THE AVIATION MAGAZINE

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№ 84 May-June 2023
Volume 14, Issue 3

- Cobra Warrior 2022
- Lightnings over Denmark
- Rapid Pacific 2022
- United Statess Forest Service
- And so much more ...

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THE AVIATION MAGAZINE

by www.TheAviationMagazine.com e-mail: editor@TheAviationMagazine.com

THE AVIATION MAGAZINE is published six times a year by a team of volunteers interested in aviation. We are devoted to cover a wide range of aviation events ranging from air shows, air base visits, military exercises, civilian spotting, and pilot and veteran interviews – accentuated with exceptional photography. THE AVIATION MAGAZINE is a leader in the e-magazine format since 2009, bringing exclusive and fascinating reports to our global aviation enthusiasts digitally.

Do you feel addressed and want to be part of our team? We would love to publish your work too, so feel free to shoot us an e-mail to editor@TheAviationMagazine.com. Please note that we do not accept any unsolicited articles or images for publication.

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FROM THE EDITOR

Dear Readers,

Welcome to a new issue of THE AVIATION MAGAZINE. Perhaps, you would like to share one or more of your favorite photos here with other aviation enthusiasts without having to write an article right away? We plan to introduce a "**From our Readers' Archives**" section at irregular intervals in future issues of our magazine. We invite you to send us your favorite photo(s)* from military aviation, government agencies & organizations, special operations, firefighting, law enforcement, ... to ***MyFavPhoto@TheAviationMagazine.com***. The image should be high resolution and have an original size of at least 2,700 x 1,800 px. Please provide us some information about what the image shows, when and where and, if applicable, on what occasion it was taken.

Surprise us and the other readers with your impressive pictures – we are very excited!

For now, download our new issue **HERE**, and we hope you enjoy reading it.

Ralf Peter WALTER
Publisher & Editor

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WORLD DEFENSE SHOW 2022
SAUDIA ARABIA

REPORT BY WOLFGANG JARISCH

In the shadow of the Ukrainian crisis, the world's largest arms fair opened its doors in Riyadh, Saudi Arabia. The event dwarfed anything seen before in the Kingdom of Saudi Arabia. Approximately 80 km north of Riyadh, in the middle of nowhere, a new exhibition center of superlatives was built. To bring the aircraft and helicopters to the event, a runway and enough parking areas have been paved into the desert and a tower has been built. In addition, a large infrastructure was erected for the dynamic displays.

The event was organized by the General Authority for Military Industries of the Kingdom of Saudi Arabia.

Already in the run-up to the event, the invited international press was informed about the latest news. In addition, the registration for the event for customers, exhibitors, and press was more than professionally organized. The participants of the event were also warmly welcomed at the airport.

During his opening speech, GAMI (Saudi General Authority for Military Industries) Governor al-Ohali thanked King Salman and Crown Prince Mohammad Bin Salman for their support in organizing this superlative event, which will now be held biennially. He also highlighted some of the key programs at this event,

To celebrate the 91st National Day, this Royal Saudi Air Force Tornado IDS received a wonderful dark black paint scheme.

such as the Future Talent Program, Women in Defense, the Thought Leadership Program, Skills and Human Capital, Technology and Innovation, and Cybersecurity, only to name a few of the many themes. The governor also concluded by reiterating Saudi Arabia's strategic goal of localizing more than 50 percent of defense spending in line with the Crown Prince's 'Vision 2030'. Therefore, a key topic was to share the latest developments in Saudi Arabia's business guidelines, investment requirements, and partnership processes in line with the national defense industry strategy, 'Vision 2030', and objectives aligned, presented by eight keynote speakers from different ministries and institutions.

The exhibition areas themselves were well secured. Security checks on the access roads, optimally regulated access systems, and air defense systems ensured the necessary sense of security. In the exhibition halls was everything, which exhibitors and customers needed for their business meetings. In addition, there were plenty of meeting zones and rooms, including larger ones for government delegations, and enough conference rooms for the numerous events.

Unfortunately, the planned dynamic displays were canceled. The reason for this could have been that, due to the exhibitors, which came from Russia as well as from Ukraine, the Saudi Land Forces as well as the Royal Saudi Air Force did not want to demonstrate their military power under these circumstances. That was a pity because there were great displays on the program. So only the flight demonstrations of the Royal Saudi Hawks and the Al Fursan from the United Arab Emirates Air Force remained on the last two days, since on the first two days no flight program wwas been possible due to a powerful sandstorm.

Let us take a brief look back at the aviation part of the event. The public debut of the Royal Saudi Naval Forces made the Sikorsky MH-60R *Seahawk*. Ten were ordered in 2015. Two different variants of the UH-60 *Black Hawk* of the Royal Saudi Land Forces were also on display: One UH-60L *Black Hawk* with a weather radar and the other one, a UH-60M, was equipped with the External Stores Support System (ESSS), a combat SAR medical evacuation system, and an unknown turret, which was covered all the days. Also on display was one of the 24 delivered Boeing AH-6I Light Attack Helicopters. The AH-6I is

Top & above right: Royal Saudi Air Force Airbus H215.
Above left: Royal Saudi Naval Forces MH-60R *Seahawk*.

Royal Saudi Land Forces UH-60M *Black Hawk* **(above)** and UH-60L *Black Hawk* **(below)**.

Royal Saudi Land Forces Boeing AH-6i **(above & below)**

in service with the Royal Saudi Air National Guard (RSANG). Two Boeing AH-64E *Apache* helicopters were part of the static display: One assigned to the RSANG to the Royal Saudi Land Forces. Two examples of the Airbus H125M, which are in service by the re-equipped RSAF No. 66 Squadron, were also present in the static display.

A rare Sikorsky S-92 *Helibus* from the Ministry of Interior was shown in the static exhibition. From the Saudi Medevac Fleet were some AW-139s and one Eurocopter EC-145 from the Royal Saudi Arabia State Security at the apron next to the Royal Saudi Hawks parked. One of these EC-145 was also presented in Hall One.

To celebrate the 91st National Day, several aircraft were given a special paint job: one Tornado IDS, one F-15C *Eagle*, one F-15S *Eagle*, and one Eurofighter *Typhoon* in a wonderful dark black painting with a green hawk and the Saudi Flag were part of the static display. Parked next to a Boeing K-3E AWACS was an Airbus A300-243MRTT. The Airbus was wearing a large motif of Saudi Arabia's King Salman and Crown Prince Mohammed bin Salman on its tail. The multi-role tanker, which is in service with No. 24 Squadron, received these markings to celebrate the 89th National Day on 23 September 2019. For the first time in public seen was a Royal Saudi Air Force Eurofighter *Typhoon* whith the markings of No. 80 Squadron of the 2nd Wing at Taif/King Fahad Air Base which was established in 2018.

Two rare foreign aircraft should also be mentioned. Honeywell brought the Boeing 757 Testbed to the WDS which was only shown on the first day of the event. Leonardo brought a special version from the Italian Air Force, a C-27J "Spartan Next Generation" with the registration C.S.X 62220 to the WDS. The Italian Air Force serial has been painted over and was therefore not visible.

Of course, all the well-known manufacturers of unmanned aerial vehicles were also present. The Saudi Arabian company Intra displayed almost all its products. Especially the licensed version of the Turkish Karayal-SU, the Haboob, caused a lot of interest. In addition, the Saudi company Scopa, founded in February 2022, was also present with a license-built version of the British "Watchkeeper". MARSS, the game-changer in the C-UAS market showed the AI-enabled autonomous interceptor drone. This is only a very small overview of the numerous manufacturers in the UAV market represented at the WDS Show.

Andrew Pearcey, Chief Executive Officer o World Defense Show, commented at the end of the event: "The industry response has been overwhelming. It reveals major confidence from the global industry in the Kingdom's defense market. The inaugural World Defense Show is the ideal opportunity for visitors to further explore the Saudi Arabian defense ecosystem while meeting with key players in a purpose-built venue designed to meet the needs of buyers and suppliers at all levels of the supply chain."

Some key figures;

- Over 600 exhibitors from 42 countries.
- More than 100 international delegations and more than 65,000 trade visitors
- 29.7 billion SAR of orders and announcements.
- More than 40 MoU's and cooperation agreements.

The Aviation Magazine would like to thank GAMI and the press officers for their great support during the preparation, the entry into the Kingdom of Saudi Arabia, and the support on-site. See you in 2024!

Royal Saudi Land Forces AH-64E *Apache*.

One F-15S *Eagle* also received the special 91st National Day paint scheme.

F-15S assigned to No. 92 Squadron

Top left: Eurofighter *Typhoon* F2 assigned to No. 80 Squadron.
Top right and above: Only one Eurofighter *Typhoon* was given the special 91st National Day paint scheme.

Main image: Sikorsky S-92A *Helibus* of the Saudi Ministry of Interior.
Insets: AgustaWestland AW139 of the Saudi Medevac Fleet.

Honeywell Boeing 757 Testbed

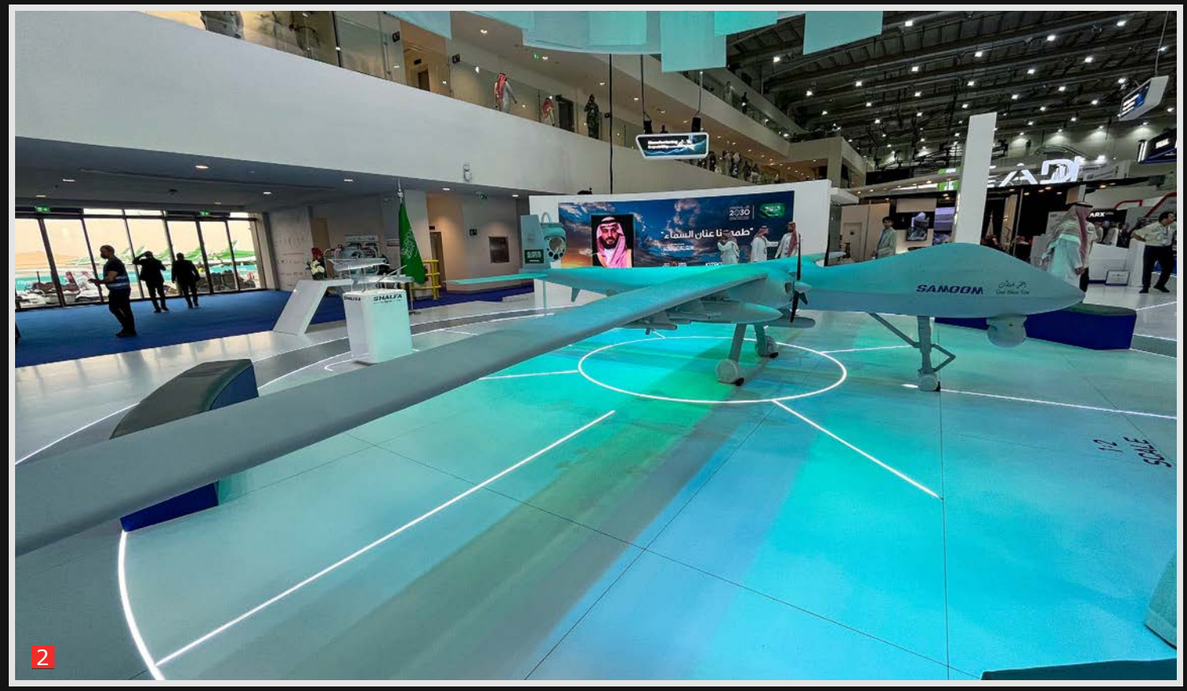
Main image: Airbus A300-243MRTT. The Airbus was wearing a large motif of Saudi Arabia's King Salman and Crown Prince Mohammed bin Salman on its tail.

Inset: Italian Air Force C-27J 'Spartan Next Generation'.

1 The Haboob is the Saudi version of the Karayel, a 650 kg UAS designed and developed by Vestel Savunma of Turkey. Its payload is 130 kg.

2 Intra presented a half-scale model of the Samoom. The twin-engine UAS has a conventional architecture with a high wing without winglets with 24 meters wingspan, a central horizontal empennage, single rudder, and tricycle landing gear. Propulsion is provided by two ultra-light 6-cylinder turbo engines providing 220 hp each, 1,400 liters of fuel ensuring up to 50 hours endurance, depending on the payload. The engine should be the UL520T, the most recent development of the 4-stroke 6-cylinder horizontally opposed UL520, by ULPower Aero Engines of Belgium, which has a weight of 122 kg. It ensures constant output power up to 15,000 ft.

3 "MARSS has a wingspan of 0.9 meters and has an overall wight of less than 10 kg. It is a high speed drone and flies up to 80 m/s, which is 155 knots or 288 km/h. The Interceptor exploits kinetic energy to down its opponent, hence titanium is used to reinforce the forward part of the fuselage, inserts being also present in the wing leading edge and in the front part of the nacelles containing the propellers", Johannes Pinl, the Austrian founder and CEO of MARSS explains, underlining that ducted fans are of proprietary design. Differential rotation speed of the rotors/propellers allow the interceptor to manoeuvre up to 4 g, the Interceptor being able to engage dogfight at altitudes of over 2 km. The drone-killer is fitted with an Imaging InfraRed sensor in the nose, which ensures maximum accuracy in the last phase of the attack thanks to IIR Artificial Intelligence-based video analysis, the Interceptor being designed to hit the enemy drone from underneath or in a frontal confrontation.



LEONARDO AWHERO

Flexible system for civil roles
AWHERO can perform a wide range of utility roles including disaster relief, environmental monitoring, support to firefighting, pipeline or powerline monitoring. It is also an ideal solution for security missions such as surveillance, patrol and aerial monitoring of sensitive targets.

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Military Forces can trust AWHERO to perform a spectrum of battlefield and maritime missions including: Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR), force protection, combat support, route clearance, cargo resupply, anti-piracy, maritime security, and Beyond Line of Sight (BLOS) communications relay.

Flexible sensor capability
Two high-capacity and modular payload bays (nose and underbelly) can carry multiple sensors which include: Leonardo Gabbiano TS Ultra-Light Maritime Radar, Electro-Optical/Infrared (EO/IR), Electronic Support Measures, Sonobuoy Data Relay and Light Imaging Detection and Ranging (LiDAR). 20:14

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AWHERO can be teamed with manned aircraft from a permanent shore base or forward deployed operating base. Operating alongside Leonardo's manned helicopters, AWHERO significantly enhances maritime operational effect and tactical reach during land, littoral and blue-water operations.

Source: Leonardo

The Garmousha drone is a light military unmanned aircraft designed to carry payloads of approximately 100 kg, with an endurance of six hours and 150 km.

HELLENIC AIR FORCE M-346B

REPORT BY MARCO MUNTZ

Designated M-346B in HAF service, CSX55277 flew for the first time in full Greek military livery on 3 April 2023. Adorned with Greek roundels and serial 250, this M-346B is seen in a left turn, shortly after takeoff from Venegono.

On 3 April 2023, the first M-346 for the Hellenic Air Force (HAF) was seen in full livery wearing Greek military roundels and serial, conducting a test flight from Leonardo factory airfield Venegono. The type will be designated M-346B in HAF service replacing the aging North American T-2C/E *Buckeye* in the advanced training role.

