EUROFIGHTER
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WORLD

SPECIAL EDITION

ILA BERLIN
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NOBLE AMBITION

The exclusive story of Germany's display ace

Eurofighter Typhoon

2024 · EUROFIGHTER **WORLD**

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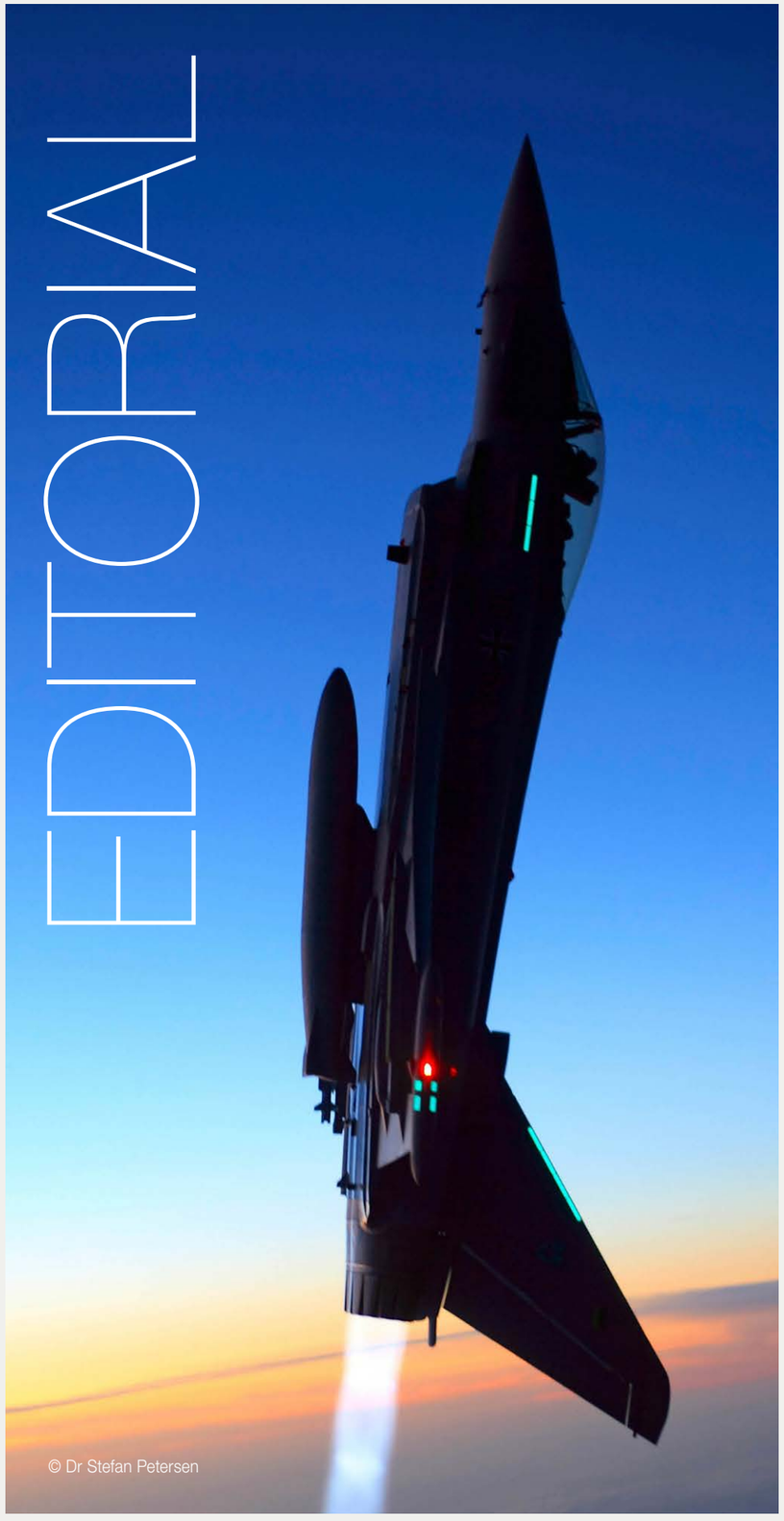


© Dr Stefan Petersen

In this edition of Eurofighter World, we speak exclusively to the CEO of Eurofighter Giancarlo Mezzanatto.

Giancarlo, your time as CEO is taking place during a very challenging geo-political period. How do you think the Eurofighter Programme is making a difference in this 'new world order'?

The world order changed very quickly following the Russian invasion of Ukraine. After more than 75 years of relative peace in Europe, the threat of war is a very real one. There are also other crises world-wide, particularly in the Middle East and the Indo-Pacific regions. Considering all these issues, there is a compelling need for European countries to increase responsibility for their own security.

The increase of defence readiness and strengthening of the industrial base are now clear objectives for European countries. These must take place as — regardless of the outcome of the 2024 Presidential Elections — it is likely that the United States will need to prioritise its military resources on multiple fronts.

The Eurofighter programme is one of Europe's leading defence collaboration programme successes. It has been proven to make a significant difference operationally as well as economically for the core nations. The positive impact the programme has made on the core nations' economies is considerable, especially in the role it plays in sustaining the European defence industrial base.

What operational role does the Typhoon platform currently play?

Typhoon is and will continue to be the central pillar of Europe Air Power. More than 80 per cent of the Partner Nations' operational air missions, during the past two years, have been carried out by Eurofighter.

Thanks to its versatility and swing-role capabilities, Typhoon has been a strong and reliable asset. Whether that's in Air policing and QRA (Quick Reaction Alert) on the Eastern flank of NATO, or on combat missions in the Middle East, in Syria, Iraq and more recently in Yemen to defend Red Sea maritime security.

Eurofighter Nations are engaged in air policing operations to protect the eastern borders of NATO in the Baltic countries, in Poland and Romania. Air superiority is an essential requirement in any battlefield and in this operational scenario. Eurofighter represents a fundamental deterrence factor in Europe.

An independent study into the impact of the programme on the core nations was recently released. What do the findings show?

That's right. The report, published in April by PwC, illustrates the significant positive impact on our Core Nations' economies of the Eurofighter Programme.

The report provides a comprehensive look into the Programme — spanning the entire spectrum of development, production and support activities across the four Core Nations – and highlights the contribution of export contracts.

The economic contribution is evaluated in terms of GDP, tax revenues and employment generated by the Programme. It looks forward to what that could be over the next ten years.

The report's 'base scenario' includes the current contracts, plus an additional 25 aircraft under negotiation with Spain. It shows the programme will generate a GDP impact of € 58 billion and tax revenues of € 14 billion over the next ten years.

With the acquisition of additional orders by the Core Nations (which are currently under discussion), and other export opportunities, these figures have the potential to reach a GDP impact of € 90 billion and tax revenues of € 22 billion.

If properly supported, the Programme will sustain a supply chain of 400 companies and a highly skilled workforce of around 98,000 people across the four Core Nations. Of this, around 24,000 are in Germany.

The study shows the huge economic return for the founding countries of the Programme, but also highlights the inter-dependencies across the four Nations. The investment of one nation impacts the economies of the others. The investments from export benefit the economy of all four Core Nations.

You talked in the past about the need to sustain European defence readiness. How is the Programme contributing to the sustainment of the European defence industrial base?

A recent European Commission paper was clear; European defence readiness will only be achieved through a responsive and resilient European Defence Industry. During the past two years, almost 80 per cent of European defence acquisitions have been made outside Europe, with the US representing 63 per cent. Therefore, it is very much in Europe's interest to reverse this trend.

The Eurofighter Programme's sustainment of highly skilled jobs, with high labour productivity rates, represents a fundamental factor for the fighter Industries of the Core Nations. Furthermore, technology and industrial assets created by the Programme are a solid baseline of Defence Industry capability. These need to be preserved and further developed.

This is essential to prevent overreliance on US technology and to provide a bridge to the sixth generation programmes.

How do you impress upon the customer to continue to invest in Eurofighter when many are looking ahead to sixth generation solutions?

I fully appreciate the need for our nations to invest in the sixth generation systems. However, according to the current plans, these new systems will not be available before 2035-2040. Taking into account the current geopolitical scenario, there is an urgent operational need to strengthen European Defence now, and that is where Eurofighter comes out on top.

