

In detail:

# MiG-29K 'NAVAL FULCRUM'



THE WORLD'S FAVOURITE MILITARY AVIATION MAGAZINE

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Chinese military aerospace is dominating the news. In this issue we review the last 12 months in this fast-paced market and reveal a series of remarkable milestones. via Chinese internet



# CA Combat Edge

The extraordinary images of the X-47B UCAS-D operating from an aircraft carrier for the first time.  
US Navy

## CONTRIBUTOR PROFILE

### NEIL PEARSON



Neil Pearson is an aviation photographer and writer living in the north-east of England. As a Special Correspondent for *Combat Aircraft*, he has contributed two important and diverse features to this issue: one on US Navy nuclear command and control with the E-6B Mercury and the other about the Norwegian Coast Guard and its Lynx operations.

Since 2010, Neil has experienced flight operations in transport aircraft, tankers, helicopters and maritime patrol aircraft and conducted air-to-air photo sorties from nine different platforms. He has also embarked on US Navy aircraft carriers in the North Arabian Sea and with the Norwegian Coast Guard inside the Arctic Circle for this month's Lynx feature — quite a contrast in temperatures!



## An extraordinary feat

**T**HE US MILITARY may be in financial disarray, with squadrons grounded and air displays cancelled, but America still leads the world in terms of technological innovation in military aviation.

The first catapult deck launch from the USS *George H. W. Bush* by the Northrop Grumman X-47B on 14 May is a staggering achievement. The concept of unmanned carrier strike platforms had seemed like a Hollywood screenwriter's dream... until now.

The progress made by the Northrop Grumman X-47B UCAS-D and Naval Air Systems Command team represents a real leap forward in what is currently a demonstration phase, ahead of the main event — provision of an operational capability.

It will be interesting to see how the difficulties of flying the UCAV away from the carrier in complicated airspace, in order potentially to undertake important missions as part of an integrated strike package,

compare with the physics and technological challenges of flying such an air vehicle around the ship, taking the wire, and sharing the catapults with F-35Cs and F/A-18E/F Super Hornets.

Even a US military with diminished short-term funding is massively impressive. The US Navy alone is still one of the largest air arms in the world. However, appropriate funding is required if this behemoth is to be allowed to continue its work.



A handwritten signature in black ink that reads "Jamie".

**Jamie Hunter,**  
Editor

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**EXCLUSIVE IMAGE**

# UCAV CARRIER OPERATIONS



## X-47B flies from US carrier

### UCAV demonstrator achieves aviation milestone

**T**HE NORTHROP GRUMMAN X-47B Unmanned Combat Air System Demonstrator (UCAS-D) conducted its first carrier-based catapult launch from the USS *George H. W. Bush* (CVN 77) off the coast of Virginia on 14 May. The milestone occurred at 11.18hrs local time. Following the launch the X-47B

executed several planned low approaches to the carrier, demonstrating its ability to navigate precisely within the controlled airspace around the aircraft carrier. The UCAS-D subsequently transited across the Chesapeake Bay and control of the air vehicle was passed from a mission operator aboard the carrier to another located in the Mission Test Control Center at NAS

Patuxent River, Maryland, where the X-47B landed at the conclusion of the 65-minute flight.

The X-47B subsequently began touch-and-go operations aboard the ship from 17 May. It will fly multiple approaches to the *George H. W. Bush* and additional shore-based testing will be conducted at Pax River in preparation for its first arrested



## Lockheed Martin UCLASS

Lockheed Martin has released the first image of a mock-up of its Unmanned Carrier-Launched Airborne Surveillance and Strike (UCLASS) air vehicle concept. The UCLASS concept is Lockheed Martin's bid to win the future US

Navy competition for a carrier-based UCAV system, which will be an operational successor to the current X-47B demonstrator phase. The design clearly draws heavily on the company's work with the RQ-170 Sentinel. Lockheed Martin







landing at sea later this summer. Three months of shore-based carrier suitability testing culminated on 4 May when the X-47B completed its first arrested landing using NAS Patuxent River's Mk7 arresting gear. Prior to completing the shore-based arrested landing the X-47B conducted precision approaches, touch-and-go landings, and precision landings.

This photo: **The X-47B launches from the USS George H. W. Bush (CVN 77) for the first time on 14 May.** US Navy

Below: **A low approach to the carrier by the X-47B before it recovered to NAS Patuxent River.** US Navy

## First RAF RC-135 unveiled

The first official image of the initial RC-135W Rivet Joint (serial ZZ664) for the Royal Air Force has emerged. The first of three aircraft being procured under the 'Airseeker' initiative is pictured at L-3 Mission Integration's facility in Greenville,

Texas. RAF crews from No 51 Squadron are now heavily involved with US Air Force operations with the 55th Wing at Offutt AFB, Nebraska, and the first aircraft should be ready to join No 51 Squadron at RAF Waddington from the end of the year.



The first RAF RC-135W in the US after being rolled out in April. USAF



A full-scale RQ-4E EuroHawk demonstrator was delivered to Manching air base, Bavaria, for test flights in July 2011. Northrop Grumman

## Germany pulls plug on EuroHawk

Germany has cancelled the EuroHawk unmanned aerial vehicle programme after it became clear that the surveillance drone would not receive the required certification for operations in civilian airspace. European Aviation Safety Agency certification was only available for flights over unpopulated areas, and there was no guarantee that this would change in the near-term. Valued at over €1 billion, the EuroHawk programme allied a derivative of the Northrop Grumman Block 20 RQ-4B Global Hawk with a Cassidian-developed SIGINT payload. In order to clear it for use in civilian airspace, a further investment of €500-600 million would have been required for a project that has already consumed €562 million. A further €500 million was earmarked for the next four aircraft, to be procured in addition to the prototype delivered in 2011. An additional €40 million has been spent on modernising the Luftwaffe's Jagel air base, where the UAVs

were to have been based. Other problems with the EuroHawk apparently related to the aircraft's flight control system and the reported unwillingness of Northrop Grumman to share technical data related to certification. The German government hopes to retain the Cassidian-developed surveillance suite for integration on an alternative (probably manned) platform.

### ALSO THIS MONTH...

#### ■ Last A-10s leave Spangdahlem

Thunderbolt II bids farewell to Europe. See *US News*.

#### ■ UK hints at F-35 plans

Batches of F-35 procurement likely to follow over next decades. See *UK News*

#### ■ Last special Luftwaffe F-4F unveiled

JG 71 'Richthofen' prepares for end of service for the Phantom II. See *Europe News*



## ‘Panther’ farewell at Spangdahlem

Last A-10s leave Europe after distinguished service

**T**HE LAST FOUR A-10C Thunderbolt IIs assigned to the 52nd Fighter Wing’s 81st Fighter Squadron ‘Panthers’ departed Spangdahlem AB, Germany, on 17 May. The 81st FS will be deactivated in June, formally ending nearly 40 years of A-10 operations in Europe. The four aircraft were ferried back to the US via Lajes using

call signs Huron 91-94. They comprised serials 81-0992 (Huron 91), 82-0647 (Huron 92), 81-0945 (Huron 93), and 81-0988 (Huron 94), with the support of a KC-10A.

The squadron completed its final tactical sorties on 14 May when three aircraft carried out a pass over the village of Fulda and the strategic Fulda Gap in central Germany. The area was seen as a strategic

‘choke point’ during the Cold War when nearly 150 A-10As were deployed to bases in England and Germany to counter a potential attack led by Soviet armour.

The squadron has flown its 21 aircraft back to the US since April. Lt Col Clinton Eichelberger, the 81st FS commander, commented: ‘Saying farewell to the 81st makes today a sad day, but it is just another chapter in the life of a fighter squadron.’



Left: **The final four European-based A-10Cs taxi out at Spangdahlem for the last time.** USAF

Below: **Farewell wave — the pilot of A-10C call sign ‘Huron 92’ bids farewell to Spangdahlem as the remaining four aircraft head for the US.** USAF





## Combat Talon I retired

The Air Force Reserve Command's 919th Special Operations Wing held a formal retirement ceremony for the MC-130E Combat Talon I at Duke Field, Florida, on 25 April. Prior to the event, four of the remaining five aircraft had conducted a final formation flight on 15 April.

The date selected for the retirement was notable because it marked the 33rd anniversary of Operation 'Eagle Claw'. As part of that mission, three MC-130Es, three EC-130Es and eight US Navy RH-53D helicopters participated in the unsuccessful effort to free 52 Americans being held hostage in Iran. An EC-130

and RH-53D were destroyed following a collision on the ground at the 'Desert One' landing site south-east of Tehran and the remaining helicopters were abandoned. Several of the aircraft that had been assigned to the 919th SOW's 711th Special Operations Squadron took part.

The first Talons entered service in 1966, the type having been stationed at Duke Field since 1995. The 711th is transitioning to a new mission and will operate the C-145A Skytruck as an associate unit alongside the Air Force Special Operations Air Warfare Center's 6th Special Operations Squadron.



MC-130E serial 64-0565 leads a flight of Combat Talon I's down the taxiway at Duke Field for their final sorties before retirement on 15 April. The 919th SOW was scheduled to deliver all the aircraft to Davis-Monthan AFB for storage by mid-May. USAF

## Navy flight hours cut

Although the US Navy says it has managed to avoid standing down any of its 10 carrier air wings, the service is dealing with sequestration by reducing flying hours drastically in a move expected to save \$2 million each month per air wing. Flight hours for four air wings are being cut back to the minimum required to maintain baseline safety standards and efficient aircraft maintenance. The so-called 'tactical hard deck status', which will apply to all non-deploying aviation assets, will ultimately have an effect on the fleet's overall readiness.

The first to be affected are the squadrons assigned to CVW-2 at NAS Lemoore, California. These will be followed by CVW-7, when the USS *Dwight D. Eisenhower* (CVN 69) returns to Norfolk, Virginia, from its current deployment this summer. The remaining two wings that will be affected include CVW-1 and CVW-9, respectively assigned to the Norfolk-based USS *Theodore Roosevelt* (CVN 71) and the Bremerton, Washington-based USS *John C. Stennis* (CVN 70). The Navy indicated that flight crews will be limited to around 11 hours monthly rather than the normal average of 25 hours.

## USAF ROUND-UP

### ■ Marine 'Hueys' for the USAF

The Fleet Readiness Center East at MCAS Cherry Point, North Carolina is re-working the first of three retired US Marine Corps UH-1Ns for future service with the USAF. Ultimately the USAF plans to acquire 26 of the Twin Hueys, but as things stand it will initially place just three in service as operational loss replacement aircraft with Global Strike Command.

Each of the is UH-1Ns is being equipped with several modifications that include the installation of a new VOR/ILS (VHF Omni-range Receiver/Instrument Landing System) and electro-optical/infra-red (EO/IR) and associated cockpit equipment, re-configuring the cockpit consoles. Additionally, a second strobe light is being installed on the lower fuselage and aircraft survivability equipment (ASE) and other systems not required by the USAF are being removed including night vision goggle (NVG)-compatible instrumentation and displays. The entire effort is being carried out at a cost of around \$1 million per airframe. The first of the re-worked 'Hueys' should be delivered in September.

### ■ More Globemaster IIIs delivered

The USAF's 221st C-17A touched down at Joint Base Charleston, South Carolina, following a flight from Boeing's Long Beach, California, facility on 25 April. This left Boeing with just two additional Globemaster IIIs for delivery to the USAF, which will also go to the 437th Airlift Wing at Charleston.

### ■ First RPA pilots receive wings at Randolph

The first student to complete undergraduate remotely piloted aircraft (RPA) pilot training with the 558th Flying Training Squadron at Joint Base San Antonio-Randolph, Texas, graduated on 3 May.

Before being assigned to operational units each of the newly-rated pilots will complete aircraft-specific training with formal training units located at Holloman AFB, New Mexico or Beale AFB, California. The 558th is the USAF's only undergraduate RPA pilot training unit.

### ■ Spartan saga continues

The USAF plans to divest its fleet of 21 C-27Js by the end of September, but on 10 May the Air Force Life-Cycle Management Center (AFLCMC) issued a Sources Sought Synopsis (SSS) survey to industry associated with the procurement of additional Spartans as directed by the 2013 National Defense Authorization Act (NDAA). The survey states that the AFLCMC is conducting market research to identify potential sources that possess the expertise, capabilities and experience to manufacture and deliver C-27Js and specifies the requirement to do so beginning in 2016.

The USAF originally planned to purchase 38 C-27Js, and between Fiscal 2007 and 2010 a total of 21 were ordered. Although funding was provided for the remaining 17 aircraft in Fiscal 2011 and 2012, the USAF never obligated the money, and according to its Fiscal Year 2013 National Defense Authorization Act Implementation Plan the contract vehicle for C-27J procurement has expired.

A total of 17 C-27Js are currently on the USAF's books, comprising 15 already in service with Air National Guard units and two being prepared for delivery at the L-3 Communications facility in Waco, Texas. Additionally, four more under construction by Alenia Aermacchi at its facility at Turin Caselle Airport in Italy will probably be placed in storage once they are delivered.



## First Block 2A F-35A delivered

### Latest-standard JSF arrives at Eglin

**L**OCKHEED MARTIN has delivered the first F-35A equipped with the latest Block 2A software. The aircraft (serial 10-5013, AF-025) arrived at Eglin AFB, Florida, on 6 May. The latest standard of software enables the use of the AAQ-37 Distributed Aperture System (DAS). The electro-optical system utilizes six infra-red sensors that can be used to warn the pilot of incoming threats and provide day/night vision, fire control capability and precision tracking of wingmen or friendly aircraft.

The latest delivery was the 10th F-35A for the Eglin-resident 58th FS, which is scheduled to receive 24 primary authorized aircraft and two back-up aircraft by February 2014. The aircraft that had already arrived at Eglin are all configured with Block 1B software. Recently the Block 1B fighters were provided with some simulated weapons capabilities and radar modes and were cleared to operate the electro-optical targeting system (EOTS).

The commander of the 58th FS became the first operational F-35A pilot to conduct aerial refuelling during a mission on 14 May, and

by the end of the month a dozen instructors were planned to be similarly qualified as the training became part of the Block 1B training syllabus.

F-35 training is now ramping up at an impressive rate, with the US Marine Corps being scheduled to open a second training centre for the F-35B at MCAS Beaufort, South Carolina, in 2014. The US Air Force will form a third at Luke AFB, Arizona, during 2015. The first F-35As for the 56th Fighter Wing, which will train both USAF and international customers, will arrive in January 2014. Other recent developments include:

- Marine Corps training unit VMFAT-501 launched eight F-35Bs in support of an air-to-air and air-to-ground training sortie on 26 April. After returning from the mission the fighters completed hot refuelling and flew a second mission. In total the squadron logged 16 sorties in three hours.
- The Norwegian government announced on 26 April that it will take delivery of six F-35As annually between 2017 and 2024 when the last of 52 aircraft will be accepted. Although the plan accelerates

Norway's initial purchase by one year, it stretches the deliveries out from four to eight years. Norway had previously ordered four F-35As — its initial pair will be built as part of the Low Rate initial Production (LRIP) Lot 7 and delivered in 2015. The second two are included in the LRIP Lot 8 and will follow in 2016.

- Lockheed Martin delivered the fourth F-35A to the 422nd Test and Evaluation Squadron at Nellis AFB, Nevada, on 24 April.
- Lockheed Martin has received a \$20.1-million advance acquisition contract that will allow the contractor to purchase long lead parts, materials and components required for the construction of two low-rate initial production Lot II F-35As for Israel.
- The F-35A recently completed high-angle of attack (AOA) testing at Edwards AFB, California. This intentionally put the aircraft out of control in several configurations that included both clean wings and with external air-to-air pylons and missiles and open weapon bay doors.

**The first Block 2A F-35A for the 58th Fighter Squadron taxis at Eglin AFB, Florida, following its arrival on 6 May. USAF**



**Eight F-35Bs operated by Marine fighter attack training squadron VMFAT-501 prepare to launch for a training sortie at Eglin AFB, Florida, on 26 April. USMC**





## Presidential helicopter project moves forward

The US Navy issued a formal Request for Proposals (RFP) associated with the Presidential Helicopter Replacement Program (VXX) on 3 May. Proposals are due in 90 days and the service has a goal of awarding a fixed-price incentive engineering and manufacturing development (EMD) contract by mid-2014.

The RFP requires that respondents offer an in-production vertical lift aircraft. The EMD effort will include two Engineering Development Model (EDM) and four System Demonstration Test Article (SDTA) aircraft, a flight training device and a maintenance training device. The optional production phase includes 17 aircraft comprising four in low-rate initial production (LRIP) lot 1, five in LRIP 2 and eight in full-rate production. The four SDTA aircraft will also become part of the operational fleet of 21 aircraft.

The new VXX aircraft will replace the current fleet of 11 VH-3Ds and eight VH-60Ns. Three teams, comprising Sikorsky/Lockheed Martin, AgustaWestland/Northrop Grumman and Boeing/Bell Helicopter or Boeing alone, are expected to compete for the \$1.85 billion programme.

## Jayhawk conversion completed

Coast Guard Air Station Clearwater, Florida, received its final MH-60T when serial 6018 arrived from the Aviation Logistics Center in Elizabeth City, North Carolina, on 3 May. The event marked the completion of the Coast Guard's conversion from the MH-60J to the MH-60T. Clearwater subsequently delivered the Coast Guard's final MH-60J to Elizabeth City for conversion on 10 May.

Prior to departing Clearwater the station's personnel autographed serial 6024's tail pylon and held a farewell ceremony. An arrival ceremony was held at the ALC on 13 May and the Medium Range Recovery Product Line personnel were able to sign the aircraft. The Jayhawk was subsequently inducted by the ALC on 14 May, where it joined six MH-60Js already undergoing conversion. MH-60T serial 6011 is scheduled to depart Elizabeth City for Air Station San Diego, California, on 10 June and will be exchanged for MH-60T serial 6032. The latter Jayhawk will be flown to Elizabeth City and undergo programmed depot level maintenance (PDM) beginning on 25 June.

In related news, the MRR Product Line has begun conversion of SH-60F BuNo 164072 to MH-60T configuration. The Coast Guard's 43rd Jayhawk will be assigned serial 6046 when the work is completed.



Past and present members of Marine helicopter squadron HMX-1 inspect MV-22B BuNo 168280 at MCAF Quantico, Virginia, on 4 May. The Osprey is the first of 12 that will be delivered to the unit by next summer. USMC

## HMX-1 receives first Osprey

The Bell/Boeing MV-22B formally entered service with Marine helicopter squadron HMX-1 following an introduction ceremony at MCAF Quantico, Virginia on 4 May. The event marked the start of the squadron's transition from the CH-46E to the MV-22B. Like the Sea Knight, the tilt-rotors will carry out Presidential support and operational 'green side' missions.

Though the aircraft will be tasked with transporting White House staff and members of the press later this year, it will immediately be assigned to support the Officer Candidate School and the Basic School at Quantico. HMX-1 received its first Osprey on 5 April and carried out its inaugural flight with the new aircraft on 26 April.

### UNIT NEWS

#### ■ End of the line for Montana Eagles

The first F-15Cs destined for the California Air National Guard's 144th Fighter Wing are scheduled to begin re-locating from Great Falls International Airport, Montana, by June. The move to Fresno will be completed by March 2014. Currently operated by the Montana Air National Guard's 120th Fighter Wing, the Eagles will be replaced by C-130Hs beginning in early 2014, and the unit will receive its final Hercules by June 2016. The aircraft will be drawn from several different airlift units.

#### ■ New RPAS squadron activated

The 91st Attack Squadron was activated under the Air Force Reserve Command's 926th Group at Nellis AFB, Nevada, during ceremonies on 5 April. Nicknamed the 'Blue Streaks', the squadron will operate the MQ-1B and MQ-9 remotely piloted aircraft.

#### ■ Tankers return to Meridian

The Mississippi Air National Guard's 186th Air Refueling Wing is preparing to transition from the C-27J back to the KC-135R as part of a USAF plan that retires the still-new Spartan fleet. The wing's initial pair of Stratotankers will arrive at

Meridian Regional Airport in July. Although the 153rd Air Refueling Squadron previously operated the KC-135R, the last tankers departed the Key Field facility in March 2011 as the unit prepared for conversion to the C-27J.

#### ■ Fort Smith plans revealed

The draw-down of the 20 A-10Cs assigned to the Arkansas Air National Guard's 188th Fighter Wing at Fort Smith will begin this summer as the unit prepares to transition to a new mission as an MQ-9A Remote Split Operations (RSO) site. The unit will lose two aircraft monthly through summer 2014. The MQ-9 mission is scheduled to achieve initial operational capability at Fort Smith in Fiscal 2016. The base will also gain a new space targeting squadron.

#### ■ Star Warriors on the move

In preparation for its move to NAS Whidbey Island, Washington, electronic attack squadron VAQ-209 flew its final sortie from Joint Base Andrews-NAF Washington, Maryland, on 17 May. The Naval Reserve's only EA-6B squadron will officially change home ports on 1 August 2013 and will subsequently commence transition to the EA-18G.





## Last RF-4C departs Davis-Monthan

End of the line for Phantom drone conversions

**T**HE FINAL F-4 to be re-generated from storage with the 309th Aerospace Maintenance and Regeneration Group departed Davis-Monthan AFB, Arizona, en route to Mojave,

California, on 17 April. RF-4C serial 68-0599 had been in storage at the Tucson base since 18 January 1989. It is the last of 316 Phantoms that will be converted into a Full Scale Aerial Target (FSAT) by BAE Systems. The Phantom's call sign for the flight

was 'Last One'. The 309th AMARG will continue to support the FSAT programme and is due to begin re-generating retired F-16Cs in June. The Fighting Falcons will be converted into fourth-generation targets by Boeing in Jacksonville, Florida.



## USS *Ford* delayed

The launch date for the aircraft carrier USS *Gerald R. Ford* (CVN 79) has been pushed back from July 2013 until November because of mounting delays in the ship's construction. As a result, delivery will be moved from September 2015 to the second quarter of Fiscal 2016. The decision followed a February

2013 review that concluded that a delay would 'allow the shipbuilder to complete the remaining critical path work and allow for increased outfitting to most economically complete the ship.' It is now expected to be 70 per cent complete when it is launched at the Newport News Shipbuilding in Virginia.

## Ospreys cross Atlantic

MV-22Bs assigned to Marine medium tilt-rotor squadron VMM-365 'Blue Knights' conducted the largest and longest Osprey trans-Atlantic flight on 26 April when six aircraft flew from MCAS New River, North Carolina, to Morón de la Frontera, Spain. During the 15-hour flight, the MV-22Bs were accompanied by two KC-130Js from VMGR-252. The eight aircraft are tasked as the Aviation Combat Element (ACE) for Special-Purpose Marine Air-Ground Task

Force, Crisis Response (SP-MAGTF CR). Initially based at Morón Air Base, the SP-MAGTF CR is a new rotational contingent that provides US Africa Command the capability to respond to crises in its area of responsibility.

The six MV-22s arrived using the radio callsigns 'Rugby 11-16'. They comprised BuNos 165850/YM-00, 166609/YM-04, 166718/YM-02, 166719/YM-09, 166721/YM-10 and 168225/YM-12.



Six VMM-365 MV-22Bs arrived at Morón on 26 April in support of the new Special-Purpose Marine Air-Ground Task Force, Crisis Response. Antonio Muñiz Zaragüeta



### DEPLOYMENT NEWS

- F-15Es operated by the 494th Fighter Squadron returned to RAF Lakenheath, UK, at the conclusion of an eight-month deployment to South-west Asia on 28 April.
- The 20th Fighter Wing welcomed the 77th Fighter Squadron back to Shaw AFB, South Carolina, on 25 April. While deployed to Afghanistan, the 'Gamblers' F-16Cs were operated by the 77th Expeditionary Fighter Squadron.
- The Wisconsin Air National Guard's 115th Fighter Wing deployed six F-16Cs and around 100 personnel from Dane County Regional Airport in Madison to Łask AB, Poland on 10 May. Upon arrival the unit participated in joint training exercise 'Av-Det Rotation 13-2'. The wing's participation marks the first rotation of fighter aircraft hosted by the USAF Aviation Detachment, which was activated in November of 2012.
- F-15Es assigned to the 389th Fighter Squadron departed Mountain Home AFB, Idaho, for a deployment to South-west Asia on 21 April. There they relieved the Lakenheath-based 494th FS.
- The 480th Fighter Squadron deployed from Spangdahlem, Germany, to Kandahar Airfield, Afghanistan, on 7 April. Normally assigned to the 52nd Fighter Wing, the 'Warhawks' are attached to the 451st Air Expeditionary Wing while deployed.
- Marine attack squadron VMA-231 and Marine aviation logistics squadron MALS-14 returned to MCAS Cherry Point, North Carolina, at the conclusion of a six-month deployment to Afghanistan on 28 April. The AV-8B Harrier IIs provided close air support and reconnaissance for coalition forces in the Regional Command South-west area of responsibility while operating from Camp Bastion in Helmand province. Replacing the 'Ace of Spades' was VMA-311, which deployed from MCAS Yuma, Arizona, in mid-April.

The last F-4 to be re-generated from storage by the 309th Aerospace Maintenance & Regeneration Group (AMARG) is prepared for departure from Davis-Monthan AFB, Arizona, on 17 April. RF-4C serial 68-0599 was flown to Mojave Airport, California, where it will undergo conversion in support of Air Combat Command's Full-Scale Aerial Target (FSAT) programme. USAF



## UK F-35 numbers unclear

### Report questions decision-making on JCA

The UK Defence Secretary Philip Hammond has given the clearest indication yet that Britain may not commit to its full buy of 138 Lockheed Martin F-35 Joint Combat Aircraft. It has long been understood that F-35 procurement for the UK is a moveable feast, the first tranche of procurement being slated to cover the 48 F-35B STOVL variants for the new Queen Elizabeth-class aircraft carrier.

Speaking to Sky News during a visit to the test centre at NAS Patuxent River, Maryland, Mr Hammond said that the first 48 aircraft on order would be bought at a cost of around £100 million each in order to establish the carrier capability. He added that further procurement would be intended to replace the current fleet of Eurofighter Typhoons. 'When we are looking to replace Typhoons we will buy further aircraft', he stated. Mr Hammond also stated that future decisions would depend on manned and unmanned options, which he said are still not clearly known.

Senior RAF officers have regularly talked openly of a split order, with a follow-on buy possibly consisting of F-35A conventional variants. The balance of 90

aircraft would appear to dovetail nicely with the planned Typhoon force of 107 aircraft by the end of the decade. As these aircraft are phased out, F-35As may be used to replace these jets. However, that is a long way off, so the F-35A may well be the only Western fighter type in production by that time!

The UK plans to stand-up No 17 Test and Evaluation Squadron (TES) at Edwards AFB, California next year. A recent UK National Audit Office 'Carrier Strike' report again questions the payload and 'bring back' capability of the F-35B and the need for rolling vertical landings (RVL) rather than vertical landings in hot, humid and low-pressure weather conditions. It is one of a number of concerns pointed out by the NAO, but it supports last year's decision to revert to the F-35B, overturning the 2010 Strategic Defence and Security Review (SDSR) move to the F-35C carrier variant. The NAO endorsed a view held by many that the 2010 decision was based on 'immature data and a number of flawed assumptions.'

The cost of converting the carrier to operate with 'cats and traps' for the F-35C was put at over £1.2 billion per carrier and the NAO praised senior defence officials

for the U-turn, stating that the costs incurred could have been '10 times higher if the decision had been made after May 2012.'

Mr Hammond faced a politically tough decision to revert to the previous Labour government's original 2008 plan to acquire the STOVL variant, but, given the current financial constraints, it was clearly the only sensible option.

However, despite savings from the move back to the F-35B, the cost of the aircraft is clearly still giving cause for concern. An order for the first 14 examples on top of the four already procured for operational test and evaluation is expected later this year.

The NAO report also questioned the 2020 operational target for the first carrier, and whether the Ministry of Defence's decision to delay the Crowsnest airborne early warning radar system on the Merlin helicopter until 2022 should affect this. Crowsnest is planned to succeed the Sea King ASaC7, with the MoD saying that it expects the system to enter service at the same time as HMS *Queen Elizabeth* and that it will be fully operational by 2022. However, many expect Crowsnest to slip and create a capability gap.



The UK National Audit Office has praised the decision to revert to the F-35B. This image depicts the STOVL variant (nearest the camera) and the F-35C carrier variant for the US Navy. Lockheed Martin



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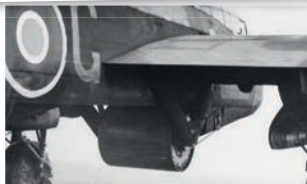
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## 323 TACTESS special

Latest 'Diana' F-16 takes flight in the Netherlands

**M**ARKING THE unit's 65th anniversary this year, the Royal Netherlands Air Force's 323 TACTESS (Tactical

Training, Evaluation and Standardisation Squadron) has created special tail art for F-16AM J-002. According to Leeuwarden Crew Chief Marcel Visser, after some discussions regarding the design, the TACTESS opted for the squadron's

famous 'Diana the hunter' motif in a form designed by Pierpaolo Maglio and previously used on a 5° Stormo F-16A ADF of the Italian Air Force. Maglio provided permission for its re-use and re-design by the Dutch squadron.



## Meteor progress

As this magazine went to press, a new series of separation trials was due to take place with the MBDA Meteor beyond visual range air-to-air missile. Conducted from a Rafale at the Cazaux flight test centre in France, the missile trials were due to be performed over water, using unarmed instrumented rounds launched in a high-g manoeuvre, and at a high angle of attack. Further tests will follow before the end of the year. A first controlled, boosted launch is planned for 2015.

Meanwhile, Germany has provided its official backing to the missile. The Luftwaffe will acquire the Meteor for its Eurofighter fleet, Berlin having allocated funds of €240 million for 150 missiles, plus €130 million for integration.

## US warns Dutch on JSF

The US Department of Defense is urging the Netherlands not to reduce its order for F-35s. US officials have warned that a cut in orders could lead to increased unit prices for the Dutch. The Netherlands is expected to reduce its 85-aircraft Joint Strike Fighter order to between 52 and 68 jets, although numbers as low as 30 to 36 have been mooted. US Air Force Lt Gen Christopher Bogdan, heading the F-35 programme, told the Dutch parliamentary defence commission that reductions in numbers would 'have a great impact on the price of the airplane'. On the other hand, cancellations of orders for the period from 2022 to 2024 would have only a marginal effect on price.



## Belarus highway exercise

In mid-April the Belarusian Air Force conducted an exercise involving operations by both fixed- and rotary-wing tactical aircraft from highway strips in the southern part of Brest Oblast. Seen here is one of two twin-seat MiG-29UBs from the 61st Fighter Air Base at Baranovichi that were

involved in the exercise. Also taking part in the operations on the M-1 highway near the western border with Poland were two Su-25UBs from the 116th 'Guards' Assault Air Base at Lida and two Mi-24s from the 181st Helicopters Base at Pruzhany. *Stanislav Bazhenov*

## DeSIRE demonstration landmark

A European project designed to integrate unmanned aerial vehicles within controlled airspace achieved an important milestone on 24 April. Funded jointly by the European Space Agency (ESA) and European Defence Agency (EDA), the trial provided a successful demonstration of UAV control using satellite technology. The flight vehicle was an Israeli Aerospace Industries (IAI)

Heron 1 medium-altitude long-endurance (MALE) drone that was controlled via a satellite communications (SATCOM) beyond line-of-sight datalink. Taking place at San Javier air base in Spain, the test was conducted as part of the DeSIRE programme (Demonstration of Satellites enabling the Insertion of RPAS in Europe), which is led by Indra.

