EUROFIGHTER

WORLD

PROGRAMME NEWS & FEATURES
JULY 2016

- RED FLAG 2016
- DANCING IN THE SKY
- KUWAIT - WELCOME ON BOARD

PROVING ITS POTENTIAL

CAPABILITY ENHANCEMENTS ON TRACK

Eurofighter Typhoon

Title:
Eurofighter Typhoon displaying the P3E Capabilities

Picture: BAE Systems

Eurofighter World is published by
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Design & Production
images.art.design. Werbeagentur GmbH
www.iad-design.de

Printed by
ESTA Druck GmbH
www.esta-druck.de

Eurofighter World on the Internet
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July 2016

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IN OUR NEXT ISSUE...
Special focus on the aircraft's future capability.

Coverage from the airshow season.

EDITORIAL

WELCOME

Welcome to the latest edition of Eurofighter WORLD, which has been published just before the Farnborough Airshow 2016. Let me start this issue by extending our welcome to Kuwait which became the eighth member of the Eurofighter Typhoon family.

This contract was a significant milestone for the whole programme. It not only secures work for a number of years, it also has given us new hope and optimism to continue our Export campaigns with even more energy and drive. In addition, it underlines that the Eurofighter Typhoon is a world class combat aircraft which is successful on the global market and our customer in Kuwait has given it the ultimate show of faith.

I've only been back at Eurofighter for a few months but it's been long enough to understand just how focused we are on developing more and more capabilities for this aircraft. We currently have 599 aircraft on contract and I am sure we will add to that number by winning new orders in the future.

In this issue of Eurofighter WORLD you can read more of my reflections on the first six months as the CEO and there is plenty more besides.

I particularly enjoyed reading about the Eurofighter Typhoon detachment of the Italian Air Force who made their debut at Red Flag 2016 in the United States earlier this year. With the Eurofighter Typhoon being called on for more and more operational duty it is difficult to overstate the importance of these exercises. They have a rich value for the teams involved with everything from logistics to interoperability with other aircraft types put to the test.

Elsewhere in the magazine Captain Joaquin Ducay de la Riva of the Spanish Air Force gives us a guide to Morón Air Base and the Ala 11 Squadron.

There's also a look into the world of support with BAE Systems UK Availability Director Steve Debonnaire, explaining just what it takes to keep the Eurofighter Typhoon in the skies.

With the air show season once again in full swing, we talk to the pilots who help make the shows special through their flying skills. They offer a fascinating look into what goes on behind the scenes as they prepare their flights.

Finally, for those who love the technical aspects of the aircraft, there are features on the engine and on the cockpit which I'm sure you'll enjoy.

Yours

Volker Paltzo
CEO
Eurofighter Jagdflugzeug GmbH

KUWAIT JOINS EUROFIGHTER TYPHOON FAMILY

The State of Kuwait has become the eighth customer after signing a contract for the delivery of 28 Eurofighter Typhoon aircraft. >>

The contract signature for 22 single-seat and six twin-seat aircraft followed the announcement on 11th September 2015 of an agreement between the State of Kuwait and the Italian government for the procurement of the aircraft.

The aircraft will be of Tranche 3 standard and will be equipped with the E-Scan radar.

The contract confirms the State of Kuwait as the eighth customer in the programme and the third customer in the Gulf Region after the Kingdom of Saudi Arabia and the Sultanate of Oman.

Eurofighter CEO, Volker Paltzo, welcomed the newest member of the Eurofighter family and said: "The confirmation of this order is further testament to the growing interest in the Eurofighter Typhoon in the Gulf Region. It will enable Kuwait to benefit from the critical mass being developed in the Gulf and the many advantages that it brings to an air force in terms of interoperability, training and In-Service Support."

Since entry into service of the first Eurofighter Typhoon at the end of 2003, more than 470 aircraft have been delivered to six nations: Germany, the United Kingdom, Italy, Spain, Austria and Saudi Arabia.

The Kuwait order follows an order by Oman in December 2012 for 12 aircraft. Eurofighter Typhoon is currently in-service at 22 operational units and the whole fleet has completed more than 340,000 flying hours worldwide. <<

EUROFIGHTER

A CLEAR WAY **FORWARD**

VOLKER PALTZO
Chief Executive Officer (CEO)
of Eurofighter Jagdflugzeug GmbH

When **Volker Paltzo** took up his new role as the Chief Executive Officer (CEO) of Eurofighter Jagdflugzeug GmbH on 1st January 2016, he said: “With Eurofighter Typhoon we have a world class combat aircraft on offer and I am absolutely convinced that we will continue to win new customers.”

Six months into his new role, Eurofighter WORLD spoke to the CEO to discover what his vision for the Eurofighter Typhoon programme is. >>

>> A CLEAR WAY FORWARD

What do you see as the current state of play for the Eurofighter platform?

We have 599 aircraft on order and more than 470 aircraft delivered, so in that sense it shows we are relatively mature both in terms of our development and production programmes.

Following the recent order from Kuwait we know production will continue until at least 2021 and this is the baseline of our mid-term plan. From a capability point of view, we have

a very clear road map. It's a way forward that has been agreed with the core nations and one that also reflects the requirements coming out of our export community.

