

AgustaWestland Lynx and Super Lynx



AgustaWestland is currently developing the Future Lynx as the latest generation of the Lynx helicopter, while also marketing its Super Lynx 300. Meanwhile, older and current versions have seen extensive action in military operations worldwide over the years, ranging from the cold wet Falklands to the hot and dusty Afghan deserts.

Text and photos: Emiel Sloot

The Future Lynx has come a long way from the basic model. The Lynx resulted from the WG.13 specifications laid down in February 1967 for a versatile all-weather helicopter. It was developed as a UK-French joint venture between Westland and Sud Aviation, with a 70-30 percent ratio. The first WG.13 prototype, serialised XW835, flew on 21 March 1971 piloted by Ron Gellatly. It was followed by twelve more development aircraft, including two for the French Navy, for an extensive testing and trials programme. During the test programme, performance turned out to be superb, the Lynx demonstrating its ability to perform loops and snap rolls. On 20 June 1972, Roy Moxam set the world speed record for helicopters at 173.7 kt (321.7 km/h) using XX153, the fifth prototype which incorporated several improvements including a longer nose, new gearbox and stiffer airframe.

While the Lynx was intended as a multi-role and multi-service platform, priorities during development

were given to a land-based army version, and most development aircraft were fitted with the skid landing gear. The first of this AH.Mk 1 variant flew on 12 February 1977, powered by two Rolls-Royce Gem 2 engines rated 900 shp (671 kW) that had been developed from the BS.360 engine programme. A total of 113 AH.Mk 1s was delivered to the Army Air Corps, with whom it entered operational service from August 1978. Lynxes primarily equipped 11 Germany-based squadrons of the British Army of the Rhine (BAOR), but also entered service with the Royal Marines' 3 Commando Brigade Air Squadron at RNAS Yeovilton.

The AH.Mk 1 was able to carry nine troops to the battlefield, or to act as anti-tank helicopter, for which 60 were modified for arming with eight Hughes TOW-missiles, guided by a M65 gyro-stabilised sight mounted on top of the left side of the roof. The TOW was later upgraded to Improved TOW with an enhanced warhead. In September 1983, two AGM-

114 Hellfire missiles were test-fired in Norway, but despite possessing better characteristics – including fire-and-forget capability – the missile was not acquired by the British.

The land-based Lynx was subsequently offered for export, but did not score much success at this front. Only three were obtained by the Qatar Police, which operated their Gem 41-7 powered Lynx Mk 28s between 1978 and 1991.

A pair of Lynx AH.Mk.7s of the AAC's 9 Regiment armed with 7.62-mm machine-guns



Initial naval Lynx versions

Proving the versatility of the design, a naval variant of the Lynx was developed as well. Beside having different mission equipment, the main external difference was the tricycle landing gear, configured to allow full turns while parked on the spot. Despite priorities during development being given to the army version, full-scale production of the Lynx reached a milestone with the first flight of the naval Lynx HAS.Mk 2 variant (serialised XZ227) on 10 February 1976. Like its army counterpart, it was powered by two Gem 2 turboshafts.

The Fleet Air Arm took delivery of 60 Lynx HAS.Mk 2s for a variety of roles, such as anti-surface vessel and anti-submarine warfare, search and rescue and troop transport. They featured a 180° Ferranti Seaspray Mk 1 multi-mode I-band radar for target search and track, and navigation. Armament consisted of two Mk 44 or Mk 46 torpedoes (later also the Stingray mod 0), or two Mk 11 depth charges. Alternatively, four BAe Dynamics Sea Skua missiles could be carried. Sea Skua is a lightweight

(320-lb/145-kg) semi-active radar-guided weapon for use against surface targets. The French Aéronavale's HAS.Mk 2 (FN), of which 26 were ordered, differed slightly in having a OMEGA-Segid ORB31W radar, an Alcatel DUAV-4B sonar and Aérospatiale AS 12 wire-guided anti-ship missiles. It also had a slightly higher all-up weight of 10,500 lb (4,763 kg).

The Lynx has a basic crew of two – pilot and system operator – with a third person added in the cabin for operating equipment such as sonar or hoist, or acting as loadmaster. State-of-the-art flight

controls were provided to allow for precision flying and to create a stable platform when hovering, even in adverse weather. A folding tail section saved room in narrow ship-based hangars, although eventually not all operators would opt for this feature.

Export success for the HAS.Mk 2 variant came quickly as the Royal Netherlands Navy ordered 24 Lynxes in three different variants. Six Lynx Mk 25s, locally designated UH-14A were acquired for land-based operations such as SAR and training, while ten Mk 27s (SH-

14B) and eight Mk 81s (SH-14C) – the latter having MAD equipment – were dedicated to the embarked flights for fleet defence. The SH-14B and C featured more powerful Gem 4 Mk 1010 engines rated at 1,120 shp (835 kW). At RNAS Yeovilton, the joint UK-Dutch No. 700L Squadron was established in September 1976 for training and trials with the new helicopter, after which the type entered service with both naval air arms. No. 700L Sqn disbanded in December 1977, simultaneously reforming as 702



Dutch SH-14D banking over the North Sea coast

Naval Air Squadron.

More export orders came from Brazil, which chose the Lynx HAS.Mk 2 for naval operations, ordering nine Mk 21s that were locally designated SAH-11, while Norway bought six Mk 86s, mainly for coast guard duties.

Upgrade to HAS.Mk 3

To augment the fleet, the Royal Navy ordered 23 Lynx HAS.Mk 3 helicopters, an upgrade version of the HAS.Mk 2 featuring updated Gem 41 engines and a DECCA MIR-2 Orange Crop ESM, of which

the first was delivered in March 1982. The remaining 54 HAS.Mk 2s were converted accordingly. Engines were updated again later, to the Gem 204/5 (rated at 1,120 shp/835 kW) variant of the Gem 42. The French navy also obtained a similar upgraded version called HAS.Mk 4, with its HAS.Mk 2(FN) fleet receiving an engine upgrade.

A number of sub-variants of the HAS.Mk 3 with various modifications appeared over the years. By the late 1980s, some were adapted for operations in the Gulf theatre and

designated HAS.Mk 3GM. Modifications included a hydraulic cooling fan, improved main rotor gearbox oil cooling, a Marston Palmer main rotor gearbox oil cooler and increased engine bay cooling vents. During the 1991 Gulf War an improved MIR-2 ESM suite, an ALQ-167 Yellow Veil jammer, a GEC Sandpiper FLIR and Tracor M130 chaff/flare dispensers were added as Urgent Operational Requirements (UORs).

A few Lynxes referred to as HAS.Mk 3(ICE) were adapted for missions over Antarctica from HMS *Endurance*, with Sea Skua and other non-relevant equipment removed. All HAS.Mk 3s became HAS.Mk 3Ss following the installation of GEC Marconi AD3400 secure speech radios, and subsequently the HAS.Mk 3GM and HAS.Mk 3(ICE) became designated HAS.Mk 3SGM and HAS.Mk 3S(ICE) after having undergone the same upgrade.

Like the HAS.Mk 2, the HAS.Mk 3 provided the basis for some export variants. Denmark ordered eight Mk 80s for search and rescue, Economic Exclusion Zone (EEZ) protection and fishery patrol along the coasts of Greenland and Faroe Islands. Germany obtained 19 Mk 88s for maritime tasks conducted from Bundesmarine frigates, while Nigeria ordered three Mk 89s with slightly more powerful Gem 43 engines, which were better suited to operations in the hot African environment.



A Lynx HMA.Mk 8DAS of 702 NAS shows its radar and sensors

Lynx goes to war

It would not take long before the Lynx would have to prove its capabilities. After the 1982 Argentine invasion of the Islas Malvinas, the Royal Navy deployed to the Southern Atlantic as part of Operation Corporate to regain the Falklands. Initially, the main task for the Lynx was to protect the fleet against the few ageing Argentine submarines, which eventually played no significant role. Instead, enemy surface vessels were targeted. On 2 May, two Lynxes engaged the patrol boat ARA *Alferez Sobral* with four Sea Skua missiles, damaging it badly before it fled into safety. On 22 and 23 May, two Argentine coast guard Z-28 type patrol boats and cargo ship *Rio Caracana* were hit by FAA Lynxes as well, destroying the latter.

Of the 24 Lynxes deployed by 815 and 829 Naval Air Squadrons, three were lost in the conflict as their parent vessels HMS *Coventry*, HMS *Ardent* and MV *Atlantic Conveyor* were sunk. Ironically, the Argentine Navy ordered ten Lynx Mk 23s prior the war, with two of them delivered by the time the conflict started. One of these was lost in an accident during the war while the other was grounded soon after and subsequently sold to Denmark. The remaining eight were never delivered due to an embargo, of which two also ended up in Denmark.

AAC upgrades

Like the navy, the Army Air Corps was soon looking for an upgrade for its Lynx fleet, and an initial order for nine AH.Mk 5s was placed to evaluate several improvements such as Gem 41-1 engines. The first to fly was ZD282 on 21 November 1984, which was later brought up to full AH.Mk 7 standard as a result of the evaluation. The second one, Mk 5X ZD559, flew on 11 February 1985. After the third Mk 5 was completed, the rest of the order was changed into AH.Mk 7s, of which an eventual 13 new-built helicopters were delivered.