On 5 January 2021, Israel's Ministry of Defense announced a procurement agreement with the Greek government to set up and exploit a flight school for the Hellenic Air Force at Kalamata AB, on the Peloponnese peninsula. Israeli Defense contractor Elbit Systems was selected as the preferred bidder in an international tender issued by Greece, beating Canadian competitor CAE which also offered a package based on the M-346. Following government-to-government negotiations, a full contract was signed between the Israeli and Greek Defense Ministries in Athens on April 16, 2021. The deal was inked by Greece's Director-General of the General Directorate of Defense Investments and Armaments, the Greek Minister of Defense, and the head of the International Defense Cooperation Directorate at the Israeli Defense Ministry (SIBAT). Stipulated in the contract, valued at USD 1.65 billion (approximately EUR 1.375 billion), Elbit Systems will establish and run the Greek International Flight Training Center (HAF-IFTC), modeled on the Israeli Air Force (IAF) Flight Academy at Hatzerim. The contract covers a period of 22 years and includes the purchase of 10 M-346 Lead-In Fighter Trainers (LIFT) from Leonardo. The HAF M-346s will be equipped with Elbit's advanced Embedded Virtual Electronics (EVA) system to simulate flight and combat scenarios. Modification kits will be supplied to Greece to upgrade their T-6A *Texan II*s. The training center will be equipped with Ground Based Training Stations (GBTS) and interconnected flight simulators. To run a smooth and efficient flight training operation, a dedicated command and control system will be implemented. Elbit Systems will exploit all training facilities and will be responsible to operate, maintain, and provide logistic support for both the Hellenic T-6 and M-346

fleet. The new training center at Kalamata AB, home to 120 Pteriga Ekpedefseos Aeros (PEA) – 120 Air Training Wing, officially opened on 21 October 2022. Operations started with 14 T-6As, the number will be gradually increased to 25 *Texan II*s and 10 new M-346Bs. It is expected to offer 7,000 flight hours on the T-6 and 3,500 hours on the M-346B annually once all training aircraft are available. Training buildings are currently under construction while a new logistics center and sun protection shelters for the M-346B have already been built. The International Flight Training Center should be fully operational from early 2024. The first two HAF M-346Bs are scheduled to arrive in Greece ahead of the country's legislative elections on 21 May. Delivery to Kalamata is planned for the second week of May including an official welcome ceremony. Since September 2022, twenty HAF technicians from 120 PEA have already made their way to northern Italy to conduct M-346B system support training by Leonardo. Six Greek instructor pilots recently completed simulator training at the IAF Flight Academy in Israel. They will continue their instructor training at Kalamata AB on the new M-346B once both aircraft have been accepted. In November 2022, the Chief of the Hellenic Air Force General Staff (HAFGS), Lt. Gen. Bourolias, made a three-day visit to the Leonardo facilities to become informed about the progress of the Greek M-346 program. On 10 November, he made a familiarization flight on a company-owned T-346A of the International Flight Training School (IFTS) which was transferred from Galatina for the occasion. The first M-346B for the HAF-IFTC, sporting Italian military test registration CSX55277, made its maiden flight from Venegono on 20 January 2023, still in primer. The aircraft received serial 250 while outer wing panels are painted in blue to be better visible in flight. The second HAF M-346B, 251, was first flown on April 21, already in its Greek military colors. The International Flight Training Centre is keen to attract students from outside Greece while future cooperation with the Israeli Flight Academy is also under consideration.

Future HAF M-346B 250 (CSX55277) on short final to Runway 17 at Venegono upon return from its first flight in Greek military colors on 3 April 2023.

The first M-346 destined for the Hellenic Air Force (HAF) made its maiden flight on 20 January 2023, from Leonardo factory airfield Venegono. Allocated Italian military test registration CSX55277, it is seen here just before touchdown on Venegono's Runway 35 after its first ever flight, still in primer.

COBRA WARRIOR 2023

TEXT: VIKRAMJIT SINGH CHOPRA & JORIS VAN BOVEN & ALEX VAN NOIJE
PHOTOS: ALEX VAN NOIJE & VIKRAMJIT SINGH CHOPRA

The exercise COBRA WARRIOR is conducted two times per year and is the largest aerial exercise in the United Kingdom. It is facilitated by the No. 92 Squadron of the Royal Air Force (RAF), which is based at RAF Waddington. The exercise is intended to train participants in tactical air warfare operations in large groups and at a high intensity. This edition of COBRA WARRIOR, also known as CW 2023-1, took place from 2 March until 24 March 2023. More than 70 aircraft and helicopters took part in the exercise and were guided by command personnel from RAF Waddington, Lincolnshire. During the exercise, a complex scenario would be flown by the participants of the exercise every other day. During the non-flying days, the units were able to deploy their own exercises locally to prepare for the COBRA WARRIOR missions. Experience shows that this option was used daily by all participants of the training.

Objectives

The COBRA WARRIOR exercise is the final piece of the Royal Air Force's tactical training. It is designed to qualify personnel in various roles in the RAF. During the exercise, the training of the Qualified Weapons Instructor, Qualified Multi-engined Tactics Instructor, Qualified Intelligence, Surveillance and Reconnaissance, and Qualified Space Instructor is completed. All these roles are dealt with in a tactical chess game and can train optimally in a unique environment. The goal of COBRA WARRIOR is to develop the tactical skills of the participating aircrews and support elements within a Composite Air Operation (COMAO) environment. The exercise provides valuable opportunities for all participating elements to practice and develop tactics, techniques, and procedures in complex scenarios against a realistic opponent. The military world is constantly changing. The world of 10 years ago is no longer the world of today. With the use of the expertise of No. 92 Squadron, the exercise is continuously being further

Indian Air Force Mirage 2000I assigned to No. 7 Squadron.

Royal Air Force Typhoon FGR4 assigned to XI(F) Squadron still wearing No. 29 Squadron markings.

developed and adapted to the geopolitical and military balance that is current in the world at that time. The lessons of this edition of the exercise, together with editions from the past, are the input for the edition that will take place later this year. Group Captain Jim Calvert, the Exercise Director of the exercise COBRA WARRIOR: "What COBRA WARRIOR provides us is what we call collective training. What nations and squadrons will do is they will train their crews to be tactical experts on their individual platforms. What an exercise such as COBRA WARRIOR does is, it brings all of those platforms together, both UK and partner-nations. It just allows us to train and integrate together, so that we can prove, and we can test, and adjust, and enhance our interoperability." For the Royal Air Force, another important aspect of the exercise is that it provides the opportunity to complete training within the Mission Employment Phase for future RAF weapons instructors. The level of training combined with the variety of training partners helps to achieve the required standards within the Weapons School criteria.

No. 92 Tactics and Training Squadron

The No. 92 Squadron, also known as No. 92 (East India) Squadron, and currently as the No. 92 Tactics and Training Squadron of the Royal Air Force, is a test and evaluation squadron based at RAF Waddington, Lincolnshire. The unit was formed as part of the Royal Flying Corps at London Colney as a fighter squadron on 1 September 1917. The squadron deployed to France in July 1918 and saw action for only four months, until the end of World War I. During the conflict, the unit flew both air superiority and direct ground support missions. After a long history with the RAF, the unit has evolved into the current No. 92 Tactics and Training Squadron. The unit is responsible for establishing modern tactics and providing training opportunities to the operational units so that the RAF can grow along with the current military situation in the world. As part of its duties at the Air Warfare Centre, No. 92 Squadron helped to set up and conduct the exercise COBRA WARRIOR in 2019. This exercise was then conducted for participating units of the RAF, Luftwaffe, Italian, and Israeli Air Force. Since then, COBRA WARRIOR has grown to its current format as it is being implemented by the unit this year. The commander of the current No. 92 Squadron is Squadron Leader John McFadden. He is the person within the squadron who coordinated this exercise in 2023. McFadden said: "We are looking forward to delivering Exercise COBRA WARRIOR 23-1. 92 Sqn have developed a challenging air-led multi-domain exercise focused on pitting our NATO, JEF, and international partners against a capable peer adversary within a contested degraded and operationally limited threat environment. Over three weeks, we will bring together our capabilities and deliver the full spectrum of Air Operations, including Defensive and Offensive Counter-Air as well as Strike Operations. These will include RAF Regiment Precision Strike Teams, Air Maneuver operations to support ground forces and also, developing our Joint Personnel Recovery Capability."

RAF Waddington

During COBRA WARRIOR, the majority of the Non-English or Non-American units were based at RAF Waddington near the city of Lincoln in the United Kingdom. One of the countries that used this airbase was Finland which sent a total of six McDonnell Douglas F/A-18C *Hornets* to the United Kingdom. The Finnish *Hornets* came from Rovaniemi AB in the north of the country. The aircraft are assigned to the HävLLv 11, which is part of the Lapin Lennosto Wing. The Finns' fighters were supported by some PC-12 light transport aircraft which took ground crew and support equipment to RAF Waddington. Finland was on the threshold of NATO membership when the exercise started. On Tuesday, 4 April 2023, the country officially joined NATO as the 31st member state in response to, among other things, the Russian threat as a result of the Ukraine war. Finland has been a loyal member of the Partnership for Peace (PfP) program for many years. The PfP countries are closely linked to NATO but not member states. PfP participants often train together with units from the NATO countries. Finland has also been a participant in the United Kingdom-led Joint Expeditionary Force (JEF) program for some time now. The JEF includes the countries Denmark, Finland, Estonia, Iceland, Latvia, Lithuania, Netherlands, Norway & Sweden. All countries, except for Sweden, are members of NATO. The JEF is intended to be a pool of troops on high readiness and adaptability designed to enhance the UK's ability to respond quickly anywhere in the world. This is done with like-minded allies or on behalf of international organizations such as the United Nations or NATO. The Finns usually flew twice a day on the non-COBRA WARRIOR days for their individual training.

The Belgian Air Force also participated in COBRA WARRIOR. The Belgians came from the 10 Wing of the Belgian airbase Kleine-Brogel in northern Belgium. In total, the Belgians participated in the exercise with six F-16AM *Fighting Falcon* fighter aircraft. They were logistically supported during the exercise by several

Four Royal Air Force Typhoon FGR4s on the taxiway towards the runway at RAF Coningsby.

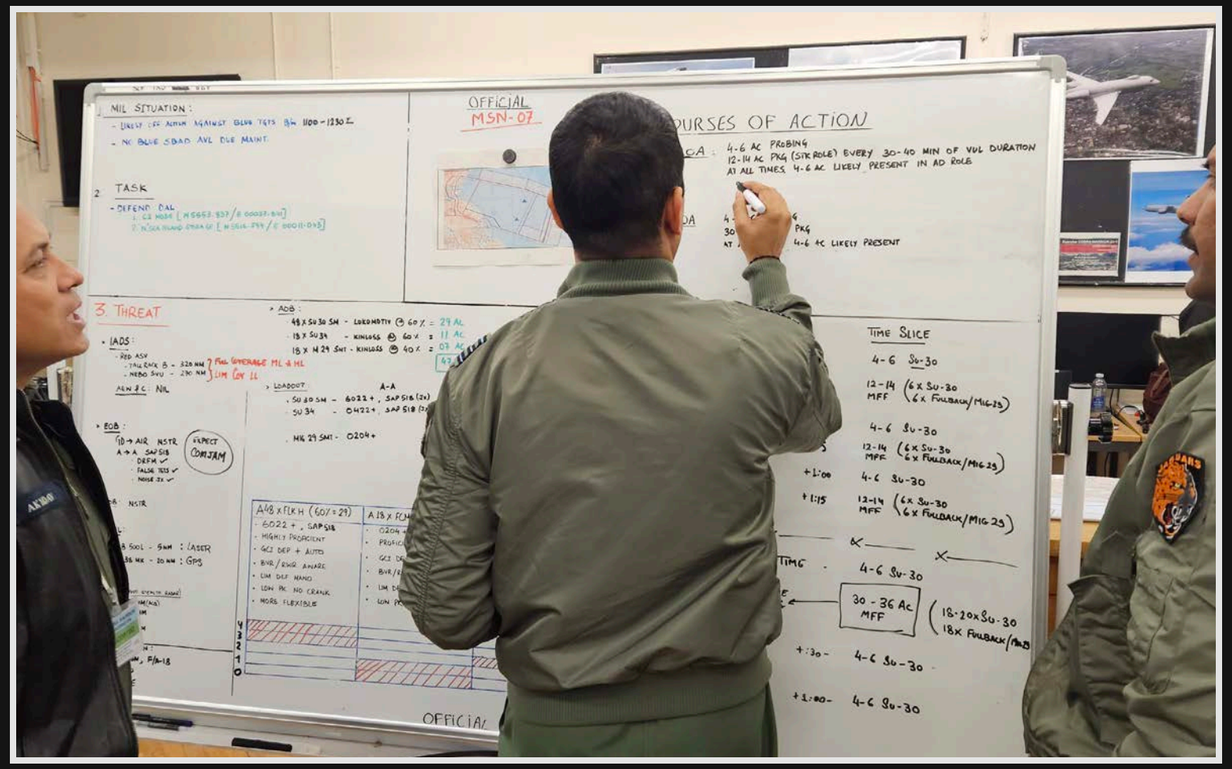
Airbus A400M transport aircraft from the 15 Wing, which is based at Brussels Melsbroek AB. What is special is the fact that the Belgians only participated in the first two weeks of the exercise. On Friday during the second week, the F-16s returned home. On the non-COBRA WARRIOR days, the Belgians also flew various individual training sessions from RAF Waddington. Several aircraft have also been sighted in the low-flying area in the Lake District in the north of England. The Belgians usually use this area more often to train low flying skills and are therefore qualified to fly here. "It is wonderful once again to welcome our fellow RAF and international colleagues to RAF Waddington to participate in this world-class air exercise", stated Group Captain Mark Lorriman-Hughes, the RAF Waddington Station Commander. "COBRA WARRIOR provides an invaluable opportunity for international Allies and Partners to train together in developing operational tactics in the air", he added.

Indian Air Force

One of the most remarkable participants in the exercise COBRA WARRIOR 2023-1 was the Air Force of India (IndAF). The IndAF had traveled to the British RAF Waddington airbase for COBRA WARRIOR with a total of more than 145 air force personnel. The delegation had gathered from all corners of India at Jamnagar Air Force Station. The main objective for the Indians was to learn to participate in exercises that allow training with multiple types of combat aircraft. Practicing combat scenarios with and against types such as the F-16 *Fighting Falcon*, F/A-18 *Hornet*, and the Eurofighter *Typhoon* is very special and also very educational for the Indian delegation. Flight Lieutenant Samarth Shukla of the Indian Air Force explained: "We have traveled halfway around the world, including stops in Saudi Arabia and Greece, to reach this place. Exercise COBRA WARRIOR is a great opportunity for us to learn and to fly with other nations. It has given us the opportunity to learn from other nations, share our experiences, and, all in all, improve ourselves. The aim of the exercise is to participate in diverse fighter aircraft engagements and learn from the best practices of various Air Forces When we get back, we will share our experiences and improve the Indian Air Force as a whole."