Achieving the next levels of capability will require us to meet a very challenging development programme but we have the certainty of having the whole programme under contract. This programme will ensure Eurofighter remains at the absolute leading edge of capability well into the next decade.

Are you happy that there is clarity in terms of the capability road map?

Yes. We have come through a situation where our customers had to think about their military strategies. We have also seen a great deal of activity over the last couple of years that has led to procurement decisions on a four nation basis.

At the same time our main development contract has now been completed with all the agreed capabilities delivered to the customers. These are now part of the current standard of the aircraft software. That's important because it means engineering capacity around Europe has freed up for work on the existing fleet and for adding additional capabilities.

I'd also say that the programme and decisions on how we can evolve the aircraft have been well managed by the two main contracting partners Eurofighter GmbH and NETMA.

Given where you are in terms of production and capability – is the future about being even more responsive to export customer needs?

I believe we have always been responsive to export customers' needs – indeed we have tried to respond to the individual needs of every customer. But from an Export perspective we have already seen dedicated requirements coming out of the Saudi and Omani customers and now we are going to introduce the Kuwait package too, which will sit on top of the core requirements.

Our development programme is building upon several standards and we are adding an Export element to each of the blocks we are delivering.

Phase 1 Enhancements (P1E) brings enhanced air-to-surface capability and enables mixed configurations, air-to-air and air-to-surface. That standard has already been developed and released into service in several steps.

Then we have P2E, which in the main is the Meteor and Storm Shadow integration. We are also working on P3E which will bring Brimstone. Of course, alongside these there are several other capability enhancements, like more options for mixed configurations and more regulatory requirements that have to be introduced into the jet to keep them compliant.

P3EB is the configuration we will deliver to Kuwait. This has been fully defined and contracted from the Italian MOD over to NETMA and into the Eurofighter consortium.

The headline from the Kuwait contract announcement was the integration of E-Scan radar into this standard. What's the significance of this?

That's correct. Kuwait will be the launching customer for an AESA radar capability. It's a significant milestone for the programme because the AESA radar is not just changing a black box, it is changing the main sensor of the aircraft and a lot of computing capability. It impacts on the attack identification system, the avionics, the structure and so on. Indeed because of the structural challenges involved we may even need another fatigue test under contract.

Given all the different strands of capability development and testing work this appears to be a very intense period for Eurofighter.

Absolutely. When I was here from 2009 to 2011 as Chief Operating Officer (COO) Capabilities, we were thinking ahead and working with our customers on the Business Model Review. At that time a lot of the things we discussed were quite conceptual. Today it's great to see the contracts have been signed and the developments are ongoing. Everything we discussed back then as mere possibilities have turned into actions. That's fantastic to see but on the flipside new capabilities and new customers also mean new configurations and when you have more and more standards of aircraft all of this needs to be managed accurately. This is a challenge in itself. You have to manage this programme in all its complexity.

Following the successful Kuwait signature how confident are you that future campaigns will be successful?

The Kuwait contract has brought fresh energy to the whole programme and there is potential for further sales. The Kuwait contract helps to keep the production lines open. At the same time our partner companies are currently running campaigns in several regions around the world; the Middle East, Asia-Pacific and in Europe.

In my view there's a realistic possibility we could contract additional customers to the Eurofighter programme in the future. We certainly should not be pessimistic but realistic. And of course the Kuwait capability aircraft is completely different to the original Eurofighter. It may look the same from the outside but inside it's a step change – in terms of the capabilities it embodies and missions it can fulfil. There's the radar, air-to-air is strengthened with Meteor integration and air-to-surface has evolved with Storm Shadow and Brimstone laser guided bombs. And of course there's more to come.

How important do you believe the Eurofighter aircraft will be in future decades for European air defence?

There's no doubt Eurofighter will be the cornerstone of European air forces until the middle of the century. That's not just my view, that's clear from the air force reviews that have taken place.

I also firmly believe the nations will continue to invest into the capabilities of the platform for the next 20 years. Therefore we will see significant capability upgrades for the aircraft. In terms of the aircraft's evolution we are looking at three time frames – from today until 2021, between 2021 and 2026 and beyond 2026. The first time frame already has a distinct road map. The next package P4E will pave the way into 2026. What happens beyond that is still under debate and we will work with our customers to define their future requirements. In fact, these discussions are ongoing and there are already some elements emerging.

For example, sensors and pods are developing all the time, so we need to make sure we can make use of all the information a sensor will be able to pick up and make it accessible for the pilot. In addition, lessons will continue to be learnt from operations and exercises. And we will see them shaping future requirements. We don't sit in a cellar on our own and think about what we could invent next. There's a permanent dialogue about the future evolution of the weapons system. >>

>> A CLEAR WAY FORWARD

There are several elements driving those talks – emerging technologies, emerging scenarios, operational considerations – and all are taken into account. Industry is not in the driving seat because the operational scenarios and requirements obviously lie with the customer community. We as industry are trying to respond with solutions.

How strong are the relationships between Eurofighter and the customer community?