Main feature of this variant was the change of rotation direction of the tail rotor to improve its yaw control authority, especially at higher weights, and also reduce noise. Furthermore, large heat-shroud boxes were placed over the engine exhausts to diffuse the hot gases for better protection against heat-seeking missiles, which were removed later. Some AH.Mk 1s were partly modified (engine and tail rotor only) and designated AH.Mk 1GT, but eventually all 107 remaining AH.Mk 1/AH.Mk 1GTs were converted to AH.Mk 7 at RNAY Fleetlands, also incorporating improved avionics such as the BAe Systems Mk 34 automatic flight control system, Racal Doppler 91 and RNS252 tactical air navigation system.

To demonstrate a battlefield variant showing the growth potential for the Lynx, Westland developed the Lynx 3. It had a wheeled undercarriage and was powered by two Gem 60-3/1 engines (rated at 1,260 shp/940 kW). The prototype, serialised ZE477, first flew on 14 June 1984 and was then used mainly for trials and demos. No orders for the Lynx 3 were taken, and after its last flight in 1987, the project was cancelled in 1988.



Lynx AH.Mk 9 of 1 Regt AAC with tricycle landing gear

In that same year, however, Westland introduced another army version, again with wheeled landing gear. This time, the battlefield support helicopter concept was demonstrated on company aircraft G-LYNX. As a result, the AAC bought 24 Lynx AH.Mk 9s in April 1987, incorporating the AH.Mk 7 improvements and powered by Gem 205 engines (a

Gem 42 variant rated at 1,120 shp/835 kW), which also is the current standard for the AH.Mk 7. In addition, an uprated main rotor gearbox was used to raise the maximum take-off weight to 11,300 lb (5,126 kg). This enables the Mk 9 to carry up to nine troops and supplies, both internal (max weight 2,000 lb/910 kg) and external as an underslung load (maximum weight 3,000 lb/1,360 kg). An avionic upgrade included improved IFF, GPS, ARN-118 TACAN and secure radios. The TOW-system was not added due to budgetary limitations. The AH.Mk 9 also has an engine failure indicator that earlier versions lack.

The first of 16 new-built AH.Mk 9s, serialised ZG884, flew on 20 July 1990, while 8 AH.Mk 7s were converted during the early 1990s. First squadron to receive the AH.Mk 9 in April 1992 was 672 Squadron at Dishforth. During 1993, the AH.Mk 7 and AH.Mk 9 received a GEC-Marconi ARI 23491 AWARE-3 radar warning receiver, replacing the Sky Guardian Mk 15 electronic warfare system. A pintle-mounted 7.62-mm machine-gun can be fitted into both side door openings.



9 Regt AAC Lynx AH.Mk 7s bank over the Yorkshire Moors

BERP blades

From the start, the AH.Mk 9 was fitted with British Experimental Rotor Programme (BERP) carbon and glass fibre rotor blades. These blades, distinguished by their paddle tips, provide a lift increase of 37 percent, reduce vibration and give the aircraft greater performance in terms of speed and hover. They also require less maintenance, are easier to repair and have an increased lifespan. The first Lynx to be equipped with BERP blades was G-LYNX. With this modification and Gem 60 engines, it set the world speed record for helicopters on 11 August 1986 at 249.1 mph (400.87 km/h), manned by pilot Trevor Eggington and flight engineer Derek Clews.

All existing AAC and FAA helicopters were subsequently retrofitted with the new blades, although it must be noted that the production blades were slightly different to the ones used for development, having anhedral tips to improve hover performance. Other operators also acquired them in their various upgrade programmes, especially since the old steel ones became increasingly unavailable.

Lynx in Gulf War

Following Iraq's invasion in Kuwait in August 1990, Lynx helicopters played a major role in the ensuing conflict. Firstly, the Royal Navy's HAS.Mk 3 became one of the coalition's main anti-ship assets as part of Operation Granby. In the years prior to the Gulf War, some Lynxes had been adapted for the local hot and dusty environment as HAS.Mk 3GMs. Before the war to regain Kuwait started, these Lynxes had flown missions over the northern Persian Gulf to enforce a maritime blockade. To jam the feared Iraqi AM39 Exocet missiles, a Whittaker ALQ-167 Yellow Veil ECM pod was carried on the port outer torpedo pylon.

Real action followed in January and February 1991, when several of the deployed helicopters attacked Iraqi boats. Most attacks were undertaken in cooperation with coalition aircraft such as US Navy A-6E Intruders. Some 15 Sea Skuas were fired, of which all but one hit their target, sinking or damaging 11 enemy ships. During the conflict, Lynx HAS.Mk 3GM flights from 815 and 829 NAS operated from HMS *Battleaxe*, *Brazen*, *Brilliant*, *Cardiff*, *Gloucester*, *Jupiter*, *London*, *Manchester* and *York*. In addition, French Lynxes were on board the destroyers FS *Dupleix* and FS *Montcalm* as part of Operation Artimon.

The AAC was very active in the theatre as well, as elements from 654, 659 and 661 squadrons

deployed 24 AH.Mk 7s, which received a desert 'pink' camouflage scheme and were equipped with Sky Guardian 200-13 radar warning receivers. These operated from Al Jubail, Saudi Arabia, as well as several dispersed bases, supporting the 1st (British) Armoured Division. An infra-red sight was installed, and together with the use of night vision goggles, night operations became possible. During the short ground war, a large number of Iraqi tanks and armoured vehicles was destroyed by TOW missiles. After the war, 3 CBAS of the Royal Marines flew close air support sorties with its Lynx AH.Mk 7s from Sirsenk in Iraq.

Super Lynx

With the desire to make an army variant of the Lynx an export success as well, Westland renewed its attempts, this time focussing on the Battlefield Lynx based on the AH.Mk 9, with several weapons options such as Hellfire anti-tank missiles, cannon- and gun pods, and rocket pods. Fitted with Allison-Garrett T800 engines each rated at 1,350 shp (1,007 kW), the upgraded Battlefield Lynx 800 was born and again G-LYNX (now reserialled ZB800) acted as demonstrator. It flew as such on 25 September 1991. Unfortunately, the project was also unsuccessful, although the engines were later used for the Super Lynx.

Meanwhile, another upgrade programme was started for the Lynx fleet of the Fleet Air Arm, including the fitment of BERP blades and a reversed tail rotor. Racal provided an improved version of the MIR-2 Orange Crop ESM system and a RAMS 4000 Central Tactical System (CTS). The latter presents mission info on a single MFD, easing workload on the crew. The initial upgraded helicopters served as an interim solution, and were referred to as the HAS.Mk 3CTS. Six of them went to the Operational



Flight Trials Unit (OFTU) at RNAS Portland.

Next step in the upgrade process was the addition of a nose-mounted turret with a GEC Sensors Sea Owl FLIR for passive thermal imaging, providing an IR picture. The radar was relocated under the nose to give it a 360° picture. The Seaspray Mk 1 radar (also known as Seaspray 3030) was retained for budgetary reasons. Besides directing the Lynx's own Mk 46 or Stingray torpedoes and MBDA Sea Skua missiles, RGM-84D Harpoons fired from frigate or



Cockpit views of a Danish Navy Lynx Mk 90B (top), a Royal Navy Lynx HMA.Mk 8DAS (middle) and a Portuguese Navy Super Lynx Mk 95, clearly showing the different layout of various versions

fast patrol boats could be directed at a surface target. A CAE ASQ-504(V) magnetic anomaly detector was planned to be fitted into the rear fuselage but was later dropped as a cost-cutting measure. A Racal RNS252 Super TANS and the TNL8000 GPS improved navigation performance. Maximum take-off weight was increased to 11,300 lb (5,126 kg), similar to that of the army's AH.Mk 9.

All this resulted in the HAS.Mk 8 variant, which was soon redesignated HMA.Mk 8 to reflect its wider range of roles. The first of them, a converted HAS.Mk 3S (ZD249), flew in 1989, but it initially lacked the Sea Owl turret. 700L Squadron was re-established at RNAS Portland on 6 July 1990 for trials with the HMA.Mk 8, which entered operational service in 1992. Later that year, ZD267 received all new modifications as the first fully converted HMA.Mk 8. Initially, only 10 HAS.Mk 3Ss were planned to undergo the conversion programme. However, as the procurement of new Merlin HM.Mk 1s was downsized according to the 1998 Strategic Defence Review, 28 more Lynxes were converted.

To enhance the operation of the radar, all HMA.Mk 8s received a digital signal processor and were temporarily designated HMA.Mk 8DSP. Recently, 12 HMA.Mk 8s received defensive aids subsystems including an AAR-47 missile warning system, an ALQ-144 IR jammer and a BAE Systems M147 flare dispenser, and are designated HMA.Mk 8DAS. A current modification is the integration of SATURN secure V/UHF radios (designated HMA.Mk 8SRU), carried out by the Alan Mann Group based at Fairoaks airport, Surrey. Latest version of the Central Tactical System is CTS 6.1, compatible to all recent modifications.

With the Lynx HMA.Mk 8 as reference, Westland marketed the upgraded Lynx for export as the Super Lynx. The navy of the Republic of Korea was the first to sign a contract in 1988. Its first Super Lynx Mk 99 flew on 16 November 1989, featuring a Seaspray Mk 3 to make full use of the 360° radar view. It is furthermore equipped with the Racal Doppler 71/TANS-N navigation system and a Bendix AQS-18 sonar.

