EUROFIGHTER

PROGRAMME NEWS & FEATURES
AUGUST 2021

WORLD

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- RAF Display Pilot
- Finland Campaign update

NATO Air Policing Mission in the Black Sea Region

Spanish and UK Eurofighter jets deployed to Romania

Eurofighter Typhoon

Cover: Photo © Picasa

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Editorial

Welcome

Welcome to this latest edition of Eurofighter World. It's one that truly shines a light on the work of the men and women who operate the aircraft on a daily basis.

While the global Covid-19 pandemic has had a considerable impact on all our lives over the past 18 months, the drumbeat of activity for our armed forces has continued at pace. I think you get a real flavour of what that means in this copy of Eurofighter World.

First up we have two articles looking at the work of the Spanish Air Force and UK RAF, who have both been deployed to Romania in 2021 to head up the NATO Air Policing missions in the Black Sea region. Our report gives an inside view from both air forces to understand what it is like to be on operational duty at the Mihail Kogalniceanu Air Base.

We also take a look at a unique partnership between the Qatar Emiri Air Force and UK RAF, who together established a joint squadron— 12 Squadron — ahead of the Qatar Emiri Air Force taking delivery of its first Eurofighter Typhoon aircraft next year.

And, in a feature called What Makes a Fighter Pilot, we discuss with former RAF pilot Glynn Gogerty and Christian "Eazy" Scharnetzky of the German Air Force, about the demands of the role and the skills required. It's a frank and honest insight that underscores the dedication and professionalism required.

Furthermore, we are given an expert view of the Praetorian Defensive Aids Sub-System (DASS) and what it provides to the aircraft and we take a look at how the Eurofighter Typhoon's UK production line is being transformed through the introduction of new technology.

When you reflect on the articles across the magazine, it's clear that the Eurofighter programme continues to go from strength to strength — thanks in a large part to the men and women who serve our nations.

I hope you enjoy the read,

Herman Claesen
CEO
Eurofighter Jagdflugzeug GmbH

GOODBYE AND HELLO

You're looking at a collectors' item. After many successful years, this edition of Eurofighter World will be the last, as we have decided to end the regular print run of the magazine.
The decision to end the print version magazine supports Eurofighter's overall commitment to reduce the carbon footprint as we commit to the right measures wherever practical.
However, our world.eurofighter.com website will continue with regular updates. Here we will keep you up to date with all the latest news and exclusive features.

You'll also be able to stay in touch through our social media channels — LinkedIn, Twitter, Instagram and Facebook. And, from time to time, we will produce one-off special printed magazines to celebrate key milestones and events.
Our mission to bring you a unique look at the world of Eurofighter Typhoon remains undimmed. We will still be looking at the latest technology updates, talking to the engineers behind them and giving you matchless access to the pilots and air forces who fly Typhoon.

Air Policing:

Ejército del Aire Completes NATO Mission in Romania

At the beginning of February Spanish Eurofighter jets deployed to Romania for the first time to head up the NATO Air Policing mission in the Black Sea region. Eurofighter World talked the Ejército del Aire personnel at Mihail Kogalniceanu Air Base about their two month-long mission.

"At that moment everything happens very fast," said a Major Alfredo Jiménez Díez-Canseco, a Spanish Eurofighter pilot who served in Romania. "During the alarms the planes are ready to go and we pilots remain equipped for the duration of our shift. When the horn sounds the heart races, but it is not the time to think about what we are going to find, there is no time for that. The planes must be in the air quickly and for that we can only comply with the procedures for which we have been trained. In that moment of tension you only think about accomplishing your mission."

Within minutes of being alerted, two of the grey painted Eurofighters pulled out of their temporary shelters on the flight line of Mihail Kogalniceanu Air Base, →

near the Romanian city of Constanta. Then the distinctive roar of the EJ200 engines rises as the jets race down the runway and into the air. They then turn east to investigate an unidentified aircraft that had been detected acting suspiciously by ground radar. Hours later the jets were back at base and the pilots handed them over to the ground crews to get them ready for action again.

"When you go out on a mission you feel an intense emotion and a great satisfaction for knowing that you will be able to apply what you have trained extensively," said Major Díez-Canseco. "It is nothing more than giving meaning to all the effort invested in years of training and preparation. Afterwards there will be time to analyze and discuss feelings and emotions."

Personnel from the Ejército del Aire's 11 Wing or ALA detachment told Eurofighter World that the air policing mission in Romania in itself was not new. Many had participated in a NATO air policing deployment to Lithuania in 2018 or stood quick reaction alert (QRA) duty back at home at Morón Air Base near Seville in southern Spain. The Black Sea theatre of operations, however, is new to them.

NATO launched its enhanced Air Policing mission in the Black Sea region in response to growing tension after the Russian occupation of the Crimea in 2014. Importance of the mission could be gauged by the presence along the ramp from the 11 Wing's hangars of a contingent of US Army Apache helicopter gunships. Other allied aircraft are regular visitors to the base for exercises to show solidarity with Romania.

José said: "Most of these were Russian Su-30 military aircraft that were flying without transponder signals or flight plans, and were not in contact with civilian Air Traffic Control. My aircrew conducted their alert missions professionally under the tactical control of the Romanian Control and Reporting Centre. They shadowed the Russian aircraft demonstrating NATO's ability to quickly respond to situations arising near Alliance air space," he added. The Russian aircraft invariably headed for home after being intercepted by the Spanish Eurofighters.

"In order for the Eurofighters to operate here, a large team of personnel on the ground is needed to make flying possible," said Captain José Manuel Martínez Álvarez. "Teamwork is essential to get the aircraft into the air, and even more so in a state of readiness, where Eurofighters are capable of being in the air in less than 15 minutes. The mission is not just about the pilots, it takes a good team of ground personnel working effectively, and a high degree of coordination is required. Only by working together are we able to get out on QRA fast and safe."

The Spanish airmen, however, have no doubt that they have the right aircraft for their Romanian task. "We can proudly say that the Eurofighter is the ideal aircraft for this type of mission," said Captain Álvarez. "Its high manoeuvrability, its high power and the exceptional capacity of its →

Ejército del Aire Euofighters were scrambled several times to investigate suspicious air activity over the Black Sea.

sensors make the Eurofighter the perfect platform to carry out Air Policing missions. With this platform, we are able to fly higher, faster and farther than others. This, together with the cockpit symbology, the great capabilities of the radar and the integration of the rest of the aircraft's sensors make our mission very easy to accomplish. A piece of cake!"

The Ejército del Aire took over the Air Policing mission on 1st February and since then have had two jets ready 24 hours a day to perform any QRA missions assigned to them from NATO's southern Combined Air Operations Centre (CAOC) at Torrejón in Spain.

The QRA sorties are only activated by the CAOC after the NATO Air Defence System detects an unidentified trace or air traffic behaving abnormally. In these situations the QRA aircraft are ordered to intercept and identify the track acting according to International Civil Aviation Organization regulations.

"Our mission is similar to the one performed by these aircraft at our home base in Seville," said Captain Álvarez. "At home we perform the Air Policing mission guarding and protecting the southwest border of Europe, while on this occasion we are defending the southeast border.
The rules of engagement here are the same as those applied in Spain and even the means with which they work are the same. The only aspect that changes is the operating environment."

The deployment of the six Spanish fighter jets and around 130 support personnel to this new NATO mission is sign that Madrid is strongly committed to alliance collective defence and international security. "With this mission the Spanish Eurofighters are not only safeguarding the territorial sovereignty of Romania, but they are also protecting the European borders to →

The Spanish airmen praised the support they had received from their Romanian hosts as "outstanding."

guarantee the security of Europe," said Lieutenant Colonel Medel. "This deployment reaffirms the bonds of union between Spain and Romania, and shows Spain's firm commitment to International Security.

The Spanish airmen praised the support they had received from their Romanian hosts as "outstanding." "Our Romanian friends and allies have a good Air Force capable of safeguarding the sovereignty of the Romanian airspace and defending its borders," Lieutenant Colonel Medel told Eurofighter World. "However, the high capabilities of the Eurofighter are widely valued and appreciated. Our Romanian colleagues also share this vision of the Eurofighter."

The deployment involves six aircraft and the Spanish officers involved in planning the mission to Romania described it as a "very complex" bringing together operations, maintenance, force support, logistics, financial management, health care and the area of networks and communications elements. "This involved a high degree of planning, a great deal of coordination between units and institutions both at national and international level, even governments," said Major Díez-Canseco. "The specific conditions of this mission are somewhat different due to the COVID-19 pandemic, however, all necessary precautions are being taken and established procedures are being applied to prevent the spread of the disease." ■

Tiger Earns New Stripes

On May 5, 2021, Germany's Tactical Air Force Squadron 74 celebrated its 60th birthday. And to mark this landmark anniversary the Bavarian Tigers, who are based in the squadron, have unveiled a specially-painted Eurofighter.

The makeover is the work of designer Alexander Hamm from Neuburg.

The Bavarian Tigers were founded on March 18, 2013, by members of Taktisches Luftwaffegeschwader 74 (TaktLwG 74) and have been a full member of the NATO Tiger Association since May 17, 2016.

The association, which was formed in the 1960s, originally consisted exclusively of NATO flying units with a feline predator on their crest. Over time, smaller, comradely meetings and joint training sessions evolved into one of the Northern Alliance's largest air combat exercises: the annual NATO Tiger Meet.

After the German Air Force disbanded the fighter-bomber squadron 321 from Lagerlechfeld, the two Neuburg squadrons continued the Tiger tradition. Since becoming members, the squadron from Bavaria has had access to one of the highest-quality exercises in the world.

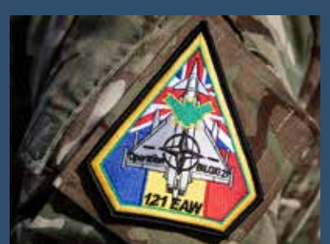
The latest Bavarian Tiger is the Neuburg team's seventh and it's the second time that Alexander Hamm been asked to design one of the Tigers. ■

Supersonic over the Black Sea

An inside look at NATO Air Policing

Eurofighter Typhoon jets from RAF Lossiemouth are operating in Romania as part of the UK's NATO Air Policing mission Operation #BILOXI.
Our EXCLUSIVE story looks in detail at this first major operation for IX(B) Squadron as a Typhoon unit.

Wing Commander Simon Batt



Photos:

"When the QRA alarm sounds and we are scrambled, your mind becomes completely focused," says Batt.

"With potentially hostile aircraft travelling at over 500 mph it is imperative that we can react quickly, and this is where our jet comes into its own," says Eurofighter Typhoon pilot Wing Commander Simon Batt.

"We can be airborne in a matter of minutes and then the raw performance allows us to rapidly climb to height and intercept the threat at supersonic speeds. The raw power and performance have always been phenomenal — flying the Typhoon still puts a smile on my face.

"Air Policing is all about securing the skies and reacting to threats immediately, wherever they are," says Batt, who commands the UK Royal Air Force's IX (Bomber) Squadron. "We could be called to intercept an airliner in trouble or meet a military threat anywhere within UK or NATO airspace. The avionic system and sensor fusion allow us to have excellent situational awareness of all the civilian traffic, airspace constraints, cooperating aircraft — such as an air-to-air refuelling tanker or other fighters — and target aircraft at all times."

In April 2021, Batt led his squadron to Mihail Kogalniceanu Air Base in Romania to stand 24/7 Quick Reaction Alert (QRA) duty with their Typhoon jets. This is the first mission to Romania for IX (B) Squadron, which only achieved Initial Operating Capability with their Typhoons three months earlier.

2021 is the 60th year of NATO Air Policing and the missions centre around having fighter jets ready to be scrambled in response to suspicious air activity close to NATO airspace. "When the QRA alarm sounds and we are scrambled, your mind becomes completely focused," says Batt. "The pilot and engineers sprint to the aircraft and rapidly get the Typhoon started and airborne. There is a myriad of checks to be done and the whole team need to work in concert to ensure we can get airborne safely and quickly. In some ways we are operating in a very similar way to a Formula 1 pit crew.