Furthermore, engineering knowledge and industrial assets must be preserved to be ready for the sixth generation programmes, and the only way to do it is to further invest on the current fighter platforms.

Typhoon also offers the opportunity to test and develop new technologies and advanced sensors, creating a natural bridge to the sixth generation platforms and systems. Typhoon's life will extend to 2060, which means there will anyway be a need to guarantee the Long Term Evolution of Eurofighter. It is not a case of Typhoon or sixth generation – the reality is that European forces will need both systems to provide a meaningful air defence.

Having completed more than one year in the CEO's office, how do you see the future of Typhoon?

Given the relevance of the Programme from an operational, economical and industrial point of view, and given the current geo-political scenario, we are working with our customers to further enhance the capabilities of the platform and keep it operationally effective for many years to come.

Enhancement Package 4 (P4E) and the Long Term Evolution programme will provide Typhoon with powerful sensors, active and passive, enhanced electronic warfare capabilities, the integration of new weapons, more advanced data processing capacity and an evolution of the cockpit and Human Machine Interface.

The future of Typhoon is bright — not only because of the sale opportunities in the next two years by Core and Export Nations — but also because there are real operational requirements to further enhance its capabilities.

In my view, this will safeguard our Defence Industry and will seamlessly bridge our Defence technology to the sixth generation systems. ■

ECONOMIC BENEFIT 2024 · EUROFIGHTER **WORLD** 7

Eurofighter's Economic Benefit Revealed

Strategy&, part of the PwC network has published an independent report that highlights the impressive scale of the Eurofighter Typhoon Programme's contribution to economies across Europe.

The in-depth report examines the entire spectrum of development, production, and support activities, encompassing the four Eurofighter Typhoon partner nations of the United Kingdom, Germany, Italy and Spain.

It delivers compelling data showing the current economic benefits of the programme as well as anticipating future economic contributions, focusing in particular on the next 10 years.

The 'base scenario' takes into account orders for new Eurofighter Typhoons from Spain (Halcon I and II) and Germany (Quadriga). This shows that, for the next decade, the programme is set to contribute €58 billion to the GDP of the four core nations' economies; generate tax revenues of €14 billion for the respective governments; and support 62,700 jobs annually.

Those numbers increase significantly in the report's 'growth scenario' with opportunities for sales of approximately 200 Eurofighter Typhoons on the domestic and export market.

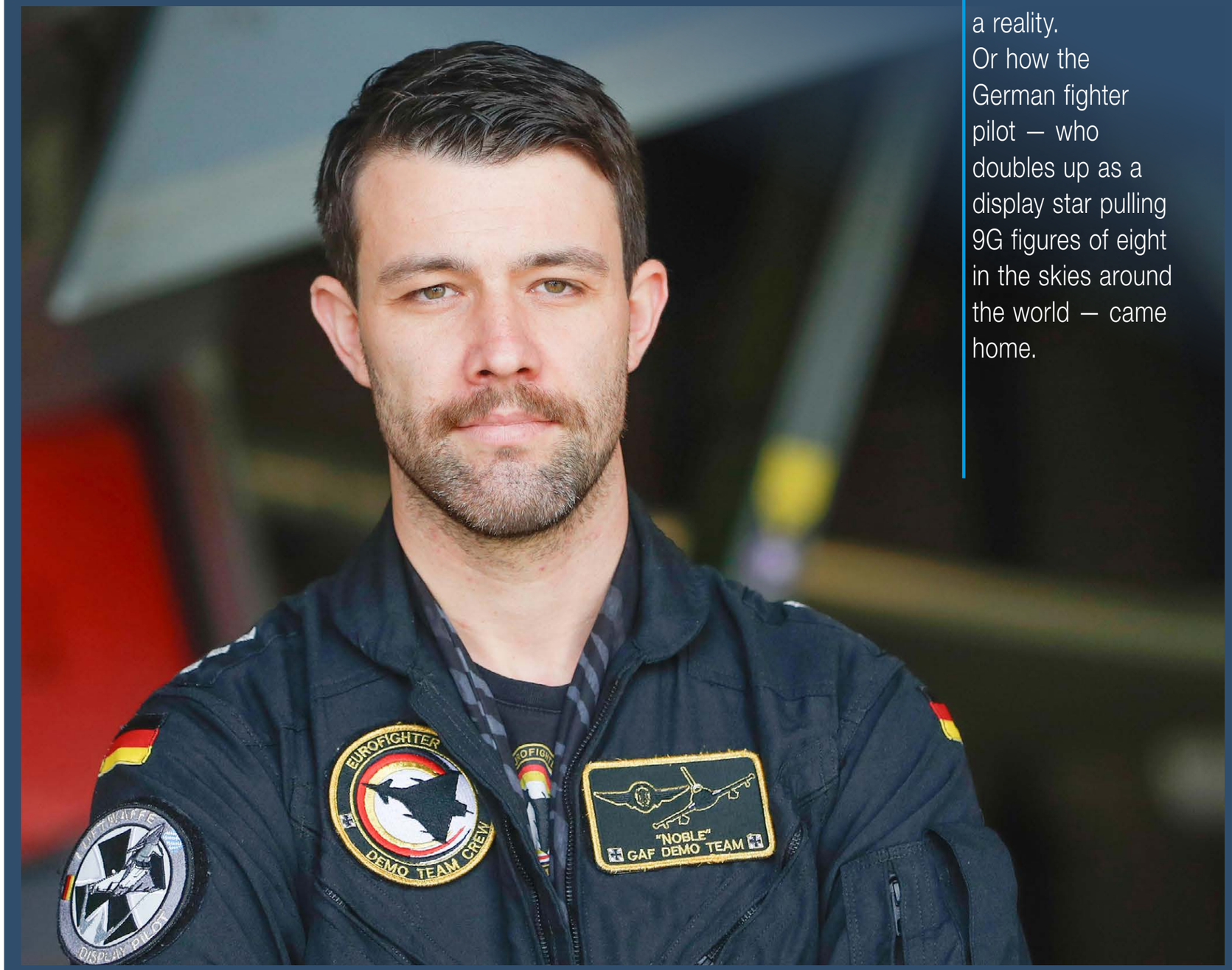
This scenario shows, for the next decade, a programme contribution of €90 billion to GDP; tax revenues of €22 billion generated; and more than 98,000 jobs each year. The benefit of future export opportunities would mean that around 30 per cent of the core nation investment would return as tax revenues.

Eurofighter CEO Giancarlo Mezzanatto said: "The vital role that the Typhoon performs to keep Europe's skies safe is widely known to all, however, people are often less aware about the incredible economic benefits that the programme also brings.

"The Eurofighter Typhoon programme directly boosts European economies and supports tens of thousands of crucial aerospace jobs – benefiting the communities where we live and work. There is also significant spill over in regions where Eurofighter production lines are located and where the programme often sustains SMEs, start-ups and educational institutions.

"Therefore, new Eurofighter Typhoon orders are essential to sustain and retain defence industry production assets in Europe. This will guarantee national and European technological independence, and industrial know-how resilience, to the core nations over a long period." ■

Noble Calling



© Bundeswehr/Germaine-Noelle Lavinia Nassal

This is the story of how one man made his dream a reality. Or how the German fighter pilot — who doubles up as a display star pulling 9G figures of eight in the skies around the world — came home.

You see, the first thing you need to know about Alex, call-sign 'Noble', the 2021-24 German Air Force Display Pilot, is that he's a firefighter's son. That's important. Or rather, the fact that his dad was a firefighter at Neuburg Air Base is a key part of the making of Captain 'Noble'.

"As a little kid, because of my dad's work, I was often allowed onto the base with him. At the time I watched the Phantom jets flying. It triggered something in my brain that said 'I have to do this'," Noble explains.

It sounds like something Spielberg might script, but Noble beat incredible odds and conquered every test under the sun to come home.