Portugal soon followed with an order for five Super Lynx Mk 95s in late 1989 to resurrect the naval air arm. The Mk 95 has a Racal Doppler 91 and RNS 252 Super TANS, but are equipped with a Bendix RDR 1500B radar. It is powered by two Gem Mk 1017 engines, a Gem 42 variant with a digital electronic fuel control system.

Meanwhile, upgrading the existing Lynx fleet to a Super Lynx standard with the HMA.Mk 8 as basis attracted several other operators. Brazil sent over its five remaining Mk 21s to upgrade these to Mk 21A standard, while buying nine new-built helicopters to augment the fleet. During this process, it turned out that the cost of refurbishing and upgrading of an old airframe was hardly less than building an all-new

airframe. Therefore, Westland set up a production line where the old airframe was replaced by a new-built one, resetting the logged flying time to zero. The old engines and some existing systems were transferred to the new airframes. The German Bundesmarine went for this option, having 15 older Mk 88s converted to Mk 88A, while buying seven additional new Sea Lynx Mk 88As. A number of nose-mounted GEC Sensors MRT FLIR turrets were acquired, which generally are only used by the helicopters deployed at sea. Denmark, which had earlier upgraded its Mk 80/90s to Mk 80A/90A standards, bought eight new airframes to adapt its fleet to Mk 90B configuration. Typically, the factory refers to these aircraft as Super Lynx, while both Germany and Denmark do not.

stationed at Ploce, with six AH.Mk 7s of 661 Sqn/1 Regt operating from Divulje Barracks. From January 1997, AH.Mk 7s have been deployed for SFOR (Stabilisation Forces) in Bosnia, while a few AH.Mk 9s acted as command and control posts during the period the British commanded KFOR (Kosovo Forces).

NATO's Operation Essential Harvest in Macedonia ran during August and September 2001, with the goal of establishing weapon collection points where rebels could voluntarily surrender their arms. The AAC's 657 Sqn deployed three Lynx AH.Mk 7s to move around special forces. AH.Mk 9s were deployed to Petrovec at the same time in support of NATO operations over Macedonia.

During 2000 and 2001, two Dutch SH-14D Lynxes



Danish Lynx Mk 90B seen hovering low

International operations

Following on from the previously mentioned armed conflicts, Lynx helicopters have been active in a number of international operations, mostly under UN or NATO flags.

Lynx flights of the navies of the UK, France and the Netherlands were active over the Adriatic Sea during the 1993 and 1994 Bosnian blockade, which subsequently became Operation Deny Flight. Army Lynxes have also participated in several operations over former Yugoslavia. From January 1995, four AH.Mk 7s of 664 Sqn/9 Regt, equipped with ALQ-144 IR jammers, supported UNPROFOR (UN Protection Forces) in Bosnia, while operating out of Divulje Barracks near Split, Croatia. During Operation Deliberate Force in Bosnia in 1995, nine AH.Mk 7s and nine AH.Mk 9s of 3 Regt were

operated off the Eritrean coast from Hr.Ms. *Rotterdam* during the UN Mission in Ethiopia and Eritrea (UNMEE). Combined Task Force 150 is a multinational naval squadron operating out of Djibouti, East Africa, with several Lynxes involved. The UN Interim Force in Lebanon (UNIFIL) is an ongoing operation off the Lebanese coast, involving Lynxes from countries such as France, Germany and the Netherlands. Generally, and depending on the operator, the sea-

based flights consists of a three-man crew (pilot, tactical coordinator/TACCO and sensor operator), a flight deck officer and around six aircraft technicians. A complete set of spares and tools is taken on board, while small modifications can be carried out at sea.

Operation Herrick against Taleban forces and terrorists in southern Afghanistan is very much ongoing, involving all current operational AAC Lynx squadrons as well as 847 NAS from the Royal Marines. Also still current is Operation Telic in Iraq, which started on 19 March 2003. Involved initially were Royal Navy Lynxes operating from various frigates but, as the invasion progressed, AAC AH.Mk 7s (then still equipped with TOW) and AH.Mk 9s moved from Ali Al Salem, Kuwait, into Iraq. Again, AH.Mk 7s of 847 NAS are active in this theatre as well. During the start of the campaign they operated

from HMS *Ocean*, but moved to Iraq at a later stage. Since 2004, the UK Lynx squadrons have largely operated out of Basra, the British stronghold in Iraq. A number of AH.Mk 7s and crew deployed to Arizona in 2007 for additional desert training in a safe environment.



Danish Lynx Mk 90B over Jutland (top); a Portuguese Super Lynx Mk 95 landing on the frigate NRP Alvares Cabral (middle); and a UK AAC Lynx AH Mk 7 flying over the historical Rievaulx Abbey site (bottom)

One of the latest Lynx involvements was off the coast of Somalia in 2008, where a Dutch Lynx operating off frigate Hr.Ms. *Evertsen* transported squads of marines to merchant vessels sailing in

this area to protect them against the piracy that has become an increasing problem in the region.

Super Lynx 300

In 1996, UK company GKN took over Westland to become GKN Westland Helicopters. In 1998, the company took on a follow-up order from South Korea, which ordered 13 additional Super Lynx Mk 99As, including one as an attrition replacement for a Mk 99 that had been written off. During the same year, GKN Westland launched the Super Lynx 300 programme. A company demonstrator serialised ZT800 first flew on 27 January 1999, fitted with LHTEC CTS800 engines. LHTEC was a joint-venture of Allison and Allied Signal but is currently owned by Rolls-Royce (which acquired Allison) and Honeywell (into which Allied Signal was integrated). The production Super Lynx 300 has two LHTEC CTS800-4N engines, each consisting of five easy-to-remove modules and equipped with FADEC. With these new engines delivering 33 percent more power than the older Gem 42, the Lynx performance in hot-and-high conditions has improved significantly. A fully integrated flight and mission display system consists of four Active Matrix 6.25×6.25-in LCD screens for air data, navigation and tactical display, and two Electronic Power Systems Instruments for engine parameter readings. Dual flight controls are provided, and the cockpit meets requirements for the Mil-Std 3009 Type 1 Class B and C night vision goggles compability. The avionics are interfaced by Mil-Std 1553B databus, while navigation is performed by two Computer Display Navigation Units that receive inputs from GPS, INS and Doppler. The Health Usage Monitoring System includes a cockpit voice recorder and flight data recorder. A Defensive Aids Suite, which includes a radar warning receiver, laser warning, a missile approach warning system, chaff and flares, is installed for protection. Armoured crew seats and cabin floor are available as options, although they impose a weight penalty. The airframe is a marinised, semi-monocoque light alloy construction, and has a wire-strike protection system. The cabin doors and windows are jettisonable in an emergency, and four floatation bags are installed for ditching. The fixed tri-cycle undercarriage is designed to withstand a 12-ft per second descent rate upon landing for ship operations in adverse weather and/or rough seas. Both the airframe and the composite BERP rotor blades have a 10,000-hour life span. In flight, the helicopter can handle 40-kt cross winds in sea-based operations. There are five fuel tanks with a jettison system for emergencies, while two auxiliary tanks can be placed in the cabin to extend the radius of action which, depending on payload and role, is then well over 200 nm (370 km). The helicopter is designed to operate from small

corvette-sized ships or larger, and is able to fold the main rotor and tail. The four-bladed main rotor creates a high downward force (3,000 lb/1,360 kg) when stationary on deck without the need of a restraining system, and is certified to operate as such up to sea state 6. To facilitate maintenance, the engines and avionics bay have easy access.

The variety of missions remains the same for the Super Lynx as for the earlier versions, and weapons options are similar. For anti-submarine warfare, it is able to carry two torpedoes or two depth charges, and against surface contacts it can deploy up to four missiles. In addition to two 12.7-mm or 7.62-mm machine-guns pintle-mounted in the door openings, it can carry 2.75-in (70-mm) rocket pods and 20-mm gun pods on the pylons. A long-range 360° radar is fitted under the nose, and other system options include FLIR, ESM and data link for contact reporting. Targets can be attacked by a fully integrated weapons management system, with assistance of a head-up display.

roping and then recover by the hoist. From its base or ship to the targeting location, the Super Lynx 300 can maintain a 132-kt (244-km/h) transit speed.

On 12 February 2001, GKN Westland Helicopters and the large Italian helicopter manufacturer Agusta completed their merge to AgustaWestland (AW). The new company was owned 50 percent each by GKN and Finmeccanica from Italy until December 2004, when Finmeccanica obtained its partner's share. AgustaWestland is currently marketing the Super Lynx 300 alongside a wide range of rotary-wing products, and offers tailor-made training programmes for air and ground crews of new customers. Due to its improved hot-and-high capability, the Super Lynx version attracted Asian customers, and Malaysia became the launch customer, buying six in 1999. Flight testing of the first Mk 100 began in April 2002. Thailand ordered two Mk 110s in 2001 and Oman bought 16 Mk 120s in 2002. South Africa became next in line to join the Lynx family, acquiring four Mk 64s in 2003.



A deck officer guides this Portuguese Super Lynx Mk 95 while landing on the NRP Alvares Cabral

The Super Lynx 300 is also capable of undertaking the SAR mission, with a hoist fitted either externally, or as an internally stowable item. The cabin can hold two stretchers. The four-axis automatic flight control system has a SAR mode as well as auto-transition mode. In the utility role, it can carry an underslung load up to 3,000 lb (1,360 kg), or carry nine troops in the cabin. For rapid disembarkation four ropes can be deployed for fast-roping. Similarly, an inspection team on, for example, an EEZ protection mission can use the helicopter for transport to a suspect vessel. The team would board the vessel by fast-

Latest customer is Algeria, which ordered four Super Lynx 300s. The contract signed in November 2007 was worth Euro 402 million and also included six AW101 Merlins. Deliveries are expected to begin in 2009.