They are excellent. In practical terms we have established integrated teams on dedicated tasks where we try to work together on a process to ensure we get things right first time, rather than industry going through a process that is later reviewed by the nations. We develop things together which avoids misunderstandings, and by getting it right we save on a review cycle and get to the end result much quicker.

We also have the benefit of the national strategies for the Eurofighter asset that are now well formulated. The whole team has a clear view of what the future needs to be for the platform.

In addition, the relationship between NETMA and Eurofighter has been strengthened by the decision to co-locate in Hallbergmoos in Germany. We are already seeing the benefits of this proximity because it allows far more interaction between the various specialists – even on a very simple basis like walking the corridors together.

How do you see Eurofighter GmbH playing its part in the future?

For me the company's role is clear. We have a number of key roles to fulfil. First, Eurofighter is the prime contractor in front of NETMA for the core programme. Second, we are the key enabling body for programme integration and therefore for all development, production and in-service aspects - we are clearly the integrator. Third, Eurofighter has to play a central role in the qualifications and certifications because we have a growing number of different configurations. This central role is where Eurofighter adds value. Thanks to the new European Military Airworthiness Requirements 21 (EMAR 21) we now have a tool in our hands which can help the different core nations gain maximum benefit. Fourth, Eurofighter will have a strong sub-contracting capability and we will be the key enabler of the future capability road map. In this hugely complex programme we need to maintain a common baseline. And finally, the International Weapon System Support Centre (IWSSC) is a central element of service support because it is the only institution where all nations that operate the Eurofighter speak regularly to each other and exchange their views.

So you believe that the Eurofighter consortium is still very much at the heart of things?

Certainly. Eurofighter was kicked off on the basis of four nations coming together and depends on funding streams coming out of the four nations. But when you put these funding streams together you have far more opportunities to introduce new capabilities than if you were only working on a national basis. As money is not unlimited, there is good economic sense in trying to develop the aircraft together and going in a common direction. Of course, within that construct there is room for some national preferences – every nation has the right to use the platform in a specialised manner if they have a requirement. However, there needs to be a common core if just for the sake of certification and qualification.

As the CEO of Eurofighter what is your focus for the future?

My focus is to ensure the Eurofighter platform remains as attractive as possible for core and export nations to put additional capabilities on the aircraft. My vision for Eurofighter is that we keep customers happy for the next two decades both in terms of reliability and the capabilities we bring forward and deliver. We also need to keep them happy in terms of speed – by this I mean how we can adapt to new operational requirements, deliver a capability and get it ready for use by the customer. The mission for Eurofighter GmbH is clearly to manage this integrated programme effectively to the highest standard of programme management. I often say that this is probably the most complex machine that European engineers have ever designed and it needs to be kept operational and supported. My mission for Eurofighter is to enable this integrated programme to be managed as effectively and professionally as possible. It's a mission that will keep the company very busy. It sounds simple but it is a tremendous effort and we have to do a lot of things to maintain a level of professionalism. Our leadership team has identified 10 Top Targets for the current year and we have a very clear focus of what we need to deliver.

What are your targets in 2016 as the new Eurofighter CEO?

In 2016, we aim to achieve a number of challenging targets which are primarily focused on customers and capabilities.

Among these targets are: to achieve Block 25 Type Acceptance and related production aircraft deliveries; to progress the capability programmes P2E (Storm Shadow and Meteor) and P3E (Brimstone) and the E-Scan radar integration; to secure the benefits of the EMAR 21; and to enhance also the In-Service Support (ISS) to core and export customers. These targets will keep us quite busy but I am sure that the Eurofighter team will manage to achieve them.

How would you describe your leadership style?

I'd say I am a strategic thinker but also a pragmatic person and consider myself as being a team player. As far as Eurofighter is concerned, I consider myself as an integrator. You have to manage a lot of people who bring lots of different views, so you have to be somewhat of a diplomat.

As CEO you must have the ability to convince your people that the programme is going in the right direction. You also have to give the team the motivation and confidence that what we are doing makes sense.

I also believe that work should be fun as well. I don't want a team that comes to work every day stressed thinking 'oh my gosh'. We have a wonderful product, wonderful people and a wonderful environment. All this should motivate us to work hard and also have fun. <<

THE EJ200 – THE TRACK RECORD

After clocking up more than 660,000 flying hours, the Eurojet EJ200 has established a very impressive track record as the power behind the Eurofighter Typhoon. This flying record has created an authoritative bank of data, pilot testimony and engineer evidence.

ANTI-FOD DESIGN

The EJ200's bladed discs have an anti-FOD design, which prevents foreign object damage and means they are very FOD tolerant.

HOT BUT NOT BOTHERED

A single crystal turbine blade is designed to operate 200°C above its melting point. That's like trying to stop an ice cube from melting in an oven.