## France

### ■ Mirage F1CR in the Baltic

Despite its imminent withdrawal, the French Air Force Mirage F1CR fleet remains busy. After seeing action in Operation 'Serval' over Mali, 11 F1CRs and 17 pilots of Escadron de Reconnaissance 2/33 'Savoie' completed their last air-to-air gunnery practice at BA126 Solenzara from 18-28 February. In April a handful of aircraft attended Exercise 'Frisian Flag' at Leeuwarden. On 26 April four F1CRs landed at Šiauliai in Lithuania as scheduled replacements for the Danish F-16s under NATO's Baltic Air Policing scheme. The four Mirages will be deployed in the Baltic for four months, beginning on 30 April. *René L. Uijthoven*

### ■ France plans for the future

A recent Defence White Paper has revealed plans for the future force structure of the French air arms up to 2025. Significantly, fighter numbers will be cut to 225 aircraft, shared between the Air Force and Navy, and including both the Rafale and upgraded Mirage 2000Ds. As a result, France wishes to slow down Rafale

procurement. It had planned to buy 294 Rafales (of which 234 would be for the Air Force), but this figure had long been scheduled for revision. Analysts expect that the Rafale production run may eventually top out at 225 jets, to replace the last Mirages. The fighter force will be supported by around 50 tactical transports (A400Ms and CN235s), seven E-3F AWACS, 12 A330 MRTTs, 12 MALE drones and an unspecified number of light surveillance aircraft. In the MALE category, France will shortly receive two MQ-9 UAVs, for use in Mali. The two unarmed Reapers will be acquired from the US Air Force.

### ■ First Tigre HAD for France

Eurocopter delivered the first production Tigre HAD version to the French Direction Générale de l'Armement (DGA) on 19 April. This milestone followed DGA qualification of the HAD version on 10 April and certification in January. France has ordered 40 Tigre combat helicopters in HAD configuration for its Army Aviation units. The HAD variant includes enhanced MTR390 turboshafts that provide 14 per cent more

power, improved ballistic protection, a new optronic sighting system, Hellfire missile capability, an improved electronic warfare suite and IFF. In related news, Eurocopter expects to see a somewhat reduced French purchase of NH90 TTH variants, as officials debate the future of a 34-helicopter order.

### ■ Rafale rebuild begins

A French Air Force industrial workshop (AIA) has delivered the first Rafale M fuselage for upgrade to F3 standard by Dassault. Arriving with the AIA at Clermont-Ferrand in November 2011, the centre fuselage of Rafale M 10 (an F1-standard jet) received structural work allowing it to be upgraded to the latest multi-role configuration. The fuselage barrel underwent some 2,200 structural modifications to provide for the addition of new wiring. On 16 April the fuselage left the AIA to be delivered to Dassault Aviation's Argenteuil plant. Here it will re-enter the production line for new aircraft, emerging as an F3. Rafale M 10 is the first of 10 fuselages to undergo these modifications.





Alenia Aermacchi



## 'Richthofen' Eurofighter

Seen at Wittmund on 23 May, Luftwaffe Eurofighter 30+66 is the first to receive markings for the new Fliegergruppe 71 'Richthofen'. The group will remain part of Jagdbombergeschwader 31 'Boelcke' during transition to the EF2000 until it receives full wing status in the future. *Jamie Hunter*

## Italian ECR MLU delivered

On 9 May Alenia Aermacchi announced delivery of the first upgraded Tornado ECR to the Italian Air Force. The jet is one of 15 to be upgraded by Alenia Aermacchi in collaboration with BAE Systems and Cassidian. The Tornado ECR Mid-Life Upgrade (MLU) includes an integrated inertial/GPS navigation system supported by a Multi-Mode Receiver (MMR) system for approaches and ILS blind landings. A new communication and identification system provides for secure

communication as well as a data transmission/reception capacity via MIDS datalink. The cockpits feature new multi-function displays, including new TV-TAB LCD colour displays for the navigator, and lighting systems compatible with night vision goggles. For the electronic reconnaissance role, the MLU has new functionalities for threat identification and localisation (ELS multi-ship ranging). New weapons options consist of the AGM-88E and JDAM.

## First Italian NH90 FOC

The Italian Army has taken delivery of its first NH90 TTH helicopter in FOC (Final Operational Capability) configuration. It was delivered on 2 May at AgustaWestland's Venice Tessera plant. With this, the Italian Army has received 21 NH90 TTHs from an order for 60. Five aircraft are currently deployed in Afghanistan, where they have notched up 470 flight hours.

Jamie Hunter

## 'Phly-out' Phantom scheme

Final JG 71 special

**T**HE FINAL RETIREMENT scheme prepared by Jagdgeschwader 71 'Richthofen' to mark the passing of the Phantom II has been unveiled on F-4F 37+01. JG 71 now has four aircraft specially marked for the 29 June retirement: 38+10 in the Norm 72 grey and green scheme, 38+33 wearing the Luftwaffe's Norm 81 camouflage, 37+22 the current Norm 90J colours and 37+01 this special 'Phly-out' scheme. Next month, *Combat Aircraft* will be presenting special coverage of the Luftwaffe F-4 retirement with exclusive images from Wittmund and a look back at 40 years of the type's German service.



## Bulgarian fighter search back on

Bulgarian President Rosen Plevneliev has announced that the country may buy nine to 10 new fighters. In late 2012, the previous administration in Sofia requested that the Defence Ministry negotiate directly with

suppliers, without going to tender. Plevneliev now expects a final stage of 'preliminary preparations' before June, and finalisation of the deal in the following three months. The new government will then make an official decision

on the purchase. It has been estimated that Bulgaria may have up to €350 million to spend on the new jets. Possible options include former Portuguese F-16s, second-hand Italian Eurofighters or new Gripens.

## Norway lines up next batch of F-35s

The Norwegian government has requested parliamentary approval to order the first six F-35s for the Royal Norwegian Air Force under the so-called main contract. Of the six aircraft in question, four will arrive at Ørland by the end of 2017, and will be the first Lightning IIs to operate in Norway. The other two aircraft will initially be used for training in the US. The government plans for Norway to receive six aircraft annually from 2017 to 2024, for a total of 48 aircraft. In addition, a further four F-35s already approved will be delivered in 2015 and 2016 for Stateside training.

## Bulgarian Albatros returns

On 19 April a Bulgarian Air Force L-39ZA took to the air for the first time since December 2007. Czech test pilots successfully flew both serials 137 and 205 operated by the Flight Training Group at Dolna Mitropolia. Bulgarian pilots are now expected to resume flying to restore their interrupted flight

training with the help of their Czech colleagues.

At the end of 2011 the Bulgarian Ministry of Defence declared its intention to return six L-39ZAs to operation. A contract for the restoration to airworthiness of four aircraft was signed with the manufacturer Aero Vodochody

in September 2012. Two (137 and 205) have been completed. The next two jets will undergo overhaul at the TEREM Georgi Benkovski plant at Graf Ignatievo. The fate of the fifth and sixth L-39s largely depends on funding for their repairs.

**Anton Balakchiev**





## May Day over Moscow

Impressive Air Force presence for Victory Day

**T**HE 9 MAY Victory Day parade over Moscow was the first to be conducted under the leadership of the new Russian Defence Minister, Gen Sergey Schoygu. The event saw a total of 68 aircraft and helicopters overfly Red Square. As in the Air Force centennial celebrations last year, the flypast included

'heavyweights' such as the Tu-22M, Tu-95 and Il-76 as well as four-ship fighter formations. The event was opened by a helicopter formation including examples of the Mi-28, Ka-52, Mi-8MTV-5 and Mi-26. A highlight was the appearance of an An-22, Tu-160 and A-50. In order to achieve the required timing, aircraft were deployed to bases closer to Moscow in the weeks leading up

to the parade. The helicopters, normally stationed at Torzhok, flew from Kubinka alongside the display teams. Reserve aircraft also accompanied the major formations on the approach to Moscow, in order to cover for any technical defects. In this way, for example, an An-124 departed Tver together with the Il-76 and An-22, before returning to its home base at Seshcha. **Alexander Golz**



An air-to-air study of Russian Air Force Tu-160 Valery Chkalov during the Victory Day Parade over Moscow's Red Square. The 6950th Air Base at Engels provided three Tu-95s and a single Tu-160, the latter simulating aerial refuelling with an Il-78. Evgeniy Kazenov

### PAK FA progress

The Sukhoi T-50 fighter will begin official state flight tests next year, according to United Aircraft Corporation President Mikhail Pogosyan. The Russian Air Force trials will start once preliminary flight-testing is completed, this being scheduled to occur before the end of this year. Pogosyan says that the first stage of state trials should be over by 2015. The T-50 fleet will also add an additional prototype this year, for a total of five flying airframes. The fifth is now nearing completion at Komsomolsk.

On 25 April a first Russian Air Force pilot took the controls of the T-50 for a test flight at Zhukovsky. The two-hour flight was part of continuing system and equipment testing.

In May, Air Force Commander Lt Gen Viktor Bondarev announced that T-50 testing at the Chkalov state flight test centre in Akhtubinsk could begin as early as July. President Vladimir Putin recently confirmed that the T-50 should enter service in 2016, not 2015 as previously envisaged.

### Russia plans 'Foxhound' successor

Russia hopes to field a successor to the MiG-31 interceptor as early as 2020 and to replace the aircraft entirely by 2028. The plans were confirmed by Air Force commander Lt Gen Viktor Bondarev, who revealed that development of a new aircraft has been initiated with a view to completion prior to the end of the 2020

State Armament Programme. It is as yet unclear if the type will be a derivative of an existing design or an all-new aircraft. According to Bondarev, the Air Force maintains a fleet of 122 MiG-31s in service, around half of which are undergoing conversion to MiG-31BM standard.

### More Polish W-3 upgrades

PZL-Swidnik has been selected by Poland's armament inspectorate to modernise two Army Aviation W-3 Sokół medical evacuation helicopters. Under a deal worth €1.1 million, two W-3A helicopters will be brought up to W-3AE configuration by 30 November

2013. The upgrade includes external lighting compatible with night vision goggles, and new racks to carry medical equipment. A single Polish Navy W-3WARM Anakonda search and rescue helicopter is also to be equipped with a new automatic identification system.



## Serbian MiG-29M deal nears

Serbia is closing in on a deal with Russia for the purchase of military equipment including six MiG-29M/M2 multi-role fighters. Press reports in Belgrade said that the deal was expected to be finalised before the end of May. Defence Minister Aleksandar Vucic has confirmed his 'clear intention' to purchase 'modern equipment for air force and air defence'. Combat aircraft, early warning radars and possibly Mi-17 helicopters are expected to be among the topics of meetings between Serbian president Tomislav Nikolic and Russia's Vladimir Putin and the countries' respective ministries of defence.

Earlier reports suggested an original requirement for 12 new combat aircraft, but this seems to have been halved by budget restrictions. The Serbian Air Force has on strength four MiG-29s (three 9.12s and a single UB trainer) that were overhauled and very slightly upgraded in 2007, their service lives being extended by 10 years or 700 flying hours. The QRA role is undertaken by a handful of MiG-21bis, the newest of which turned 30 years this March. Unofficial reports suggest the MiG-21s' service lives have been extended over the 30-year limit, in co-operation with the manufacturer. **Igor Salinger**

## Serbian Gazelles on parade

Eight Serbian Air Force (Vazduhoplovstvo i protivvazduhoplovna odbrana — ViPVO) Soko/Aérospatiale SA341H/342L Gazelle and Gama helicopters return over central Serbia to Ladjevci air base following a display held over Krusevac on 20 April to mark Armed Forces Day.

The eight-ship (plus one acting as reserve) was assembled from two wing-size units and three squadrons: 714th Squadron 'Shadows' and 119th Squadron 'Dragons' of the 98th Aviation Brigade and Belgrade-based 890th Squadron 'Pegasus' of the 204th Aviation Brigade. **Igor Salinger**

## Turkey

### ■ T-129 delivery nears

The Turkish Land Forces expect to take delivery of their first T-129 ATAK in the coming weeks. With production under way, four examples of the attack helicopter are ready for delivery. These initial T-129As will be used to train the first batch of pilots and maintainers. Furthermore, three production aircraft are currently undergoing factory acceptance tests with Turkish Aerospace Industries (TAI).

While initial production focuses on the T-129A, the definitive T-129B will include integration of the Rocketsan Cirit guided rocket and infra-red-guided UMTAS missile. Qualification trials of the T-129B are set to begin in mid-2013, with UMTAS tests scheduled for July. Production of the T-129B is expected to begin next year.

The manufacturer is now building the ATAK at a rate of one aircraft per month and will maintain this tempo until 2018, by which time all 59 helicopters will be delivered. TAI is also examining options for upgrade, including a millimetre-wave radar and manned-unmanned teaming capability. These and other upgrades will be trialled using the two existing prototypes.

### ■ TAI plans for Black Hawk manufacture

Negotiations between Sikorsky and Turkey's Undersecretariat for Defence Industries regarding local production of the S-70i Black Hawk are close to being finalised. Turkey selected the type in 2011 with a view to the licence production of 109 T-70i versions, with Turkish Aerospace Industries (TAI) as prime contractor. A contract award

is now imminent and the programme is valued at up to \$3.5 billion, including work undertaken by Sikorsky and other contractors. TAI will be responsible for licence manufacture of cabins, cockpits and rotor blades, together with final assembly. The T-70i will be equipped with an Aselsan avionics suite, its General Electric engines will be manufactured under licence by TEI. Landing gear and the transmission will be the responsibility of ALP Aviation.

Sikorsky recently delivered the first of two new VIP-configured S-92 helicopters to the Turkish National Police. This joins one previously delivered in 2005. The remaining example will be delivered before the end of the year.

### ■ Turkey reveals fighter concepts

During the International Defence Industry Fair (IDEF) staged in Istanbul in May, Turkish Aerospace Industries (TAI) unveiled possible configurations for its TF-X future fighter project. The planned successor to the F-16 is a stealthy fifth-generation fighter, for which TAI is responsible for conceptual design, with technical assistance being provided by Saab. The three configurations comprise single-engined (with the General Electric F110) and twin-engined (using Eurojet powerplants) aircraft with conventional tailplanes, and a single-engine design with twin tails and canard delta. The last of these is reminiscent of the Saab Generic Future Fighter (GFF) study. Turkey plans to fly the TF-X in 2023, followed by service entry of the new type before the end of that decade.

Other items of note that emerged at IDEF 2013 included:

- The Turkish Navy has amended its order for 10 ATR-72-500 maritime patrol aircraft to cover six ATR-72-600 TMPA (Turkish Maritime Patrol Aircraft) Meltem 3s equipped with the Thales AMASCOS mission system. The first aircraft began conversion with TAI at Akinci in April and will be delivered in February 2017, with the remainder set to follow before the end of 2018. Two utility-configured ATR-72-600 TMUA (Turkish Maritime Utility Aircraft) are to be delivered in June and July.
- The TAI Hurkus turboprop trainer is due to fly in July. An initial production order is expected in the coming weeks.
- The Turkish Air Force is to retire the majority of its (N)F-5 Freedom Fighter fleet. A small number of aircraft will be retained for the Turkish Stars aerobatic display team. Meanwhile, around 55 T-38 Talons are being upgraded to assume lead-in fighter training duties from the F-5.
- The Undersecretariat for Defence Industries is currently preparing a request for proposals for the preliminary concept phase of the TAI Strike UAV (SIHA) project. The turboprop combat drone will be derived from technologies used in the Anka medium-altitude long-endurance UAV. A contract for the conceptual design phase could be signed before the end of the year.
- Looking further ahead, Turkey plans to introduce the National Unmanned Combat Aircraft (MISU) to the Air Force by 2020, pending operational service from 2035.



# DAMASCUS RAID

ALLEGED ISRAEL AIR STRIKE IN SYRIA

An F-16D Barak from 105 'Scorpion' Squadron takes off from Hatzor, armed with the IMI Delilah. Note the datalink pod under the Barak's centreline pylon. Ofer Zidon

Israel apparently carried out two air strikes on Syria in early May, hitting targets in the vicinity of Damascus. Western intelligence sources were quick to claim that the raids were an attempt to stop a shipment of advanced, Iranian-made missiles heading to Hezbollah in Lebanon.

report: **Ofer Zidon**

**U**N-NAMED US AND European sources reported that the Israeli Air Force was responsible for the two air raids that struck in the vicinity of Damascus during the nights of 3 and 4 May. Israel has neither confirmed nor denied the reports. The target of the alleged attack was reportedly a shipment of Iranian-made Fateh-110 single-stage solid-propellant surface-to-surface missiles, weapons with a range of 300km and a 600kg warhead. Israel considers this missile a 'game-changing weapon' due to its increased accuracy — to within 200m — and has declared in the past that it would not allow such weapons to find their way into Hezbollah hands.

The first strike on the night of Friday 3 May apparently targeted storage facilities at Damascus airport. The second attack, on the following night, took place in the mountains north of Damascus. Eyewitnesses in Damascus reported flames and secondary explosions that lasted through the night.

Syria's president, Bashar al-Assad, insisted that no Israeli aircraft had penetrated Syrian

airspace. With a distance of only 30km between the Israel-Syria border and Damascus, the president's statement suggests that the alleged attack could have been conducted from 'stand-off' range, in which the involved aircraft launched precision-guided munitions from long distance. Stand-off attacks are usually employed to avoid dangerous anti-aircraft defence systems protecting the target.

The Israeli Air Force possesses a number of stand-off weapons, including the Rafael AGM-142 Popeye, Rafael SPICE, IMI Delilah, and the US-made GBU-31 Joint Direct Attack Munition and GBU-39 Small Diameter Bomb. Any one or more of these weapons could have been used in the alleged attack, but the characteristics of the targets suggest the use of high-penetration munitions.

## Weapons options


The Popeye is an air-to-surface missile with an operational range of 80km and a 350kg warhead. The Popeye has TV/infra-red guidance, and uses a datalink between the missile and its operator in the launch aircraft. The Popeye II is a smaller and lighter version

of the Popeye to be carried by smaller fighters like the F-16C/D Barak and F-16I Sufa.

The SPICE (Smart Precise Impact, Cost Effective) is an add-on 'smart bomb' guidance kit for Mk83/84 bombs. Its guidance mechanism is based on the Popeye seeker (TV/IR) and image comparison, with the addition of GPS. The maximum range of SPICE is 60km and it can be fed pre-flight with the co-ordinates and images of up to 100 targets. The final guidance stage can be completed using image-comparison software to discriminate between the actual target and its pre-loaded image.

The Delilah has the characteristics of a cruise missile and was first used in combat in Lebanon in 2006. With a range of 250km, its turbojet engine and on-board autopilot allow it to loiter over the battlefield searching for targets. The Delilah warhead weight is 60kg. The guidance mechanism is based on GPS or TV/IR seekers with a datalink to the launching aircraft. The datalink allows the operator to verify targets or send navigation and flying commands such as 'pull up', 'go around' and so forth.

The GBU-31 JDAM is a free-fall GPS-guided bomb. The target co-ordinates are loaded into the bomb's guidance mechanism prior to launch. The GBU-31 range is derived from the altitude and trajectory of the aircraft launching it, up to a maximum range of 30km.

The GBU-39 SDB is a 250lb precision-guided glide bomb, stored in clusters of four bombs using a BRU-61 rack attached to an aircraft's hardpoint. The bomb is GPS-guided with a range of 110km and a 93kg warhead with high penetration capability. 







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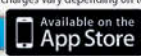
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**P-8I serial IN321 arrives at INS Rajali on 15 May wearing the Boeing test registration N521DS. Boeing**

## Poseidon in India

First P-8I arrives at INS Rajali for Indian Navy

**T**he Indian Navy's first P-8I maritime patrol aircraft arrived in India on 15 May. It touched down at INS Rajali (Arakkonam) in Tamil Nadu. The initial Indian Poseidon will be followed by two more examples before the end of the year. In 2009, India signed a contract with Boeing for eight P-8Is and is in the process of acquiring a further four that were included as an option. While the next two aircraft will arrive with Eastern Naval Command in August and November, the remaining five will be delivered by 2015.



## Pakistan seeks ATR-72

The Pakistani Navy has issued a tender for a single ATR-72-500 aircraft. The Navy requires a Combi that will be used to transport passengers and freight and conduct secondary rescue missions. The aircraft is required to be less than 12 years old, with fewer than 25,000 flight hours and a rear door that can be opened in flight to deploy relief equipment and personnel.

## Kuwait to add second C-17

Kuwait is likely to acquire an additional Boeing C-17, the US Defense Security Co-operation Agency (DSCA) announced on 16 April. The new request is valued at up to \$371 million, including equipment and support services. In September 2010 Kuwait requested its first Globemaster III, under a procurement valued at up to \$693 million. The aircraft is due to be manufactured during 2013.

## India

### ■ 'Black Panthers' commissioned

On 10 May the Indian Navy commissioned its first squadron of MiG-29K/KUB carrier fighters. INAS 303 'Black Panthers' was officially formed during a ceremony at INS Hansa (Dabolim) in Goa on India's west coast. The squadron includes 12 single-seat MiG-29Ks and four two-seat MiG-29KUBs, supplied by Russia under a 2004 contract. INAS 303 was previously as an Intensive Flying Training Unit (IFTU) handling introduction of the type (see our feature in this issue for more on the MiG-29K/KUB).

Meanwhile, the carrier INS *Vikramaditya* is in dry dock at Russia's Sevmash shipyard for 'cosmetic' repairs. These will precede final sea

trials beginning in July and delivery to the Indian Navy in early December.

### ■ IAF seeks new transports

On 8 May the Indian Defence Ministry issued a request for proposals ahead of the purchase of 56 tactical transport aircraft for the Indian Air Force. It has been issued to eight companies including Airbus, Alenia Aermacchi, Embraer, Ilyushin and Lockheed Martin. The acquisition was approved by the Defence Acquisition Council in 2012 and stipulates provision of the first 16 aircraft off-the-shelf, followed by licence-manufacturing of the remaining 40 in India. The aircraft will replace the IAF's fleet of Avro (HAL) 748s.

## Mixed messages on AMCA

India's Defence Research and Development Organisation (DRDO) has countered press reports suggesting that the Advanced Medium Combat Aircraft (AMCA) multi-role stealth fighter project has been shelved. The media had indicated that the Ministry of Defence had put AMCA on hold in order to focus on the delayed Light Combat Aircraft (LCA) Tejas. Tejas project costs have increased by a

factor of 10 since it was initiated and the jet may not meet its initial operational capability landmark, planned to be before July. In May, the DRDO stressed that the AMCA remains in the design phase, to be followed by a governmental review lasting around a year. The project includes development of a fly-by-light control system and a new engine, the latter a co-production with a foreign company.



Lockheed Martin

## Final Iraqi Hercules arrives

C-130J serial YI-308, the fourth new Hercules for the Iraqi Air Force, departs Dobbins Air Reserve Base in Marietta, Georgia, on 23 April. Iraq's second batch

of C-130Js flew across the Atlantic at the start of their delivery flight on 1 May. Iraq received its first C-130J in December 2012 and has a total of six C-130Js in its fleet.

## More Iraqi 'Vipers'

Lockheed Martin is being awarded an \$830-million contract to deliver a second batch of 18 Block 52 F-16C/Ds to Iraq. Announced by the Pentagon on 30 April, the deal will extend production of the fighters until mid-2017. Iraq ordered an initial batch of 18 F-16C/Ds in December 2011.

## Bell 407 deliveries complete

Deliveries of the Bell 407 JetRanger scout and light attack helicopter to the Iraqi Army have been completed. The US military announced the Iraqi Army's receipt of its 24th and final IA-407 on 1 May. The last batch of three helicopters was transported to Iraq from the Redstone Arsenal, Alabama on board a US Air Force C-17 on 3 April, thus marking the eighth delivery on behalf of the Armed Scout Helicopters Project Office. Three T-407 trainers were delivered to Iraq in 2010 and the first production IA-407 was delivered in August 2012. Three prototype aircraft remain at Redstone for future development and testing.

## Israel

### ■ Hezbollah UAV shot down

On 25 April an F-16C Barak from the Israeli Air Force's 117 'First Jet' Squadron shot down a Hezbollah UAV. The UAV took off from Lebanon and flew west towards the Mediterranean Sea. It crossed the Lebanese shoreline between Tyre and Saida in south Lebanon. Over the sea the UAV turned south, in the direction of Israel. The UAV was identified at about 13.00hrs by Israeli Air Force control units, when still over Lebanon. When it was confirmed as a hostile air vehicle over Israeli territorial waters, two pairs of F-16Cs from Ramat David's 'First Jet' Squadron were scrambled, together with a pair of AH-64A Apaches from 190 'Magic Touch' Squadron. The F-16 made contact with the UAV 8km west of Haifa, the largest city in northern Israel, and shot it down using a single Python missile. An Israeli

Navy ship with an AS565 maritime helicopter from 193 'Defenders of the West' Squadron, also stationed in Ramat David, conducted a search for the wreckage. Lessons learned from a previous incident, the shooting-down of an Iranian UAV over southern Israel on 6 October 2012, led to rapid identification of the hostile UAV and a quick response by interceptors when it was still over the sea. **Ofer Zidon**

### ■ Reconnaissance Sufa at Hatzetim

Seen below landing at Hatzetim in mid-April, Israeli Air Force F-16I Sufa 863 from 107 'Knights of the Orange Tail' Squadron is in the little-seen reconnaissance configuration, with an Elbit Systems Condor 2 reconnaissance pod under the centreline. The Condor 2 carries a long-range oblique photography payload with

electro-optical/infra-red sensors providing simultaneous high-resolution visible and IR reconnaissance images at a long stand-off distance from the target. **Patrick Roegies**

### ■ Israeli F-35 update

Israel Aerospace Industries (IAI) has signed a deal with Lockheed Martin to produce wings for the F-35 Lightning II. Under the contract, which has a duration of 10-15 years, IAI will begin delivering the F-35 wings in 2015. The contract is potentially worth up to \$2.5 billion. A new wing production line has been inaugurated at IAI's Lahav Wing Production Center. In related news, Lockheed Martin was recently awarded a \$20.1-million contract to provide long-lead parts for Israel's first two F-35As in Low-Rate Initial Production 8. Work will be completed in May 2014. Israel has decided to arm its future F-35s — which have now received the official Hebrew name Adir (awesome) — with an enhanced version of the Rafael SPICE stand-off precision weapon.

### ■ Osprey for Israel

Israel is likely to become the first foreign operator of the V-22 Osprey. A deal for the tilt-rotor was proposed during a visit to Israel by US Defense Secretary Chuck Hagel in April. In addition to an unspecified number of V-22s, Israel is also likely to acquire new precision strike missiles, air defence radar and KC-135 tankers. Hagel also mentioned that the planned arms package would include 'anti-radiation missiles and advanced radars for (Israel's) fleet of fighter jets.'





## Africa



The two Nigerian Alpha Jets operating from Niamey comprised NAF 455 in the new grey maritime camouflage and NAF 453 in desert camouflage. It was probably one of these aircraft that was lost in a crash in Niger on 6 May (see Losses). Benoit Denet

### ■ Nigerians at Niamey NAF supports Malian operations

The Nigerian Air Force (NAF) is supporting African-led International Support Mission in Mali (AFISMA) operations from Niamey International Airport in Niger. Since January the NAF has provided two Alpha Jet Es and two Mi-35s to strengthen the Economic Community of West African States (ECOWAS) intervention forces battling extremist rebel forces in Mali's northern flank. The Alpha Jets, authorised for combat operations, took off from the Nnamdi Azikiwe International Airport in Abuja on 18 January, bound for Niamey. They were followed the same day by two Mi-35s. The Mi-35s (one of which is NAF 534) are often equipped with rocket pods, and seem to fly much less often than the two jets. Also at Niamey are a French Navy Atlantique, a French Air Force C-130H and two US-registered Swearingen SA-227TTs. US unmanned operations have since moved to another airfield in Niger, probably Agadez. **Benoit Denet**



AF 015, a Ugandan Su-30MK2 from the initial six-aircraft order, at Entebbe on 24 April. Local reports suggest that deliveries of a second batch of six aircraft may have begun. Benoit Denet

### ■ More Ugandan 'Flankers'?

It has been reported that the Uganda People's Defence Air Force (UPDAF) may be receiving an additional batch of Su-30MK2 fighters. According to the reports from Kampala, another delivery was made in early May. In September 2012, a Russian news agency reported that Uganda had begun negotiations with Rosoboronexport for a possible purchase of six more fighters, a follow-on to six Su-30MK2s previously ordered. Alternative reports suggest the latest (two-aircraft) delivery may simply round off the

previous order, previously assumed to have been completed by 2012.

### ■ Algeria eyes transports and tankers

The Algerian Air Force has carried out evaluations of the Boeing C-17 and the Airbus A330 Multi-Role Tanker Transport. In April a Globemaster III from the 446th Military Airlift Wing, based at McChord AFB, Washington, was put through its paces at Boufarik and at the Air Force test centre at Tamanrasset. This was followed by the arrival of the A330 MRTT — destined for the Royal Air Force and thus equipped with wingtip refuelling pods and no flying boom — at the Boufarik transport base in May. The Algerian Air Force reportedly hopes to acquire three MRTTs and six to eight C-17s.

### ■ Peace Vector VII deliveries

A four-aircraft batch of F-16 Block 52s for the Egyptian Air Force ordered under the latest contract for these jets has through Lajes on delivery, comprising three F-16Cs (9752, 9754, 9755) and one F-16D (9821). Using 'RETRO' call signs, the jets arrived at Lajes on 11 April and departed three days later, accompanied by a KC-10A. A previous four-aircraft delivery took place in January. **André Inácio**



## South Korea

### ■ Countdown to F-X Phase III

A decision on South Korea's F-X Phase III fighter competition is to be made in June. The Pentagon has officially notified Congress of the potential sale of 60 Boeing F-15 Silent Eagles or Lockheed Martin F-35s, while the Eurofighter Typhoon is also in the running. Since it is not a Foreign Military Sale, the unit cost of the F-15SE is unconfirmed, but is likely to be around \$100 million. Lockheed Martin has offered Seoul an F-35A package worth \$10.8 billion, including aircraft, engines and the USAF-standard Block 3F software.

Selection of the Typhoon or F-15SE would involve local production by Korean Aerospace Industries (KAI). South Korea may also be offered work on the F-35 centre wing box and tail surfaces. KAI is already responsible for design and manufacturing of the F-15SE's conformal weapons bays. Local production for F-X Phase III is seen as an important stepping-stone towards a proposed indigenous fighter, the delayed KF-X, in which Eurofighter in particular is keen to be involved, while Lockheed Martin and Boeing have also offered developmental support.