EARLY ADVENTURES

After finishing school, he became an apprentice maintenance mechanic with Fighter Bomber Wing 32 at Lechfeld Airbase, home of the ECR Tornado fleet. Later, aged 21, he successfully applied to become an officer. He went to Munich for an intense assessment. He confides: "They carried out a full-blown medical. Then you had to go into a simulator for more specific tests followed by an interrogation by a psychologist as to why you wanted to be there."

Noble passed and was selected for fixed-wing aircraft, which then led to more detailed simulator tests of his flying ability. He even practised at home on Microsoft Flight Simulator to sharpen up!

It was then off to Officer Training School. Finally, he got to fly a plane. Noble's first flying experience came when he started training at Goodyear Airport in Arizona. His first solo flight came in a Grob G120. He admits: "You are nervous. It's like having your first lesson in a car."

After Goodyear, it was on to Sheppard Air Force Base in Texas where he flew the T6 Texan 2, flying patterns, formations, and at low level. The best progress to the T-38 and learn to fly four-ship formations, then supersonic and, finally, low-level 4-ship.

IT'S PRISON BREAK

After 12 months in Texas, the students got their wings. It's a day Noble remembers well not least because the finale was marked by a Drop Party which his class decided to theme around the TV show Prison Break.

But, there is one last hurdle. An Introduction to Fighter Fundamentals (IFF) course where pilots learn how to fly tactics. Noble made it through everything and returned to Neuburg. And, yes, his dad was still working there!

At Neuburg, Noble joined the 742 'Zapata' squadron, carrying out a lot of flying hours, working in the simulators, and preparing for quick reaction alert (QRA). There were exercises and deployments too, including to Romania for Air Policing when the war in Ukraine started.

PASSING THE AUDITION

"Pilots on the squadron also pick up lots of side jobs," says Noble. "Every pilot has them — some are technical but necessary, some involve lots of paperwork and some are cool. Like being the display pilot!"

"In Germany, the display pilot is still a combat pilot and their main task in Neuburg is QRA. The role is rotated between different bases and when I heard the Neuburg Air Force base was going to have the job I wanted to do it straight away."

He adds: "First, you go through simulator flights in what is known as step-down training. You go from 4,000ft and eventually down to 500ft. You tackle all sorts of emergency scenarios and bad weather options too."

"Then the head of standardisation comes into the simulator and you have to perform the display while he adds in some emergencies like an engine fire. Finally, once you feel comfortable you go into the real jet and practice it for the first time."

There are strict parameters — all safety-driven — that each display pilot has to consider but they do have the chance to add their personality to what in essence is a noisy aerial ballet.

Says Noble: "There's a mix of fast passes, slow passes, loops, a spiral up, a spiral down, an aileron roll, a cube eight all at 500ft. You use a lot of afterburner and you are constantly pulling 9G. Essentially, you max out the jet.

"But the special thing about this kind of flying is that you are close to the ground. That makes it spectacular for the crowd. It also means your reaction time is in microseconds. If you're not fast, you will hit the ground. And the ground never forgives."

HARD LANDING

It is both physically and mentally demanding because while pilots know their display by heart they can't plan for the weather conditions. →

Noble learned the hard way in Poland. Set to go out on his display there was a delay for an hour because of traffic at the nearby international airport, by which time light cloud had turned into heavy rain.

He says: "I could still do my display, no problem, but I was not prepared for landing on a concrete surface that was now full of water. On my first landing attempt, my jet just blasted down the runway with no chance of braking at all. It was like landing on ice. I only had 2,000ft of runway remaining but I was still doing 140 knots."

"My only option was to take off again. That has been my most shocking moment. That incident showed me that the display is not over until it's over and you are back at the bar!"

"On my second time around, I used the minimum landing speed and touched down a little bit harder. It was like a landing on a carrier."

For the air show display connoisseur, each pilot brings something new but for Noble, it's the different locations that are memorable.

He says: "Last year we went to the mountainous Mollis Air Field in Switzerland. It was insane. Typhoon showed how special it is there. If you go towards the mountain it can pull up vertically — we don't have any problems with thrust.

"Another show in Poland was good, too, because we flew during sunset. You could see 100,000 smartphone cameras flashing!"

© Martin Agüera

TEAM EFFORT

The former Tornado mechanic has never forgotten his roots. He is keen to emphasise the importance of the wider display team – he has a 10-strong team around him. He handpicked his maintenance boss emphasising the special bond between the group.

When it's display time it is important to have people around you know and trust. Then it's time for action and he goes into his routine: "There are crowds but you need to focus. I go into my bubble 60 minutes beforehand. No media, no press, nothing. Everyone wants to follow you into the cockpit and take pictures but in those final moments, I block it out and mentally prepare. My cockpit is my safe place. I have my routine card on my knee and I go through the steps in my mind."

After the display Noble is happy to spend time with the fans who flock to the shows.

He says: "I want to inspire young people. We talk to people for hours and get a lot of questions. What makes me happy is when young kids come along and say, that was a cool show."

SHOW STOPPER

The Eurofighter Typhoon is often the star of the show when it comes to displays not least because of the power of the EJ200 engines.

Noble says: "The pure thrust they give is incredible — 2x90 kilo-newtons when I use the afterburner and I use them most of the time. The aerodynamics are a big plus too because our flight control system is awesome. I also like the cockpit design because you can use the whole 360 degrees when we turn our head at 9G."

Interview over, Noble prepares for his first display flight of 2024. Weather perfect. Good to go. 15:00 hrs. Watches set. The time ticks over – then Noble blasts heavenwards. Afterburners on full. Neuburg Airbase standing to attention. The moves are magnificent and balletic.

As we watch the display a fire engine pulls alongside the runway and the firefighters watch in awe. And, I wonder what are the chances? What are the chances of that firefighter's child coming to the base to see where their dad works, then 20 years later being the pilot in the cockpit making the world turn and stare? ■

Fighter Show continues to climb to higher levels

Twelve months in, The Fighter Show has been meeting its mission to educate, inform and entertain by telling stories about the wider Eurofighter family.

Launched on YouTube in 2023, The Fighter Show is a unique series focused on the work of the people involved in the Eurofighter community.

It is filmed at a variety of outdoor locations including Air Bases and Air Shows, plus studio episodes with a live audience.

The show, hosted by Eurofighter's Flo Taitsch, has featured a broad range of guest interviews with pilots, engineers, technicians and industry partners. It has explored new capabilities and air force exercises and deployments.

It has taken viewers on exclusive behind-the-scenes visits to locations including German Air Force's 74 Squadron in Neuburg, Albacete Air Base, Spain, Naval Air Station Keflavik in Iceland, RAF Waddington in Lincolnshire, and Gioia del Colle Air Base in Italy.

And, with Eurofighter being the backbone of Europe's air defence, the show has gained a real following across Europe and in the Middle East. It has already clocked up well over 500,000 views.

Earlier this year Flo and the team who work on the show were honoured at the International Brilliance Awards in London to mark their achievement in attracting a new audience.

You can watch all episodes of The Fighter Show now on Eurofighter's YouTube channel: youtube.com/eurofightergmbh ■

Check it out →

Italian Air Force celebrates 20 years of Typhoon

This year, the Italian Air Force (ItAF) marked the 20th anniversary of the delivery of the **first Eurofighter Typhoon** with a special event at the Grosseto Air Base, the home of the 4th Wing.

Since that momentous occasion in 2004, the Typhoon has gained more than 200,000 flying hours with the ItAF – both home and abroad. Today, the Typhoon is the backbone of Italian air defence having flown 135,000 sorties.

Colonel Alberto Rosso, who was Wing Commander and Chief of Staff of the Air Force, received the first Typhoon which was then assigned to the IX Squadron.

Speaking at the 20th-anniversary event in March, **Gen. DA Luigi Del Bene,** Commander of the Combat Forces of the Air Force, said: "The 20th anniversary of the delivery of the first F-2000 marks an important occasion in the history of the Italian Armed Forces. It was also the start of an important evolution for the ItAF, which covers training, operational and industrial cooperation successes.

"Typhoon is an impressive multi-role aircraft which, thanks to the evolution and continuous updating of new technologies, can always adhere to today's new operational scenarios.