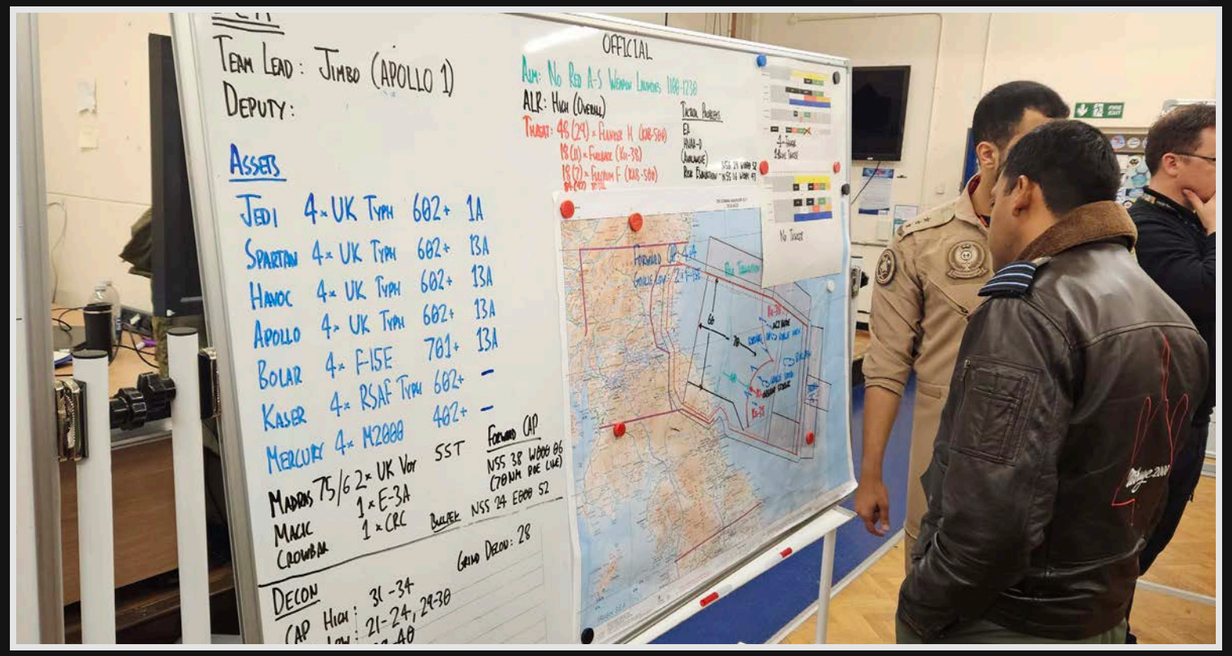
Group Captain Pranav Raj is the commander of the 7th Mirage squadron 'Battle Axes'. He is the Exercise Director of the Indian Air Force during this detachment. Pranav said: "The team has faced several challenges, including the weather, which is quite different from Gwalior in Central India. More than 80% of the team saw snow for the first time. Despite these challenges, the maintenance team has done a great job keeping all five aircraft available for missions. The exercise was a great learning experience as the Indian Air Force has flown with F-18s and F-16s and participated in the full spectrum of air operations, including offensive and defensive counter missions." The participating delegation from India consisted of five Mirage 2000I & 2000TI fighters (respectively two Mirage 2000I and three Mirage 2000TI aircraft). The fact that Mirages from the IndAF come to this exercise can simply be called special. The IndAF has only a relatively small pool of these aircraft in its inventory. Most fighters in the Indian Air Force are MiG-21s and Su-30s. The Indian Air Force has only one wing that operates with the Dassault Mirage 2000. This unit is the 40 Wing based at Gwalior/Maharajpur Air Force Station which is part of the Central Air Command. The 40 Wing was formally established on 28 November 1982. After its establishment, the wing was immediately equipped with the Mirage 2000. The 40 Wing is the only wing in India to fly the Dassault Mirage 2000. The first Mirages were delivered to this wing from the

Finnish Air Force F/A-18C *Hornet*s assigned to the HävLLv 11



end of 1985. The Mirages during COBRA WARRIOR came from two squadrons, namely 1 Squadron 'The Tigers' and 7 Squadron 'Battle Axes'. The aircraft were escorted by an Ilyushin IL-78 *Midas* tanker during the long flight from India to Europe. The IL-78 came from Agra Air Force Station of the Central Air Command and is assigned to the 78 Squadron of the 4th Wing. This unit is also known as 'Valorous Mars' in India. Two Boeing C-17A *Globemaster III* strategic transport aircraft were used for the transport. These aircraft both came from Hindon Air Force Station of the Western Air Command. These aircraft are operated by 81 Squadron 'Skylords', which is part of the 28 Wing.

The fact that the Indian Air Force's Dassault Mirage 2000 were coming to Europe is very unique, given that the aircraft are already getting old and the IndAF only has 56 airframes in use. The Dassault Mirage 2000 is referred to in India as the Mirage 2000 'Vajra', freely translated from Hindi this means 'Lightning'. The Indian Air Force has received a total of 48 single-seat Mirage 2000H and eight two-seat Mirage 2000TH aircraft. The big difference with the version in service with the French Air Force is the fact that the Indian Mirages are able to carry the Russian R-73AE *Archer* missile under the wings. As is known, the Indian Air Force also has many Russian types in service, which made the upgrade to carry this missile a logical choice for the Indians. The Mirages can carry the R-73AE since the 2007 upgrade. From 2015, the IndAF's Mirages were upgraded to the Mirage 2000-5 MK2 standard. Following the upgrade to the Mirage 2000-5 standard, the IndAF's Mirages will be referred to as the Mirage 2000I & Mirage 2000TI. This version of the aircraft is an Indian-specific version for the Indian Air Force, the aircraft is similar to the Mirage 2000-5 Mk2 which is equipped with a mix of Indian, French, and Israeli avionics and weapons packages. The contract was signed in 2011 and the first upgraded aircraft was delivered in 2015. Dassault-Aviation updated the first few Mirage 2000H and 2000TH aircraft to 2000I and 2000TI standard. The later updates were carried out by Hindustan Aeronautics Limited. It is the intention that the Mirages of the IndAF standard will last at least until the year 2030. From that moment on, the intention is that the aircraft will be replaced by a new type to be purchased. Which type is for now still an unanswered question.



RAF Coningsby, Lakenheath, Brize-Norton, Leeming

In addition to RAF Waddington, many participants of the exercise were based at RAF Coningsby in Lincolnshire. The Royal Air Force participated from this airbase with a large number of *Typhoons* from the local units on this air base. The Royal Saudi Air Force was one of the foreign participants in the COBRA WARRIOR exercise. The Saudi Arabian Air Force participated with a total of six EF2000 *Typhoon* aircraft. The planes all came from Taif/King Fahd Air Base where the aircraft are part of the Royal Saudi Air Force (RSAF) 2nd Wing. This unit has three squadrons flying the *Typhoon* on active duty at this air base. These squadrons are No. 3 Squadron, No. 10 Squadron, and No. 80 Squadron. During COBRA WARRIOR, all three of these units were present at RAF Coningsby to train with the International Alliance. All three squadrons were present in the United Kingdom with two aircraft and were all equipped with the squadron markings of the relevant units. It is quite special to see these planes in Western Europe because these aircraft don't come this way very often. The RSAF aircraft were supported by transport aircraft of the type Lockheed C-130 *Hercules*. The *Typhoons* were escorted to the United Kingdom by two Airbus A330 MRTT aircraft which also carried the associated ground crew on board. These aircraft were also refuel the Typhoons in the air during the flight to the west. From the American airbase RAF Lakenheath, F-15E *Strike Eagle* fighter aircraft participated in the exercise. These aircraft are assigned to the 48th Fighter Wing of the United States Air Force Europe. The specific unit that took part in COBRA WARRIOR was the 492nd Fighter Squadron 'Bolars/Madhatters'. The entire exercise was supported by several Voyager tankers operating from RAF Brize-Norton in the south of England. In addition, the British Joint Helicopter Command was temporarily stationed at RAF Leeming from where it took part in the exercise. The RAF's Air Mobility Force also took part in the exercise where elements of the 16 Air Assault Brigade were deployed on an associated ground mission which formed part of the overall exercise scenario. The helicopters were deployed and were in the meantime supported by the combat aircraft in the same area.

Indian Air Force Mirage 2000TI **(above left)** and Mirage 2000I **(above right)** assigned to No. 7 Squadron.

Indian Air Force Mirage 2000TI **(above left & right)** and Mirage 2000I **(above middle)** assigned to No. 7 Squadron.

Royal Saudi Air Force Typhoon T3 assigned to No. 10 Squadron.

Royal Saudi Air Force *Typhoon* F2 assigned to No. 80 Squadron **(above)** and *Typhoon* T3 **(below)** assigned to No. 10 Squadron.

Royal Saudi Air Force *Typhoon* F2 assigned to No. 80 Squadron.

Royal Air Force RC-135W *Rivet Joint* assigned to No. 51 Squadron.

LIGHTNINGS OVER DENMARK

REPORT BY RALF JAHNKE

From 6 to 16 March, five U.S. F-35A *Lightning II*s practiced over Denmark along with the Royal Danish Air Force's Escadrille 727. The *Lightning II*s were from the U.S. Air Force Europe's 495th FS *The Valkyries* of the 48th FW, based at RAF Lakenheath. Two missions were flown daily together with up to four F-35s *Lightning II*s and ten F-16 *Fighting Falcon*s from the Esk 727.

The visit was part of the preparations for the arrival of the first six Danish F-35 *Lightning II*s in Denmark at the end of October this year. Cooperation with Denmark's closest NATO ally has been routine for Fighter Wing Skrydstrup for more than two decades!

The visit by U.S. fighter jets and associated personnel was an important part of the Royal Danish Air Force's (RDAF) preparation for the introduction of its own aircraft to Denmark this year. All areas of the squadron, from aircraft mechanics and weapons maintainers to transport personnel and firefighters, participated in the international training program at Skrydstrup AB. Valuable experience was gained during joint operations in the air and on the ground.

The deployment of combat aircraft is always teamwork. Therefore, the joint operation had to be coordinated across all professional groups, all forces of the air base were involved so that this joint exercise could be a success.

The Americans' visit was the final milestone in preparations for the arrival – also called "First Aircraft Arrival" – of the first six Danish stealth fighters of the latest generation on 27 October 2023. The 27th of October was deliberately chosen as the designation Eskadrille 727 ends with the digits "27""

Denmark has purchased a total of 27 *Lightning* II fighter jets from U.S. defense contractor Lockheed Martin to succeed its F-16 *Fighting Falcon* multi-role jet fleet. It is the largest purchase of the Danish defense budget in the country's history. However, it remains to be seen whether the relatively small number of the new type will be sufficient in the long term for the daily training flights required in the U.S. as well as training and QRA missions in Denmark. At least four aircraft are still kept on constant alert.

The F-35 is much more technologically advanced than the F-16 *Fighting Falcon* and has highly sophisticated sensor, radar, and communications systems. The F-35 also has an innovative computer control system that provides real-time information to the pilot. The F-35 is much more expensive than the F-16, with the unit price of a *Lightning II* at around USD 100 million, while an F-16 was "only" around USD 30 million at the time.

The new *Lightning II*s will replace the Royal Danish Air Force's current F-16AM/BM fleet of 43 aircraft. Originally, the F-16s were to be retired promptly with the acquisition of the first F-35s, but due to the Russian invasion of Ukraine, the Ministry of Defense announced last summer that it would extend the service of the F-16s until 2027.

This will cost the taxpayer an additional DKK 1.1 billion (EUR 148 Mio) over the years. Currently, the Danish F-16s are also receiving the "Have Glass V" paint scheme of the F-35A. Nine aircraft have already been repainted.

The RDAF added two F-35A *Lightning II*s to its fleet last summer. The two new fighters, designated L-005 and L-006, arrived from Lockheed Martin's Fort Worth facility in the U.S. state of Texas and were transferred to the 308th FS at Luke AFB in Arizona. The entire Danish F-35 fleet thus currently consists of six aircraft, all of which are stationed Luke AFB. This is where the training of the future pilots takes place. The technical personnel are trained directly at the manufacturer in Florida.

Flyby of a Royal Danish Air Force F-16AM *Fighting Falcon* assigned to FWS and two U.S. Air Force F-35A *Lightning II*s assigned to 495th FS *Valkyries* at RAF Lakenheath.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An RDAF F-16AM is waiting to be cleared to enter the runway after an F-16BM taking off **(main image)**. Another RDAF F-16BM **(left inset)** and F-16AM **(right inset)** of Fighter Wing Skrydstrup (FWS) – painted with the new Have Glass V color scheme – are taxiing to the runway.

U.S. Air Force F-35A *Lightning II*s assigned to 495th FS *Valkyries* at RAF Lakenheath.

RDAF F-16s with different weapon loads

Image right: F-16AM loaded two AIM-9 *Sidewinder* missiles under the wing, a red painted, *Sidewinder*-shaped AMD (Acceleration Monitoring Device) at the wing tip, and a center-line mounted fuel tank.

Image below left: F-16AM carrying two AMDs, two AIM-9 *Sidewinder*s, a LITENING pod, and two fuel tanks.

Image below right: F-16AM carrying two AIM-120 AMRAAM missiles at the wing tips, two AIM-9 *Sidewinder*s, a LITENING pod, and two fuel tanks.

U.S. Air Force F-35A *Lightning II*s assigned to 495th FS *Valkyries* at RAF Lakenheath.


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Royal Danish Air Force F-16 *Fighting Falcon*s of Fighter Wing Skrydstrup

F-16BM 'ET022' and F-16AM 'E-005' with the new Have Glass V paint scheme, whereas F-16AM 'E-074' still has the old paint scheme.

RAPID PACIFIC 2022

TEXT: RALF PETER WALTER
PHOTOS: BUNDESWEHR - CHRISTIAN TIMMIG UNLESS STATED

German Air Force *Eurofighter* 31+11 'Air Ambassador' assigned to TaktLwG 74 (Tactical Air Wing 74) in a low-level flight over northern Australia during Exercise Rapid Pacific 2022.

On 15 August 2022, the Luftwaffe (German Air Force) took off on its first major deployment to the Indo-Pacific region. The deployment comprised six Eurofighters – all the latest Tranche 2 standard, capable of operating in both air-to-air and air-to-ground roles – from Taktisches Luftwaffengeschwader 74 (TaktLwG 74) at Neuburg AB, four A400Ms from Lufttransportgeschwader 62 at Wunstorf AB, three A330 MRTT tankers from the Multinational Multirole Tanker Transport Unit (MMU) at Eindhoven Air Base in the Netherlands, and some 250 personnel. The Eurofighters, accompanied by the three A330 MRTTs, were tasked to arrive in Singapore in less than 24 hours. Seven hours after departing Neuburg AB, the Eurofighters made a stopover in Abu Dhabi to exchange crews en route to Singapore. While the EF2000s were from the TaktLwG 74, the pilots were from across the Luftwaffe. The fighters landed on the runway at Paya Lebar AB in Singapore less than 20 hours and 22 minutes after taking off from Neuburg AB. The Eurofighter '31+11' – named 'Air Ambassador', carrying a special paint scheme – had to stay behind in Abu Dhabi to fix a problem with its hydraulic system. The aircraft joined the others a few days later. On 18 August, the five Eurofighters and the tankers left Singapore to Darwin Air Force Base in northern Australia to participate in two international exercises – Pitch Black 2022 and Kakadu 2022 – to test their interoperability with allies inside and outside NATO throughout the Indo-Pacific region.

At the end of September, after completing their mission in Australia, the Eurofighters flew back to Singapore along with their A330MRTT and A400M support aircraft. From there, in an eight hours flight, three Eurofighters, an A330 MRTT, and an A400M made their first visit to Japan. Led by the 'Air Ambassador', the German fighters were welcomed in the air in front of Mount Fujiyama by two F-2s of the Japan Air Self-Defense Forces (JASDF). The Inspector General of the German Air Force, Lieutenant General Ingo Gerhartz, personally piloted the 'Air Ambassador'. The Eurofighters stayed at JASDF Hyakuri Air Base from 28 to 30 September to conduct joint exercises with JASDF fighter jets. At the same time, an A400M flew to South Korea and three other Eurofighters trained in air operations with the Republic of Singapore Air Force.

After some 40,000 km, 700 flight hours, and more than 500 air refuelings, all six Eurofighters landed safely in Neuburg AB, Germany, on 8 October 2022, successfully completing Operation Rapid Pacific 2022.

A Royal Netherlands Air Force A330MRTT tanker, assigned to the Multinational Multi Role Tanker Transport Unit (MMU) provides fuel for the Eurofighters on their filght from Neuburg AB via Abu Dhabi and Singpaore to Darwin in northern Australia.

Two of the tankers flew in formation with a horizontal separation of 0.5 miles and a vertical separation of 500 ft. The third A330 MRTT served as a backup in case one of the two tankers encountered technical problems and was unable to refuel any of the Eurofighters. It flew at a distance of about 5 miles and 4,000 ft above behind the two A330 MRTTs. At 2.5 tons of remaining fuel, the Eurofighters topped off their tanks with between four and five tons of kerosene. At a fuel transfer rate of around 550 kg/min, the Eurofighter is attached to the hose and drogue for about eight minutes. From Neuburg AB to Darwin AB the Eurofighters refueled 13 times: from Neuburg to Abu Dhabi four times, from Abu Dhabi to Singapore six times, and from Singapore to Darwin three times.