As competition intensifies, Lockheed Martin has suggested a unit price of less than \$125 million for the F-35A and offered reassurances that the Lightning II will be ready for deployment (with initial operational

## Jordanian Black Hawks delivered

The US Army Security Assistance Command (USASAC) completed the delivery of a pair of modified UH-60Ms to the Royal Jordanian Air Force at Marka air base in Amman on 1 April. The Black Hawks were flown to Jordan aboard a United Arab Emirates Air Force C-17A after modifications were completed. The Black Hawks were prepared for the VIP mission by the Sabreliner Corporation facility in Perryville, Missouri. **Tom Kaminski**

## Saudi AWACS visitor

An interesting visitor to RAF Mildenhall in England was this Royal Saudi Air Force E-3A. Operated by No 18 Squadron, serial 1804 (c/n 23420) arrived on 28 April and is seen departing Mildenhall two days later for a flight to the US. **David J. Mackey**



## Saudi C-130J deal nears finalisation

Lockheed Martin has announced that it expects a C-130J order from Saudi Arabia soon. The deal will involve the first batch of aircraft from an overall requirement for 25 C-130Js previously disclosed to the US Congress as a potential sale. The order covers up to 20 C-130J-30 airlifters and five KC-130J tankers.

## Saudi Typhoon deliveries resume

Although price negotiations for the 72-aircraft order are ongoing, BAE Systems has resumed deliveries of the Eurofighter Typhoon to Saudi Arabia. They re-commenced in April despite ongoing discussions 'relating to the formalisation of price escalation on the Salam Typhoon programme'. Price negotiations relate to the addition of new capabilities on the final 24 aircraft for the RSAF.

## Thailand adds Black Hawks

Sikorsky Aircraft will deliver an additional UH-60M to Thailand under the terms of an \$11.4-million Foreign Military Sales contract from the US Army Contracting Command. Thailand previously received three UH-60Ms (serials 7220, 7221 and 7222) that were delivered in April. Sikorsky received another \$26.9-million order for an undisclosed number of Black Hawks for Thailand in March. **Tom Kaminski**

## RCAF future fighter search resumes

Canada's National Fighter Procurement Secretariat has issued a draft questionnaire to industry seeking information on the price of available fighter aircraft, in order to replace the CF-188. The questionnaire has been provided to five manufacturers: Boeing, Dassault, EADS, Lockheed Martin and Saab. After feedback from the companies is reviewed and incorporated, a final questionnaire will be sent to the companies for completion. A further questionnaire will subsequently clarify industrial benefits to Canada.

capability) in 2016, as stipulated under F-X Phase III. 'We have sufficient capability to build and deliver those airplanes (for South Korea). We are in the process of increasing (production) capacity as we increase orders and deliveries,' said director of F-35 International Business Development, Dave Scott.

The Republic of Korea Air Force is likely to face a shortfall of around 100 fighters by 2019, following withdrawal of the remaining F-4Es and F-5E/Fs. RoKAF plans call for deployment of 100 'high-end', 200 'middle-end' and 100 'low-end' fighters. Seoul is hopeful that the mid-end category will eventually be filled by the KF-X.

### ■ Apache wins in Korea

Boeing has won South Korea's 36-aircraft AH-X requirement to supply a new heavy attack helicopter. The 36 Apache Guardians will be supplied to the Republic of Korea Army under a Foreign Military Sales contract worth \$1.6 billion. The AH-X decision was expected in late 2012 but was delayed by Seoul's presidential election. Deliveries are anticipated between 2016 and 2018.

### ■ Surion for Korean Marines

Korea Aerospace Industries (KAI) is to develop a maritime assault version of its Surion transport helicopter. The helicopter is intended to meet a requirement for around 40 aircraft

for the Republic of Korea Marine Corps. The development programme is worth around \$713 million and will begin in July. Development completion is due by the end of 2015, and production machines will serve on South Korean Navy Dokdo-class assault ships.

### ■ Second FA-50 order

On 6 May, Korea Aerospace Industries (KAI) announced receipt of a contract from the Defense Acquisition Program Administration (DAPA) to build a second batch of FA-50 lightweight fighters for the Republic of Korea Air Force. The order, worth around \$1 billion, is for an undisclosed number of aircraft and follows a previous production contract issued in 2011.

### ■ Global Hawk sale approved

The US has approved the sale of four RQ-4B Global Hawks to South Korea. Although it has received a letter of offer and acceptance, South Korea, which originally requested the aircraft eight years ago, has not yet committed to purchasing them due to a higher price than expected. The South Korean government had initially set a price of \$435 million for the RQ-4Bs but a December release from the Pentagon's Defense Security Co-operation Agency indicated that the project would cost around \$1.2 billion. **Tom Kaminski**

## South America

### ■ Brazilian tanker work planned

Brazil is to conduct conversion work on one of two Boeing 767 tankers for the Brazilian Air Force. According to a contract with the prime contractor, Israel Aerospace Industries, the second of two 767-300ER airframes will receive tanker modifications at the facilities of TAP subsidiary TAP Manutenção e Engenharia Brasil.

### ■ Chile cancels trainer purchase

The Chilean Air Force has cancelled the purchase of new advanced trainers to replace its A-36 Halcón fleet, due to lack of funds. The types under consideration were the Alenia Aermacchi M-346, BAE Systems Hawk and Korean Aerospace Industries T-50. The original plan was to buy 12 examples for \$250 million. **Santiago Rivas**

### ■ Peru orders Learjet

The Peruvian Air Force has ordered a Bombardier Learjet 45 to replace a Dassault Falcon 20F used for VIP flights. The Falcon was grounded after being damaged in an emergency landing at Chiclayo Airport in June 2010. The Learjet was purchased second-hand in the US and is destined to serve with Grupo Aéreo No 8 (Ala Aérea No 2) at Jorge Chávez International Airport in El Callao, near Lima. **Santiago Rivas**





Above: **Until a fixed-wing AEW platform is deployed, the Z-8YJ will play an important role as China's interim carrier-based AEW aircraft. First spotted in 2009, the 'Black Bat' features a retractable radar antenna attached to the rear ramp. The radar is reportedly a long-range multi-mode AESA type that can be lowered vertically to provide 360° coverage.**  
via Chinese internet

## Chinese carrier plans

Following the commissioning of the *Liaoning* (CV 16), China plans to build additional indigenous aircraft carriers with catapult assisted take-off but arrested recovery (CATOBAR) capability. Rear Admiral Song Xue announced that future carriers will accommodate a larger complement of aircraft than the *Liaoning* (the former *Varyag*), which can carry around 30 J-15s. Xinhua has reported that the J-15 requires more trials before it is declared operational on *Liaoning*; however, in an important development,

the PLAN has established its first carrier-based aviation unit. The unit, approved by the Central Military Commission on 10 May, will operate J-15s as well as trainers, helicopters and support aircraft. Future carriers will embark 'reconnaissance aircraft, anti-submarine aircraft, electronic countermeasures aircraft, and rotary-wing aircraft'. Song also noted that *Liaoning* is under the direct command of naval headquarters, and is not assigned to any of the PLAN's three fleets.

## Taiwan mulls fighter options

Taiwan has abandoned efforts to acquire a squadron of F-16C/D Block 50/52s from the US as a stop-gap measure while an equivalent force of F-16A/Bs undergoes upgrade. The latest request followed previous plans to procure 66 F-16C/Ds that had been frustrated by Washington. In the meantime, funds allocated for the 66 new jets have been re-directed to the F-16 upgrade effort.

The Republic of China Air Force will retire its final 32 F-5E/Fs by 2019, while its 55 Mirage 2000-5s will be withdrawn in the next 10 years. Taiwan's recent Quadrennial Defense Review states that next-generation multi-role fighters will be acquired or developed to meet the forthcoming shortfall. The country's Defence Minister has admitted that the RoCAF needs a fighter 'more advanced' than the F-16A/B, and the F-35 is likely to be the favoured long-term candidate, unless Washington agrees to provide AESA-equipped F-16C/Ds.

In related news, Boeing has received a \$19.6-million contract modification for the procurement of AH-64D Apache Block III helicopters for Taiwan. The total value of the contract exceeds \$624 million.

## More UAE F-16s?

The United Arab Emirates may acquire additional F-16s. Under a \$10-billion arms package prepared by the Obama administration for Israel, Saudi Arabia and the UAE, the Emirates may purchase 25 additional F-16E/F Block 60 Desert Falcons, together with undisclosed 'stand-off missiles'.

## Australasia

### ■ RAAF to get new Growlers

Under its 2013 Defence White Paper announced in May, Australia has elected not to convert 12 of its 24 F/A-18F Super Hornets into EA-18Gs, but will instead retain 24 fighters and buy 12 new Growlers. The move was taken to avoid any air combat capability gap pending F-35 Lightning II deliveries. Australia intends to acquire a total of 100 F-35As. A decision on replacing the Super Hornets with additional F-35s will be made closer to the withdrawal of the Super Hornets, which is not expected until around 2030. The government remains committed to the Lightning II, and plans to field three operational squadrons entering service from around 2020 to replace the F/A-18A/B Hornet.

### ■ Australia studies Triton

Australia has reiterated its plans to acquire the Northrop Grumman MQ-4C Triton unmanned maritime surveillance aircraft. The Australian government will issue a letter of request to the US Navy to gain access to detailed cost, capability and availability information ahead of

a potential Foreign Military Sales buy. Under the 2013 Defence White Paper, Australia plans to replace the AP-3C fleet with the manned P-8A Poseidon, as well as with the unmanned MQ-4C, which is one of the options being considered under Project AIR 7000 Phase 1B.

### ■ MRH90 milestone

The MRH90 helicopter has received official type certification and service release from the Australian Defence Force's Airworthiness Authority, the Chief of Air Force. The milestone comes three years later than planned. Initial operational capability with the Royal Australian Navy is expected in June (37 months late), while Army MRH90s are due to achieve IOC in 2014 — this milestone having slipped from April 2011. From a total of 46 MRH90s ordered, 19 have now been accepted for service. Four early production aircraft are receiving upgrades to bring them up to the latest standard. A further five helicopters are likely to be completed this year, and the remainder will follow in 2014. Australian Aerospace will deliver a 47th MRH90,

at no additional cost, to be used as a training aid at the Army's Aviation Maintenance School at Oakey, Queensland.

### ■ New Zealand to purchase Super Seasprites

New Zealand is to acquire eight Kaman SH-2G(I) Super Seasprite naval helicopters previously rejected by Australia. The total package is worth up to \$242 million and also includes two additional airframes for use as spares, a full motion simulator and Penguin anti-ship missiles. The purchase will allow aircraft to be embarked on the two ANZAC-class frigates as well as offshore patrol vessels and the multi-role ship HMNZS *Canterbury*; only two helicopters can currently be deployed simultaneously. The Royal New Zealand Air Force's existing fleet of five SH-2Gs will be retired. The SH-2G(I) airframes (upgraded former US Navy SH-2Fs) were originally built for Australia, but the contract was cancelled in 2008 after cost over-runs and technical deficiencies. The airframes are in storage in Connecticut, and will be delivered between 2014-16.



# SU-32/34

## FRONTLINE BOMBER

report: **Richard Johnson**

**T**he Su-34 frontline bomber (the export version Su-32) will be the striking core of the Russian frontline aviation. This is an adequate successor to the Su-24M all-weather day/night frontline bomber. Its development and production is among Sukhoi's top priorities. Sukhoi is a United Aircraft Corporation (UAC) subsidiary.

The State Joint Acceptance Tests of the Su-34 were completed in November 2010. The Russian Air Force commander signed the Su-34 State Tests report in April 2011 recommending its deployment to the Russian Air Force.

The series production of the Su-34 is organized at the Sukhoi Company's Novosibirsk aircraft plant. The aircraft are supplied under a state five-year contract with the Russian Defense Ministry signed in 2008. In March 2012, Sukhoi Company signed another state contract to supply

a large batch of Su-34s to the Russian Defense Ministry.

The Su-34 effectively engages ground, sea and air targets by using the complete range of airborne munitions, including high-precision types under adversary's fire and information warfare in all weather conditions, day and night. In terms of operational capabilities this is a 4+ generation aircraft. Its active protection system together with the latest computers creates extra opportunities for the pilot and navigator to carry out precision bombing and maneuver under adversary's fire. The superior aerodynamics, large internal fuel tanks, highly efficient digitally controlled bypass turbojet engines, air refueling system, add-on tank suspension and a comfortable crew cockpit enable a long distance flight up to 10 hours. The onboard digital open architecture equipment allows an easy replacement of its complexes and systems for new models.

The aircraft features excellent flight performance and agility, long-range aiming system, and modern onboard system of communication and information exchange with on-land flight control centers, ground troops, surface ships and flying aircraft. The Su-34 employs highly efficient long range guided air-to-surface and air-to-air weapons using a multiple channel capability. It is equipped with a smart radar countermeasure and defense system. The Su-34 has a sophisticated survivability suite, including an armored cockpit. Presently the operational capability of the aircraft is being increased with new airborne weapons.

According to pilots and navigators, the aircraft offers excellent ergonomics and extensive automation from takeoff to target approach, operational use, and landing. The machine is easy to handle.

The Su-34 bomber has set seven world records, including that of the horizontal flight altitude with a 5,000 kg load.





US Army officials at the Redstone Arsenal, Alabama, conducted the first flight of the OH-58F Kiowa Warrior during a ceremony on 30 April.

report: **Jamie Hunter and Michael Keaveney**

**T**HE US ARMY has conducted the maiden flight of the first OH-58F Kiowa Warrior, modernized under the Cockpit and Sensor Upgrade Program (CASUP). The OH-58F features a nose-mounted Common Sensor Payload (CSP), re-designed cockpit software, an upgraded control and display sub-system (CDS5) with three all-colour displays, integrated aircraft survivability equipment displays, an emergency stand-by instrument system and the ability to view and compare different sources of video simultaneously, as well as an upgraded weapons suite, navigation system and a dual-channel Full Authority Digital Engine Controller (FADEC) that provides improved engine performance and communications. The OH-58F also weighs 200lb (90.7kg) less than the OH-58D at 3,590lb (1,630kg).

Unusually, the US Army assumed the role of system integrator for the OH-58F upgrade effort, a first in US Army aviation. A manufacturer would traditionally fulfil the development, integration, and production role. This new approach allows the government and contracted engineer developers to keep working directly with military and government programme management, resulting in significant cost savings. By taking on the system integrator role, the Army says it has saved some \$37 million during the research, development, and test and evaluation phase, and more than \$551 million in the course of the procurement/production phase.

Col Robert Grigsby, Armed Scout Helicopter Project Manager, explained other benefits that result from expanding the Army's role: 'With the Army as integrator, we can maximize capability while minimizing taxpayer impact. Controlling the design allows us to rapidly field mature technologies to support the soldiers who depend on the Kiowa Warrior.'

The US Army's Armed Scout Helicopter Project Office at Redstone Arsenal in Huntsville is currently upgrading three OH-58Ds to the new configuration at the US Army Aviation and Missile Research Development and Engineering Center (AMRDEC)'s Prototype Integration Facility (PIF) at Madison County Executive Airport in Meridianville, Alabama. Each helicopter conversion will cost \$4-5 million, and building the aircraft at the Corpus Christi Army Depot is set to save the service about \$551 million.

Production will be carried out by the Corpus Christi Army Depot in Texas. Low-rate production is due to start in March 2015, and the first operational squadron should be fully equipped with OH-58Fs by 2016. The Army plans to convert a total of 368 Kiowa Warriors to the OH-58F configuration over the following five years.

### Prototype OH-58F

The 'cab' chosen as the first prototype OH-58F was originally delivered in January 1970 as serial 68-16821. In February 1970 it was assigned to the 35th Engineer Group's Aviation Section in Vietnam. The aircraft stayed in Vietnam until December 1971 and then served in Hawaii and Germany. Following this it was transferred to 1-17 CAV of the 82nd Aviation Combat Brigade and used in the invasion of Grenada.

The airframe was modified by Bell Helicopter in October 1993 to OH-58D standard and was allocated its current serial 93-00960. It served in Iraq from September 2005 to August 2006 with the 2-17 CAV. The 2-17 CAV took the helicopter to Afghanistan from January until December 2008, and it was back in Afghanistan for most of 2009 with the 7-17 CAV before being assigned to Redstone in August 2010 for testing, leading up to its conversion into an OH-58F. 📧

Below: **The first OH-58F, serial 93-00960, conducts its maiden flight.** US Army via Michael Keaveney



# OH-58F

TAKES FLIGHT





• Both pilots aboard a **Royal Jordanian Air Force Slingsby T67** trainer were killed when the Firefly crashed near King Hussein Air Base in Mafraq on 16 May.

• **F-16A** serial 6622 (USAF serial 93-0723), operated by the **Republic of China Air Force's** 455th Tactical Fighter Wing, crashed into the Taiwan Strait shortly after take-off from Chiayi Air Base on 15 May. The pilot, assigned to the 21st Fighter Squadron, ejected safely and was recovered by the crew of an S-70C from the Air Rescue Group.

• A **Turkish Air Force Block 50 F-16C** assigned to the 5th Main Jet Base (5 AJÜ) in Merzifon crashed near Caksir plateau in the Amanos Mountains of southern Osmaniye Province on 13 May. Although the pilot ejected from the stricken aircraft he did not survive. The mishap occurred near the Syrian border.

• An **Indian Army Dhruv MkIII** helicopter crashed on the Siachen glacier on 13 May. Neither pilot aboard was badly injured in the mishap.

• A **Yemeni Air Force Su-22** crashed in a residential area of Sanaa's Al-Asbahi district on 13 May, killing the pilot.

• A **T-41D** operated by the **Hellenic Air Force's** 360 Moira Aeroporikon Efarmogon (360 Initial Training Squadron) was damaged during an emergency landing in a rural area near Oropos, Greece on 13 May. The mishap was the result of an apparent engine failure.

• **M-346** serial CPX617 (6964/003) crashed during a test flight approximately 20 minutes after departing Turin-Caselle Airport, Italy, on 11 May. The Alenia Aermacchi test pilot ejected safely before the Master trainer went down in mountainous terrain in Val Bormida, between the regions of Piedmont and Liguria. The mishap marks the second loss of an M-346 prototype.

• A **Mi-24V** operated by the **Nigerian Air Force** crashed while attempting to make an emergency landing at Port Harcourt air base on 9 May. Although a post-crash fire wrote off the helicopter, the crew escaped safely.

• An unidentified **USAF remotely piloted aircraft** reportedly crashed in the Musa Kala district of Afghanistan's Helmand Province on 9 May.

• Both pilots aboard an **Alpha Jet E** operated by the **Nigerian Air Force** were killed when the aircraft crashed near Dargol in western Niger on 6 May. It was operating from Niamey, Niger, as part of the African-led International Support Mission to Mali (AFISMA), and was returning from a sortie when it went down around 37 miles (60km) west of the capital.

• Two pilots aboard a **Pakistan Army Schweizer 300C** helicopter escaped serious injury when the aircraft crashed near Gujiranwala district in Wazirabad Province on 3 May.

• **US Air Force KC-135R** serial 63-8877 crashed near the village of Chaldovar in northern Kyrgyzstan on 3 May. Although the aircraft and crew had been attached to the 376th Air Expeditionary Wing at the Manas AB Transit Center near Bishkek, Kyrgyzstan, the pilots and boom operator were normally assigned to the 92nd Air Refueling Wing's 93rd Air Refueling Squadron at Fairchild AFB, Washington. The Stratotanker itself, which went down around 100 miles (160km) west of Manas, was assigned to the 22nd ARW at McConnell AFB, Kansas.

• A **Boeing 747-428BCF** operated by National Air Cargo under a government contract crashed shortly after departing Bagram Air Base, Afghanistan, on 29 April, killing seven crew. The aircraft, which carried the civil registration N949CA (c/n 25630/960), was reportedly carrying five military vehicles when it went down.

• A **US Air Force MC-12W** assigned to the 451st Air Expeditionary Wing crashed in southern Afghanistan on 27 April, killing all four crew. It went down near Sah Joy in Zabul Province approximately 110 miles (177km) north-east of Kandahar Airfield. The aircraft and crew had been attached to the 361st Expeditionary Reconnaissance Squadron.

• A **Kazakhstan Air Force MiG-31B** crashed into a corn field in the Karagandinskoy region near the village of Prostornoye on 23 April. Although both crew ejected from the aircraft, the pilot was killed. The mishap occurred 60 miles (97km) south-west of the city of Karaganda.

• Both pilots aboard an **Islamic Republic of Iran Air Force F-5F** were killed when the fighter crashed into Filman Mountain in

Abdanan Province on 21 April. The fighter had taken off from Dezful, 285 miles (460km) south-west of Tehran, and the crash occurred near the Iraqi border.

• Four personnel aboard an **Iraqi Air Force helicopter** were injured when the unidentified aircraft crashed near Habaniya Base in Anbar Province, 6 miles (10km) south of Fallujah, on 19 April.

• **US Marine Corps CH-53E** BuNo 162484 was destroyed by fire following a hard landing near the Jipo-ri Range in Cherwon, South Korea, around 55 miles (88km) north of Seoul, on 16 April. The Super Stallion had been conducting operations in support of Exercise 'Foal Eagle' when the mishap occurred near the border with North Korea. Five crew and 16 Marines were aboard the helicopter and six were hospitalised. Normally based at MCAS Miramar, California, the CH-53E, which had been assigned to Marine Heavy Helicopter Squadron 465 (HMH-465), was attached to Marine Medium Helicopter Squadron 262 (HMM-262) (Reinforced) as part of the 31st Marine Expeditionary Unit (MEU). ☒

## SECOND MASTER LOSS

Seen in happier times at Rivolto air base, M-346 serial CPX617 was lost on 11 May. Alenia Aermacchi test pilot Matteo Maurizio, formerly of the Italian Air Force's Reparto Sperimentale Volo, was taken to a hospital in Cuneo by a helicopter of the regional emergency service. His injuries included fractured vertebra and a thoracic trauma. As this magazine went to press, the cause of the crash remained unknown, and civil and military investigations were in progress.



Marco Rossi



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# FRONT LINE

Combat Aircraft's regular column — taking a look behind the headlines

by Robert F. Dorr

Contact the author at [robert.f.dorr@cox.net](mailto:robert.f.dorr@cox.net)



## PENTAGON BOSS ENCOUNTERS THE MESS IN WASHINGTON

A Pentagon official told me that Defense Secretary Chuck Hagel got 'hot under the collar' when told it would take 18 months to transfer a fighter squadron from one base to another.

'And then we briefed him on the budget situation, which he was going to have to explain to Congress', said the official. Famous for his temper, Vietnam War infantry veteran Hagel held himself in check this time. 'We could see he was learning. He thought it would be difficult to accomplish anything in Washington. Now, he knows it's almost impossible.'

### Capital conundrum

Hagel, from Nebraska, sat in the US Senate from 1997 to 2009 but isn't a Washington insider. He's a Republican in a Democratic administration. He's new to the bureaucracy. And he's frustrated.

In a divided, partisan Washington, three budget proposals for Fiscal Year 2014 are in contention — one each from the Senate, the House of Representatives, and the administration Hagel works for. None stands a chance of being enacted. Any kind of traditional budget is likely to remain out of reach amid bickering and gridlock for the foreseeable future. Still, the administration's proposal is the one Hagel must explain and defend. And it's the official version, the one that draws comment from press and public.

The \$526.6-billion proposal takes into account the harsh measures imposed by the Budget Control Act of 2011 — the so-called sequester — which requires the Pentagon to reduce expenditures by \$487 billion over the next 10 years. Yes, Washington is the only place where you 'save' by not spending money you weren't going to get anyway.

From an air power perspective, the 2014 budget proposal is straightforward. A new, multi-year C-130 Hercules initiative cuts across service branches and funds six C-130Js, one HC-130, four MC-130s and five AC-130s. The proposal funds procurement of 12 MQ-9 Reaper unmanned aerial vehicles (down from a once-planned 24), 19 F-35A Lightning II Joint Strike Fighters and three CV-22B Osprey tilt-rotor aircraft, plus upgrades and modifications including improvements to all 1,018 of the US Air Force's F-15 Eagles and F-16 Fighting Falcons. Funding for the KC-46A tanker continues.

The plan also includes money for what's now called the Long-Range Strike Bomber, which so far is more an idea than an aircraft. The projected next-generation bomber has undergone name changes in recent years, but has received only token funding.

### Reluctant retirements

The plan retires all 18 RQ-4B Block 30 Global Hawk drones, something the US Air Force has been trying to do for several years — and which Congress opposes. It includes retirement of 11 C-21A Learjets, aircraft that are often used by congressmen for travel — something no-one thinks will survive scrutiny on Capitol Hill.

The administration's proposal gives the US Navy 21 more EA-18G Growler electronic warfare aircraft. Production of the F/A-18E/F Super Hornet will end, with about 515 Super Hornets and 114 Growlers in the inventory by the end of 2015. The US Navy also receives almost \$1.5 billion to finance construction of the Ford-class aircraft carriers USS *Gerald R. Ford* (CVN 78) and USS *John F. Kennedy* (CVN 79). The Ford-class carriers are slated to replace as many as 10 Nimitz-class carriers as they reach their 50-year lifespan over coming decades. Development of the Navy's MQ-4C Triton Broad Area Maritime Surveillance aircraft — a derivative of the Global Hawk — is being slowed partly as a function of the budget proposal and partly because of technical issues with its V-tail design and integration of its mission computer.



*'Planned future spending cuts the heart out of operating and maintenance expenses, the importance of which is often underestimated'*



This photo: **The consolidation of the US Air Force's F-22 fleet has proved far more troublesome than was originally envisaged.** USAF

Left: **US Secretary of Defense Chuck Hagel.** US DoD



None of these changes will prevent Boeing from marketing an upgraded version of the F/A-18E/F it hopes to sell to the US Navy and plans to fly for the first time this summer.

### **'Complete uncertainty'**

Hundreds of people spent tens of thousands of hours shaping this plan — Hagel is said to have spent days studying the result of their work — yet no-one knows what sort of actual spending will take place when a funding law is enacted. 'We are living in a world of complete uncertainty', Hagel said at a news conference, referring to the dysfunctional state of governance in the US capital. Responding to the charge that he'd been appointed for the purpose of slashing defence, Hagel rejected the idea that his mission is to 'cut the heart out of the Pentagon'. He also said he wants to avoid 'a swamp of knife fighting' over budget issues.

Meanwhile, before anything is known about the next fiscal year, current budget restraints have forced the US Air Force to cut planned flying hours by 45,000 prior to 1 October. Planned future spending does, in fact, cut the heart out of operating and maintenance expenses, the importance of which is often underestimated.

The most publicised military spending cuts — cancellation of performances by the Blue Angels and Thunderbirds demonstration teams, of airshows and of 'Red Flag', 'Red Flag Alaska' and 'Global Challenge' exercises — are not related to the proposal but, instead, reflect the situation during the current fiscal year.

Hagel is reported to have said that he thought he knew Washington — he was a senator, after all — but that he didn't truly understand how crippled the process of government has become.

That transfer of a fighter squadron? Somebody had to go back to Hagel and explain that it won't take 18 months after all. It'll take three years.

Among symbols of everything that isn't working in the US government today, the move by the 7th Fighter Squadron from Holloman Air Force Base, New Mexico to Tyndall Air Force Base, Florida stands out. Never mind that a traditional budget hasn't been in place for more than four years. 'We can't even move a bunch of jets from Point A to Point B?' he asked. It's not known whether Hagel's famous temper came to the fore over this movement of metal.

Several years ago, in a routine move reported in this magazine, the US Air Force decided to

shift the 7th Fighter Squadron — known as the 'Bunyaps' or the 'Screamin' Demons' — with its 21 F-22s, seven T-38C Talons, 860 military personnel and 200 civilians from Holloman to Tyndall. It was a good idea. It would have reduced the total number of F-22 bases and consolidated a niche fleet that has no 'attrition spares' in its inventory. Holloman was to acquire other assets as compensation.

As long ago as September 2011, a Pentagon official cautioned that it would happen incrementally. 'They won't all fly there in one day', the official said. The move was to be finished by 30 September 2012. When no budget was in place, the move was delayed for a year. And then, legislation was passed to permit the move but no funds were allocated. At press time, the F-22 outfit was still at Holloman and might — or might not — make the move in 2014.

And Hagel? He is said to be 'thoroughly briefed' on this maze of fiscal and financial confusion and to be mellowing in office. He may very well be angry about how ineffectual Congress has become. Most Americans are. But for now, Secretary of Defense Chuck Hagel is doing his job and staying cool.

In Washington, that's not easy. 🇺🇸

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***"We are living in a world of complete uncertainty',  
Hagel said at a news conference, referring to the  
dysfunctional state of governance in the US capital"***

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# MiG-29K SHIPBORNE 'FULCRUM' COMES OF AGE







This photo: **One of the Indian Navy's two-seat MiG-29KUBs powers down the runway at INS Hansa.** Angad Singh

Below: **Single-seat pre-production MiG-29K 'Bort 941' conducts deck trials in July 2012. The two-seat and single-seat versions feature exactly the same fuselage and canopy, but the latter has a fuel tank in place of a rear seat.** Images by RAC MiG unless credited otherwise



The MiG-29K/KUB shipborne fighter programme has emerged from apparent oblivion and turned into a success story thanks to huge Indian investment and the Indian Navy's reliance upon the capabilities of the Russian carrier jet and associated ship-building industries.

report: **Alexander Mladenov**

**M**AJOR DEVELOPMENT WORK on a totally revamped MiG-29K/KUB, which now features a re-designed fuselage, modified engines and an all-new avionics suite, was largely completed by 2010, with serial production having been launched two years previously and first customer deliveries taking place in 2009.

As many as 16 MiG-29K/KUBs from the first batch, ordered in 2004, were taken on strength by the Indian Navy's air arm between 2009 and 2011, while the initial examples from the second batch of 29 aircraft, ordered in March 2010, were delivered in 2012.

The solid progress of the Indian MiG-29K/KUB programme eventually prompted the Russian Defence Ministry to place an order for 20 single-seat and four two-seat shipborne 'Fulcrums'. These are set to be flown by the 279th Carrier-borne Fighter Regiment (KIAP), the sole shipborne fast jet unit within Russian naval aviation. Here, the new multi-role derivative will supplement and eventually supersede the Su-33 'Flanker-D'. This contract, signed with Russian Aircraft Corporation MiG (RAC MiG) in February 2012, foresees delivery of 24 MiG-29K/KUBs between 2013 and 2015. The first four jets are slated to be handed over during the first half of 2013 and will undergo a brief flight-testing and evaluation programme, carried out by the Russian Air Force's 929th Flight Test Centre at Akhtubinsk. Delivery plans for 2014 and 2015 foresee the hand-over of 10 aircraft per year. The new type is destined for operations from the deck of the *Admiral Kuznetsov*, the sole Russian Navy aircraft carrier.

The MiG-29K/KUB offers a true multi-role capability. Thus the shipborne 'Fulcrum' will provide the *Admiral Kuznetsov* with a genuine (air) power projection role, something that cannot be said for the Su-33, which remains a pure air-superiority fighter.

### Flight trials on *Vikramaditya*

It is a fact widely known that the re-fit and testing of INS *Vikramaditya*, the former Soviet aircraft carrier *Admiral Gorshkov* (originally launched in 1982 as the 'heavy aircraft-carrying cruiser' *Baku*), has not progressed as originally planned. This is due to a combination of technical and organisational issues, which eventually led to significant delays and huge price increases compared to the original purchase agreement.