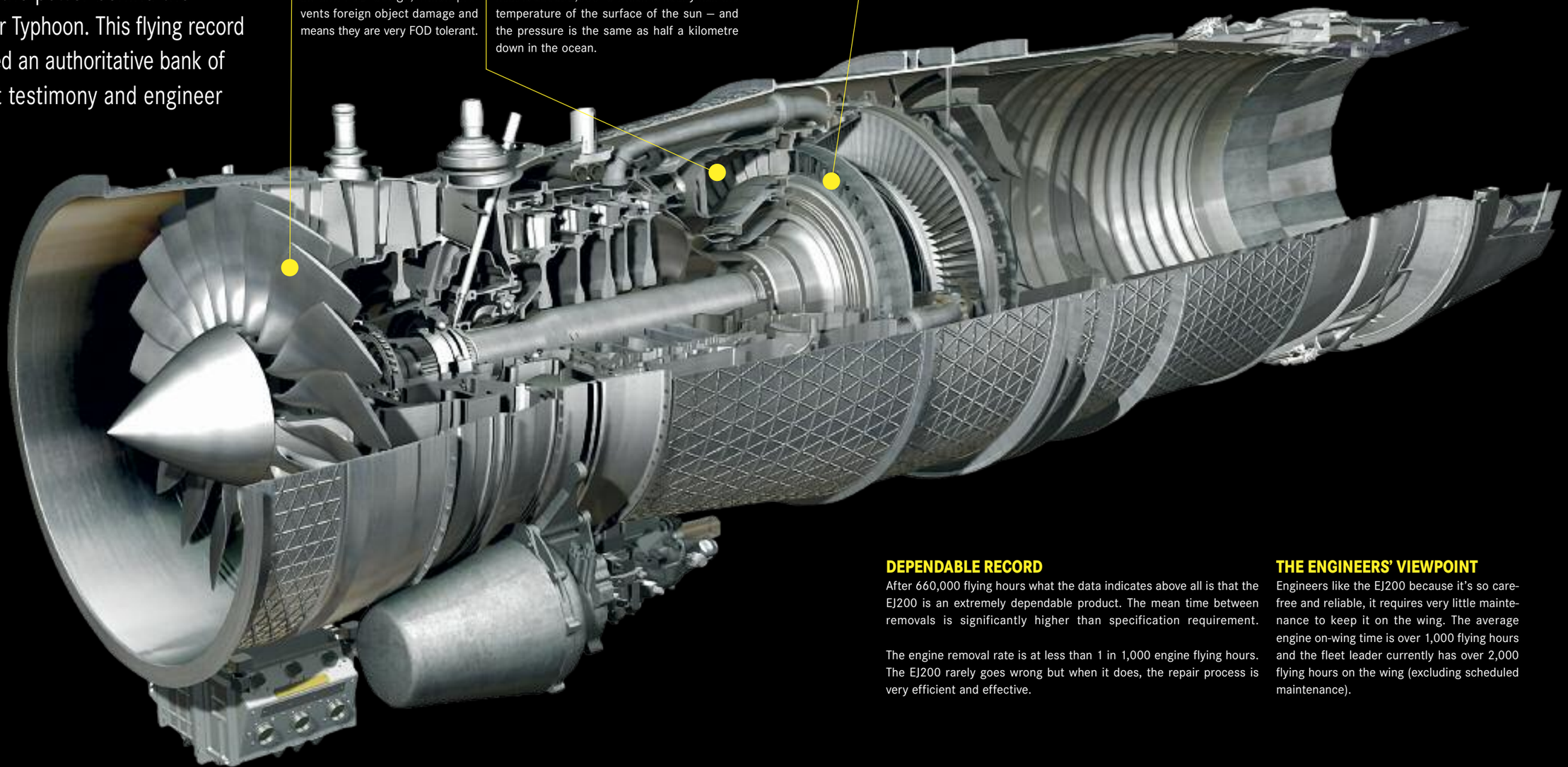
At its heart, in the combustion chamber, the heat is about 2,000°C which is nearly half the temperature of the surface of the sun – and the pressure is the same as half a kilometre down in the ocean.

A FORCE FOR GOOD

The force on the small first stage turbine blade at take-off is about 10 tons. That's equivalent to hanging a double-decker bus on each blade.

PILOTS' PERSPECTIVE

Air force pilots say the EJ200's power gives them combat edge. For them energy regain is a key factor. It means that during air-to-air combat manoeuvres their aircraft is more responsive and they can get the power back quicker than most rivals. There's no dead zone. When the pilot hits the throttle the engines respond.



DEPENDABLE RECORD

After 660,000 flying hours what the data indicates above all is that the EJ200 is an extremely dependable product. The mean time between removals is significantly higher than specification requirement.

The engine removal rate is at less than 1 in 1,000 engine flying hours. The EJ200 rarely goes wrong but when it does, the repair process is very efficient and effective.

THE ENGINEERS' VIEWPOINT

Engineers like the EJ200 because it's so carefree and reliable, it requires very little maintenance to keep it on the wing. The average engine on-wing time is over 1,000 flying hours and the fleet leader currently has over 2,000 flying hours on the wing (excluding scheduled maintenance).

SEEING RED

The Nevada Test and Training Range covers a staggering 15,000 square miles of airspace and represents one of the most realistic testing environments for air forces on the planet. In this edition of Eurofighter World we find out what happened when the Italian Air Force Typhoons made their debut there in a Red Flag exercise.

