the Northern Fleet, the other two to the Pacific Fleet.

The Il-38 is ageing but inexpensive to operate and maintain, and most, if not all, 28 active aircraft will undergo a comprehensive mission-



**Above:** The Ka-27PS is the main SAR type of the naval air arm, operating from both ships and land bases. It is also used for supporting naval infantry and the special operations detachments.

**Below:** The Ka-31R is a deck-capable airborne reconnaissance and over-the-horizon targeting helicopter; two are currently in service. An additional 12 are due to enter service by the end of the decade.



suite upgrade to Il-38N standard to enhance their maritime patrol and ASW capabilities. A major overhaul will meanwhile extend their service lives, rendering them good for use until the late 2020s.

The Tu-142 ASW, a derivative of the Tu-95 strategic bomber, was developed specifically for ultra-long-range oceanic operations, up to 4,500km (2,477nm) from base. Today's fleet of around 25 active aircraft comprises the Tu-142MK and Tu-142MZ versions introduced in the 1980s, the latter remaining in production into the early 1990s. The Pacific and Northern Fleets have one Tu-142 squadron each.

### Rotary-wing ASW/SAR

The RNA's rugged and dependable Ka-27 shipborne ASW and SAR helicopters are scheduled to serve until 2030 or beyond.

The Ka-27PL *Helix-A* is the dedicated ASW version; the Ka-27PS *Helix-D* is the SAR and utility transport derivative, also used for special forces support on anti-piracy missions.

Most of the *Helix* fleet was built in the mid- and late-1980s and about 70 are in active service. They are grouped into five shipborne helicopter squadrons, one each assigned to the Black Sea, Northern and Baltic Fleets, and two to the Pacific Fleet, in addition to a composite training squadron assigned to the training centre at Yeisk (which also ▶



**Above:** The Baltic Sea Fleet operates one composite attack/assault transport helicopter squadron equipped with the Mi-24VP. They are used for close air support of the naval infantry units, and also for intercepting slow-speed targets in the Kaliningrad region.



**The Ka-52K is intended for a wide range of attack missions against sea and land targets. The latest Russian Navy plans call for its fielding with a composite air wing to operate from the deck of Russia's only aircraft carrier, Admiral Kuznetsov. AAC**  
Progress via Alexander Mladenov

operates three Ka-28s, the export derivative of the Ka-27PL).

Northern and Pacific Fleet Ka-27PLs regularly fly short-range combat duty patrols from ship and shore bases inside and outside Russia's territorial waters. They search for and track foreign submarines shadowing the movements of Russian nuclear-armed submarines as they transit to and from their bases and designated patrol areas in

the Pacific or Atlantic Oceans.

The RNA's land-based rotorcraft fleet includes around ten Mi-8s, in T, P, MT, MTV and MTV-5 versions. They are usually incorporated into the structure of the transport squadrons or regiments assigned to each fleet, and used for utility transport and SAR. In addition, eight electronic warfare (EW) Mi-8s serve the Black Sea Fleet.

An ongoing programme is procuring Ka-31R airborne early warn-

ing (AEW) and over-the-horizon targeting helicopters. Of an initial batch of two ordered in 2008, the first arrived at Yeisk in June 2012 and the second later that year.

The intention is to deploy the type with the Northern and Pacific Fleets, assigned to the composite shipborne squadrons alongside the Ka-27PS/PL and Ka-29.

Low-rate Ka-31R acquisition is set to continue through the mid-term as Russia's ambitious

National Armament Programme 2020 foresees procurement of as many as 12, although no contracts for follow-on Ka-31Rs are known to have been signed.

### Attack and assault

The RNA operates a small number of Ka-29 *Helix-B* assault helicopters in parallel with the Ka-27PL and Ka-27PS. The Northern Fleet had one serviceable *Helix-B* in 2015, while the Yeisk training centre flew two more; in 2016 the number of serviceable Ka-29s will increase as overhauled machines are reintroduced into service.

The Baltic Fleet has a dedicated attack/assault squadron equipped with Mi-24VP *Hind* and Mi-8MTV *Hip-H* helicopters, and based at Chkalovsk, near Kaliningrad. It is mainly tasked with naval infantry battlefield support, but its secondary roles include low-level air defence against

## Helix-A upgrade

**The entire Ka-27PL anti-submarine helicopter fleet is scheduled to undergo a deep upgrade to the Ka-27M standard, with the first examples expected to be taken on strength later this year.**  
Ivan Voukadinov

THE Ka-27PL is ripe for upgrade, with sufficient airframe hours remaining on around 48 *Helix-A* to operate until the late 2020s or even early 2030s.

An ambitious upgrade programme launched in the early 2000s set out to solve acute obsolescence issues, but its design, development, testing and evaluation proved a protracted undertaking. No production upgrade contract was signed before 2012.

Dubbed Ka-27M, the modified helicopter features a modern long-range radar with air-to-surface and air-to-air modes, enabling the *Helix-A* to take on a significant share

of the job originally assigned to the Ka-31 shipborne AEW helicopter.

Its combat capability compared to the legacy Ka-27PLs is claimed to be three times greater, thanks to its integrated open-architecture mission suite, new sensors and ordnance. The mission suite enables search, track and attack operations against submarines at depths of up to 500m (2,600ft) and speeds of 70km/h (40kt), up to 200km (110nm) from the ship (with a patrol time of two hours) in sea state 5, by day or night and in all weathers.

A comprehensive life-extension programme accompanies the mis-

sion avionics upgrade, ensuring a further 20 years or 3,000 flight hours of operational service.

The Ka-27PL upgrade programme launched in March 2003 soon fell foul of huge delays, apparently through inadequate funding. The first phase of the joint state testing effort, undertaken by the Russian Air Force's State Flight Test Centre, was only completed in November 2013. Kamov then launched the Ka-27M into 'production' at the Kumertau Aviation production Enterprise (KumAPE) plant in Kumertau. Delivery of the first production Ka-27Ms is expected this year. ■





**Left:** The An-26 is the backbone of the Navy's support tasks. One of the most important duties is delivering assault troops by parachute, at low altitude.  
**Below:** The Black Sea Fleet has three Be-12PS turboprop amphibians dedicated to SAR and maritime patrols. Ivan Voukadino



low-speed aircraft over the Kaliningrad exclave, an isolated chunk of Russian territory on the Baltic Sea coast bordering Poland and Lithuania.

The navalised version of the Ka-52, designated Ka-52K and named Katran (prickly shark) by manufacturer Kamov, had been selected as a new shipborne attack type and a contract for 32 was signed between the Russian MoD and the AAC Progress pro-

duction plant in April 2014.

The initial pre-production Ka-52K (from a batch of four test and evaluation airframes) flew for the first time on March 7, 2015 at AAC Progress's Arsenyev airfield.

The aircraft had been intended for operation from two 'Mistral'-class amphibious assault ships built by STX at St Nazaire, France. Each vessel would have embarked up to eight Ka-52Ks and a similar number of Ka-27/29s.

But French refusal to hand over the ships, amid tension after Russia's involvement in the Ukraine crisis, led to contract termination in August 2015.

The first batch of eight to ten production Ka-52Ks is now tentatively set for handover in 2017. They may be fielded by a newly formed shore-based attack helicopter squadron at the RNA's Nikolaevka air base and assigned to the Pacific Fleet.

## Transport and special missions

The RNA's transport and special mission branch is tasked with moving Russian Navy command authorities, personnel and cargo between bases – plus a variety of other roles including general SAR in the fleet area of responsibility, parachute training with naval infantry and naval combat diver units and SAR support to manned re-entry vehicles splash-



**Above:** The Pacific and Baltic Sea fleets operate the Forpost UAV (IAI Searcher Mk II, assembled in Russia), which has an endurance of 17.5 hours and operational radius of 134nm.

**Right:** The Orlan-10 UAV, has an operational radius up to 65nm and a mission endurance of up to 10 hours. It's operated by dedicated reconnaissance detachments in the Black Sea and Northern fleets. Alexander Mladenov

**Below:** One of the three An-12PS dedicated maritime SAR platforms assigned to the aviation element of the Northern Fleet.



ing down in the Pacific Ocean.

The An-26 is the branch's work-horse, with 24 active, while only two of the much larger An-12 remain. Six An-72 short take-off and landing (STOL) twinjets are used for passenger and cargo transport. Seven Tu-134s and two Tu-154Ms meanwhile provide transport to command personnel.

In early 2013, the RNA took its first An-140-100 passenger transport on strength. Three more were expected to arrive through 2013 and 2014, but only two were delivered, late in 2015, and a third in May this year. One pair now serves with the Ostafyevo-based transport unit and the other with the Yeisk training centre.

The branch operates three An-12PS maritime SAR platforms within the Northern Fleet, while two Il-22s and two Il-20RT special mission aircraft serve the Northern and Pacific Fleets.

Outfitted for long-range passenger transport, they are augmented by an Il-18D used for continuation training by Il-38 pilots, as well as



**Above:** The sole Tu-134A-4(UBL), which serves as the air transport for the Black Sea Fleet Commanding Officer. Ivan Voukadinov

passenger and cargo transport.

In 2015, An-26 crews from all four fleets gathered for a specialised training course at Chernyakhovsk, near Kaliningrad, which taught them how to employ their aircraft as a bomber. The additional role has been facilitated by four hard-points on the lower fuselage. The An-26 could be useful against an enemy lacking air defence weapons or for dropping illumination bombs during SAR operations.

The Black Sea Fleet retains four

Beriev Be-12PS turboprop flying boats for the maritime patrol role. The aircraft were cycled through an overhaul and service life extension programme at Taganrogskiy Aviatzionnny Nauchno Technicheskiy Kompleks (TANK – Taganrog Aviation Scientific Technical Complex) Beriev in Taganrog between 2012 and 2014, which included a minor avionics upgrade. The refurbished amphibians are now good for service until 2020.

## Jet flying boats

The SAR force is set for renewal after an order for five Be-200 jet amphibians. A batch of six Be-200s was ordered in May 2013 and scheduled for delivery between 2014 and 2016, but contractual difficulties have caused the postponement of the initial handover to the second half of 2016 at the earliest. The order is valued at about 8.4 billion roubles (\$270m).

Two of the amphibians will be to Be-200ChS standard, identical to those delivered to the Russian Ministry of Emergency Situations and capable of SAR and firefighting. The others will be Be-200PS aircraft, equipped only for SAR.

The RNA intends to establish two dedicated SAR detachments, each equipped with three Be-200s. The first will be at Yeisk to cover the Black Sea and the second at Knevichi, near Vladivostok, to oversee the southern part of Russia's Pacific coastline.

The Be-200PS/ChS has a payload of 5,000kg (11,020lb) and can transport up to 50 paratroopers or 30 casualties on stretchers. In the SAR role its operational radius is around 1,300km (700nm).

In July 2015 there were suggestions that the RNA might place orders for the newly developed armed Be-200 version, equipped for ASW and maritime patrol, which could partially replace the Il-38.



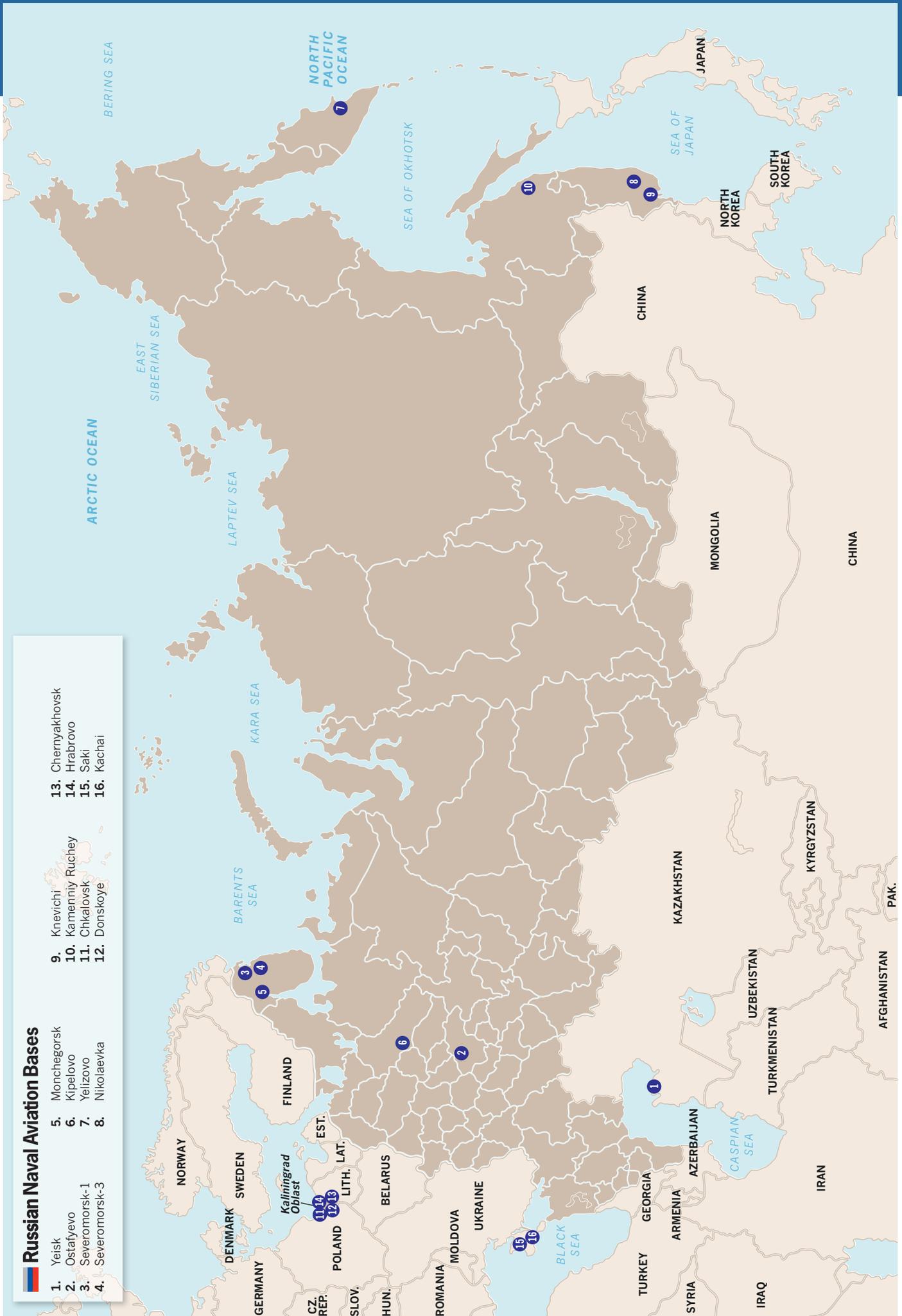
## Russian Naval Aviation Service Order of Battle, April 2016

Data compiled using publicly available information. No official data has been released since the radical reform launched in late 2009.