"Once airborne you are immediately assessing the tactical situation: what is the threat, what could its intent be, where is the aircraft(s) of interest, what are the weather conditions, what civilian or military traffic could be in the way. Working alongside the ground-based battlespace manager, our job is to intercept the target aircraft as quickly as possible, without endangering other airspace users."

QRA missions are, he says something of an emotional rollercoaster, with periods of intense and rapid activity, mixed with times of relative calm and long transits.
"As soon as the alarm goes you are sprinting to the aircraft, and the adrenalin kicks in. The heart rate jumps but once you reach the aircraft your training takes over and you are completely focused on the task at hand. It is only after you have completed the mission that you have time to reflect on what you have just done. I always get an immense sense of satisfaction after a QRA mission, knowing the combined effort of the whole team has once again delivered and maintained the air deterrence 24/7."

→

"It is a vital mission for the UK and NATO, allowing us to demonstrate our combined resolve and interoperability at all levels," says Batt.

WE ARE THE FINAL LINKS IN A LONG DEFENSIVE CHAIN

The Black Sea is a highly active theatre of operations. NATO also routinely stages deterrent exercises in the region which involves Romania-based air policing units. Batt says a particularly memorable mission involved escorting two US Air Force bombers.

"It was a particular pleasure to be able to escort two USAF B-52 Stratofortress bombers across Romanian airspace, literally watching them depart in the sunset," he says. "The interoperability we have achieved with our NATO allies across the spectrum of our activities is truly remarkable. We have seamlessly integrated with air, maritime and land forces from Romania, Hungary, Italy, Spain and the United States to name a few."

RAF tactics and procedures are NATO-aligned and so the air policing mission in Romania is very similar to UK QRA duty. "The only real difference is the airspace we fly in," says Batt. "We therefore fly training missions to familiarise the pilots with the operating area ahead of any QRA missions."

"As the pilot, we are the final link in a long defensive chain of people and units. Our job is to intercept the target aircraft as quickly and efficiently as possible. We can then positively identify the aircraft and monitor its behaviour. We feed all this information back to our command chain so that they have the full tactical picture and can make informed decisions. The command chain has feeds and information from other sources that they can piece together to get a fuller picture of the situation; as a pilot we can only really see what is happening in our particular area."

QRA duty is not all action. Batt stresses that discipline and patience as events unfold is just as important as quick reactions. "At times we may be held on Combat Air Patrol for hours waiting to see if a threat penetrates our Flight Information Region — a piece of defined airspace that a NATO country or air force looks after."

IX(B) Squadron is the RAF's newest Typhoon unit, which formally stood up at RAF Lossiemouth in April 2019 to be the service's dedicated QRA and aggressor squadron. In this role, the squadrons' pilots simulate threat aircraft during training missions and fly against other RAF and allied units.

A VITAL MISSION FOR NATO

NATO has been contributing to the enhanced Air Policing (eAP) of Romanian airspace since the 2014 Crimea crisis and the alliance decided additional assurance measures were required to protect its members on its eastern flank. IX(B) Squadron's mission is the third time the RAF has deployed to Mihail Kogalniceanu Air Base, near the port city of Constanta, for the air policing mission. Around 60 personnel from IX(B) Squadron are part of a larger 180 strong RAF contingent, under the umbrella of 121 Expeditionary Air Wing.

"It is a vital mission for the UK and NATO, allowing us to demonstrate our combined resolve and interoperability at all levels," says Batt. "This is the first time IX(B) Squadron has deployed to Romania and we are thrilled to be here and supporting our NATO allies. Romania is a key NATO ally and we are proud of what we have achieved together. Security of the Black Sea Region is of paramount importance to both the UK and the Alliance. Operation Biloxi highlights the UK's continued commitment to the Alliance and the region, assuring our allies and deterring any aggression."

During its mission to Romania the RAF will host a contingent of German Luftwaffe Typhoons at Mihail Kogalniceanu Air Base for joint exercises. "They are deploying their Typhoons for a couple of weeks and we will be supporting each other, with RAF and Luftwaffe engineers working alongside each other and on each other's aircraft," Batt says. "This is only possible due to the alignment of our policies and procedures, which is made possible in part by the NATO alliance."

The IX (B) Squadron pilot says that standing up a QRA detachment far from their home base is a major test of the RAF's logistical capabilities.

"It is safe to say that deploying anywhere that requires a lot of equipment and personnel is challenging, but as an air force it is what we are trained to do and I think we do it well," said says. "To give you an idea of the scale of the task: so far we have moved over 200 RAF Regular and Reservist personnel; four Typhoons; 35 specialist airfield support vehicles and equipment; and 72 tonnes of freight including 130 computers for use across multiple systems. All of these assets have been transported over thousands of miles to Romania from the UK by a combination of road, sea and air moves."

Batt says planning for these movements commenced months ahead of the deployment, to ensure that the RAF contingent was fully prepared and able to operate effectively from the off. "It is a real team effort, with logisticians, engineers, pilots, police and human resources experts (to name just a few), who all have to plan and deliver together to ensure that the mission can be executed effectively," he said. "If one part of the team's preparations fails, then the whole mission can be put in jeopardy; that's how reliant we are on each other to do our jobs and do them well."

"This deployment also provides a brilliant opportunity for the Squadron and Expeditionary Air Wing to develop as a formed unit," says Batt. "We have been drawn together from units across the RAF and UK. Living and working together in such close proximity is a great opportunity to learn about each other's jobs and to see how we all contribute to the delivery of air power. Within the current COVID-19 limitations, it is also amazing to be able to see a bit of this beautiful country and enjoy the local hospitality. We are only 12 miles from Constanta on the Black Sea coast, so this area has a lot to offer."

"I am pleased to say that for Operation Biloxi all the planning, preparation and hard work paid off. We were flying training missions less than 48 hours after our Typhoons arrived in Romania and completed NATO accreditation on time."

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BUILDING STRONG AND LASTING RELATIONSHIPS

IX (B) Squadron's deployment to Romania has also seen growing co-operation with their host's air force and its has been conducting joint training for close air support with the Romanian Joint Terminal Attack Controllers and the MiG-21 Lancer pilots from 861st Combat Aviation Squadron.

"These training opportunities are invaluable to develop our tactics, align our procedures, and most importantly build strong and lasting relationships," says Batt. "As we are all part of NATO, we all use common standards and procedures. This makes it very easy to operate with and train alongside our allies. By working together, we deliver a more resilient and effective defensive network for the benefit of all."

The Romanians have been welcoming and helpful says Batt. "What is great is how we can work together and complement each other's strengths to provide a much more effective defensive system overall."

"Deployments like this are a brilliant opportunity to develop and hone our skills, train alongside our allies and strengthen the bonds we have with our NATO partners. The variety of missions we fly is fantastic. As well as delivering QRA and escort missions, such as with the USAF B-52 Stratofortress Bombers, we are doing close air support, helicopter support training and dissimilar air combat, where we practice air combat manoeuvres with another aircraft."

Summing up the mission, Batt stresses the importance of all the RAF contingent working together. "This is a bit of a cliché, but we need the whole team to work effectively," he says. "We hold QRA 24/7 and so we need the caterers and support teams to keep us fed and warm; our communications engineers and battle space managers produce and publish the recognised air picture. Force Protection provided by the RAF Regiment whilst we are here in Romania keeps us safe; the operations team update us with the weather and other aircraft movements; logistics personnel provide fuel and weapons; our engineers keep the aircraft primed and ready to go and the supporting ground equipment operational; and finally the pilots are there ready to fly. All of this is maintained 24/7 so that we can launch at a moment's notice to meet any threat.

The whole team works together to ensure we can get airborne in the fastest possible time, day or night, whatever the weather. In this job time is everything; when you are travelling at over 500 miles an hour every second counts." ■

"What is great is how we can work together and complement each other's strengths to provide a much more effective defensive system overall."

About this image:

The photo was taken during a training flight with the Italian Air Force's IX Squadron of the 4 ° Stormo of Grosseto. It was part of a Blue vs Red mission. Francesco describes it as his favourite Eurofighter image.

Francesco Militello Mirto

Photo-journalist Francesco has more than190 flying hours on 44 different types military aircraft — both helicopters and jets, and has been to Afghanistan twice. Francesco started collaborating with photo agencies, such as ANSA images, NurPhoto Agency about 8 years ago. For about two years he devoted his time to local journalism telling stories from his Palermo Sicily home via Zuma Press and LaPresse. Today he is the editor of EmmeReports.it.

What makes a Fighter Pilot

GLYN GOGERTY

Squadron Leader

In this series we get under the skin of the Eurofighter Typhoon fighter pilots and try to understand the demands of the role and the skills required.

After joining the RAF in 1999 Glyn Gogerty went on to have an impressive 21-year career in the force, chalking up a number of Eurofighter Typhoon firsts.

Tell us about your RAF career?

I joined the Royal Air Force in 1999 and my first assignment was in 2003 flying Jaguars. Three years later I started conversion training to Typhoon at RAF Coningsby, joining the newly-reconstituted XI Sqn. Later I became a Qualified Weapons Instructor on 3(F) Sqn then joined the Typhoon Force Standards and Evaluation team, formulating and publishing Tactics, Techniques and Procedures (TTPs).

In 2012, I became Flight Commander on the Typhoon Test and Evaluation Squadron and in 2015, I became a student at the Empire Test Pilots' School (ETPS) where I conducted live assessments on 17 different aircraft. After graduating, I moved back to the Typhoon TES as the Development Test Flight Commander. In 2017, I moved overseas on an exchange posting with the US Air Force (USAF) as an F-16 Operational Test Pilot at Nellis AFB, Las Vegas. After retiring from the RAF in 2020, I joined the BAE Systems Flight Ops Team. My current role, embedded with the RAF Typhoon TES, is to be a conduit between the company and the RAF.

How many Eurofighter Typhoon flying hours have you?

I have 1150 hours on Typhoon. The remainder of my approximately 2300 hours is split between a number of types.

What's your operational experience?

In March 2011 I flew the RAF's first ever Typhoon combat mission, patrolling the no-fly zone over Libya as part of the NATO Operation UNIFIED PROTECTOR. I flew a number of missions in that campaign, both supporting the no-fly zone and conducting pre-planned and dynamic Air-to-Surface strikes. I have also conducted Air Policing missions in the Falkland Islands, and have spent many days on Quick Reaction Alert (QRA) in the UK.

What are key attributes you need to become one of the elite?

First and foremost, I'd say luck. Many of those who apply will not get the chance for any other number of reasons like being too tall or near-sighted. Once you are in the door, then luck plays a part all the way through.

If you are lucky enough to be given the chance, you need to be dedicated, hard- working and studious, but one other key attribute is to be adaptable; able to absorb, retain and internalise information and techniques quickly. Hand-eye coordination, spatial awareness, and rapid mental dead- reckoning are very important skills. Another key attribute is an element of stubborness and perseverance — a 'never give up' attitude. Finally teamwork. Once you're on a course, the mutual support of your course-mates is vital. →

Did you ever contemplate failing to make the grade?

Constantly. In fact, I still worry about that now, even though my military career is over. Throughout flying training I always had a fear that at any point my chosen career path would be shut.

Is there any truth in the Hollywood stereotypes?

Not that I've ever seen. Everybody is different but with very few exceptions the pilots I have worked with have been humble and self-deprecating. As for the Top Gun stereotype of being chiseled and buff, while a certain level of fitness is required, it should be focused on maintaining a level of G-tolerance and protecting the areas of your body that are subject to the most stress, which in Typhoon is your neck.

What are the pressures like?