Italian Detachment Commander Col. Marco Bertoli at Red Flag 16-02

It's a mere 40 minutes from the craziness of the Las Vegas strip to Nellis Air Force Base in the northeast of 'Sin City'. Though we're heading up Highway 15 towards Nevada's vast desert emptiness, we're actually still on the outskirts of town when we pull up at the base's security gates.

Two things strike you when you climb out of the minibus. The first is the heat, or rather lack of it – it's a pleasantly warm mid 20s and some way off the air con-busting averages they often see in this part of the world. The second thing is the noise.

Wave after wave of up to 80 military fast jets taking to the skies make an awesome, bone-shaking din. Welcome to Red Flag.

Even by the United States' supersize standards and the no holds barred ethos of Vegas, Nellis and the Nevada Test and Training Range is off the scale huge. It has more squadrons than any air force base in the US, covers a staggering 11,300 acres, and the training range consists of around 15,000 square miles of airspace.

It's also the host, several times a year, to the most realistic combat training exercise involving the air, space, and cyber forces of the US and its allies. These are the Red Flag exercises. They take place in a unique environment, containing more than 1,900 possible targets, realistic threat systems and an opposing enemy force and well, to put it bluntly, there's nothing else like it anywhere in the world.

These exercises have been running since 1975, with air crews from the United States Air Force (USAF), United States Navy (USN), United States Marine Corps (USMC), United States Army (USA) and numerous NATO or other allied nations' air forces taking part in these two-week exercises held throughout the year. Ahead of this latest Red Flag, air expeditionary wing commander Col. Andrew "Saint" Bernard said one of the goals is to achieve clear communication skills. Col. Bernard says: "Everybody comes with a different background and we have to work through that a little bit. But aviation itself is its own language, and the tactics that we use are our own. And we all come with a little bit of, for lack of a better word, 'baggage,' of our own. And we sometimes need to use something like Red Flag to break that down."

During this particular 'Red Flag 16-02', around 80 aircraft are scheduled to depart Nellis twice a day, often remaining in the air for up to five hours.

It's a particularly important one for the Italian Air Force (Aeronautica Militare Italiana: AMI). Commanded by Col. Marco Bertoli, it's the first time in Red Flag's 41-year history that the AMI has been involved. The hike over the Atlantic and across to Nevada also represents one of the force's longest ever overseas

>>

>> SEEING RED

deployments for a Typhoon detachment. The ability to ferry a group of complex fighters over such a long distance and then quickly establish a core fighting capability in an unfamiliar and harsh environment is a test for anyone.

“Participating in an operation like Red Flag means many challenges,” Col. Bertoli told the waiting media. “One, of course, was bringing eight aircraft and almost 200 people here, 6,000 miles away from home. We had to show a great deal of deployment capability.”

▲ Eurofighter Media visit at Nellis Air Force Base

The AMI went to Nellis on the back of leading the Baltic Air Policing mission between January and September 2015. That assignment taught them a great deal and they were able to take that practical know-how with them.

“We learned that our platform is capable of operating pretty much in every weather condition possible, and we learned that we can deploy pretty much all over the world. It gave us a great amount of experience to plan our deployment to Nellis, which is the furthest we have done so far with the Eurofighter.

“Every time you plan an operation, even if it's training, you learn things and we have already brought together a lot of learning points from our experience at Nellis. It is not easy to operate so far from our home station, but it’s an experience we will learn from.”

The whole point of taking on the Red Flag challenge is the training value it brings. This may be a city where 200 dollars can disappear faster than a Eurofighter on full reheat, but at Nellis nothing is left to chance. It’s all about preparation, planning and being fit for the future – whatever that may bring.

Col. Bertoli had no doubts about the venue, its tests and rewards: "The Italian Air Force feels that this is one of the best combat training environments that our pilots can find anywhere in the world to be ready for future operations with our NATO partners.

"We brought young pilots to the exercise, in order to transfer the Red Flag experience to the Italian Air Force. Their job will be to pass on their experience to the country’s future aviators, as well as be ready to participate in future operations with NATO allies. Our pilots will be ready to face challenges of the future.”

The main focus of AMI at Red Flag 16-02 was flying their eight Eurofighters in the air-to-air role, but it also took the opportunity to roll out the air-to-surface capabilities in an effort to help promote the platform in those regions of the world for which it takes the lead as part of the wider Eurofighter consortium. It was this air-to-surface role that was viewed with interest by the watching media, who were eager to understand more.

"We are developing a swing-role capability, which is mostly to support the Typhoon's export capabilities for other countries, and during Red Flag we dropped inert bombs as part of the exercise,” explained Col. Bertoli. "Italy is the lead weapons integrator for the partner nations. We also have prime responsibility for promoting the export of the aircraft to particular regions, in Kuwait, for example, and so we need to know ourselves about the swing-role capabilities we are promoting.”

Of the eight AMI aircraft in Nellis, five were Tranche 1 platforms and three were Tranche 2 platforms fitted with the P1E(B) software and it is these that were involved in the swing-role tests.

"We were testing GBU-16 [Paveway II] and GBU-48 [Enhanced Paveway II precision-guided bombs], and developing the Storm Shadow stand-off cruise missile capability too. We were developing the tactics, techniques, and procedures, as well as checking the software and attack suites.”