Unit	Base	Types
<b>Centrally Subordinated Units</b>		
859th TsBPIPLS 190th Uchebnyy Smeshannoy Aviatzionny Polk (USAP – composite training regiment)	Yeisk	Il-38, Il-38N, An-26, Tu-134, Ka-27PL/PS, Ka-28, Ka-29, Ka-31R, Mi-8, An-140-100, L-39C, Su-25UTG, MiG-29K/KUB
7055th Guards Air Base (one transport sqn)	Ostafyevo (Moscow)	An-26, An-72, Tu-134, Tu-154M, An-140-100
<b>Northern Fleet</b>		
7050th Air Base (one ASW & maritime patrol sqn, one shipborne helicopter sqn, one transport & SAR sqn, one UAV detachment)	Severomorsk-1	Il-38, Il-38N Il-22, Ka-27PL/PS, Ka-29, Mi-8MTV-5, An-12BK, An-26, Tu-134, Forpost UAV
Component of the 7050th Air Base – long-range ASW & maritime patrol sqn	Kipelovo	Tu-142MZ/MK, An-26
297th OKIAP (two fighter sqns)	Severomorsk-3	Su-33, Su-27UB, Su-25UTG
100th OKIAP (two fighter sqns)	Severomorsk-3	MiG-29K/KUB
98th SAP (one interceptor sqn, one bomber/reconnaissance sqn)	Monchegorsk	MiG-31BM, Su-24M, Su-24MR, Mi-8
<b>Pacific Fleet</b>		
<b>Vladivostok</b>		
7060th Air Base (one interceptor sqn; one composite ASW, maritime patrol, transport/SAR sqn; one composite ASW, SAR and utility transport helicopter sqn; one UAV detachment)	Yelizovo (Petropavlovsk-Kamchatskiy)	MiG-31/D, Il-38, Il-38N, Ka-27PL/PS, An-26, Mi-8, Forpost UAV
7062nd Air Base (one ASW & maritime patrol sqn, one shipborne ASW and SAR helicopter sqn)	Nikolaevka	Il-38, Il-38N Ka-27PL/PS, Ka-29
Component of the 7062nd Air Base – one long-range ASW & maritime patrol sqn	Kamenniy Ruchey	Tu-142MZ/MR, An-26, Mi-8, Ka-27PS
Component of the 7062nd Air Base – one transport and SAR sqn	Knevichi	An-12, An-26, Il-18D, Il-22, Tu-134A
<b>Baltic Sea</b>		
<b>Kaliningrad</b>		
72nd Guards Air Base (one fighter sqn, one attack/assault helicopter sqn)	Chkalovsk	Su-27/UB, Mi-8MTV, Mi-24P/VP
Components of the 72nd Air Base – one attack squadron, one UAV detachment	Chernyakhovsk	Su-24M/MR, Forpost UAV
Component of the 72nd Air Base – one shipborne ASW helicopter squadron	Donskoye	Ka-27PL, Ka-29
Component of the 72nd Air Base – one transport and SAR squadron	Hrabrovo	An-26, Tu-134, Ka-27PS
<b>Black Sea Fleet</b>		
<b>Sevastopol</b>		
43rd OMSHAP (one attack sqn, one reconnaissance sqn)	Gvardeiskoye	Su-30SM, Su-24M, Su-24MR
318th SAP (one shipborne helicopter sqn, one transport & SAR sqn, one detachment of EW helicopters, one UAV detachment)	Kacha (Sevastopol)	Ka-27PL/PS, Mi-8MTV, Mi-8MTV, An-26, Be-12PS, Tu-134A-4(UBL), Orlan-10 UAV

## Russian Naval Aviation Bases

- |                  |                |                    |                   |
|------------------|----------------|--------------------|-------------------|
| 1. Yeisk         | 5. Monchegorsk | 9. Knevichi        | 13. Chernyakhovsk |
| 2. Ostafyevo     | 6. Kipelovo    | 10. Kamenny Ruchey | 14. Hirabrovo     |
| 3. Severomorsk-1 | 7. Yelizovo    | 11. Chkalovsk      | 15. Saki          |
| 4. Severomorsk-3 | 8. Nikolaevka  | 12. Donskoye       | 16. Kachai        |



# india's Sea Harrier

Sanjay Simha reports on the end of worldwide Sea Harrier operations, following the withdrawal of the type by the Indian Navy.

1

1: The past and present meet in this unique formation of two MiG-29Ks and Sea Harrier 617. Flying the lead aircraft was 'Tiger Lead' Cdr Shikku Raj, outgoing CO of INAS 300 'White Tigers'. All images author unless stated. 2: Four Sea Harriers await their final sortie, 602 and 617 flew the mission, 609 and 614 were the reserve aircraft. 3: The cockpit of Sea Harrier 614 illustrates the cramped layout of the instrument panel, a result of upgrades that provided the aircraft with an Elta EL/M 2032 radar and the ability to engage targets at BVR.

2

# ers Sign Off

*"A very sad day for all Harrier fans across the world, she will be missed."*

**R**ETIREMENT OF the Sea Harrier from Indian Navy service was marked by an impressive ceremony at Indian Naval Station Hansa, Goa-Dabolim on May 11. It was attended by high-ranking officials, together with current and retired personnel who had been involved with the type. The event also saw the de-commissioning of Indian Naval Air Squadron 300 'White Tigers', which flew the Sea Harrier FRS1 and had been the only Indian squadron to fly the single-seat variant.

The ceremony marked the end of 33 years of service by the type in India. The aircraft had operated not only from the now withdrawn

carriers INS *Vikrant* and INS *Viraat*, but also from the recently acquired ex-Russian INS *Vikramaditya* (formerly *Admiral Gorshkov*). The initial batch of Harriers came with Ferranti Blue Fox radars, which had limited range. A few upgrades later, most notably the LUSH (Limited Upgrade Sea Harrier), the aircraft's capabilities were enhanced by installing Blue Vixen and later Elta EL/M 2032 radars, as well as integrating Derby beyond-visual-range missile systems.

This, along with introduction of air-air refuelling capabilities, made it a potent weapon platform. The Harriers have carried out exercises with various air arms worldwide, including the British, French and US navies. During its Indian Navy service, the type had its fair share of losses and although official figures are not available, it is believed up to 17 have crashed during service.

While the Sea Harrier is gone, during its retirement ceremony INAS 300 inducted a new air-



craft type into its fold, the MiG-29K. India has ordered 45 MiG-29K/KUBs and is believed to have received about 20 to date. The MiG was first commissioned into service exactly three years earlier, on May 11, 2013, with INAS 303 ►

3



'Black Panthers'. Since then, they have come a long way, conducting various weapons and system trials. While INAS 303 continues to be the training-cum-qualifying squadron for both pilots and the aircraft, INAS 300 will take over the operational role in a phased manner. This is the first supersonic aircraft flown by the Indian Navy and it also uses the ski-jump concept for take-offs from aircraft carriers.

INAS 300 White Tigers has had an illustrious record. Formed in 1961 with the Hawker Sea Hawk, initially in the UK at RNAS Brawdy, Pembrokeshire, the squadron saw action during the 1971 Indo-Pak War flying the Sea Hawks from the deck of INS *Vikrant*. It began operating the Sea Harrier in 1983.

As the outgoing Commanding Officer, Cdr Shikku Raj aptly said: "A very sad day for all Harrier fans across the world, she will be missed."



**Above:** During operational service the jets regularly deployed aboard the aircraft carrier *INS Vikrant*. This image shows the transition to a newer low-visibility overall grey camouflage. *Simon Watson*

## A British perspective

WILLIAM 'BILL' Dean joined the Royal Navy as a pilot. He flew operationally, first as a SAR helicopter pilot, based in Scotland, and then, after fast jet training, as a Sea Harrier pilot operating from HMS *Invincible*. After specialising as an Operational Evaluation Unit pilot, he served with the USN on an exchange posting flying the F/A-18C Hornet and AV-8B Harrier at the USN weapons test centre at China Lake, California. On return to the UK in 2006, Bill served at RAF Cottesmore with The Joint Force Harrier before retiring from military service in 2008. He joined Rolls-Royce in 2011 as Chief Pilot (Defence) where he holds the distinction of being the last British pilot to fly in an Indian Navy Harrier.

Rolls-Royce Defence Aerospace works closely with its customers worldwide to maximise the operational effectiveness of military aircraft fitted with Rolls-Royce engines. As part of these support activities, a team from Rolls-Royce, based in Bristol made a number of trips to Goa, India, in 2014 and 2015 to provide engine-related technical and flight operations assistance in support of India's Sea Harriers.

In September 2014, Tim Williams, Chief Engineer Pegasus, Helicopters and Transport for Rolls-Royce Defence Aerospace and William Dean travelled to Indian Naval Air Station (INS) Hansa, Goa, to brief Indian Navy pilots and engineers on proposals for a hover performance recovery programmes, similar to that instigated by the Royal Navy and Rolls-Royce for the UK's Sea Harrier FA2s as the aircraft neared the end of their operational service.

In October the following year, the two men made another visit to INS Hansa, to assist INAS 300 'White Tigers' with a high priority engineering task to improve the 'at-sea operational capability' of the squadron's remaining aircraft. A number of the Sea Harriers had been refitted with overhauled engines. Unfortunately, during subsequent airborne testing, one of the aircraft had been unable to achieve an acceptable hover performance. Rolls-Royce's flight operations support team concentrated on possible recovery procedures on aircraft 656, a former RAF T4 trainer.

The aim of this visit was to provide additional forms of support to the customer, whereby as many Sea Harriers as possible could participate in the Indian Navy Fleet Review, held in February this year. On this occasion the team was introduced to Chief Staff Officer (Technical) at Indian Naval Air Engineering HQ, as well as the Station Commander of INS Hansa, and the INAS 300 Commander, pilots and engineering officers. 'Bill' commented that: "The squadron hosted the visit at all times showing tremendous hospitality and friendliness which was much appreciated by the Rolls-Royce team."



**Above:** Rolls-Royce Chief Pilot (Defence) William Dean is congratulated by Commander Shikku Raj at the end of the Check Test Flight in 656 last October. *William Dean*

A highlight of the visit was when Bill Dean, at the request of Indian Navy HQ, participated in a Check Test Flight (CTF) sortie in aircraft 656 with the squadron CO, Cdr Raj.

After the flight he enthused: "It was a fantastic and unexpected opportunity to fly the Harrier again and be the last British pilot to fly in an Indian Navy example in operational service – we planned a very busy sortie, which included a max power climb to 30,000ft followed by a high-speed acceleration, at low level, to over 500kts in the Bay of Goa. The best part of the flight, as always in the Harrier, was transitioning to the hover – even after all these years of operational service, the aircraft is still an engineering marvel and, of course, the

key to its ability to hover is the fabulous Pegasus engine."

Speaking in more detail about the hover profile part of the check test-flight, William said: "After the high-speed acceleration check at low level, when we achieved 540kts, the aircraft returned to INS Hansa to conduct the hover performance tests. Prior to arriving in the airfield overhead a 'power assurance and water flow check' was conducted. This involved lowering the undercarriage below 250kts, setting the water switch to 'take-off' mode, selecting 97% rpm, checking the water flow light had illuminated and noting the Jet Pipe Temperature (JPT) at a stabilised 230kts – the JPT reading was 652°C. The procedure was repeated with 'water selected off', and the subsequent JPT recorded was higher, as expected, at 686°C."