You might think that once you'd completed training and arrived on a squadron, the pressures would go away, but that's not the case. Once you've arrived, you need to perform a work-up to become Combat Ready, then after a period of consolidation it's into work-ups for Pairs Leader, Air Combat Leader, 4-ship leader, and then probably some level of Instructor qualification.

The pressure of being on operations will be different for everyone, and is obviously dependent on the operation. A former colleague who flew in the first Gulf War told me they were launching on missions they didn't expect to return. I can't imagine the pressure they were under then.

My experience was much less dramatic, as the danger was far less, however, there were still feelings of nerves before each mission. Additionally, when you are tasked to employ weapons operationally, there are so many things to be considered which add additional pressure. Training and familiarity with the Rules of Engagement and other orders help.

What's the difference between an average pilot and a leading fighter pilot?

I have worked with some truly exceptional fighter pilots. In Basic Fighter Manoeuvres (BFM – Dogfighting at close range), pilots must be able to recognise and react to situations, while manoeuvring their own aircraft accurately, and understanding what the opposing aircraft is doing. Some pilots have an ability to do this naturally and with split-second timing. They are then able to completely recall what happened for the debrief.

Beyond this, what separates the best fighter pilots is their capacity outside their cockpit. At the top end, the best pilots are the ones who can be effective Mission Commanders. This needs you to have a full understanding of what the mission is, what phase you're in, and where everybody needs to be at any one time. All this, while still doing everything you need to do in your own cockpit. The capacity and situational awareness to see and deal with the bigger picture is what makes a leading fighter pilot.

What skills do you need?

At a basic level, hand-eye coordination, spatial awareness and mental dead-reckoning skills are vital for getting through flying training. Then the ability to multi-task becomes important.

For example, the ability to hear and process auditory inputs (such as radio calls or warning sounds) while also conducting more visual tasks on cockpit displays is vital. As such, one vital skill is the ability to prioritise actions in real-time.

Whenever I'm asked by parents or school-kids how to become a fighter pilot, I always say "get good at video games" as the skills gaming gives you, learning complex control schemes and interpreting complicated displays, are key to a 21st century fighter pilot.

How do you balance being a fighter pilot and a personal life?

It is very difficult, and almost out of your control. In the time I was on a front-line squadron, I found it impossible to plan a social life. Even something as simple as going out for dinner couldn't be planned a day in advance.

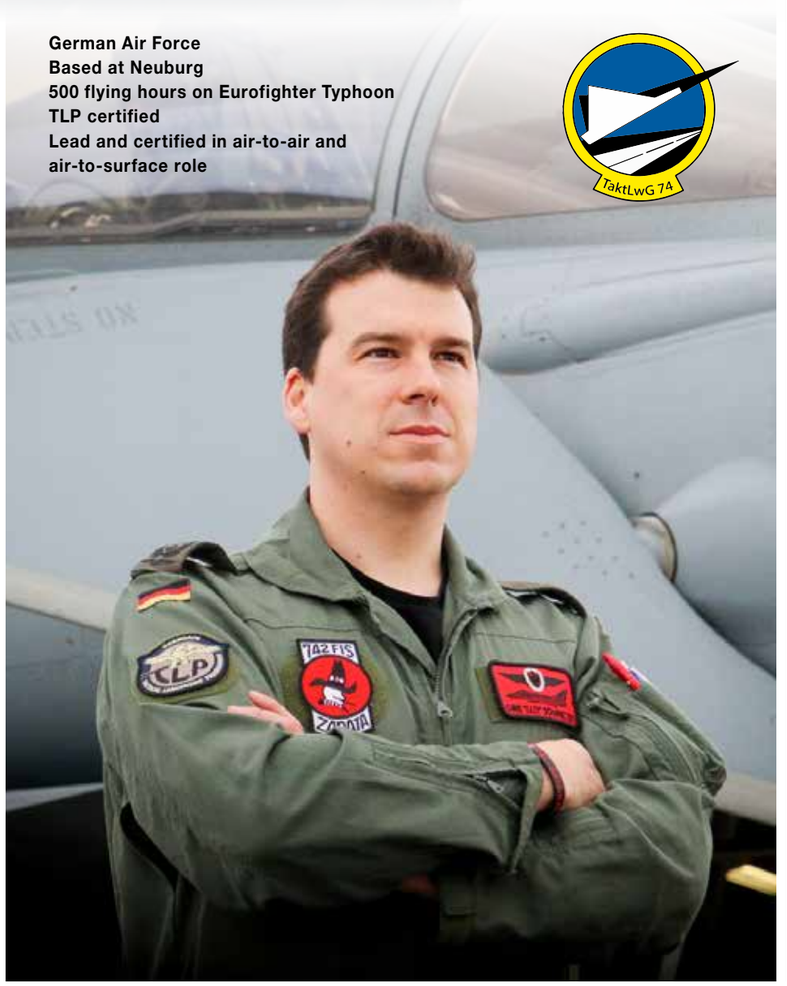
Detachments and deployments are measured in months these days, so it's not uncommon for pilots to spend over half the year away from home. For a single person this may not be so bad. The excitement of fast jet flying and overseas travel might well outweigh the missed opportunities for a home life. However, as pilots get older, getting married and having children, then the balance tends to swing the other way.

Do you think your experience as a fighter pilot has influenced the person you are today?

I don't think it has changed my personality, as I feel that I am still the same awkward, nerdy kid I was when I joined the RAF. However, it did give me the skills to be more confident, and to be much more of a critical and analytical thinker. ■

CHRISTIAN "EAZY" SCHARNETZKY

German Air Force
Based at Neuburg
500 flying hours on Eurofighter Typhoon
TLP certified
Lead and certified in air-to-air and air-to-surface role



What inspired you to be a fighter pilot?

I'm from a region in Germany called Allgäu. There was a fighter bomber wing close by and as a kid I remember hearing the aircraft flying overhead and thinking that would be a very cool job.

Later my two sisters happened to find work in the city where the fighter wing was located. In fact, they both went on to marry pilots from the base, which made it very easy for me to ask more and more questions about the job.

My brothers-in-law really brought me into the flying world. As a teenager they took me to an open day, and I still have a picture of me sitting in a Tornado simulator from that day. They also took me to a couple of social events, and I really liked the community — the living and working together — on the wings.

Getting to know them and their work cemented my desire to be a pilot. When my brothers-in-law realised how keen I was they gave me all the information I needed, I was even able to shadow them for a couple of days.

How did you then turn that dream into reality?

I read everything I could about what the Bundeswehr expects from a fighter pilot. And I tried to become that exact person.

At college, I chose sports and physics for my majors because I figured that a mathematical or physics background would help me and a great physical fitness is obviously a prerequisite for that calling.

I was incredibly determined. Then, a year before finishing up college, I got word from the German armed forces that they would hire me. Of course, you can never →

take for granted that you will achieve your goal until you actually sit in the Eurofighter. It's the same even when you are flying the Eurofighter. You have to keep on working to keep the job, to stay on the cutting edge of the business.

I started basic training in Bavaria six days after I left school. After that, I went to Officer School for about a year and then to the University of the Federal Armed Forces in Munich. I elected to study aerospace engineering — my decision back in college finally paid off – and I finished up with a degree in aerospace engineering in 2009. During that time, I elected to try to improve my English by going to the University of Arizona in Tucson for my diploma thesis.

When was the first time you actually got inside a cockpit?

A year after I finished university. I joined a pre-test squadron before going over to the Euro-NATO pilot training in Texas for academic practice, survival and centrifuge training. From there I went to Goodyear, Arizona, close to Phoenix. which is where you actually get to fly an aircraft the first time by yourself – in a Grob 120.

I remember it clearly. The first time you are alone in your aircraft your mind is like 'OK, hopefully I studied everything.' When the instructor got out, he gave me a pat on the shoulder saying, 'You've got this, brother.' I was very excited. But then I flipped a mental switch to focus on the procedures and the techniques I needed. Right from take-off I functioned like a well programmed machine and the first time I took a step back and realised 'Hey, this is actually easy and fun' was ten minutes into that solo-flight. That night I promised myself I would always take the time for those easy and fun moments during every flight and never take privilege of enjoying it for granted.

That focus has been the same throughout the last ten years. Every time I do something new that focus kicks in. It's always exciting to do something the first time but focus is really important.

When the air force carries out their assessment of potential pilots, they do a psychological evaluation to see if you have the correct mindset for flying fast jets. When you look at the pilots in my squadron, I think that 'focus' is a key feature they're looking for. Mental attitude is the most important thing, because you can overcome drawbacks in G-sustainability, for example. It is more about the assertiveness of your character. I think the reason why they put you through all the training is to figure out who has the right attitude, the drive, and who is really committed to the job.

Training never stops. And if you stop trying to be better than you were the day before, then I guess you stop trying to be a good pilot.

Was the training character-building?

You do about 30 hours in the Grob 120 before going on to fast jet pilot training in Sheppard Air Force Base in North Texas. For the first six months or 100 hours you're in the Texan II and then you step up to the T-38. You earn your wings after about 12 months. In that time, you learn to fly the aircraft, fly in formation with another aircraft and do the baby steps of tactical employment — like low-level flying and manoeuvring in a tactical formation.

Once you earn your wings you think you made it, but obviously the training never stops. That's the story of your life until you retire. I went on to the Introduction to Fighter Fundamentals in the T-38 Talon learning about the tactical employment of a jet you already know by then.

Those three months were really character building. Right there they check if you have what it takes and show you what will be expected of you for the rest of your career in the fighter community.

Within the first 15 months, if you haven't experienced any kind of setback in your performance, you will experience it later. Everybody struggles at some point. Everybody. What they put you through in those 15 months in Texas is important because you will need it later in your career.

Later in your life it might be paramount that you know how to deal with setbacks. When you're flying your Eurofighter and find something isn't how it should be in a mission, or performance-wise you're not at your best, or you find different threats from what you were expecting, you need to be able to cope. If you allowed these drawbacks to disturb you so that you were not able to fulfil your mission, that would be unacceptable at best and could cost your life at worst. Mentally we have to be prepared to fight in wartime and have that ability to compartmentalise and think 'Well, this didn't go as I wanted it to, but I have to get over it and get my next steps done'. That focus will save your life.

Did you return to Germany at this stage?

Normally I would have gone back to do my qualification on my chosen aircraft — either a Tornado or a Eurofighter. You don't select them, the instructor pilots get together, to draw a picture of your character, your performance, your abilities, and come up with the best role you would fit into.

But I did not go right to the Eurofighter because there was opportunity to stay in the United States as an instructor pilot in the undergraduate pilot training programme. Obviously, since childhood I wanted to fly Eurofighters so part of me wanted to go directly there but, after taking advice from my brothers-in-law and my mentor-IP in ENJJPT, I volunteered for the instructor

role. As it turned out this was a really good experience for me and the advice I received was excellent. I would make the same decision in a heartbeat.

In 2012 I started my stint as a First Assigned Instructor Pilot (FAIP). You go right out of training and into the role as an instructor amongst other pilots, same age. Suddenly, you have to be the responsible guy in the aircraft and instruct students who are barely younger than you. You also have to live up to the standards and expectations you put onto your students each day and take pride in the character-building process during their training.

For me, that was the most intense evolution of my flying career. I went from flying an aircraft solo for the first time in October 2010 – when I was in the 'Look at me, I'm not dying' phase, to December 2012 when I was actually starting to teach people not to kill themselves!

Coming back to Germany in December 2015 my bag of tricks as an aviator was pretty full. I had seen a lot of things in those three years, which I have been able to capitalise on ever since. I was able to focus far more on getting the mission done correctly.

When you left the States, where did you go to next?

I went straight to Neuburg in December 2015 where I'm stationed today, though I'm soon to be transferred to Ingolstadt to join the test squadron. In the summer of 2016, I started flying the Eurofighter at Laage and by February 2017, I had completed the initial training and returned to Neuburg Airbase as a mission capable pilot air-to-air. Today I'm a combat ready Four-Ship Flight Lead air-to-air and I completed combat readiness training air-to-surface, so I can use the Eurofighter in its swing role capacity.