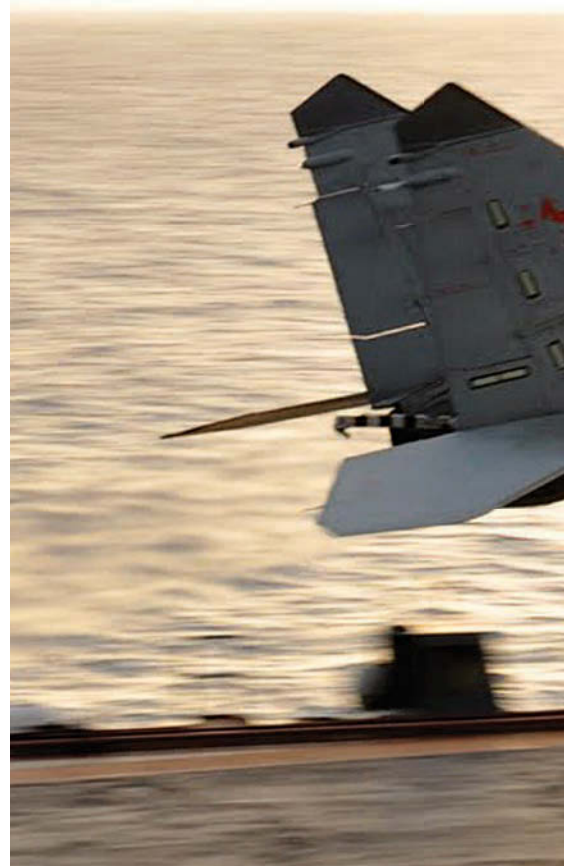




The aircraft carrier, re-fitted and converted at the Sevmash shipyard in Severodvinsk, finally commenced its long-delayed sea trials campaign in the White Sea and Barents Sea on 8 June 2012. This intensive effort lasted 107 days and also called for the scrupulous testing and evaluation of all on-board systems supporting aircraft flight operations, handling and maintenance, including the optical and instrument landing system, approach and surveillance radars, arrestor gear, take-off restraints and the hangar and aircraft handling equipment. The trials also saw extensive use of the first MiG-29K ever to be built, 'Bort 311' (produced in 1988), which acted as a full-scale mock-up for various hangar and deck handling/servicing tests, together with mock-ups of the Ka-27 and Ka-31 helicopters.

The initial testing and evaluation phase of the ship's approach/surveillance radars and radio and optical landing systems was performed in early July 2012 by Su-33 fighters belonging to the 279th KIAP. These flew a number of mock approaches with go-around passes (i.e. without touching the deck), allowing the ship's landing systems personnel to check the calibration alignment and functionality of the ship's newly-installed radio and optical landing aids and approach radars. A series of real-world deck trials followed, utilising two RAC MiG-owned aircraft deployed to Severomorsk-3 airfield near Murmansk, better known as the home base of the 279th KIAP. The first of these, MiG-29KUB 'Bort 204', was a newly-built production-standard example, replacing the pre-production MiG-29KUB ('Bort 947') that was lost during flight-testing at Akhtubinsk in June 2011. The other was the hard-working first pre-production MiG-29K, 'Bort 941'. The two-seater, with highly experienced RAC MiG test pilots Mikhail Diorditsa (recipient of the Hero of Russia award, occupying the rear seat)

**Indian MiG-29KUB 'Bort 672' conducts trials from the Russian Navy aircraft carrier Admiral Kuznetsov sailing in the Barents Sea.**



Above, top to bottom: The Indian Navy formally inducted its fleet of MiG-29Ks and KUBs to service at INS Hansa air base in Goa with INAS 303 'Black Panthers'.  
Mrityunjay Mazumdar

RAC MiG completed in-flight refuelling trials of the Indian naval 'Fulcrums' prior to delivery.

Sergei Korotkov, CEO of RAC MiG, in the back seat of a MiG-29KUB during the 2012 trials.



and Mikhail Belyaev at the controls, commenced landing approach practices in mid-July. A first touch-and-go was reported for 'Bort 947' on 17 July, and it was followed the same day by the single-seater, piloted by Russian Air Force test pilot Oleg Mutovin, another Hero of Russia owing to his achievements as a military test pilot.

After several successful touch-and-goes, the first arrested landing by the MiG-29KUB, flown by Mikhail Belyaev and Oleg Diorditsa, took place on 28 July; on the same day the two-seater made the first take-off from the 'ski-jump' ramp and then performed its second deck landing.

Within the space of less than two months, the two MiG-29s amassed 41 deck take-offs and landings, testing different external load configurations, the first of which included two RVV-AE (AA-12 'Adder') and two R-73E (AA-11 'Archer') air-to-air missiles and a centreline fuel tank. The heaviest 'Fulcrum' configuration flown off the deck of INS *Vikramaditya* during the 2012 campaign was the 'buddy-buddy' tanker, incorporating one centreline PAZ-1MK refuelling pod and four underwing tanks.

The flight trials campaign also saw a number of take-offs and landings being performed at the limits of the deck roll and pitch envelope, while on 20 August 2012 Col Mutovin reported the initial launch from the 'short' start position, situated next to the island. During the flight operations, the ship maintained a speed of between 18 and 22kt.

All the flight trials and evaluations completed by both the single- and twin-seat MiG-29s, as well as flights by the Ka-27/31 helicopters and the operation of all aviation-related systems, were observed closely by Indian Navy officers. The final sorties from the deck of INS *Vikramaditya* in September 2012 were carried out in twilight conditions, in

## MiG-29K (MiG-29KUB\*) SPECIFICATION

Dimensions	
Length	17.30m
Wingspan	11.00m
Height	4.40m
Wing area	38.00 square metre
Weights	
Normal take-off	18,550kg (18,650kg)
Maximum take-off	24,500kg
Performance	
Maximum speed at sea level	1,400km/h
Maximum speed at high altitude	2,200km/h (2,100km/h)
Ceiling	17,500m
Ferry range on internal fuel	2,000km (1,700km)
Ferry range with three drop tanks	3,000km (2,700km)
* MiG-29KUB data provided in parentheses where these differ	

order to evaluate the performance of the deck lighting system.

It was reported that some 70 per cent of the arrested landings made during the 2012 campaign saw the aircraft trapping the second wire, that recommended for a good landing. This is a testament not only to the pilots' skills but also to the ship's fine-tuned Resistor-E instrument landing system and the Luna optical landing system that provides precise flightpath guidance until touch-down. In total, the fighters and helicopters involved in the test and evaluation effort logged 218 sorties from the deck of *Vikramaditya*.

The deck tests and evaluation campaign lasted until mid-September 2012, since it

emerged that the ship's propulsion system failed to work according to the specification at the full-power rating. This was a result of production deficiencies relating to the boilers. It delayed the completion of deck tests as well as postponing the contractual delivery date that had been set for the end of 2012. In late 2012 and early 2013, INS *Vikramaditya* received a modified propulsion plant and underwent minor repairs at Sevmash in a bid to re-commence its sea trials in late May or early June 2013 when the sea ice has melted. The sea trials are tentatively slated for completion by the end of the summer, while the ship's hand-over to the Indian Navy is finally expected to take place by the end of the year. >





## INS VIKRAMADITYA

The purchase, re-fit and conversion of the *Admiral Gorshkov* into a STOBAR carrier with a 14.2-degree ski jump was originally priced at \$750 million. A contract was signed in March 2004, together with that for development and production of the shipborne MiG-29s. Rosoboronexport was appointed by the Russian government to lead the deal, and a delivery date was set for 2008. However, cost disputes significantly delayed re-fit and in March 2010 a new price tag of \$2.35 billion was agreed, together with a new delivery schedule calling for hand-over at the end of 2012.

The ship, now known as *INS Vikramaditya*, is 920ft (274m) long, has a full displacement of 45,300 tonnes and can accommodate a mix of between 30 and 40 MiG-29s and Ka-28/31s. Conversion entailed alteration of the entire forward section of the ship, the hangar area and portions of the superstructure. Some 780 tonnes of material were deleted and 8,500 tonnes — mostly in the extension of the flight deck — added in the process. Together with the longer flight deck, it received a 'ski-jump' ramp to facilitate take-offs by conventional fighters and a three-wire arrestor system. Other major upgrades included a new propulsion plant with engines and boilers, new generators, electrical machinery and communication system, and an all-new suite of navigation and aircraft servicing/handling aids.

There are two take-off positions equipped with blast deflectors and restraints — dubbed 'long' and 'short' — and providing the MiG-29K/KUB with a take-off run of 640ft (195m) and 410ft (125m) respectively. Use of both provides increased launch rates and reduced overall take-off time in the event of large air-group operations.

The concluding phase of the exhaustive test and evaluation effort of the ship's systems supporting air wing operations is slated to be carried out in the Barents Sea during the spring and summer months. It will mainly comprise night take-offs and landings in order to check the calibration and functionality of the ship's Luna optical landing system and flight deck lighting.

### 'Black Panthers'

The Indian Navy evaluated the type in April 2002. Cdr Surendra Ahuja, a naval test pilot, flew the prototype MiG-29K solo in Russia without any familiarisation on a two-seater simply because the KUB variant had not yet been developed. This was also the first time the Russians had permitted a foreigner to test-fly the prototype. Thus was set in motion the acquisition process.

The first Indian order for the shipborne 'Fulcrum' derivative comprised 12 single-seat MiG-29Ks and four two-seat MiG-29KUBs, reportedly priced at \$740 million, a figure that also included the development activities. This became a long-awaited opportunity for the crisis-stricken RAC MiG to commence development and production of the new-generation shipborne MiG-29. It thereby resurrected a two-decades-old programme abandoned in the early 1990s, resulting in a shipborne aircraft (designated as izdeliye 9.41

This photo: **An Indian Navy MiG-29K shows off an impressive weapons fit.** Angad Singh

Clockwise from right: **'Bort 941' is a newly-built MiG-29K 'second-generation' shipborne single-seater (the first of the new version) built in 2007 and with a first flight on 25 June that year, owned by RAC MiG and extensively used during the testing and evaluation effort.**

**The Indian Navy selected the Thales TopSight-I helmet-mounted sight for the MiG-29KUB.** Thales

**The MiG-29K/KUB is equipped for 'buddy-buddy' refuelling, for which it employs a centreline PAZ-1MK pod and up to four 1,150-litre underwing tanks.** Stanislav Bazhenov



for the single-seater and izdeliye 9.47 for the two-seater) completely different from the first-generation MiG-29K, first flown on 23 July 1988.

An all-new fuselage with extensive corrosion protection was developed, as well as a good many new systems and a more powerful 'maritime' derivative of the Klimov RD-33K jet engine. Two pre-production aircraft — one two-seater and one single-seater — using exactly the same basic fuselage design were built to bear the brunt of the flight test effort. These aircraft took to the air on 20 January and 25 June 2007 respectively, while the first production-standard shipborne 'Fulcrum' for the Indian Navy made its maiden flight on 18 March 2008. The first four production MiG-29K/KUBs that rolled off the line at the RAC MiG final assembly facility in Lkhovitsy near Moscow were employed for the conversion-to-type training of a group of nine Indian instructor pilots in Russia, which took nine months.

Delivered in December 2009, the initial six MiG-29K/KUBs (including two of the latter) were taken on strength by 303 'Black Panthers' Squadron (INAS 303), home-based at INS Hansa in Goa, and formally inducted on 19 February 2010. INAS 303 then operated as an Intensive Flying Trials Unit (IFTU).

Initial ship compatibility trials of the naval 'Fulcrum' were carried out in late September

2009 when the pre-production MiG-29K 'Bort 941', and one production-standard MiG-29KUB built for the Indian Navy, 'Bort 672', operated from the Russian Navy aircraft carrier *Admiral Kuznetsov* sailing in the Barents Sea.

The second Indian order for 29 MiG-29K/KUBs, placed in March 2010, is estimated to be worth some \$1.5 billion; it was, in fact, an exercising of the option to purchase more MiG-29K/KUBs as included in the original 2004 contract. Both contracts also incorporated pilot and technician training services, delivery of spare parts and maintenance equipment as well as flight simulators and interactive ground- and sea-based training systems.

Delivery of the 'Fulcrums' covered by the second Indian contract is currently under way in order to re-equip one more Indian Navy fighter squadron. As of March 2013, as many as four aircraft from the second order had been delivered to India; seven more were expected to be handed over before the end of the year and all 29 by 2015.

Having made operational the aircraft and its weapons systems, INAS 303 was formally commissioned into the Indian Navy on 11 May 2013 with 16 MiG-29Ks and four KUBs. The new fighters are data-linked to each other and to other types like the Kamov Ka-31. The Indian Navy concept of operations (CONOPS) calls for use of the two platforms.



## Towards maturity

The MiG-29K features a number of design alterations compared to the baseline 'Fulcrum', introduced in a bid to make this derivative better suited for shipborne operations. These render the aircraft suitable for operations from small-sized aircraft carriers (above 28,000 tonnes of displacement) and enable 'ski-jump' launches and arrested landings at high weights.

Most of the design novelties implemented in today's shipborne 'Fulcrum' were tested on the original MiG-29K prototypes (known by the RAC MiG internal designation izdeliye 9.31) in the late 1980s and early 1990s. These include the larger folding wings — with increased span and area — as well as the beefed-up undercarriage. The MiG-29K/KUB boasts an all-new wing that incorporates large-size double-slotted trailing-edge flaps, double-slotted leading-edge slats and drooping ailerons. The wing introduced the so-called Krueger flaps (small leading-edge vortex controllers extending from the wing root), used for low-speed stability improvement by reducing oscillations on the glide path during the landing approach. The extensive wing area and highly automated mechanisation provides for a considerable lowering of the aircraft's approach speed, resulting in a comfortable angle of attack for the pilot on finals and while touching down on the deck.

The dorsal spine terminates in a 'beaver tail' with a hydraulically driven square-section arrester hook installed below. Extensive corrosion-protection measures are included in the airframe construction, engine and systems, a pre-requisite for operations in an aggressively salty maritime environment. The airframe incorporates approximately 15 per cent composite materials.

The internal fuel tanks were made much more capacious than those of the baseline 'Fulcrum', holding 11,463lb (5,200kg) of kerosene, equivalent to 6,666 litres, and include a conformal dorsal tank, holding 858lb (390kg) or 500 litres in the fuselage centre-section aft of the cockpit. The single-seat MiG-29K boasts a 1,082lb (492kg)/630-litre internal tank housed just behind the cockpit, while the MiG-29KUB has the rear cockpit in the same location, leading to an internal fuel capacity seven per cent lower than that of the single-seater. The shipborne MiG-29 introduces a new 2,150-litre under-fuselage fuel tank, as well as up to four 1,150-litre underwing drop tanks. It has a fully retractable in-flight refuelling probe to the port side of the windshield.

The powerplant consists of two Klimov RD-33MK Sea Wasp engines, rated at 88.3kN (20,160lb) at maximum afterburner and 52.97kN (11,900lb) at the military power setting, while their dry weight is 2,340lb

(1,062kg). The Sea Wasp (actually a literal translation of the Russian for a type of jellyfish) is a follow-on derivative of the improved RD-33 Series 3. The new engine boasts sophisticated fully-automatic digital engine control (FADEC) and re-designed fan, high-pressure compressor, combustor, and low-pressure and high-pressure turbines in order to increase thrust, reduce smoke and extend both the time between overhauls (TBO) and the overall service life (to 4,000 hours). The engine intakes are fitted with simple and lightweight protective grilles to prevent foreign object damage on take-off and landing.

The new, radically re-designed KSA-33M accessory gearbox has two independent modules (one assigned to the port and the other to the starboard engine) for driving its own set of generators and pumps as well as its own starter. The VK-100 turbine starter has its exhaust tube directed upwards to improve fire safety during deck operations; this also permitted a much larger under-fuselage drop tank on the centreline pylon compared to that of the baseline MiG-29.

The MiG-29K/KUB is equipped with the KSU-9.41 quadruple-channel digital fly-by-wire (FBW) flight control system with envelope protection, auto-throttle (especially useful during deck landings) and in-flight load alleviation functions, as well as a specific mode for improving stability and



controllability during air-to-air refuelling. The FBW system affords fully-automatic lift control in all flight regimes via continuous in-flight scheduling of the slats, trailing-edge flaps, Krueger flaps and tailplane, depending on the angle of attack and Mach number, and without trim changes being felt by the pilot.

MiG-29K/KUB equipment also includes the highly automated Karat on-board self-diagnostic and data-recording system, the Berkut video recorder system and the Sapfir ground mission-planning system, while the pilot sits in an improved Zvezda K-36D-3.5 'zero-zero' ejection seat.

The naval jet and its systems feature the so-called on-condition maintenance concept, which contributes to a reduction of some 40 per cent in direct operating costs per flight hour. Scheduled maintenance checks are due

every 300 flight hours or 30 months (whichever occurs first), while heavy maintenance checks occur every 1,000 hours or 10 years.

### All-new mission avionics

The mission avionics include the PrNK-29K integrated targeting and navigation suite, developed by the Ramenskoye Instrument Design Bureau and based on a quadruple-channel Mil Std 1553 avionics databus. The most important system within the suite is the Phazotron-NIIR FGM-129 Zhuk-ME mechanically scanned slotted-antenna pulse-Doppler radar. This works in both air-to-air and air-to-surface modes, and has a multiple-target engagement capability, with a claimed maximum detection range of about 81nm (150km) and acquisition range of 65nm

(120km) against a fighter-size target (with a radar cross-section of 5 square metres). In the air-to-surface mode, its maximum detection range against large-size ships extends to 161nm (300km). The radar can track up to 10 aerial targets and provide data for the engagement of four of these with RVV-AE beyond visual range (BVR) active-radar missiles, while the air-to-surface modes also take in a high-resolution terrain-mapping function. Ground and sea target positioning accuracy is advertised to be within 16ft (5m), while resolution in the air-to-surface mode is within 10ft (3m).

The NIIP OLS-UEM electro-optical (EO) search and track system is also capable of operating 90 degrees left and right (in azimuth), 15 degrees below and 60 degrees above (in elevation). It incorporates infra-red (IR), laser and TV sensors and works in both air-to-air and air-to-surface modes. In the former mode, the EO system is claimed to be capable of detecting and automatically tracking aerial targets in tail-on engagements at a maximum distance of 24nm (45km), while the head-on detection range is up to 8nm (15km). The embedded laser rangefinder is useful in attacks against air and surface targets and has a range of up to 8nm (15km).

The third component of the MiG-29K/KUB's sophisticated targeting suite is the Thales TopSight-I helmet-mounted sight and display (HMSD) system, allowing off-boresight target designation and cueing of the EO sensor, radar, inertial navigation system (INS) and the seekers of IR- and TV-guided air-to-air and air-to-surface missiles. It also facilitates off-boresight visual acquisition by the pilot in





both the air-to-air and air-to-surface modes, by using target position data derived from the EO sensor, radar, INS and missile seekers. Another HMSD capability, available only for the MiG-29KUB two-seater, is target designation from front seat to back seat and vice versa (also known as target hand-off) — useful for enhancing safety and operational effectiveness. Testing of the TopSight has begun using 'Bort 941', initially with the pilot in the rear cockpit retaining the Russian-made ZSha-7 helmet.

The MiG-29K/KUB has provision for employing a targeting pod and its open-architecture avionics design allows easy integration of additional Russian and Western-made systems.

Another non-Russian mission system integrated on the Indian MiG-29K/KUB is the IAI Elta EL/L-8222 podded self-protection jammer (SPJ), which can be installed on the starboard outer underwing pylon and is typically intended for use as a self-escort jammer. The MiG-29K/KUB's self-protection suite also features the Indian-made Tarang radar warning receiver (RWR), as well as two Russian-made downwards-firing 50mm chaff/flare dispensers on the outer side of the engine nacelles below the fins, each containing 16 rounds. RAC MiG claims that a set of measures were undertaken to provide a significant radar cross-section reduction.

The communication, navigation and identification (CNI) suite of the Indian shipborne MiGs incorporates a mixture of French, Indian and Russian equipment, most, if not all, of which have already been integrated on the Indian Air Force's

Su-30MKIs. French equipment used in the CNI suite comes in the form of the high-performance Sagem Sigma 95N INS, with an integrated GPS receiver for accurate navigation and targeting. The list of Indian-made items includes a radio altimeter, TACAN short-range navigation system, VOR/ILS/MRK navigation aids, IFF and UHF/VHF radios, while the Russian company Polyot supplies the R-800L2 VHF/HF radio as well as the R-098 jam-resistant secure tactical datalink system for sharing targeting and navigation data. The A380MS carrier instrument landing system, working together with the ship's Resistor-E instrument landing radio aid, is another Russian-made system on board the Indian jets.

The single-seater's fully digital 'glass' cockpit incorporates a large monochrome IKSh-1M head-up display (HUD) with 26-degree field of view and three side-by-side 6 x 8in MFI-10-7 LCD displays, while the two-seater has seven such displays. Each MFI-10-7 is used for displaying flight/navigation, targeting and system status information as well as digital terrain maps and targeting data.

## Weapons options

The MiG-29K/KUB sports nine pylons for carrying weapons or other stores — eight under the wings and one beneath the fuselage. In addition, the two innermost underwing pylons can be fitted with tandem bomb racks, increasing the number of hardpoints to 13.

The air-to-air weapons integrated on the Indian aircraft include a mixture of R-77 RVV-AE BVR and R-73E within visual range (WVR) missiles — up to eight can be carried in different combinations, or six missiles plus

two underwing fuel tanks. The air-to-surface missile options include the Kh-31A (AS-17 'Krypton') and Kh-35E/UE (AS-20 'Kayak') active radar-homing anti-ship missiles as well as the Kh-31P anti-radiation missile and Kh-29T/TE (AS-14 'Kedge') TV-guided missiles — up to four can be carried under the wings. Among the guided bomb options are up to four KAB-500Kr 500kg (1,100lb) TV-guided bombs, while the unguided weapons selection takes in free-fall bombs weighing up to 500kg (1,100lb) each, and various rockets. The maximum combat load is 5,500kg (12,100lb).

The MiG-29K/KUB retained the tried and tested GSh-301 30mm cannon with 150 rounds, installed in the port leading-edge extension.

Examples built for the Russian Navy retain the Sigma 95N and TopSight-I systems, but all the equipment of Indian and Israeli origin is removed and Russian-made equivalents integrated. For example, the Tarang RWR is replaced by the SPO-150 Pastel. The Russian Navy's shipborne MiGs are also capable of using the non-export versions of all air-to-surface guided weapons already integrated on the Indian MiG-29K/KUBs, which, as a rule, boast higher performance than that of their export derivatives. The list of air-to-air weapons available for carriage on the Russian MiG-29K/KUB, or at least planned for integration in the foreseeable future, includes the new RVV-SD BVR missile with a maximum range in head-on engagements at high altitude of 60nm (110km) and the RVV-MD WVR missile, a vastly improved R-73 derivative. 

Above left: **The MiG-29KUB features the Phazotron-NIIR FGM-129 Zhuk-ME slotted-antenna pulse-Doppler radar, with air-to-air and air-to-surface modes.** Alexander Mladenov

This photo: **The first arrested landing by the MiG-29KUB, flown by Mikhail Belyaev and Oleg Diorditsa, took place on 28 July 2012.**

Right top to bottom: **MiG-29KUB 'Bort 204' during the July 2012 trials aboard Vikramaditya. The flight deck is in STOBAR (short take-off but arrested recovery) configuration with a 14.3-degree ski-jump and a 198m angled deck.**

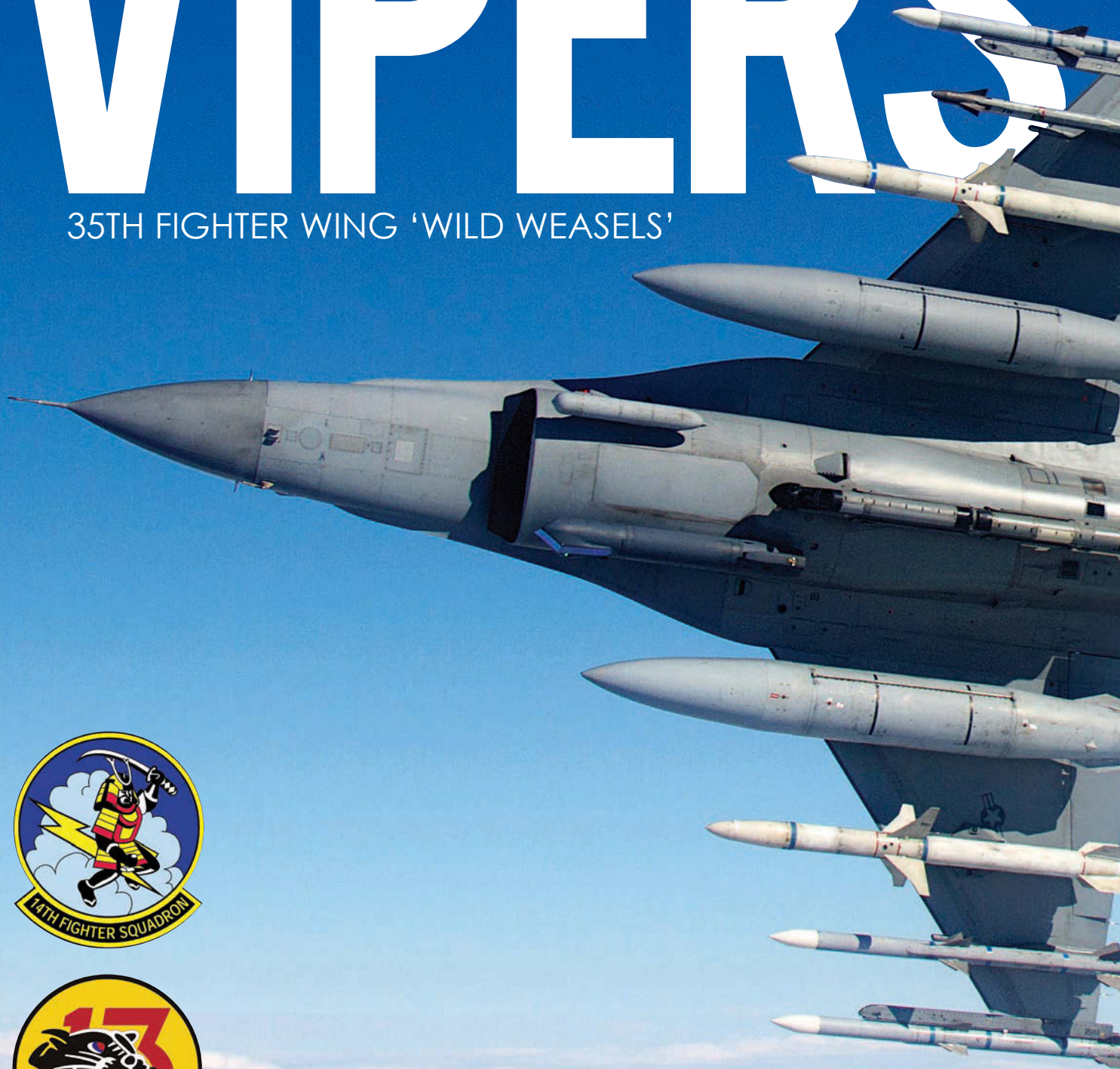
**Indian Navy MiG-29KUB 'Bort 672' aboard the Admiral Kuznetsov in the Barents Sea for initial ship-compatibility trials in September 2009.**





# MISAWA VIPERS

35TH FIGHTER WING 'WILD WEASELS'





As well as being special 'SAM-killers', the 35th FW's F-16 drivers keep themselves sharp in all elements of the wider range of operations for the 'Viper'.



With an illustrious history behind it, the US Air Force's 35th Fighter Wing is today the host unit at Misawa Air Base — the northernmost US air base in Japan. As well as recent deployments in support of the 'War on Terror', the SEAD specialists are charged with the defence of US and Japanese interests in the vital Pacific region.

report and photos: **Jake Melampy**

**F**OLLOWING A LONG and very successful tenure operating the legendary F-4 Phantom II at George Air Force Base, California, the 35th Tactical Fighter Wing was de-activated on 15 December 1992. For a brief period the wing returned to life at Naval Air Station Keflavik, Iceland, protecting and securing the North Atlantic region, until it was again subject to de-activation on 30 September 1994. The following day, it was once again re-constituted as the 35th Fighter Wing at Misawa Air Base in northern Japan, assuming the missions and responsibilities previously performed by the 432nd Fighter Wing.

Today, the 35th FW is one of the premier fighter wings within the US Air Force, flying two squadrons of F-16 Fighting Falcons in the suppression of enemy air defences (SEAD) or 'Wild Weasel' role. The 13th Fighter Squadron, the 'Panthers', led by Lt Col John 'Cheech' McDaniel, and the 14th Fighter Squadron, 'Samurai', headed by Lt Col Gene 'Owner' Sherer, are each assigned the Block 50 version of the F-16, designed with the 'Weasel' mission in mind.

In essence, 'Weaseling' is the art of detecting, locating and suppressing enemy air defences long enough for allied strike aircraft safely to reach their targets and employ ordnance. First pioneered by the USAF's 388th TFW in Vietnam, the 'Wild >



Weasel' concept has been put to use in every major aerial conflict since.

Col Sam 'Boomer' Shaneyfelt began his career shortly after Operation 'Desert Storm' in 1991, and is now the 35th Operations Group commander at Misawa AB. Over time, he has experienced the spectrum of 'Weasel' operations. 'I started flying the 'Viper' operationally at Spangdahlem AB, Germany, in 1991. After the Gulf War, the 480th Tactical Fighter Squadron converted from a mixed pair, F-4G/F-16 SEAD/DEAD 'hunter/killer' unit to a conventional strike unit. I was the second 'new-guy' lieutenant to certify as a strike pilot, but all previous new pilots were checked out as 'Wild Weasels' or 'hunter/killers'. I did become familiar with the 'hunter/killer' tactics and spent two rotations in northern Iraq, doing exactly that with the 561st and 81st TFS, hunting surface-to-air missiles (SAMs) north of the 36th Parallel in Iraq. The F-4G would range the threat radar in. We would execute a 'comm-out' (no radio communication) manoeuvre, then be passed data via radio on where the threat site was and in a few seconds turn back into the threat and execute the game plan. If we had HARMs on board, we could use them, but typically we were carrying cluster bombs in the form of parent-mounted CBU-87s. The F-4G would suppress the site and the F-16 would bomb/strafe it out of business.

'I have always had great respect for the Electronic Warfare Officers (EWO) who could, in very short order, dial up a threat via their F-4G's AN/APR-47, physically listen to the on-air radar emissions, and, with great precision, identify what the signal was while the system geo-located the threat. This required countless hours listening to secret audio cassette tapes of the threats.