"After arriving in the airfield overhead, the aircraft was positioned downwind with 1,200lbs of fuel and the jet continued in a descending turn to achieve an into wind deceleration to the hover, over the threshold of Runway 26 at Goa International Airport. Water injection was used during the deceleration, and water flow was checked and confirmed as the aircraft decelerated and power was increased to counter the reduction in wing-generated lift. The hover height was 100ft [30m] and a stabilised, zero ground-speed hover, was maintained for approximately 30 seconds in order to note engine readings and calculate the 'wet' performance hover figures. Additional 'dry' hover performance readings would be calculated on later sorties.

On completion of the hover check, power was reduced slightly to establish a rate of descent before a rolling vertical landing was carried out on the active runway, followed by a short taxi back to dispersal on the military side of Goa airport." ■



**Above:** The Indian Navy acquired two Harrier T4s from ex-RAF stock in 2003, designating the aircraft T4I. Both aircraft served in the training role alongside four T.Mk 60 two-seaters. *Simon Watson*

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# Stripes in the Spanish Sun

Kees Otten, Wim Das and Koos Heemskerck headed to northern Spain for the 2016 NATO Tiger Meet at Zaragoza Air Base.

**Above:** A French Air Force Mirage 2000D from EC 1/30, based at BA 118 Mont-de-Marsan, was decorated with Spanish national colours over its tail and wings. *Wim Das*

**Right:** An E-2C Hawkeye from Aéronavale's 4 Flottille, based at Lann-Bihoué, arrived suitability decorated for the meet. *Wim Das*

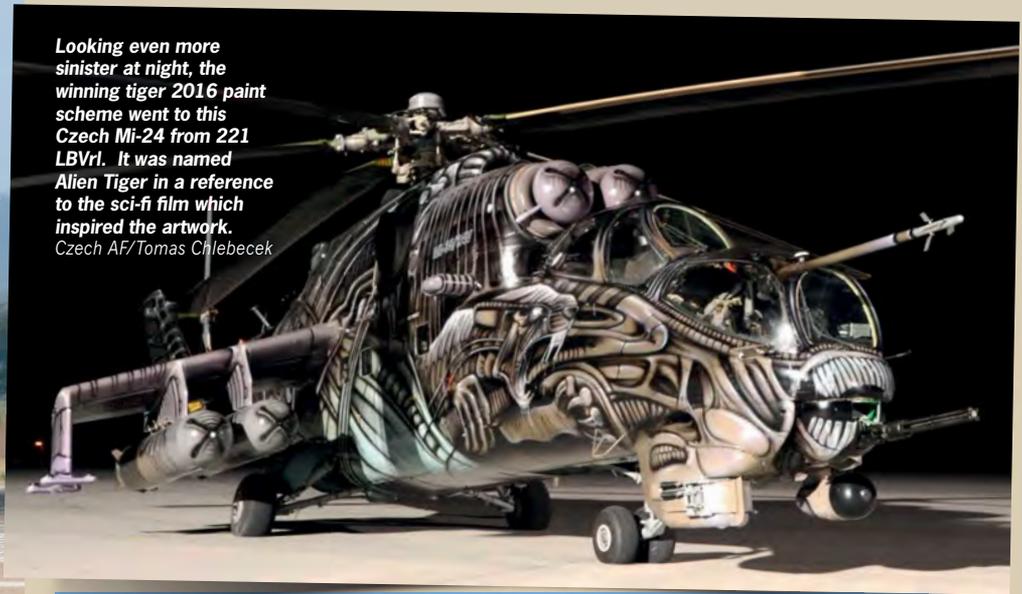


## NATO Tiger Meet 2016 Participants

No	Type	Unit	Operator	Base
6	EF-18A+	Ala15	SpAF	Zaragoza
6	Typhoon	142 Esc	SpAF	Albacete
2	AB-212 ICO	21 Gruppo	ItAF	Grazzanise
6	Typhoon	12 Gruppo	ItAF	Gioia del Colle
8	F-16A/B MLU	31 Sqn	BAF	Kleine Brogel
8	Typhoon	JG 74	GAF	Neuburg
6	Rafale M	11F	FN	Landivisiau
4	Mirage 2000D	EC 5/330	FAF	Mont-de-Marsan
4	F-16C/D Block 52+	335 Mira	HAF	Araxos
2*	F-16A/B MLU	313 Sqn	RNLAF	Volkel
4	JAS-39C/D Gripen	59/1 Sqn	HuAF	Kecskemét
6	F-16A/B MLU	338 Skv	RNoAF	Ørland
2	E-3A Sentry	1 AEW&CS	NATO	Geilenkirchen
6	F-16C/D Block 52	6 ELT	PoIAF	Poznań-Krzyszyn
4	JAS-39C/D	211 TL	CzAF	Čáslav
2	Mi-24 Hind	221 LBVrl	CzAF	Námest
1	Mi-17	221 LBVrl	CzAF	Námest
5	F/A-18C/D Hornet	Staffel 11	ChAF	Meiringen
5	F-16C/D Block 50	192 Filo	TuAF	Balikesir
1	Puma HC2	230 Sqn	RAF	Benson
1	Learjet	GFD	Civil	Hohn
1	E-2C Hawkeye	4F	FN	Lann-Bihoué
2	SA.342M Gazelle	3 RHC	ALAT	BA d'Etain-Rouvres
1**	KDC-10	334 Sqn	RNLAF	Eindhoven

\* first week only \*\* Flying from Eindhoven AFB (NL)





Looking even more sinister at night, the winning tiger 2016 paint scheme went to this Czech Mi-24 from 221 LBVrl. It was named Alien Tiger in a reference to the sci-fi film which inspired the artwork. Czech AF/Tomas Chlebecek



Right: The Hellenic Air Force Aegean Tigers from the Araxos-based 335 Mira sent one of its F-16C Block 52+ jets with tiger-decorated CFTs and under wing tanks. Wim Das Right middle: A rare sight at Tiger Meets these days are SA.342Ms. Two specially painted Gazelles from the French Army's 3 RHC based at BA d'Étain-Rouvres were external participants at Zaragoza. Jens Schymura Below: Polish and Dutch F-16 pilots walk out to their aircraft at the start of another morning launch during the meet. Wim Das



Above: Dubbed Cyber Tiger, Typhoon 30+29 from JG 74 proved popular among aircrews present at Zaragoza Air Base. During the meet JG 74 was granted full membership of the NATO Tiger Meet Association. Wim Das



**Above:** MiG-21s are becoming an increasingly rare sight in Europe. Newer more advanced jets are taking over as air forces look to acquire increasingly sophisticated systems. Alan Warnes

# Securing the Skies

The final part of European Fighter Survey, compiled by **Alan Warnes** and assisted by more **AFM** correspondents covers Romania to the UK.

**T**URKEY AND the United Kingdom boast two of the strongest fighter forces in Europe and both are supported by a large aerospace industry. With around 240 F-16s and 30 F-4Es the Turkish Air Force (THK) has always looked towards the US to support its needs. Once, just like neighbours Greece, it relied on surplus jets handed down by America under the military assistance program (MAP). It led to F-4s, F-100s and F-104s making up the bulk of the THK in the 1970s and 1980s. Then Turkey bought brand new F-16s in the mid-'80s, which led to Turkish Aerospace (TUSAS) assembling them for the next 25 years until the last one rolled off the line in 2014. Over that period, Turkish Aerospace Industries (TAI), as it is now called, worked with new technologies to support the THK's needs. Over 100 F-16 Block 40s have been through sig-

nificant upgrades at TAI's Ankara facility, which shares a runway with Akinci Air Base. Today Turkey has a new aerospace industry, which has been built on the F-16 offsets of the mid-'80s. The competence of the industry is demonstrated by the fact that it is manufacturing parts for the F-35 Joint Strike Fighter and will, in future, manufacture the Turkish Fighter (T-FX) fighter.

The RAF relies on BAE Systems to support its Tornado fleet and in the past upgraded the fighter's capabilities. BAE has done likewise with the Typhoon with Phased 1 Enhancement (P1E) now being integrated into the RAF's Tranche 2/3 jets.

The company, which now has interests all over the world, also provides maintenance and support for both fleets. BAE has its own Depth Support Wing facility at RAF Marham, looking after the Tornado and at RAF Coningsby, it is contracted to deliver the Typhoon Availability Service. BAE Samlesbury in Lancashire, is also building several parts of the JSF including the aft fuselage, horizontal/vertical tails and the wing folds.

Both industries play a key role in the fighter fleets of their respective countries and most recently have come together on the T-FX

programme. BAE Systems has been selected to work with TAI on the design of the new Turkish fighter programme (T-FX), which is planned to fly in 2023 to coincide with Turkey's 100th anniversary.

While discussing fighter fleets supported by industry, there is no greater example than Saab which has been building fighters since World War 2. Today, it still builds fighters, with the JAS 39 Gripen.

Over the 20 years the Swedish Air Force (SwAF) Gripen has evolved, from the basic JAS 39A/B to the more capable JAS 39C/D. There are around 100 of the latter in today's SwAF, however by the end of this decade they will start being phased out as the first of the larger enhanced 60 JAS 39Es (see page 10-11) enter service.

This isn't just about having an aerospace industry to support the air force. It is also about national security, which we in the UK pride ourselves on. Then there are the export campaigns to offset the costs of the national programme and to make further profits. Saab has already done that with Gripen and BAE Systems (as part of Eurofighter consortium) does with Typhoon. TAI is hoping to do likewise with the T129 attack helicopter.

These three examples are in stark contrast to the aerospace companies of Romania and Switzerland. Aerostar and RUAG respectively are these days limited mainly to the maintenance and overhaul of military fighters. Not every country can afford to build up its aerospace industries and fund the design and manufacture of new aircraft. However, the acquisition of F-16s by the Romanian Air Force could see Aerostar working on the type eventually, and consequently become as familiar with Western fighters as it is with those from Russia. Getting to grips with new technologies is the only way these companies can grow as Saab, TAI and BAE Systems can attest.

## Fighter Fleets

<b>Romania</b>	20 x MiG-21 LanceR B/C
<b>Serbia</b>	2 x MiG-21UM, 2 x MiG-29, 1 x MiG-29UB
<b>Slovakia</b>	10 x MiG-29AS, 2 x MiG-29UBS
<b>Spain</b>	20 x F/A-18A+, 54 x EF-18AM, 12 x EF-18BM, 45 x EF-2000 Typhoon, 8 x EAV-8B, 1 x TAV-8B (Navy)
<b>Sweden</b>	100 x JAS 39C/D Gripen
<b>Switzerland</b>	30 x F/A-18C/D Hornet
<b>Turkey</b>	225 x F-16C/D, 30 x F-4E-2020
<b>UK</b>	90 x Typhoon T3/FGR4, 60 x Tornado GR4



With its brake-chute deployed, this Lancer C prepares to come to a halt at Câmpia Turzii after one of the regular 40-minute sorties in September 2014. Dirk Jan De Ridder



# F-16s for LanceRs

**H**AVING HAD 110 MiG-21s upgraded to the new LanceR A (air-to-ground), LanceR B (dual-seat) and C (air-to-air) versions during the late 1990s, barely 20 are still flying today – most of these are C variants, with a handful of Bs. All of the As have been withdrawn from use.

Back in 1993, the Romanian MoD signed a \$345 million contract with Bacău-based Aerostar to upgrade 71 MiG-21M/MFs to LanceR As, 14 MiG-21UMs to LanceR Bs and 25 MiG-21MFs to the air defence configured LanceR Cs. Israel's Elbit Systems was sub-contracted to carry out the work. At the heart of the upgrade was a modular mission computer and MIL-STD 1553 databus, which worked with the impressive Elta EL/M2032 multi-mode radar on the LanceR Cs. It meant the pilots of the transformed fighter could call upon the Elbit DASH (Display and Sight Helmet) as well Rafael Python III and Mica Magic II missiles for air-to-air missions. Although the upgrade was carried out nearly 15 years ago, the missiles are still relevant in today's world with the potential for terrorist attacks or Russian air space violations – see *Russian Roulette* (see pages 42-46).

The jets were delivered to three main bases, at Bacău (Baza Aeriană 95), Borcea-Fețești (Baza Aeriană 86) and the newest base, Câmpia Turzii (Baza Aeriană 71).

Today, the surviving LanceR Cs are used for Quick Reaction Alert (QRA) at Câmpia Turzii and Mihail Kogălniceanu. The latter, which was shut down as an operational air base on April 22, 2004 (*Mihail Kogălniceanu Air Base Closes*, June 2004, p9) is being used, while Fețești is being prepared for the arrival of the F-16s in September (see *European Fighter Survey, Portugal*, June, p88). Most are now

lined up, in storage at Bacău close to the co-located Aerostar factory. LanceRs were also based at Bacău, with Escadrille 951 which previously trained the LanceR pilots, but operations there have now stopped.

Four LanceR Cs were deployed to Šiauliai, Lithuania from August 1 to December 1, 2007 for Baltic Air Policing duties. They never returned, mainly due to their own heavy domestic QRA commitments

and the availability of aircraft.