Photo by Bundeswehr – Francis Hildemann

Planned route from Neuburg AB, Germany to Darwin AB, Australia including air refueling 'stops'. **(c) Bundeswehr**

Exercise RAPID PACIFIC's key-objective is to prove the German Air Force's capability

- ◇ to deploy globally within 24 hours to a region of strategic importance such as the Indo-Pacfic region,
- ◇ of interoperability with allies inside and outside NATO,
- ◇ to cooperate with partners worldwide and simultaneously be active in the 'Enhanced Air Policing Baltics' in national and alliance defense.

The Eurofighter 31+11 in the special 'Air Ambassador' livery flies together with an Airbus A330MRTT of the Multinational Multirole Tanker Transport Unit (MMU) and another Eurofighter over the Australian landmarks, Uluru (Ayers Rock) and Kata Tjuta (The Olgas) during exercise Pitch Black 2022 as part of Rapid Pacific 2022.

Air Marshal Robert Chipman, Chief of the Royal Australian Air Force in an EA-18G *Growler*; Lieutenant General Ingo Gerhartz, Inspector General of the Air Force, with the Eurofighter 'Air Ambassador' from Tactical Air Wing 74; and U.S. Air Force General Kenneth S. Wilsbach, Commander Pacific Air Forces; Air Component Commander, U.S. Indo-Pacific Command; and Executive Director, Pacific Air Combat Operations Staff, Joint Base Pearl Harbor-Hickam, Hawaii in the F-22 *Raptor* flying together during the generals' flight during Exercise Pitch Black 2022 over Royal Australian Air Force Base Darwin, Australia on 7 September 2022.

A German Air Force Eurofighter and a Royal Australian Air Force A-18G *Growler* of No. 6 Squadron.

German Air Force Lt. Gen. Ingo Gerhartz, German Air ForceInspector General, flies the Eurofighter 31+11 in the special 'Air Ambassador' livery in formation with another Eurofighter 30+72 and two Japanese F-2 fighter jets to Japan past Mount Fuji during Exercise Rapid Pacific on 28 September 2022.

German Air Force Lt. Gen. Ingo Gerhartz in Eurofighter 31+11 'Air Ambassador' flies past Mount Fuji on 28 September 2022.

THE AIR AMBASSADOR

On the occasion of 'Rapid Pacific', TaktLwG 74's Eurofighter 31+11 was named **Air Ambassador** and received this special livery. The right wing shows the national flag of Japan and – at the trailing edge – of South Korea. The left wing shows the Australian national flag and – at the trailing edge – of Singapore. Painted on the vertical stabilizer's starboard side was the flight route from Germany to Australia including the short visits to Japan and South Korea. The port side again showed a large Australian national flag and small flags of Germany, Abu Dhabi (stopover for crew exchange), Singapore, Australia, Japan and South Korea.

Photo by Ralf Peter Walter

Photo by Ralf Peter Walter

20 YEARS OF AUSTRIAN AIR FORCE C-130s

TEXT: WOFLGANG JARISCH | **PHOTOS:** WOLFGANG JARISCH UNLESS STATED

On Friday, 24 March 2023, the Austrian Air Force celebrated a very special anniversary. Almost exactly 20 years ago, on 20 March 2003, the first of three Lockheed C-130K *Hercules* – registration 8T-CA, ex-Royal Air Force XV 181 – for the Austrian Air Force landed at Linz Hörsching. The three C-130Ks were purchased from the Royal Air Force and overhauled. In 2004, *Hercules* 8T-CB (ex-RAF XV 291) and 8T-CC (ex-RAF XV 292) were delivered. In this context, it should be mentioned that in December 2015 a fourth Hercules, with the registration 8X-CZ (Ex RAF XV 295) landed at Linz-Hörsching. However, this aircraft did not reinforce the fleet but has since served as a spare part donor.

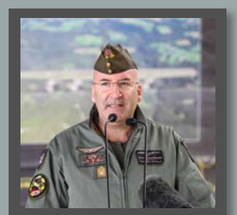
Since the introduction of the *Hercules*, a new era has begun for the Austrian Air Force. Whereas until then, transport capacity for international missions had to be requested from other air forces or purchased from civilian companies, the Austrian Air Force now had considerable transport capacity at its disposal with the *Hercules*. For 20 years, these workhorses have been tirelessly deployed on every continent except Australia. This special achievement had to be celebrated accordingly. And so, the "top brass" of the Austrian Armed Forces, above all Air Chief Brigadier Gerfried Promberger and the commander of the air support brigade, Brigadier Wolfgang Luttenberger, as well as top politicians, especially from Upper Austria, gathered at Vogler Air Base for this celebration.

The first test for the newly purchased *Hercules* was the tsunami in Sri Lanka. The area of operation was then expanded, and supply flights to Africa were the order of the day. During the mission in Chad, supplies and soldiers from the fighter command were flown into the area of operations three times a week. Missions to Mali and Lebanon were also the order of the day. Most recently, the *Hercules* provided valuable services in helping earthquake victims in Turkey. And a new operational area is already fixed: the Austrian Hercules will soon be seen at the airfield in Niamey, Niger.

Of particular note is the Medical Evacuation (MEDEVAC) module that was acquired. Since April 2010, this module has been able to transport two intensive care patients or nine non-intensive care patients in a vibration- and noise-protected environment. A maximum of five physicians and paramedics are on board to care for the patients.

Among other features, the module has its own power supply that can maintain the autonomous operation of the medical systems for at least seven hours. The system is unique in the world; several foreign air forces have already expressed interest in acquiring one. The price of the MEDEVAC module cost was EUR 1.2 million.

Since the introduction of the C-130 *Hercules* in Austria, approximately 17,000 flight hours have been accumulated without any accidents. This can be attributed to the high standard. In a message, Defense Minister Klaudia Tanner – she had to cancel her participation in the anniversary celebration due to illness – paid a special tribute to the exceptional performance of the *Hercules* crews: "We can rely on them in any situation, and, thanks to our own air transport system, we are independently able to bring Austrian citizens or soldiers home safely from crisis areas. But the C-130 *Hercules* is also indispensable in supplying our foreign contingents."



Brigadier Gerfried Promberger
Commander Austrian AF

In his address, the commander of the Air Force, Brigadier Gerfried Promberger, emphasized above all the need for a dedicated and independent airlift capability. "The C-130 *Hercules* has proven its worth over the past 20 years and is still the umbilical cord for our soldiers in the foreign contingents: in the Balkans, Lebanon, Mali, and soon in Niger. Only with our own air transport capability are we independent and in a position to supply our soldiers abroad, but also to evacuate Austrians or EU citizens if the need arises", he says, referring to the Arab Spring, in which Austrians were flown out of Egypt, or the COVID-19 pandemic, in which numerous fellow citizens were brought home safely from abroad.

In his speech, Provincial Councilor Wolfgang Hattmannsdorfer emphasized: "Especially in times when a war is raging just a few hours away by plane, the Austrian Armed Forces are needed as a central pillar of our security architecture. We are clearly committed to the Hörsching helicopter base and the air forces of the Austrian Armed Forces. In the future, decisive investments in military equipment, especially in the high-tech sector, will also be made in Hörsching. The helicopter site is therefore also of enormous importance for Upper Austria as a business location and has our full support."

However, the *Hercules* has an expiration date due to its enormous range of uses and its age. Hence, an intensive search is already underway for a successor. The Lockheed Martin C-130J *Super Hercules* or the Embraer C-390 *Millennium* are still considered favorites. We are curious to learn which type of aircraft we will see in Linz-Hörsching in the future.

The Aviation Magazine thanks the Austrian Armed Forces for the invitation to the anniversary celebration.

Flying display of *Hercules* '8T-CA' at the anniversary celebration at Hörsching AB in March 2023.

Hercules '8T-CA' in March 2023 at Hörsching AB.

Hercules '8T-CA' in 2009 at Hörsching AB and at the 2009 AIRPOWER airshow **(main image & right inset)** and in November 2017 at Hörsching AB **(left inset).**

Hercules '8T-CB' parked on the ramp at Hörsching AB in December 2021.

The loadmaster of *Hercules* '8T-CB' performs last checks before the aircraft leaves the ramp towards the runway for take-off at Hörsching AB in April 2009. The aircraft is configured with a boom for mid-air refueling.

Hercules '8T-CC' in 2010 at Hörsching AB **(main image)** and in 2012 at Aigen AB **(insets).**

This K-130 *Hercules*, photographed in December 2015 at Linz-Hörsching, was acquired from the Royal Air Force and serveres exclusively as spare part donor for the Austrian Air Force's three active K-130s.

These pages and following pages show C-130K *Hercules* '8T-CB' with the old paint scheme during a photo shoot over the Austrian Alps. **Photos Bundesheer / Austrian Air Force**


8T CB


8T CB

HUNGARIAN GRIPENS ON PATROL OVER THE BALTIC STATES

REPORT BY ISTVÁN KELECSÉNYI

***Gripens* patrol over the Baltic States**

From 1 August to 30 November 2022, Hungarian *Gripen* fighter aircraft carried out air policing missions in the Baltics from Lithuania's Šiauliai airbase for four months.

Hungary's first Baltic Air Policing (BAP) deployment consisted of four JAS-39 *Gripen* fighter aircraft from 1 September 2015 to 6 January 2016 at Šiauliai AB in Lithuania. The second time, from 2 May to 3 September 2019, the Hungarian Air Force led the 50th rotation of NATO's Baltic Air Policing at Siauliai AB. With the Ukrainian crisis and the annexation of Crimea to Russia, NATO increased the number of aircraft on standby and added air-to-air missiles to their armament.

End of July 2022, the Hungarian contingent, officially named MH Baltic Armed Air Defence Standby Unit (MH BAP FLKA), deployed again to Šiauliai AB. During the deployment, the technical and command staff flew to Lithuania in A319-112 troop transport aircraft. The JAS-39C *Gripens* assigned to the BAP carried the missiles when relocating to Lithuania but in a "non-combat" configuration. This means that the missiles are armed, but the flaperon "guidance planes" are not fitted, so they would become uncontrollable after launch. This method to transport the missiles was significantly cheaper to transport air-to-air missiles than flying them to Lithuania in a separate transport plane. The commander of the contingent was Lieutenant Colonel Attila Ványik.

The Hungarians, as the Lead Nation, took part in the mission with four JAS-39C *Gripen* fighter jets. The Czech Air Force had extended the duration of its participation in the BAP by two months, remaining at the Šiauliai AB. So, the Lithuanian air policing tasks were carried out by a mixed Hungarian-Czech *Gripen* fleet. From 1 October 2022, the Czech Air Force was replaced by the Polish Air Force with F-16C fighter aircraft.

Near Šiauliai, at Estonia's Ämari AB, the German Air

Hungarian Air Force JAS39C *Gripen* armed with two AIM-9L1-I *Sidewinder* short range air-to-air missiles on the wingtips, two AIM-120C5 Advanced Medium Air-to-Air Missiles with 'Beyond Visual Range' capability (AMRAAM BVR) on the outer wing pylons, and a center-line mounted fuel pod.

Baltic Air Policing is part of the NATO Quick Reaction Alert (QRA) and NATO Integrated Air Defence System (NATINADS). The air policing tasks of Estonia, Lithuania and Latvia are carried out by members of the NATO Readiness Force on a voluntary offer basis, as the Baltic member states do not have combat aircraft flying above the speed of sound. The purpose of the operation is to provide civil air traffic control under the Chicago Convention and to monitor and control infringing aircraft from Russia and Belarus.

Force was with four Eurofighters, and in Malbork, Poland, the Aeronautica Militare (Italian Air Force) with F-2000A Eurofighter fighter aircraft present.

On 21 September 2022, the author had the opportunity to visit the forces deployed in the Baltic region with several representatives of the Hungarian and international media. For the "media flight", an early morning appearance at Kecskemét Air Base was mandatory and after six o'clock, the Airbus A319-112 troop transport aircraft with registration number 604 departed for Lithuania. Air Force observer Major General Nándor Kilián and Kecskemét base commander Brigadier General Csaba Ugrik accompanied the team. Zoltán Kaszab, the commanding flag officer of the Hungarian Armed Forces, and Tamás Bezsenyi, the commanding flag officer of the Air Base also were on board, together with several members of the military communications organization.

In the last 15 minutes of the uneventful flight, the Airbus troop transport aircraft was intercepted by the JAS-39C aircraft pair 33 and 39.

The *Gripen* is armed with two AIM-9L1-I *Sidewinder* close-in missiles on the wingtip and two AIM-120C5 AMRAAM BVR missiles on the outer wing pylons. The inner pylon was empty, where typically 1,275 liter Swiss RUAG composite fuel tanks are mounted, instead of or in addition to a center-line fuel pod. Fully armed AIM-120C5s can(not) be carried on the inner pylons, but NATO aircraft are on air policing missions, not war. A Rafael LITENING IIIE targeting and reconnaissance pod is always part of the *Gripen* fleet to facilitate visual identification in the air. The Hungarian *Gripen* escorted the troop-carrying aircraft to the airport and then broke away.

Since the visit to the base three years ago in 2019, the author could see that more construction work was underway. A large hangar was under construction, which could provide a covered "parking space" for either early warning or aerial refueling aircraft. Several decommissioned Airbus A340s and some other aircraft have also been preserved, waiting with diminishing hope for their fortunes to change for the better.

JAS39C *Gripen* parked in front of a shelter at Šiauliai AB.

After landing, the media was briefed on the activities of the Hungarian contingent in an old Russian shelter.

Since taking over the Quick Reaction Alert (QRA) on 1 September until 20 September, there have been a total of six ALPHA scrambles to intercept Russian military aircraft. The Russians had NOT entered NATO airspace, including the airspace of the Baltic States. The interception took place over international waters. An ALPHA scramble is triggered when the Russians either failed to file flight plans, failed to switch on their identification transponder or communicate with the air traffic controllers in the area. The intercepted Russian military aircraft were not only combat aircraft but also transport and reconnaissance aircraft. Russian air activity at that time was much lower than it was seen three years ago.

In addition to air power, the number of military units in the Kaliningrad enclave has also been significantly

This JAS29C *Gripen* just left the hangar towards the runway (top Image). The ground crew performs last pre-flight checks of the *Gripen* and the LITENING II pod (left inset) and the AIM-9L1-I *Sidewinder* **(right image).**

reduced. The Russian contingent, which numbered more than 30,000 before the war against Ukraine, has been reduced to a few thousand, with many of the soldiers being relocated to the war zone. The air defense and airborne units remained, but very few of the latter flew combat aircraft During the briefing, some images of intercepted Russian aircraft were presented, such as an AN-72 type 41 side-numbered transport aircraft flying into Kaliningrad. Another intercepted red Su-35S with side number 23 was presumably part of the Pokriskin Guards Fighter Regiment, also based in Kaliningrad. It was loaded with R-77-1 BVR and R-73/R-74 short-range air-to-air missiles.

After the appearance of Hungarian JAS-39C *Gripen* fighter jets in the airspace, the Russian aircraft that had been photographing the CV-33 USS Kearsarge in the Baltic Sea departed. The US. Navy amphibious assault ship carries six AV-8B *Harrier* or F-35B *Lightning II* aircraft, 12 MV-22B *Osprey* tilt-rotor aircraft, four AH-1W/Z *Viper* battle helicopters, three to four UH-1Y *Venom* light utility, and four CH-53E *Super Stallion* heavy transport helicopters in various combinations.

With the reduction in air activity, however, a new threat was that Russian and Belarussian detection/tracking systems would intercept scrambled NATO aircraft almost as soon as they took to the air. These systems include reconnaissance and fire control radars, the latter being the ones that target anti-aircraft missiles (SAMs). Whether they are also switched on and what kind of radars are switched on is a matter for EW (Electronic Warfare), which was not disclosed because of its confidential nature. However, the fact is that the detection of "enemy" radars is positive from the point of view that their data and characteristics are stored/classified by the advanced systems of the *Gripens*, thus increasing the database of the aircraft. Data "vacuuming" is an almost constant task in the region, even in peacetime. The Russian and Belarusian S-300 and S-400 air defense systems in the Kaliningrad, Pskov, and Leningrad areas could, in a live situation, significantly hamper or halt air operations from the region.