In an operational context, during the past last three years alone, the F-2000s of the four Wings of the ItAF have taken to the skies on more than 50 occasions to carry out real interceptions to safeguard the national skies. While conducting Air Policing duties for NATO (in Lithuania and Poland) in 2023, there were approximately 40 scrambles to defend the eastern flank of the Atlantic Alliance.

Colonel Filippo Monti, Commander of the 4th Wing of Grosseto, said: "Twenty years of Eurofighter Typhoon sits nicely within the history of the ItAF which celebrates its 101st birthday.

"It had a weapons system that required a change in the hearts and minds of the personnel - first of the 4th Wing - and then of the entire Arma Azzurra. Since then it has been continually developed to keep up with the times and make the Typhoon as effective as it's always been." ■

DR STEFAN PETERSEN

Photographer

Aviation photographer Dr Stefan Petersen talks about the secrets of the perfect image.

Life Through the Lens

How did you get into aviation photography and when did it turn into a career?

It all began in 1979 when I was a young conscript in the former Leichtes Kampfgeschwader 41 (later Fighter-Bomber Wing 41) of the German Air Force. In those days I had a cheap single-lens reflex camera which I used to take black and white images for the Wing's monthly magazine of which I became editor.

Then in 1983 I became the Germany correspondent for the Israeli military magazine Defence Update International. By now I was using professional Canon cameras and I was soon taking shots flying aboard Starfighters, Phantoms and Jaguars and later F-15, F-16, F-100, Tornado and Mirage 2000. I have logged 225 flight hours in 17 different types of military jet aircraft including MiG-23 and MiG-29. I am proud to say that more than 75 of those hours have been aboard Eurofighter Typhoons!

What are the main challenges involved in getting a good shot?

Successful photography is all in the planning. Before every mission, I discuss with the crews every detail I want to achieve and what is required to get them. I think about everything from the position of the sun, the formation of the jets before their movements and where and how they have to move. I already have the final picture in mind but the art is to get all of the aircraft positioned so that the image happens. At the debrief when the pilots say "We never did that before" I know my shots will be spectacular.

How do you describe your style?

My style is simple – to try and catch images in the air like the striking box art paintings of the Airfix kits back in the 1970s!

What makes the Eurofighter Typhoon a good subject for your work?

The Eurofighter Typhoon is my number one jet for aerial photography. It is fast and highly manoeuvrable. From the formation splitting, in a very short time, the whole flight is able to reform together ready for the next photo set-up. Due to its raw power that also goes for formation loops, when I want to catch pictures in the vertical or while going over the top.

Where have your images been published?

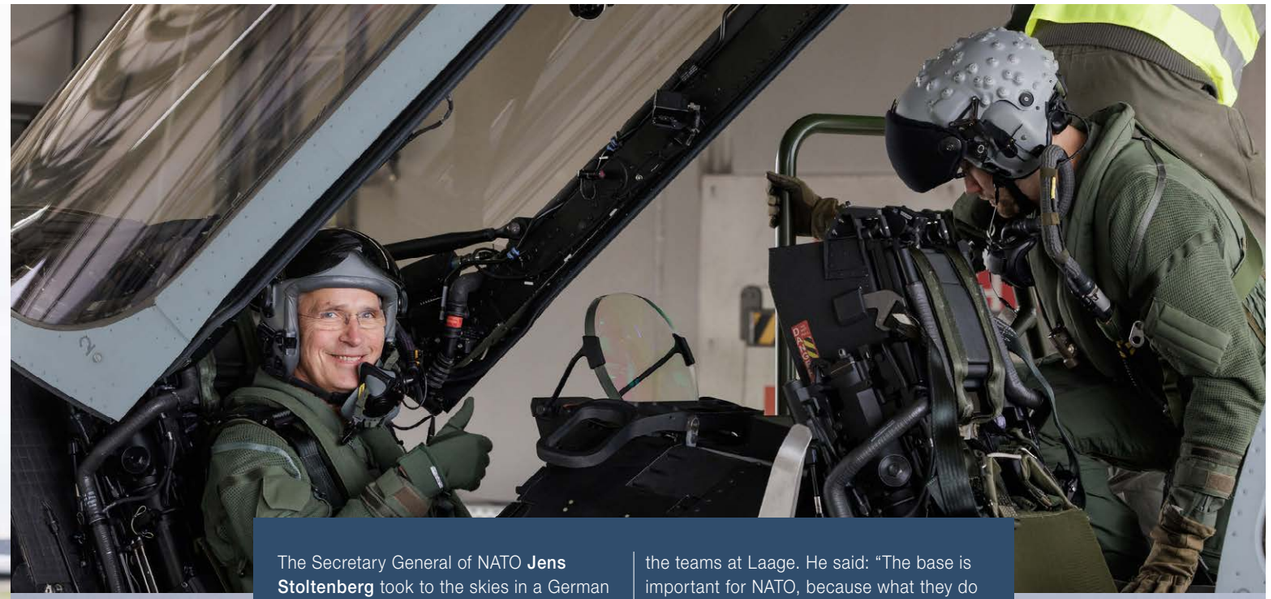
My work has been published all around the world including in Japan, the UK and the US. My proudest moment was covering the first visit of Israeli jet fighters to Germany in 2020 when I took a picture of the historical fly-by of a mixed formation of Israeli F-16s and German Eurofighters at the concentration camp memorial at Dachau. Next day it was used on the front page of every Israeli newspaper as well as in many German newspapers.

Where has the work taken you?

While my work is based in Germany I mostly have covered the Luftwaffe all over Europe as well as the likes of Sheppard Air Force Base in Texas, Goose Bay in Canada, and Decimomannu in Sardinia. ■

NATO Secretary General takes Eurofighter Flight

NATO Secretary General Jens Stoltenberg with Major Mark Härtel.



The Secretary General of NATO **Jens Stoltenberg** took to the skies in a German Eurofighter as part of his visit to the 73 Tactical Air Wing at Laage Air Base in Germany.

Mr Stoltenberg described the flight as a great experience and praised the work of the teams at Laage. He said: “The base is important for NATO, because what they do from here is to educate the best pilots in the world and also support the different air policing missions, which is important in a more challenging security environment.”

Eurofighter Expert

I've never had a day when I didn't want to go to work.

From being a regular at Farnborough Air Show to shaping aircraft that will be flown by future generations, **Jen Richley** has a true passion for aerospace.

"Your first flight in a fighter jet never leaves you," says Jen Richley, who joined Eurofighter in October 2023 on a three-year secondment, becoming Operational Factors Manager in front-end development. "It's exciting and fun, but a lot of training has led you to that point."

Growing up close to Farnborough in the UK, which is home to the world-famous Air Show, and with two parents in the aerospace industry, there was perhaps never much doubt about Jen's career path.

She joined the RAF in 2001, aged 19, spending 11 years flying the Tornado F3, including three frontline tours.

Passionate about sharing her love for aerospace, she now speaks to young people about pursuing similar careers, so she has often recalled that first flight.

"I vividly remember lining up on the end of the runway," she says. "The throttle went up and the brakes released and I started accelerating. It's exciting and momentous every time, and then you're airborne and straight into work because you have a job to do.

"Monday morning is just Monday morning. But I've never had a day when I didn't want to go to work."

Leaving the RAF in 2012, she gained an Open University degree in economics and mathematical sciences while working for DSTL on projects around unmanned systems and swarming. She next became electronic warfare officer at Cobham Aviation Services, flying Falcon 20 and providing operational readiness training for UK, NATO and international customers, with a focus on jamming, comms jamming and radar.

"I've been lucky to have an amazing career that's taken me all over the world," says Jen. She's had four tours to the Falkland Islands as well as work in the US, Finland, Denmark, Lithuania, Cyprus, Oman. A highlight was going to Lithuania in 2004. "It was with the NATO Baltic air policing operation," she says. "I was on my first operational tour, and it was a really terrific opportunity to go and see somewhere different and to be on the NATO frontline."

Jen joined BAE Systems in 2019, teaching in the Typhoon simulator at RAF Coningsby and latterly as an aircrew advisor specialising in fast jet mission planning.