For ten years, the Romanian MOD considered several options to replace the LanceRs, including the Lockheed Martin F-16C/D Block 52 and Saab JAS 39C/D Gripen. It finally chose to buy nine ex-Portuguese Air Force F-16A/Bs and three ex-USAF F-16s in September 2014 for a cut price €186m. All of the aircraft are being brought up to a mid-life upgrade standard by Alverca-based OGMA Industries. Romanian personnel – pilots, ground crews and mission planners – started training at the Portuguese Air Force's F-16AM/BM base, Monte Real, in late 2014. The first deliveries are expected in September and will be based at Borcea-Fețești.

## Fighter ORBAT

### Baza Aeriană 71 – Câmpia Turzii

Escadrille 711/712 MiG-21 LanceR B/C

### Baza Aeriană 57 – Mihail Kogălniceanu

Escadrille 861/862 MiG-21 LanceR B/C

*While Fețești's runway receives attention*



Above: With the Romanian Air Force investing its limited budget in defending its air space with Lancer Cs, all the LanceRs have been grounded. This example is seen landing at Câmpia Turzii in 2006. Alan Warnes



SERBIA



Such is the state of Serbia's fighter fleet, that even the dual-seat MiG-21UM Mongols have been modified to carry the R-60 (AA-8 Aphid) air-to-air-missiles. Dimitrije Ostojic

# Fighter problems

THINGS AREN'T looking too good for the Serbian Air Force and Air Defence (SAF&AD) fighter fleet. Most of the MiG-21s and MiG-29s, which were acquired in the 1980s, are now grounded due to a lack of funding for spare parts and maintenance.

The 101st Fighter Aviation Squadron based at Batajnica is the only fighter unit and has just two single-seater MiG-29s, 18102 and 18108, operating alongside one two-seater MiG-29UB 18301 and two dual-seaters MiG-21UM 16178 and 16180. The Quick Reaction Alert (QRA) usually has two MiG-29 jets armed with infrared R-60 (AA-8 Aphid) missiles, although occasionally there is one MiG-29 and one unarmed MiG-21UM.

The SAF&AD has, for the first time, upgraded both MiG-21UMs so they can be armed with the R-60 air-to-air missiles. Meanwhile the SAF&AD is trying to return to service one MiG-29, 18101, which has not been flying more than four years, and also complete the overhaul of one MiG-21UM, 16185.

For years plans for procurement of new multi-role combat aircraft have been merely 'on paper' with none having been purchased. After the Serbian defence ministry issued a Request for Information (RFI)

in 2010, six manufacturers responded. Information on the Rafale, Eurofighter, F-16C/D, MiG-29M2, Su-30 and FC-17 (JF-17) were all analysed. But work on the acquisition was suspended in 2011. Then, immediately after a new coalition government came to power in the summer of 2012, contact was made with Moscow to procure six new aircraft from RSK MiG – two-seater MiG-29M2s or MiG-35s.

During 2013, a RSK MiG technical team inspected nine of the SAF&AD's MiG-21bis built between 1980 and 1982, which would have been overhauled as part of an interim solution. During the summer of 2014, talks with Moscow ceased due to Serbia's poor economic situation. Overhaul of the MiG-21bis never took place and only two aircraft, built in 1983, remained in service until they were grounded – the first in June 2014 and the second in September 2015.

Due to the urgent need to work with new-cutting edge technologies, officials from the Serbian Government visited Moscow reportedly to discuss the procurement of up to 14 second-hand MiG-29s. However, RSK MiG is interested in selling only new aircraft, so it is unclear what the future holds for Serbia's fighter fleet. **Aleksandar Radic**

**Fighter ORBAT**

101 Fighter Aviation, Batajnica

MiG-21Bis/UM, MiG-29/UB

# Hornet & Tifón Heaven

THE BACKBONE of the Spanish air defence force is the Eurofighter EF-2000 Tifón and EF-18M Hornet. The Hornet fleet is in good shape – its equipment and capabilities have been through various upgrade programmes since the service entry of the EF-18A/B,

now designated EF-18M. Of the initial 72 aircraft delivered, just six have been lost in almost 30 years of service. The multi-role capabilities of the Hornet (or C15 as it is designated by the Ejército del Aire) enables the jet to be armed for both air-to-air and air-to-ground missions. The two units equipped with



Ala 11 is equipped with two squadrons, one operational with single-seaters and an OCU (Operational Conversion Unit) using two-seaters.



the EF-18M (Ala 12 and Ala 15) can equally perform any type of mission, although for now Ala 12 is the only Hornet unit able to undertake tactical aerial reconnaissance using the Rafael Reccelite pods.

One of the most important factors in gaining maximum capability from the EF-18M has been the ability of the EdA to evolve and develop its own OFP software. Thanks to this process, undertaken by the CLAEX (EdA Logistics Centre) at Torrejón de Ardoz air base, new capabilities are being integrated on to the aircraft. These include the Scorpion helmet, new armament – especially the integration of domestically developed weapons such as the general purpose BR-250/500 or laser guided BPG-2000 bombs. The standard weapon fits are the AIM-120 AMRAAM, AIM-2000 Iris-T, AIM-7 Sparrow and AIM-9 Sidewinder air-to-air missiles plus the air-to-ground AGM-65 Maverick, AGM-84 Harpoon or AGM-88 HARM.

The KEPD 350

Taurus missile will also



Ala 12 has amassed around 175,000 flight hours on the Hornets since they replaced the McDonnell Douglas F-4Cs in the early 1990s. All photos, Roberto Yáñez

equip EdA Eurofighters. Next September various Ala 12 EF-18Ms will go to the huge Vidsel weapons range in Sweden to launch the Taurus stand-off weapon and the latest models of laser guided bombs. The most commonly used smart bombs are the Paveway II, III and Enhanced Paveway II. Apart from the software upgrade, the Albacete Air Depot is also conducting a structural upgrade of the fleet to lengthen the type's operational life.

The third Hornet unit is Ala 46 at Gando, in the Canary Islands. Initially equipped with 24 ex US

Navy F/A-18As, its primary mission is the air defence of the Canary Island archipel-

ago. Of the initial lot delivered in the mid-1990s four have been lost. Just like the EF-18M, the Canary Hornets have received various updates to their combat capabilities, although economic and technical constraints mean these aircraft are at a lower operational level than the EF-18M. Despite this, it is still a weapons system ideally suited to its deployed environment and assigned missions.

Like the EF-18M fleet, the F/A-18A+ Hornets undergo strict periodic inspections to counteract the effects of the salt water environment in its area of operations.

Having served for nearly 30 years, a replacement for the EF-18Ms is pending. The preferred option is the F-35A Lightning, although this is unlikely to happen before 2025.

Meanwhile Torrejón and Zaragoza Hornets will receive additional

upgrades, allowing the F/A-18A+ to be replaced by the 'Ms, as more Eurofighters become available.

Of the 72 EF-2000 Tifóns (or C16s in the EdA) initially contracted by the Spanish Government, around 45 are in service and two have been lost in accidents. There are 29 assigned to Ala 11, with the remaining 16 at Ala 14 in Albacete.

The latter base is also being used to store Tranche 3A jets, which have come off the production line and not yet assigned to units. However, one aircraft, C16-56/10007, was seen with Ala 14 during the recent NATO Tiger Meet at Zaragoza. Ala 14 is expected to receive around five new airframes leading to the reactivation of 141 Escuadrón in 2017.

This will achieve the EdA's goal of operating four operational EF-2000 squadrons, with a fifth serving as an operational conversion unit. There remains a possibility that some of the early tranche jets will be sold.

The EF-2000s' fleet readiness is very high and for the last few years they have been participating in the nation's QRA mission, along with the Hornets. Ala 11 and Ala 14 have also undertaken air policing missions over the Baltic states and it is expected there will be a Eurofighter detachment to Nellis AFB, Nevada, in August for a Red Flag exercise.

Additionally, the first national software upgrade for the EF-2000s developed by the CLAEX at the national level will serve as a base for the introduction of new capabilities and weapons in the same way as it did for the EF-18M fleet. Future capability improvements to the EF-2000 force incorporate the Rafael Litening III navigation and targeting pod, working alongside the improved Litening II systems used by the EF-18M units.

The Spanish Navy operates eight EAV-8B+ and a sole TAV-8B acquired from the US in 2001.

Roberto Yáñez/Alex Rodriguez



Fighter ORBAT

<b>Ala 11, Morón de la Frontera</b>		<b>Ala 14, Base Aérea de Albacete</b>		<b>Ala 46, Base Aérea de Gando (Gran Canaria)</b>	
111 Esc 'Dólar'	EF-2000 Tifón	142 Esc 'Dardo'	EF-2000 Tifón		
113 Esc 'Gallo'	EF-2000 Tifón	<b>Ala 15, Base Aérea de Zaragoza</b>		462 Esc 'Halcón'	F/A-18+ Hornet
<b>Ala 12, Torrejón de Ardoz (Madrid)</b>		151 Esc 'Toro'	EF-18M Hornet	<b>SPANISH NAVY, Rota</b>	
121 Esc 'Poker'	EF-18M Hornet	152 Esc 'Marte'	EF-18M Hornet	Esc 009	EAV-8B+/TAV-8B
122 Esc 'Tenis'	EF-18M Hornet	153 Es 'Ebro'	EF-18M Hornet		



SLOVAKIA

# MiG-29s soldier on...just

**S**LOVAKIA RELIES on a fleet of ten MiG-29AS Fulcrums to defend its skies, along with a pair of MiG-29UBS. However, only a handful are thought to be serviceable at any one time. Some reports say it could be as few as two.

The aircraft, all based at Sliac with the 1st Fighter Air Wing/1st Fighter Squadron, were upgraded to NATO standards to meet ICAO requirements by RSK MiG

**Fighter ORBAT**

1st Fighter Air Wing/1st Fighter Sqdn	MiG-29AS/UBS	Sliac
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between 2005-2008. Until then the Slovak Air Force (SAF) flew 21 MiG-29AS and three MiG-29UBS.

The old Russian jets are now past their prime and, at the Paris Air Show last June, it was announced Slovakia had selected the JAS 39C/D Gripens to replace

them. It is believed that the SAF want to lease eight although to date no contract has been signed. The Czech Air Force, which already operates 14 JAS 39C/Ds, is a great advocate for the jet and has undoubtedly been asked for its opinion.



Slovak Air Force MiG-29 Fulcrums are edging towards the end of their careers, with the Gripen looking likely to succeed them. This MiG-29UBS is seen taxiing out at RIAT during July 2012. Chris Lofting



SWEDEN

The JAS 39C has an anti-ship role, armed with RBS-15F missiles, as seen here on the inner pylons. Gunnar Åkerberg



# Twenty years of Gripen



Above: The SwAF Gripens are being upgraded with the new MS20 software, which allows the integration of more sensors and weapons, including the GBU-39 Small Diameter Bomb and Meteor Beyond Visual Range missile. Alan Warnes

**A**FTER OPERATING a variety of Saab fighters through the Cold War, the needs of today's Swedish Air Force (SwAF) are served by just one type – the JAS 39 Gripen. Following the official introduction of the Saab jet into Swedish Air Force (SwAF) service in June 1996, the Gripen fighter force is now busier than ever. With an increasing number of Russian military flights over the Baltic Sea, the Gripen fleet is being used more frequently flying quick-reaction alert sorties.

The SwAF inventory currently includes nearly 100 Gripen C/D-model aircraft assigned to six frontline squadrons. The 71 and 72 Fighter Squadrons (known as stridsflygdivisionens in Sweden) based at F 7 Wing in Sätenäs broadened their role on January 1, 2016 from solely training new Gripen pilots to also acting as frontline units. Swedish, and more recently, foreign Gripen pilots and technicians, train at F 7 Wing's Gripen Training Centre.

In the southeast of the country, F 17 Wing in Ronneby is home to the 171 and 172 Fighter Squadron, and in the north the 211 and 212

Fighter Squadrons operate out of Luleå, where F 21 Wing is based.

The Gripen Operational Test & Evaluation (OT&E) Unit located at Malmen Air Base near Linköping is tasked to support the development and testing of new capabilities of the SwAF Gripen Force.

The latest MS20 software upgrade will see a major improvement to the Gripen's capability, allowing it to use an extended range of precision-guided weapons – including Meteor BVR air-to-air missiles and GPS-guided Small Diameter Bombs. The MS20 upgrade will also include enhancements to Gripen's advanced electronic warfare (EW) capability. There is still a lot of potential for further development of the current 39C/D versions. Proposed long-term changes include an upgrade of the fighter's radar to increase the detection range. However, no decision or funding has been finalised.