In addition to the scrambles, the standby service carried out sixteen training flights, which included training air-to-air combat, air-to-ground training, and fly-by operations, the latter being a fly-by over the capital on Lithuania's national holiday. Hungarian

In addition to the ALPHA scrambles, the QRA was put ten times on Readyness State 5 (RS5), that is the aircraft are in the shelter, pilots strapped in and engines running so the QRA is airborne within five minutes after the alarm goes off. 23 times they were on RS10, meaning pilots are in the cockpit with the aircraft's APU running in order to be in the air ten minutes after being scrambled.There was also a SIERRA scramble: the jets did not take off but the QRA went through the procedures, taxied to the runway and then back to the shelters including post-landing operations. This SIERRA scramble was performed for NATO inspectors as part of the NATO CREVAL – Combat Readiness Evaluation – that ensures that a unit is able to fully cooperate in conducting joint defense or attack operations.

aircraft participated in the Lithuanian exercise Furious Wolf as a close air support unit. On 26-27 September, they were also scheduled to fly in the Ramstein Alloy 2022 exercise with Czech, German, Italian, Spanish, and Polish aircraft, in interception, identification, beyond visual range (BVR) air combat and search and rescue missions.

After the briefing, the media was able to watch a TANGO (practice) scramble alert in the presence of the Lithuanian commander and Lieutenant General Romulusz Ruszin-Szendi, Commander of the Hungarian Defense Forces. The practice alert went well, unlike at the media day three years ago, when due to the high intensity of Russian aircraft activity, we saw three Alpha alerts with Hungarian aircraft pairs and Spanish aircraft taking to the air. After the alert, a short visit was paid to the Czech contingent, which came from the 211th Fighter Squadron, and with their five *Gripen* fighters participated in about 40-50 alerts during their service.

The Czech aircraft carried the AIM-9M dogfight missiles instead of the Hungarian Sidewinder AIM-9L-I, and their BVR missiles were also AIM-120C5 AMRAAM. The Czech aircraft flew with two 1,275 liter wing tanks, while the Hungarian aircraft flew with only one 530 liter center-line tank. The Hungarian aircraft were therefore more maneuverable but had a shorter range of engagement. The Czechs also carried the target designation and reconnaissance pod LITENING IIIE. Wing fuel pods were available to Hungarian aircraft, these could be quickly fitted to the inner wing pylons.

There were also U.S. RC-12N/Q or X variant *Guardrail* reconnaissance aircraft present. This aircraft, a modified version of the Beechcraft King Air, comes in several variants, differing in internal instrumentation, antennas, and electronics. The aircraft is not in service with the U.S. Air Force but with the U.S. Army, primarily for SIGINT reconnaissance missions. Two such aircraft have been deployed to Lithuania.

The visit ended at 1:15 p.m. Hungarian time when the Airbus took off for the 1.5 hours flight back to Kecskemét AB.

The author and The Aviation Magazine thank the Defence Forces for making this report possible.

During its four months of Baltic Air Policing in Lithuania, the Hungarian Air Force had 19 ALPHA scrambles - all of them caused by unidentified Russian aircraft. The four Gripens accumulated 304 flight hours in 246 sorties.

▲ Infra-red homing short-range air-to-air misssile AIM-9L-1 *Sidewinder*.
▼ Active radar-guided missile AIM-120C5 AMRAAM-120 (Advanced Medium-Range, Air-to-Air Missile).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HUNAF

103° GRUPPO – 80TH ANNIVERSARY

TEXT: MARCO PAPA AND ALESSANDRO STOICO
PHOTOS: MARCO PAPA AND ALESSANDRO STOICO UNLESS STATED

The AMX MM7163/51-72 received this special paint scheme to celebrate the 80th anniversary of 103° Gruppo.

Istrana, 15 February 2023

On 22 September 2016, the roll call of the "Indians" of the 103rd Squadron was held, honoring a glorious and unique group in the history of the Italian Air Force. For 74 years, the "Indians of the 103rd" filled Italian Air Force (AMI) with pride wherever they were deployed in the world. The 103rd Fighter Bomber Squadron was established on 15 February, in Lonate Pozzolo (Varese) and was equipped with German-made Ju-87 *Stuka* dive bombers. The squadron was sent to various national fronts during the war, in particular to the two largest islands, Sicily and Sardinia, to fight enemy ships with their "divers," the nickname given to the *Stukas* in Italian units.

However, the squadron was disbanded a few weeks after the armistice of 8 September 1943, only to be revived on 15 June 1952 as the 103rd Fighter Bomber Squadron and equipped with the legendary but already outdated F-47D *Thunderbolt*. Shortly thereafter, the transition to F-84G *Thunderjet* took place, and the squadron was redeployed to Villafranca Airport in 1953. A few years later, another change took place, this time to F-84F *Thunderstreak*, and the squadron was transferred to Rimini. These were years of profound changes and a rebirth of the Italian economy and industry, and it was during this period that the glorious FIAT G-91 was born, a milestone in the Italian aviation industry.

Starting in August 1958, the prototypes were assigned to the 103rd Squadron (then part of the 5th Air Brigade), which tested their characteristics during operational missions. In 1959, the squadron was transferred to Treviso Sant'Angelo, where a historical bond with the city and the Marca Trevigiana was formed, which led to the "Indians" flying over the city's skies for 30 years with their G-91R aircraft with a yellow stripe on the tail.

The squadron was initially assigned to the 5th Air Brigade in Rimini, then in September 1962, reassigned to the 51st Air Brigade at Istrana AB. It remained with the latter for only two years until 1964, when the 2nd Wing was reconstituted, at Treviso Airport, and the 103rd Squadron was merged into it. These were years of intense evaluation, such as the use of G-91 aircraft on grass runways, which was to become the entry ticket of the Italian aircraft and the Italian industry in various NATO tenders, from which they emerged as the undisputed winners.

Years passed and in 1989, the "old" G-91R was retired from service to make way for the new national product, the AMX *Ghibli*. The "Indians of the 103rd" were transferred to the nearby Istrana AB, home of the 51st Wing *Ferruccio Serafini*. A truly intense decade for the 103rd began, with Operational Capability achieved in 1991, and the participation in NATO operations in the former Yugoslavia (1995 and 1999). During this period, the Squadron also participated in major international exercises, such as those in the United Arab Emirates and Norway, and in Maple Flag in Canada in 1998.

In 2003, the 103rd, together with other AMX groups, participated for the first time in one of the most important and prestigious American exercises, Red Flag, held at Nellis AFB in Nevada.

In March 2011, civil war broke out in Libya and the United Nations authorized the military intervention "to protect civilians and civilian populated areas under threat of attack" from violence between government forces and opponents. NATO led the intervention, including establishing a no-fly zone and launching aerial attacks on government forces. For this reason, the AMXs of the 103rd Group were deployed to Trapani, home of the 37th Wing, to conduct mission in the southern Mediterranean.

The war on terrorism and the events related to the Arab Spring forced the NATO member nations to continuous deployments in the Middle East. The most famous Italian deployments were the "Black Cats," where the AMX and the 103rd participated in several allied operations over the years, both from the base of Herat in Afghanistan and Al-Jaber in Kuwait.

On 16 September 2016, the 103rd Squadron was disbanded as part of a general restructuring of AMX units. But the "Indians" have not vanished from the hearts of the men and women who wore their colors. On 15 February of this year, the 80th anniversary of the establishment of the 103rd was celebrated. An official ceremony was held at Istrana AB. It was attended, among others, by the Deputy Chief of Staff of the Italian Air Force, Gen.SA Aurelio Colagrande (an ex-Indian since the beginning of his career as a pilot). On this occasion, an AMX returned to wear the typical yellow color, that has always distinguished the Squadron, in the form of a special livery created by the men of the 51st Wing and the 3rd RMAA of Treviso, under the direction and participation of Silvano Mainini, a true specialist in the creation of specially painted aircraft. To make this event even more important and historic, there was also the fly-by of various assets, both local, such as the Eurofighter *Typhoons* of the 132nd Group, and from other bases, such as a pair of Tornados from the 155th Group in Ghedi, and two F-35As from the 13th Group in Amendola.

Certainly, a truly unique and unrepeatable day in the history of the legendary "Indians of the 103rd."

Aircraft of 103° Gruppo

1 Junkers Ju 87. **Photo Asisbiz**
2 FIAT G-91R. **Photo UCOM Aeronautica Militare**
3 Front to back: T-33A *Shooting Star*, F-86K *Sabre*, F-104A/ASA *Starfighter*. **Photo UCOM Aeronautica Militare**

ISTRANA OPEN DAY

REPORT BY ISTVÁN KELECSÉNYI

Across Italy, the 100th anniversary of the creation of the Aeronautica Militare (AMI), the Italian Air Force, was celebrated on 28 March 2023. This does not equate to the history of Italian military aviation, as the Servizio Aeronautico was organized by military order in 1884, and consisted of balloon squadrons, as the airplane had not yet been invented. It was in the Italo-Turkish war of 1911-12 that the Taliyan soldiers first used 'bombing' balloons against Turkish targets. During the First World War, the Austro-Hungarian Air Force were the Italians' main opponent. Heroes such as Francesco Baracca with 34 air victories were born and died over the Italian front, and on the Austro-Hungarian side, Godwin Brumowski with 34, Julius Arigi with 32, and József Kiss 19 with air victories master pilots/aces.

In 1923, he name of the Italian flying and airship units was changed by King Victor Emmanuel III to Regia Aeronautica or Royal Air Force. Under this name, they fought in Ethiopia, the Spanish Civil War and the Second World War. After World War II, the reorganized air force was renamed Aeronautica Militare.

The main venue for the celebrations was in Rome, where a solemn ceremony was attended by dignitaries of the state. Some 60 planes and helicopters flew in the airspace of the Italian capital.

The festivities covered almost all bases and objects. At Ghedi AB, where, in addition to the static program, flights of A-200 Tornado and F-35A aircraft were announced. A registration page was also set up for the open day, but in the end, only an afternoon static display was allowed. After the news, and on the advice of an Italian friend, we therefore went to the Istrana airbase, where the 51st Ferruccio Serafini Stormo (Flying Wing) is based, with AMX International A-11B *Ghibli* and Eurofighter AF2000 *Typhoon* aircraft.

Ferrucio Serafini is not a World War I pilot. He was born in 1920 and rather than being drafted into the Navy, he voluntarily enrolled at the Royal Air Force Flying School where he was commissioned as a pilot on 22 November 1939. On that day, however, there was a family tragedy when one of his brothers, Andrea, crashed an SM S.79 *Spaviero* bomber during a training flight. Ferrucio was already a Fiat C.R.32 biplane pilot in 1941 and was part of the 51° Stormo, 155° Gruppo in the air battles over Malta. Soon afterward, he flew missions in Macchi C.202 fighter aircraft. On 12 October 1942, he scored his first air victory as a member of a joint Italian-German fighter squadron. Two days later, he again shot down a British Supermarine Spitfire aircraft. After the air battles over Malta, the 51° Stormo provided air defense for the cities of Rome and Naples from 1943. Here, the unit was rearmed with the Aermacchi C.205 *Veltro*. With this type, Ferrucio Serafini also scored several individual and shared air victories. He flew his last mission on 22 July 1943 in his Macchi C.205 *Veltro* III variant aircraft. On that date, 21 Italian fighter aircraft engaged about 48 P-40 Curtis Tomahawk fighters of the 325th Fighter Group. In this air battle, it collided with one of the American P-40s and after nine air strikes, his aircraft crashed. Ferrucio ejected from his aircraft, but the low altitude meant that his parachute could not save his life. For his bravery, Sergeant Serafini was awarded first the Posthumous Silver Medal and then, on 2 August 1946, the Gold Medal for Military Valour.

Flyby of an F-2000A *Eurofighter* in formation with two AMX ACOL. The aircraft are assigned to Gruppo Efficienza Aeromobili (51° GEA), which makes them available to 132° Gruppo.

The 51° Stormo's coat of arms, however, is not associated with Serafini. The drawing of the cat catching mice dates from 1939, when 351 Squadron, flying Fiat G-50s, captured three Savoia-Marchetti SM-79 bombers during an exercise in the defense of Rome. To commemorate this fact, and to annoy the pro-bomber airmen, pilot lieutenant Vincenzo "Bill" Sant Andrea had the former Red Wolf crest repainted to depict a black cat capturing three green mice. This did not please the Air Force General Staff, as the Duce's favoured unit was the "Green Mice" of the 12th Bombing Regiment, because among its sailors was Bruno, the third-born son of Mussolini. It was ordered that the green mice should be painted grey. The 51st reluctantly obeyed the order. The story of the 51st is the same as that of Ferruccio Serafini, who fought in Sicily after his death. After the armistice, they remained on the royal side and fought with Aermacchi C.205s and British Supermarine Spitfire Mk.V.Bs fighter aircraft as part of the Cobelligerent Air Force against their former allies. After the World War, the 51st was manned entirely with Anglo-USA Spitfire Mk.IX, North American P-51, and Republic Thunderbolt aircraft. In 1953, the 51st Aerobrigade was formed and the unit was based at Istrana AB. From that year on, the brigade was equipped with jet aircraft, Lockheed T-33A, Republic F-84G Thunderjet, F-84F Thunderstreak, and North American F-86K. For a short time, the Italian-built Fiat G.91R was also in service with the 51° Stormo.

From 1963, the unit was converted to the F-104G *Starfighter* fighter-bomber and in 1969, became the first Italian unit to fly the F-104S *Starfighter*.

In 1989, the Italian-Brazilian co-designed and manufactured AMX International light strike fighters were put into service at the 51° Stormo. With these, the unit participated in 'Deny Flight' over Yugoslavia, 'Allied Force' over Bosnia, and ISAF operations over Afghanistan. In Afghanistan, they were stationed at Khawaja Rawash airfield sharing the base with AB.212 helicopters under the name "Black Cat" Squadron. In 2011, they were deployed to Birgi AB in Trapani during operations in the Libyan Civil War as part of Operation Unified Protector.

In July 2014, they joined the 51st as part of the 101st OCU Training Unit. At that time, the Ferruccio Serafini Regiment was manned by the 103rd "Davide Velut", the 132nd "I quattro gatti" AMX and AMX-T squadrons, and the 101st OCU.

Despite modernization programs, the AMX light strike and reconnaissance aircraft are slowly being phased out of the system. As recently as 2012, the Tornado and AMX strike aircraft were to be replaced by the fifth-generation Lockheed-Martin F-35A aircraft assembled under license in Amendola, Italy. Due to the *Lightning II* cost and the changing political and military situation the number of aircraft ordered was reduced. Today, the A-200 Tornado fighter-bomber and ECR variants are still flying in Ghedi, and currently 19 of the A-11B (AMX) ACOL *Ghibli* variants and three of the TA-11B (AMX) ACOL Ghibli variants are flying at Istrana AB. Meanwhile, in 2017, two pairs of Eurofighter *Typhoons* were deployed on rotation from Trapani AB and Grosetto AB to Istrana AB, respectively, to perform air policing tasks in the Slovenian airspace with the Hungarian JAS-39 Gripen aircraft of the Republic of Slovenia.

The 51° Stormo returned to the air defense area again on 9 April 2020, and currently, their 132nd Squadron is equipped with Eurofighter fighters, which are not new production aircraft but aircraft transferred from other units. The Italian concept is that Eurofighters are air superiority aircraft. Their 103rd "Indian" squadron will continue to fly AMX aircraft, but these are expected to be withdrawn from service around 2023 or 2024. The AMX squadron practices combat reconnaissance, close air support, and air-to-ground operations. The successor to the AMX, whether it will be a Eurofighter at Istrana AB or will actually be F-35A *Lightning II* strike fighters is still a matter of debate.