It's a career that has neatly come full circle, returning to one of the people who has been her inspiration. "My dad is a private pilot and aeronautical engineer," Jen says. "He worked on Typhoon in the early days of wind tunnel models in the 1980s, so he sparked my love of aviation. He's always been an excellent sounding board, full of clever, considered opinions so I have always enjoyed being able to discuss my work with him. My mum works in defence and aerospace, too, on air weapons – it's great to have your parents as an inspiration."

Her latest role as one of two operational factors managers (the other being her husband), is described broadly by Jen as being "the voice of the operator across the business". She works on the development of the aircraft and future requirements that will map out how Typhoon is developed all the way to 2060.

She is equally as enthusiastic about the impact she can have on the aircraft, providing that end-user focus, as she is about the role enabling her to give her three children the travel opportunities she had.

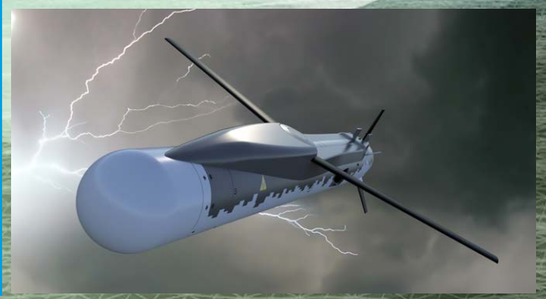
"Eurofighter is the company that makes Typhoon happen so it's great to be a part of the organisation that oversees everything, rather than small parts of it," she says. "This is where you see everything and that's interesting to me. This week I've been involved in discussions with pilots from Germany, Italy, Spain and the UK, but sometimes I spend time with the marketing team, and I've also been doing some workshops as part of the mentoring scheme at Eurofighter."

It's a fantastic journey that perhaps took flight as a regular visitor to Farnborough Air Show as a child, and Jen is inspired by the chance to impact future generations.

"The world has changed massively in 20 years, so to think how the world of air operations might change next year and over the next 20 years, makes this a really exciting space to work in," she says. ■

The Growing Importance of Electronic Warfare

With the battlespace becoming increasingly contested and congested, the importance of Electronic Warfare (EW) grows. But what do we mean when we talk about EW and why does it matter?
We speak to former fast jet pilot **Jen Richley** who today works as Eurofighter's Operational Factors Manager to find out more.



What do we mean by Electronic Warfare?

Electronic Warfare is a term perhaps not as easily understood outside specialist communities, but it's becoming increasingly important.

The world is more connected than ever before – and that can make us vulnerable. Think about how the smartphone in your pocket talks to the watch on your wrist or how your smart home device communicates with the lights in your living room. The same applies to the military space.

There are sensors and connections in everything we do, giving us a shared operational picture that expands beyond an aircraft to the troops on the ground, the ships and submarines. While it gives us fantastic insight and strengthens our abilities, it also creates a large target for hostile operators to exploit what we're doing.

Is EW a new thing?

No. Communicating via the electromagnetic (EM) spectrum has always been an integral part of how any aircraft is used. The spectrum is made up of all types of EM radiation, from visible light and radio waves to infrared light, ultraviolet light, X-rays and gamma rays.

Electronic Warfare is everything that can be done to ensure friendly use of the electromagnetic spectrum while stopping the enemy from using it themselves. A simple example is you want to use your radio, but your enemy wants to use the radiowaves as well. Electronic Warfare is used to stop them from using your radiowaves, but also to stop them from stopping you from using your radio.

So in simple terms what does EW look like?

There are three types of EW – Electronic Attack, Electronic Protection and Electronic Support.

1. Electronic Attack.

This is what we do to reduce the effectiveness of how the enemy is trying to use the spectrum. Are there hostile radio frequencies I need to jam, are hostile weapons being employed – it's all about the things we use that seek to stop hostile use of the spectrum.

2. Electronic Protection.

This is how we protect ourselves against what an opposition force might do to us. That might be how we design our radars so they are not susceptible to jamming or using decoys to present a more seductive target.

3. Electronic Support.

This enables the other two. This involves getting information about the hostile signals using radio or certain radars that allow the operator to make decisions about how they will continue.

Am I going to shoot at them, are they going to shoot at me? It's time-critical and technical and provides information about what they're doing, which then leads on to the other two.

Have we reached the ultimate in EW?

It's an ever-evolving landscape and there's a constant need to be innovative. In effect, we are in an EW arms race as technologies progress.

Radar technology is advancing all the time and, of course, the physical methods we can use on an aircraft are determined by the size of the aircraft itself – you can't fit something the size of a tank onto an aircraft.

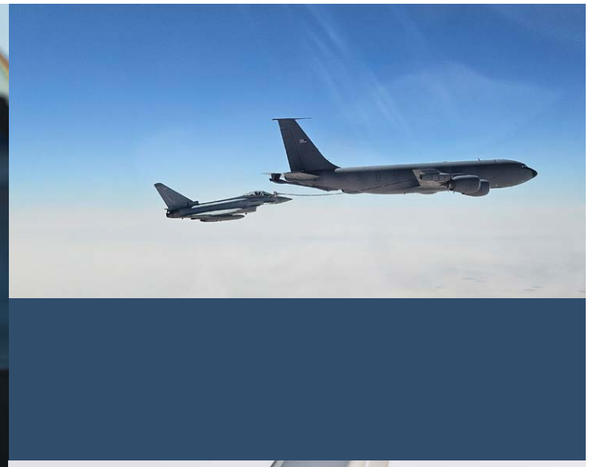
Does Eurofighter have good EW credentials?

The Typhoon has excellent EW credentials in self-protection, with a suite of detection, identification and classification systems, and a broad range of countermeasures across the spectrum. German Parliamentary budgetary approval has also recently been granted to develop a version of Typhoon specifically for Electronic Combat (the EF EK).

This is a really exciting development for Eurofighter, including a new transmitter location and self-protection system, and integrating the AARGM anti-radiation missile.

These developments include cutting-edge technology, such as AI analysis of signals to determine appropriate self-protection measures, to provide a first-class capability that strengthens and augments Typhoon's strong operational base. ■

A Tale of VICTORY



Eurofighter Typhoon from RAF's (Fighter) Squadron took part in **Spears of Victory** — a multi-national air training exercise organised by the Royal Saudi Air Force in the Kingdom of Saudi Arabia.

During the exercise — which is smaller in scale but similar in complexity to the US-led Red Flag exercise — the RAF Typhoons flew daily sorties.

In total over 60 aircraft took part, including Eurofighter Typhoons, Tornados and F-15s from the host Royal Saudi Air Force. The Royal Air Force of Oman was also represented flying their Typhoon.

In addition, there were squadrons from Pakistan, Greece, the UAE and France, while the US supported the action by providing Air to Air Refuelling capability.

During the sorties, the pilots conducted air operations against a simulated adversary. They carried out a wide range of training missions including, defensive counter-air and offensive counter-air operations, as well as air interdiction training against both live and simulated threats.

The exercise required a large training area and the King Abdulaziz Air Base, Dhahran, located near the Gulf coast in Saudi's east was ideal, providing a training area covering around 300 sq km.

RAF Squadron Leader Hodgkinson, the UK Detachment Commander, said: "This was an extremely important training opportunity for everyone who deployed. Both for the force enablers who had the opportunity to work alongside strategic partners in the region as well as the fighter pilots who were carrying out the missions. The pilots and aircrew on this multinational exercise were able to build relationships through shared experiences." ■

Fighting Fit at 50

The Unique World of Multi-Unit Albacete Air Base.

Colonel Ignacio Zulueta

"We strongly believe that its capabilities will help us maintain national security for many years to come."

THE UNIQUE WORLD OF MULTI-UNIT ALBACETE AIR BASE

Spanish Air and Space Force Colonel Ignacio Zulueta's office at Albacete Air Base is normal in every respect but for two things. The first is the doorway that leads up to the air traffic control tower directly above his office. The second is the view from his balcony. It's incredible — every aircraft enthusiast's dream.

From there Colonel Zulueta can look out across the base's extensive runway – the balcony is at the midpoint. It's perfect for viewing the work of the ALA 14 Wing in their Eurofighter Typhoon jets. It's a window into a distinctive world.

"This is a unique base because of the three different units that we have here," says Colonel Zulueta, who still flies each week.