The current plan is that the SwAF will stop flying JAS 39C/Ds at the end of 2026 and from then on only operate JAS 39Es. The first Gripen E, test aircraft 39-8 was rolled out on May 18 – see page 10-11. Gunnar Åkerberg

**Fighter ORBAT**

Location	Squadron	Aircraft
'Skaraborgs' flygflottilj, F7 WG, Sätenäs	71. stridsflygdivisionen	JAS 39C/D
	72. stridsflygdivisionen	JAS 39C/D
'Blekinge' flygflottilj, F 17 WG, Ronneby	171. stridsflygdivisionen	JAS 39C/D
	172. stridsflygdivisionen	JAS 39C/D
'Norrbottens' flygflottilj, F 21 WG, Luleå	211. stridsflygdivisionen	JAS 39C/D
	212. stridsflygdivisionen	JAS 39C/D



The Swiss Air Force has initiated another study to find a replacement for the ageing F-5E/Fs that have served the SAF since 1978. Dirk Jan de Ridder

**H**AVING REJECTED the JAS 39 Gripen in a referendum on May 18, 2014, Switzerland announced on February 24 that it was once again evaluating options for the acquisition of a new fighter aircraft for the Swiss Air Force. The initiative follows a previous attempt to buy 22 Saab JAS 39E Gripen Es to replace the F-5E/F Tiger II fleet, which was cancelled after a national ballot on the issue

A proposal will be submitted to parliament in 2017 for approval after a panel of experts completes its studies and tests. The team will also discuss the future of the current Swiss Air Force F-5E/F and F/A-18C/D Hornet fleet. The defence department noted that, despite rejection of the Gripen deal, the decision does not change the need to replace the F-5s, which are more than 30 years old.

Although the current Swiss inventory comprises 54 F-5E/Fs only 30 are still operational. In addition, there is a need to replace the 30 Hornets remaining in service. The department says that the Hornets will be nearing the end of their expected useful life in 2025. If the aircraft were to remain in service for another five years after that, an estimated half a billion

# Evaluating options **again**

Swiss francs would have to be invested to keep them operational.

It is therefore planned to officially launch the new fighter acquisition programme in 2017. A type will then be selected in 2020, with proposals for the purchase submitted to parliament for approval in 2022. Delivery of the new aircraft would start in 2025.

The Swiss Hornet fleet comprises 25 single-seat F/A-18Cs and five F/A-18Ds. Three of the four losses have been two-seaters, which resulted in four fatalities – two in April 1998 and two in October 2013.

All the jets have been through capability improvements as part of the Upgrade 21 programme. This included integration of the Joint Helmet Mounted Cueing System (JHMCS) and launcher rails, to enable the carriage of

the AIM-9X. A new programme, known as Upgrade 25 has also seen the jet's systems fitted with new countermeasures, cockpit displays and the Raytheon ASQ-228 ATFLIR. On April 14, 2015 the Swiss Air Force announced that its operational F-5E inventory would be reduced to 26 examples, following the discovery of airframe cracks in 16 aircraft, ten of which were immediately withdrawn from service on a per-

manent basis. The other six will undergo repair, for a reported cost of CHF1m (\$1.065m) and were due to have been returned to service by the end of March 2016.

The Hornet fleet is split between Payerne Fliegerstaffel 11 (Fl St 11) and Meiringen, while the F-5E/Fs fly out of their home bases at Payerne, Meiringen and Sion during courses and exercises, but out of Payerne for normal day-to-day flying activity.

## Fighter ORBAT

Fliegerstaffel 6	F-5E/F	Payerne
Fliegerstaffel 8	F-5E/F	Meiringen
FliegerStaffel 11	F/A-18C/D	Meiringen
FliegerStaffel 17	F/A-18C/D	Payerne
FliegerStaffel 18	F/A-18C/D	Payerne
FliegerStaffel 19	F-5E/F	Sion

 **TURKEY**



*Turkey is the biggest operator of the F-16 in Europe. This F-16C with conformal fuel tanks, serving 181 Filo at Diyarbakir, was one of five to visit RAF Lossiemouth in April.*  
Niall Paterson

# Trouble On Most Fronts

**Fighter ORBAT**

Wing No/Filo	Type	Callsign	Base
1nci 111	F-4E 2020	Panter (Panther)	Eskişehir
4nci	141	F-16C/D	Murted
	142	F-16C/D	Murted
	143	F-16C/D	Murted
5nci	151	F-16C/D	Merzifon
	152	F-16C/D	Merzifon
6nci	161	F-16C/D	Bandirma
	162	F-16C/D	Bandirma
7nci	171	F-4E 2020	Erhaç
8nci	181	F-16C/D	Diyarbakir
	182	F-16C/D	Diyarbakir
9nci	191	F-16C/D	Balikesir
	192	F-16C/D	Balikesir

*Only two squadrons of F-4E 2020 Terminators are left flying with the Turkish Air Force. This example serves 111 Filo at Eskişehir.*  
Alan Warnes



F-16 squadrons – Nos 141, 142, 143, 151, 152, 161, 162, 181, 182, 191 and 192 Filos (squadrons) equipped with the type.

Between 1974 and 1994 the THK took delivery of a total of 236 F-4E and RF-4E Phantom IIs – 54 were modernised by Israel Aircraft Industries (as it was in the late 1990s), with new avionics, radars, precision-guided weapons and service life extension, which will see them through to the 2020s, as the name of the project, F-4E 2020 suggests. Around 45 of these aircraft are still in service with 111 and 171 Filos. All other F-4Es as well as RF-4Es were retired.

The Turkish Air Force is planning to commission 100 Lockheed Martin F-35A Lightning IIs, and the country is a Level III partner of the Joint Strike Fighter Program.

The Navy (Türk Deniz Kuvvetleri) also has plans to induct F-35B for the LHD (Landing Helicopter Deck) class ship, which is being built in-country under licence from Navantia, as well as the future LHA.

Until recently, the weapon and sensor systems of the THK were exclusively of US origin. Developments in the local defence industry resulted in a number of precision-guided weapon systems and sensors to be delivered. One of the most important of these is the SOM air launched cruise missile, developed by TÜBİTAK SAGE. The F-4E 2020 and F-16s are using this missile, while a derivative named SOM-J designed for the F-35 is being developed together with Lockheed Martin. Other guided weapons developed by SAGE include HGK, an INS/GPS guidance kit for the Mk-series of bombs, NEB penetrator bomb and KGK wing kit. **Arda Mevlütoğlu**

THE CIVIL war in Syria, Russian intervention, the resurgence of the Kurdistan Workers' Party (PKK) resurgence in urban areas and ongoing insurgency in Iraq have been the top four topics on the already long list of Turkey's national security issues. As well as imposing huge pressure on the land forces, these problems have placed extra burdens on the country's land forces and its Air Force, the Türk Hava Kuvvetleri (THK),

The THK's fighter force is built around its fleet of 240 Lockheed Martin F-16s, procured through Peace Onyx I, II and IV Programs. It acquired a total of 180 Block 30 and 40 F-16s under Peace Onyx I between 1987 and 1995, followed by Peace Onyx II between 1996 and 1999, where 80 Block 50s were delivered.

The fleet received extensive avionics and weapon systems upgrades under Peace Onyx III modernisation project between 2007 and 2013. A further 30 Block 50+s entered service with Peace Onyx IV, which was completed in 2012. All Peace Onyx projects were undertaken by local aerospace firm Turkish Aerospace Industries (TAI). There are 11 operational

# It's Full On!



**Above: RAF Tornados have been deployed on continuous overseas operations for more than 25 years. The veteran bomber is being used around the clock at RAF Akrotiri, Cyprus for Operation Shader missions.** Crown Copyright

**T**ODAY'S RAF fighter force is made up of around 90 Eurofighter Typhoons and 60 Panavia Tornado GR4s.

They are divided between seven frontline squadrons, two operational conversion units, one flight and one test and evaluation squadron (TES).

The Typhoon Force Commander, Air Cdre Ian Duguid (see *Typhoon Over The Horizon*, October 2015, p32-36), has, under his responsibility, 1(F) Squadron, II(AC) Sqn and 6 Sqn, all based at RAF Lossiemouth, Moray; 3(F) Sqn, 11(F) Sqn and 29(R) Sqn at RAF Coningsby, along with the 41(R) Test and Evaluation Sqn; 1435 Flt at RAF Mount Pleasant, Falkland

Islands; and 100(R) Sqn, the Hawk T1 aggressor unit (see *The Great Pretenders*, April, p42-49) at RAF Leeming, North Yorkshire.

Meanwhile Air Cdre Harvey Smyth, the Tornado GR Force Commander has, under his responsibility, IX(B) Squadron and 31 Squadron based at RAF Marham, Norfolk, and 15(R) Sqn at RAF Lossiemouth. Since April 1, he has also been Commander of the F-35 Lightning Force (see *JSF and Tornado – The Way Ahead*, January, p34-41).

The F-35B is expected to start operating from RAF Marham in

2018, when 617 'The Dambusters' Sqn stands up after moving in from MCAS Beaufort, South Carolina. British personnel from the Royal Navy and RAF are working up at the huge US base as part of the USMC's Marine Attack Fighter Training Squadron (VMFAT) 501.

## Full capacity

On the US west coast, the UK's F-35B operational test and evaluation unit, 17(R) Squadron, is working out of Edwards AFB, California, with two jets (ZM135 and ZM136). Right now, the Tornados and

Typhoons are operating at full capacity – some might even go as far as saying they are overstretched. And this is why:

Operation Shader, which began in the summer of 2014, has six Typhoons and eight Tornado GR4s flying from RAF Akrotiri, Cyprus, as part of the coalition effort to destroy Daesh in Iraq and Syria.

The six Typhoons are the most capable of the fleet, flying with the latest P1E(B) software enhancements. This enables them, among other things, to drop the Paveway IV 500lb INS/GPS bomb. The weapon's fusing and ▶

## Fighter ORBAT

### RAF Lossiemouth, Moray

1(F) Sqn	Typhoon FGR4
II(AC) Sqn	Typhoon FGR4
6 Sqn	Typhoon FGR4
15(R) Sqn	Tornado GR4

### RAF Coningsby

3(F) Sqn	Typhoon FGR4
11(F) Sqn	Typhoon FGR4
29(R) Sqn	Typhoon FGR4/T3
41(R) TE Sqn	Typhoon FGR4/T3

### RAF Marham

IX(B) Sqn	Tornado GR4
31 Sqn	Tornado GR4

### RAF Mount Pleasant, Falklands Islands

1435 Flt	Typhoon FGR4
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**Above: Typhoons have deployed to Estonia for Baltic Air Policing on three occasions. No 6 Sqn was present in 2015.** Crown Copyright



**Left:** All four RAF Coningsby Typhoon units, 3(F) Sqn, 11(F) Sqn, 29(R) Sqn and 41(R) Test and Evaluation Sqn are seen flying in echelon formation. Crown Copyright  
**Right:** RAF Typhoons and the new F-35B Lightning will be operating together, protecting British interests, by the end of the decade. Crown Copyright

impact angles are programmed, and even reprogrammed, in the air to achieve the best effects.

Typhoons can now also operate the Litening III targeting pod to 'lase' their own laser-guided bombs onto the target, which they couldn't do during Operation Ellamy over Libya in 2011.

The pod also enables pilots to monitor activity on the ground, providing Joint Terminal Air Controllers (formerly Forward Air Controllers) or Ground Commanders with an aerial perspective of the surrounding area, usually from around 15,000 to 18,000 ft, where the enemy can barely hear you.

Tornados use the deadly MBDA Dual Mode Brimstone (DMB) to hit targets day and night. They are phenomenally accurate and because of the warhead, cause little collateral damage. The Typhoons are not using the DMB yet, although they should be by December 2018.

Tornados also use the Storm Shadow cruise missile, first employed during Operation Telic in the 2003 Gulf War II (*Launched in Anger*, May 2003, p38-39), although they are unlikely to have been used over Iraq or Syria.

They also have the RAPTOR pod for mapping areas of interest, enabling imagery analysts to pass on tactical information.

Both the Tornado and Typhoon are working with the Voyager Force (see *Voyager Force*, pages 30-35) during Op Shader sorties, enabling some missions to last up to six hours.

### Baltic Air Policing

Another commitment is NATO's Baltic Air Policing, known by the UK as Operation Azotize. The current deployment, which began in late April, is the third in three years and, as on previous occasions, four Typhoon FGR4s are on QRA at Ämari Air Base, Estonia, protecting the skies of the three Baltic states

– Estonia, Latvia and Lithuania.

This year it's the turn of II(AC) Sqn, led by Wg Cdr Roger Elliott, which reached initial operating capability in January.

No 3(F) Sqn, under Wg Cdr Chris Moon, was the first to take on the fourth BAP commitment (Tornado F3s deployed in October 2004 for two months), which lasted from May 1 to August 31, 2014.

No 6 Sqn covered the commitment during the same period in 2015, which saw the Typhoons scrambled 17 times and intercepting more than 40 Russian aircraft ranging from transports to long-range fighters. During one launch in July that year, Typhoons intercepted ten separate Russian aircraft, including eight fighters.

No II(AC) Sqn is expected to return from its commitment in late August. By May 17, its Typhoons had intercepted Russian aircraft on at least two occasions – the second saw four Su-27 *Flankers* and an Il-20 *Coot-A* reconnais-

sance aircraft intercepted.

The Russian military aircraft operated as they regularly do, without transmitting recognised squawk codes or communicating with regional air traffic control centres.

In addition to Operations Shader and Azotize, QRAs are manned at RAF Coningsby and RAF Lossiemouth as well as RAF Mount Pleasant in the Falklands. Each operational Typhoon unit takes its turn at being on the round-the-clock alert.