In total right now I have completed around 1,700 hundred flying hours, about 500 on the Eurofighter and about 1,000 as an instructor pilot on the T-38.

What do you remember of your first Eurofighter flight?

It felt exactly the same as the very first solo ride, but 1,000 times cooler because the thrust-to-weight ratio of the Eurofighter is second to none. The first time you hit the afterburners and take off with the nose high into the sky it feels like you just launched a rocket towards the moon. It really was the best experience ever.

The three years as an instructor pilot were very fulfilling but being alone in an aircraft, where you don't have to talk to another guy, it's just you and that incredibly powerful aircraft, was a lot of fun.

What do you think are the key personal attributes you need to get to the top?

Definitely assertiveness about fulfilling your personal goals, and striving to be the best is one. The fighter pilot world is a competitive environment. Everyone here in Neuburg shares that strong Band of Brothers mentality and we are there for each other every day. But the second we start flying there's a competitive edge. You want to be the best of the best in your squadron. You want to be driving the mission, succeeding the best way possible.

I would also say being accountable for your own actions is another key attribute. Reliability and integrity are very important too because if you are not a reliable guy you will not survive in this community. Dealing with pressure is key too. All these tools will make you a very good pilot and help you focus on succeeding.

Do these things help or hinder in day-to-day life?

You can take off the flight suit, but you cannot get the pilot out of the person. When I drive home, I'm a dad with my kids and my family. But the default way you tackle things, is always with the fighter pilot mentality. I'm always assertive and if I want to get something done, I get it done. I will figure out a way, the best way to do it. You can never just turn that switch off.

I would say that fighter pilots are probably interesting people to deal with because of that. If you are part of the solution, they are very easy to work with. If you're part of the challenge, then it's going to be interesting!

What's the key difference between a fighter and commercial pilot, in terms of skillset and mindset?

The common traits are accountability and reliability. The commercial pilot has to take care of 200 passengers and their thought process is more driven by safety. They've also got to think commercially, about operating in an economical way.

While the fighter pilot also always has the safety aspect in mind, they need to weigh up the risks versus benefits in the air in a heartbeat and sometimes make a decision between survival and mission success.

To make mission critical decisions, like, can I proceed into a weapons employment zone of a possible hostile fighter without sacrificing the mission? While the mission in the commercial world is focussed mainly on safety, the fighter pilot sometimes has to put his flight, depending on the mission risk level, in the context of John Wayne's quote: Courage is being scared to death but saddling up anyway.

What are the highlights of your career to date?

Two instances are imprinted on my brain as very good learning experiences. The first was the Arctic Challenge Exercise in Bodø 2019. It's one of the best exercises →

we have on the continent. It was a great deployment with very realistic scenarios for large force employment. We brought a lot of Eurofighters and brothers from Neuburg and Wittmund and we represented Germany very well. For me the best part of that exercise was being able fly in the same COMAO side by side with some of my former students from other nations like Norway and the United States, who I trained during my time in Texas. It was very rewarding to see those personalities succeeding in the fighter world knowing that I was fortunate enough to have been part of the moulding process of those aviators.
The second experience was the Tactical Leadership Programme in Spain. It was a chance to work in the international environment again and also a character-building event.
In it you are amongst 50 highly-trained, very professional military aviators, who all know their weapons systems very well, know their capabilities, know all their and the enemies' tactics, techniques and procedures. I was lucky to be elected as a mission commander for one day.
It was an interesting and rewarding day. You have to know your business — the rules, the numbers, the threat rings, the tactics ... everything. You also have to display in a heartbeat in both verbal and non-verbal ways that you bring exactly the right character attributes with you.
I was the guy who was accountable for the whole COMAO — for all 30-plus aircraft. When you're up in front— the make-it or break-it guy — you have to transmit the integrity that makes a fighter pilot with every word you say. And you need the assertiveness everybody is looking for in every decision you take. You want those warriors to follow your plan in the air, and they only do if they realise you walk the talk already on the ground.

What do you think about the Eurofighter? How would you describe it?
I was trained in an aircraft which was 60-years-old, the T-38. Learning 'how' to fly the aircraft was the most important thing. Going into the Eurofighter flying was not even secondary, it was tertiary because the Eurofighter design is all about carefree handling.
The aircraft pretty much flies itself. You tell it where to go and it will tell you if you get too slow or off track. But at the same time, it will give you a myriad of information that you have to process, prioritise and compartmentalise. You get audible info, with three different stations talking, there are the three displays and the head-up control panel. All the different sensors are fusing into the picture, and all of this is displayed at the same time. The system gives you priority messages from things like the DASS (Defensive Aid Sub-System) or if you've been engaged by a hostile fighter while you are on your mission.
In this instance, you have a split second to make your mind up what to do. Should I shift my attention from, for example, a surface-to-air engagement to air-to-air? You do it in a heartbeat. As a machine, the Eurofighter is excellently designed to help you in that decision process.

The mental and physical demands on your body must be quite exhausting?
Yes, but the equipment like the G-suit is excellent. It helps us to sustain high G-force loads while still being able to concentrate on the thought process. The limiting factor is not so much physical but mental. That's why the selection process is really important. The information has to go through the brain of the pilot, and that has to work under real physical stress.

What's attracted you to your next role as a test pilot?
I love the operational world of the Eurofighter and flying my daily missions but over the last couple of years I'd become very keen to switch over to the test side of the house, which looks at the operational testing of future equipment.
I was lucky because they only look for new test pilots every ten years or so. When the request came I was in the right place at the right time, with the right education and training.
I hope that over the years I remain in service I can actually try to make the lives of future pilots easier with the equipment that is being introduced. I will still be heavily involved with Eurofighter and I'm looking forward to it. It's already a great aircraft, but to make it even better and help the operator to get improvements they need to stay on the cutting edge is what I'm really looking forward to. The Quadriga decision was good news for the Eurofighter and now, with the implementation of the E-Scan radar and new effectors, it will be a very interesting period to be a test pilot.

Do you have any advice you've been given that you'd share for anyone reading this who'd want to follow in your footsteps?
My motto for life might help them. When you're aiming for perfection, it's very easy to fall into a habit of being so focused on the job that you totally forget to enjoy the moments you are airborne — like the first time solo or the first time in the Eurofighter. That's why when I started flying, I set my motto as 'chill and aim for excellence'. I guess that's why they call me 'Eazy' because yes, I'm very focused on the job, but I always make sure to remember the fun part in everything I do, too. ■

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EUROJET CEO Gerhard Bähr sees Bright Future for EJ200

The power behind Eurofighter is the twin EJ200 engines. Each delivers world-class performance for the Eurofighter platform which is one of the reasons why the aircraft is loved by pilots.

“Its handling and flexibility are unrivalled,” says EUROJET CEO Gerhard Bähr. “The feedback we receive from our customers constantly references the unprecedented reliability and high performance of the Eurofighter propulsion system.”

Gerhard’s words are supported by the numbers:

- The total fleet engine flying hours are already above 1.3 million and the leading engine in the fleet now has more than 2,500 flying hours.
- The mean time between the removal is more than 1,200 engine flight hours, which is outstanding for fighter engines.
- The in-flight shut down, based on a 12-month rolling report, is below 0.01 per 1,000 engine flight hours.

“These facts are the reasons why the EJ200 has earned such a tremendous reputation,” says Gerhard, who became CEO of EUROJET in July 2020, after a career with MTU, where most recently he was responsible for the company’s military MRO-and production plant in Erding, Germany.

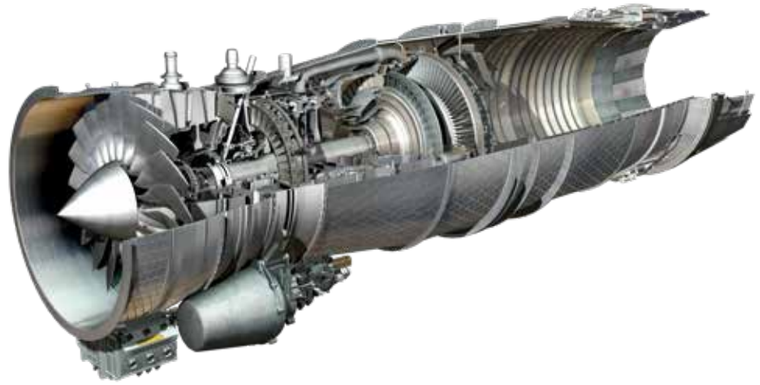
“The engine is ‘the’ benchmark in terms of reliability and performance.”

The third key characteristic that the engine has proved over its time in service is its ease of maintenance. Living with the EJ200 is straightforward for Eurofighter customers, with repairs only required on an ‘on condition’ basis rather than the more typical fixed maintenance schedule used by traditional fighter engines. An in-built health monitoring system gives intelligent focused guidance to the maintainers.

Gerhard says: “With the EJ200 maintainers can be selective because of its 15 fully interchangeable modules. The scope of repair works can be limited to primary and secondary causes. In fact, a number of the modules on the engine can be repaired without the need of a further test run.”

Its compression system combines high-tech aerodynamics to provide the performance, but it is tolerant to Foreign Object Damage (FOD) too. The ‘blisk’ design — the blade and the disk combined — helps makes the EJ200 a very capable, robust engine and one that is more cost efficient to live with than many of its competitors.

It looks destined to stay that way too. Just as there are studies into potential enhancements for the Eurofighter platform, there are closely aligned studies looking at the engine too. These are looking specifically at increasing thrust, reducing fuel consumption, improved life cycle costs and bridging to a future combat air system as a side effect.



“We are closely integrated with Eurofighter,” says Gerhard. “For example, if the aircraft capability enhancements bring new systems and heavier weapons loads it would need more thrust in order to keep the same thrust-to-weight ratio and restore the aircraft’s performance and agility.

“The next generation weapons systems, which are being developed in Europe, will undoubtedly require tomorrow's technology on the engine side. But a capability enhancement of the EJ200 could potentially be a bridge to tomorrow's technologies. Such a long-term evolution of the engine would keep the Eurofighter propulsion system state of the art well into the next decades. This is key for the nations which are already planning to operate this weapon-system beyond the mid of the century.

But Gerhard is clear that the current EJ200 still represents the most modern technology engine. He says: “Because of the way the engine architecture has been designed there is no need to re-invent the EJ200 but there are certain aspects around the engine controls and the engine hardware mechanics where we can insert technology improvements on system level or in specific modules, like a two-parametric nozzle or the Low Pressure Compressor. As it stands today, the EJ200 still represents leading-edge technology keeping the Eurofighter-Typhoon platform a world class European fighter system for existing and potential future customers.”

Gerhard, who started his career as a Development and Test Engineer with MTU and later had a stint in the United States working on various programmes including military programs, became CEO of EUROJET last summer when Europe had already gone into lockdown. He said: “Taking over in the middle of the Covid pandemic restrictions was unusual as 80 percent of my team were working from home. Obviously, it limited business travel to meet customers which isn’t ideal, but it could not be avoided. That said, it’s an exciting time to join the business.” ■

How does Typhoon Handle Climate Extremes?

Typhoon is renowned for its power and performance but – among the men and woman who fly it — it's also got a well-deserved reputation for being one of the most reliable and robust combat aircraft in service.

Flight Lieutenant James Sainty is an experienced Typhoon pilot. Over the past 5 years he has flown at two Red Flag Exercises in Las Vegas, twice deployed on operations in Iraq and Syria, been to the Falklands three times and to Oman twice, for Exercise Magic Carpet. If anyone knows how the aircraft perform in the extreme climate conditions, he does.

"In the Falklands, the weather is actually very similar to the UK. It's just very windy," says Flight Lieutenant Sainty.

"It actually a pleasure to fly Typhoon in a crosswind with its flight control system, all I have to do when I'm coming down to land is ease the rudder in until about 10 feet to go. It's very simple.