Lynx User Group

When all its systems are fully serviceable, (Super) Lynx is a very potent platform, being one of the world's best naval attack and support helicopters. Unfortunately, some operators have encountered problems in some aspects of serviceability, ranging from ageing components to unpredictable spares

supplies. To tackle these problems, as well as to exchange valuable experiences in the field of maintenance, all present customers have united in the Lynx User Group. Annually, one of these members hosts a meeting to facilitate discussions on these topics, with the goal to improve the overall serviceability.

A noticeable complaint from Army Air Corps technical crews is that the large number of modifications to the airframe have created problems. Tampering with and the removal of existing systems in support of new hardware has resulted in some system failures that are highly inconvenient given their operational impact.

Future Lynx

As the fleet of British Lynxes aged, a replacement programme was instigated by the UK Ministry of Defence. On 29 January 2002, a GBP 20 million contract was awarded to AgustaWestland in which the Future Lynx project was confirmed as having the best potential to meet the Battlefield Light Utility Helicopter (BLUH) requirement. Simultaneously, the Royal Navy expressed a requirement for 55 to 60 ship-based Surface Combatant Maritime Rotorcraft (SCMR) to replace its fleet of Lynx HAS.Mk 3s, HMA.Mk 8s and AH.Mk 7s. A final decision on the BLUH was initially expected by late 2003, however, the MoD decided to combine both the Land (Find) and Maritime (Surface) Attack elements. On 24 March 2005 the ministry announced that the Future Lynx had been selected for both, with an order for some 90 helicopters expected soon after.

The Future Lynx, based on the Super Lynx 300 rotor and transmission systems and equipped with the same engines, is fully capable to operate both by day and night, and is suitable for hot-and-high operations. The aft fuselage has been redesigned and features a horizontal stabilizer with conformal antennas and vertical fins added to improve flying characteristics. The tail rotor has been redesigned as well, to meet the performance and load requirements for operation at or near the increased maximum take-off weight of 13,800 lb (6,260 kg). The Future Lynx has self-sealing fuel systems with the option of adding external tanks. The cockpit will be equipped with four General Electric 10x8-in LCD integrated display units, secure intercom and voice/data communications, and a tactical data link including a data modem for inter-aircraft and ground-to-aircraft links. An electro-optic device with laser range finder will be fitted on the nose, while the laser target designator is downlink-capable. Two Control and Display Navigation Units manage the communication and navigation systems.

Mission systems will be managed by a Tactical Processor (TP) jointly developed by General Dynamics (UK) and AgustaWestland. Display and management of tactical views, and control of the sensor suite, is undertaken via the Integrated Display Units and a Cursor Control Device. Prior to commencement of a mission, the Mission Planning System (MPS) can receive and process relevant mission information, including mission orders, tactical airspace information, meteorological and geographical data, enabling missions to be planned for multiple platforms. An embedded training system enables synthetic training against fictive targets.

The aluminium airframes, incorporating monolithic machined components, will be constructed by Oldland CNC in Bristol, with some 30 percent fewer components. Large cockpit doors will enhance crew egress. The helicopter is designed to operate up to 12,000 flying hours.

On 22 June 2006, the UK Ministry of Defence awarded a contract worth nearly GBP 1 billion to AgustaWestland for the delivery of 70 Future Lynx helicopters, with an option for 10 more, with the first flight planned for 2009 and deliveries starting in 2011. Two variants will be built for the UK military, both with the same airframe. It will have a built-in mass growth provision to allow incremental cost-effective capability upgrades from the in-service date maximum all-up mass (MAUM) of 12,780 lb (5,790 kg) through to an out-of-service date MAUM of 13,800 lb (6,250 kg).



The UK Lynx fleet of both the Army Air Corps and the Fleet Air Arm will be replaced by the Future Lynx

Full-scale production was confirmed by the British MoD on 11 December 2008, but the number to be procured was slightly downgraded. The Army Air Corps will receive 34 (of 40 initially planned) of the Future Lynx's Battlefield Reconnaissance Helicopter (BRH) variant. Roles include aerial reconnaissance and surveillance, target acquisition, close air support, casual evacuation and utility support. Although Future Lynx can be armed with 2.75-in (70-mm) rockets and 20-mm gun pods integrated with helmet-mounted sights and head-up display for fire support, the AAC helicopters will not be armed as such. A nose-mounted optical sensor can provide target acquisition. Furthermore, the helicopter will

provide air transport for commando and other specialist teams. Bowman radio will be provided to interact with the new British forces secure radio and data network.

Initial operating capability is currently planned for 2014, and simultaneously the AH.Mk 7 fleet will gradually dwindle as they are required as part of a donor programme. In a contract signed late 2008, twelve AH.9s will be upgraded by AW with CTS800-4N engines to pull forward Future Lynx technologies, with four expected to be delivered by late 2009 and the remainder in 2010. The BRH is expected to replace the capability of the current fleet with a combination of more capable systems and greater reliability, resulting in greater availability. With the AAC's recent experiences in hot-and-high conditions in Iraq and Afghanistan, it will require a platform well able to operate in these environments. BRH will have to prove itself well suited for its tasks when it enters service.

The Royal Navy will take delivery of 28 (of 30 planned initially) Future Lynx that will become operational from 2015. The naval variant for maritime surveillance and attack has a virtually all-

new avionics and mission system – even compared to the Super Lynx 300. It will have a new Seaspray 7000E I-band radar, dual Attitude and Heading Reference System (AHRS), Saturn radios, tactical datalink and a digital air data unit. L3 Wescam will provide the MX-15Di stabilised electro-optical laser designator turret (also for the BRH of the army). These sensors can include an infrared camera, daylight TV camera and a laser ranger/designator.

The naval Future Lynx will retain the Stingray torpedoes currently used by the HMA.Mk 8. It will, however, be equipped with a new stores management system and new launchers to prepare for the Future Air-to-Surface Guided Weapon (FASGW) programme that will replace the Sea Skua missile.

Future Lynx forms an important contract for AgustaWestland's Yeovil plant, which currently also takes care of all AW101 assembly. Furthermore, the AW149 project office is located at Yeovil. Future Lynx will introduce a new generation of a helicopter that has been very successful in the past, with over 420 built for 17 countries, and will likely take part in several future operational theatres.

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Current Lynx/Super Lynx operators

Algeria

The Algerian Armed Forces placed an order worth Euro 402 million (USD 586 million) with AgustaWestland for four Super Lynx 300 and six AW101s. The Super Lynx will be tasked mainly for transport duties, and deliveries are expected from 2009.

Brazil

Nine Lynx Mk 21s, locally designated SAH-11, were ordered in 1975 (serialled N-3020 to 3028) for service with the 1° Esquadrão de Helicópteros Esclarecimento e Ataque (HA-1), which was activated at São Pedro da Aldeia on 17 January 1979. Nine new Super Lynx Mk 21As were acquired and delivered between September 1996 and August 1997 (serialled N-4001 to 4009) while the five survivors of the initial batch were shipped to Westland for an upgrade package ordered in 1991. They were subsequently rebuilt to the same standard, receiving new serials (N-3027/23/25/26/21, corresponding to N-4010/4014). The new and upgraded helicopters are designated AH-11A, losing the S for Submarine warfare in their designation as their role has become far more diverse, ranging from anti-surface, anti-submarine, and target acquisition and tracking beyond the horizon, to reconnaissance. Secondary tasks are SAR, medevac, transportation and recovery of target drones. A Seaspray 3000 radar is fitted together with RNS252 and Doppler 71 navigation systems, while the old MIR Mk 2 ESM system is retained. Unlike other Super Lynx variants, Brazil's AH-11A lacks the FLIR. Either two Mk 44 or two Mk 46 torpedoes can be carried alongside the Mk 9 depth charge. Alternatively, four Sea Skua missiles can be fitted. Two AH-11As have been lost in accidents (N-4007 and 4008).



The 'Niterói'-class frigates (F40 *Niterói*, F41 *Defensora*, F42 *Constituição*, F43 *Liberal*, F44 *Independência* and F45 *União*), the 'Inhaúma'-class

corvettes (V30 *Inhaúma*, V31 *Jaceguai*, V32 *Júlio de Noronha* and V33 *Frontin*) as well as destroyer D27 *Pará*, can carry one Lynx, while the 'Greenhalgh'-class frigates (F46 *Greenhalgh*, F48 *Bosísio* and F49 *Rademaker*) can house two. Various other vessels, including the aircraft carrier A12 *São Paulo*, have helicopter landing decks available.

Denmark

The Danish Lynx fleet forms the sole aviation component of the Søværnet (Navy). During 1980 it took delivery of eight Lynx Mk 80s (S-134, S-142, S-170, S-175, S-181, S-187, S-191, S-196), the first three being handed over on 6 June 1980 to the Søværnets Flyvetjeneste. Main mission has been SAR, coastal patrol and fishery control around Greenland and the Faroe Islands.