Typically, the Typhoons are armed with four AIM-120C AMRAAMs and four AIM-132 ASRAAMs, and crews are on a 15-minute timeline to be airborne once the klaxon goes off to signal a QRA launch.

The Typhoons will be armed with the MBDA Meteor beyond visual range air-to-air missile by June 2018 as part of the P2E enhancements. The missile



**Above:** Scorching hot desert conditions have proved challenging during Tornado operations over Iraq, Afghanistan Libya and now Syria. Crown Copyright  
**Right:** A British pilot taxis a VMFAT-501 F-35B at MCAS Beaufort, South Carolina, where personnel of the first UK F-35 unit, 617 'Dambusters' are working up. Vince Hill.



is a joint collaboration developed by France, Germany, Italy, Spain, Sweden and the UK.

The Meteor is fast, highly manoeuvrable and has a long range, and senior RAF officers refer to it as the 'big stick'. The Swedish Air Force Gripen is expected to become the first aircraft to use the weapon operationally for QRA later in the year.

The Tornado has had a remarkable career, having served on overseas commitments continuously since Gulf War I in 1990. When the Tornado GR Force was expecting to take a well-earned rest after deployments to the Middle East and Afghanistan ended in late 2014, it was called into action again against Daesh.

Before that, the jets had also been operational over Libya in 2011 and in Nigeria in mid-2014, where their RAPTOR pods helped in vain to search for 276 school girls kidnapped by Boko Haram militants.

Looking to the future, the Tornado GR4 is expected to retire by April 2019, its roles taken over by the Typhoon which will have gone through the P3E enhancements and be capable of most of the things the Tornado can do.

An active electronically scanned array (AESA) radar should be operational by 2022, making the Typhoon even more capable through to its projected retirement date of 2040.

Currently all the RAF's Tranche 3 Typhoons are being placed into storage at BAE Warton until the RAF needs them.

According to the former AOC 1 Group, AVM Gary Waterfall, there is no



rush to put them into service.

Two Tranche 3s have been delivered to RAF Coningsby where they will eventually be used by 41(R) Test and Evaluation Squadron. This unit, with its ten jets (seven Typhoons and three Tornados), is responsible for introducing new systems and capabilities to the Tornado/Typhoon Force.

## Lightnings

As well as regular deployments to Naval Air Weapons Station China Lake, California, for trials work, its personnel work closely with BAE Systems at Warton, where Typhoon T3 ZK303/'AX' (also referred to as 'BT017') is used as a Phased Enhancements development jet. Personnel from 41 and BAE fly the aircraft.

The UK has a requirement for 138 F-35 Lightnings, with 14 actually on order.

Three have been delivered: one is at MCAS Beaufort with VMFAT-501 and the other two are with 17(R) Sqn, the Lightning Operational and Evaluation Unit based at Edwards AFB. None of them are likely to come to the UK.

Personnel from both the RAF and Royal Navy are already training up at MCAS Beaufort (see *British at Beaufort*, May, p32-36), led by Sqn Ldr Hugh Nichols.

The Lightning Force HQ at RAF Marham officially stood on April 1. The base will be the home to the first F-35B unit, 617 Sqn, which will relocate there from Beaufort in the second half of 2018.

There are also plans for 809 Naval Air Squadron to stand up at RAF

Marham in 2023, as well as a future operational conversion unit, but details are sketchy.

The Lightnings will be armed with UK-specific weapons such as the Paveway IV, AIM-132 ASRAAM and AIM-120C AMRAAM. Longer-term F-35B integration is planned for the Storm Shadow and the new SPEAR Capability 3 air-to-ground guided missiles.

The pioneers now training at MCAS Beaufort will play a big part in the modern evolution of the world-famous 'Dambusters'.

When in service, the fifth-generation Lightning will work with the Typhoon, a fourth-generation fighter – which is why the UK is so keen to get the Typhoon interoperable with the USAF's F-22 Raptor whenever it can: ironing out fourth/fifth generation interoperability issues before the F-35 arrives means that when it does, it will hit the ground running!



# Badge Mystery Solved



IN THE May issue of *AFM*, on page 19 you describe some new markings on a recently delivered F-35B Lightning II for Marine Fighter Attack Squadron 121 (VMFA-121) 'Green Knights'. You mention a large '1' sur-

rounded by five stars in a diamond for which the significance is unknown to you.

Actually it is very simple – on the tail of this particular jet is the shoulder emblem of the 1st US Marine Division.

The 'Green Knights' is part of the 3rd Marine Aircraft Wing which serves as an element of the 1st Marine Expeditionary Force, for which the 1st Marine Division is the ground element to be supported, hence the mark-

ing on the F-35 Lightning II.  
**Erik Ruesink**

**AFM reply:** Excellent, thanks for the additional information, Erik, it's much appreciated.

# French Fighter Force Updates

THERE'S SOME inaccurate information within your *European Fighter Survey Part One* in *AFM's* May 2016 issue regarding the French fighter force, pages 73-75:

- 1: There are four Rafales in Chad (not three), eight Rafales in the UAE (not six) and eight Mirage 2000Ds in Jordan (not six).
- 2: The photo caption on page 74 – those personnel belong to the Navy, not the French Air Force.
- 3: It's also stated that the *Charles de Gaulle* left because

of the 13/11 attacks; this is not true, the operation in the Gulf was decided months before. It's mentioned that the *Charles de Gaulle* is expected to be back in France in the coming weeks; in fact, she was back on March 16.

- 4: The squadron EC 5/330 doesn't exist anymore; it's now ECE 1/30 Côte d'Argent.
- 5: Rover isn't a radio but a full motion video link to transfer the pod imagery. One final point: more than 20 Mirage 2000Ds

have already been converted to carry the ASTAC pod.

I hope that these additional updates will prove valuable to your readers.

**Jean-Marc Tanguy**

**AFM reply:** Keeping on top of the numbers of aircraft or indeed the types is quite difficult in the French deployment, but thanks for pointing out your observations.

# Global Strike Supplement

I'D LIKE to congratulate *AFM* on the Air Force Global Strike Command Supplement in the May issue. Within just 16 pages you crammed all the information one would need to know on this impressive American nuclear deterrent force, in an in-depth and well laid out supplement. I hope we can expect the occasional bonus supplements in the future, when a suitable topic presents itself? Well done.  
**Douglas Barton**

**EUROPEAN FIGHTER FLEETS 2016 - PART ONE**

**FRANCE (Continued)**

**Aéronavale Fighter ORBAT**

Unit	Location	Notes
Escadron 111	Lannion	RAF 111
Escadron 112	Lannion	RAF 112
Escadron 113	Lannion	RAF 113
Escadron 114	Lannion	RAF 114
Escadron 115	Lannion	RAF 115
Escadron 116	Lannion	RAF 116
Escadron 117	Lannion	RAF 117

**Armée de l'Air Fighter ORBAT**

Unit	Location	Notes
Escadron 1/30	Côte d'Argent	RAF 1/30
Escadron 2/30	Côte d'Argent	RAF 2/30
Escadron 3/30	Côte d'Argent	RAF 3/30
Escadron 4/30	Côte d'Argent	RAF 4/30
Escadron 5/30	Côte d'Argent	RAF 5/30
Escadron 6/30	Côte d'Argent	RAF 6/30
Escadron 7/30	Côte d'Argent	RAF 7/30
Escadron 8/30	Côte d'Argent	RAF 8/30
Escadron 9/30	Côte d'Argent	RAF 9/30
Escadron 10/30	Côte d'Argent	RAF 10/30

**AFM reply:** Keeping on top of the numbers of aircraft or indeed the types is quite difficult in the French deployment, but thanks for pointing out your observations.

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**AirForces**

**AFM reply:** Thank you for the kind words, Douglas. We are looking at topics for more supplements later this year. Keep your eyes peeled.

# Military Aircraft Markings 2016

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As Ukrainian Su-24s return to Lutsk, Alexander Golz gains unprecedented access to the reserve base and



becomes the first foreign journalist to photograph a 'Fencer' air-to-air.

**INDIA'S NORTHERN EXPOSURE**

Ivan Voukadinov attends 'Red Flag Alaska' as the Indian Air Force makes a significant showing in this lesser-known of the 'Flag' exercises.

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# Pilot Errors Caused F-16 Landing Collision at Nellis



Above: The two US Air Force/457th Fighter Squadron 'Spads' F-16Cs after colliding on landing at Nellis AFB, Nevada. Extensive fire damage to the rear of aircraft, 85-1549 'TX', is clearly apparent. USAF

**A**N ACCIDENT Investigation Board report has cited errors by two pilots as the cause of the collision between a pair of US Air Force F-16Cs on the runway at Nellis Air Force Base, Nevada, on August 15 last year – see *Attrition*, October 2015, p95. The report, released on May 9, says one pilot's landing, lack of comprehensive braking and flight path de-confliction, combined with the second's delayed transition to the correct side of the runway, led to the crash.

The aircraft involved 85-1546 'TX' (Mishap Aircraft 1 – MA1) and 85-1549 'TX' (Mishap Aircraft 2 – MA2) were assigned to Air Force Reserve Command's 301st Fighter Wing/457th Fighter Squadron 'Spads' at Naval Air Station Fort Worth Joint Reserve Base, Texas. At 1102hrs, MA2 impacted the rear of MA1, conjoining them. Mishap Pilot 1 (MP1) was uninjured, but Mishap Pilot 2 (MP2) suffered life-threatening injuries. The estimated repair cost of MA1 is \$5,412,111, while MA2, valued at \$64,036,628, was destroyed. Total government loss is valued at \$69,501,839.

The mishap occurred as part of a local area orientation sortie for Red Flag 15-4, a large force training exercise. The report stated the mission was uneventful until landing, when MA2 impacted MA1 slightly left of the centreline with 2,512ft (765m) remaining on Runway 21 Right. MP1's landing, aerobrake and initial landing

rollout were uneventful. However, during deceleration after rollout, he did not clear to the cold (exit) side of the runway. MP2 configured for landing without opening his speed brakes – the flight control surfaces that slow the aircraft.

While MP2 landed with proper spacing, he landed too fast, touched down long and had the engine above idle power. Additionally, MP2 did not aerobrake within prescribed limits. Combined, these actions created a substantial closing velocity between the aircraft. MP2 did not immediately perceive this closure.

As MP2 recognised the problem, he saw MA1 still on the hot (landing) side of the runway. MP2 then applied heavy braking pressure and directed MP1 to

"clear to the right" (runway exit/cold side). MP1 let his aircraft continue drifting left as he mentally processed this directive radio call.

On hearing MP2's second directive radio call, MP1 braked and manoeuvred hard right toward the cold side. Simultaneously, MP2 applied maximum braking (minus extended speed brakes) and abandoned normal runway de-confliction with a hard right manoeuvre in an attempt to pass MA1 on the right. MP1's hard right manoeuvre coincided with MP2's right manoeuvre, resulting in a ground collision. The force of this collision conjoined the aircraft, pinned MP2 under MA1's right wing, fired MP2's ejection seat and drove them off the runway.

When the conjoined aircraft came

to a stop, MP1 ground egressed. MP2 sustained life-threatening injuries and was lodged in his aircraft, which promptly caught fire, engulfing MA2 in flames. Nellis AFB first responders were on the scene and fighting this fire in 68 seconds and subsequently removed MP2 from the wreckage. MP2 was transported to the Nellis AFB Hospital where medical personnel initiated critical life-saving measures.

The Accident Investigation Board President found, by a preponderance of evidence, the causes of the mishap were MP2's landing, lack of comprehensive braking and flight path de-confliction, combined with MP1's delayed transition to the cold side of the runway. ■



Above: The view of mishap aircraft 1 (MA1, 85-1546) from MA2 (85-1549) as the latter began making a hard right turn in an abortive attempt to avoid a collision and pass MA1 on the right-hand side. USAF

## Accident Reports

**D:** May 10  
**N:** Syrian Air Force  
**T:** Unidentified Helicopter

Daesh claimed to have shot down this helicopter in the countryside of the central Homs province. The Daesh-affiliated news agency Amaq said the helicopter had been downed over the town of Huwaysis. There was no word on the fate of the crew. The Syrian Army made no comment on the report, which has not been independently confirmed.

**D:** May 11  
**N:** Chinese PLANAF  
**T:** Unidentified fighter

At about 1930hrs in the city of Taizhou, Zhejiang province, this aircraft crashed during a night-time training mission. The pilot ejected safely, after which the aircraft crashed into an un-occupied sewing machine factory. Parts of the building were destroyed, but no casualties were reported on the ground. The type of aircraft involved was not announced, but it was assigned to the East China Sea Fleet.

**D:** May 13, 2016  
**N:** Turkish Land Forces  
**T:** AH-1 Cobra

Both crew members were killed when this helicopter crashed at 0550hrs in Çukurca, Hakkari province, on a close air support mission. A technical problem was initially said to have caused the accident, but officials later acknowledged it had been shot down by an Igla man-portable air defence system. The helicopter had been sent to the area to assist security forces in a fight that had erupted about an hour earlier with PKK militants at the Çiğli base. The TKK operates AH-1P and AH-1S Cobra variants, along with AH-1W SuperCobras, but the version involved in the crash is unknown.