In truth the swing-role element of the flying took up a small fraction of the AMI's efforts at Red Flag. The bulk of their involvement was dedicated to the platform's primary air-to-air role.

"The key for the exercise was integration within a large force, so that when we go to future operations we will have 60 per cent of the work already done,” said Col. Bertoli. “Understanding and learning from each other is the key point of this exercise. From an air-to-air point of view, the pilots performed very well, and we learned a lot. I was very satisfied with what we achieved, especially as we brought such young pilots and the days were very demanding."

All Red Flag exercises give pilots unrivalled experience of intensive multiple air combat sorties and this one was no different. That translates to an awful lot of demanding work for the pilots, the ground crew and of course the aircraft. The latter performed well and of particular note was its reliability.

"We learned a lot about the reliability of the Typhoon during the Baltic Air Policing mission that Italy led from January to September 2015, when we had 48 scrambles and didn't miss a single one,” the colonel explained. That level of performance continued in Nevada – with only one sortie lost and that due to the weather. The high standard of reliability was all the more outstanding considering the AMI's Typhoon force was such a long way from home.

With a daily flying programme that’s testing in the extreme and an entire squadron set up as ‘the enemy’, the sorties come thick and fast at Nellis. But, says Col. Bertoli, his next job will be to share the experience among the Eurofighter community so that everyone can learn from their two weeks in Nevada.

"At the next Eurofighter Typhoon Interoperability Project meeting we will bring the lessons that we have learned at Red Flag, and I am sure the UK too since the Royal Air Force participated at Red Flag in 2015. This is how we learn and develop standard operating procedures as a community.” <<

RED FLAG IN NUMBERS

11,300
NELLIS AND THE NEVADA TEST AND TRAINING RANGE COVERS 11,300 ACRES.

15,000
THE TRAINING RANGE CONSISTS OF AROUND 15,000 SQUARE MILES OF AIRSPACE.

75
MORE THAN 75 PER CENT OF ALL LIVE MUNITIONS USED IN US AIR FORCE TRAINING ARE DROPPED AT THE NEVADA RANGE.

THE ART OF NOISE

"Noise is a physical stress even if you don't realise it, it's a stress on the brain," says Eurofighter Pilot Dietrich Springer.

Springer, who has been flying the aircraft since 2008, has notched up over 600 hours and knows all about the passive noises that come from various sources like the engines, aerodynamics, electronic coolers and air vents. They've always been there and had an impact. >>

Like most military jet pilots around the world, Dietrich Springer currently relies on simple earplugs to reduce the noise, and hence the stress.

Problem solved, you may think. But the issue with earplugs is that they're uncomfortable to wear under a helmet for prolonged periods, plus there's always the risk of them getting lost on the flight line or even in the cockpit – causing the feared FOD (Foreign Object Debris). In the worst cases they may also reduce the audio signal quality coming from the onboard communication and warning systems.

That's why Airbus Defence and Space has teamed up with the Danish company Terma to develop a solution for Eurofighter pilots. In short, they've produced an Active Noise Reduction (ANR) system by interconnecting

Eurofighter Typhoon Pilot Alexander Miksitz at Zeltweg Air Base

Terma's ANR flight demonstrator headset with the Typhoon communication system and have adapted it to fit inside the pilot's helmet.

This modified helmet has been successfully tested on the ground, using the communication system test laboratory at Airbus Defence and Space in Manching.

Earlier this year the team took the next step with flight tests conducted by pilots from the Austrian Luftstreitkräfte, who were tasked with assessing the ANR system's usability in the Typhoon cockpit.

The feedback was positive. The noise was all effectively cancelled out. For a pilot like Dietrich Springer, who took part in the trial, it represents a very sensible step forward in the development of the Eurofighter's cockpit.

"There's a lot of information to take in when you're in the cockpit, you need to understand the information and react," he said. "With this ANR package you could feel the difference, even within a short length of exposure."

His colleague, Display Pilot Alexander Miksitz, was equally impressed: "My first thought was 'damn, that's quiet'. The noise reduction was so good."

Alex, who has also completed more than 600 flying hours since joining the Eurofighter fleet in 2008, doesn't wear earplugs when flying and added: "I could focus on what was important, as it distinctively reduced distraction."

Matthias Nitsche, Technical Integration and Campaign Support at Airbus Defence and Space, believes the ANR solution is a great example of partnership working.

"The project has proven how efficient new systems can be integrated into Typhoon when industry and Eurofighter Partner Nations are working proactively together. From supplier contract to first flight, this has only taken four months and we are very grateful to the Austrian Luftstreitkräfte for making that possible."

Clearly, the feedback from the pilots has been a crucial part of the testing process and, in turn, they value being involved in it. Dietrich said: "I feel it's invaluable for us to present our opinions and feelings to the Eurofighter consortium, and to see the work that goes on behind the scenes to improve systems is useful. That link is obviously important.