"In other aircraft, it's a lot more complicated because of the way the controls work. It's often much more of an art to get them on the ground, whereas with Typhoon it's very easy, very simple.

One of the tensest times he has ever faced in the Typhoon was flying out to Red Flag one year.

"We were flying out of Eglin Air Base in Florida and just joining up with our Voyager transport when we hit some of the biggest thunderstorms that I've ever seen," recalls Flight Lieutenant Sainty. "We had to fly into one of the storms where the turbulence and icing was severe, there was even some lightning in the cloud as well. Luckily none of us got hit by it.

"But the fact was the Typhoon was able to handle that sort of violent turbulence. In fact, we all managed to remain in formation and because of the power of the jet we were able to get through it. The manoeuvrability of the jet showed that day was really quite impressive. We we're all a little bit shaken up by that experience and when we got back on the ground, we were all talking about it." ■

People Said I Would Never Be A Pilot

I Just Ignored Them

Flight Lieutenant **James Sainty** is an experienced Typhoon pilot. Over the past five years he has flown at two Red Flag Exercises in Las Vegas, twice deployed on operations in Iraq and Syria, been to the Falklands three times and to Oman twice, for Exercise Magic Carpet. This year he has been selected as the Typhoon Display Pilot.

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What inspired you to be a pilot?
I wanted to be a pilot after my father took me to Sunderland Air Show when I was nine years old. The whole air show was incredible, but it was the Red Arrows that I enjoyed the most. (Typhoon hadn't come into service at that point.) From that point on I was hooked and my parents encouraged me. When I was 13, I joined the Air Cadets and was part of 242 Cramlington Air Cadets right up until age 18 when I joined the Air Force. As a cadet I got into gliding and joined 645 Squadron Volunteer Gliding Squadron at Topcliffe. I flew a lot, became an instructor and started to teach other cadets. I actually flew solo before I could drive a car!
Throughout school my focus was on one thing — I wanted to fly jets. Initially I wanted to be a Harrier pilot, but when they went out of service, I turned my attention to Typhoon.

How did your early RAF career develop?
I went through initial officer training in 2009 at Cramwell. After graduating I spent time on the 84 Squadron in Cyprus where I was very lucky to get an introduction to flying in the Griffin helicopter. I particularly enjoyed being thrown in the sea as a survivor and getting picked up by the helicopter!
When I returned to the UK, I started my flying training on the Grob Tutor on the 57 Squadron at RAF Wyton. I was then streamed to fast jets on 72 Squadron flying the Tucano. It's there that I got my wings. My next posting was to the University of Southampton Flying Squadron. I was doing the same kind of job I used to do in the glider school but now in the Grob Tutor. From there I joined cohort seven on the Hawk T2 at RAF Valley in 2014. While I was there I linked up with Typhoon HQ for six months, which cemented my ambition to fly the Typhoon. After completion of tactical weapons training, I was streamed to Typhoon in 2015.

Do you have any memories of your first flight in Typhoon?
Yes, my first flight was in a two-seater (today's students do their first flight solo, which is incredible) and I was flying with a pilot called Brucie. When I released the brakes at the end of the runway the aircraft accelerated, I was thinking 'Wow, this is quick'. Then Brucie said 'You still need to select max power'. I was still only at 70 percent. After that it was a bit like in the movie The Fast and the Furious when he presses the nitrogen button, and everything goes blurry. →

So what do you think of the aircraft?
Typhoon is extremely capable. Even in the time I've been on the jet, they've introduced a lot more capability. We've now got Storm Shadow, Brimstone and Paveway IV fully integrated and we've also started flying with Meteor.
In terms of capability, it's a fast jet with phenomenal power, that can carry a lot of bombs and air-to-air weapons. It means you can fight your way in, hit the target and then fight your way out. It's fully swing role now and has really come into its own in the last two or three to four years. It's really impressive.

And from a pilot's perspective, how do you feel about being in the cockpit?
It's very easy to fly because it has to be. We don't have navigators anymore, so the pilot is more of a sensor operator. You don't want to worry about flying the aircraft and thankfully, it's got lots of automated systems that make our life easier. For example, the carefree handling element of the flight control system means I can move the control column into any position, at any speed and the jet physically will not let me overstress it. I can move the throttles with my left hand as much I want, I don't have to think too much about it because I'll never overstress the engines. And the jet will always give me power when I demand it. The engines are very reliable and extremely powerful.

Why do you think Typhoon impresses so much at air shows?
I think it's down to sheer power— it has greater than the one-to-one thrust ratio. It's so light and powerful that you can put the engines into reheat and the aircraft can accelerate vertically, which is an incredible feat.
The ability to pull 9G and combine it with raw speed means that you can keep the display really tight to the crowd lines. You've got the energy you need to be able to pull off manoeuvres very close to the crowd, they get a great view and it's loud.

What is your advice if people are considering joining the Air Force?
The biggest piece of advice I'd give is don't listen to anyone who tells you there's no point or that you might not be able to do it. You never know. Keep believing you can do it and go for it. That's what I did — I had people who said I would never be a pilot. I just ignored them, went for it and did it. Get down to the careers office and tell them what you're interested in. They'll give you advice and a lot of information on how to apply.

What do you think are the key attributes to being a Typhoon pilot?
I think the biggest one is motivation. Flying Typhoon involves a lot of reading, research and learning throughout the seven, eight years it takes to train to be combat ready. During that time, there's a lot of data you've got to learn, plenty of reading material and checklists that you've got to memorise.
And even once you're qualified as a combat ready pilot, it doesn't stop there. Once you're on the Typhoon, there are upgrades to achieve — you can lead a two-ship or a four-ship. Then from there you can get professional qualifications as a flying instructor or a weapons instructor. You're constantly reading the books and learning new things about the aircraft. That's why I'd say motivation is the number one.
Other key attributes you need are fitness and the ability to prioritise. There's a lot going on in the cockpit so that's why prioritisation is important. You've got to be able to manage many different tasks at once and make sure that you're selecting the correct tasks at the right time.
And, of course, it's also physically demanding as the jet can pull 9G and can roll very quickly. The physical effort of pulling 9G on numerous occasions can get quite tiring. The fitter you are, the better able you are to handle those sorts of forces.

What's the aspect of the job that you buzz off the most? What do you like best out of the role that you've chosen?
I particularly like being part of a team, working with the squadron. Away from the display flying I am an instructor and I like seeing the progress students make. I like it when they go flying for the first time and I get to see the smile on their faces when they return and hear them talk about how good it was and how much power the aircraft has. Then later down the line I see them when they are ready to leave the Operational Conversion Unit (OCU) and can see how proficient they have become before they go to the frontline. I get a kick out of that, seeing that they have learned something from the experience that I provide.

One of the most rewarding things is when you deploy on the front lines or on exercise. You then get a chance to work with a highly motivated team.

As a display unit are you part of a huge team?
Yes. We are nothing without the engineers, the logistics people, the suppliers, or the PR team — there is a whole chain of people without whom we would not be able to display. As a display pilot you have to be absolutely aware of the fact, that you are there representing the entire team. And everyone on the team wants to succeed and to produce the display. You're there just to deliver it. Without those key elements, I wouldn't be able to fly.

What are you looking forward to most in the display season?
I'm looking forward to getting out onto the display circuit, meeting the public and promoting the RAF Typhoon force. It's good to think I might inspire the next generation in the way I was as a 9-year-old. I'm also extremely excited to have the opportunity to fly the jet to its limit at low level in front of huge crowds.
I think it will be surreal to fly at the Sunderland Air Show, I'll have to pinch myself, to be honest. When I think back to going to the show with my late father 21 years ago and looking at the Red Arrows, to now be going back in the Typhoon in front of my home crowd — well, it's just a massive privilege.

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Is there a particular aspect of the display you have worked on?
My display will try to showcase the acceleration the jet has from slow to high speed and how much excess power it has. I'll be demonstrating its ability to accelerate from slow speed and combine that with manoeuvres very close to the crowd line. There'll be a lot of noise and hopefully it will be awe-inspiring.

Are there past displays that you've drawn inspiration from or is this very much your fingerprint on it?
There are aspects of a few displays I've used, for example the entrance from the 2016 display, but I have put my own twist on. There are also a couple of aspects from Jim Peterson's 2019 display, particularly the high-speed barrel roll. In terms of things that I am bringing to the display, there's something that I am calling the 'Derry Rectangle'. It starts with a Derry turn and comprises a lot of rolling around a rectangle shape, it all takes place very close to the crowd line and I hope it will look cool from the ground.

What kind of weather do you feel is optimum for displaying?
I was fortunate enough to be the spare pilot for Jim Peterson's Friday evening show at Sunderland Air Show a couple of years back. I think the light at sunset is ideal because it really brings out the afterburners from the back of the engines. It looks absolutely incredible.
High moisture days are good too. You can make your own clouds when you're pulling G with a high alpha. I think that it's really cool when the Typhoon disappears into its own cloud.

What kind of preparation takes place behind the scenes in the month before the display season?
The display work starts in February. The first few will be flown at 5000 ft to prove I have the manoeuvres in my head and that I'm sticking to the height and speed limits. There are a minimum of six displays at 5000 ft before I can safely bring it down to a lower level. I go down to 1500 ft, then 1000 ft for six more flights at each height before I am declared good to fly at low level. That involves carrying out the full display at a minimum of 500 ft for the aerobatic elements. The lowest I'm allowed to fly is 100 ft and the highest will be about 4,000 ft.
At the same time I'll also be carrying out a lot of simulator flying with my mentor Mark Long, the 2016 display pilot. He sits in the simulator with me, checking my flying manoeuvres, making sure they are carried out correctly and safely. Obviously, there's a lot of emphasis on safety.

Is display flying physically demanding?
My display is around eight minutes long — I burn just under three tons of fuel and pull 9G on numerous occasions. So, yes, by the time I have flown the full display, it's physically quite exhausting. I wouldn't want to do much more than eight minutes.

What's the day-to-day routine like during the display season?
We deploy two jets to the air show — we have a spare aircraft in case there are any snags. On the day of the display our engineers go in early to prepare the aircraft, running through their checklists and making sure everything is safe. There's potential for me to do some PR in the morning, then I'll go to the airfield.
After the display it depends on the programme. I might be signing autographs and doing some more PR activity, or I might have to do a show at a different event. If that's the case, I'll need about two and half hours on the ground before going again. I'm limited to three displays a day.

What attracted you to this display pilot role?
It was a chance to represent the Air Force and Typhoon force. I've been very lucky over the past five years with what I have achieved on the frontline. I have been to two Red Flags in Las Vegas, deployed on operations in Iraq and Syria twice. I've been to the Falklands three times, to Oman twice, where I took part in Exercise Magic Carpet. I have also been to Langley on the east coast of America. During that time, I've been very lucky to be picked on some of the best exercises in the world. Now I have the opportunity to inspire people and motivate them to join up. It's a massive privilege. It's also an opportunity to fly the jet at the limit of its envelope at low level. I'm sure it will be some of the most incredible flying I've ever done. ■

Joined Up Thinking

When the Qatar Emiri Air Force takes delivery of its first Eurofighter Typhoon aircraft in the summer of 2022, , it will be perfectly placed to take full advantage of the aircraft's capabilities with a team of trained pilots and engineers ready for action.

Such preparedness is thanks to a unique partnership between the Qatar Emiri Air Force and UK RAF, who together established a joint squadron in July 2018 — 12 Squadron.

Right now Qatari pilots are training with RAF Typhoons and Qatari engineers are learning the RAF ways at RAF Cosford.

Born out of mutual relationships and shared security interests between Qatar and the UK, 12 Sqn is the RAF's first multinational squadron since World War Two.