Following two write-offs in the 1980s (S-187 and S-196), two Mk 90s (S-249 and S-256) were acquired and delivered in 1987 as replacements. They were originally part of an Argentinean order, becoming available for delivery to a third party as a result of the embargo following the Falklands war. A third airframe was obtained directly from Argentina, which retired its sole Mk 23 survivor soon after the Falklands war. It was subsequently used by the Danes for ground instruction and spares.

Between 1991 and 1994, all were brought up to Mk 80A/Mk 90A standard. Besides upgrading the gearbox from two to three-pinion standard, a Tactical Data System was installed, largely similar to the CTS in use with the Royal Navy's HMA.Mk 8, apart from some different menus and colour usage. The TDS integrates the various communications, navigation and tactical systems including a datalink with which targets over the horizon are tracked for Harpoon missile-equipped ships, as the Danish Lynxes do not carry these or any other external weapons. A Racal Merman ESM was introduced with this modification as well, being an indigenous adaptation of the Mermaid system in use on Danish navy vessels. A Safire FLIR can be installed when required for the mission.

Eight new airframes were bought from GKN-Westland in 1997 for an upgrade of the Lynx fleet to Super Lynx Mk 90B (although Denmark refers to these still as Lynx instead of Super Lynx), putting the old systems including the Seaspray Mk 1 radar into the new airframes. New construction numbers were allocated to these frames, but they retained the old serial numbers. Engines were upgraded to Gem 42 Mk 1017, tail rotors reversed and BERP blades added in a contract worth USD 36.5 million. The upgrade included S-170, which was heavily

damaged during a crash at a Polish airshow on 14 June 1997. For this particular rebuilt, parts of the Mk 23 acquired from Argentina were used as well. The first Mk 90B was delivered on 1 November 2000 while the last conversion did not rejoin the fleet until 1 February 2008. To date, the new airframes have logged some 1,500 flying hours on average. Currently, the Lynx helicopters equip the Søværnets Helikoptertjeneste (naval helicopter service), which was established on 1 January 2004 when the squadron moved from Værløse to Karup. The SHT was to become Eskadrille 728 as part of the Helicopter Wing of the Danish Air Force, but this plan was cancelled due to limitations laid down in the CFE treaty. Under the Defence Agreement 2005-2009, it was initially decided to further update the Lynx fleet with GPS, a radar upgrade to 360° scanning, nose mounted FLIR, new radios and avionics, a defensive aids suite and cockpit upgrade to NVG compability. However, these plans were discontinued recently and Denmark is now looking to buy 10-12 replacement helicopters instead, for which several types are under evaluation, including the MH-60R, S-92, AW101, NH-90 and Future Lynx. Generally, two Super Lynxes are deployed at sea. They can embark the 'Thetis'-class ocean patrol vessels HDMS *Thetis* (F357), HDMS *Triton* (F358), HDMS *Vædderen* (F359) and HDMS *Hvidbjørnen* (F360), and the 'Absalon'-class flexible support vessels HDMS *Absalon* (L16) and HDMS *Esbern Snare* (L17). In the near future, two 'Knud Rasmussen'-class inspection vessels – HDMS *Knud Rasmussen* (P570) and one yet to be named (P571) – as well as three new patrol vessels (F361 - F363) will join the fleet, all able to house a helicopter up to EH-101 size.



Main mission is to patrol the coastal areas of Greenland and the Faroe Islands on EEZ protection. Armed with a FN Herstal M3M 12.7-mm machine-gun, the Lynxes can be used to force foreign ships to be inspected. One Danish Lynx temporarily deployed to a German frigate in the Mediterranean during Operation Active Endeavour. In 2008, a Danish Lynx was planned to be involved in

Combined Task Force 150 in Djibouti, operating from HDMS *Absalon*.

France

With Sud Aviation (later Aérospatiale) participating in the original WG.13 joint venture, the French Aéronavale became one of the first operators of the Lynx. The Lynx HAS.Mk 2(FN) differs only slightly from its then UK HAS.Mk 2 counterpart. It fired AS 12 missiles instead of Sea Skuas while a French radar is installed – the OMER-SEGID ORB31W. The first HAS.Mk 2(FN) flew on 24 October 1979, and a total of 26 were delivered (serialled 260-267, 269-278 and 620-627).

The fleet was soon expanded by 14 Lynx HAS.Mk 4s (801-814), similar to the Royal Navy's HAS.Mk 3 with updated Gem 42-1 engines. BERP blades were fitted during the mid-1990s, but the radar and most avionics were not upgraded in its service career. The Lynx currently equips operational squadrons 31F at Hyères and 34F at Lanvéoc-Poulmic, while a few are used by crew training squadron 10S at Hyères. Two early production HAS.Mk 2 models (serialled 03 and 04) are located at Rochefort, available for ground instruction.

In February 2004, AgustaWestland signed a support agreement with the French MoD that provided for repair and overhaul of the complete rotor and transmission system. The Lynx is being replaced by the NH-90, a process that began in 2008 when part of the fleet was retired. Another 15 are planned to stay in service until 2015.

Vessels able to carry two Lynx each are the two 'Tourville'-class destroyers FS *Tourville* (D610) and FS *De Grasse* (D612) as well as the seven 'Georges Leygues'-class frigates FS *Georges Leygues* (D640), FS *Dupleix* (D641), FS *Montcalm* (D642), FS *Jean de Vienne* (D643), FS *Primauguet* (D644), FS *La Motte-Picquet* (D645) and FS *Latouche-Tréville* (D646). The two 'Cassard'-class frigates FS *Cassard* (D614) and FS *Jean Bart* (D615) can carry one Lynx each.

Germany

Nineteen Lynx Mk 88s (called Sea Lynx by the Germans and serialled 83+01 to 83+19) were ordered in the late 1970s, with deliveries starting on 9 September 1981 for service with Marinefliegergeschwader 3 'Graf Zeppelin' at Nordholz. The NH-90 was selected as replacement for both the navy's Sea King and Sea Lynx, but when that programme was delayed, seven new Lynx Mk 88As (83+20 to 83+26) were ordered in October 1996 in a contract worth DM 312.5 million (equivalent then to USD 204 million) with deliveries in 1999 and 2000. Like neighbour Denmark, Germany also decided to obtain new airframes to

upgrade the older ones to the new version in a DM 255 million (USD 132 million) contract. While it was the intention to rebuild all 17 survivors (83+01 was written off on 3 December 1991 and 83+16 on 30 January 1994), eventually only 15 underwent the conversion process as two more were lost (83+08 on 30 October 1999 and 83+14 on 16 February 2000) before they could be handed over to GKN Westland.



During the conversion, engines were upgraded to Gem Mk 1017, BERP blades fitted and tail rotor reversed. The old Racal RNS252 NCDU mission computer was replaced by the Rockwell Collins CDU-7000. A Seaspray 3000 radar was built in, still able to direct the Sea Skua against surface targets. A GEC Sensors MRT FLIR can be mounted on top of the nose, which generally is only done when the Sea Lynx is deployed to sea. For anti-submarine warfare, the AQS-18 sonar was retained while the Lynx can be armed with Mk 46 mod 2 torpedoes (to be replaced by the Eurotorp Mu 90 in the next decade). A FN Herstal M3M 12.7-mm gun can be installed in the door opening. Surprisingly, no ESM suite has been installed for self-protection.

The Sea Lynx is being expected to remain in service until 2020, as the NH-90 will first replace the navy's Sea Kings. In 2007, a modification programme was started incorporating a new navigation management system, GPS and two multi-function displays for primary flight and navigation data. Flight trials with the first 'glass' cockpit Sea Lynx started in May 2007, and by April 2008 a second upgraded Sea Lynx had been delivered, with more under conversion by Eurocopter. MFG-3 will probably take over the full mission flight simulator currently based at De Kooy, Netherlands, where the Marineflieger is one of the participating countries in this joint Lynx simulator project.

Ships able to operate a Lynx flight are the 'Bremen'-class frigates *Bremen* (F207), *Niedersachsen* (F208), *Rheinland-Pfalz* (F209), *Emden* (F210), *Köln* (F211), *Karlsruhe* (F212), *Augsburg* (F213) and *Lübeck* (F214); the 'Brandenburg'-class frigates *Brandenburg* (F215), *Schleswig-Holstein* (F216), *Bayern* (F217) and *Mecklenburg-Vorpommern*

(F218); and the 'Sachsen'-class frigates *Sachsen* (F219), *Hamburg* (F220) and *Hessen* (F221). German Lynxes are involved in Operation Enduring Freedom off Djibouti, as well as UNIFIL off Lebanon. Apart from the main tactical missions, the Lynx has a secondary SAR task in support of its fleet squadron when deployed at sea.

Malaysia

In 1999, the Super Lynx 300 was selected in favour of the Kaman SH-2G Sea Sprite to replace the ageing Westland Wasps of the Tentera Laut Diraja Malaysia (Royal Malaysian Navy). Six Super Lynx Mk 100s (serialled M501-1 to M501-6) were ordered in a contract worth GBP 100 million, and all but one were delivered in 2003. One remained at Yeovil for Sea Skua integration and tests. Following this, it was handed over during the Farnborough Airshow on 19 June 2004. The helicopters equip Skuadron 501 'Lynx', which was established at Lumut on 9 August 2004. The Super Lynxes operate alongside the AS555 Squirrels of Skuadron 502, which trains future Super Lynx pilots.