"We have ALA 14 Wing, which celebrates its 50th anniversary this year, the Eurofighter air defence wing. Then, we have the Maestranza, which is responsible for the overhaul and deep maintenance of all our fighter jets, including Eurofighter and F-18, as well as various training and logistics aircraft.

"The third unit is the Tactical Leadership Programme (TLP). Normally a small unit, they conduct huge flying courses four times a year when the base receives around 40 visiting fighter jets and around 1,000 people."

Centrally located on the Iberian Peninsula, Albacete benefits from being both close to the capital, Madrid, but also from having an airspace that offers pilots a huge training area.

"There are no civilian airways above us so this is the main training area," says Colonel Zulueta. "We just have to take off and start the training mission. You don't lose any power or fuel travelling to the training areas. That's also why the TLP is here.

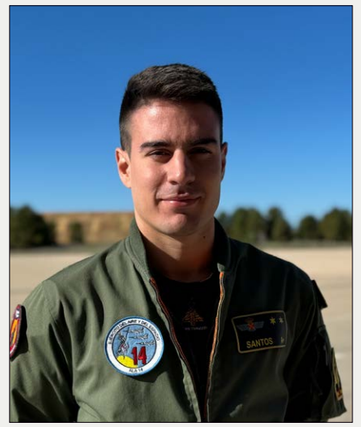
"We are in the middle of the peninsula, so it's very easy for us to reach any point of the airspace that Spain is responsible for — we can go anywhere we need to very fast.

"Eurofighter is the backbone of the Spanish Air and Space Force and it is the backbone of the NATO alliance here in Europe. It's an exceptional aircraft that allows us to do our job. It's capable of intervening in any kind of mission or operation and it can operate alongside other nations."

ALWAYS ON ALERT

ALA 14 is always busy. For example, during our visit five aircraft were in Romania on deployment, but their primary focus is Quick Reaction Alert (QRA). Pilots and crews are on 24/7 duty, 365 days a year, primed and ready to respond to any request from NATO.

Eurofighter pilot Lieutenant Alejandro Fernández Santos says: "Our main goal is to protect the Spanish airspace, so we dedicate a lot of resources to the QRA missions. We have a building next to the runway, with two planes always ready to take off."



Eurofighter pilot Lieutenant Alejandro Fernández Santos

He agrees that the aircraft is ideal for this work. "Eurofighter's thrust-to-weight ratio and its facility to gain energy is just awesome. It can reach speeds of up to Mach 2, which is great for a fighter. It can also carry a large payload. That all means we can carry out a wide range of missions — both air-to-air and air-to-ground. It's easy to change from one to the other in the same aircraft."

Lieutenant Santos says that flying is relatively straightforward because of Eurofighter's carefree handling system. This allows the pilot to concentrate on the mission — managing all the different sensors and making sense of the information that comes their way.

He's also excited about the future direction of the aircraft. He says: "Eurofighter is a relatively new aircraft and still in development. We strongly believe that its capabilities will help us maintain national security for many years to come. Even now projects are being carried out by industry to improve capability further — like, for example, the new radar. We are very excited about the future."

After completing his five-year military training at the national academy, Lieutenant Santos selected Albacete and has no regrets: "I wanted to fly the Eurofighter and here at Albacete we have the most up-to-date version of the aircraft. The best part of living here for me is the work. I think we have amazing personnel in general, and the aircraft is great."

And with the 50th-anniversary celebrations being in 2024 for ALA 14 it is going to be a year to remember for Lieutenant Santos and his colleagues. →

TEAM SUPPORT

Of course, while the pilots and their aircraft always attract a lot of attention, there is a whole team of people behind the scenes working hard to ensure they can carry out their missions and training flights.

In the maintenance hangar, Lieutenant Pablo Eusa López de Murillas explains that after each flight the aircraft are checked over and any issues are addressed.

"In addition to these checks, there are planned period inspections for each aircraft depending on flying hours or time. Some things are checked every few months and we have inspections after 200, 400, 500, 600, 800 flying hours. Each inspection requires several tasks to be performed on the aircraft.

"Eurofighter has a lot of advantages because of the design concept. Almost every part of the aircraft can be removed easily and exchanged for another part, which is a good way to work because it's very fast and very easy to fix certain things."

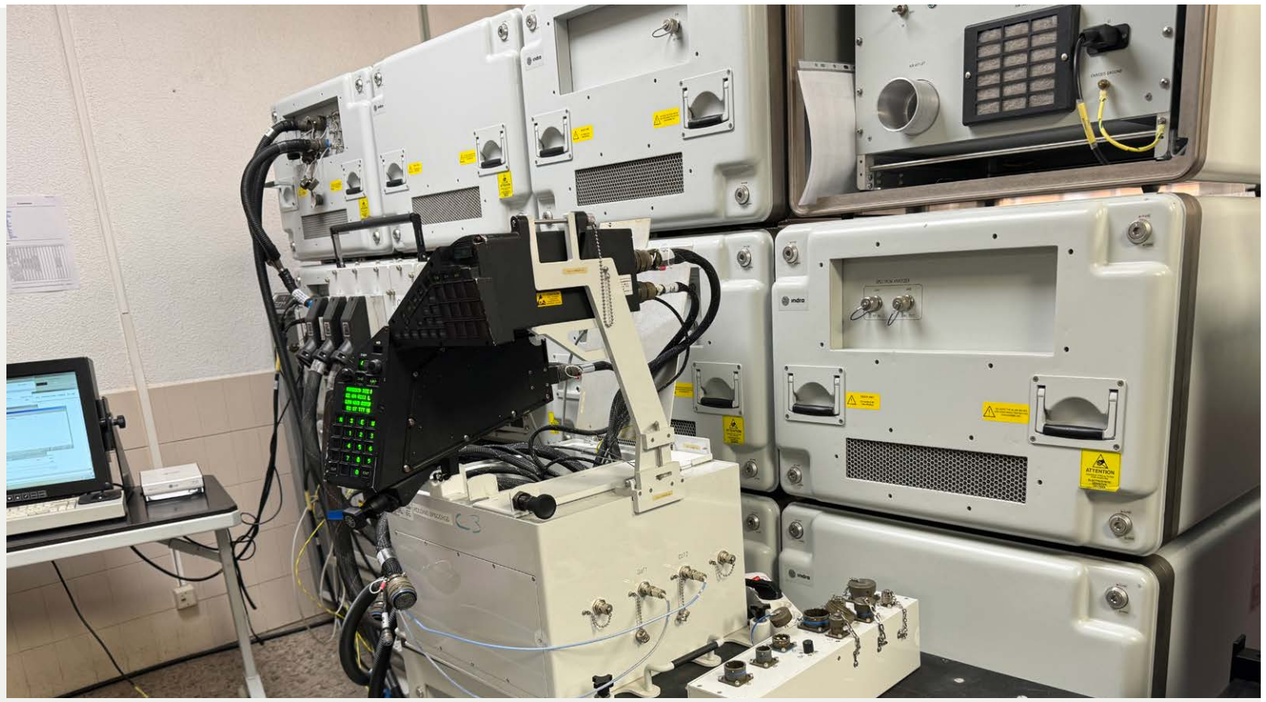
Lieutenant Pablo Eusa López de Murillas

Pablo says that even a large component like an engine can be removed relatively easily in a matter of hours.

Pablo, who studied for a degree in aeronautical engineering, says the team often talk with other engineers at Moron and the wider Eurofighter community. "We exchange information between nations and discuss common problems. You may have a question and someone else already had the solution before so it is good to have forums like the European Air Group. Working together like this, with the Germans, Italians and UK engineers, maximises your knowledge."

The unique mix of units makes Albacete a special base – it also makes for a unique blend of military and industry people. It's a common model across the Spanish Air and Space Force.

Colonel Zulueta says: "We have a lot of engineers from the industry here and many work side by side with our military people. That's beneficial because it is easier to solve issues when they arise if you can talk directly to the people who design the systems."



INDUSTRY PARTNERS STANDING BY

A perfect illustration of this approach is the team from Indra, which provides support for the team at an electronic workshop.