The entrance to the base opened at 9 a.m., before the announced 10 a.m. for the open day, and a surprisingly large number of visitors came to view the aircraft, engines, and equipment on display by the regiment. An ASPIDE complex of air defense missiles was also on display. The modelers also found their match with many aircraft powered by engines or propellers on the ground and in the air. The base also hosted a veteran car exhibition and a dozen racing vehicles.

The main attraction was the static line where AMX (A-11B) with different color schemes as well as an F-2000 *Typhoon* fighter from 132 Squadron were on display. Also on display was an MD-500 helicopter equipped with the 651 Search and Rescue Squadron. Several types of aircraft in service with the regiment were also part of the exhibition. Also, five aircraft

Two AMX ACOL assigned to 132° Gruppo.

were on display in an area closed to the general public where the regiment's memorial stood.

In a slightly different way from the Italians, although the open day was held in honor of the 100th anniversary of the Italian Air Force, there was no ceremonial flag-raising, no commanders' speech, no anthem, practically a casual event without military drill at the Treviso unit. There were no cordons set up for the dynamic program either, with a few soldiers and senior volunteer helpers showing the spectators how to position themselves away from the runway.

The flights were carried out by three AMX and two Eurofighters from local squadrons. The light strike aircraft were first guided from the ground by the local J-TACs to mimic various attacks, flown at high altitude. Then, they came down to the ground level for some passes either over the runway or perpendicular to it. After them, two Eurofighters took to the air and disappeared from the sky. After a short idle, the two AMXs and one Eurofighter returned together as a formation, and then again in a landing configuration with the landing gear down. After two low-speed and runway passes, the aircraft landed, bringing the morning flights to a close.

First, an A-200 Tornado aircraft from the neighboring Ghedi base, where the 4th Wing is based, flew over the runway twice, and then the morning programme was flown again by 51st Wing aircraft, in the opposite direction due to the change of the wind direction.

AMX ACOL assigned to 132° Gruppo.

AMX ACOL assigned to 132° Gruppo.

F-2000A *Eurofighter* assigned to 132° Gruppo.

Main image: Tornado IDS assigned to GEA 6
Left inset: TF-2000 *Typhoon assigned* to 132° Gruppo
right inset: NH500E assigned to 208° Gruppo SVE

Aermacchi MB326 **(above)** – Lockheed T-33A *Shooting Star* **(below)** – Lockheed F-104S ASA *Starfighter* **(right)**

AMX ACOL assigned to GEA 51° Stormo / 132°Gruppo **(above & below)** – Lockheed F-104S ASA *Starfighter* **(right)**

▲ F-86K *Sabre* of 103° Gruppo.
▼ Fiat G91R/1B of 103° Gruppo.

F-84F-61-RE *Thunderstreak* of 103° Gruppo. ▲
AMX ACOL of 132° Gruppo. ▼

TLP 22-3

Tactical Leadership Program

TEXT BY DAVID MAZÓN GÓMEZ | **PHOTOS** BY DAVID MAZÓN GÓMEZ AND JUAN MIGUEL ANATOL

U.S. Navy F/A-18E *Super Hornet* assigned to VFA-143 *Pukin Dogs*.

The flying course TLP 22-3 was held from 12 to 30 September 2022. It was characterized by the large participation of the United States and the first complete participation of 5th generation aircraft as 'Blue Air'.

PARTICIPANTS

- U.S. Air Force with six F-35 *Lightning II*s of the 495th FS and 11 F-15E *Strike Eagle* of the 494th FS, both based at RAF Lakenheath in England, UK.
- The U.S. Navy participated with a total of four F/A-18 Super Hornets – two F/A-18E of VFA-86 and VFA-143 and two F/A-18F of VFA-103 – from the aircraft carrier George W. Bush (CVN-77). This was very noteworthy and gives hope for further U.S. Navy involvement in the future.
- Spanish Air Force fighter aircraft participating in this edition were five EF2000 Eurofighters assigned to 11th Wing at Morón AB. A C-295 of the 35th Wing and an NH-90 of the 48th Wing also took part in the CSAR and Slow Mover missions.
- Belgium sent nine F-16AM Fighting Falcons, one of them in the livery for the 105th anniversary of the Belgian Air Force
- The Royal Danish Air Force was with seven F-16AM Fighting Falcons, assigned to FWS, present The aircraft had different color schemes, since a darker gray is being applied to the recently painted ones.
- France participated with an E-3F AWACS of 00.036 EDCA (Escadron de détection et contrôle aéroportés – Airborne Warning Control Squadron) which operated from BA 702 Avord.
- Equally noteworthy is the inclusion of the MQ-9 Reaper, which is an example of the growing weight that unmanned aerial vehicles have in modern combat scenarios.

U.S. Navy F/A-18E *Super Hornet* assigned to VFA-86 *Sidewinders*.

HISTORY

During the cold war seven NATO nations shared the West German airspace in a defensive cold war posture, ready to take action at any time. They recognized the need for joint operations, the need to train together and the need to generate leaders for challenging multinational air defense and air strike missions.

With this aim in mind, in January 1978, the signatory nations Belgium, Canada, Germany, Netherlands, UK and the USA formed the AAFCE TLP at the German Air Force base of Fürstenfeldbruck. Early TLP courses took the form of a two week seminar where aircrew discussed and formulated NATO tactics, techniques and procedures. In March 1989, TLP moved to the Belgian Air Force Base at Florennes, where the staff, the task and the area of responsibility was expanded. Two branches were added and aside from flying courses, TLP started to instruct allied forces in academic courses and began writing NATO doctrine related to tactical air operations. Starting as a Central Region organization with the mission to defend the inner German border, TLP adapted new challenges, preparing the future tactical leaders to be ready for conflicts that could take place in any geographic location all around the globe.

In September 1979, TLP moved to Jever AB in Northern Germany where the course length was extended to four weeks in order to include a flying phase. TLP, part of the NATO organization took the task to train flight leads to be qualified to plan, brief and conduct multinational combat air patrol missions employing mixed force fighter formations and to lead multinational counter air operation strike packages. When TLP ceased the operation in Jever at the end of 1988, 71 flying courses had been completed and nearly 2000 NATO aircrew had graduated.

Since TLP staff had been selected from the most experienced and respected airborne leaders in their own air forces, by the end of the cold war, TLP had grown to be the European center of excellence in all matters related to coalition force air operations. Therefore it was unquestionable to the TLP nations that the Tactical Leadership Programme would play an important role after the cold war.

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The number of nations participating in TLP flying and academic courses and joining the program increased. Aside from the member nations, other countries, including some non-NATO allies, began regularly sending military specialists to TLP to be trained in all the skills related to tactical air operations. By 2012 more than 7000 aircrew have participated in TLP flying courses.

As the NATO focus has shifted away from a potential conflict in central Europe, TLP needed a training area that is representative of the theaters of potential future conflicts. With the dawn of the new century, TLP member nations then started investigating new and more favorable locations for TLP to cope with the challenge of growing air traffic congestion in Central Europe. The TLP choice was Albacete AB in South East Spain, blessed with some of Europe's most favorable meteorological conditions and a large airspace structure.

Finally, in 2009, the TLP moved to Albacete AB.

Source TLP

U.S. Air Force F-15E S*trike Eagle*s assigned to 494th FS *Spearheads.*

U.S. Air Force F-15E S*trike Eagle* assigned to 494th FS *Spearheads*.

COURSE OBJECTIVES

The TLP COMAO Flying Course aims to improve the tactical leadership skills and flying capabilities of front line fighter Mission Commanders (MCs), to improve the tactical interoperability of NATO Air Forces through exposure to tactics and capabilities of other Air Forces and to provide a flying laboratory for tactical employment concepts.

The course also enables exchange of information on weapons, tactics and capabilities between the participating Nations. By providing an environment that encourages the discussion and development of multi-national tactics, participants find the best way to employ the differing aircraft capabilities of the multi-national forces in Composite Air Operations (COMAO).

COURSE SYLLABUS

During each course, a building block approach is used to progress the crews through a total of 12 missions:

- ◇ Three "synthetic" missions: planned as real life sorties but flown in the TLP Synthetics System for plan validation. These missions aim to familiarize the participants with the planning process and COMAO procedures, start building up leadership skills and enhance teamwork and cooperation among aircrews.
- ◇ Nine Live missions: these missions aim at challenging the participants to develop the tactical leadership skills necessary to plan, brief, fly, and debrief fully integrated multi-national formations.

Each day a different crew leads the others through all phases of missions that grow in complexity during the course. Participants are exposed to a wide variety of missions that simulate different types of real world scenarios, updated frequently to incorporate modern warfare tactics and intergrade new weapon systems.

Missions are flown from Albacete and use both overland and overseas training areas. Long range missions may use air to air refueling depending on availability. A wide range of terrain targets are available.

COURSE LENGTH AND START/FINISH OF COURSE

Nominal course duration is three (3) weeks [nineteen (19) days]. The TLP COMAO Flying Course begins on Monday of the first scheduled course week. The first week includes all necessary Academic lectures and the three (3) Synthetic missions, followed by two (2) weeks filled with nine (9) consecutive live missions. The second Saturday of the course is a working day.

U.S. Air Force F-35A *Lightning II* assigned to 495th FS *Valkyries*.

Aircraft should be ready to fly on the second Monday of the course and the last Friday is reserved for redeployment.

Actual course length may be adjusted to account for other TLP requirements and/or Spanish national or regional holidays that may disrupt course continuity.

The TLP COMAO Flying Course fly-window is one wave in the afternoon. This allows an additional "shadow wave" in the morning or at night if appropriate bi-lateral agreements with Spain are coordinated.

COURSE TARGET AUDIENCE

The TLP COMAO Flying Course aims to educate tactical fast jet aircrews in the joint environment of COMAO. The lectures and missions are designed for the junior tactical aircrew or individuals with limited COMAO experience, typically at the senior First Lieutenant/ young Captain (OF-1/2) level with more than 500 flight hours on type/in role.

The logical progression of the TLP course attendance is the Support Course, followed by the COMAO Synthetics Course and finally the COMAO Flying .

The secondary target audience is support personnel likely to be involved in a COMAO in the future, including intelligence officers, fighter controllers and C2ISR operators.

COURSE COMPOSITION

The ideal number of participants for a flying course is as follows: 24 jets (12 pairs) with their respective aircrews, 5 GCI/C2ISR participants and 6 INTEL participants. Slot allocation will be coordinated during the annual Scheduling Conference for the following calendar year.

Source TLP

U.S. Air Force F-35A *Lightning II* assigned to 495th FS *Valkyries.*

Belgian Air Force F-16AM *Fighting Falcon* assigned to 1st Squadron.

Royal Danish Air Force F-16AM *Fighting Falcon* assigned to Fighter Wing Skrydstrup.

Spanish Air Force Eurofighter EF2000 assigned to Ala 14 **(top)** and Ala 11 **(bottom).**

Spanish Army Aviation AS532AL *Cougar* assigned to BHELEME II/UME.

UNITED STATES FOREST SERVICE

REPORT BY MIKE GREEN

General William J. Fox Airfield, otherwise known more simply as Fox Field, is the only general aviation airport in the Antelope Valley, serving several communities including Palmdale, Rosamond, and Lancaster, California. Fox Field has one paved non-precision instrument Runway (6/24), which is 7,200 feet in length, along with a state-of-the-art FAA air traffic control tower.

Fox Field is also home to the 'Fox Tanker Base' and a fleet of fire-fighting aircraft operated on behalf of the United States Forest Service (USFS). The United States Forest Service is an agency of the U.S. Department of Agriculture that administers the nation's 154 national forests and 20 national grasslands. With a variety of aircraft and helicopters at Fox, it is worth pointing out that all the firefighting aircraft and helicopters are not owned by the Forest Service but contracted to USFS, aside from a couple of fixed-wing aircraft used as 'Lead Planes'.

The peak of the wildfire season in California usually occurs between July and November when hot, dry winds are most frequent – typically ending when the first significant rainstorms of autumn arrive, which is usually around October in Northern California, and early November in Southern California. During fire season, Fox Field becomes a major hub for aerial firefighting suppression, with additional aircraft and helicopters taking up residence. At the time of our visit in mid-October, it was evident that the season was winding down, evidenced by the fact that one of the two Erickson S-64s was due to leave within the next couple of days to head for Australia.

The coloured retardant seen in most photos you see is Perimeter Solutions PHOS-CHEK MVP-Fx. PHOS-CHECK is a powder concentrate transported into Fox Field, which is then mixed with water. A highly visible colour retardant that provides superior visibility in the air and on the ground, it slowly fades during exposure to sunlight. PHOS-CHEK is a gum-thickened, medium viscosity retardant that provides highly effective and accurate aerial drops, its elastic nature improving aerial delivery performance by reducing drift and evaporation. PHOS-CHEK is made up of ammonium polyphosphate, water, fertilizer type salts, a colouring agent, corrosion inhibitors, and flow conditioners. As a long-term fire retardant, it means it can be sprayed on an area and unless it gets washed away by a rainstorm it will stay in situ for months.

Now retired from military service, modern payloads are more likely to include transmission towers, fire suppression tanks, construction equipment and HVAC units, as well as custom-rigged loads. Its revolutionary centre-spine airframe, which increases lift capacity and dramatically reduces payload shift, combined with the introduction of a specialized third pilot, makes the CH-54A ideal for operations requiring pinpoint precision and immense power.

U.S. Forest Service Beechcraft 200GT *King Air*

U.S. Forest Service Aero Commander 690

DYNAMIC AVIATION

The **Beechcraft C-12D** operated on behalf of the USFS by Dynamic Aviation is equipped with a FLIR Star SAFIRE 380-HD camera system below the rear fuselage, which provides superior image stabilization, ultra-long range imaging performance, and true metadata embedded in the digital video. It also features internal navigation for precise targeting, a medium wave infrared (MWIR) thermal imager, HD color and low-light cameras, along with multiple laser payload options. Equipped with satellite communication (SATCOM), the C-12D normally spends around one hour 'on station' during a typical two-hour mission, during which it is used by the USFS for spotting and monitoring any potential fires and fire risks, downloading information and images as it happens.

The Beech C-12D we saw, #N40Y, has a varied and interesting past. Built in 1982, it was placed on the military register as #82-23782 with the Montana Army National Guard, and since taking up #N40Y with Dynamic Aviation, it has also been seen in an overall grey scheme wearing U.S. Army markings

COASTAL HELICOPTERS

Coastal Helicopters has a long history in the aerial firefighting industry, servicing many government agencies across the nation on various 'Exclusive Use' and 'Call When Needed' contracts. Currently operating for the United States Forest Service, Department of the Interior, Oregon Department of Forestry, Washington Department of Natural Resources and Cal Fire, each agency has its own strict set of requirements for safety, equipment, and personnel. The Coastal Helicopters **Bell 205A-1** we saw at Fox was built way back in 1973, but looked in immaculate condition. The aircraft and crews from Coastal Helicopters were awaiting some distinguished guests from Greece at the time of our visit, illustrating the sharing of experience in the aerial firefighting community. During a fire situation, the Bell 205 can be quickly and easily deployed, and can draw water from almost any accessible source via a snorkel attached to the belly tank.

AEROFLITE AERIAL FIREFIGHTING

Aeroflite is one of the most experienced aerial firefighting companies in the United States, delivering an extensive range of next-generation fire control aircraft and services to a variety of national customers. AEROFLITE has over 57 years of fire management experience in aerial forest firefighting, employing more than 150 skilled individuals with a fleet of 11 aircraft. AEROFLITE has grown from flying converted military planes to operating modern, purpose-built and engineered firefighting aircraft - the **Avro RJ85-AT** tankers having proven to be an efficient, fast, and reliable aircraft, delivering a large volume of fire retardant in a short period of time in support of wildland fire management and ground fire-fighters. The four-engine RJ85's reliability provides excellent short-field performance along with multiple system redundancy, whilst also giving it excellent low-speed and high-speed performance, making the aircraft an ideal airtanker in any terrain.