Beside the Seaspray 3600 radar, the Mk 100 has a Sky Guardian 2500 ESM suite and FLIR, and can be armed with four MBDA Sea Skua missiles or two Eurotorp A244S torpedoes, and a FN Herstal 12.7-mm machine-gun. Primary roles are anti-surface and anti-submarine warfare, surface surveillance and over-the-horizon targeting, along a wide range of secondary tasks which include the protection of Malaysia's EEZ, transport, SAR and vertical replenishment.

The following vessels can take along a Super Lynx 300 for sea-based operations: the 'Lekiu'-class frigates KD *Jebat* (F29) and KD *Lekiu* (F30); the two 'Kedah'-class Ocean Patrol Vessels KD *Kedah* (F171) and KD *Pahang* (F172); and three Multi-Purpose Command and Support Ships KD *Inderasakti* (1503), KD *Mahawangsa* (1504) and KD *Sri Inderapura* (1505), the latter having a deck only. Two more 'Lekiu'-class frigates and four more 'Kedah'-class vessels being KD *Perak* (F173), KD *Terengganu* (F174), KD *Kelantan* (F175) and KD *Selangor* (F176) will be commissioned in the near future.

Netherlands

Export success came quickly for Westland when the Netherlands ordered the Lynx HAS.Mk 2 variant as replacement for both the AH-12A Wasp and (I)UH-1 (AB204). In total, the Marineluchtvaartdienst (Netherlands Naval Air Service) took delivery of 24 Lynx in three versions: six Mk 25s (serialled 260 to 265 and locally designated UH-14A), ten Mk 27s (266 to 275 as SH-14B) and eight Mk 81s (276 to 281 as SH-14C), all based at De Kooy. The first few

temporarily joined the UK-Dutch trials unit 700L Squadron at RNAS Yeovilton from December 1976 till May 1977.

When deliveries were completed in April 1981, the UH-14A equipped VGSQ (Vliegtuigsquadron) 7, which used them mainly for SAR and crew training, while VGSQ 860 was responsible for the detachments embarked at sea, operating the SH-14B and -C, the latter differing in having MAD-equipment for anti-submarine warfare.

The STAMOL (STandardisation and MODification Lynx) upgrade programme ran from 1991 to 1997. First, removal of MAD equipment led to the conversion of all SH-14Cs to -Bs. Then, all 22 remaining helos (263 and 275 were lost in 1982 within 24 hours, although in separate accidents) were brought up to the same standard known as SH-14D, with engines uprated to Gem 42-1. BERP blades were fitted during 1994. All helicopters now have AIDA (Automated Inflight Data Acquisition), a HUMS-like system developed in cooperation with AgustaWestland that measures 17 different parameters in relation to airframe stress and fatigue, such as engine torque and main rotor rpm, enabling well-directed inspections and maintenance. The SH-14D can be armed with Mk 46 torpedoes and a MAG 7.62-mm machine-gun, and an Alcatel DUAV-4A sonar can be fitted for ASW missions.

On 10 November 1998, Lynx 282 encountered a gearbox failure and was written off following a forced landing. Recently, seven airframes have undergone a service life extension programme at the factory, stretching the maximum flight hours from 7,000 to 8,000. Delay in the NH-90 programme forced the navy to similarly update three more helicopters, with the last one back on line in 2009.

Currently, only 17 of the 21 SH-14Ds are in a complete state due to lack of spares. VGSQ 7 carries out the land-based missions, which include search and rescue, transport of marines and (military) police special units, and crew training. A full mission flight trainer is based at De Kooy in support of the Joint Lynx Simulator Training Establishment, with the Dutch, German, Danish and Norwegian Lynx operators as full project members, while Portugal makes use of this facility as well. The project countries all have flight instructors detached at De Kooy. In 2011, the simulator is expected to move to Nordholz, Germany.

VGSQ 860 supplies the sea-based Lynx flights, of which one is permanently deployed in the Caribbean, mainly in support of anti-drug missions around the Netherlands Antilles. The squadron currently is capable of supporting six flights. Four more flights are temporarily disbanded due to the introduction of the NH-90NFH. Twelve of these new helicopters will replace the SH-14D from 2009.

On 4 July 2008, parent unit MARHELI disbanded and both VGSQ 7 and 860 transferred to the newly

established Defence Helicopter Command at Gilze Rijen, although the Lynx fleet remains based at De Kooy. With the introduction of NH-90, VGSQ 860 will take over all operational tasks from VGSQ 7, leaving the latter responsible for training only.



Ships with capacity to house one Lynx are the four 'De Zeven Provinciën'-class frigates Hr.Ms. *De Zeven Provinciën* (F802), Hr.Ms. *Tromp* (F803), Hr.Ms. *De Ruyter* (F804) and Hr.Ms. *Evertsen* (F805) as well as the two 'Karel Doorman'-class frigates Hr.Ms. *Van Speijk* (F828) and Hr.Ms. *Van Amstel* (F831). Two Landing Platform Docks, Hr.Ms. *Rotterdam* (L800) and Hr.Ms. *Johan de Witt* (L801), can carry six Lynxes. Finally, supply ship Hr.Ms. *Zuiderkruis* (A832) can take two, and Hr.Ms. *Amsterdam* (A836) three Lynxes.

Nigeria

From March 1984, the Nigerian Navy took delivery of three Lynx Mk 89s (serialled 01-F-89 to 03-F-89) with uprated Gem 43 engines rated at 1,135 shp (847 kW) for improved hot-weather performance, and a Bendix Primus 500 radar. They operated with 101 Squadron, which could supply an embarked Lynx-flight to the 'Meko-360H'-class frigate NNS *Aradu* (F89). While 02-F-89 had been written off in 1989, the remaining two were planned to return to the factory in Yeovil for major overhaul in 2001 but this did not occur. Instead, the navy recently bought four AgustaWestland A109E helicopters. Due to lack of spares being bought, the Lynx has been grounded for years and it is highly unlikely that the type will re-enter service.

Norway

For coast guard duties, 337 Skvadron at the northerly base of Bardufoss operates six Lynx Mk 86s (serialled 207, 216, 228, 232, 235 and 237) that regularly deploy to the Kystvakten's vessels. The first Norwegian Lynx flew on 23 January 1981 and the type was declared operational on 1 May 1983. The coast guard falls under the responsibility of the

navy, while 337 Skvadron in turn reports to 139 Luftving at Bardufoss. The Lynx fleet, which is currently suffering from lack of spares, is being replaced by the NH-90 from late 2008, of which a total of 14 are on order with eight destined for 337 Skvadron. Lynx 235 was damaged in an accident on 12 January 1988, but has been rebuilt by Westland, using a new-built airframe.

The Kystvakt's three 'Nordkapp'-class Ocean Patrol Vessels, which are KV *Nordkapp* (W320), KV *Senja* (W321) and KV *Andenes* (W322), can carry one Lynx for coast guard duties, fishery inspection and protection duties inside the Norwegian EEZ that also covers both Svalbard and Jan Mayen islands. Furthermore, the icebreaker and offshore patrol vessel KV *Svalbard* (W303) can have a Lynx flight on board. The helicopters are unarmed.

Oman

A contract for sixteen Super Lynx 300s (designated Mk 120 and serialled 757 to 772) was signed on 19 January 2002. The first flew on 25 October 2003 and, after a period of crew training in the UK, the first three were delivered by An-124 on 23 June 2004. The helicopters have entered service with both No. 3 Squadron based at Salalah and No. 15 Squadron at Al Musana'ah air base, the latter being a new base of which construction started in 2003. Oman's Lynx fleet is solely land-based, and roles include transport, search and rescue, armed escort and border protection. For its armed missions, it can carry two 20-mm cannon pods or two pods each containing 19 2.75-in (70-mm) rockets. A FLIR sensor is mounted on the nose, and Oman's Super Lynxes are the first equipped with a next-generation HUMS system. One Super Lynx 300 (765) was written off on 18 August 2006.

Pakistan

Three second-hand Lynx HAS.Mk 3 helicopters were bought from the Royal Navy in June 1994 (XZ227, XZ231 and XZ240), reserialled 21 to 23 by Pakistan. XZ227 was the oldest production Lynx, first flying on 10 February 1976. The first two were shipped to their new operator in August 1994 and the third in 1995, all following overhaul at RNAY Fleetlands. The helicopters entered service with 222 Squadron of the Pakistan Bharia (Pakistan Navy), a unit established in September 1994 at PNS Mehran near Karachi. The Lynx was also able to operate from its six 'Amazon'-class Type 21 frigates PNS *Tariq* (D181), PNS *Tippu Sultan* (D186), PNS *Babur* (D182), PNS *Khaibar* (D183), PNS *Shahjahan* (D185) and PNS *Badr* (D184) that were obtained from the Royal Navy. The Pakistan Navy refers to these vessels as destroyers rather than frigates. It has been reported that the Lynx was retired in

2007 or 2008. Also, the Pakistan navy no longer mentions the Lynx as being part of its current equipment in official presentations.

Portugal

To re-establish a naval air component, Portugal ordered five Super Lynx Mk 95s during late 1989. Two (serialled 9201 and 9202) were converted from HAS.Mk 3S airframes that had previously seen brief service with the Royal Navy, and were handed over on 24 August 1993. Two more (9204 and 9205) followed on 16 November 1993 with the first new-built Mk 95 (9203) followed a week later on 22 November.