**D:** May 14  
**N:** Libyan Air Force  
**T:** Mi-8T Hip  
**S:** 8216

This Mi-8 crashed during the evening while en route from Lubraq Airport to Tripoli. The air ambulance helicopter rolled over onto its port side and was extensively damaged. All the crew reportedly exited the wreckage safely. The cause of the crash was not immediately known.



**Above:** The wreckage of the Turkish Land Forces AH-1 Cobra following its shoot down on May 13.

**D:** May 14  
**N:** Russian Air Force  
**T:** 4 x Mi-24P Hind

Four attack helicopters destroyed on the ground at T4/Tiyas Air Base, west of Palmyra in Syria, were first reported by Daesh but their claims appeared doubtful at the time. However, satellite imagery released on May 24 confirmed their loss. All four were seen intact on images from May 14, but appeared as burnt-out hulks on a May 17 image. The circumstances remain unconfirmed, with some reports suggesting a ground accident.

**D:** May 14  
**N:** Syrian Air Force  
**T:** MiG-25 Foxbat

During the above incident, the aircraft was badly damaged on the ground at T4/Tiyas Air Base, west of Palmyra in Syria. Damage included a large section of the rear of the starboard wing appearing to have been blown away. It is almost certain, however, that this was a long out-of-use aircraft and unlikely to have been operational.



**Above:** Royal Malaysian Air Force MB339CM M34-20 after its crash on May 17. USAF

**D:** May 15  
**N:** United Arab Emirates Air Force and Air Defence  
**T:** Air Tractor AT-802U?

Two crew were killed when this aircraft crashed on a training flight. Student pilot Captain Nawwaf Abdullah Salim Al Nuaimi died, along with a US instructor pilot, Daniel Swayne. The precise location and type involved were not reported in an official statement released by the General Command of the UAE Armed Forces, but it subsequently emerged from media reports that an Air Tractor AT-802U was involved.

**D:** May 17  
**N:** Royal Malaysian Air Force/3 FTC  
**T:** MB339CM  
**S:** M34-20

Both crew members ejected safely (although one suffered a broken leg) before the aircraft crashed at 1250hrs in a paddy field, due to a technical malfunction southwest of the town of Nenasi, Pahang. The MB339, operated by 3 Flying

Training Centre at No 4 Air Base Kuantan-Sultan Haji Ahmad Shah Airport, had taken off from there for a routine training flight. An investigation board is due to be convened to determine the cause

**D:** May 18  
**N:** Libyan Air Force  
**T:** MiG-21UM

This two-seat aircraft crashed while attempting to land at Tobruk-Gamal Abdul El Nasser Air Base, killing one of the two crew. A Libyan military official said the accident had been caused by technical problems. Instructor pilot Colonel Mohamed Rabie died while the other crew member, student pilot Captain Abdulgader Ali, survived the crash with minor injuries.

**D:** May 18  
**N:** US Air Force/5th BW/69th EBS  
**T:** B-52H Stratofortress  
**S:** 60-0047 'MT'

At approximately 0830hrs, this Stratofortress crashed within the confines of the airfield at Andersen Air Force Base, Guam. All seven crew members safely exited the wreckage and no injuries were reported to any of them. The B-52, which was destroyed by the impact and post-crash fire, was deployed to Andersen from the 5th Bomb Wing's 69th Expeditionary Bomb Squadron 'Knighthawks' at Minot Air Force Base, North Dakota. It was part of the United States' on-going continuous bomber presence mission in the Pacific. The aircraft was only just starting a routine training mission and taking off with a full fuel load, when the crew aborted the flight and it crashed within the confines of the base. The cause of the accident is under investigation. ▶

## ATTRITION REPORT

## Accident Reports

**D:** May 20  
**N:** French Gendarmerie  
**T:** EC145  
**S:** (F-M)'JBH' (c/n 9037)

Just before mid-day, during a high altitude training mission in the Massif du Vignemale, Cauterets, this helicopter crashed in the Hautes-Pyrénées. The pilot, co-pilot and two mountain rescue personnel from the Gendarmerie's Platoon Pierrefitte-Nestalas died when it hit the side of a mountain. The helicopter, callsign 'Choucas 65' ('Jackdaw 65'), was operated by a Gendarmerie unit at Tarbes.

**D:** May 24  
**N:** Islamic Republic of Iran Air Force  
**T:** MiG-29UB  
**S:** 3-6304

This MiG-29UB was involved in an accident at around 1150hrs local time, resulting in the death of one crew member. The aircraft had an engine failure and was attempting an emergency landing at Tactical Fighter Base 3 Hamedan-Nojeh (formerly known as Shahrokhi) when it crashed. Back-seat crew member Ali Gholi-Pour suffered minor injuries after ejecting safely on final approach, but there was a malfunction in the K-36DM ejector seat of the front-seat pilot, Major Razbeh Nazerian. This left him partially out of the cockpit when the aircraft stalled and pancaked into the ground. He was recovered from the wreckage severely injured and taken to Be'that Hospital in Hamedan by an IRIAF Bell 214C SAR helicopter. Suffering from severe brain trauma, he was then flown on an IRIAF Falcon 20 air ambulance to Tehran for surgery, but died during the subsequent operation. The aircraft came to rest on its belly and appeared not to have too much damage. The IRIAF reportedly plans to repair it for return to service.



The still fiercely burning wreckage of US Air Force/5th BW/69th EBS B-52H Stratofortress 60-0047 'MT' after its take-off crash at Andersen AFB on May 18.

**D:** May 25  
**N:** Sri Lankan Air Force/  
 7 Helicopter Squadron  
**T:** Bell 206A JetRanger

This JetRanger crashed at Hingurakgoda Air Base. The solo student pilot survived the crash-landing after take-off at the base and was uninjured. The helicopter reportedly rolled to one side on lift-off and was substantially damaged.

**D:** May 26  
**N:** US Navy/VFA-211  
**T:** 2 x F/A-18F Super Hornet  
**S:** 166807 'AB-203' and  
 166813 'AB-207'

An in-flight mishap at about 1040hrs local time off the coast of Cape Hatteras, North Carolina, led to the loss of these two Super Hornets. All four crew ejected safely, were recovered and taken to medical facilities for check-ups. Both aircraft, from Strike Fighter Squadron 211 (VFA-211) 'Fighting Checkmates' at Naval Air Station Oceana, Virginia, were on a routine training flight when they collided 25 miles (40km) east of Oregon Inlet. The fishing vessel *Jamie* picked up the aircrew, who were transferred to a US Coast Guard MH-60 Jayhawk helicopter from Coast Guard Air Station Elizabeth City, North Carolina, and taken to Sentara Norfolk General Hospital.

**D:** May 27  
**N:** OSCE/SMM  
**T:** Schiebel Camcopter S-100

This UAV, operated by the Organization for Security and Co-operation in Europe (OSCE) Special Monitoring Mission to Ukraine (SMM) crashed during a mission over that country. At 0928hrs, all communication with the UAV was lost while it was flying over Donetsk People's Republic (DPR)-controlled Ozerianivka. It was 22 miles (35km) northeast of Donetsk, on the southwestern outskirts of the DPR-controlled Horlivka, which is 24 miles (39km) northeast of Donetsk. Despite emergency procedures, there was no response from the UAV. Shortly before comms were lost, the Camcopter had spotted a multi-purpose tracked vehicle with an 120mm 9K35 *Strela-10* surface-to-air missile system mounted on top of it. At about the same time, an SMM patrol based in nearby Horlivka heard an explosion about 2½-3 miles (4-5km) to the southwest, in the area where contact had been lost with the UAV. An SMM patrol, which went to Ozerianivka, were told by residents they had also heard an explosion northwest of the village at the same time. Both the Ukrainian Armed Forces and DPR members informed the

SMM that the area was mined so they could not reach the presumed crash site to investigate further. The OSCE began to use the Camcopter for Ukraine ceasefire monitoring in October 2014. The UAVs are operated by Schiebel under contract to the OSCE to gather information to monitor general security in Ukraine.

**D:** May 30  
**N:** Syrian Air Force  
**T:** Unidentified helicopter

A technical malfunction caused this helicopter crash, killing both crew. It had taken off from Al-Qamishli and was en route to Deir Ezzor. It came down near Al-Qamishli.

**D:** May 31  
**N:** Piaggio Aerospace  
**T:** P1HH HammerHead  
**S:** CPX621/001 (c/n XAV-5A-002)

After taking off from Trapani-Birgi, Italy, for a routinely scheduled flight test, this prototype UAV crashed at around 1140hrs local time in the Mediterranean Sea. About 20 minutes after getting airborne, contact with the UAV was lost, for yet unknown reasons, following which it ditched and sank about 5 miles (8km) north of the island of Levanzo. The manufacturer has begun an investigation into the loss. An earlier less serious incident with



Above: US Navy/VFA-211 F/A-18F 166807 'AB-203' prepares to launch from the USS Theodore Roosevelt (CVN-71) on February 2, 2015, in the Atlantic Ocean. This was one of the aircraft involved in the collision on May 26.

US Navy/Mass Communication Specialist Seaman Apprentice Alex Millar

Left: US Navy/VFA-211 F/A-18F 166813 'AB-207', seen here on board the USS Theodore Roosevelt (CVN-71) on March 25, 2015, was the other one of the two which collided and crashed on May 26. Dylan Eklund

Abbreviations: D: Date N/U: Nationality/Units T: Type S: Serials

the HammerHead had occurred in March, when it ran off the taxiway at Trapani while taxiing, incurring only minor damage. The HammerHead, an unmanned derivative of the P180 Avanti II executive aircraft, is designed as a multi-mission ISR platform. The Italian Air Force ordered six under a contract announced on February 26, 2015, while the United Arab Emirates Air Force and Air Defence signed a deal for eight on March 8 this year.

**D:** May 29  
**N:** US Navy/VAQ-133  
**T:** EA-18G Growler  
**S:** 168379 'NG-503'

A landing incident on board the aircraft carrier USS *John C Stennis* (CVN 74) in the South China Sea resulted in this Growler being extensively damaged. The mishap occurred at 2109hrs when the aircraft, from Electronic Attack Squadron 133 (VAQ-133) 'Wizards' at NAS Whidbey Island, Washington, was making a night landing. While attempting to land, but still airborne, the aircraft's hook caught one of the arresting cable, after which the nose was damaged when the nosewheel came down heavily on the deck. Foreign objects and debris from the flight deck were also ingested into the engine. Neither of the crew or anyone on the flight deck were injured. It was initially assessed as a Class A mishap by the US Naval Safety Center, indicating it had incurred a repair bill of at least \$2m. The damaged aircraft was deemed non-airworthy and was being assessed to determine the possibility of repairs in situ or if a new Growler replacement would have to be flown out to the carrier. The Wizards are assigned to Carrier Air Wing 9 (CVW-9) aboard the *Stennis*, which has been operating in the South China Sea since mid-April with its



**Above:** Piaggio Aerospace P1HH HammerHead CPX621, which was lost when it crashed into the Mediterranean Sea on May 31. Piaggio Aerospace

Strike Group as part of a regularly scheduled 7th Fleet deployment.

**D:** Jun 2  
**N:** Libyan GNA Air Force  
**T:** Mirage F1ED

The pilot of this aircraft was forced to eject after it had a fuel pump failure during an evening mission. It crashed 18 miles (30km) west of Sirte. The loss leaves Libya with only one other Mirage F1ED, which is currently not airworthy while awaiting a replacement engine.

**D:** Jun 2  
**N:** Romanian SMURD  
**T:** EC135T2+  
**S:** 347

This EC135T2+, operated by Romania's Emergency Rescue Service, SMURD, was destroyed in a crash at 1413hrs which killed all four occupants. The fatalities were the pilot, co-pilot, a doctor and a nurse. The helicopter was on an air ambulance flight. It had taken off at 0955hrs from Iași International Airport, Romania, then flown to Vulcănești, Moldova, where it landed at 1100hrs. Half-an-hour later it left with an elderly patient for Chișinău Airport, Moldova. After dropping her off and refuelling, it left around

1310hrs for Cahul, where it was to pick up a 64-year old patient who had suffered a stroke. However, before reaching there, it crashed in a very heavily wooded area near the village of Haragăș, in the Cantemir district of Moldova. Unconfirmed local media reports suggest the pilot had decided to turn back just before the crash due to poor weather. Gusting winds, rain and heavily overcast skies were reported at the crash site. Following the accident, all SMURD EC135s were grounded pending further investigation.

**D:** Jun 2  
**N:** USAF/Thunderbirds  
**T:** F-16C  
**S:** 92-3890 '6'

This Thunderbirds F-16, aircraft No 6 (opposing solo), had just completed a flypast with the team over an Air Force Academy graduation ceremony in Colorado Springs, Colorado, when the pilot, Major Alex 'Tuna' Turner, found there was a technical problem with the jet. However, he was able to eject safely on final approach to Colorado Springs Municipal Airport at around 1315hrs. He had first made every effort to manoeuvre the F-16 away from local residential areas

before ejecting at low level, leaving the aircraft to pancake into a field near South Powers Boulevard and Fontaine Boulevard. It skidded for some distance before coming to rest, still substantially intact but with considerable damage to the nose area. Turner was initially evaluated by paramedics from the Academy after which he was taken to a medical facility on Peterson Air Force Base before being released that evening. The wreckage of the F-16 was due to be removed from the crash site the following day.