'In my humble opinion, I doubt even today that removing the man (the EWO) from the loop has made SEAD more effective from a purely tactical standpoint. The F-4 airframe was in its twilight, however, and

I do believe in the long run it was better to field a new SEAD platform. In order to fill the gap in SEAD, the Air Force correctly chose the highly manoeuvrable and fuel-efficient F-16C with its AN/ASQ-213 HARM Targeting System (HTS) pod. In a dense threat environment, the HTS works extremely efficiently at detecting and classifying threats. Though not having an EWO to listen to the threats does slow things down, overall the capability is phenomenal and the latest HTS and F-16C advances allow us to detect threats with enough precision to put a bomb through the radar site. While the AGM-88 HARM (High-speed Anti-Radiation Missile) is quite capable of taking down a SAM system, a 2,000lb high-explosive bomb allows us the opportunity to obliterate the whole site, operators, and supporting infrastructure, which, of course, is the preferred way to do business.

'Despite the hand-wringing that a lot of us did when the F-4G SEAD team was retired, the F-16 has proven itself in many combat situations as the correct evolution of SEAD/DEAD that began in Vietnam with the F-100F and follow-on F-105F.'

### WW tail flash

Lt Col McDaniel explains the current mission as it applies to operations from Misawa AB. 'SEAD is our primary mission here. We have the WW ('Wild Weasel') tail flash on our jets, and we take that moniker and the role it represents very seriously. 'Wild Weasels' have

a reputation for getting the job done despite the odds. We have great respect for those that went before us and honour their traditions and sacrifices. It's an honour to call ourselves 'Wild Weasels'.

'On a typical 'Weasel' mission, mission planning normally starts the day prior. We fuse intelligence data about enemy SAM locations, adversary air-to-air tactics, etc, into our tactical game plan. The day of the mission, each of the pilots in that mission sits down to brief the flight about 2.5 hours prior to take-off. Once airborne and established in the holding area, we start building the enemy order of battle — essentially looking for SAMs that are radiating, and enemy air threats. We push forward on a pre-determined time and kill all enemy aircraft in our way until the 'strikers' [coalition aircraft performing the strike mission] push to their targets. We then fly ourselves between the SAMs and the strikers, with the goal being to get the strikers to the target unmolested. We'll engage surface threats and air threats until the strikers are off target, then we re-form and get out of 'bad-guy land' as soon as possible.'

SEAD is a highly specialised mission, requiring specific skill sets, continuous training and a disciplined pilot. Col Shaneyfelt speaks to this effect. 'If F-16 squadrons do not train specifically to SEAD, all of the technological advantages [gained in recent years] are negated. It is vital to intimately master the SEAD missions to be effective. SEAD is a full-time job and,

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***'We fly ourselves between the SAMs and the strikers... We'll engage surface threats and air threats until the strikers are off target, then we re-form and get out of 'bad-guy land' as soon as possible'***

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**Lt Col John 'Cheech' McDaniel, commander, 13th FS**



This photo: **The 35th FW flagship pops a pair of flares as it flies over the Sea of Japan.**

Left: **Misawa's F-16 pilots are very much SEAD specialists and the bulk of the flying schedule consists of training missions specifically designed to maintain proficiency for these skills.**



when not performed often, the skills quickly atrophy. Moreover, the threat and systems knowledge fade away quickly when they are not exercised with routine, dedicated training missions. We are required to get between the threat SAM systems and the good guys and hang out inside the SAM's engagement area while performing a deadly ballet with the SAM operators. They're trying their best to kill us and we're doing our best to return the favour. In order to make it back home alive, our 'Wild Weasels' have to be on their A-game. There is no slack in this business. If you make an error, misjudge timing, your position or your tactics, you'll likely pay for it with your life.'

### Challenging work

Lt Col Sherer goes on to discuss the 35th's pilots: 'SEAD is a challenging mission set with a lot of dynamic variables that can impact [upon] real-time success/failure. It takes a fighter pilot who has the ability to develop not only an effective game plan that exploits the threat, but also a fighter pilot that can adjust their game plan while airborne to maximise the capabilities of our aircraft avionics and systems in a rapid manner. A SEAD pilot has to understand and be able to counter the capabilities and exploit the limitations of his adversary. We get a mix of young 1st Lieutenants and more experienced pilots assigned to us throughout the year, some with SEAD experience and some without. Neither presents a problem to our capability to execute the mission; however, the more experienced pilots will adapt more quickly in dynamic situations where a delayed reaction to a pop-up threat, even as little as 30 seconds to one minute, could result in the loss of a friendly asset.'

The 35th Fighter Wing is blessed with plenty of room in northern Japan to sharpen the skills of its pilots. Within 15 minutes' flying time is a large area of restricted airspace over the Sea of Japan, west of Misawa, that >

**The recent Sequestration defence spending cuts have not hit the 35th FW too hard — unsurprising given its location. The 13th FS will remain combat-ready mission-capable, with the 14th FS being basic mission-capable.**





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*'We have an amazing aircraft that can employ a wide variety of ordnance and an incredibly proficient cadre of pilots that are ready, willing, and able to do our nation's bidding when called upon to do so'*

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Lt Col Gene 'Owner' Sherer,  
commander, 14th FS



allows a wide variety of missions to be flown. Says Lt Col Dave 'Heat' Lyons, 35th Operations Support Squadron commander, 'We primarily use the Charlie airspace about 100 miles west of Misawa Air Base. The airspace is incredible. We can fly anywhere from the surface to 50,000ft, fly supersonic, expend chaff and flare, with plenty of room to fight. When we drop bombs (BDU-33), we have a class A range just 10 miles north of Misawa AB. Draughon Range is perfect for getting ready to go to Alaska for 'Red Flag' or, more importantly, spinning up for a deployment to the CENTCOM AOR (Central Command Area of Responsibility). We can use Draughon Range to drop training bombs and practice live strafe with our 20mm gun.

'What we lack is an electronic warfare (EW) range. We must deploy to 'Red Flag Alaska' to train and fight against surface-to-air missile systems. Unfortunately, at Misawa we don't get to drop live ordnance beyond live strafe. Although we *can* fire the AGM-88 HARM in Japan, due to the limited available quantities we'd prefer to do so on an instrumented range to ensure we maximise the ability to evaluate the missile. To do so, we'd have to shoot it at China Lake, California, White Sands Missile Range, Utah Test and Training Range, or the Eglin, Florida, ranges. These opportunities do not happen very often so the average pilot has never shot a HARM. Typically we deploy to either Guam

or Alaska to get our fill of dropping live munitions other than HARM. Alaska is by far the best place to accomplish air-to-ground training, due to its massive training ranges, target sets and EW range.

'On an average day, each squadron flies 18 sorties. This is a standard 10 x 8 turn pattern. If we 'hot pit'-refuel, then we fly up to 28 sorties per squadron', explains Lt Col Lyons. The opportunity is also occasionally available to train alongside regional allies such as the Republic of Korea Air Force (RoKAF) or the Japan Air Self-Defense Force (JASDF). In addition to the occasional training missions with the locally based JASDF F-2s, the 35th Fighter Wing has several joint exercises per year that allows training alongside its JASDF counterparts. These include 'Keen Sword', 'Iron Spear', and 'Seikan War', each of which permits the Americans to fly with and against the JASDF and Japanese Ground Self-Defense Force SAM sites.

Understandably, the bulk of the flying schedule consists of training missions specifically designed to maintain proficiency for SEAD-specific skills. However, pilots are tasked with a variety of additional training sorties designed to enhance other aspects, including both air-to-air and air-to-ground missions. These missions improve the overall capability to execute specific tasks that could be encountered while flying SEAD missions. Lt Col Sherer adds, 'SEAD is our bread and butter and we will always be proficient in that mission. The SEAD mission requires us to fight our way in, penetrate known surface-to-air missile system engagement zones and disrupt an enemy's ability to effectively counter our presence. We have an amazing aircraft that can employ a wide variety of ordnance and an incredibly proficient cadre of pilots that are ready, willing, and able to do our nation's bidding when called upon to do so. The 'Wild Weasels' of the 35th Fighter

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***'The SAM operators are trying their best to kill us and we're doing our best to return the favour. In order to make it back home alive, our 'Wild Weasels' have to be on their A-game. There is no slack in this business'***

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**Col Sam 'Boomer' Shaneyfelt, commander 35th OG**

This photo: A sharp four-ship of 'Weasels' forms up near Misawa.



Wing realise we could be in the fight in no time. The close proximity [to potentially hostile nations] keeps 35th Fighter Wing pilots that much more lethal and effective.'

### 'Viper' upgrade

The 35th's F-16s have been updated to keep abreast with emerging threats. One of the largest upgrade efforts was the Common Configuration Implementation Program (CCIP). This programme, which aimed primarily to bring commonality to the USAF's F-16 fleet of Block 40 to Block 52 F-16s, was completed in 2011 (see *Combat Aircraft*, May 2013). CCIP also brought about improvements to the jets' avionics, to include addition of the Link 16 datalink system and Joint Helmet-Mounted Cueing System (JHMCS) pilot helmet. Lt Col McDaniel commented on how CCIP has impacted his job. 'The addition of Link 16 and JHMCS, along with changes to our HARM Targeting System (AN/ASQ-213 HTS) pod have enhanced our lethality. We have far better situational awareness on where our own forces are and where the enemy surface and air threats are. We use that situational awareness to modify our tactics. For instance, if we think a SAM that is radiating is not a threat, based on the disposition of our forces, we will not prioritise shooting that threat. We may shoot it if we have a HARM available, but we may skip it if we have few HARMs remaining.'

CCIP has also led to some of the SEAD-specific hardware being integrated into the Block 40/42 fleet, to be used by non-'Weasel'-specific F-16s in traditional strike squadrons. Specifically, the HTS pod now can be commonly seen on Block 40/42 F-16s, providing these aircraft with a new capability, and vastly improving their situational awareness on the battlefield. However, 'Weasel' pilots are quick to point out that the addition of the HTS pod does not make those aircraft true SEAD assets. Lt Col McDaniel: 'Yes, the equipment (HTS pod) used for SEAD has migrated to the Block 40, but the time and effort it takes to train a pilot to be a 'Wild Weasel' is a price too big to pay for squadrons that are focused more on surface attack with bombs than suppression. It's always a continual battle to balance equipment and training. Just because you have the equipment doesn't mean you have the training. Most F-16 pilots will fly both Block 40 and Block 50 aircraft during their career, so the level of understanding of each other's tactics is fairly high. We just don't have the time to train proficiently to all tasks.'

### Joint SEAD

The future looks bright for the 'Wild Weasel' mission generally, and for the 35th Fighter Wing specifically. Col Shaneyfelt again: 'We have been working diligently with

the US Navy's VAQ (Electronic Attack) squadrons with their EA-18G Growlers. This combined team provides an unmatched SEAD capability and the team provides the next generation of SEAD tactics. The extra HARM-carrying capability and electronic jamming allow the F-16s to get up close and personal with advanced threats. Misawa 'Vipers' have been training with VAQ-132 and VAQ-138 Growlers from NAS Whidbey Island, Washington, for over two years now, and the tactics have matured into a phenomenal Joint SEAD capability. More importantly, we've established close relationships and trust with the Growler crews, which is vital to our follow-on effectiveness. Once Misawa is able to build an electronic warfare range in northern Japan, we expect an even closer relationship with the Joint SEAD team. The F-16s are still in need of some critical upgrades that will allow us to perform SEAD until the F-35 can take the F-16's place, but the combined 'Viper'/Growler team packs a huge punch.'

Acknowledgements: The author would like to extend his appreciation to Col Sam 'Boomer' Shaneyfelt, SSgt Jessica Lockaski, the pilots of 'Basco' flight (NAM, Cuffs, Klepto, and Tuck), and the entire 35th Fighter Wing team for their assistance with this article.





# COMBAT AIRCRAFT MONTHLY

A Lockheed Martin F-16C Block 50 Fighting Falcon of the 35th FW,  
13th FS 'Panthers' from Misawa AB, Japan. Jake Melampy







**D**EPARTING FORBES FIELD Air National Guard Base in Kansas, KC-135R Stratotankers serials 63-8004 and 61-0277 are operating under the call signs 'WYLIE 83' and 'WYLIE 84'. The tankers are operated by the 'Kansas Coyotes' — the 190th Air Refueling Wing's 117th Air Refueling Squadron. Their mission is a 10-hour transfer flight to Geilenkirchen, also known as 'GK', for a two-week temporary deployment (TDY) to provide NAEW&CF E-3A AWACS aircrews with AAR training. The 117th ARS is one of the 19 ANG units that deploy to Geilenkirchen throughout the year.

The NAEW&CF was established at Geilenkirchen in January 1980. Today it consists of two operational elements, or components: the multi-national NATO E-3A component at Geilenkirchen, operating 17 E-3As, and the Royal Air Force E-3D component at RAF Waddington, England, with six E-3D Sentry AEW1s.

The NAEW&CF is made up of 18 nations, of which 16 provide personnel for the E-3A component. While Geilenkirchen is the Main Operating Base (MOB) for the NAEW&CF, three Forward Operating Bases (FOB) are also in use at Trapani in Italy, Aktion in

Greece and Konya in Turkey. There is also a Forward Operating Location (FOL) at Ørland, Norway.

The person behind the scenes responsible for co-ordination between the ANG and NAEW&CF is Air National Guard Liaison Officer (ANGLO) Lt Col Mark Pehrson. 'My duties and responsibilities as the ANGLO are to co-ordinate all the assets for the ANG unit being here, and co-ordination between the ANG and NATO in order to provide NATO with their training schedule', he says. 'NATO works through me, telling me when they want to perform AAR on which days and how many sorties they want to fly, so I can pair the crews with the aircraft to fly AAR missions for NATO.'

The agreement between the ANG and NATO is a two-year Foreign Military Sales contract that is put out to tender every two years. Among the other bidders are active commands such as USAF Air Mobility Command (AMC), several European air forces with tankers in their inventories, and a civilian company. 'I think the reason why NATO goes for the ANG is because they like us, and we have a great working relationship with them', says Pehrson. 'We are very accommodating and try to give NATO all the training they

request. Since we have such a great working relationship and we're a known quantity, every two years when the contract comes up for bid, we continue to win the contract.'

### Reduced hours

The current contract states that each year the ANG provides AAR for NATO E-3As in the form of 44 weeks of support, which includes 850 flying hours for the KC-135s and around 6.5 million pounds of fuel. However, the current contract is being adjusted due to the ongoing defence budget cuts within NATO countries. NATO has reduced E-3A AWACS flying by 25 per cent, and looks to amend the contract accordingly. The funding for the current contract covers only 34 weeks and 637 flying hours a year, but the ANG is trying to increase this to 40 weeks and 637 flying hours.

'If you cut down from 850 to 637 flying hours and from 44 to 34 weeks due to maintenance and weather issues it is going to be very difficult to reach those 637 flying hours', Lt Col Pehrson adds. 'It is important that they fly those hours, otherwise the E-3 pilots will not be able to maintain their currencies. I expect the decision is going to be made very soon. The current contract expires on 30 June 2013. NATO has asked for an





# KANSAS COYOTES IN EUROPE

## GUARD TANKERS AT GEILENKIRCHEN

Since 1993 the NATO E-3A AWACS aircrews from the NATO Airborne Early Warning and Control Force stationed at Geilenkirchen Air Base, Germany, have kept their air-to-air refuelling skills up to speed with help from the US Air National Guard.

report and photos: **Cristian Schrik**



extension of the current contract to the end of 2014 to get everything worked out properly. We'll have to wait and see what NATO comes up with.'

The ANG KC-135s on TDY at Geilenkirchen cannot refuel aircraft other than the NATO E-3As and RAF E-3Ds. As the agreement between ANG and NAEW&CF is formalised under an FMS contract, the ANG retains tactical control over its deployed KC-135s. According to Pehrson, 'I do get phone calls from other units asking if I can assist them providing AAR. Even if my tankers are up in the air or standing here on the platform I can't do it.'

Geilenkirchen is the last TDY location in the ANG, as the Guard's spending has been reduced in line with falling budgets. As a result, many TDY locations have been scrapped.


The ANG crews come to Germany for two weeks, with an option to complete a mid-term rotation with other crews from the unit. The 190th ARW, which was on TDY from 28 January to 8 February 2013, brought three aircrews and 18 maintainers to Geilenkirchen. Three crews are required in order for personnel to have sufficient crew rest between sorties. A side benefit is that

typically one crew has a day off between sorties. 'GK is a great location to be at, with so many great places to visit, and things to do and see. Also operating in the European theatre is very good training', says Maj Mark Kelly, one of the 190th ARW KC-135 pilots on TDY to Geilenkirchen. 'Back home we are familiar with procedures, areas and air traffic control, but here things are a little bit different. Although flying procedures are the same, the various English accents we deal with in ATC communications makes it challenging.'

However, refuelling the E-3A is easier than a Globemaster III or Galaxy, as 190th ARW boom operator SSgt Brandon Gray explains: 'An E-3 has a narrower body that has less effect on us compared to a C-17 or C-5. As the E-3 approaches us, less air is being pushed up against our 135, making the AAR process easier and control of the boom more stable, and I bump up and down less.'

ANG tankers use 'ESSO' as a permanent mission call sign while deployed to Geilenkirchen. *Combat Aircraft* was given the opportunity to fly with 'ESSO 75' (63-8004) that was scheduled to refuel two E-3As in the Kim Long AAR track in northern Germany, an area specially reserved for refuelling E-3s. The track is 112nm long

and 16nm wide. AAR is performed between FL270 and FL300. During AAR training the E-3 aircrews make multiple dry hook-ups with the KC-135, while flying manual or on autopilot; this is upon request of the E-3 aircrew. 'I personally prefer manual flying, as the autopilot trims the aircraft constantly and it is like you are flying on waves', SSgt Gray notes.

To maximise efficiencies and training opportunities for E-3A aircrews, the AWACS will trail 200ft behind the KC-135 after a successful hook-up as crews swap seats for their turn. During AAR the two aircraft are only 10ft from each other as 20,000lb of fuel is transferred from one to the other, allowing the E-3 to extend its time in the air, and increasing the time spent on station performing its vital mission. 

Acknowledgements: **Thanks to Col Mark Pehrson, 190th ARW PAO Capt Joseph Blubaugh, NAEW&CF PAO SSgt Richard Longoria and Capt Wilko ter Horst, and the crew of 'ESSO 75': Maj Mark Kelly, Maj Kevin Dark and SSgt Brandon Grey, and the rest of the 'Kansas Coyotes' at Geilenkirchen.**







Flight deck activity on *Juan Carlos I* in the form of landings and take-offs by the two FAMET helicopters, a Tigre and a Cougar, assigned to the initial carrier qualification phase. Francesco Francés

# SPANISH

## ARMY AT SEA

Qualifications on *Juan Carlos I*

Flagship of the Spanish Navy fleet is the new Landing Helicopter Dock *Juan Carlos I*, a multi-role amphibious assault ship that has now begun operations with a rotary-wing aviation component provided by the Spanish Army.

report: **Salvador Mafé Huertas**

**I**N RECENT YEARS Spanish Army Aviation (Fuerzas Aeromóviles del Ejército de Tierra – FAMET) has been undergoing a major process of change, with incorporation of the Eurocopter Tigre (Spanish military designation HA.28), and in response to the armed forces' constant need to adapt to developing missions. The future addition of the NH90 helicopter also involves significant challenges and adjustments, and all this is being carried out under a very difficult economic climate and amid severe budgetary constraints.

Commissioned in 2010, the new Landing Helicopter Dock (LHD) *Juan Carlos I* (L 61) is destined to become the centrepiece for future international deployments by the Spanish armed forces. In recent months, several phases of 'navalisation' have been planned and executed for FAMET's helicopters and their crews.

With eight landing spots for EAV-8B Harrier IIs and helicopters across a flight deck that is 201.9m long and 32m wide, *Juan Carlos I* has the capacity to accommodate Chinook-type helicopters, as well as the V-22 Osprey. The ship's hangar can take various items of equipment, including a total of 10 Chinook-size helicopters, or up to a total of 30 helicopters in the class of the Cougar or NH90.

A joint training plan was launched in late 2011, beginning with an initial practice phase. In early 2012, under the direction of the Spanish Navy's Centre for Operational Combat Readiness (CEVACO), a series of studies was completed during which data was collected regarding compatibility between the ship and FAMET helicopters, the types of support required for rotary-wing operations, and protocols for aircraft movements on the vessel, maintenance and hangar parking.

The initial phase of this joint plan was developed to certify the Tigre, Cougar and Chinook. The helicopters were loaded on board using the ship's crane, requiring only the dismantling of their rotor blades. The second phase of the test saw the helicopters being moved from the deck to the hangars using the access ramps. Specialists then manipulated the aircraft inside the ship, in the

process establishing protocols and checking compatibility with the deck elevators.


This static phase was followed by a second in which a series of take-offs and landings were completed while the vessel was docked at Rota Naval Station. These set down protocols for 'cold' and 'hot' refuelling, security procedures on deck, mobility and tie-down. Essentially, all manoeuvres required on the flight deck during the execution of rotary-wing air operations were tested.

### Crew certification

After this phase, the next element focused on the training of the crews, these also requiring certification to operate from the ship. At Rota the crews received lectures from instructors of the Escuela de Dotaciones Aeronavales (EDAN) and were trained in procedures that included conducting shipborne air operations with helicopters, flight safety, signalling, movement on deck, flight deck personnel identification by jacket colours, communications and terminology.

Accompanying the lecture phase, and as a fundamental part of the training received by FAMET crews, in October 2012 these personnel had to complete a phase of survival and movement in water. The Water Survival Centre provided hands-on training for survival and ditched helicopter evacuation, using the crew training pool better known as the 'Dunker'.

Since FAMET Chinooks are not fitted with rotor brakes they could not be certified to operate from a moving ship. With this limitation, the Chinook could only receive certification for transfer and subsequent projection from a stationary vessel.

Given the Chinook's limitations, the practical phase while the ship was under way was performed only with Tigre and Cougar helicopters. Based at Rota Naval Air Station, these flew directly to L 61, which was sailing 60 miles offshore. Each pilot completed a total of eight landings over three days. These represented the initial qualifications — during 2013 night qualifications will be performed, using night vision goggles. Finally, in 2014 it will be the turn of Spanish Army Aviation's brand-new NH90s to operate from the deck of the LHD. 







The first flight of the Chengdu J-20 in January 2011 was seen as a major step forward for Chinese industry. However, it was just the tip of the iceberg. Since then Chinese aerospace has taken huge strides forward with a diverse range of new projects.

All images via Chinese Internet

# CHINA'S YEAR OF THE DRAGON

The latest Chinese Year of the Dragon ran from 23 January 2012 to 9 February 2013. In that time, the rising Chinese aviation industry once again showcased a number of significant — and surprising — developments, as Andreas Rupprecht details.

report:  
**Andreas Rupprecht**



**T**HE YEAR 2012 was a most interesting one with regard to the progress and results achieved by China's aviation industry, and especially its military sector. As Michael Raska postulated in a review published for the Institute of Defence and Strategic Studies, China 'took advantage of its astrological fortune' in the latest Year of the Dragon.

For many, what lies beyond the 'Bamboo Curtain' remains unfamiliar. However, developments in the last two years have provided ample evidence that China's aviation industry is currently enjoying significant success in managing multiple advanced aircraft programmes simultaneously. Furthermore, 2012 was the most successful year to date in this regard. To quote a well-known Chinese aviation blog: 'At present, no other nation can — or does — allocate so many personnel and financial resources so rapidly towards achieving national strategic goals.'

Some of the clearest evidence of this success is provided by China's two biggest military-production enterprises, the China North Industries Group Corporation (NORINCO) and especially the Aviation Industry Corporation of China (AVIC), which posted record turn-over and earnings in 2012. Between 2008 and 2010 both groups had already achieved a 20 per cent compound annual growth rate in revenues, and similar results were recorded in the following two years. According to AVIC's General Manager Lin Zuoming, in 2011 AVIC's revenue increased by 23 per cent to \$41.04 billion and net profit by 18.8 per cent to \$1.94 billion compared to \$1.64 billion in 2010. For 2012, AVIC's revenue went up by 14 per cent and reached about \$48 billion, while net profit rose by five per cent to \$2.07 billion.

#### **AVIC's rise**

With their latest results, NORINCO and AVIC are already comparable in turn-over to major Western aerospace enterprises. Although the turn-overs of both still lag

behind EADS (\$68.7 billion in 2011) and Boeing (\$65.7 billion in 2011), they are superior to Lockheed Martin (\$46.5 billion in 2011), BAE Systems (\$30 billion) and Northrop Grumman (\$26.4 billion). According to industry analysts this success is mostly related to the successful acquisitions of companies home and abroad. In the past three years, AVIC has purchased 58 companies, increasing its operating revenue and net income, and AVIC has announced that it remains committed to this strategy in the future. AVIC has an ambitious strategic goal of reaching a turn-over of about \$160 billion in 2020.

Overall it seems that AVIC's strategy has proven successful, with most major development projects progressing smoothly. The shift from the previous simple updating and modernisation of older fighters to indigenous 'fourth-generation' types, and now the latest developments concerning 'fifth-generation' fighters, large transports and UAVs provides a clear testimony. This transformation has progressed in concert with the gradual development of scientific, >



technological and project-management capabilities over the past decade. Several companies that previously focused on reverse engineering as recently as the late 1990s have evolved their capabilities and are now developing and producing indigenous models.

The latest next-generation fighter prototypes such as the J-20 and J-21/31, and even the modernised J-10 and J-11 and the newest J-15 and J-16 versions, are closely comparable to competing products. Overall, they demonstrate the increased sophistication of China's combat aircraft, but, more importantly, the ongoing transformation of the Chinese military aviation sector. Whether this progress was all achieved through research, time and tremendous investments in both funding and manpower, aided by international co-operation via technology transfer and manufacturing agreements, or also by industrial espionage and illegal copying of foreign technologies, is beyond the scope of this article. However, China has clearly narrowed the once-wide technology gap.

### Challenges ahead

Nevertheless, there still remain some challenges ahead, and more than a few of these lie within AVIC's structure. Although the head office in Beijing is responsible for fundamental decisions and general strategy, allocating resources and establishing financial targets, overall the system is too bureaucratic, and rivalries between 'competing' enterprises — for resources, reputation and influence — might make it difficult to secure compliance with strategic goals. With a corporate identity that has become more fragmented through the years, local facilities are often reluctant to cede power directly to new subsidiaries, since they rely heavily on support from regional and local governments. The risk of inertia is







Above: 2012 saw the commissioning of the aircraft carrier *Liaoning* (CV 16) and the first deck landings made by J-15 multi-role fighters.

Left: Production of types such as the Chengdu J-10B is ramping up to a high level.

real, and the level of diversification might hamper the creation of a true 'united' Aviation Industry Corporation of China.

Regardless of these persistent weaknesses, China's aviation industry is now able to manufacture almost every type of platform and system required by the country's military. As such, AVIC's financial success in recent years reflects China's continued increases in defence spending in line with its rapid economic growth. More resources are being allocated for the procurement of new equipment, mainly related to the growing demand from the home market and the armed forces' modernisation efforts. Between 2001 and 2011, China's military budget grew by an average of 11.8 per cent each year. However, while this might be required to drive defence spending higher and rapidly modernise the armed forces, this expansion of China's military aviation sector might pose a problem in the future, when global economics no longer permit such spending and the growth rate cannot be sustained (currently, China has relatively high inflation, reaching 4.5 per cent in February). Moreover, it will be problematic if the products being manufactured are still

not comparable or competitive with 'high-end' foreign offerings, since Chinese arms exports in the past have mainly concentrated on lower-end military equipment or less sophisticated systems. As such, the main exports have gone to developing and Third World nations with strained or 'undecided' relationships with the West. Such customers are typically unable to acquire Western equipment due to political considerations, and often do not have the ability to purchase Russian or other equipment of similar standards. Additionally, customers have included many nations that were dependent on the 'Chinese option' due to Chinese economic aid as well as China's relaxed attitude to the political situation in these states 'as long as the bill was paid.'

According to data published by SIPRI, China's exports of conventional weapons increased by 162 per cent between 2008 and 2012 compared with the previous five-year period. In recent years Chinese arms producers appear to be increasingly competing with the established manufacturers of advanced weapons systems. On the other hand, with increased >



domestic production, China has also become less reliant on imported weapons, which can be seen by the fact that the country's arms imports declined by 47 per cent in the same timescale.

As a consequence, the Chinese government is at present investing eagerly in this important industrial sector, the primary aim being to rectify its main weaknesses. First among these shortcomings are technology-related factors, including material science, structural strength, and above all powerplants. Other key weaknesses include quality control, system integration, process standardisation and management. Combined, these often result in repeated design modifications, prolonged testing, cost over-runs and subsequently delays.

Domestic industry has so far failed to build a reliable, high-performance jet engine. In an effort to overcome this 'Achilles' heel', AVIC persuaded the government to initiate a multi-billion dollar plan to build jet engines for the future. These include engines like the WS-15 high-thrust turbofan for the J-20 and the high-bypass WS-20 for the Y-20, while even more effort has been expended upon research into technology, designs and materials for aircraft engine design and manufacturing. Participants in the project include the Shenyang Liming Aero-Engine Group Corp, Xi'an Aero-Engine (Group) Ltd and research institutes such as the Beijing University of Aeronautics and Astronautics







Left page, top to bottom: The J-15S made its maiden flight on 3 November 2012. It is powered by the WS-10A 'Taihang' engine, which would appear to have overcome reliability problems.



Somewhat crude radar cross-section (RCS) trials being conducted on a J-10B at Chengdu.

On 27 February 2013, China's initial aircraft carrier, the *Liaoning*, moored for the first time at its home port near Qingdao, in eastern China's Shandong Province. The naval base for the carrier became operational after four years of construction, according to a PLAN statement.

Above left: The J-31's existence had been rumoured for some time, but since its maiden flight further details and sightings have been limited.

Left: CAC is still testing the multi-role J-10B. The first prototype was originally powered with the WS-10B but the first four pre-series aircraft feature the AL-31FN.



(BUAA). An initial investment of about \$1.53 billion has been allocated for 2011 to 2015 and overall the current aircraft engine development programme will be worth about \$16 billion, according to the state-run Xinhua news agency. Some Chinese observers even forecast investments of up to \$49 billion over the next two decades to reduce the dependency on foreign engine suppliers.

### Success in 2012

Following this introduction to the current Chinese aviation industry it is worth taking a look at the astonishing results achieved in 2012. Surely the most spectacular of these was the commissioning of the aircraft carrier *Liaoning* (CV 16), as well as the first deck landings by J-15 multi-role fighters. These were closely followed by the maiden flights of both the J-31 stealth fighter and the Y-20 strategic transport. The public witnessed the unveiling of the Z-10 helicopter gunship and the Z-19 armed scout helicopter at Zhuhai, accompanied by their fielding in larger numbers by PLA regiments. Several new UAVs were also noted, these not only being unveiled to the public but also fielded operationally.

Besides these milestones, the production rate of the J-10 and J-11 fighters remained at a high level, and new versions of both types either entered limited serial production and operational testing (J-10B and J-15) or flight-testing (J-15S and J-16). Less obvious to the public but nevertheless as important was the steadily growing fleet of support types including Y-8 special-mission

versions. Another major aspect was the expansion of the transport fleet through introduction of a few second-hand Il-76s and the arrival in service of the new Y-9 tactical transport. Finally — and probably the most important indication of the current progress in the modernisation of the armed forces — several structural and administrative changes were initiated and the training process was streamlined.