Reserialled in 1994 to 19201 to 19205, the helicopters form the Esquadilha de Helicópteros and operate out of Base Aérea No.6 Montijo. Instead of the Seaspray radar, Portuguese Super Lynxes are equipped with the 360° Bendix RDR 1500B – an upgraded weather radar without locking device. A Bendix AQS-18(V) sonar can be installed in the cabin, featuring a 300-metre cable. Armament consists of Mk 46 torpedoes, and from 2009 a FN Herstal 12.7-mm M3M machine-gun will be added. The Portuguese Lynxes have the usual range of maritime ASW and support tasks, mostly during daytime only as they lack FLIR and NVG compability.



For a few years, the navy has been considering buying a few extra helicopters, but no matching serviceable airframes will become available in the near future, while the variant in use is no longer being build. Instead, Portugal is now looking to acquire more training time with the Joint Lynx Simulator Training Establishment at De Kooy, Netherlands as less training hours on the actual helicopters will increase their operational deployment time.

The Portuguese navy has deployed its Lynx to the Adriatic Sea in 1995 and 1996 under the NATO flag to enforce the Yugoslav embargo, while during 1998 the squadron carried out a non-combatant evacuation over Guinea-Bissau. In 1999, a Lynx

flight flew missions in support of UNTAET over East Timor, and from 2002 the Portuguese Navy had been involved in Operation Active Endeavour. The squadron currently maintains three deployable flights that are commonly named after cartoons or video games. The three 'Vasco da Gama'-class frigates NRP *Vasco da Gama* (F330), NRP *Alvares Cabral* (F331) and NRP *Corte Real* (F332) can carry two helicopters each. In addition, Portugal bought two multi-purpose frigates from the Netherlands navy, to be delivered in 2008 and 2009. They will be able to carry one Lynx flight each. Replenishment ship NRP *Berrio* (A5210) has a flight deck for Lynx operations.



Republic of Korea

The Han Guk Hae Gun (Republic of Korea Navy) was the first customer for the Super Lynx, ordering 12 Mk 99s (serialised 90-0701 to 0703, 90-0705 to 0706 and 91-0707 to 0713). The first two were handed over on 26 July 1990, and initially stayed at Yeovil for crew training. These and the rest were shipped to South Korea between December 1990 and May 1991, and entered service with 627 Squadron, which is part of Air Wing 6 based at Jinhae.

The country's positive experiences with the type led to a follow-up order worth USD 337 million for 13 Mk 99As (serialised 99-0721 to 0723, 99-0725 to 0726, 00-0727 to 0733 and 00-0735) delivered by sea between September 1999 and early 2001, and they equip 629 Squadron at Jinhae, reporting to the same Air Wing. The latter batch included an attrition replacement for a lost aircraft (90-0706 crashed on 12 August 1993). Note that no serial carries digit 4, as this is locally associated with death due to the similar pronunciation.

Korean Lynxes have a Seaspray Mk 3 360° radar and a Bendix AQS-18(V) dipping sonar system, and can be fitted with MBDA Sea Skua missiles. Recently, the fleet has been upgraded by Korea Aerospace Industries (KAI) Ltd with the goal to have similar capabilities as the Super Lynx 300. The final

helicopter under this contract was redelivered on 12 November 2004. Another upgrade programme involving the implementation of a new ESM suite was awarded to KAI in 2004, with first conversions underway by late 2007.

Ships able to carry Lynx helicopters include the 'Gwanggaeto the Great'-class destroyers ROKS *Gwanggaeto the Great* (DDH-971), ROKS *Eulji Mundeok* (DDH-972) and ROKS *Yang Manchun* (DDH-973), which have space for two helicopters each, while the Aegis destroyer ROKS *King Sejong* (DDH-991) can also take on a Lynx flight.

South Africa

In search for a replacement of the maritime Alouette III and Oryx, a contract was signed on 14 August 2003 for four Super Lynx 300s. The first flew on 24 April 2006 and, from early 2007, crews were trained at AgustaWestland's Customer Training Centre. After the handover, the helicopters (designated Mk 64 and serialised 191 to 194) were airlifted in two An-124 cargo flights to South Africa on 11 and 27 July 2007. They are now based at AFB Ysterplaat, forming 22 Squadron. The official handover took place on 14 February 2008.

Operated by an air force squadron, the helicopters support naval operations and carry SA Navy titles. The Mk 64 is mostly equipped with indigenous systems like the nose-mounted Denel Optronics Argos 410-M FLIR, an advanced Sysdel CC Sea Raven ESM system and a Tellumat PT-2000 IFF. Radar installed is a Telephonics APS-143B 360° search radar. The avionics are managed by two integrated Thales UK Control Display and Navigation Units.

The Super Lynx can deploy to the 'Valour'-class frigates SAS *Amatola* (F145), SAS *Isandlwana* (F146), SAS *Spioenkop* (F147) and SAS *Mendi* (F148), acting as airborne sensor platform. Armament is limited to a door-mounted 12.7-mm machine-gun, although other weapons may be obtained at a later stage. Secondary roles are EEZ protection, transport, fleet replenishment, maritime surveillance and SAR.

Thailand

The smallest Lynx operator in terms of numbers, Thailand bought only two Super Lynx 300s (Mk 110, serialised 2313 and 2314) on 1 August 2001. The contract was worth GBP 26.9 million and included integrated logistics support and service, with AgustaWestland to accept Thai products in return as counter-trade for half the contract amount. The first flew on 26 July 2004.

Following a few months of crew training at Yeovil, they were delivered to the Royal Thai Navy by the end of that year and were officially handed over on 8

February 2005. They are used for both search and rescue and maritime patrol duties, including anti-surface and anti-submarine warfare. The helicopters are in use with 203 Squadron/No. 2 Wing, which recently relocated from U-Tapao to Songkhla. The Lynxes can deploy to the 'Naresuan'-class frigates HTMS *Naresuan* (FF-421) and HTMS *Taksin* (FF-422). Although Thailand has expressed interest in acquiring extra Super Lynx 300 helicopters, no order has been placed at present.

United Kingdom – Army Air Corps

The original Lynx AH.Mk 1 was mainly deployed to eleven squadrons (651, 652, 653, 654, 656, 657, 659, 661, 662, 663 and 669 Squadrons) reporting to the British Army of the Rhine in Germany, operating alongside Gazelle AH.Mk 1 scouts. In the UK, 655, 664, 665 and 672 Squadrons were front-line Lynx operators, while 671 Squadron used the type for training and 667 (D+T) Squadron performed trials. Sixty were equipped with TOW missiles and mainly served as anti-armour platforms.

Apart from those few that had been lost in accidents, the fleet was converted to AH.Mk 7 during the mid-1980s. From 2002, the Lynx AH.Mk 7 fleet gradually lost its TOW-equipment, and with it its anti-tank role, following the introduction of the Apache AH.Mk 1. Today the Lynx is used mainly as battlefield utility helicopter, while it can operate alongside the Apache in the search role. For armed reconnaissance and assault missions, a 7.62-mm machine-gun can be fitted onto pintles in the port and starboard door openings. Troop and supply transport, as well as medevac, form other daily duties.

For logistical and economic reasons, Dishforth became the main operating base for the Lynx AH.Mk 7 during mid-2007, while the based Apache squadrons moved to Wattisham. At Dishforth, 9 Regiment AAC consists of 659, 669 and 672 Squadrons. The other currently operational AH.Mk 7 squadrons are 665 Squadron as part of 5 Regiment AAC at RAF Aldergrove, Northern Ireland, whose aircraft can carry the OXBOW camera system, and 657 Squadron at RAF Odiham for the transport of UK special forces. All mentioned units report to the Joint Helicopter Command (JHC) while 9 Regt also supports 16 Air Assault Brigade. In 1997, the Lynx AH.Mk 7 deployed for the first time to BATU (British Army Training Unit) at Suffield, Alberta, Canada, where a huge range is located.

From 2005, the AAC's Lynx AH.Mk 9s equip 652 and 661 Squadrons as part of 1 Regiment AAC at Gütersloh, Germany. This regiment supports 1 (UK) Armoured Division, and reports to the JHC as well. Main missions for 1 Regt comprise ISTAR (Intelligence Surveillance Target Acquisition and Reconnaissance) in support of fast jets and artillery, to provide airborne command and control posts, and

movement of troops and cargo. Occasionally, a few AH.Mk 9s are deployed to 9 Regiment, while on the other hand 1 Regiment sometimes operates one or two AH.Mk 7s at its home base for crew training, as the AH.Mk 9 fleet is generally heavily involved in international operations. With the slightly higher maximum weight, and improved communication and GPS systems, the AH.Mk 9 is preferred for these operations and therefore currently detached on a permanent basis, although the mission profile is similar to that of the AH.Mk 7.

Army Lynxes are currently deployed in both Operation Telic (Iraq) and Operation Herrick (Afghanistan). 672 Squadron deployed to Kandahar, Afghanistan, for most of 2006 and 2007. 659 Squadron deployed to Basra, Iraq, during 2003, 2005 and 2007, where it was tasked with assistance in command and control, transporting demolition and reconnaissance groups, and conducting aerial reconnaissance and fire support. 669 Squadron undertook similar tours to Iraq in 2004 and 2006. Previously, it had completed several rotations to former Yugoslavia. Additionally, elements of 1 Regiment are detached abroad in support of ongoing military operations in both Iraq and Afghanistan, where they make use of the MX15 digital video system with infrared capability.