**D:** Jun 2  
**N:** US Navy/Blue Angels  
**T:** F/A-18 Hornet  
**S:** 163455 '6'

US Navy Blue Angels pilot Marine Captain Jeff Kuss was killed when this aircraft crashed at approximately 1501hrs CDT, just after take-off from Smyrna-Rutherford County Airport, Tennessee, for a practice display. The Hornet, aircraft No 6 assigned to the Blue Angels Flight Demonstration Squadron, went down in an open field about 2 miles (3km) beyond the departure end of runway 14. The other five Blue Angels aircraft were not involved in the mishap and landed safely moments later. The team's planned display in the Great Tennessee Air Show at Smyrna the following weekend was cancelled due to the accident.

**D:** Jun 5  
**N:** Islamic Republic of Iran AF  
**T:** PC-7 Turbo Trainer

This aircraft was substantially damaged in a forced-landing near Zafarqand while on a flight from Isfahan/Tactical Air Base 8. Both crew members were injured, but exited the aircraft safely.

**Additional material from:** Donny Chan, Arda Mevlutoglu and Scramble/Dutch Aviation Society.



**Above:** The USAF/Thunderbirds F-16 following its crash on June 2.  
**Left:** Fireman douse the smouldering remains of Romanian SMURD EC135T2+ 347 following its crash on June 2, in which all four on board died. Dse.md



**Apache over Libya**

Pen and Sword  
Will Laidlaw  
£19.99  
Pages: 180  
ISBN: 978-147-38676-2-8

THIS IS the story of how an elite group of Army Air Corps Apache pilots from 656 Squadron fought a war over Libya from the flight deck of HMS *Ocean* during Operation Ellamy in 2011. They flew ultra low-level night-time attacks along the coastline of Libya, well within the range of Colonel Gaddafi's highly capable air defence systems and army units. On completion of the missions the aircrews then had to fight their way back home to the deck of HMS *Ocean*.

Eight army and two Royal Navy pilots who played a significant role in the NATO-led campaign describe their successes, fears and the skills required when flying Britain's finest attack helicopter.

Facing one of the best-equipped armies in the Middle East, British Apache aircrews defied the odds and survived. The first-hand accounts vividly convey what it takes to be an attack helicopter pilot, which at the same time puts over the British view of what the AH-64 Apache can do – this is quite rare, given the MOD's security restrictions which prevent aircrews discussing recent operations.

In my opinion there are only two great books on British Army Apache operations – *Apache* by Ed Macy, and this one. **Glenn Sands**

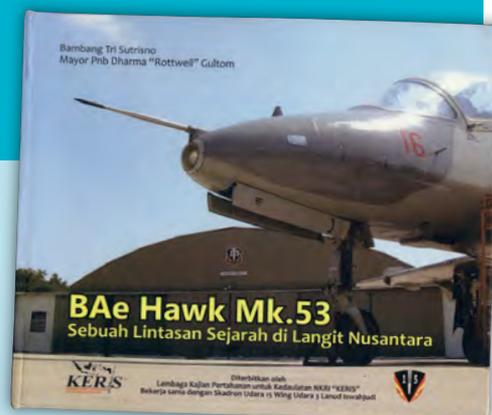
**BAe Hawk Mk.53**

Sebuah Lintasan Sejarah di Langit Nusantara Keris  
Bambang Tri Sutrisno and Mayor Pnb Dharma  
'Rotweil' Gultom  
£39.99. Pages: 271. ISBN: 978-602-18879-2-9

THIS IS an Indonesian language book that focuses on the operational career of the BAe Hawk within the Indonesian Air Force (TNI-AU). Unfortunately, with no English translation provided for the extensive copy and captions, we were only able to review this as a picture book and in that respect alone, this is an impressive publication. In 1978 Indonesia ordered its first batch of Hawks designated Mk.53s – the differences between the RAF examples and the new jets is explained (in English) in technical specification panels taken from BAe's own handbook. There are plenty of personal images included within the early chapters, show-

ing Indonesian pilots training at RAF Valley and British Aerospace's Kingston-Borough production facility. In addition, there are pictures of the delivery flight and the formation of the 15th Air Squadron Wing 3 at Iswahjudi Air Base, Madiun that would serve as the advanced pilot training unit for the TNI-AU. A total of 20 Hawk Mk.53s were delivered – the last of which arrived in 1984. More than 20 years of operational service, modifications and changing camouflage schemes

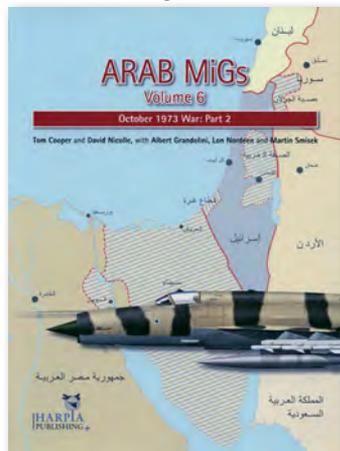
are illustrated, as is the retirement ceremony of the Mk.53s in March 2015. They were replaced by the Korea Aerospace Industries T-50 Golden Eagles. Don't be tempted to dismiss these books simply because there is practically no English text, the rare images are worth the cover price alone. **Glenn Sands**



**Arab MiGs Volume 6 October 1973 War: Part 2**

Harpia Publishing  
Tom Cooper and David Nicolle, with Albert Grandolini, Lon Nordeen and Martin Smisek  
£34.99  
Pages: 255  
ISBN: 978-0-9854554-6-0

NEW FROM Harpia Publishing comes part two of its detailed examination of the 1973 October War. The authors have corrected any errors in the previous Arab MiG volumes at the start of this book, thus demonstrating that facts about aerial battles in this region continue



to come to light from both official and unofficial sources.

During the latter half of the conflict, Israel rapidly mobilised its armed forces and was counter attacking the air assets of Egypt and Syria in the air and on the ground. Other Israeli jets were flying hundreds of ground-attack sorties every day in an attempt to regain territory lost early on.

Smartly broken down into the various phases of the war, the authors examine the blunders made by the Arab forces during the conflict. These allowed Israel to capitalise and attack military units left unprotected because Egypt's air force was too thinly stretched to provide adequate cover.

Some of the myths that have emerged from the October war are examined, such as the ferocious air attacks by Israeli jets on Port Said between October 7 and 14.

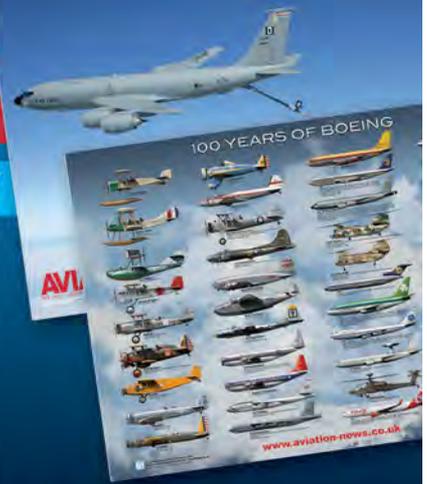
The authors conclude the Israeli claim that this was for 'testing purposes' was false. The strikes were flown to stop Egypt setting up launch sites for its *Scud* missiles that could have reached targets deep within Israel.

Throughout the book there are exceptionally accurate colour profiles – reflecting an extraordinary level of detailed research. This is a stunning piece of work and one recommended to any serious observer of Middle Eastern air wars. **Glenn Sands**

**These titles are available from:** The Aviation Bookshop, 31-33 Vale Road, Royal Tunbridge Wells, Kent, TN11 1BS, United Kingdom. **Telephone:** +44(0)1892 539284 **Website:** www.aviation-bookshop.com

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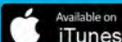
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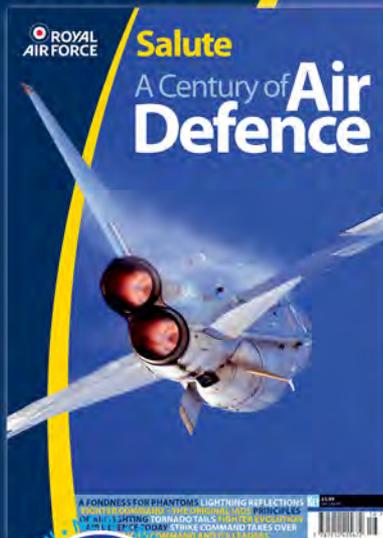
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MAY 18 2016



**Left:** Emerging out of the morning mist, RAF Hawk T2 ZK018 of IV (R) Squadron from RAF Valley, arrives at RAF Lossiemouth on a routine training sortie. The Hawk still wears its 100th anniversary tail colours despite the centenary being reached in 2014. The unit serves as the RAF's advanced fast jet training squadron.

Michael Leek

**Below:** Voyager KC2 ZZ330 taxis out at RAF Lossiemouth towards Runway 05 prior to its departure back to RAF Brize Norton on May 18. Operated jointly by 10 and 101 Squadrons, the reason for tanker's two-hour visit to Scotland was not disclosed but it was rumoured to be connected with a VIP visitor to the air base. Michael Leek

MAY 18 2016



**Right:** Russian Air Force An-30 Clank RA-30078 on approach to RAF Lossiemouth on May 27. The Clank was on an Open Skies sortie from RAF Brize Norton and called into the airfield for fuel before departing south an hour later. Niall Paterson

**Below:** French Air Force Mirage 2000D 643 '3-JD' of EC3/3 'Ardennes' from Nancy-Ochey Air Base lands at RAF Lossiemouth on May 26. It was one of a pair visiting the airfield for a short stay before departing back home via the UK's low-level flying system south of the Isle of Skye. Niall Paterson

MAY 27 2016



MAY 26 2016



MAY 13 2016



**Left:** EC-130J Commando Solo II 00-1934 from the 193rd Special Operations Wing/193rd Special Operations Squadron of the Pennsylvania Air National Guard, callsign 'RCH1024', departs RAF Mildenhall on May 13. Based at Harrisburg International Airport, it had flown in from the US en route to an undisclosed deployment. The type is used for Psychological Operations (PSYOPS) - its crew can broadcast via the radios of civilians or hostile personnel. Ryan Dorling  
**Below:** Arriving at RAF Lakenheath on the afternoon of June 3, as 'Trend 03' flight, were two F-15E Strike Eagles from the 391st Fighter Squadron/366th Fighter Wing. It is thought these jets were heading back to Mountain Home AFB, Idaho, from a deployment down range as both carried a large number of mission markings on their nose. Ryan Dorling

JUN 3 2016



**Right:** On May 15, C-130H 74-1687 from the Connecticut Air Guard's 103rd Airlift Wing, callsign 'RCH856', landed in the evening. This was the first Connecticut Air Guard C-130 to visit RAF Mildenhall after the unit made the transition from A-10s to C-130s. Ryan Dorling

MAY 15 2016



**Below:** A RC-135S Cobra Ball 61-2663 callsign 'Tora 82' climbs away after take off from RAF Mildenhall's Runway 11. The RC-135 serves with the 45th Reconnaissance Squadron based at Offutt AFB, Nebraska. The aircraft was present at the base for a short TDY before returning to the United States. Ryan Dorling

MAY 27 2016





# Backyard Bogey

**B**Y US Navy reckonings it was planned to be another typical electronic intelligence (ELINT) gathering mission for one of its EP-3E Aries II of Fleet Air Reconnaissance Squadron One (VQ-1) on May 17. Its track would take the aircraft east of Hainan, the land mass China created within the hotly disputed Spratly Island chain in the South China Sea.

Not surprisingly two Chinese Shenyang J-11 fighters from the People's Liberation Army Air Force (PLAAF) rose to shadow the US ELINT platform while it was in international air space. What followed is the subject of great debate, but during a press briefing Department of Defense spokesperson Lt Col Michelle Baldanza

said: "Two tactical aircraft from the People's Republic of China intercepted the US patrol aircraft, flying approximately 50ft from it." Much of the detail remains classified, but the action was described as "unsafe".

This event comes just weeks after Russian Air Force Su-24 *Fencers* flew what the US termed "simulated attack runs" at the US destroyer USS *Donald Cook* while it was in the Baltic Sea, passing within 30ft of the vessel.

America has been quick to publicly condemn both events, but when asked why its assets were in the area in the first place, it trots out the familiar public relations claim that that they were "maintaining freedom of navigation and stability in the region".

In contrast, intercepts carried out by the RAF receive little coverage in the UK, often being reduced to a brief mention in a broadsheet newspaper.

I can't help but wonder how the Russian and Chinese media report these incidents? The West seems to relish the opportunity demonise such encounters but I rather doubt the 'other side' resorts to such a sensationalist

headline grabbing approach. I've yet to see a news report in which a *Bear* crew is complaining about a NATO fighter intercept.

If the US continues to send its assets to snoop around in someone else's backyard – as it has done since the 1950s – it shouldn't be so surprised when the 'occupier' gets annoyed. Surely making such a big deal out of every response its actions provoke is simply upping the stakes in a very dangerous game of Russian roulette.



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