### CV 16

Long expected by followers of the PLAN, commissioning of and the first flight from the carrier *Liaoning* took place in 2012. Following a long and closely observed conversion from a rusting wreck to an operational carrier at Dalian, the inaugural take-off and landings of J-15 fighters were completed aboard *Liaoning* by 20 November, and more tests (now including multiple J-15s) were accomplished three days later. While this marked completion of the first stage of the PLAN's carrier project, it is only the beginning. Now the long process of developing a fully operational carrier group with its own naval aviation doctrines has begun. The second step in this direction followed on 27 February 2013 with the *Liaoning's* transfer from Dalian to its new home port and official assignment to the North Sea Fleet.

The new home of CV 16 is Guzhengkou Bay naval base, which was completed in February 1988. The facility is located at Xiaokouzi, Jiaonan City, about 30 miles south-west of the port of Qingdao, and is the base for all destroyers of the 1st Destroyer >





**Top: Several KJ-200 airborne early warning aircraft entered service in 2012, the latest examples (including 3017 seen here) having joined the PLAAF's 26th Special Mission Division at Wuxi-Shuofang.**

**Above: The maiden flight of the Xian Y-20 transport was completed on 26 January, before the aircraft was painted and embarked on reverse thrust and further flight trials.**

**Right: The Shaanxi Y-9 tactical transporter has now entered service, the first aircraft being assigned to the 4th Transport Division.**





Flotilla assigned to the North Sea Fleet. With the clear intention of establishing a 'blue water' navy in the coming years, observation will shift to Jiangnan Shipyard in Shanghai, where new carriers will reportedly be built.

### China's big birds

Just before the turn of the Chinese year the Xi'an Y-20 performed its maiden flight. This type's importance cannot be over-stated. Perhaps more than any other project, the Y-20 will contribute to the PLAAF's desire to transform into a modern air arm with global reach and force projection capabilities. As such, the 'Kunpeng' is not only a project of national pride but a substantial breakthrough for China's large aircraft programmes in particular and the country's aviation industry in general. It will surely be some time before a Y-20 is seen undertaking long-range flights with heavy cargo, and even longer before it can prove its reliability and effectiveness under real-world conditions. However, a long and interesting road lies ahead for the Y-20.

The importance of the Y-20 lies primarily in the collapse of a contract for an additional 30 Il-76MDs signed with Russia in September 2005. This fell through due to rising manufacturer's costs, and threatened to cause a severe lack of strategic transport capability. This was noted after the major earthquake in Sichuan Province in 2008. After that setback the PLAAF ordered three second-hand Il-76s from Russia in December 2011 instead of waiting for the newly-constructed airframes. All three were delivered in 2012, but this was only a small boost to the transport fleet. The PLAAF is now receiving a total of 10 second-hand Il-76MDs and Il-76TDs from various sources, which will be overhauled and refurbished as a stop-gap.

Another important milestone in 2012 was the service introduction of the Shaanxi Y-9. Development of this modern tactical transport officially began in October 2005 and construction of the first prototype commenced in 2006. However, due to the higher priority of the 'High New' series of Y-8 aircraft as well as the standard Y-8C transport, the project stalled in 2007. Development resumed in late 2008 and the first prototype made its maiden flight on 5 November 2010. Following intensive tests the Y-9 entered PLAAF service in 2012, the first aircraft being assigned to the 4th Transport Division. It has been rumoured that a new medium jet transport proposed by XAC and Institute No 603 is also in the works. Besides that, the latest rumour claims that a new 'flying boom' in-flight refuelling system is currently under test on board a former Russian Tu-204C cargo aircraft.

Finally, 2012 saw continued testing of the Y-8GX-6 sub-hunter, unveiling of the GX-8 ELINT platform and the introduction of several more KJ-200 airborne early warning aircraft, of which at least five are now operational with the PLAAF's 26th Special Mission Division at Wuxi-Shuofang, plus around six KJ-200H (Y-8WH) versions with the PLANAF's 2nd Specialised Naval Air Division at Dalian-Tuchengzi.

### Jet fighters and trainers

Following the spectacular first flight of the Chengdu J-20 in January 2011, 2012 saw the emergence of China's second fifth-generation fighter project. At first leaked as a radio-controlled model at an AVIC-sponsored convention in late 2011, a strange road convoy provoked interest in September 2012, before finally arriving at No 623 Institute, the Xi'an structural test facility. Although a competing project to CAC's J-20 had long been speculated, few expected the >





unveiling of this new SAC fighter so soon, and the inaugural flight of the still mysterious J-21 or J-31 in October re-ignited the discussions. It is currently unclear whether the new type will only be offered for export, or whether it will serve as a new carrier-borne multi-role type or a complement to the larger and more expensive J-20. However, while it faces a long developmental road ahead, it is a clear indication of the growing capabilities of not only the Chinese aviation industry but the Shenyang Aircraft Corporation in particular.

Overall, 2012 was a successful year for SAC, which has been much criticised for its lack of innovation and dependence on older types such as the J-8F and JZ-8F, which were still built in 2012, as well as 'Flanker' derivatives. Over the last few years, SAC lost out to its allegedly more innovative competitor at Chengdu, and its successful J-10 and J-20 projects. The J-11B/BS programme in particular faced long delays due to reliability issues with the WS-10A 'Taihang' engine. However, since 2011 both this turbofan and the indigenous 'Flanker' version can now be considered a success, and several regiments are operational. Furthermore, all 'Flankers' rolling off the production line since then have been powered solely by the 'Taihang', and include new prototypes such as the two-seat J-15S and J-16, the latter being China's equivalent to the multi-role Su-30. Only the first J-15 prototypes — including those that successfully took part in the carrier trials — continued to rely on the

trusted AL-31F, while the latest low-rate production aircraft have returned to the WS-10A. Remarkably, with these two multi-role types SAC may be in an even better position in the coming years since the PLAAF and PLANAF are eagerly awaiting more long-range multi-role jets. These latest 'Flanker' versions will therefore fulfil a similar role to the F-15E and F/A-18E/F and will offer an edge in performance over the smaller, single-engined J-10B.

Chengdu, by contrast, is heavily involved with continued flight-testing of the J-20. 2012 saw the transfer of both prototypes to Xi'an-Yanliang, where they entered the next phase of testing. In late 2012 the second prototype, 2002, returned to CAC and re-appeared after a short period (when it was at first mis-identified as the third prototype) with a new radome probably housing AESA radar, and other minor modifications. Since then it has been tested extensively at Chengdu-Huangtianba. This work has included weapons trials, as noted by several calibration markings around the starboard fuselage side.

Besides this, CAC is still testing the multi-role J-10B version. While a prototype was flown with the WS-10B in 2011, the first four pre-series aircraft noted in mid-2012 were again powered by the AL-31FN. It is unclear if this is an indication of reliability problems with the 'Taihang' — especially relevant for a single-engined fighter — or simply a measure to accelerate the operational

evaluation phase using a proven engine before the definitive series version receives the indigenous powerplant. It seems likely that the four AL-31FN-powered prototypes and the four new pre-series jets had been brought up to a common standard by early 2013, and will most likely form an operational trials unit, similar to that once equipped with the J-10A. In the meantime, all Block 6 aircraft have been delivered to operational units, an eighth regiment (36th Air Regiment, 12th Division at Qihe) is converting to the J-10A from Block 7, and a second PLANAF J-10AH regiment is also expected to be established.

CAC's second fourth-generation type, the FC-1/JF-17, is also progressing well, with weapons integration now including the Brazilian MAR-1 anti-radiation missile and the recently-unveiled CM-400AKG stand-off supersonic missile. Additionally, the Pakistan Air Force plans to acquire another 50 JF-17s — probably again in the current Block 1 configuration — and several Asian and African countries have expressed interest in the FC-1. According to reports from December 2012, Sri Lanka plans to buy an initial six JF-17s, with deliveries starting in 2013. Meanwhile, a further improved version — sometimes referred to as the Block 2 — featuring AESA radar, infra-red search and track and a refuelling probe is reportedly under development, as well as a two-seat variant. CAC has completed serial production of the J-7 series, and the last examples — the F-7BGI, a customised J-7G version for Bangladesh featuring a 'glass'





This photo: CAC has completed serial production of the J-7, with the F-7BGI, a customised J-7G version for Bangladesh, now being delivered.

Left clockwise: The new Hongdu L-15 supersonic trainer will be known in service as the JL-10.

The JL-9G has been developed as a dedicated aircraft carrier training aircraft for the PLANAF.

No 601 Institute/Hongdu has developed the 'Lijian' (Sharp Sword) UCAV. Recent images from Nanchang, where Hongdu is located, show a design that appears very similar to the X-47B and which seems to be powered by an RD-93 engine.



cockpit with multi-function displays and HOTAS controls — are currently being delivered.

Another new type that will play an important role in the PLAAF's modernisation is the Hongdu L-15 supersonic trainer, due to be introduced to service as the JL-10. Following a lengthy development phase, the PLAAF and PLANAF introduced the JL-9 as an interim measure, this being based upon a heavily modified J-7 airframe. However, the JL-9 will also be procured as a dedicated carrier trainer, designated JL-9G, for training pilots in aircraft carrier operations. A first batch of the new JL-10 is reportedly currently in limited serial production, with the first aircraft being rolled out in March 2013. Several foreign countries have expressed interest in the L-15 and 12 examples have reportedly been ordered by an unspecified foreign customer (possibly Bangladesh).

Finally, several new types either under development or even undergoing secret flight-testing provide a glimpse into the future. The heavily modified JH-7B reportedly performed its maiden flight in late 2012. The new H-X supersonic bomber programme — also referred to as the 'strategic project', and allegedly a 'flying wing' design — was expected to gain full speed at No 603 Institute/XAC following the Y-20's maiden flight. As regards a new naval multi-role fighter, it is rumoured that the J-21/31 will compete with a new design from No 611 Institute.

## Entering the unmanned world

Another important development and indicator of China's progress is the great number of UAVs developed by various universities, research institutes and manufacturers in recent years. Even if only a few of these have entered series production or service, 2012 can be regarded as a breakthrough year. China's first long-range-capable reconnaissance UAV, the BZK-005 is now operational with a special strategic reconnaissance squadron under the direct control of the PLA General Staff Department at Beijing, at Taizhou-Luqiao naval air base, and it has also been seen at several other PLAAF bases. A possible successor to the BZK-005 might be the Sky Wing UAV, which is similar in configuration to but smaller than the RQ-4 Global Hawk, or even the unique 'Xianglong' (Soaring Dragon), both developed jointly by the No 611 Institute and GAIC. The Soaring Dragon seems to be a true high-altitude, long-endurance UAV for strategic reconnaissance missions, similar to the RQ-4 but featuring an unusual tandem-joined or 'diamond' wing planform. According to rumours it was first tested unsuccessfully in 2009, and a successful first flight in late 2012 remains unconfirmed.

To date the most publicised UAV type is the No 611 Institute/GAIC 'Wing Loong' (Pterodactyl I), unveiled at the last Zhuhai airshow and which is similar to the MQ-1 Predator. It is also able to carry small air-to-ground stores including the KD-10 anti-armour missile. For some time now

No 601 Institute/Hongdu has also been working on a long-range stealthy UCAV similar to the X-47B under the designation 'Lijian' (Sharp Sword), and a model was secretly unveiled in September 2011. The first prototype was built by the end of 2012 and performed its first high-speed taxi test on 26 January 2013. A first flight is expected by mid-2013.

## Helicopter programmes

Although known for some time, both Chinese combat helicopters — the heavy Z-10 combat type and the lighter and smaller Z-19 scout and reconnaissance type — were finally introduced to the public during the 2012 Zhuhai airshow.

Development of the Z-10 remained secretive for almost the last 10 years, but in 2012 operational examples were noted in ever-increasing numbers. Perhaps the biggest surprise emerged during the Heli-Expo convention this March, when Sergei Mikheyev, general designer of the Kamov Design Bureau, revealed that the Russian helicopter company had secretly completed the preliminary design of the Z-10 at China's request in 1995. This baseline design, internally known as Project 941, was then handed over for final development and Kamov did not participate in any further work on the Z-10. In contrast, the Z-19's development began much later, and a first flight was accomplished in 2010. Since it was not subject to the same level of secrecy, it was therefore often regarded as an export product, which proved erroneous. >



Indeed, both types are already deployed far more widely than previously estimated and more units are still due to receive the new types. Currently the Z-10 is operated by five and the Z-19 by four different PLA brigades or regiments, each of which has one squadron equipped with 12 helicopters.

Looking towards the future, it will be interesting to see how the Z-15 (EC175) programme will evolve and if it could emerge as a successor to the Z-9 family, or whether a new 'clean-sheet' design will be developed instead. It was reported in 2012 that the No 602 Institute is developing the PLA's next-generation medium and large transport helicopters. Sometimes designated Z-18 and Z-20, these are intended to replace the venerable Z-8 family and the Mi-17/171. Reportedly, a first prototype of one of these aircraft is close to being completed and a first flight is expected in 2013.

## PLAAF restructuring

Although unrelated to the aviation industry, perhaps the most important change has been to the Air Force's structure, through initiation of a major re-organisation. Although this reform had been expected for some years, very few hard facts have become available and most of the changes noted so far have been related to unit nomenclature and serial systems. As such, it appears that major changes will only occur in 2014-15.

A full report on the re-organisation will be published in a future issue of this magazine, but it seems as if the present seven Military Regions (MRs) are to be transformed and that besides the established divisions and regiments the new structure will include bases and brigades. The main difference noted to date is that those bases will be expanded to include a total of four subordinate units, called brigades. Meanwhile, those divisions that were reduced to only two regiments during the 1980s and 1990s will again receive a third regiment. The fourth brigade in all bases will most likely act as a training, transition and operational conversion unit. At this stage at least, the brigade restructuring concerns only the Lanzhou, Shenyang, Nanjing and Guangzhou MRs, while Beijing, Jinan and Chengdu are not affected.

The stated purpose of this re-organisation is to streamline the command structure, reduce redundancy, provide each zone with sufficient strategic depth, and improve levels of preparedness across the entire PLA for possible future conflicts. At the same time, the measures will further reduce the overall size of the armed forces.

Overall, while the number of PLAAF divisions has remained stable at 29 since 2003 (of which four are now styled as bases), the PLAAF has now re-established additional units. In line with this process of re-organisation, it is not only the front-line and combat units that have been affected. At the end of April 2012 the PLAAF re-organised its training units. A similar but less comprehensive re-structuring is also planned for the PLANAF.

Parallel to these structural efforts, huge steps can be noted in terms of the increasing transparency of the PLA. A few years ago it was almost impossible to gain any open

information on units, their bases or even serials, since most images were censored. It is now possible to access the latest images from familiar aviation websites. Several military blogs provide a much more precise depiction of recent PLA programmes than ever before. Images of new aircraft appear well before their first flights — the J-20, J-31 and Y-20 are the best-known examples — and what was at first deemed as intentional 'leaking' by the manufacturers themselves has become a more public affair, with the Chinese government even attempting to explain its defence programmes in a much more open fashion. As blogger Feng (<http://china-pla.blogspot.com>) observes: 'None of this is done accidentally. The PLA has increased confidence over the weapon systems that are being developed and deployed. And it also wants to show that to address concerns from other countries.'

Along with these efforts in PR, restructuring and the quality of the hardware itself, the PLAAF and PLANAF are also considerably improving their training syllabus. Since 2005 the PLAAF has staged its own version of the US Air Force's 'Red Flag' exercise. Known as 'Red Sword' or 'Blue Sword', these integrated tactics exercises are held at Dingxin and are becoming more complex every year. 'Blue Sword' is mainly related to aerial combat, but the last exercise progressed to divisional or even Military Region-level confrontations, more than 100 aircraft of different types and their associated support units being involved. The PLAAF has also introduced its own version of TOPGUN, with the award of the prestigious 'Golden Helmet' to the pilots who perform best in different combat scenarios.

## Conclusion

Overall, observers of the Chinese aviation scene need to be careful not to become overly focused on new aircraft types, but to keep the overall picture in sight. These immense transformations and above all the rapid progress in several fields simultaneously do not, in all likelihood, provide a completely clear testimony of what is going on behind the 'Bamboo Curtain'. However, they do reveal an increased confidence in China's armed forces and the quality of its equipment. Moreover, they show that China is ready to take the role as a leading global power.

This military development goes hand-in-hand with China's economic success, and in this regard especially Beijing enjoys one key advantage. Its armed forces and aviation industry receive steady funding, whereas the budgets of Western air forces have been repeatedly reduced due to political restraints. Fortunately, due to the closely woven interconnections of global economics it is highly unlikely that Western and Chinese pilots will face each other in battle, but developments in China demonstrate clearly the beginning of the end of the unquestioned air-to-air dominance enjoyed by the last generation of US pilots.

China clearly took advantage of its 'astrological fortune' in 2012, and its prospects for the future have perhaps never been better. ☞

Right: **The Z-10 has been shrouded in secrecy for almost a decade. The type is operated by five PLA brigades or regiments, each of which has one squadron equipped with 12 helicopters.**

Far right: **The 'Xianglong' (Soaring Dragon) has been developed jointly by the No 611 Institute and GAIC as a high-altitude, long-endurance UAV for strategic reconnaissance missions.**

Below: **The Z-19 scout and reconnaissance helicopter first flew in 2010.**











# ARCTIC CATS ON GUARD

THIRTY YEARS OF NORWEGIAN LYNX OPERATIONS

*Combat Aircraft* was at Bardufoss Air Station to see how the Royal Norwegian Air Force's 337 Skvadron supports the Coast Guard and what the future holds for its Lynx helicopters.

report and photo: **Neil Pearson**

**W**ITH AN ANNUAL value of over 30 billion Norwegian krone (over \$5.16 billion), and employing more than 30,000 people, the fisheries industry is one of Norway's foremost export sectors. It is therefore of the utmost importance to the nation that its living marine resources are managed fairly and sustainably, and one of the highest priorities of the Norwegian Coast Guard, or *Kystvakten*, is to protect those resources.

The areas of sea under Norwegian jurisdiction cover some 2.2 million square kilometres, roughly seven times the size of Norway's mainland. It is no surprise that, of the Coast Guard's 13 ships, four (one Svalbard class and three Nordkapp class) are capable of carrying helicopters to extend their reach.

In October 1981 the first of six Westland Lynx Mk86 helicopters arrived at Bardufoss Air Station, which lies some 200 miles inside the Arctic Circle. 337 Skvadron was declared fully operational in May 1983 and still operates the Lynx on behalf of the Norwegian

Coast Guard, which also provides the unit's funding.

'We have a limited role in offshore special operations but our main task is to provide helicopters to the four helicopter-carrying Coast Guard ships', said Maj Tom Kristensen, 337 Skv's executive officer (XO). 'The first priority for our serviceable aircraft is to go to sea, where most of our flying is done. When we are embarked, the crew consists of a single pilot in the right-hand seat who is in command of the aircraft; to his left is the system operator and in the back we have a flight engineer and a rescue swimmer. The system operator and flight engineer are technically trained so we can be a self-sufficient unit on the ship.'

'In the early days of operating the Lynx, we would have two pilots and many technicians — one who looked after the avionics, one for engines and so on — but now we don't take any extra technicians. We have to be able to do everything ourselves when we're at sea. A crew will normally embark for two to three weeks and are on 45 minutes' alert but, if there is an emergency, we can be in the air from sleeping in our cabins in under 20 minutes.'

## Fisheries protection

Domestic and foreign fishing vessels are subject to stringent controls in all Norwegian fishing waters. A Lynx crew's main role is to assist the Coast Guard with reconnaissance, identification and inspection of these ships. With new technology such as the Automatic Identification System (AIS), most of their time is spent on inspections to check that a vessel's catch tallies with its logbook.

'We carry one or two fisheries inspectors in the back of the aircraft so when we have identified a specific target vessel, we hoist them down to the deck so they can carry out their inspection to make sure that they are doing everything correctly', explained Maj Kristensen. 'There are many reasons why the Coast Guard uses helicopters for this task: speed, surprise, flexibility, expanded coverage and simply the presence of air power particularly in the [200nm] fisheries protection zone around Svalbard. If a Coast Guard vessel is in the area, everyone knows about it and they stop doing whatever they might be doing but, by using the helicopter, we can surprise and catch them.'





Lynx 207 reached its maximum of 9,000 hours and was withdrawn from use in early 2013. It was photographed here while operating from Norwegian Coast Guard vessel KV Svalbard (W 303), an offshore patrol vessel and ice-breaker.

The Coast Guard performs more than 1,800 inspections of fishing vessels in Norwegian waters annually, resulting in up to 300 warnings being issued and 20 to 25 arrests being made.

Svalbard is the Norwegian Arctic archipelago located mid-way between mainland Norway and the North Pole. It is a breeding ground for many seabirds and supports polar bears, reindeer and marine mammals. The Lynx are additionally tasked to fly teams of researchers to the area during the summer months. They also perform search and rescue and transport of cargo and personnel.

Maj Kristensen told CA that the majority of their operations are flown north of Bjørnøya, an island some 300nm north of Bardufoss in the Svalbard archipelago. Svalbard experiences a 'midnight sun' period from mid-April to mid-August, during which the sun never sets. The opposite phenomenon, polar night, occurs from November to February when the sun stays below the horizon throughout the day. 'It's dark!' says Maj Kristensen. 'It really is like being in a room with no windows or doors and we

don't have NVGs [night vision goggles] so we are flying unaided. The most difficult flying is during the final part of landing on the mothership when the pilot has manual control, but the main battle we have is the weather during winter, especially out in the Spitsbergen area.

'From October to May we're operating in icy conditions so we can't fly very high. We have to stay at 200 to 400ft over the sea and have to fly around mountains, not over them, when we're flying in the fjords. It can be -20°C, 60kt wind, ice and snow all at the

same time. The heating system is not very good so it gets very cold in the aircraft. It's okay down to eight or nine degrees but, after that, it only blows cold air. We always fly in immersion suits over the water with thick underwear and neoprene layers. If we had to ditch, we carry a seven-man dinghy aboard but I don't think we'd last more than one or two hours.

'I've been flying the Lynx since 1987 in all kinds of conditions, but the worst are during the summer around Bjørnøya because the fog is incredibly dense and it can appear in an

*'From October to May we're operating in icy conditions so we can't fly very high. We have to stay at 200 to 400ft over the sea and have to fly around mountains, not over them, when we're flying in the fjords. It can be -20°C, 60kt wind, ice and snow all at the same time'*

Maj Tom Kristensen



Right, top to bottom: A Lynx approaches the Svalbard. The hangar on the vessel is large enough for the new NH90, which has an automatic main rotor and tail folding system to ease storage and maintenance on deck and in the hangar.

Maj Tom Kristensen (left) is now working for the Norwegian Defence Logistics Organization in Oslo as project manager for the Life Extension-Lynx programme. Seated in the Lynx here is new squadron XO Maj Paulsrud.



instant. That's because the Gulf Streams come up and meet the cold streams from the Arctic at exactly that point.'

'For normal operations at sea when we have no land alternative, I can fly with as little as 0.5nm visibility and a 200ft ceiling', added Maj Robert Paulsrud, a Lynx pilot with over 1,700 hours of experience. 'My minima to see the ship are 0.25nm and 125ft. If I don't see the ship, I need to go around and fly an ELVA [Emergency Low-Visibility Approach] approach type. We'll fly a transition system, which is close to an automatic hover system, which takes me automatically from 200ft and cruising speed down to a height between 40ft and 150ft. We would descend down to 80kt, flying just left of the ship's wake with 10kt overtake speed.

'We land based on what we see on the deck and what instructions the flight deck officer is waving. With a combination of those we can hit the grid every time and, as soon as we're down, we have a button on the collective to engage the harpoon. It shoots out from the bottom of the helicopter, grabs one of the holes in the grid and pulls the helicopter down to secure us to the deck.

'Night operations are probably the hardest thing to do and also the most risky because the flight deck officer is talking to you, you're changing altitude and airspeed quite close to the water and you have no visual clues of the horizon until you get close to the ship. It takes a lot of practice to reduce speed and altitude at a continuous rate. You want to slow down as soon as possible to have a comfortable approach speed but then you can get too slow

at a large distance from the ship which is dangerous because you are close to hovering with no visual references.'

### Enter the NH90

The Lynx currently flown by 337 Skv are essentially the same aircraft that were delivered 30 years ago, receiving only modest improvements in the interim: uprated engines, composite main rotor blades and a GPS moving map display. A mid-life upgrade to enhance their capabilities, adding NVGs for example, was planned but later cancelled when a Lynx replacement was ordered in 2001. A total of 14 NHIndustries NH90 NFH (NATO Frigate Helicopters) were ordered: eight in 'coast guard configuration' to replace the Lynx of 337 Skv and a further six in 'frigate configuration' to be operated by (the currently inactive) 334 Skv on the Royal Norwegian Navy's Nansen-class frigates.

A new RNoAF unit, OT&E NH90, was established on 1 May 2010 to conduct operational testing and evaluation but it was November 2010 before an example of the type, owned by NHI and operated by AgustaWestland, first arrived at Bardufoss. From December 2010 to March 2011, the first four Norwegian pilots of OT&E NH90 were trained for a total of 144 hours and qualified as instructor pilots and maintenance test pilots.

The NH90 represents a massive leap in capability for 337 Skv, the most significant differences being increased range, capacity and modern avionics. 'When flying around Bjørnøya on an ambulance flight, it is over two hours' flying time to the nearest land',

said Maj Kristensen. 'The Lynx can just about do that in good weather conditions and with the wind behind us. Outside of those conditions we need to carry an extra fuel tank inside which gives us a maximum endurance of 3hr 20min but it means we only have room for one patient'. By contrast the NH90 has a maximum endurance of five hours and can accommodate 20 fully-equipped troops, while the diminutive Lynx can carry seven passengers at a squeeze.

Capt Kjetil Laerum, who flew the Lynx with 337 Skv for seven years, told *CA* what it was like to fly the new helicopter and some of the other benefits: 'The biggest surprise to me was how manoeuvrable it is for such a big helicopter. You can do really fast and hard turns and I think it's maybe more manoeuvrable than the Lynx. I'm so used to flying the Lynx manually but in the NH90 you don't have to be hands-on all the time; you can program the route you want to fly and let the autopilot do it for you. The whole helicopter feels very solid and you don't get as much vibration.

'The weight of the NH90 is the most noticeable difference when flying. You can stop very quickly in the Lynx but now you have 11 tons of helicopter so you have to be more forward-thinking when you want to stop. The biggest difference, procedurally, is that you have a lot more information presented to you and your situational awareness is a lot better with the map displays. The biggest concern in the areas where we operate the Lynx is icing but now, with the anti-icing system, we are able to fly into the clouds,





*'Night operations are probably the hardest thing to do and also the most risky... you have no visual clues of the horizon until you get close to the ship. It takes a lot of practice'*

Maj Robert Paulsrud



which will expand the envelope of our operations. The NH90 is NVG-capable and they're testing a helmet-mounted sight and display system so we'll have NVGs on the helmet with the picture projected on our visor. The night flying that we're doing with the NH90 now is unaided but, even without NVGs, the NH90's fly-by-wire system means flying at night is easier than in the Lynx. The map displays adjust automatically to the ambient light and we only have two switches to dim everything in the cockpit; the Lynx has 36 switches to do the same thing!

'At my age, I appreciate the comfort of the seats and the heating system!' joked Maj Erik Mikkelsen, executive officer of OT&E NH90. 'The aircraft flies beautifully but with the fly-by-wire system you don't get that physical feedback from the main rotor to the cyclic and you sometimes feel that you're not in direct interaction with the aircraft because you're flying a computer. It handles very well and the autopilot system is a big benefit. The challenge is how you manage all of the information that is presented to you.'

### Endangered species

When it became apparent that the NH90 delivery schedule would not be met, each of 337 Skv's Lynx had almost reached their airframe life of 7,000 hours. Following thorough inspections in Norway, and re-working at AgustaWestland in the UK, their lives were extended to 9,000 hours but, by the start of 2013, three aircraft had reached that limit and been taken out of service. With fewer aircraft to fly and maintain, and as personnel

transfer to the NH90, the squadron has more than halved in size over the past three years and embarkations have been reduced. Up until 2010 Lynx crews were spending a total of 650 days at sea; that was reduced to 500 in 2011 and 400 days during 2012.

Six years later than originally planned, the first RNoAF IOC (Initial Operational Capability) NH90 was accepted on 30 November 2011 and delivered to OT&E NH90 at Bardufoss on 10 December 2011. This IOC helicopter lacks some of the mission systems necessary for tactical operations on board the frigates but is fully capable for operations with the Coast Guard. Throughout 2012, OT&E NH90 continued test and evaluation of the aircraft under Norwegian operational conditions, procedural development and publication development. The unit is also responsible for the training of aircrew and technicians for 337 and 334 Skvadrons, both of which will be based at Bardufoss.

With the second IOC aircraft expected in April 2012, followed by a further four in three- to four-month intervals, the plan was to qualify crews for the NH90 to take over Coast Guard operations in late 2012. However, the second aircraft was only handed over in November 2012 and Defence Minister Espen Barth Eide made it clear that the government's patience was wearing thin. While Oslo remains committed to the NH90 as the right aircraft for its requirements, there are suggestions that policy-makers are looking at viable alternatives such as the Sikorsky H-60 Seahawk. NHIndustries' chief adviser in Norway, Aage Jørgensen, said: 'we have agreed

with Norway to deliver fully operational helicopters from 2014, and this is the target we are working toward'. Delivery of the 14 Final Operational Capability (FOC) helicopters is expected to be complete by 2017.

The delays have forced the RNoAF to look at extending the retirement date of the Lynx beyond the end of 2013. Since CA's visit, Maj Kristensen has been assigned as Project Manager for a Lynx life-extension programme and told this magazine that they are working with AgustaWestland to extend the life of five airframes by 600 hours by means of detailed inspections and minimal re-working.

'The hours will keep the Lynx around for another five years at current production', explained Maj Paulsrud, who has taken over as 337 Skv XO, 'but the Lynx will be terminated when the NH90 is ready and not when the Lynx is dead. The RNoAF is also buying lots of parts this spring [from the recently retired Royal Netherlands Navy Lynx fleet] and both hours and parts should help us a lot in keeping them operational. The NH90 is now officially planned to take over in summer 2014 and the Lynx will be shut down at the same time. But there will be another high-ranking meeting this autumn to re-consider or consolidate this. I don't think we'll stop next summer.' ❏

Acknowledgements: Thanks to Lt Col Jørn Stangnes, Maj Tom Kristensen, Maj Robert Paulsrud, Maj Erik Mikkelsen, Capt Kjetil Laerum, Cdr Bjørn Schjerven and the crew of KV Svalbard.



# THE SYRIAN AIR BATTLE

Syria recently marked the second anniversary of the outbreak of protests, which eventually escalated into a major armed uprising and civil war against the regime in Damascus. Tom Cooper discusses the participation of the Syrian Arab Air Force (SyAAF) in this extremely brutal and destructive conflict.

report: **Tom Cooper**

## air....intelligence....

**T**HE UNREST IN Syria initially followed the patterns already established during the so-called 'Arab Spring' in Tunisia, Egypt and Libya. Although calls for protest against the regime in Damascus, launched with the help of social media in early February 2011, failed to attract much attention, the regime reacted to early peaceful protests with such brutality that this supposed 'anti-terror' operation eventually provoked outrage across the country. It also provided the 'spark' that led to the ongoing civil war. For all practical purposes, it can be concluded that the regime in Damascus 'set its own hair on fire', and can thus be considered fully responsible for all of the destruction and deaths that Syria has experienced since.