ERICKSON AIR-CRANE HELICOPTERS

Jack Erickson founded Erickson Air-Crane in 1971, pioneering heli-logging techniques before expanding into powerline construction and firefighting. At the time, firefighting required ground crews to wrap cables around fallen timber and hook them to the aircraft long line.

Over the next couple of years, Erickson purchased three S-64E from Sikorsky Aircraft Company, and in 1992 purchased the rights to the S-64 from Sikorsky, becoming the sole manufacturer and type certificate holder, with the first new **S-64F *Air-Crane*** also rolling off the Erickson production line in Central Point, Oregon.

In 2000, the 'Sea Snorkel' allowed for dynamic filling of the fire suppression tank of the S-64 with salt water from oceans and other water sources, great for conserving fuel and reaching more remote fires. In 2010 the first S-64 to include a Night Vision Goggle (NVG) capability was developed by Erickson, meaning aerial rescues and firefighting were now much more feasible at night.

Erickson S-64 *Air-Crane*

Siller S-64 *Skycrane*

SILLER HELICOPTERS

Headquartered in Yuba City, near Sacramento, CA., the history of Siller Helicopters is rooted in the majestic timberlands of the High Sierras, where founding partners and brothers, Andy and Neal Siller, started the company over 40 years ago. Since then, Siller Helicopters has grown to include firefighting, transmission line construction, ski-lift construction, power grid expansion, HVAC placement, logging, heavy-lift operations, and hydro-seeding across the United States.

N7095B (ex 67-18430) is one of two **CH-54A *Skycrane***s operated by Siller. Designed by Sikorsky Aircraft for the United States Army in 1962, only 54 CH-54As were ever produced, making the aircraft one of the most sought-after helicopters across the heavy-lift industry, with Siller also operating two S-64 *Skycrane*s – the CH-54's civilian counterpart. Powered by twin 4,500 horsepower engines, the CH-54 is capable of lifting payloads approaching 20,000 lbs, which in the past have included United States Army tanks, other helicopters, and heavy munitions. Now retired from military service, modern payloads are more likely to include transmission towers, fire suppression tanks, construction equipment and HVAC units, as well as custom-rigged loads. Its revolutionary centre-spine airframe, which increases lift capacity and dramatically reduces payload shift, combined with the introduction of a specialized third pilot, makes the CH-54A ideal for operations requiring pinpoint precision and immense power.

SEA HARRIER NIGHT SHOOT

TEXT: KRIS CHRISTIAENS | **PHOTOS:** KRIS CHRISTIAENS AND GERT TRACHEZ

On Friday, 3 March 2023, the Centre Of Aviation Photography (COAP), in collaboration with Jet Art Aviation Ltd., organized a special photo shoot with a Sea Harrier fighter plane once used by the British Royal Navy. The event took place at the former British Royal Air Force base RAF Church Fenton which closed in 2013 and has since been used as a civilian airport under the name Leeds East Airport. During this very well-organized photo shoot, about 25 photographers had the opportunity to extensively photograph the Sea Harrier from numerous angles and positions.

Thanks to some reenactors, some iconic scenes could be reenacted such as the pilot entering the cockpit and a post-flight check of the aircraft by the pilot and a Flight Deck Officer (FDO). At the end of the day, we had the chance to photograph the Sea Harrier on the runway during a beautiful night shoot. Special lighting and smoke effects by the Centre Of Aviation Photography (COAP) allowed photographers to photograph the Sea Harrier as if it were operating at night from an aircraft carrier.

The British Aerospace Sea Harrier was a naval short take-off and vertical landing/vertical take-off and landing jet fighter, reconnaissance, and attack aircraft. It was the second member of the famous Harrier family. The Sea Harrier first entered service with the Royal Navy in April 1980. The aircraft was equipped with a single Rolls-Royce Pegasus turbofan engine with two intakes and four 'vectorable' nozzles. In 1993, a second, updated version was made as the Sea Harrier FA2 with improving air-to-air abilities and weapons compatibilities, along with a more powerful engine. British Sea Harriers served in the Falklands War and the Balkans conflict.

During these missions, it mainly operated from British aircraft carriers. Sea Harriers shot down twenty enemy aircraft during the Falklands War and only two of these jets were lost to enemy ground fire. These fighter jets were also deployed on board the HMS Illustrious in 2000 as part of Operation Palliser, the British intervention in Sierra Leone. Manufacturing of the Sea Harrier ceased in 1998 with the last aircraft

retiring from the Royal Naval service in 2006. India was the only other operator of the Sea Harrier and continued to use these fighters until 2016. A total of 98 Sea Harriers were built.

RAF Church Fenton, nowadays Leeds East Airport, is located in North Yorkshire. This former military airfield was opened in 1937 and was first used by RAF No. 71 Squadron and their Gloster Gladiator biplane fighters. During the Second World War, RAF Church Fenton provided protection for major industrial sites in Leeds, Bradford, and Sheffield and became home to the first RAF Eagle squadron of American volunteers. The airfield was also home to the first all-Canadian and all-Polish squadrons. After the Second World War, RAF Church Fenton first retained its role as a fighter base, being among the first to receive modern jet aircraft, the Gloster Meteor and the Hawker Hunter. Later, this air base was mainly used for training and education by the RAF No. 7 Flying Training School equipped with Hunting Aircraft Jet Provost T3 trainer jets. For some years, RAF Church Fenton was also home to the Royal Navy Elementary Flying Training School (RNEFTS), using the Scottish Aviation Bulldog training aircraft. In March 2013, it was announced that this airbase would close by the end of that year and that the remaining units would be relocated to RAF Linton-on-Ouse. Because of the many old buildings and hangars at this airfield and its remote location, this location was perfect for a photo shoot with an old Royal Navy Sea Harrier.

The Sea Harrier used during this photo shoot was delivered to the Royal Navy in March 1996 and was part of the Fleet Air Arm 801 Naval Air Squadron of the Royal Navy. This jet flew missions from several British aircraft carriers such as HMS Illustrious and was officially decommissioned in 2005. At that time, the aircraft had 1,558 flying hours. In late 2020, Jet Art Aviation Ltd. acquired this Sea Harrier and moved it to Leeds East Airport in January 2021. Jet Art Aviation Ltd. is specialized in the supply of static display and museum aircraft, aircraft engines, cockpit sections, ejection seats, aircraft spares, and aviation collectibles.

Naval Air Squadrons of the Royal Navy flying the Sea Harrier FRS.1 and FA.2


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PT6 – THE STORY OF A LEGEND

ARTICLE BY IGOR BOZINOVSKI

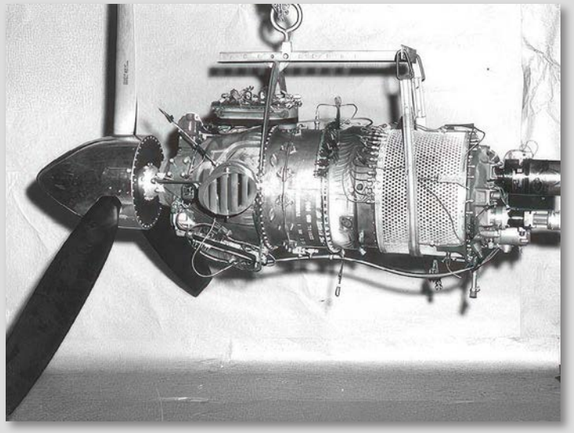
For most people, PT6 means nothing as it seems like a non-sense combination of two capital letters and a single-digit number. However, for the aviation world, it means a lot and much more. It is a designation for an exceptional gas turbine engine that offers unmatched performance and reliability. PT6 is an iconic piece of technology that constantly transformed aviation for the past six decades and will very likely keep doing so for many years, and decades to come.

The Pratt & Whitney Canada (P&WC) president Ronald Riley was already well aware in the early 1950s that despite the demand for his company's Wasp radial engine still being strong and production profitable, the future was demanding focus on small gas turbine engines. This led him to think and eventually decide to channel some of the P&WC profits from its piston engine spare parts business towards the development of gas turbines smaller than those made by P&WC's parent company, the US-based Pratt & Whitney. Thus, in 1956 Riley told P&WC engineering manager Dick Guthrie to hire a team of gas turbine specialists to design a small gas turbine engine. The incentive financially supported by 100,000 Canadian Dollars soon created an engineering mafia teamed by Gordon Hardy, Jim Rankin, Fernand Desrochers, Fred Glasspoole, Ken Elsworth, Allan Newland, Pete Peterson, Hugh Langshur, Jean-Pierre Beauregard, Elvie Smith, Dick Guthrie, and Thor Stephenson.

Brilliant minds give birth to brilliant ideas and so was the case with the "Guthrie's twelve". On the road to their "eureka," they first created one other small engine that eventually became designated Pratt & Whitney JT12. The real success, however, came driven by the market need for a 450 shaft horsepower (shp) turboprop engine for powering smaller twin-engine aircraft. And so, the engine we know today as PT6 was finally born in Canada in 1961.

The legendary engine first flew from Toronto's Downsview Airport on 30 May 1961, mounted as a third engine in the nose of a Beechcraft CT-128 Expeditor Mk. 3T (also known as "Model 18" or "Twin Beech") aircraft, serial HB109. This former United States Air Force and Royal Canadian Air Force plane made 719 flights and logged 1,068 hours with P&WC testing many PT6 models and related propellers before being retired to l'École aéronautique in Saint-Hubert after its last flight on 3 June 1980.

The first production PT6 engine, the PT6A-6, was certificated in December 1963. By that time it was already used by the Beech Aircraft Company to power its proof-of-concept Model 87 plane, a modified twin-turbine Queen Air that made its first flight on 15 May 1963. The unique Queen Air 87 later ended with the US Army getting first designated NU-8F Seminole and then YU-21. For history, the "87" was the spark

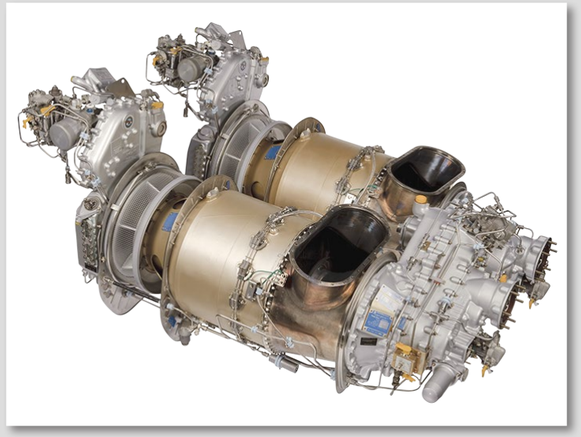


PT6 first production engine. **Photo P&WC**

that launched the legendary King Air line of twin-turboprop utility aircraft. Still available today from Beechcraft – part of Textron Aviation since 2014 – the King Air is legendary on its own with over 7,700 planes already delivered to commercial and military customers around the globe and some 6,320 still flying. Not less remarkable, the global King fleet already clocked some 63 million flight hours!

The PT6A-6 was a highly innovative gas turbine when it appeared 60 years ago. It represented a significant advance in technology from the traditional piston-driven engines used to power small aircraft. Its "magic" was in the fact that it had, among other advantages, a much higher power-to-weight ratio than piston engines.

In 1967 Piper's PA-31 Navajo made its first flight powered by PT6A-20 and already the following year the P&WC's ST6L73 engine (a derivative of the PT6A-6 without the gearbox second stage) entered service as an auxiliary power unit (APU) for the Lockheed L1011 TriStar airliner. That same year Bell Helicopter placed its initial order for P&WC's PT6T Twin-Pac engine, a combo of two PT6A turbines driving a common output reduction gearbox and producing up to 2,000 shp. This package developed to power medium-sized, twin-engine helicopters entered service in 1970 when the US military started receiving their first of 294 ordered UH-1N helicopters, a military designation for the famous Bell 212. The Twin-Pac engine (designated T400 by the US military) was then installed on the twin-engined Bell AH-1 Super Cobra attack helicopter and today, 53 years later, still powers the newly-build, Japan-made Subaru Bell 412EPX helicopter (PT6T-9) that soon in two examples will join the Croatian Ministry of Interior.



PT6T Twin-Pac engine for helicopters. **Photo P&WC**

The second-stage power turbine was introduced on the PT6A-41 in 1973 in what was a step change in the PT6's power and efficiency. Six years later, in 1979, an Air Tractor AT-400 agricultural aircraft powered by a PT6A-15AG (680 shp) engine was unveiled in Las Vegas - the first time a combination of an agricultural plane and a gas turbine was seen coupled. This was followed in 1982 by Cessna Aircraft Company's decision to select the PT6A-114A engine for its new Cessna 208 Caravan aircraft.

In 1984, a first-stage Integral Bladed Rotor (IBR) technology was introduced on the PT6A-65 model resulting in fewer parts in the engine and better efficiency. That same year Piaggio P180 Avanti became one of the first aircraft to be powered by the PT6A-67 engine (later, this changed, and PT6A-66 was selected to power the plane). Interestingly, Avanti to date remains the fastest certified twin turboprop, also known as "the Ferrari of the Skies".

The PT6B family of turboshaft engines made its debut with the PT6B-36 in 1985 and this engine became a power-provider to the twin-engine Sikorsky S-76B. This new engine upped the power of the S-76 by 46% compared to previous models of the aircraft. In the next milestone, the Pilatus PC-12 flew for the first time on 31 May 1991 powered by the PT6A-67B engine, and that year the PT6A-68/1 turboprop was selected to power the Embraer EMB-312H Super Tucano advanced trainer designed for operations in high temperature and humidity conditions, and from extremely rugged terrains. These were also times when Air Tractor AT-802 was born in Texas. Being the world's largest single-engine aircraft it took off for the first time powered by a single PT6A-67R (1,424 shp) turbine and being certified by the Federal Aviation Administration (FAA) for use of other PT6 variations, including PT6A-65AG (1,295 shp) for agricultural and PT6A-67AG (1,350 shp) for fire-fighting applications.

The so-called single-crystal blade technology [single-crystal turbine airfoils have as much as nine times the life in terms of creep deformation and thermal fatigue resistance compared to multi-grain components. They help engines operate more efficiently and cleanly. Also, they make possible the 25,000-hour Time Between Overhaul (TBO) interval of today's engines] was first introduced on the PT6A-67A in 1993 resulting in increased temperature capability for the engine, allowing it to operate at higher gas path temperatures and providing more power for the same size engine. In 1996 a modified Beech/Pilatus PC-9 Mk II (later designated T-6A Texan II) powered by a single PT6A-68 engine took off in the air in what prompted serial production of over 850 such aircraft and engines to date.

Of course, there is always fun in doing big business: in 1998, P&WC and Pilatus executives met in Nuuk, Greenland, to sign a contract after Pilatus selected the PT6A-68B for its new PC-21 trainer. As a demonstration of the confidence that both companies have in their combined products, P&WC executives

made an 11½-hour round trip aboard a Pilatus PC-12 powered by a 1,200-shp PT6A-67B while Pilatus executives in Switzerland traveled to Nuuk in a single-engine aircraft; a round trip of 8,610 kilometers.

In 2000, the PT6A-42A-powered Piper Malibu Meridian aircraft, known for its ability to climb to altitude quickly and efficiently regardless of weather and turbulence, was certified. The following year 2001 was also important as it gave birth to PT6C. The third turboshaft family based on the PT6A debuted with a pair of PT6C-67Cs powering the 15-seat AgustaWestland AW139 helicopter. The Italian link was also present on 7 March 2003 when the innovative Bell/Agusta AB609 tiltrotor (later renamed AgustaWestland AW609) flew for the first time powered by two PT6C-67A engines.