Indra, a Spanish company with a global footprint, is the second-largest supplier of avionics systems for the Eurofighter Typhoon. At Albacete, it has had a team directly involved in helping the maintenance teams improve availability levels with a unique support model for more than a decade.

Jose Vicente Ruiperez Angulo, who was Indra's Head of the Eurofighter Support Programme for over 10 years, says: "We have created a support model with our customer (the Spanish Air and Space Force) that was designed to reduce the number of pieces of equipment that were being sent for repair.

The programme has been successful in analysing failures and reducing the number of equipment repairs required off base.

"We have learned over time and increased the numbers of engineers involved. We now have around 30 people at both Albacete and Moron Air Bases and we are constantly innovating the solutions. It's important to be working side by side with the customer because it allows you to have all the information you need to provide the right solution."

Lieutenant Pablo agrees: "Sometimes our reality means we have to do things differently. That's why it is important to have people right here on the ground to see how things work day to day."

Getting to the right solution for Indra includes developing specific tools and systems like Orion, which can load software on aircraft without the maintainers having to power up the aircraft. The team are also using AI and machine learning to analyse over 6,000 hours of flying to learn more about how the different pieces of equipment wear over time and develop a predictive approach.

This team approach is a theme echoed by the Base Commander. Colonel Zulueta says: "Eurofighter is a European project. It is good for us in Spain and good for Europe too.

"We have to stick together, we have to collaborate and we have to follow this road.

"Eurofighter is the base of the defence industry, not only in Spain but in Germany and the UK too."

That's a good base to build on. ■

"Eurofighter is the backbone of the Spanish Air and Space Force and it is the backbone of the NATO alliance here in Europe. It's an exceptional aircraft that allows us to do our job. It's capable of intervening in any kind of mission or operation and it can operate alongside other nations."

A European Success

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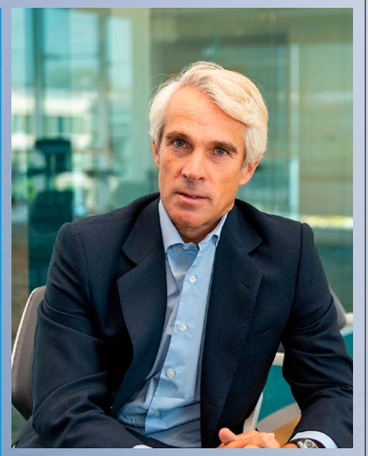


Borja Ochoa
Managing Director
Indra Defence

When you see the Eurofighter Typhoon fly vertically into the sky, engines glowing on full reheat, it is easy to be amazed by the power, the speed and the noise. But beneath the skin, the aircraft is a complex inter-connected body made up of 1,000s of high tech systems — large and small. In some cases, incredibly small!

At Indra's facility in Torrejón, east of Madrid, a team of engineers works in special clean rooms making tiny circuit boards. The hand-crafted miniatures they produce are used in the aircraft's radar systems. The boards are the size of a fingernail. They are made using gold, which is one of the most effective elements for connectivity.

It takes real skill, the precision of surgeons, to put these delicate pieces of the Eurofighter jigsaw in place.

Indra's involvement with the Eurofighter programme goes back more than two decades. It works as a valued partner with a whole host of Eurofighter suppliers on different aspects of the programme.

Indra is one of Eurofighter's main avionics systems suppliers. It plays a key role in the development and production of all the aircraft's systems — from sensors and communications, to weapons systems. Its input is key to both the performance of the aircraft and its survivability and overall mission success.

It has contributed to the development of the Captor radar and the Praetorian DASS system — the fighter's vital defensive aid package. Indra's work also includes work on the communications system, the flight control and navigation system, and the test benches that monitor the platform's health to ensure maximum operability. And in another facility close to Madrid's international airport a team is working on the simulation systems on which pilots are trained.

Indra's Defence managing director, **Borja Ochoa**, explains: "Indra is the second-largest supplier of avionics systems for the Eurofighter Typhoon.

"We are proud that we can say we are are one of the main companies involved in the evolution of the self-protection system and the development of the two new versions of the radar, once again highlighting the company's ability to accelerate the development of the new generation of technologies that European armed forces are demanding."

EUROFIGHTER OPENS DOORS

Today, Indra is working on the MK1 E-SCAN radar, with Hensoldt (which will be used by Germany and Spain), and the MK2 radar, with Leonardo to be used by the United Kingdom. It is also contributing to the development of the new capabilities of the Praetorian DASS. These provide it with greater bandwidth, which will enable Typhoon to fly in increasingly hostile environments.

Borja says involvement in the Eurofighter programme has been an important stepping stone in the growth of the Company. Participation has given Indra a platform to show off its technical capabilities and build credibility in the industry.

"Indra has been part of the Eurofighter programme since its inception," he says. "Today we have the confidence of our partners and the different Air Forces that operate with it. We have demonstrated a great capacity to face the most demanding technological challenges and to meet deadlines. In doing so, we have contributed to the development of one of the most advanced multi-role aircraft in the world.

"Our collaboration with our European partners has yielded great results, but above all it has prepared us to tackle together new, even greater challenges that no company or country could face alone.

"In this sense, I believe that the Eurofighter programme goes beyond the development of the fighter itself and has laid the foundations for jointly tackling new European technology programme.

"Our work on Eurofighter has also opened the doors to customers all over the world."

PRIDE IN THE BADGE

A global technology business, with a presence in 140 countries, Indra employs more than 58,000 people. Around 500 of these are directly involved in different Eurofighter projects. That figure is more than 3,000 when you factor in the broader network of external companies Indra works with. But the impact of Indra's involvement in the Eurofighter programme is probably more profound than those numbers suggest.

Borja says: "Eurofighter has provided us with knowledge and experience of enormous value and has contributed to the development of the aeronautical industry in Spain. At the same time, it has strengthened our position to compete worldwide with leading companies.

"It is also important to highlight the pride we all feel in being part of this programme generates. It is very satisfying for us to be working on the development of an aircraft like this, which incorporates the most advanced technologies, collaborating with professionals from other countries who are undoubtedly the best in their areas of specialisation.

"Many of our engineers have dedicated large periods of their professional careers to this programme. And have done so with an enormous level of commitment."

FUTURE IS BRIGHT

Looking to the future, Spain has shown great commitment to the Eurofighter programme through the Halcon programme. 20 new Eurofighters will replace the F18s at the Gando air base in the Canary Islands. A second Halcon phase is under discussion.

Says Borja: "Halcon demonstrates our country's commitment to the Eurofighter →

programme. Halcon is key to the evolution of the platform and the entire Eurofighter family will benefit from it.

"For example, we are currently equipping the new Eurofighters with state-of-the-art technologies. They will be equipped with the new E-Scan active electronic scanning radar and the Praetorian DASS self-protection system, as well as incorporating improvements in another 15 additional avionics devices that affect communications, cockpit survival, consumables monitoring and platform health management.

"In parallel, Indra is also part of the Quadriga program to deliver 38 new Eurofighters equipped with the most advanced systems to the German Ministry of Defence.

"These acquisitions make it clear that the Eurofighter will remain, well into this century, the main aircraft of the world's most modern air forces and that is why it is so important that we ensure that its capabilities remain up to the challenge. Moreover, the improvements we are making send an important message to the international marketplace that improves our chances of winning future contracts."

A recent independent report published by PwC revealed the impressive scale of the Eurofighter Typhoon programme's contribution to economies across Europe. It shows that the programme is helping create and sustain skills, is sparking the development of key technologies and has been the catalyst for the growth of a wide variety of companies. The Indra example brings the report to life.

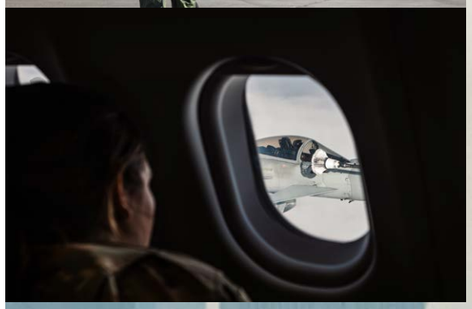
The PwC report shows that, for the next decade, the programme is set to contribute €58 billion to the GDP of the four core nations' economies; generate tax revenues of €14 billion for the respective governments; and support 62,700 jobs annually.