Internally known as the 'silent service', the Syrian Arab Air Force is and remains the base of the Assad regime. Father of the Syrian President Bashar al-Assad, and the 'originator' of the current regime in Damascus, Hafez al-Assad became politically active while flying Gloster Meteors and MiG-15s in the late 1950s. He established his original power base while serving as station commander, and ascended to power in Damascus while acting as SyAAF

Chief of Staff, and finally as Minister of Defence in the late 1960s. By the time he secured his position in power in 1970, the Syrian Air Force was Assad's 'fortress' — and its Intelligence Department (SyAAFID) became the most powerful (and notorious) intelligence agency and internal security force in the country, a position it maintains to this day.

The SyAAF has shown an absolute minimum of dissent since the start of unrest in Syria. In two years of war, only four active pilots (including two squadron commanders and one pilot who flew his MiG-21 to Jordan), several mid-ranking officers and a number of retired pilots but active intelligence officers (among them the first and only Syrian cosmonaut) have defected.

### Combat fleet

The SyAAF began the war in the process of overhauling and re-conditioning many of its assets, following a period during which the entire force had experienced much neglect (see 'Syria's Secret Air Arm', *Combat Aircraft* September 2012).

The first element to become involved in the fighting was the huge helicopter fleet,

consisting of more than 120 Mi-8/17 transport and assault helicopters, around 20 recently overhauled Mi-25 helicopter gunships, and some 30 remaining SA342 Gazelle light helicopters. The interceptor fleet, consisting of around 20 MiG-29s (many of which recently underwent overhaul at the depot in Aleppo) and 40 MiG-23MLs (including a number of MiG-23MFs re-built through the addition of MiG-23MLD components), have so far seen very little combat service. This is hardly surprising considering that the SyAAF's ground-based air defence component has been much weakened after rebels over-ran a number of radar and SAM sites, rendering large parts of its integrated air defence network non-operational, and thus forcing the air arm to react to intensive operations by Israeli reconnaissance UAVs inside Syrian airspace by scrambling its interceptors.

At the start of the war the backbone of the SyAAF's fighter-bomber force consisted of around 60 MiG-21bis, about 100 MiG-23MLs and MiG-23BNs, some 50 Su-22M-3/4Ks and 20 Su-24MKs. Furthermore, the SyAAF pressed into use at least two recently overhauled MiG-25RB reconnaissance-bombers, several An-26 transports equipped





This photo: **One of the locally overhauled (and, reportedly, upgraded) MiG-23BNs, serial 2379, releases two FAB-250M-62 bombs towards a target in the Rif Dimashq area in September 2012. Units equipped with this type are responsible for flying most of the combat sorties.** Courtesy SNN

Below left to right: **The SyAAF's fleet of L-39ZOs has not suffered heavy losses during the fighting, but has proven vulnerable to small arms fire and the MANPADS now used by several insurgent groups. Correspondingly, the type has appeared seldom over the battlefields since November 2012. Serial 2118 was captured intact (although non-operational) at Kshesh on 13 March 2013.** via R.S.

**The deployment of L-39s nominally operated by training units based at Minakh, Kwers and Kshesh to attack insurgents advancing into Aleppo in late July 2012 marked the start of the phase of the war in which air power saw intensive deployment. L-39ZO serial 2136 was photographed while releasing two RBK-250 cluster bombs on 2 September 2012.** Courtesy SNN



for reconnaissance, and dozens of L-39 Albatros jet trainers, which are deployed for light strike duties. In the course of the conflict, but especially since summer 2012, the SyAAF introduced to service a number of reconnaissance UAVs. Around 20 of these — nearly all of Iranian origin — are known to be operational.

### SyAAF at war

The SyAAF's participation in the civil war developed somewhat gradually. Throughout most of 2011 it focused primarily on supporting loyal Army units and intelligence

services with the provision of transport aircraft and helicopters. Such operations became more frequent during the first half of 2012, but combat units only intensified their maintenance activities and reconnaissance operations, obviously preparing for 'the inevitable'. Correspondingly, the first few losses suffered by the SyAAF in this war all occurred when Mi-8 and Mi-17 helicopters were under way to re-supply some of the dozens of various loyalist garrisons cut off by insurgent activity, in April and June 2012.

'The inevitable' came in summer 2012, when large-scale insurgent operations took place

almost simultaneously in three major urban centres. MiG-23BNs and Su-22s flew their first strikes in response to the wholesale collapse of the military and security apparatus in Dayr az-Zawr, in July 2012. Starting in August of the same year, L-39s assigned to training units based at Kwers and Kshesh air bases began launching attacks against insurgents that had assaulted Aleppo and captured nearly 60 per cent of that city.

The SyAAF fighter-bombers initially encountered only limited opposition from the ground: the insurgents not only lacked suitable weapons, but also training and





practice in engaging aircraft and helicopters. However, by August 2012, insurgent units in the Dayr az-Zawr area not only captured a number of anti-aircraft guns, but also began setting up ambushes for incoming SyAAF strikers. Following several days of 'cat-and-mouse games' between the insurgents and MiG-23BNs, one of the latter was shot down over Mohasan, outside Dayr az-Zawr, on 13 August 2012, becoming the first Syrian jet fighter lost during this war. Significantly, it was over the same area that the SyAAF also suffered its first Su-22 loss of the war, on 5 September 2012.

Between September and October 2012 the SyAAF further intensified operations. It then also began suffering heavy losses, partially because the insurgents started to target some of the many helicopters involved in bombing attacks, but also because of a series of insurgent offensives aimed at disabling all air bases in the Idlib and Aleppo Provinces. An attack on Taftanaz air base launched by several different insurgent units on 29 August 2012 resulted in the damage or destruction of 10 Mi-8/17s. From 30 August to 4 September other insurgent groups then put Abu ad-Duhor airfield under siege, shooting down two MiG-21s and damaging an Il-76 transport there. Both of these bases were over-run by insurgents in December 2012, while the crucially important Minakh air base, 35km north-west of Aleppo, has been under siege ever since (the SyAAF has so far lost at least four helicopters while attempting to re-supply the local garrison).

Insurgent units active in the Damascus area knocked out a number of Mi-8 and Mi-17 helicopters during the same period in 2012, effectively forcing units equipped with these types to cease operating over the Syrian capital. Another area that proved much too risky for SyAAF helicopters stretches from downtown Homs to the towns of ar-Rastan and Talbiseh, north of the city. Although precise details about regime losses there remain sketchy (primarily because this area is surrounded by regime units), since November 2012 only Su-22s and Su-24s have operated there.

In October 2012 the SyAAF remained busy, its L-39s pounding the rebels in Aleppo and surrounding areas, but following the fall of the strategically important crossroads of Ma'arat an-Nuমান it was forced to further intensify its operations and began launching up to 200 combat sorties a day, primarily deploying MiG-21s, MiG-23s and Su-22s. In the course of the battles for this town and the nearby Wadi ad-Dayf Army base, the SyAAF started to deploy Mi-8/17s and Mi-25s as forward air controllers for formations of MiG-23s and Su-22s hitting local rebel bases and captured ammunition depots. However, its units also repeatedly received stringent orders (all issued by the Ba'ath Party HQ in Damascus and addressed to leading officers of all fighter-bomber units, all of whom are party members) to attack bakeries and apartment areas, causing extensive civilian casualties and heavy material damage. Eventually, it was the intense SyAAF activity — combined with disunity between different insurgent commanders — that prevented the rebels from over-running Wadi ad-Dayf and establishing themselves in control of the local stretch of the



strategically important M5 highway between Hama and Aleppo.

The pace of operations increased in November 2012, peaking mid-way through that month when up to 250 combat sorties were launched daily. It was in this period that the SyAAF began deploying Su-24s to hit targets in Aleppo and Idlib Provinces (previously, Su-24s were used only over distant areas, primarily Dayr az-Zawr), because the skies over Syria's largest city became 'too hot' for L-39s. Simultaneously, MiG-21s and Su-22s were heavily utilised to pound targets in al-Qusayr and ar-Rastan.

Above, top to bottom: Apart from MiG-23BNs, SyAAF Su-22M-3Ks and Su-22M-4Ks are flying most of the combat operations. via R.S.

The SyAAF fleet of around 25 MiG-25s of different variants was largely de-activated in 2009. However, at least two MiG-25RBs (this is serial 2709) have been returned to use and are flying reconnaissance operations as necessary. R.S.

Some of the circa 20 MiG-29s still in service underwent an overhaul at the depot at Nayrab air base (Aleppo International) in 2009-10, where this photograph (including serial 2460, on the right) was taken. Latest reports from ar-Raqa Province indicate that MiG-29s might now also be used as fighter-bombers. R.S.





Above, top to bottom: **A SyAAF Mi-17 shot down by an insurgent-operated ZU-23 gun over Damascus on 27 August 2012. The helicopter exploded seconds later, possibly caused by so-called 'barmil' bombs — makeshift weapons consisting of metal pipes filled with explosives.** via R.S.

**At least eight Mi-8s, some derelict, were captured by insurgent units at Marj as-Sultan air base when it was over-run on 13 January 2013.** via R.S.

**A SyAAF Su-24MK loaded with FAB-250M-62 bombs over Jabal az-Zawiyah. At least one insurgent claim for downing a Su-24MK is known, but all that can be confirmed is that one example was damaged by ground fire.** Courtesy SNN

Bad weather began hampering SyAAF operations during December 2012, forcing the regime to start deploying ballistic missiles — including the SS-1c 'Scud-B' and various Iranian-designed models such as the Fateh-110 — to keep rebel-held areas under pressure. Furthermore, heavy losses have forced the SyAAF to begin re-organising its remaining resources. Units equipped with MiG-23MLs have still not been deployed in combat, although they possess a secondary air-to-ground capability (and are flown by appropriately trained pilots), but the first air strikes flown by MiG-29s were reported from

ar-Raqa Province in April 2013. Similarly, the relatively large fleet of Gazelles is held well away from the front lines: not only are they mainly flown by pilots of questionable loyalty, but the type is well-known as being vulnerable to ground fire and is thus of little use under present circumstances.

### Macabre statistics

Under the prevailing conditions, it is unsurprising that the insurgents have issued much-exaggerated claims about the destruction of SyAAF aircraft and helicopters. For example, they claimed to have shot down no fewer than 27 jet fighters and 44 helicopters by as early as 15 October 2012.

More importantly, although the SyAAF remains loyal to the regime and despite stringent control by what is left of the security apparatus, there are sympathisers of the rebellion within the air arm. They are in contact with various insurgent commanders, providing valuable intelligence. Thus it was that the orders from the Ba'ath Party HQ in Damascus calling for SyAAF fighter-bomber units to attack bakeries and apartment buildings became known in public. It is also in this way, and in combination with monitoring and reporting of air operations by the armed opposition, that relatively detailed statistics concerning SyAAF combat operations have become available.

Correspondingly, between 7 March 2012 and 20 April 2013, the SyAAF is known to have suffered confirmed losses of 47 jet fighters, 56 helicopters, four UAVs and one transport aircraft (damaged on the ground and written off after landing at an airfield that has meanwhile come under rebel control). Another 35 aircraft — mostly 'stored' and not flown for some years — and at least 26 helicopters have been destroyed on the ground, while the insurgents have also captured at least 15 intact (though usually damaged or derelict) helicopters. The latter fact leaves open the option of the rebels establishing their own air force, since they have captured extensive stocks of spares. During the same period, the SyAAF lost 331 pilots and crew members KIA and nine PoWs. The fate of 43 pilots and crew members remains unknown, while only 12 pilots and crew members (three Mi-8 crews) have been recovered. Because of this, as well as the loss of four air bases, a number of units have been disbanded and their remaining equipment and personnel re-assigned to other brigades and squadrons.

The area that has so far seen most of the activity by SyAAF fighter-bombers is Damascus City and the surrounding Rif Dimashq Province. More than 1,000 combat sorties were flown over this region between early November 2012 and late April 2013; of these, MiG-21bis fighters of 73 Brigade based at Khalkhalah are known to have completed 145 combat sorties, and MiG-23BNs of the an-Nasiriya-based 17 Brigade have flown 202. Other areas of intensive SyAAF activity are Aleppo, Idlib and Dayr az-Zawr Provinces, although it must be kept in mind that the data concerning combat operations in Homs Province — where the insurgents recently over-ran the abandoned Dhab'ah air base (known as 'al-Qusayr' in the West) — is incomplete, because this part of Syria remains cut off from the outside world.





**In autumn 2011, in an attempt to deter the population from launching an armed uprising, the Syrian Ministry of Defence publicised its annual combined-arms exercise, and for the first time released a number of photographs of various aircraft and other systems in service with the Syrian armed forces. Among them was Mi-25 serial 2802, recently overhauled in Russia. Syrian MoD**

In terms of ‘per-type’ breakdown, more than a third of fighter-bomber operations are flown by units equipped with MiG-23BNs and Su-22s, but the Su-24MKs of 819 Squadron based at T.4 — only around 19 of which are available, and even fewer ‘fully mission-capable’ by Western standards — are known to have flown no less than 300 combat sorties across all of Syria so far.

Although the majority of SyAAF ordnance is apparently ‘missing’ its targets, i.e. hitting apartment buildings, bakeries and markets, causing thousands of civilian casualties and widespread destruction and material damage, the regime considers most of its air strikes as ‘accurate’ — to have hit targets the regime wants them to hit. This stems from the fact that the SyAAF is not only used to bomb insurgent headquarters and troop concentrations, but foremost to ‘punish’ the local population for the uprising, terrorising them and forcing them to flee. Therefore, bombs that hit apartment buildings are considered as ‘delivered on target’. Furthermore, the regime is repeatedly and purposefully targeting bakeries and makeshift hospitals, on one side in order to increase the suffering of the local population, on the other to deny their use to the rebels.

Aside from this macabre ‘success’, the SyAAF is performing relatively well in interdicting the flow of supplies to the rebels, especially so between the border with Turkey and the rebel-held areas of Aleppo and Idlib Provinces. There the L-39s armed with little more than GSh-23 cannon and UB-16-57 rocket pods flew over 300 (mostly successful) attacks on trucks carrying fuel and ammunition for the rebels between late July and November 2012 alone. All the traffic in this part of Syria has since been active only at night, when the SyAAF fighter-bombers are not operating. The introduction of locally manufactured chaff and flare dispensers on most MiG-21s and MiG-23s (in addition to Russian-built examples already fitted to Su-22s and Mi-25s) has also proven a success, and at least a dozen of these fighter-bombers have been saved from near-certain loss to the increasing number of MANPADS captured by the insurgents since summer 2012.

Nevertheless, the regime’s insistence on supporting garrisons cut off deep within territories secured by the insurgents has resulted in extensive losses to the helicopter fleet. The regime has also continued to insist on the deployment of heavier, yet less suitable, fighter-bombers for attacking targets

that could have been hit with better precision and at lower cost by more agile MiG-21s and L-39s. In particular, Rif Dimashq Province has suffered greatly at the hands of units equipped with MiG-23BNs and Su-22s. Only since early 2013 have MiG-21s been more intensively deployed in this area.

## Outlook

Overall, the future of the SyAAF is not especially promising. Although fighter-bomber losses have remained relatively limited so far, the helicopter fleet has suffered badly, and might entirely disappear entirely from Syrian skies by the end of this year if the conflict continues at the current pace. Furthermore, a number of crucial air bases in the east, north and south of the country are under siege, the only reason they have not yet fallen being the latent disunity between different rebel factions. Should the SyAAF continue to lose air bases at a rate similar to that since summer 2012, it might be forced to concentrate all of its remaining assets at a few airfields in central and western Syria, from where the majority of its fighter-bombers and helicopters will not be able to continue supporting remaining garrisons cut off deeper within rebel-held territories. However, exactly this is the key for the future of this conflict: unless the rebel factions begin to co-operate and launch well-organised and well-supplied, large-scale operations against major military installations in Homs Province, they are going to remain unable to break the present stalemate on the front lines in Damascus, Aleppo and Idlib.

Finally, one issue is already now certain: the SyAAF’s loyalty to the al-Assads and the Ba’ath Party, and its involvement in mass atrocities against the civilian population of Syria is practically a guarantee for its ultimate demise. No matter how much longer this conflict might continue, it is certain that the regime is going to fall — once the war is over, nothing in Syria is going to be the way it was before 2011. ❌

**No fewer than 10 Mi-8s at Taftanaz air base, before insurgents over-ran it in late October 2012. Most of the helicopters were damaged or even destroyed during repeated assaults that took place in November and December that year. Courtesy SNN**





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# Glory Days

**F**OR GENERATIONS, IT was one of the most beloved aircraft in the US Air Force inventory.

But it was a love-hate relationship. The first cadre of instructors who taught the first students said the Northrop T-38A Talon was too hard to fly, too hard to land and too tough to handle in the airfield pattern, even if their boss contradicted them. A later cohort of instructors and students complained that the T-38 was too easy to fly. Either way, generations of US Air Force pilots received their advanced training in the T-38's cockpit and none ever forgot it: many of them continued their careers as pilots of 'heavies' — bombers, airlifters and tankers — so their student days in the splendid, all-white T-38, or the 'white rocket', as everyone called it, gave them the highest-performing flying they ever experienced.

Our nostalgic look at T-38 flying examines the years when every US Air Force pilot flew the Talon.

After that, it all changed. It was a 'universal' pilot training scheme — although the term UPT actually stands for *undergraduate* pilot training — until 1992 and the introduction of the T-1A Jayhawk into the Air Training Command (ATC) fleet. When student pilots en route to assignment in heavies began flying the T-1A instead of the T-38, the Talon was no longer the common thread that bonded everyone who ever pinned on the silver wings of an Air Force pilot. Until then, it was something they all shared, every one of them.

## 'A sports car...'

'It was a sports car', said Stephen G. 'Steve' Wood, who first strapped into a Talon at Craig Air Force Base, Alabama as a member of Class 76-07 in December 1975. Like everyone of his era, Wood climbed into the glamorous T-38 after undergoing primary training in the frumpy, underpowered T-37A 'Tweet', famous for being screechingly loud and for having air conditioning that never worked.

'It's a sleek aircraft', said Wood of the T-38. 'It *looks* like it goes fast. Learning the instrument pattern and gauges was a challenge. You no longer had an instructor to your right side who could grab your oxygen hose if he needed to get your attention. You're out on the end of that airplane, like being on a needle, so it's different. The instructors worked hard to teach you about stalls and accelerated stalls so you'd know where you could get yourself in trouble in a high-performance jet.'

When test pilot Lew Nelson completed the first flight of a YT-38 Talon trainer (58-1191) at Edwards AFB, California on 10 April 1959 — the 'Y' prefix signifies service-test — Nelson described it as a 'benign, trouble-free aircraft' and uttered the company line that it might remain in service for as long as 20 years. If, instead, he'd said 50 his estimate would have been low. 'This was not just an >



**A three-ship of T-38As from the 82nd FTW conducts some non-standard echelon formation work for the photo ship while on an instructor continuity training mission from Williams AFB in 1978.**  
Douglas Barbier





# THE WHITE ROCKET

TOO DIFFICULT FOR ONE GENERATION, TOO EASY FOR THE NEXT

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Robert F. Dorr talks to the men who flew the T-38 Talon in its glory days, from 1962 to 1992, when every US Air Force pilot strapped into the 'white rocket' as part of the undergraduate pilot training programme.

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report: **Robert F. Dorr**







*'When student pilots en route to assignment in heavies began flying the T-1A instead of the T-38, the Talon was no longer the common thread that bonded everyone who ever pinned on the silver wings of an Air Force pilot. Until then, it was something they all shared'*



This photo: High over central Arizona, T-38s from the 82nd FTW at Williams AFB, practice an echelon turn. Douglas Barbier

Above left: Framed by pine trees and summer sky, a T-38 rests in front of Base Operations at Williams AFB, on a quiet Sunday afternoon in 1975. Four Peaks mountain is behind the jet and the Superstition Mountains are to the right of the nose. The F-5 on the left of the frame is from the 425th TFTS. Douglas Barbier

Right: Douglas Barbier, here with a T-38A-85-NO Talon (70-1955) was a student in the Northrop trainer in the mid-1970s and a flight instructor in the aircraft immediately afterwards. Douglas Barbier

aircraft', said Wood. 'This was an institution.'

The Talon was a product of the design team headed by Lee Begin and was a derivative of Northrop's single-seat N-156F single-seat fighter, which evolved into the F-5 Freedom Fighter/Tiger II series. In short order, it became more recognised and more numerous than the fighter from which it was derived. Three YT-38s (including a static test aircraft) were followed by 1,187 production T-38As powered by two 3,850lb static thrust afterburning General Electric J85-GE-5A turbojets. In years to come, production T-38As became AT-38A, AT-38B and T-38C models, all beyond the scope of this look at the Talon's glory days.

The T-38 is a conventional twin-engine, low-wing jet with extremely small, sharp-edged wings (spanning 25ft 3in or 7.70m), lightweight airframe, and a slender, area-ruled fuselage. It is unique in being a trainer intended for routine flight at supersonic speed. The instructor is seated behind and 0.25m higher than the student pilot, both having rocket-assisted ejection seats. The tandem cockpit is pressurised and air-conditioned. A fully powered rudder is fitted and the low-set tailplane is a one-piece, all-moving unit. The straight wing with modest sweep on its leading edges has no trim tabs. The ailerons are powered.

The first operational T-38 was delivered to the 3510th Flying Training Wing at Randolph AFB, Texas, on 17 March 1961. Delivery pilot Col Arthur Buck was authorised to create a sonic boom at altitude before landing. The Talon started out by training instructors at Randolph and soon afterwards was training students at Webb AFB near Big Spring, Texas. In an era when production rates were high, according to an ATC history, by the end of 1961 Randolph had 44 new T-38s and Webb had 21. Soon afterwards, five of ATC's eight UPT bases had T-38s and ATC reported transition from the T-33A Shooting Star to the T-38 to be a year ahead of schedule.

Initially during the T-38 era, ATC's training wings were the 3500th, Reese AFB, Texas; 3525th, Williams AFB, Arizona; the 3550th, Moody AFB, Georgia; 3560th, Webb; 3575th, Vance AFB, Oklahoma; 3615th, Craig; 3640th, Laredo AFB, Texas; and 3646th, Laughlin AFB, Texas. All were situated to take advantage of good flying weather in the American south-west but most were in small towns far from the urban centres in which half the US population lived. Laughlin had the advantage of being on the border with Mexico, where Ciudad Acuna proffered 'Boys Town' with its bars and brothels', while one student pilot bemoaned that the Stateside city adjacent to the base, Del Rio, was 'so small the local Baskin-Robbins has only one flavour.'

Pilot training was vastly accelerated during the Vietnam build-up. At Laughlin in 1966, the wing commander introduced a new way to conduct daily launch and recovery operations. Previously, the 3646th Wing had divided the day into four flying periods and

launched up to 45 aircraft of each type (T-37 and T-38) into nearby training areas, but they were small, overcrowded and difficult for student pilots to manage. There were 41 T-38 training areas and 30 for the T-37s. Under the Laughlin plan the wing divided the day into three-and-a-half-minute segments, thus providing 315 take-off times for each type of aircraft. The programme allowed the wing to enlarge the size of the training areas and reduce the number needed. The new training areas were large enough to allow the student to fly any kind of T-38 mission and the continuous flow relieved congestion experienced under the old block-launch system. All eight ATC flying training wings adopted the Laughlin plan.

These wings had four-digit designators at the time they began T-38 operations. A decade later in 1972, to preserve the lineage of combat units as post-Vietnam downsizing began, ATC replaced four-digit flying training wings with two-digit designators.

After basing changes the 1972 total was nine flying training wings in ATC: the 12th at Randolph; 14th, Columbus AFB, Mississippi; 29th, Craig; 38th, Laredo; 47th Laughlin; 64th, Reese; 71st, Vance; 78th Webb, and the 3630th at Sheppard AFB, Texas, which was alone in retaining a four-digit designator.

## Bothered boss

Not everything about the T-38 was perfect. Not everybody thought it posed too many obstacles. ATC boss Lt Gen James E. Briggs told anyone who would listen that the T-38 was too easy to fly. The silver wings of a US Air Force pilot, Briggs indignantly proclaimed, should be won only after 'great challenge'. Besides, fighters then in service like the F-100 Super Sabre and F-105 Thunderchief were decidedly not easy on their pilots. Briggs wanted his men to be prepared. Briggs' 1963 successor and subsequent ATC bosses do not appear to be on record about the T-38. Others will never forget it.

Too easy? Nothing like the T-38 had ever pierced the sun-drenched skies of the American south-west and the 'white rocket' could be easy once you'd mastered it, but that took time. 'If you respected the corners of the >







Left: Capt Marc Marchesseault here with a T-38A-85-NO Talon (70-1955) as part of the 82nd Flying Training Squadron, 78th Flying Training Wing, Webb Air Force Base, Texas. The bright colours signal the US Bicentennial in 1976, but Webb was closed in 1977. Marc Marchesseault

This photo: Airborne during the winter of 1977, high over the Mogollon rim in central Arizona, these T-38s from the 82nd FTW are at 90 degrees of bank practicing wing work. Note the bored instructor in the front cockpit of the nearest aircraft with his helmet resting on his hand. The white strip across the top of the photo is a right of way for a power line. Douglas Barbier

Below: Two Bucks: student pilot Capt (later, Lt Col) Brian C. 'Buck' Rogers (left) and instructor Lt Col Bruce A. 'Buck' Bleakley of the 97th Flying Training Squadron, 82nd Flying Training Wing, with a T-38A-60-NO Talon (65-10393) at Williams AFB, Arizona, 27 February 1984. Today, Bleakley is director of the Frontiers of Flight Museum in Texas. Brian C. Rogers



## T-38 SERIALS

58-1191/1193	3	YT-38-5-NO
58-1194/1197	4	T-38A-10-NO
59-1594/1601	8	T-38A-15-NO
59-1602/1606	5	T-38A-20-NO
60-0547/0553	7	T-38A-25-NO
60-0554/0561	8	T-38A-20-NO
60-0562/0596	35	T-38A-35-NO
60-0597/0605	(9)	Cancelled T-38 order
61-0804/0947	144	T-38A-40-NO
62-3609/3752	144	T-38A-45-NO
63-8111/8247	137	T-38A-50-NO
64-13166/13305	140	T-38A-55-NO
65-10316/10475	160	T-38A-60-NO
66-4320/4389	70	T-38A-65-NO
66-8349/8404	56	T-38A-65-NO
67-14825/14859	35	T-38A-65-NO
67-14915/14958	43	T-38A-70-NO
68-8095/8217	123	T-38A-75-NO
69-7073/7088	16	T-38A-80-NO
70-1549/1591	43	T-38A-85-NO
70-1949/1956	8	T-38A-85-NO







flight envelope, the thing was a joy to fly', said Douglas Barbier, who first piloted the T-38 as a student at Williams with Class 75-05 in September 1974 and later instructed in the Talon, also at Williams, until 1978. He described the baptismal experience:

'After six weeks in the simulator and ground training, the first ride in the aircraft for the student — who's in the front seat — was the 'boom' ride', said Barbier in an interview. 'It was your initiation to high-performance flight. You did an afterburner take-off, left it in burner, climbed to 45,000ft, levelled off and did a supersonic speed run. You could go from take-off to 45,000ft in under five minutes and you were only about 45 miles downstream. As in all supersonic jets, the only way you could tell you'd gone supersonic was to look at the Mach meter.'

Another T-38 student pilot, Randy Gurchin, echoed Barbier's comments: 'I couldn't afford a Porsche back in UPT. However, the kick-in-the-ass response of the 'white rocket' was my version of having a Porsche — a supersonic one with jet engines.'

A student pilot soloed at the seven-hour point and soon learned manoeuvring and formation flying. 'You got ahead of the jet or it stayed ahead of you', Barbier warned. Early in his T-38 experience, Barbier encountered what the Air Force calls an IFE — an in-flight emergency.

### Crisis in the sky

After an instrument flight interrupted by traffic issues, Barbier was in the back seat ready to descend toward Williams, or 'Willy', while on instruments, with an instructor pilot, an IP, in the front seat.

'The IP had me go back under the hood', Barbier said. 'He gave me a 'nose-low' unusual attitude recovery to perform, since we had to go down to FL230 [23,000ft] to hit the IAF [initial approach fix] for 'Willy'.

'Just after I got the jet back upright and to level flight, we had an explosive decompression. Now we're talking FL 390 [39,000ft] at midnight and 0.9 Mach here.

'My first thought was that the IP had ejected and not warned me. But then I realised' — because of the design ejection sequence — 'that I would have gone first and that there had been no flash from the rocket motor of the ejection seat. So I ripped the instrument hood back and saw that the front seat was still there and his helmet was visible as well. It was impossible to communicate with him due to the windblast and noise and I had no idea if he was disabled, but fortunately, he had taken his arms off of the canopy rail where they'd been resting for the last half hour and was guarding the stick during my recovery.

'That was the only time in my life I've ever declared a 'mayday'. Everything went haywire on the jet. All the lights went to full bright, the air-conditioning system went to full hot, the altimeter had frozen at the 12 o'clock position and I was pressure-breathing from the oxygen system because we were so high. I threw the speed brakes (boards) out, slowed to 250 KIAS [knots, indicated air speed] and started down. I got down to about 15,000ft when the altimeter unstuck, spun like a top for many revolutions and finally started working again. Due to the terrain, I couldn't get much lower, so I dropped the

flaps and slowed to 200 KIAS, at which point I could finally hear the IP up front as he shouted into his mask against the wind noise. The plan was to get radar vectors to an ILS [instrument landing system] final and for me to fly it as low as I could and he would take it for the landing — as a student, I had never attempted a back-seat landing, much less one at night. I got down to about 25ft before I felt the stick wiggle and he took it.

'It turned out that his canopy had simply disintegrated. The canopy rails were still on the jet but virtually no Plexiglas was left. The very next day, an FCF (Functional Check Flight — a test hop on a jet that's just come out of heavy maintenance) went up and during his afterburner climb to altitude, the pilot heard a loud 'crack', looked over and saw his canopy was cracked from side to side. It turned out that both canopies were from a new contractor and were defective.'

The T-38 trained generation after generation, and Barbier was just finishing his T-38 student and instructor experience when Tom Cecchetti arrived at Laughlin in Class 80-05 in November 1979. Cecchetti was exactly the type for whom the T-38 was unique: although he would enjoy a long career as a 'total aviation person', he would never again handle the controls of a high-performance aircraft.

'I went from 'Tweet' to Talon and it was a quantum leap. On my first flight in a T-38, I was so far behind that airplane I felt like I was hanging on to the elevators and clinging for dear life', said Cecchetti.

Similarly challenged was Brian C. 'Buck' Rogers of Class 84-04, who followed Barbier to Willy and made his first flight as a T-38 student in September 1983.

### Buck Rogers' rocket

Rogers told *Combat Aircraft*:

'The time span from your first day in the squadron to your first solo in the T-38 was very brief — 'Holy crap, I'm going up by myself here!' — and you feel like you're hanging behind the jet and, 'I've got some catching up to do'. You have to get to the point where you can say, 'Okay, I'm very comfortable with this jet'. It comes naturally and quickly that you say, 'I've got this jet by the horns and I can control this thing.'