For exercises over largely uninhabited areas, such as encountered in Belize or Kenya, dayglo doors and tail rotor shaft covers are applied for better recognition in case an accident occurs. As well as land-based operations, AAC Lynx units can operate from ships. During October 2005, 656 and 672 Squadrons participated in an embarked operations exercise from the Royal Navy's assault ship HMS *Ocean*.



For crew training, 671 Squadron operates the Lynx AH.Mk 7 alongside the Gazelle AH.Mk 1 as part of 2 (Training) Regiment AAC, and also hosts the Blue Eagles display team, a mixed formation with Gazelles and a single Lynx. A few AH.Mk 7s are allocated to 667 (Development & Trials) Squadron. Both units are based at Middle Wallop. Finally, the SEAE (School of Electronic and Aeronautical

Engineering) at Arborfield uses some retired airframes for ground instruction.

In response to operational requirements, a number of incremental improvements are presently carried out. These include an improved IFF and a secure communications radio system. Lynx maintenance and overhaul is carried out by Vector Aerospace (former DARA Fleetlands). From 2014, the first of 34 Future Lynx will become operational as replacement for the current army Lynx fleet.

Serials: the fleet of AH.Mk 1s serialled XZ170-199, XZ203-222, XZ605-617, XZ640-655, XZ661-681 and ZD272-285 was converted to AH.Mk 7, except for XZ189, XZ204, XZ213, XZ640, XZ671 and XZ681 which were written off earlier, while ZD285 was completed as an AH.Mk 5 for trials. Operational in 2009 are XZ173, XZ176-185, XZ190-191, XZ193-196, XZ203, XZ205-206, XZ208, XZ210-212, XZ214-217, XZ219-222, XZ605-609, XZ611-612, XZ615-617, XZ641-643, XZ645, XZ647-648, XZ651-655, XZ661, XZ663, XZ669-670, XZ672-680, ZD272-274 and ZD277-285.

AH.Mk 5's ZD560 and ZE375-376 were later converted to AH.Mk 7, while ZE377-382 and ZF537-540 were newly built as such. Of these batches, only ZE378 and ZD560 are still operational (the latter with the Empire Test Pilots School). Eight were converted to AH.Mk 9 (ZE375-376, ZE380, ZE382 and ZF537-540), of which all but one (ZE382) are operational. Several operational helicopters are temporarily stored at Fleetlands.

The new-built AH.Mk 9s are serialled ZG884-889 and ZG914-923, and all remain in service.

United Kingdom – Fleet Air Arm

The first of 60 Lynx HAS.Mk 2 entered service with 700L Naval Air Squadron at RNAS Yeovilton, a joint UK-Dutch unit established for development and trials with the new helicopter. The Lynx was subsequently taken on charge by 702, 815 and 829 Naval Air Squadrons at RNAS Portland. In 1993, 829 Squadron disbanded and, following the closure of RNAS Portland in March 1999, the Lynx force moved to RNAS Yeovilton, where 702 and 815 Squadrons are still equipped with the type in the crew training and operational roles, respectively. Already based at Yeovilton was 847 Naval Air Squadron, supporting the Royal Marines. This unit, formerly known as 3 Command Brigade Air Squadron (3 CBAS) previously operated a mix of Lynx AH.Mk 1s and Gazelle AH.Mk 1s, and is currently equipped with the Lynx AH.Mk 7.

Together with the acquisition of 23 new Lynx HAS.Mk 3s in the early 1980s, the surviving HAS.Mk 2s were brought to the same standard. From then on, a number of modifications have appeared. The HAS.Mk 3GM (Gulf Modification) was adapted for

operations in the hot and sandy Persian Gulf area, while a few were equipped for arctic operations from HMS *Endurance* and designated HAS.Mk 3(ICE). After installing secure communications, all became HAS.Mk 3S (and, HAS.Mk 3SGM and HAS.Mk 3S(ICE) where applicable). Seven HAS.Mk 3Ss have dual flight controls for pilot training.

Installation of a new mission computer, the Central Tactical System, led to the HAS.Mk 3CTS, from which the HMA.Mk 8 was developed. An upgrade programme covering a digital signal processor controlling the Seaspray radar led to the temporary designation HMA.Mk 8DSP, which was dropped again following completion of the update in 2006. Two HMA.Mk 8s (XZ722 and ZD252) were temporarily equipped with an avionics cooling system and known as HMA.Mk 8ACS, but this modification was discontinued a few years ago. Currently, 12 HMA.Mk 8DASs have received advanced defensive aids subsystems. Another modification is the installation of SATURN secure V/UHF radios by Alan Mann. This newest variant is designated HMA.Mk 8SRU. Oddly, none of the Royal Navy Lynxes is equipped with sonar, mainly because this is normally provided by the surface vessels located in the operating area of the helicopter.



A number of airframes is temporarily in storage with Vector Aerospace in Southampton, which took over the Defence Aviation Repair Agency (DARA) Fleetlands in early 2008. This facility has also been responsible for several of the Lynx modification programmes for both navy and army.

815 NAS takes care of the 26 Small Ship's Flights, embarked flight units deploying to the following Royal Navy vessels: F85 *Cumberland*, F86 *Campbeltown*, F87 *Chatham* and F99 *Cornwall* (Type 22 Frigates); F78 *Kent*, F79 *Portland*, F81 *Sutherland*, F82 *Somerset*, F83 *St Albans*, F229 *Lancaster*, F231 *Argyll*, F234 *Iron Duke*, F235 *Monmouth*, F236 *Montrose*, F237 *Westminster*, F238 *Northumberland* and F239 *Richmond* (Type 23 Frigates); D89 *Exeter*, D90 *Southampton*, D91 *Nottingham*, D92 *Liverpool*, D95 *Manchester*, D96

Gloucester, D97 Edinburgh and D98 York (Type 42 Destroyers), while finally two HAS.Mk 3S(ICE) can be taken by HMS Endurance (A171) for arctic patrols. Two 'Albion'-class landing platform docks, HMS Albion (L14) and HMS Bulwark (L15) are also able to carry helicopters. As a result of the Comprehensive Spending Review issued by the British government in 2007, all four Type 22 frigates and one destroyer will be decommissioned in the near future.

A secondary task for 815 NAS is counter-terrorism over land. A FN Herstal M3M 12.7-mm machine-gun can be fitted in the door opening. RN and RM Lynxes also routinely deploy to operational areas, and both 815 and 847 NAS are currently deployed in Operation Telic in Iraq. From 2015, the Future Lynx of which 28 are on order, is expected to become operational as replacement for the existing fleet.

Serials: The 60 HAS.Mk 2s were serialised XZ227-252, XZ254-257, XZ689-700 and XZ719-736. All were converted to HAS.Mk 3 except for XZ242-243, XZ247, XZ249, XZ251 and XZ700. New-built HAS.Mk 3s were serialised ZD249-268, ZD565-567 and ZF557-563. Survivors were modified to HAS.Mk 3S, and still operational today are XZ228*, XZ229*,

XZ232*, XZ233, XZ234, XZ235**, XZ237, XZ238**, XZ239*, XZ245*, XZ246**, XZ248, XZ250, XZ254, XZ257, XZ693, XZ694*, XZ696*, XZ720*, XZ721*, XZ727, XZ730, XZ733*, XZ735, ZD249-251, ZD254, ZD255*, ZD263 and ZD264* (* for HAS.Mk 3SGM, ** for HAS.Mk 3S(ICE)).

Thirty-eight HAS.Mk 3Ss were converted to HMA.Mk 8, of which 35 are still operational: XZ236, XZ255, XZ689-691, XZ692*, XZ697*, XZ698, XZ719, XZ722*, XZ723, XZ725-726, XZ729, XZ731-732, XZ736*, ZD252, ZD257-258, ZD259-261*, ZD262, ZD265*, ZD266-268, ZD565-566*, ZF557-558, ZF560*, ZF562* and ZF563 (* for HMA.Mk 8DAS). HMA.Mk 8s XZ256, XZ695 and XZ728 have been written off in accidents. 847 Squadron's AH.Mk 7s are included in the Army Air Corps serials.

QinetiQ

QinetiQ's Empire Test Pilots School at Boscombe Down operates the sole Lynx Mk 5X (ZD559), and also has one AH.Mk 7 (ZD560) available for its syllabus. Furthermore, QinetiQ also has the single AH.Mk 5 (ZD285) and occasionally uses an AH.Mk 9 and a naval HMA.Mk 8 for trials work.

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The author would like to thank the following for their great assistance in completing this article: Geoff Russell at AgustaWestland; Cdr Richard Seymour at RNAS Yeovilton, Royal Navy; Cdr Chris Mahony and Lt RN Bill Thompson of 702 NAS, Royal Navy; Jan Kemal (HQ 1 (UK) Armd Div), LtCol. Mike Smith (1 Regt AAC), Capt. Chris Collett (1 Regt AAC) and Maj Paul Gautron (9 Regt AAC) of the Army Air Corps; Cdr Martin Ole Thorup of the SHT, Danish Navy; Oberbootsmann Nils Torben Simon of MFG-3, German Navy; 'Pak Lan' of Skvadron 501, Royal Malaysian Navy; LTZ1 Niels Kleingeld and LTZ1 Peet Rood of VGSQ 7, Royal Netherlands Navy; and LtCdr Hugo Cabral of the Esq de Helicópteros, Portuguese Navy.

This article has been completed for publication in International Air Power Review (UK/USA – Vol.26). Furthermore, images and articles on specific Lynx operators have been used in various other aviation magazines.

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