"Working together, exchanging questions and answers – it's the best way to get things right. So from an Austrian Luftstreitkräfte point of view, we're very willing to help and search for improvements and solutions. Ultimately we know it will support our missions and help our pilots." <<

THE COOLEST JOB ON THE PLANET

STEVE FORMOSO
BAE Systems Chief Test Pilot

Chief Fast Jet Test Pilot. It's up there with brain surgeon, pop star or rocket scientist as one of the coolest jobs on the planet. >>

It's associated with the glamour of air show displays and daring record-breaking feats like those carried out by Chuck Yeager in the 1940s, 50s and 60s. The early US astronauts all came from test flying backgrounds.

But what's the reality behind the job title? In the 21st century what are the skills that are required and is it all about pushing the envelope?

Steve Formoso was appointed Chief Test Pilot at BAE Systems in 2015. His CV is impressive. It combines expert flying abilities, engineering knowledge, communication skills, a good contacts book and a dash of diplomacy.

"There are probably some myths about the job," says Steve with a smile. "For example, the sort of stick-and-rudder flying that Yeager and his ilk had to do where they were fighting with the controls is not really where it is in 2016.

"Today the job is all about offering the right amount of knowledge at the right time into the programme. You use your experience of how the aircraft is used and make sure it influences the product at the right time." >>

"TODAY THE JOB IS ALL ABOUT OFFERING THE RIGHT AMOUNT OF KNOWLEDGE AT THE RIGHT TIME INTO THE PROGRAMME. YOU USE YOUR EXPERIENCE OF HOW THE AIRCRAFT IS USED AND MAKE SURE IT INFLUENCES THE PRODUCT AT THE RIGHT TIME."

>> THE COOLEST JOB ON THE PLANET

Fast jets like the Eurofighter Typhoon are a constant work in progress, with incremental changes bringing improvements to capability throughout an aircraft's life – a lifespan that often stretches across decades. Air Forces request specific capability requirements and then the engineers bring them to reality. Working somewhere in the middle of that exchange is where a test pilot like Steve adds real value.

"We are the Babel fish between the designers and engineers on one side and the operator on the other. You're translating between the two," he explains. Having had more than 20 years working as a pilot in the UK Royal Air Force and several more working with the industry teams he's well placed to act as a go-between.

While it's not always about flying the aircraft to its outer limits, it is a crucial part of the job to try to look for any potential weaknesses.

"That's the only way we can improve the product but we have to do it in the right way. Communication is key to most jobs and this is no exception. As a test pilot you have to be able to say there's something not right about the design. When you operate with the aircraft you find things that need changing and understand why they need changing. It's a bit of an art form and that's what you are trained to do as a test pilot.

"AS A TEST PILOT, YOU ARE OFTEN THE ONLY PERSON IN THE COMPANY WHO WILL SEE AN ISSUE BECAUSE THERE ARE ONLY FIVE OF US ACTUALLY FLYING THE PRODUCT. IT'S A PRIVILEGED AND IMPORTANT POSITION AND THAT'S WHY COMMUNICATION IS CRUCIAL."

"In an ideal world, you would be able to simulate everything in the test rigs and not actually go flying but it's never going to happen. There is so much that goes on during a flight, so many variables, you just can't simulate it adequately. Time and time again we will find things during a flight test that you'll never see anywhere else. That's one of the chief reasons we do what we do.

"As a test pilot, you are often the only person in the company who will see an issue because there are only five of us actually flying the product. It's a privileged and important position and that's why communication is crucial."

Formoso is leading the BAE Systems team at one of the busiest times in the Eurofighter's life, with the capability journey reaching a critical juncture.

"On Typhoon we have been firing the Meteor missile recently and we're also working on Storm Shadow and Brimstone. There are lots of challenging timescales ramping up for testing and developing," he adds.

From his view in the cockpit, Steve has a unique perspective on the aircraft and while he is a firm advocate of Typhoon, he says his role demands honesty.

"We trade on our honest opinion. It's key. Our reputation can be destroyed in an instant if we overegg something, but in the same breath we can also paint the aircraft's capabilities in the right light.

"Test pilots are designed to look for flaws in products but you have to communicate it as part of the wider team. If we just sit on the sidelines poking at problems and not helping, you're not actually adding any value. We need to push for the capability to deliver, push for those export sales; it's what keeps the programme alive.

"So the ability to carry multiple weapons at the same time is key, because the world demands a much more flexible way of operating. When you combine greater capability with what Typhoon can do as a basic platform – the power, the flight control system and so on – you have a really potent weapons system."

So how did he get there? Steve's introduction to flying came when he was an eight-year-old, when his mum and dad took him out for a day trip and, quite by chance, they decided to go for a glider trip at an airfield near Oxford.

"I remember that day vividly and still have an old polaroid my dad took. I was hooked from that moment on. I knew what I wanted to do. It seemed to me to be the most natural thing in the world to decide."

He joined the air side of the cadet force as soon as he was old enough and took a flying scholarship while still at school. Then it was time for university.

"When I was considering my options I weighed up whether the university had an air squadron and somewhere I could hang glide. As far as career paths were concerned, my top three were air force, commercial flying and, if all else fails, messing about with hang gliders."