Four years later, in 2007, the AT-802 powered by the 1,700-shp PT6A-67F (one of the highest-power PT6A engines) was certified, although limited to 1,424 shp to match the aircraft's FAA certification. This solved the shortage of power on AT-802 when

PT6A-42. **Photo P&WC**

operating in the amphibian Fire Boss configuration with a "slightly" underrated PT6A-67AG (1,350 hp) turbine missing power for that huge fire-fighting plane, especially in hot-and-high and critical power-demanding situations. That same year, the PT6C-67E was selected to power the Eurocopter EC175 (now Airbus H175) while Viking Air revived de Havilland Canada's Twin Otter aircraft and restarted production of the new Series 400 Twin Otter with powerful PT6A-34/-35 engines.

2013: The PT6 engine fleet exceeds 380 million hours of flight!

Since early PT6 versions lacked a Full Authority Digital Engine Control [FADEC, a system that nulls direct pilot control over the engine; a digital computer and its related accessories control all aspects of aircraft engine performance by receiving multiple input variables of the current flight condition including air density, throttle lever position, engine temperatures, engine pressures, and many other parameters], the Automatic Throttle [a system that allows a pilot to control the power setting of an aircraft's engines by specifying a desired flight characteristic, rather than manually controlling the fuel flow] could be installed as an aftermarket upgrade with an actuator, initially for single-engine aircraft like the PC-12 and potentially in twin-turboprop aircraft.

In October 2019 the PT6 E-Series was launched on the PC-12 NGX, the first general aviation turboprop with an electronic propeller and engine control system with a single lever and better monitoring for longer maintenance intervals that increased from 300 to 600 hours. The TBO also increased by 43% to 5,000 hours, reducing engine operating costs by at least 15%. In April 2022, Daher announced that the updated SOCATA TBM-960 would be powered by the PT6E-66XT engine… The PT6 went digital!

The continued development of Unmanned Aerial Vehicles (UAV) and increased focus of the industry on this segment of aviation brought more business to P&WC. Its engines already power the Piaggio P.1HH *HammerHead*, a state-of-the-art Unmanned Aerial System (UAS) that based on the P180 *Avanti* is designed for Intelligence, Surveillance, and Reconnaissance (ISR) missions. The potential for selling more PT6 engines now lies with the Turkiye's Bayraktar Akıncı B and Akıncı C Unmanned Combat Aerial Systems (UCAS) as well as in the interest of General Atomics Aeronautical Systems (GA-AS) to install PT6 E-Series model turboprop engine on its MQ-9B *SkyGardian* Remotely Piloted Aircraft (RPA) with demonstrated airborne endurance of more than 40 hours and capability for automatic takeoffs and landings under Satellite communications (SATCOM)-only control.

"Integrating the PT6 E-Series engine onto our MQ-9B *SkyGuardian* aircraft offers an alternate option for future customers that includes a 33% increase in power, dual channel electronic propeller and engine control system, as well as all the benefits of the PT6 engine family," GA-AS president David R. Alexander said last year.

PT6 is all but a designation for a short list of different engines. The PT6A family embodies three series of models with increasing power levels, referred to as PT6A "Small" (A-11 to A-140, 600-1,075 shp), PT6A "Medium" (A-41 to A-62, 1,000-1,400 shp) and PT6A "Large" (A-64 to A-68, 1,400-1,900 shp). The PT6B and PT6C are turboshaft variants for helicopters. The 1,000-shp PT6B was derived directly from the legendary PT6T Twin-Pac and produced in seven models. The 1,600-2,000-shp PT6C-67 Series is produced in four models for application on AW609 (-67A, 2,000 shp), AW139 (-67C, 1,700 shp), DynCorp-developed UH-1H Global Eagle conversion (-67D, 1,680 shp), and H175 (-67E, 1,800 shp). Depending on the engine model, the PT6 unit price can go north from 400,000 up to around 1 million US dollars for a single engine and far beyond that for the PT6T Twin-Pac turboshaft engine.

Today's PT6 is up to four times more powerful, has a 50% better power-to-weight ratio, up to 20% better specific fuel consumption, and an overall pressure ratio reached 13:1 compared to the original 1963 engine that had 6.3:1 overall compression. Its development continues and while today its basic configuration is the same as in 1963, updates have included a cooled first-stage turbine vane, additional compressor and turbine stages, and single-crystal turbine blades. In summary, the PT6C-67A turboshaft that powers the AgustaWestland AW609 tiltrotor features a compressor with a pressure ratio of 13:1, which is currently the highest that can be used without cooled turbine blades. In comparison, a typical compression

PT6A-67P. **Photo P&WC**

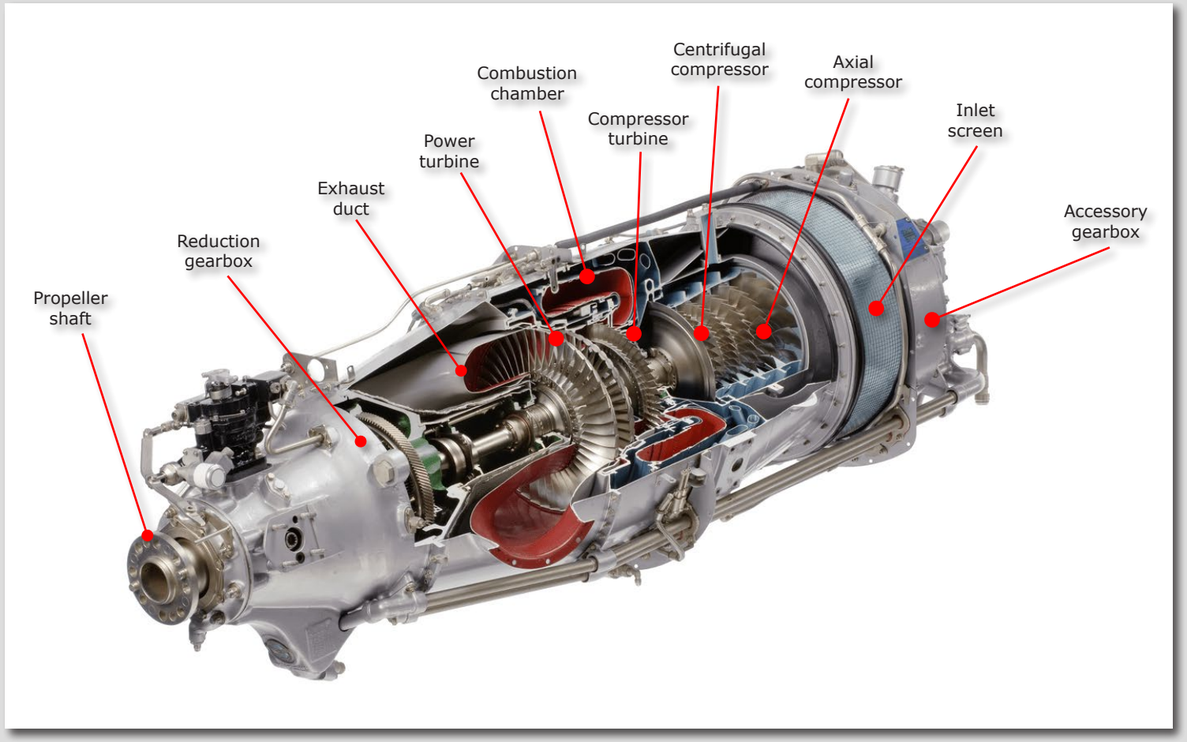
ratio for light turboprop aircraft propellers ranges between 7:1 and 10.8:1 depending on the version of the engine.

Technically speaking, all PT6 versions consist of two sections that can be easily separated for maintenance: a gas generator supplies hot gas to a free power turbine. The starter has to accelerate only the gas generator, making the engine easy to start, particularly in cold weather. Air enters the gas generator through an inlet screen into the low-pressure axial compressor. This has three stages on small and medium versions of the engine and four stages on large versions. The air then flows into a single-stage centrifugal compressor, through a folded annular combustion chamber, and finally through a single-stage turbine that powers the compressors at about 45,000 revolutions per minute (rpm). Hot gas from the gas generator flows into the power turbine, which turns at about 30,000 rpm. It has one stage on the small engines and two stages on the medium and large ones. For turboprop use, this powers a two-stage planetary output reduction gearbox, which turns the propeller at a speed of 1,900 to 2,200 rpm. The exhaust gas then escapes through two side-mounted ducts in the power turbine housing. The turbines are mounted inside the combustion chamber, reducing overall length.

Interestingly, in most aircraft installations the PT6 is mounted so that the intake end of the engine is towards the rear of the aircraft, leading to it being known by many as the "back-to-front" engine. This places the power section at the front of the nacelle, where it can drive the propeller directly without the need for a long shaft. Intake air is usually fed to the engine via an underside-mounted duct, and the two exhaust outlets are directed rearward. This arrangement aids maintenance by allowing the entire power section to be removed along with the propeller, exposing the gas generator section. In some rare installations, such as with PT6A-66B on the P180 Avanti, the engine is reversed, with the propeller acting as a "pusher", the accessory gearbox facing the front of the aircraft.

Whichever PT6 is in question, one thing is granted for all models: reliability! Absolutely stunning and unmatched! The workhorse has an in-flight shutdown rate of: 1 per 333,333 hours up to October 2003; 1 per 127,560 hours in 2005 in Canada; 1 per 333,000 hours from 1963 to 2016; 1 per 651,126 hours over 12 months in 2016, etc. When it comes to engine reliability, it is commonly accepted that the in-flight shutdown rate for a PT6A is around one in 370,000 flight hours i.e. less than 3 in-flight shutdowns in 1 million flight hours. All this comes under TBO of between 3,600 and 9,000 hours and hot-section inspections between 1,800 and 2,000 hours.

On 23 February P&WC reported achieving one billion (yes, that is correct: number 1 followed by nine zero digits) flying hours since the formation of the company 95 years ago, in 1928. Over this time,



PT6A-15GAE. **Photo P&WC**

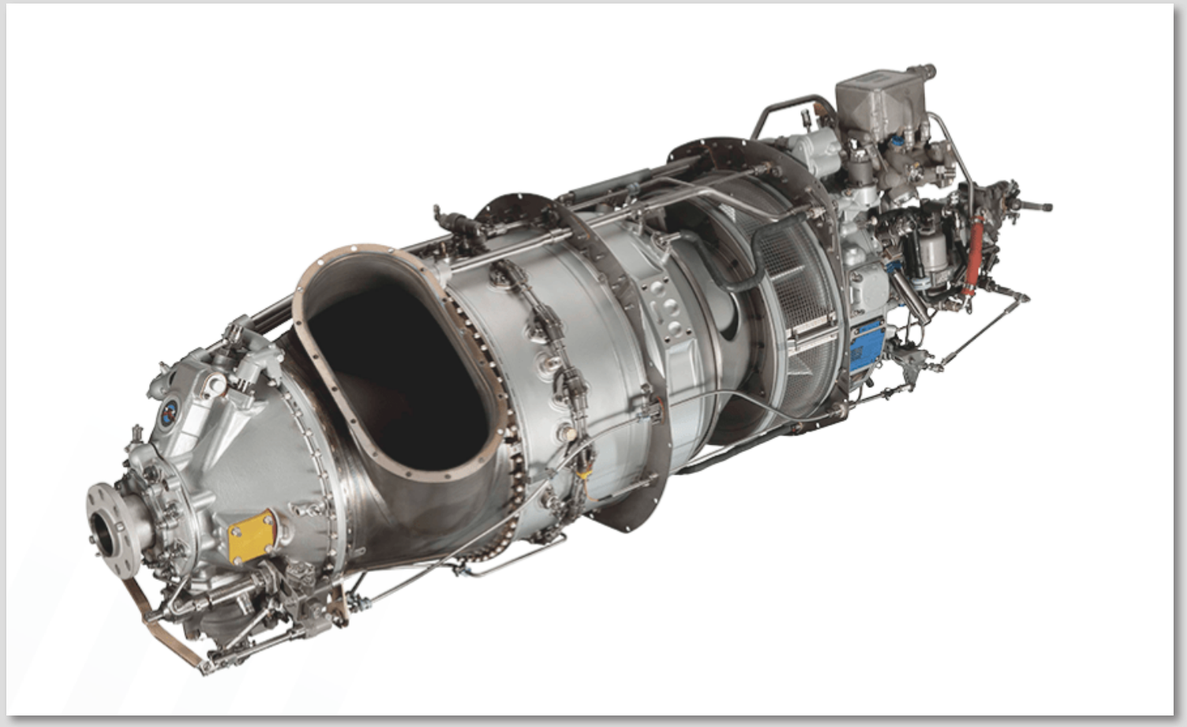
more than 110,000 engines have been produced, with over 66,000 currently in service powering over 16,000 customers worldwide. "Every second, a P&WC-powered aircraft takes off or lands somewhere on the planet," P&WC president Maria Della Posta said earlier this year. The PT6 engine family also celebrates 60 years of excellence and innovation this year. With more than 64,000 produced in 120 variants since 1963, PT6 powers over 155 different aviation platforms achieving unmatched engine performance, reliability, and dispatch availability.

When we speak numbers, also worth noting is that the PT6T Twin-Pac engine has already been produced in 11 models and its versatility has been demonstrated on a wide variety of applications for 358 operators in 76 countries. Nearly 7,400 PT6Ts delivered have already accumulated more than 45 million flying hours in such applications as oil exploration, emergency medical service, maritime patrol, and utility operations.

Half of P&WC's annual engine assembly production is devoted to the PT6 engine: about 9,200 square meters of production area is used to assemble more than 1,000 PT6 engines a year. And, remarkably, over 100 PT6 E-Series engines have already rolled off the new production line at the P&WC's Centre of Excellence in Lethbridge, Alberta, while at the same time, older engine models are produced at Longueuil, Quebec. At the same time, PT6 remains the only turboprop engine in the world to be approved for Single-engine Instrument Flight Rules (SEIFR) in commercial passenger flights in Europe, North America, New Zealand, and Australia.

This amazing engine that already logged 500 million flying hours wasn't always used to power airplanes, helicopters, or UAVs but in its early days, the PT6A's predecessor (an industrial version called the ST6) appeared in a number of other surprising applications: the "Thunderbird" ocean racing boat, the turbine-engined "Turbo Train", STP-Lotus Turbo Car racing cars, the "Jet Vett" custom-made Corvette sports car, hovercrafts, snow plows, trucks, electrical plants… can you believe it!?

With all these pluses on the side of the PT6 one question appears on the horizon: is there competition for the PT6? The simple answer is "yes", and a brief analysis would say that the hegemony of the PT6 is questioned by two new competitors developed by strong manufacturers like the General Electric (GE) subsidiary GE Aviation and Safran Helicopter Engines, previously known as Turbomeca. While the US company launched the Catalyst turboprop engine of clean-sheet design with innovative technologies that allow an overall pressure ratio of 16:1 and 16-17% more efficiency than competitors, the French company has bet on a mature Ardiden 3 turboshaft engine that was developed into a quite secretive turboprop version Ardiden 3TP. The battle for the turboprop market is increasingly heating up in the last five to six years and P&WC is clearly not standing still, as proved by the recent developments offered by the PT6 E-Series.



PT6A-15GAE. **Photo P&WC**

With the obvious potential to keep changing the future of aviation, the PT6 also helps the Oshkosh-based company Basler in keeping from extinction some old, rare, and precious "birds". For those not familiar, Basler is committed to reinventing the legendary Douglas DC-3 Dakota that began to emerge from the Douglas factory in California in 1936. Counting all license variants and sub-variants, around 16,000 of these classics were built and some 300 of them are still in service today. Brought to market as the Basler BT-67, this new DC-3 is recognized by the FAA as a brand-new aircraft with zero flight hours as only 10% of DC-3 original metal is retained in the BT-6 with the remaining 6,800 parts and components being manufactured in-house. Powered by two new, highly efficient PT6A-67R engines (installed in place of the old radial engines), a new BT-67 starts at around 12 million US dollars, and 70 such aircraft were already completed by the time you read this article.

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