"The two air forces have got a long history of working together, in fact Qatar's Senior Responsible Officer actually carried out his flying training with the RAF," says Wg Cdr Chris Wright – RAF OC 12 Sqn. "And of course, the RAF has flown many operations in the Middle East and alongside the Qatari Air Force on different exercises. But the co-operation has never been this strong. This initiative takes the bilateral relationship in security and defence to a whole new level.

"We both have a shared interest in operating Typhoon to the best of its capability and the best of our ability as air forces, so it makes sense to bring that together under one roof at RAF Coningsby. For Qatar the benefit is clear. Rather than having to establish a squadron from a standing start when they receive delivery of their Typhoons in August 2022, they will be ahead of the game."

OFF TO A FLIER

Following the announcement of the joint multinational squadron the plans grew at pace. Less than a year later, in June 2019, an RAF-only element of 12 Sqn flew its first sortie. Then in June 2020 Wg Cdr Wright flew the first joint sortie with his Qatari co-commander, Lieutenant Colonel Faisal Al-Ghanim.

"That was quite a milestone — walking out together with my joint commander for the first sortie. We flew common tactics in a common language, flying a very capable aeroplane and pushing it to its limits. That was a huge day." →

12 squadron operated with integrated QEAF personnel for the first time in Qatar on Ex EPIC SKIES IV, completing over 60 successful missions

Establishing the squadron took a great deal of planning but it's clear it has already met many of its original objectives.

The first group of Qatari pilots arrived in the UK with fast jet experience but being based at RAF Coningsby and introduced to the Typhoon cockpit gave them a new perspective.

ON A MISSION

Already 12 Sqn has deployed to Qatar twice. The first time it went, in December 2019, it was in its infancy and all the pilots were from the UK RAF. A year later the squadron returned.

"Going back there we had Qatari pilots and engineering officers in 12 Sqn badges, plus flying in Qatar alongside their colleagues who were operating with Mirage 2000 and Rafale was huge. We were there as a joint squadron of Typhoon pilots. It was great," says Wg Cdr Wright.

Both joint commanders say the foundations are now in place with the first six Qatari pilots having been bedded in and there are now several Qatari engineering officers. More recently the first of more than 60 Qatari technicians joined the squadron too. But over the next 12 months the pace will continue.

Wg Cdr Wright says that means a very busy 12 months lie ahead. "We've got to get as much knowledge into the Qatari officers and technicians as we can because this time next year they're going to be within weeks of receiving their Typhoon aircraft in Qatar. We will be cementing and building their qualifications, experience, knowledge and their relationships with industry partners like BAE Systems, so that when those jets arrive in August 2022 they're up and running.

"I'm confident the team are going to get there. We've got the resources. We've got the people and we've got the foundations in place."

TWO FORCES, ONE EDUCATION

The aim is to help Qatar get the most out of the Eurofighter Typhoon platform and therefore the vast amount of the training has been RAF to Qatar. The latter are new to the aircraft and everything goes with it. They were trained for the same mission sets as the RAF.

However, the knowledge swap hasn't only been one way. The UK team has learned from their Middle Eastern counterparts too, says Wg Cdr Wright. "We are learning from their ethos, their experience and their regional concerns. But we are also learning from their questions. Each time they ask us why we do a certain thing a particular way it forces you to consider every process we use, every custom we operate to, even some of the tactics. I think that's a great thing. That's why joint squadrons were a great thing in World War Two. And that's what we're trying to get out of this as well.

BEYOND 2022

The immediate focus for 12 Sqn is the next 12 months but beyond that both joint commanders believe the legacy will live on in some form. Both believe it has cemented the bilateral relationship between Qatar and the UK.

Wg Cdr Wright says: "Once they're off and running in Qatar we will continue to put several cadres of pilots through our air flying training, both on the Hawk in the newly-announced Joint Hawk Squadron, and then onto the Typhoon. They will then go out to Qatar and do their combat ready training.

"In terms of training capacity and relationship between the two countries, I don't see it ending anytime soon because of the immense foundations and relationships that have developed between the two countries at a very high level." ■

Lt Abdulla Al Hay and Lt Bader Al Bader were the first Qatari pilots to join 12 Sqn after completing the full training pipeline in the UK, training at RAF Cranwell, RAF Valley and RAF Coningsby.

Qatari and RAF personnel flew together for the first time, in Typhoons newly-adorned with the squadron badge of UK & Qatar flags.

Hitting the Economic Target

WHAT IT WANTS

Finland is replacing its F-18 fleet, with deliveries required between 2025 and 2030.

THE PROCESS SO FAR

A RFQ response was submitted in 2019, a revised RFQ response in January 2020 and the Best and Final Offer (BAFO) in April 2021.

WHAT'S NEXT?

A decision is due around Q4 2021.

Finland makes its decision on purchasing a new combat aircraft in the coming months. It is looking to replace an ageing fleet of F-18s and Eurofighter Typhoon is in the running. The campaign team submitted their Best and Final Offer (BAFO) in late April and a key element of the proposal concerns the wider economy. Here we speak to Ross Dickson, who played a part in the BAE Systems campaign team in Finland and find out what selecting Eurofighter could mean for Finnish industry.

When nations are in the market for new fighter jets there's more to the campaigns than simply reviewing the relative strengths of the competitor aircraft. It's important that the offer is up to the job but it's not simply a case of combat aircraft Top Trumps.

Any purchase decision represents a large-scale national investment and consequently governments expect an element of inward investment to support their indigenous industry. Collectively, this part of the proposal is known as industrialisation.

In this case, Eurofighter has developed its offer to Finland based on the methodology set out by the customer, who alongside the strengthening their military capability, want to see an economic benefit in terms of inward investment, job creation and sustainment.

The budget set aside by the Finnish Defence Forces for the contract is €10 billion. A target for the industrialisation programme was set at approximately 30 percent of the acquisition value. In other words, Finland wants the acquisition to create billions of euros of benefits for Finnish industry.

"The Eurofighter partners have crafted an offer package that actually exceeds this target by a considerable margin," says Ross.

"The package is made up of 63 different distinct work projects and each of these have been developed following talks with Finland's business community. We had ideas about the sort of capabilities that we might offer but the high proficiency of Finnish industry meant it was sensible to craft and tailor the packages in conjunction with them to fill the needs they had."

And, to make an even more compelling case, the Eurofighter campaign, which is led by BAE Systems and supported by Airbus, Leonardo, MBDA, Rolls-Royce and EuroJet, decided only to include projects that were assured pieces of work.

"Some rivals may offer opportunities to bid for work rather than guaranteeing work, whereas every single one of our 63 projects represents real assured work. We are saying to Finnish industry you will actually build 70 aircraft engines; you will support the aircraft, and you will get involved in planning. We are committing to them saying Finland will be involved in all stages from the design, development, planning, operation and support, right through to the future development of the aircraft.

Ross Dickson, who played a part in the BAE Systems campaign team in Finland.

"A good example of this is with the ECRS Mk2 radar programme — the most advanced radar programme in Europe. We're offering Finnish industry the opportunity to be involved in the development of radar."

The projects were developed over the past three years and involved a team of around 20 subject- matter experts, who covered a wide range of fields including engineering, cyber and mission systems. This core team was supplemented by other experts. Some of the projects were driven by the needs of the Finnish Defence Force and some following consultation with industry.

"We had a deeper involvement with industry and the Finnish Defence Force than in previous campaigns. The fact that we're providing the opportunity for 70 engines to be produced in Finland, by Finnish industry is big. It's the first time this capability has ever been transferred by EuroJet. We're also giving very deep access to the systems on the aircraft and the ability to have sovereign control over the mission data and general data of the overall system."

Ross adds that the 63 projects were selected with the long term in mind. "We very deliberately excluded short-term projects that may have had a three or four-year lifespan. Instead, we have developed projects that have capabilities beyond 20 years. The industrial partners will have the confidence of knowing they'll be supporting the aircraft for the full lifecycle of the aircraft. In fact, some of the projects are going to involve the future development of Eurofighter, which in turn means opportunities to be involved in the development of future products could open up."

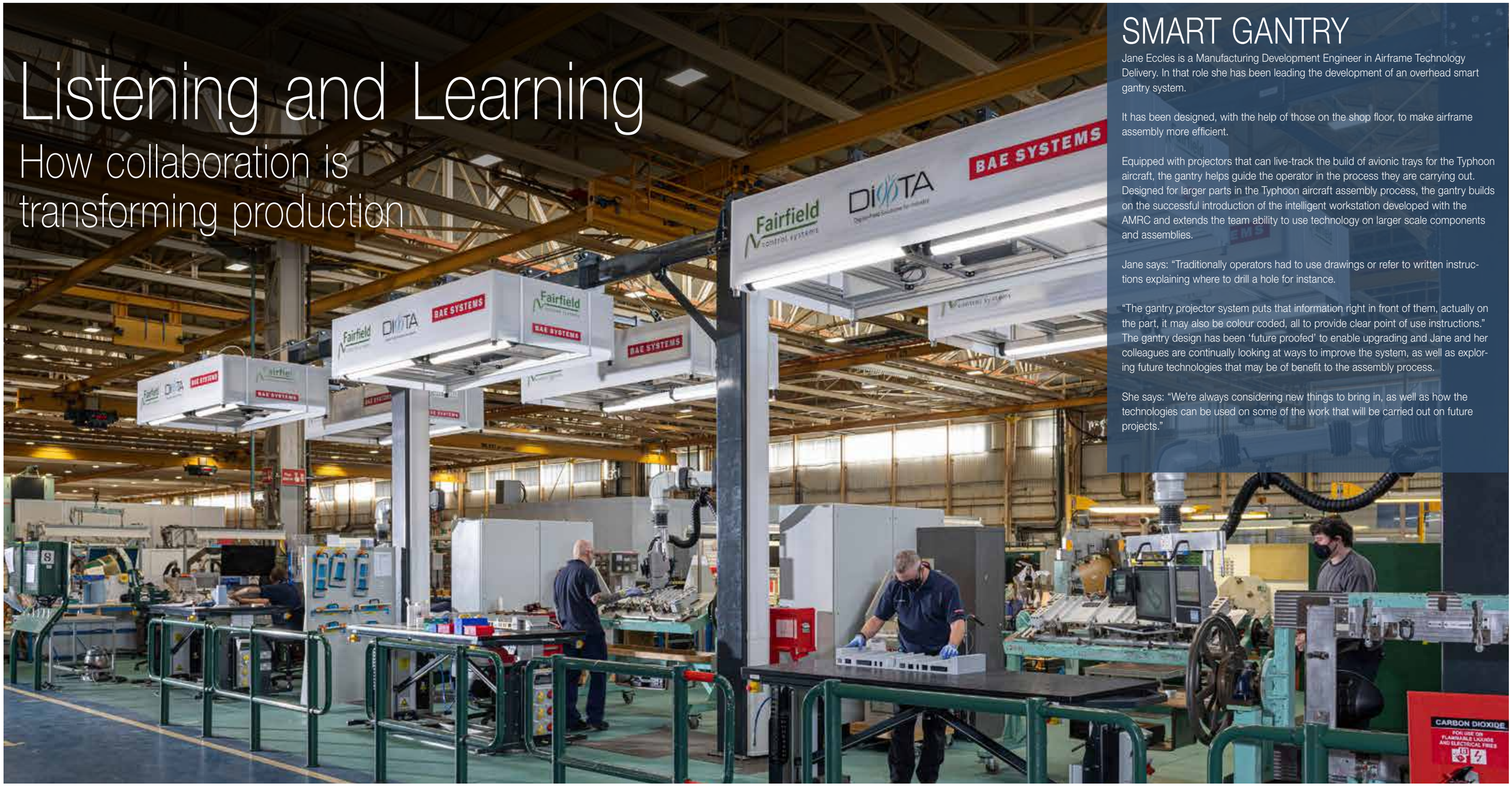
Another feature of the proposal is the invitation to join the wider Eurofighter family. "We are saying if you choose Eurofighter, you're forging stronger ties with four nations and six major European companies whose combined purchasing spend is in the region of €40 billion every year."