Behind the big numbers are 100s of other companies who work to support the programme. ■

indra

- The Eurofighter programme will cumulatively secure 26,000 jobs in Spain until 2060.
- During its life cycle, the manufacturing phase (2020-2030) and maintenance phase (2023-2060) of the Halcon and Quadriga programmes will create on average 657 jobs - direct, indirect and induced - per year.
- It will reach a total of 26,000 positions by 2060 - which equates to a total annual employment impact of 2.7% direct jobs in the Spanish aerospace sector.
- Indra allocates 9% of the company's sales to innovation each year. Over the past six years, we have spent more than 1.6 billion euros on innovation, and more than 4.1 billion euros since 2000.

Source: 2023 PricewaterhouseCoopers (PWC) study on the economic impact of the 'Halcon' and 'Quadriga' contracts on Spain



The ACE in the Pack

This wasn't just to extend the trip for the sake of it. It is part of the RAF's Agile Combat Employment (ACE) thinking. Almost every exercise it now conducts has an element of ACE in it – all of which is designed to give the force greater flexibility on how, when and where it deploys from.

That's why straight after Red Flag instead of returning to their home base the UK detachment relocated from Nellis to March Air Reserve Base in California, about a 30-minute flight or four-hour drive away.

"You can't expect to operate your high-end aircraft from a home base because they're going to be a target for long-range weapons," explains Tom Raeburn, a 6 Squadron pilot, who was part of the deployment from RAF Lossiemouth.

The 'hop' from Nellis to March represented another iteration of ACE. But it wasn't just a switch of airfield — the whole exercise took on a different complexion. Red Flag consisted of long planning days followed by short but intense sorties. This was the opposite.

Says Tom, "We operated a complex long-distance scenario flying 500 miles out into the Pacific and then had to fight our way back towards the coast. All the US squadrons we were exercising with dispersed as well, so were operating from six different airfields along the West Coast. From the command and control to the airspace battle managers, everyone had to coordinate a very complex plan from a distance.

"At March we only had a couple of hours to plan and then we were airborne for several hours. That's probably more realistic of a high-end war-fighting scenario.

"As an exercise the second phase was massive and we were a tiny component. Not only did you have 50 to 60 aircraft airborne every day and every night, but you also had the US Carrier Strike Group, submarines, and surface ships involved. As an individual operator on Typhoon, you get less from that, but the whole picture fits together in more of a realistic war-fighting scenario."

Adds Tom, "The reporting that comes out from this is the first major iteration of it will be interesting. It will inform what we do down the line for our Agile Combat Employment in the UK."

At BAE Systems, the Typhoon Training Facility at RAF Coningsby also plays its part in getting the pilots prepared for their exercises, including the ACE elements, thanks to the work they do in the flight simulation.

"In the month before 3(F) Squadron went to Red Flag, we facilitated a lot of training," explains David Hake, BAE Systems' Aircrew Simulation Instructor. "For example, we were able to develop a comms guide and replicate what the Nellis Air Traffic Control would sound like. The simulators have also got a geographical database which meant we were able to put the guys in and out of the base." ■

Red Flag is tough. A gruelling two-week combat air exercise that's one of the largest and most intense in the world. But in 2024 it got even tougher for the Typhoon crews from the UK RAF's 3(F) Squadron from RAF Coningsby. Not only did they face two weeks of demanding daily sorties at the Nellis Air Force Base, but when they'd completed that phase it was straight to California for round two.

How Eurofighter Tackles Drone Attacks

Former RAF Pilot **Mike Sutton** led 1(Fighter) Squadron during combat operations over Syria and Iraq. He's also the author of the best-selling book 'TYPHOON'. Here Mike explains how the aircraft is used in drone attacks.

What do we mean by drone warfare?

RAF Typhoons generated headlines around the world this year with their critical role in countering the unprecedented Iranian mass drone attack on Israel. The swing role pedigree of the jet was plain to see: switching mission sets from air policing and reconnaissance to blasting Iranian drones out of the sky. Albeit, this mission was on a larger scale, it echoed a previous task in Syria where Typhoons were re-roled from close air support to shoot down a drone posing a threat to friendly troops.

Drone warfare invariably captures the public imagination, its automation embodying one of the more chilling aspects of modern military technology. Yet the term 'drone' captures a huge spectrum of capabilities — from tiny systems equipped with miniature cameras, to highly automated missiles with limited human interaction. In seeking a definition, the lines are blurred.

The Iranian Shahed drones are comparatively cheap to make, requiring components that can escape sanction and can be produced and fired en-masse. Together with faster cruise missiles, they are all essentially airborne targets that can be destroyed with sufficient combat firepower.

What are the demands on the pilot?

In theory, the air interception process is something with which fighter pilots will be very familiar. Long-range radar controllers provide information about the air tracks to the pilots, who can then conduct an intercept, acquire them on their radars and helmet-mounted sighting systems and blast them out of the sky.

In practice ,it can be more challenging. Drones can fly low, and have small radar cross-sections, making them difficult to acquire with radars.

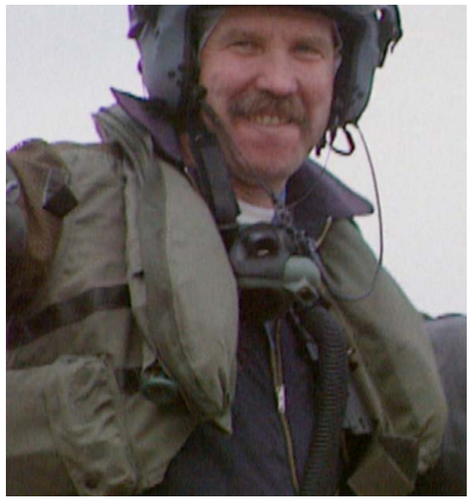
What are the main challenges?

Fighters are limited in number, and mass drone attacks can provide problems of scale and saturation; notwithstanding issues of associated cost. It is expensive to use a high-performance missile to knock out a cheap drone. Should we develop a low-cost anti-drone option in the form of high explosive cannon rounds, cheaper multi-launch missile pods or directed energy weapons? To financiers, the cost per kill is important. To add to the complexity, some high-tech systems also pose greater challenges: they fly too fast and high to counter with traditional air-to-air missiles. Flying into space and hurtling towards earth at supersonic speeds then, as now, is a threat that requires a seriously capable air defence system. ■

30 YEARS YOUNG

The 30th anniversary of the maiden flight of the first Eurofighter development aircraft, DA1, was celebrated earlier this year.

DA1 flying over Bavaria, Germany on a test flight with test pilot C Worning in the cockpit



Peter Weger emerging from the cockpit after his maiden flight

The 30th anniversary of the maiden flight of the first Eurofighter development aircraft, DA1 was celebrated earlier this year.

The flight took place at DASA (now Airbus) in Manching on 27 March, 1994. **Peter Weger**, the company's chief test pilot, made the historic flight in the prototype aircraft which had Rolls Royce Spey engines, rather than the EJ200 engines which were adopted later in the development.

Crowds gathered at DASA's site in Manching to witness aviation history being made as DA1 took off. The aircraft — with the 98+29 serial number — was flown in a restricted envelope with limits on the speed and the angle of turn.

Eurofighter CEO **Giancarlo Mezzanatto** said: "The 30th anniversary is a special landmark and while, we rightly celebrate the people who dedicated their careers to creating an incredible aircraft we can also look forward with excitement. The aircraft they helped develop continues to go from strength to strength. That is their legacy.

"Eurofighter Typhoon has established itself as the backbone of European defence and a fundamental asset for our air forces. At the same time, the Eurofighter programme has played a pivotal role in fostering the fighter industry in the UK, Germany, Italy and Spain and will continue to do so for many years. The product vision is to keep Typhoon operationally effective for another 30 to 40 years."

DA1 aircraft remained in service, aiding the early development programme, until 2005 — a full 11 years on from its first flight. It is now on display at the Flugwerft Schleißheim in Munich. ■

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nothing comes close