'The T-38 is the threat equaliser: if you enter flight training with commercial multi-engine experience you're going to gallop out to the front in a basic aircraft like the T-37 'Tweet', but once you get in the T-38 and you enter a high-g loop at 500kt, your past experience doesn't help that much.

'In time, you say to yourself, 'This is a military flying machine. I want to take it into the air and do magical things with it'. If you're intimidated by it, you're in the wrong line of work'. Rogers logged much of his dual-control time with an instructor who shared a

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***'If you respected the corners of the flight envelope, the thing was a joy to fly'***

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**Douglas Barbier, Class 75-05**





nickname, Bruce 'Buck' Bleakley. Years before becoming an instructor, Bleakley was the earliest T-38 Talon student pilot interviewed for this perspective and the only one who was in a pilot training class before the US Air Force started identifying them entirely with numbers: his class was 68-H.

Decades later, Bleakley told *Combat Aircraft*: 'The neat thing about the T-38 — it gave all pilots an opportunity to fly a high-performance aircraft. It demanded a high degree of attention, especially when landing. The majority of students who washed out did so upon landing. If you could land it, you could handle anything else because, when you approached the edge of the envelope, all it required was for you to really pay attention.'

## Return to the Talon

Marc Marchesseault returned to the T-38 Talon in 1976, the year of the American Bicentennial, when aircraft were splashed in red, white and blue to commemorate the nation's 200th anniversary. He was a student in Class 71-01 at Randolph before flying prop-driven T-28s in South-east Asia. Now, he was an instructor at Webb. Marchesseault thought of himself as caught between two generations of T-38 trainees — those for whom the Talon was too easy to fly because it lacked the bad habits of an earlier generation's F-100 Super Sabre, and those to whom it was too difficult because it lacked the push-button ease of newer fighters like the F-16 Fighting Falcon.

In an aircraft where you could take off from Texas and be over Los Angeles in a few hours, Marchesseault felt there were a lot of positive opportunities for students to learn airmanship while feeling enormous blasts of power behind their backs. You were at enormous heights in the T-38. You were freed from the clouds, from nearly all weather, up where if you could see the earth at all you could almost detect its curvature.

If the comments of T-38 veterans seem to be uttered with almost a single voice, it is because they shared an experience that was like nothing before it and they were, and still are, in awe. T-38 students are like members of a closed clique or a secret society. If you've been there, you don't need to explain. If you haven't, there is no way, really, to convey the risk, the triumph and the peril of flinging the 'white rocket' around in the highest and farthest reaches of the sky. The peril is a small part of the story, but it's there. Not everyone walked away from a flight in a T-38.

Marchesseault said that some students may have been intimidated by the T-38's extraordinary roll rate, while others revelled in it. 'The airplane was very light, very sensitive on the controls — which is why it was so manoeuvrable. It had a roll rate of 720 degrees per second. That's two full, complete turns in one second. You can scramble your brain at that roll rate — and you can hurt yourself doing that.'

You would be okay in the T-38, Marchesseault believed, so long as you didn't get into an engine-out situation while heavy with fuel on landing. It helped that angle of attack (AoA) indicators, not installed at the factory, had been retro-fitted by the time Marchesseault began instructing. 'It was a problem aircraft if it was in single-engine

configuration at heavy weight. The high angle of attack in the back seat gave you no view of the runway at all. The new AoA indicator told you something about how the airplane was doing but of course it was still your hands on the stick and throttle.

The old guys were used to flying F-100s and others in the 'century series' that were very unforgiving and you didn't flare those aircraft on landing. The T-38 being able to flare and to use aileron for roll on final was sacrilegious to those old guys'. Even in a worst-case situation, Marchesseault said, you would be okay if you could keep track of everything the aircraft was doing around you, every moment.

Air Training Command took receipt of its 1,114th and last T-38A Talon (70-1956) at Palmdale, California, on 31 January 1972, ending 11 years of steady deliveries. Counting overseas customers, Northrop built 1,187 Talons.

In October 1985, the US Air Force launched Pacer Classic, a maintenance programme to rebuild and modernise the T-38. Already being called 'venerable', the T-38 had been used in flying training for nearly a quarter of a century and was showing signs of wear. Following two wing failures in 1978, ATC had initiated a programme to replace the T-38's wings. Then, in 1982, several initiatives were taken to improve the T-38's J85 engine. These efforts collectively evolved into Pacer Classic, an umbrella programme, under which the T-38 fleet would receive various airframe modifications and engine enhancements to prolong its service life.

Fully two decades after the last T-38 rolled out of the factory, on 5 July 1991, with pilots Mike Preston and Bud Francis doing the honours at Wichita, Kansas, an entirely new kind of training aircraft took to the sky, the T-1A Jayhawk. The new aircraft (a derivative of the Beechjet 400A, which, in turn, was a version of the Mitsubishi MU-300) was delivered in 1992 to the 62nd Flying Training Squadron, 64th Flying Training Wing at Reese. Class 93-12 began pre-flight training on 20 July 1992, flew the first student sortie in the T-1A on 19 February 1993, and graduated on 26 July 1993. It was the beginning of the end for the 'universal' experience, fully three decades of it, in which every US Air Force pilot was tested on the Talon. From that point onwards and until today, only *some* would fly the T-38. This was a huge shift in the way airmen were trained, a quantum shift in military culture — and the end of the glory days of the 'white rocket', the Northrop T-38 Talon. ✈

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***'The kick-in-the-ass response of the 'white rocket' was my version of having a Porsche — a supersonic one with jet engines'***

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**Randy Gurchin, Class 81-04**

## WHERE ARE THEY NOW?

Bruce Bleakley (Class 68-H), who no longer uses the nickname 'Buck', flew the C-130 Hercules in Vietnam before instructing in the T-38. A retired lieutenant colonel, he is director of the Frontiers of Flight Museum in Dallas.

Marc Marchesseault (Class 71-01) instructed Vietnamese pilots in the T-28 at Keesler AFB, Mississippi and flew AT-28D combat missions in South-east Asia. He later flew F-4C, F-4D and F-4E Phantom IIs, and had a role in early development work on the F-117 Nighthawk stealth aircraft. A retired lieutenant colonel, Marchesseault manages the website for the Hangar 25 Air Museum in Big Spring, Texas, where Webb AFB closed in 1977.

Douglas Barbier (Class 75-05) flew with the 57th Fighter Interceptor Squadron in Iceland — 'I got the only Soviet 'Bear' intercept in a T-33' — and went into the Michigan Air National Guard in 1980. He flew the F-4C and F-4D and the F-16A Block 15 Air Defense Fighter as a Guardsman. He is a retired lieutenant colonel in the Guard and a retired American Airlines Boeing 777 first officer and Fokker 100 captain. He is an active aviation researcher and photographer.

Stephen G. 'Steve' Wood (Class 76-07) piloted the F-4 in England in 1977-79 and subsequently instructed in fighter tactics in the AT-38B Talon at Holloman AFB, New Mexico. He reached three-star rank and was the US air commander in South Korea before retiring in 2009. He works for jet engine maker Rolls-Royce in northern Virginia.

Thomas D. Cecchetti (Class 80-05) piloted the C-141A and C-141B StarLifter. A retired major, he is also a retired American Airlines Boeing 767 captain. Today, he pilots a Falcon 900EX executive jet for North Carolina evangelist and philanthropist Franklin Graham.

Randy Gurchin (Class 81-04), flew the KC-135 Stratotanker for a brief period before spending a career at the controls of RC-135 Rivet Joint reconnaissance aircraft. He stopped flying when he retired as a lieutenant colonel in 2004. Today, Gurchin works for ISR Group, a subcontractor to Boeing on the Scan

Eagle unmanned aerial vehicle.

Brian C. 'Buck' Rogers (Class 84-04) graduated from the nimble T-38 to the heaviest

'heavy' of all, the B-52 Stratofortress. He spent a career in the big bomber and flew combat missions in Operation 'Desert Storm' in 1991. A retired lieutenant colonel, today he flies for a company in Wichita, Kansas.







Above: T-38s from the 82nd FTW pitch out high over Arizona in 1978. Douglas Barbier

Below: Three T-38s from the 82nd FTW fly close formation over Roosevelt Lake, east of Phoenix, Arizona, en route to the working MOAs (Military Operating Areas). Note the solo student in the number two aircraft on the right of the formation. He was the last student in the class to finish and needed this four-ship solo ride to be able to graduate. Douglas Barbier





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# TACAMO TAKE CHARGE AND MOVE OUT

US NAVY NUCLEAR COMMAND, CONTROL  
AND COMMUNICATIONS

*Combat Aircraft* enters the clandestine world of Strategic Communications Wing ONE at Tinker AFB, Oklahoma, to look at the role of the E-6B Mercury.

report and photos: **Neil Pearson**

**T**HE 'NUCLEAR TRIAD' of land-based ballistic missiles, long-range bombers and ballistic missile submarines has been a key element of the US defence posture for decades, but in the event of a nuclear attack the ability to communicate with them and order a counter-strike is essential.

Twenty-four hours a day, 365 days a year, US Navy E-6B Mercury aircraft stand alert at locations across the United States, ready to launch at a moment's notice to relay messages from the National Command Authority (the President and Secretary of Defence) in the event that ground-based control becomes inoperable. It is a mission conducted under the acronym TACAMO — Take Charge And Move Out.

The aircraft and personnel fall under the administrative command of Strategic Communications Wing ONE (SCW-1). They also belong to Task Force ONE TWO FOUR (TF-124), an operational command responsible to Commander, United States Strategic Command (USSTRATCOM). 'Our mission, in a nutshell, is to provide a survivable, reliable and enduring communication link from the national leadership out to their strategic forces', said the wing commander, CAPT Tim Pedersen. 'TACAMO is our primary mission, which is doing the Emergency Action Message [EAM] relay mission out to the strategic forces, and we do the USSTRATCOM Airborne Command Post ('Looking Glass') mission. We also do a Non-Strategic Nuclear Forces mission where we go over to Europe and practice our battle staff mission with a EUCOM [European Command] battle staff on board, and we have exercised our ability to fly DoD personnel within the country.' >





A fine airborne study of an E-6B Mercury above a thick cloud deck during a mission from Tinker AFB.







Home-based at Tinker AFB, Oklahoma, two Fleet Air Reconnaissance Squadrons (VQ) fulfil these missions: the 'Ironmen' of VQ-3 and the 'Shadows' of VQ-4. Each squadron has over 500 personnel and operates eight aircraft and 11 crews. The E-6B fleet flies a total of 12,000 hours annually.

### Operations and training

To perform the TACAMO mission, E-6 detachments are permanently located at forward operating bases at two locations on opposite sides of the US. VQ-3 keeps an aircraft and crew on alert at Travis AFB, California to cover the Pacific Ocean, while VQ-4 stands alert on the Atlantic coast at NAS Patuxent River, Maryland. There is also an auxiliary alert at Tinker and a contingency alert at an unspecified location to ensure cover should one of the main alert aircraft go down.

The E-6 receives and transmits secure and non-secure voice and data message traffic on multiple frequency spectra. Its primary communications mission is accomplished at very low/low frequencies (VLF/LF) and also via ultra-high-frequency (UHF) line-of-sight and satellite communications systems. At the heart of VLF communications is a 200kW transmitter and a dual trailing wire antenna system: a half-mile-long short trailing wire antenna (STWA) and a five-mile-long trailing wire antenna (LTWA). Each copper wire is about a pencil-width thick and has a

90lb drogue attached to stabilise it in flight. Controlled by the reel operator, each wire is extended to a length determined by the VLF frequency to be used. VLF radio waves emitted from the LTWA are able to penetrate the ocean's surface and can be received by submerged submarines trailing a receiving wire.

If the President makes a decision that he needs to relay to a nuclear submarine, that message is sent from USSTRATCOM via satellite and secure radio to the E-6B where it is first authenticated. 'When we're over the ocean, the reel operator will begin to extend the wire out up to 5nm', said CDR Mike Black, commanding officer of VQ-4. 'While the wire is extending, we'll extend our flaps down to an intermediate setting of approximately 20 degrees. We slow the aircraft down to a few knots above stall speed and fly a large orbit profile at up to 40 degrees angle of bank. As we reduce speed, the wire will stall and begin to hang vertically. We're trying to get the wire to be 70 per cent vertical to make a very tall antenna and then we can start transmitting the message.'

The crew can also fly a trail profile, dragging the wire and drogue behind the aircraft. This profile has the advantage that fuel is burned at roughly half the rate of flying an orbit profile but reduces the effectiveness and range of the antenna. In an emergency, the wire can be cut from either the flight deck or the reel operator's position.

A third squadron flying the E-6B from Tinker AFB is VQ-7 'Roughnecks'. As the E-6 Fleet Replacement Squadron (FRS), they are responsible for training US Navy aircrew for the TACAMO mission, which can take six to 12 months depending on their role. Pilots will spend time on operational flight trainers and the impressive full-motion ELDES (E-6 Level 'D' Equivalent Simulator) before flying four 'bounce' events in the aircraft, to practice landing with crosswinds, and four air-refuelling events. 'Landing is a critical phase for us because we have a very low tolerance for wing rock', said commanding officer CDR Mark Hustis.

'At full gross weight, the ground clearance on those inboard engine pods is 22in, so if our wings dip more than five degrees in a full-flap configuration we'll scrape an inboard motor. Air refuelling is another critical phase of flight, for obvious reasons, followed by letting the wire out. With airspeed and bank limits, your situational awareness has to be spot-on when you're flying so close to stall speed. Generally we'd be orbiting on autopilot but we train to fly manually so, in the event of the autopilot failing, they can still do the mission and get the message out.'

After six months with VQ-7, they are qualified as 'third pilots' before earning further qualifications with either VQ-3 or 4, ultimately becoming an Aircraft Commander after 18-24 months. The Weapons Tactics Unit (WTU) plays a large part in the post-FRS certification.





This photo: This image dates back to April 2003, when the first E-6B was moved into the Boeing Aerospace Support Center at Cecil Field to be retro-fitted with the new cockpit and an advanced communications package. US Navy

Below: The updated E-6B glass cockpit is based on that of the Boeing 737 Next Generation, with six flat-panel digital displays and dual flight management systems.

A 90lb drogue is attached to the end of the short trailing wire antenna that extends from the aircraft's tail cone.

Under the supervision of WTU instructors, entire crews can come together and run through four- to six-hour simulator events to work as a team and prepare for exercises.

### From 'Herc' to 'Merc'

The TACAMO mission was conceived in July 1963 when a young US Navy lieutenant, Jerry O. Tuttle, was told to start a project based on the concept of a survivable airborne communications link between the National Command Authority and deployed nuclear ballistic missile submarines. On receiving the order, he was told to 'take charge and move out', which Tuttle noted as 'TACAMO'.

Installed in a US Marine Corps KC-130F Hercules, the prototype solution (TACAMO >



*'Our mission, in a nutshell, is to provide a survivable, reliable and endurable communication link from the national leadership out to their strategic forces'*

CAPT Tim Pedersen





***'Block I improves the reliability and availability of the UHF command, control and communications system and enhances the electrical power and cooling systems. The introduction of the multi-level secure network dramatically increases the efficiency of the warfighter'***

**CAPT Chuck Baker**



## **ON BOARD THE E-6B MERCURY**

The E-6B is flown by two pilots and a flight engineer. Behind them is a crew rest area for the off-duty pilot and off-duty flight engineer. Further aft is the Battle Staff area that is occupied during ABNCP missions, and Communications Central, the heart of the aircraft, from where the TACAMO communications equipment is operated. At the back of the aircraft is the Reel Control Panel, where the Reel Operator controls the trailing wires, and the power amplifier that creates 200kW of power for the wires.

### **US Navy TACAMO Aircrew (13):**

- 3 Pilots
- 2 Naval Flight Officers (NFOs)
- 2 Flight Engineers
- 3 Airborne Communicators (ACOMs)
- 2 In-flight Technicians
- 1 Reel Operator

### **Joint ABCNP Battle Staff (8):**

- Airborne Emergency Actions Officer
- Mission Commander
- Airborne Operations Officer
- ALCS/Intel Officer
- Command and Control Manager — Emergency Actions
- Command and Control Manager — Force Status Logistics Officer
- METOC (Meteorology and Oceanography)
- Effects Officer

This photo: **Landing is a tricky phase of flight for E-6B pilots due to the limited ground clearance provided by the engine pods.**

Left top to bottom: **A pair of E-6Bs on the flightline at Tinker AFB, the home of the 'Ironmen' of VQ-3 and the 'Shadows' of VQ-4.**

The 'hump' on top of the E-6B's fuselage houses a high-frequency antenna to enable communications with ground stations and other aircraft through the MILSTAR secure satellite network.

An E-6B takes on fuel from a Tinker-resident KC-135R jointly operated by the 137 and 507th Air Refueling Wings.





It was a VLF transmitter capable of communicating with submerged submarines through a wire antenna trailed from the rear of the aircraft. Following successful trials, four EC-130G Hercules were delivered within 18 months of the initial order being given. They were fitted with the TACAMO II system that consisted of three removable, self-contained vans that could be installed in the aircraft within five hours. The TACAMO programme was expanded in 1966 when eight EC-130Qs were delivered with the more powerful TACAMO III system permanently installed. Two dedicated squadrons were commissioned in 1968 and, from 1981, were flying continuous airborne coverage whereby aircraft would be in the air over both the Pacific and Atlantic oceans 24 hours a day. This posture would continue until February 1991 when the squadrons reverted to a ground alert status following the end of the Cold War. Throughout the 1970s and 1980s, the aircraft received continual modifications including TACAMO IV (the more powerful 200kW transmitter and dual trailing wire system), a message processor system and wingtip antenna pods for satellite communications.

The E-6A Mercury was designed to replace the ageing EC-130Q using the last Boeing 707 airframes to come off the production line and installing some of the communications systems from the Hercules. First flown in February 1987, the E-6A entered service in August 1989, the venerable EC-130Q being retired in 1991. Delivery of the 16th and final Mercury came in May 1992 and SCW-1 was established at Tinker AFB in Oklahoma.

Due to the nature of its mission, the E-6 was designed to be survivable, reliable and enduring. An electro-magnetic pulse (EMP) is a burst of electro-magnetic radiation and could be the result of the detonation of a nuclear warhead high above the Earth's atmosphere. The effect would be devastating, with electro-magnetic waves destroying electrical circuits and disabling radio communications. Such an attack would cripple the ability to communicate with nuclear forces and order a counter attack. The EMP-hardened E-6 is the US Navy's only survivable means of nuclear command and control. Every hinge and joint on the aircraft is bonded together in multiple places to allow electricity to flow smoothly from one panel to another. Fuel lines and hydraulic lines are also bonded to the airframe to ensure that electricity cannot build up on them and enter the aircraft. In addition, EMP shields protect all of the windows and the wiring from over 50 antennae is fed into special grounding devices before entering the aircraft.

Expertly maintained, CAPT Pedersen said the E-6 is incredibly reliable. This is essential given their alert posture and the small number of aircraft: during 2012, as many as five were undergoing maintenance or modifications at any one time. 'In 2009, we removed an originally installed engine that had done just shy of 20,000 flight hours [19,655] without needing to be taken off the wing for maintenance. That engine was from one of the very first E-6As to enter service in 1989, which is testament to the designers of the CFM56 and the sailors who maintain them'.

Fully fuelled, the E-6 has an endurance of up to 14 hours. With in-flight refuelling, it can fly for up to 72 hours before requiring oil maintenance.

## Changing roles

At the height of the Cold War, 59 aircraft were assigned to provide connectivity to the US strategic forces. Today there are only 20 aircraft performing the mission in what is called the nuclear 'Thin Line' architecture: four US Air Force E-4B NAOC (National Airborne Operations Center) platforms and the US Navy's 16 E-6Bs.

1992 saw the end of the USAF's Strategic Air Command (SAC) and the birth of the joint US Strategic Command (USSTRATCOM), combining the US Air Force and Navy's nuclear components, which is headquartered at SAC's former complex at Offutt AFB, Nebraska. The Air Force's EC-135 'Looking Glass' aircraft were retired in October 1998 and their Airborne Command Post (ABNCP) role was assumed by the Mercury following upgrades to E-6B standard. Modifications included additional communications equipment and the installation of command consoles to be operated by an eight-person joint Battle Staff, augmenting the 13-strong Navy TACAMO aircrew. Externally, the key difference is the distinctive 'hump' on top of the fuselage which houses an additional high-frequency antenna to enable communications with ground stations and other aircraft through the MILSTAR (Military Strategic Tactical and Relay) secure satellite network. The new E-6B configuration provides greater endurance and >





lower operating costs than the retired EC-135 fleet and can communicate with all three arms of the nuclear triad.

The E-6B upgrade also equipped the aircraft with an Airborne Launch Control System (ALCS) making the Mercury capable of launching land-based intercontinental ballistic missiles (ICBMs). In July 1998, prior to the October transfer of the 'Looking Glass' mission, an E-6B with its TACAMO/battle staff crew test-launched an LGM-30G Minuteman III ICBM for the first time. In addition to their TACAMO commitments, VQ-3 and VQ-4 each provide crews and aircraft to a permanent ABNCP detachment at Offutt AFB.

In a dramatic change from its role of nuclear deterrence, between October 2006 and April 2009 TF-124 was forward-deployed to Al Udeid, Qatar in support of Operations 'Iraqi Freedom' and 'Enduring Freedom', monitoring coalition ground convoy movements in Iraq. 'We pulled out most of the traditional command and control role equipment which

took the aircraft down to pretty much a basic 707', said CAPT Pedersen. 'We installed some new radios, ideally suited for that area of operations, and were able to relay urgent information for the commanders and troops on the ground. We were flying that aircraft six days a week, 12-14 hour sorties, orbiting above some pretty hot areas.'

The E-6B and its aircrews flew a total of 714 sorties, for some 5,753 hours on station over Iraq, and completed almost 17,000 tactical support calls ranging from information on possible improvised explosive device (IED) detonations to medical requests for convoys that were out of radio contact.

## Upgrades and the future

In 2003, the analogue cockpit of the E-6B was replaced with a modern 'glass' cockpit, based on that of the Boeing 737 Next Generation, with six flat-panel digital displays and dual flight management systems. In addition to the cockpit upgrade, Boeing also integrated new battle management, command,

control and communications mission equipment while reducing overall aircraft weight.

Technological advances mean that the E-6B's communications systems are in an almost constant state of modification to maintain their effectiveness. As with most aircraft modifications, they go through developmental test and operational test before they reach the fleet. In 2011, because of the aggressive schedule of modifications that are planned, the Fleet Introduction Team (FIT) was established to oversee the introduction of aircraft system modifications to the fleet. Working closely with the test agencies during development, the FIT team is responsible for training the fleet squadrons so they are ready to deploy with new modifications.

'We're undergoing 16 modifications right now', said FIT Officer in Charge, CDR Marc Genauldi. 'Some of them are small changes which don't require much in the way of training such as replacing the analogue fuel quantity gauge with a digital one, and we're upgrading our steel brakes to carbon





brakes which will help with weight-saving. The major project right now is the Block I modification which is basically modifying the whole comms suite.'


The Block I modification upgrades the aircraft's communication infrastructure to support the movement of data on, off and throughout the aircraft. This will support the ever-increasing bandwidth demands of the digital battlespace. The work being completed by Rockwell Collins addresses immediate modernisation requirements, designed to repair a number of inefficiencies identified by USSTRATCOM, and the open-system approach will enable system expansion in the future.

'Block I features an open-system architecture for mission avionics, a voice-over internet protocol (IP) intercommunications system and an on-aircraft, multi-level secure (MLS) network supporting video and data processing, radio control/monitor and other mission applications', said Deputy Commander CAPT Chuck Baker, who has taken command of SCW-1 since *Combat Aircraft's* visit.

'The programme improves the reliability and availability of the UHF command, control and communications system and enhances the electrical power and cooling systems. The introduction of the MLS system dramatically increases the efficiency of the warfighter by allowing workload sharing across all positions during mission execution. Additionally, the Block I system allows for much higher bandwidth capabilities through digital IP services, enhancing the E-6B aircraft's already impressive airborne command post mission. This increased bandwidth will be instrumental in bringing new capabilities to the TACAMO and ABNCP missions.'

The first aircraft began the six-month modification process in September 2011. At the time of writing, SCW-1 had received three Block I aircraft and the fleet is expected to be completed by November 2018. By the time the Block I modification has been completed, the E-6B airframes will be an average of 30 years old. With a life expectancy of 22,000 flight hours and the fleet currently averaging 21,000

hours, a Service Life Extension Program (SLEP) is under way to double airframe lives. 'The SLEP provides re-work of critical airframe infrastructure with the intent to increase aircraft service life beyond 2038 or 45,000 hours', said CAPT Baker. The intention is that each aircraft will accomplish SLEP before going through the Block I modification. The first SLEP aircraft was completed in June 2010 and seven have now been finished, with the final airframe scheduled for delivery in January 2017.

CAPT Baker told *Combat Aircraft* that there are no longer previously announced Block II and Block III modification programmes, though clearly there will have to be future upgrades to maintain the E-6B's abilities. 

**Acknowledgements: Thanks to CAPTs Tim Pedersen and Chuck Baker, CDRs Ed McCabe, Mike Black, Mark Hustis and Marc Genauldi, LCDR Doug Moore, MC1 Chris Delano, MC2 Jessica Vargas, Lt Col Rich Curry (USAFR) and the crews of 'ELGIN 97' and 'OKIE 21'.**





# The Coming Hypersonic Arms Race

BY DAVID AXE

**I**T WAS A breakthrough years in the making. On 1 May a US Air Force B-52 bomber launched an X-51A Waverider unmanned test vehicle from a wing pylon. The two-ton, missile-shaped X-51 fired a solid rocket booster, accelerating quickly to Mach 4.8. Twenty-six seconds into its flight over the Point Mugu, California, test range, the Waverider switched to an air-breathing scramjet engine — and cruised for another six minutes at Mach 5.1 before splashing into the sea.

The 200-mile flight represented an ‘unprecedented achievement’, the US Air Force announced. It was the first successful, sustained test of a Mach 5-or-faster ‘hypersonic’ air-breathing vehicle, a triumph for US aerospace... and the potential trigger of a new arms race between the world’s leading air powers. As the US worked towards the X-51’s successful test, China and Russia prepared their own hypersonics programmes, aiming to match America’s advancements.

The X-51’s success followed years of failure costing some \$2 billion. For more than a decade the US Air Force, Navy, Army and NASA have laboured to produce a reliable hypersonic vehicle capable of controlled atmospheric flight. But test after test ended in failing components and crashed vehicles, their fatal tumbles usually attributed to the complexity of their ‘combined cycle’ engines, which blend rockets and air-breathing motors — the former for acceleration, the latter for cruising.

Having proved it can work, the X-51 — a collaboration between the Air Force Research Laboratory, NASA, the Defense Advanced Research Projects Agency, Boeing and Pratt & Whitney — could spawn new test vehicles and, eventually, a host of manned and unmanned hypersonic aircraft for military and civilian use. But the US may not be alone in producing these new, high-speed aircraft. And any military advantage resulting from their development might not be America’s alone.

Russia, a world leader in military-grade propulsion technology, is also working on hypersonic technology, although less successfully than the US. Soviet government researchers had studied hypersonics as early as the 1980s, but the government suspended their work during the political and economic tumult of the late 1980s and into the early 2000s.

Calling the suspension of hypersonics development ‘nothing less than treason’, last year Deputy Prime Minister Dmitry Rogozin announced Moscow would form a new state company devoted to Mach 5 flight. Initially the Russian military wanted its new PAK-DA

bomber, still in early development, to be capable of hypersonic flight, but this year the bomber was downgraded to a subsonic design.


Russian research into high-speed flight continues, however. The new hypersonics corporation is aiming to finalise its master plan for new technologies no later than this summer. ‘The work is not easy’, said Boris Obnosov, the government’s director of tactical missile development.

China, too, is firming up its hypersonics flightplan — but it faces even greater obstacles than Russia does. Where Russian industry has decades of experience designing and producing high-quality military aero-engines, Chinese industry struggles with even basic engine design. To date, almost all Chinese warplanes have been powered by imported Russian or other foreign engines, or by copies of Russian engines.

But that doesn’t mean China isn’t trying. In May 2012 the state-owned China Academy of Sciences Institute of Mechanics tested for the first time a new wind tunnel capable of simulating hypersonic speeds up to Mach 9,

according to a Pentagon report on Chinese military developments released in May. The new wind tunnel is reportedly the largest in the world, the report said.

One indication that China is moving forward with hypersonics could be the acquisition by Beijing of related technologies from Russia, Europe or even the US by legal or illicit means. ‘China often pursues these foreign technologies for the purpose of reverse engineering or to supplement indigenous military modernisation efforts’, the Pentagon report notes.

America’s own next moves are unclear. The X-51 model has been retired following its triumphal May test, but new high-speed test vehicles are sure to follow. The Pentagon has long wanted a conventional hypersonic strike missile capable of being launched by submarines — a potential first real-world application of the technologies proved in part by the Waverider. It should come as no surprise if Russia and China also begin developing such weapons as a down payment on future fleets of Mach-5 warplanes. 

*‘The first successful, sustained test of a Mach 5-or-faster ‘hypersonic’ air-breathing vehicle was a triumph for US aerospace... and the potential trigger of a new arms race between the world’s leading air powers’*

The X-51A Waverider flew its fourth and final mission on 1 May over the Point Mugu Naval Air Warfare Center Sea Range, during which the test team achieved a record-setting 210 seconds of air-breathing hypersonic flight. USAF/Bobbi Zapka







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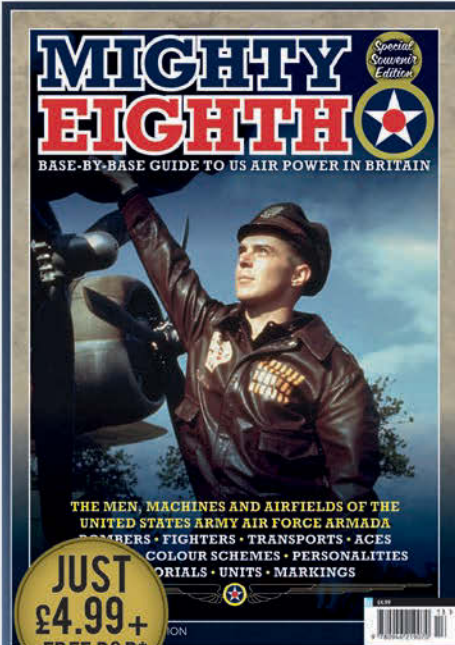
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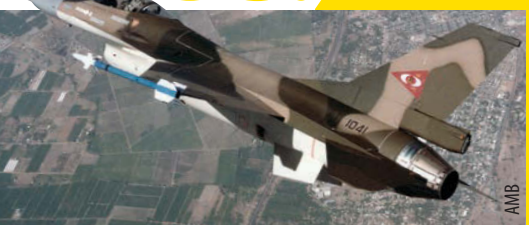
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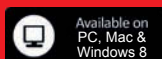
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