How big a factor is industrialisation in the final decision? Says Ross: "Of course, the aircraft for many of the stakeholders in Finland is hugely important. But for me, the industrial programme is very important for the Finnish economy and the Finnish people. When you speak to politicians, or an industry association, they are very interested in the jobs, the capabilities and what we can offer Finland.

"And that's an important message from the Eurofighter team to Finland — you are going to be looking after this aircraft, you are going to be operating the aircraft and you are going to be planning for this aircraft's future. You are going to have full sovereign control of this asset." ■

Listening and Learning

How collaboration is transforming production



Change is in the air. The Eurofighter Typhoon's UK production line is being transformed through the introduction of new technology, an innovative spirit and effective collaborations across BAE Systems teams and with key suppliers.

That collaborative approach is illustrated by the way the teams on the project are driving those changes forward – sharing their ideas and thoughts on how the tasks they must carry out can be made easier through this transformation.

As a result, the days of 'old tech' 2D drawings and text-heavy instructions are being replaced by the 'new tools' of 3D animated work instructions, augmented reality, projected work instructions and use of headsets, all being harnessed to help drive further efficiencies.

Martin Knott is the Assembly Team Lead for Airframe Technology Delivery.
He believes these are exciting times for those working on the Typhoon where production work is underway in support of the Quadriga programme for the German Air Force. And he explains how the need for change is being driven by a focus on export programmes affordability with a variation of production rates and requirements.

He says: "There is a need to adapt to that world. It is a competitive marketplace and it is no longer a case of doing things the way we've always done them. We're investing in technologies and techniques that support the operators and to help them to do their jobs, to increase efficiency."

That support includes 3D animated instructions, created by the Manufacturing Engineering teams to show the operator what needs to happen in a process and the sequence it needs to happen in.

Martin likens it to the way we look for information when at home, we pick up a tablet and look at YouTube tutorials or like furniture business IKEA use an app to make its assembly processes clearer. He adds: "It is about knowing exactly what is required and exactly what the operation is."

These new innovations can be found on the Typhoon production line integrated into smart gantry systems. Each gantry features a projection system that live tracks a part and guides the operator to the correct positioning requirements.

The use of tablets that provide augmented reality information is also making things clearer for the production line worker and more intuitive to understand. Easier to handle, their flexibility is a big plus. When it comes to working in confined spaces on the airframe, newly developed headsets allow the fitter or electrician to work hands free, with the information they need projected in front of them or overlayed onto the 'real world'.

Much of this innovation is being born on the shop floor, with apprentices and time-served operators working together in developing, testing and also getting feedback which can be used to further hone the technology. →

SMART GANTRY

Jane Eccles is a Manufacturing Development Engineer in Airframe Technology Delivery. In that role she has been leading the development of an overhead smart gantry system.

It has been designed, with the help of those on the shop floor, to make airframe assembly more efficient.

Equipped with projectors that can live-track the build of avionic trays for the Typhoon aircraft, the gantry helps guide the operator in the process they are carrying out. Designed for larger parts in the Typhoon aircraft assembly process, the gantry builds on the successful introduction of the intelligent workstation developed with the AMRC and extends the team ability to use technology on larger scale components and assemblies.

Jane says: "Traditionally operators had to use drawings or refer to written instructions explaining where to drill a hole for instance.

"The gantry projector system puts that information right in front of them, actually on the part, it may also be colour coded, all to provide clear point of use instructions." The gantry design has been 'future proofed' to enable upgrading and Jane and her colleagues are continually looking at ways to improve the system, as well as exploring future technologies that may be of benefit to the assembly process.

She says: "We're always considering new things to bring in, as well as how the technologies can be used on some of the work that will be carried out on future projects."

The collaborative approach that is being taken can also be seen in the close working relationship that exists with specialist suppliers in a range of areas, from augmented reality to IT security.

The project has its roots in BAE System's 'Factory of the Future' initiative where technologies are developed and often implemented in other areas of the business. A good example would be the Intelligent Workstation which came out of a collaboration with the Advanced Manufacturing Research Centre (AMRC) in Sheffield and was introduced to the Typhoon production line in recent years

Key supply chain partners in the smart gantry system include UK-based systems integration specialist Fairfield Control Systems and French company Diota, a leading software provider in augmented reality solutions and the developers of the projection systems being used.

Martin says the positive reaction on the production line is making a real difference in ensuring the technologies are adapted to be of the biggest possible benefit to those using them – and that includes improving the working environment, an important part of the process. He says: "It does require a change in mindset. It is about getting the right systems and communication in place and honest feedback is vital in that.

"The engineers that have been leading the developments and driving the introduction of the technologies have been fully engaged with the fitters, electricians, supervisors, engineers and managers and that has been a huge positive. The team has really come together to embrace change."

That dynamic will continue. The technologies introduced continue to be improved upon and Martin talks about possible future innovations, which will extend the use of technologies right the way through the production facility.

He says: "We're on a journey with this, constantly adapting to and incorporating the latest available technologies that add benefit". Our common goal is to improve efficiency and to embrace technology and new ways of doing things in the process and that is exciting.

"This is all about assisting our people and helping make it easier for skilled people to do the job they have been trained for."

Ian Sudlow, Head of Technology Delivery for Airframe, agrees. He says: "This is another great example of the work we are doing to spin out technology from our Factory of the Future project at Warton and deliver benefit onto our current programmes.

"The use of collaborative technologies has the potential to significantly reduce cost, improve quality and enable our skilled workforce to add value by providing them with the information they need exactly at the point and in the format they need it.

"These technologies form a key part of our manufacturing approach for the future and it's great to see us able to de-risk and leverage their potential on Typhoon. I'm really proud of what the team has achieved with this work in a relatively short time span." ■

HEADSET TECH

Operating in confined, tight spaces on the Typhoon airframe has been one of the challenges for production line workers. It has not been made any less difficult by the continuing need to refer to drawings and written instructions.

The headset technology Neelofar Ansari, a Senior Manufacturing Engineer in Airframe Technology Delivery, has helped to introduce, are easing that strain, improving working conditions and making the tasks involved easier to complete.

They allow the fitter or electrician to work hands free, with the information they need projected in front of them or overlayed onto the 'real world'. Neelofar explains: "The labels they need to put in place as part of the process are overlayed, so they don't need to keep continually referring back to drawings. Here they can see it all in front of them." She says that the development of the technology originated from a challenge set by the operators to provide a solution to this difficult activity and during the development the feedback received from operators has been vital in ensuring the technology is of help to them in their roles and is delivering efficiencies.

She says: "All the teams we've been involved with have been really good in working with the technologies, to see how they can be of real benefit. It has been a collaborative approach, with everyone on board.

"We've been told when things aren't working as well as they could be and that is really important. People must be comfortable with the technology and confident that it is benefitting them.
"When operators start using the technology and we begin to get the feedback, that's when the project becomes really exciting, you find out how best to improve the technology to work for the operators and the job at hand."

Help them See, Keep them Safe

Following the announcement in April that Germany's Eurofighter Typhoon Quadriga programme will feature the Praetorian Defensive Aids Sub-System (DASS) we look at what it provides the aircraft and discuss more about Electronic Warfare (EW). We asked Fiona Clark, Capability Manager for Electronic Warfare Sensors at Leonardo UK, to give us an expert overview.

Fiona Clark - Capability Manager, EW Sensors - Leonardo

WHAT IS EW?

Electronic Warfare (EW) in the Eurofighter context can be summed up in one phrase: 'Help them see, keep them safe'. The purpose is to provide information and capability to protect the platform and most importantly, the crew. It is about protecting pilots from anything that's trying to do harm to the platform — most typically missiles.

HOW DOES IT WORK?

Essentially, the Praetorian system helps pilots see by sensing electromagnetic energy in the environment around them that comes from something that could harm them. It listens to radars and laser systems and looks out for missiles approaching the platform. It gives the pilot 'situational awareness', a picture of the environment around them. They are constantly aware of the danger level and where any possible threat is. Then, if they need it the EW system helps keep them safe through deployment of appropriate countermeasures. These are designed to prevent adversary attacks from being successful. They work by either confusing or deceiving the enemy into thinking that you're not there or are somewhere else.

HOW FAR CAN THE PRAETORIAN SYSTEM SEE?

In simple terms, that depends on how much power the adversary system is transmitting. For example, if somebody in your garden has a lighted match, if they're close to you, you see the match. But as they walk away, you get to the point where you can no longer see the match burning because there's not enough energy getting back to you. The mathematics for the DASS system follows the same principle.

The Eurofighter Typhoon system is sensitive enough to see anything a pilot might be worried about, as far away as they need to see it. It can see up to the limit of the radar horizon which is slightly further than the visual horizon. Effectively the system is designed with the ability to see any weapon system that may attempt to engage the Eurofighter.

A key point here is that with any guided weapon system, the missile's radar transmits energy to reflect off the target aircraft and track it. This energy bounces back to the radar for it to derive range and angle information to the target. The Typhoon system only has to listen to that energy as it hits the aircraft – a one-way path — and therefore Typhoon can see radars at much greater range than they can see the aircraft. This advantage means that Praetorian can give early warning of missile systems as soon as they start to look at Typhoon, allowing the pilot to avoid or evade the threat.

WHAT DO THE PRAETORIAN SENSORS LOOK FOR?

Electronic Support Measures (ESM) look for radio frequency (RF) energy. Radar-guided weapon systems transmit bursts of RF energy, which have a certain frequency and characteristic in the electromagnetic spectrum. The ESM systems listen out for this electronic chatter. Each weapon system has a slightly different characteristic. Thanks to Praetorian, Eurofighter is intelligent enough to pick up all the different signals, discriminate them and identify exactly what the threat is.

In addition, Typhoon features a missile approach warner which looks for missiles that are coming towards it at speed. The Italian Typhoon version also features a laser warning receiver which listens for laser signals in a similar manner to the ESM and RF.

HOW DOES THE PRAETORIAN DEFENSIVE AIDS SUB-SYSTEM (DASS) COMPARE TO RIVAL SYSTEMS?

Praetorian is world class in its signal processing and identification capability. But the thing that makes Praetorian stand out is that it has been designed to be completely adaptable – in terms of the way the software is configured and optimised— and this allows users to adapt what it does based on how data is programmed.

Adaptability was a core design aim from the start, and it means the Eurofighter Praetorian system is completely mission programmable. Each operating nation can decide exactly how they want the system to behave, so for example, can optimise how it searches the environment for threats, or the countermeasures it uses when it detects something.

It also offers operators a rapid turnaround. They can quickly get recorded data off the aircraft, analyse it, and then programme threat data for the next mission, so that the next time they fly the system is updated. That makes Praetorian incredibly powerful because the pilot has the best, most up-to-date information. Not surprisingly, this programmability and adaptability is highly valued by the forces that use it.

WHAT DO WE MEAN BY EUROFIGHTER'S DIGITAL STEALTH?

With countermeasures you are either trying to 'disappear' or persuade the threat that's looking at you that he really wants to look some other way. Praetorian can do both or combinations of each — it's a form of what's been dubbed 'digital stealth'.

Of course, no aircraft can be invisible, but you can make yourself very small and hard to find. Some aircraft do it by their shape or their skin, known as "stealth", Eurofighter does this digitally. Praetorian transmits waveforms that make it harder for an adversary to find it. For instance, it can increase the background noise that the radar must overcome, and then hide in this digital smokescreen. In physics terms that's the equivalent of making yourself a much smaller target.

The system can also transmit waveforms to make the enemy think there is a better target elsewhere. In its countermeasures arsenal, Eurofighter has a towed radar decoy, a jammer on a cable that is towed behind the aircraft, to deceive rival radar, which adds a geographical aspect to the fight against threats. The beauty of using digital stealth is that it can adapt to any changes in the threat, without having to make any design changes to the aircraft shape or covering.

WHAT BENEFIT WILL EW BRING TO THE E-SCAN RADAR Mk2?

A radar with an EW component is relatively unusual but the UK has committed to a significant development programme to enhance the EW capabilities of the Eurofighter's new ESCAN radar, through the Mk2 programme.

The concept is that you already have a high-quality, high-power radar on the aircraft. In a strike attack, it's the radar that will pinpoint the target. In a conventional set-up when the EW system is in the sensing mode, it gives the pilot a picture of the environment — it's like a road map pointing you to the street location of your "target". The pilot can then use the radar to pinpoint exactly where that target is. The ESM gives the first part of the picture, the radar then confirms it and can guide missiles.

But the point about the ECRS Mk2 radar is that Eurofighter pilots will be able to use the radar antenna to transmit jamming waveforms to make it even harder to engage the aircraft. That gives the programmers an extra dimension — they can push out waveforms through the radar, steer them to the threat and combine that with the existing countermeasure suite, giving significantly more options in the future. ■

On Our Radar

Ross Wilson, Radar Chief Engineer for Leonardo UK, leads a team who are designing, developing and delivering the Active Electronically Scanned Array (AESA) European Common Radar System Mk2 (ECRS Mk2) for the UK RAF Eurofighter Typhoons. We spoke to him about the challenges and rewards of a job that will help enhance Typhoon for years to come.

LEONARDO

Not long into his career Ross Wilson experienced moment of clarity. He had been redesigning the electronic systems for a mid-life upgrade to the Tornado F3 aircraft for 2 years, part of the role involved the execution of a period of flight trials. It's a month he's never forgotten.

"That was the time that made me really enthusiastic about my career in electronics. Being involved in the early design and development of an upgraded processor that actually went onto an aircraft was exciting," says Ross. "I can still remember the day of the trials. I watched the jet come out of the hangar, take off, we were sat in the control room listening to the operations and then, when it landed, we were hands-on able to suck out data and run real-time analysis within minutes. That direct interaction with the RAF has stuck with me ever since.

Ross Wilson

"Today, it's something I keep telling the younger engineers who are starting off their careers. This is an exciting job. We are doing something unique and, knowing where the equipment we develop is in use, we are helping to protect our nations."

Ross, whose family has a farming background, studied electronic engineering at the University of Newcastle. He went straight from there to BAE Systems' electronics division in Milton Keynes, which was later and encompassed by Leonardo. As his career took off, he moved up to Edinburgh taking in other aspects of the radar development, namely getting his designs into production and support phases as well as many research and development activities.

Ross has been in his current role — looking after UK development programmes for Typhoon — for the past seven years. In September 2020 BAE Systems and Leonardo were awarded a £317 million contract to develop the ECRS Mk2 and today Ross heads the engineering team who have to turn that contract into reality.

"Over a span of 20 years my career has taken in all aspects of design and development taking control of the full lifecycle and I have worked across all of the various engineering functions — hardware initially, then software, systems, integration and trials. That gave me the breadth of knowledge I needed to take on the Chief Engineer role for a large programme like ECRS Mk2."

The Chief Engineer sits alongside the Programme Manager at the head of the programme. The pair are the key day-to-day decision-makers. Between them they are responsible for everything from the bid process, the development lifecycle and design reviews, through to the future test, production and support roll out.

In addition, the Chief Engineer provides governance as the system design authority as well. "Basically, holding the golden pen, meaning I have the sign off authority from a technical perspective, making sure the design is compliant from a form, fit and functional perspective, safe, and meets all quality standards. Essentially, it's up to me and the team to get us to a point where we are able to ship the product out of the door and, from a system design point of view, know that it is fit for purpose."

A WORLD-LEADING CAPABILITY

The ECRS Mk2 is a multi-functional radar system (MFRS) that in addition to traditional radar functions will deliver a world-leading Electronic Warfare capability, including wide band Electronic Attack. It will equip pilots with the toolset and ability to locate, identify and suppress enemy air defences using high-powered jamming within a contested and congested environment. They can engage targets whilst beyond the reach of threats — even when they're looking in another direction — and operate inside the range of opposing air defences, remaining fully protected throughout. It also enables Typhoon to link up with future data-driven weapons to combat rapidly evolving air defences, ensuring UK Typhoons will dominate the battlespace for years to come.

The development of this ground-breaking radar is a phased process, with Ross' team providing verifiable evidence at key points to a number of stakeholders, including the end customer and specialist consultants. It's a process designed to prove the maturity of the technology in a timely manner.

"We've been achieving maturity points step by step," he says. "We are being assessed on a Technology Readiness Level [TRL] and Risk basis, which is a slightly different route to contract when compared to previous programmes. Effectively we develop the kit, test it in the lab and prove it works before we go to the next phase. This kind of maturity-based development is good from an engineering perspective and from a customer perspective, because we can continually see the risk reducing."

This process is also a positive for the younger engineers in the Leonardo team. Unlike their predecessors they get to see a full development cycle pass in a relatively short timeframe, this in addition to many new lessons learnt such as agile software development we enable the engineers to flourish as early as possible. Says Ross: "Breaking it down like this means it often takes just a matter of weeks to carry out a single pass on a function when previously it could have been anything up to five years between developing the whole system and testing it in a flexible manner."

FUTURE PROOF

Of course, the most significant challenge facing Ross and the Leonardo team is a technical one. They are inventing, developing and building advanced technology that will have a life beyond Typhoon, as they will mature key technologies for future combat air systems. Ross says the ECRS Mk2 radar has supported the generation of knowledge, expertise and technology that will be further advanced in some of the early development work for the Tempest programme. What might flow forward?

"The design architecture can't flow forward as-is but will be further enhanced and some of the functionality provided by the software and systems teams can also be utilised. It's kind of an evolution, we always evolve, innovate and learn from previous systems, something we call spiral development through continuous improvement. But it's not a one-way system. Some of the early research work on Tempest is currently feeding into ECRS Mk2 and the combined ideas generated will feed future product of tomorrow.

"Effectively we are trying to extract from the future to further enhance ECRS Mk2."

DEVELOPING THE NEW GENERATION

The ECRS Mk2 contract sustains more than 600 highly skilled jobs, including more than 300 at Leonardo's site in Edinburgh, over 100 electronic warfare specialists at the company's site in Luton, and 120 engineers at BAE Systems.

Part of Ross' role is to pass the torch on to the new generation of engineers. He's helping bridge the gap between them and the experienced generation.

"There's a need to get younger members of the team up to speed quickly in the most efficient way. We call it a flow in and flow out of knowledge. We've been looking at how we transfer knowledge into the current teams and the new generation of engineers, but different generations have different ideas, processes and development mindsets. To facilitate this, we're employing "new ways of working" like Agile Project Development specifically employing different approaches to systems and software that enable us to learn lessons from the past."

The role is anything but straightforward. The in tray is stacked full of challenges — one minute he's asked to look at a technical issue, the next he's being asked to support an export campaign — but this mix doesn't faze him.

Ross says: "Of course, there are challenges but that's why I'm in the job. I describe it as a constant mix of firefighting, problem-solving, decision-making and politics. It's about continually resolving problems, jumping from an obscure topic to speaking to the aircrew about how the equipment operates and how far they can see in the sky. The breadth of knowledge and awareness needed to cover everything is vast. Getting your head around that can be tricky sometimes so it's important to be able to hand things off to the vast SMEs around you.

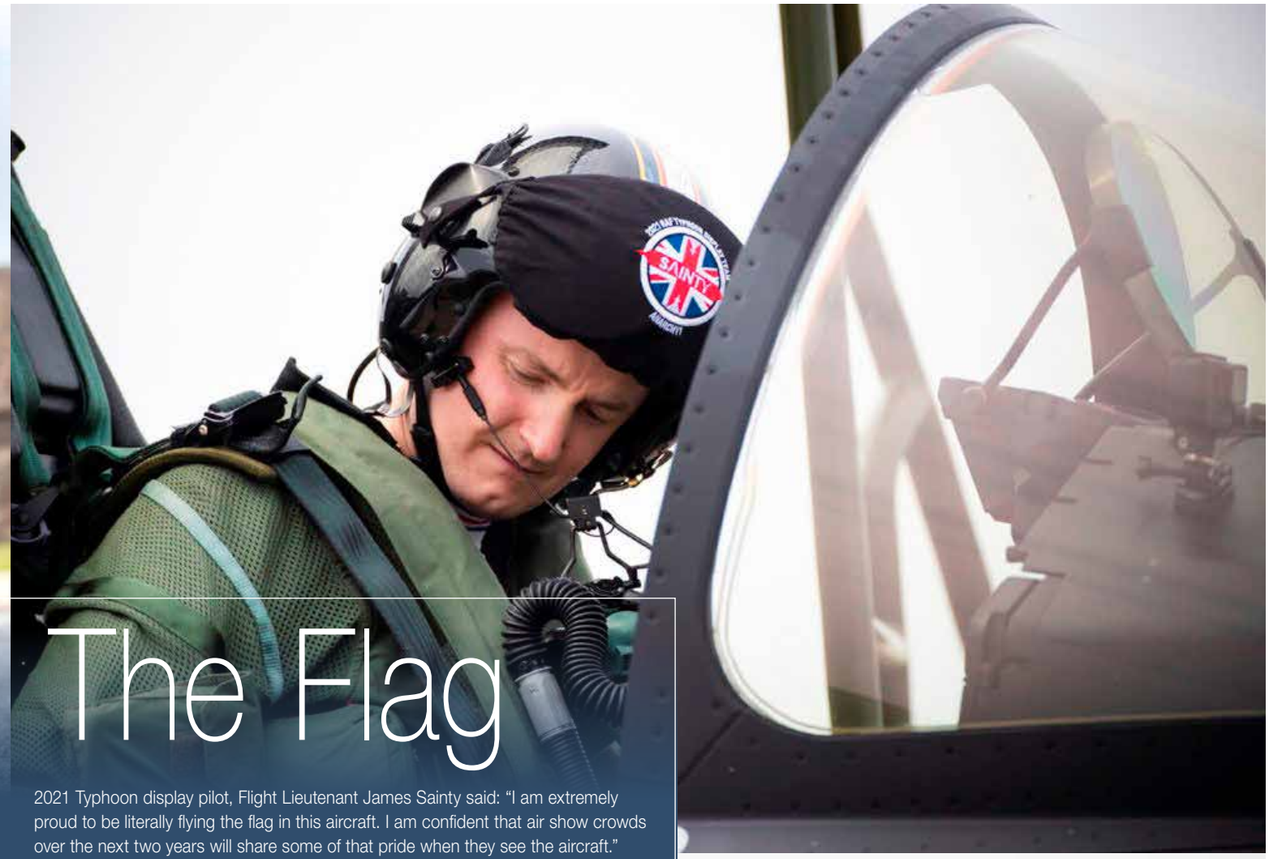
"On the positive side I get to see the full scale of engineering from conception to completion. That kind of thing gets me out of bed in the morning. The other thing that excites me is the diversity of the people. At one end, we have apprentices coming in the door, at the other we have highly skilled scientists and a multitude of stakeholders from a variety of nations, who understand the system in a totally different way."

Being able to interact with a broad range of people on a daily basis only feeds Ross' enthusiasm for a job which gets more interesting with every passing day. ■

Flying The Flag

The UK RAF 29 Squadron has unveiled a Eurofighter Typhoon aircraft with a spectacular 'Union Jack' paint scheme. The design, revealed at RAF Coningsby, covers large areas of the aircraft's fuselage and wings and will be a highlight at air shows for the next two summers.

2021 Typhoon display pilot, Flight Lieutenant James Sainty said: "I am extremely proud to be literally flying the flag in this aircraft. I am confident that air show crowds over the next two years will share some of that pride when they see the aircraft."
The Typhoon display represents a culmination of months of hard work, detailed preparation and concerted effort by the team behind the display.

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