He ended up going to Swansea University because it ticked all his boxes and, not surprisingly, joined the RAF immediately after graduation in August 1990. Then during his RAF training he volunteered for the Euro NATO Joint Jet Pilot Training Scheme and went to the United States to carry out his primary flying.

His formative military flying career took place at Shepherd Air Force Base in Texas on T37s and T38s, amid young pilots from the United States, Germany, the Netherlands, Denmark and Turkey. It was in this melting pot that he got his wings. After graduating in 1992 he went on to fly Jaguars on operational duty with 54 Squadron.

That introduction to life as a frontline pilot was perfect preparation for a busy few years, which included operations in northern Iraq working out of Turkey. Then one day in 2001 he got a call out of the blue asking if he wanted to go to the United States to fly Strike Eagles with the US Air Force as part of an exchange. He started the course flying F15Es and then linked up with the 336th Fighter Squadron, the Rocketeers.

When that chapter ended, Steve returned to the UK to face a different kind of challenge. As a staff officer with 1 Group he was asked to look at Typhoon operations at a time when the aircraft was being readied to go into service with the RAF. His role as Flight Commander on the Typhoon Conversion Unit meant day-to-day flying on the aircraft, as well as working closely with pilots from the RAF and other forces. It was also his first exposure to BAE Systems.

He was then offered a place at the Empire Test Pilot School and, after graduating, went back to RAF Coningsby, but this time as a test pilot with 17 Squadron.

"I came to test piloting relatively late but part of test piloting is the amount of experience you bring to the job. You can't walk into it as your first job; it would be impossible and you'd have no credibility in the role."

So how does Typhoon compare to other aircraft on his CV?

"It is truly gobsmacking to fly. On the production test flights where we take the performance of the aircraft to the max, I still have those moments where I'm saying to myself, 'I can't believe I have this job.' It's like riding a huge ball of almost unlimited energy. The power is unbelievable. At the end of the day when you've just done Mach +1.6 and pulled 9G over the Irish Sea there can't be too many people topping that day-to-day in the UK."

It sounds an incredible place to be. It still sounds like one of the coolest jobs on the planet. <<

Eurofighter Typhoon: “Dancing in the Sky” at Farnborough Air Show 2014

DANCING IN THE SKY

Display flying is an intriguing mix. Part theatre, part sales, part engineering. There's the courage of the world's most incredibly gifted pilots showing off their skills, and the majesty of fast jets performing at the max. But what exactly makes a good display? What kind of preparation goes into it? And what goes through the minds of the men and women in the cockpit as they dazzle the crowds below? >>

GERI KRÄHENBÜHL

Chief Test Pilot for Airbus Defence and Space

When it comes to display flying, Geri Krähenbühl is a master of the art. The Chief Test Pilot for Airbus Defence and Space based in Manching, Geri has performed countless displays both in the Eurofighter Typhoon and the 40s vintage Messerschmitt 262. Each aircraft type presents a different challenge but when it comes to any display, Geri has three principles – and a mantra based on five Ps – that guide him.

The first principle is to remember exactly who he is looking to please. In truth the only people Geri is really concerned with trying to impress – or entertain – are the members of the public who turn out in great numbers to the air shows. He has his own 'ice cream' test to check if his display is hitting the mark.

"In my view air show display flying is meant for the public, not the pilots. That's the most important thing to remember. For me some displays look great, but are too low. They're probably a rush for the pilot carrying out the manoeuvres but it's no good if half the crowd aren't able to see it properly. I think it is essential that everyone can see my display.

"I could do the best low flight path ever, or the most thrilling flight path, but if the crowd start to go for an ice cream while I am flying then I have failed."

The second principle for Geri is to show off the positives of the aircraft he's been asked to display.

"With the Eurofighter I love to perform verticals." A crowd-pleasing take off where the aircraft turns skyward and heads up at 90 degrees. "Taking off vertically, performing a loop and coming back to the airfield. If you look at some other aircraft types they have to do oblique stuff before they get enough energy to go vertical. Eurofighter can go straight into the vertical.

"We celebrate this and try to show the performance of the aircraft right from the opening move. As an industry display pilot, you want to highlight where the aircraft has the edge on a rival. That's the major difference between an air force and an industry display pilot. There might be thrilling manoeuvres, but if a rival aircraft could offer similar performance then we wouldn't be interested in doing it because we are simply doing the same thing – which we don't want. The air force pilot has a different perspective; they just focus on putting on a good public display."

So for an industry display pilot like Geri there is an onus on him to 'sell' the performance of the product, but there is more to it for him. It's about professionalism.

"It's not that we have to fly in a certain way, but it is fun to show the aeroplane in routines that other people can't perform.

"I would not say we are part of the sales process. The sales team is happy with the way we fly a display. But if we did it differently, they would still be happy because they wouldn't really notice the difference. But a fellow pilot can tell and can see what we can do in our aircraft compared to what they can do in theirs. And for us this difference in performance is the thing we like to highlight."

During a display the aircraft is pushed to the limits which means lots of G-forces pounding the body. But this is another area where Typhoon excels.

"If you just do one display for six minutes or so, it's not too bad," says Geri. "I was once asked to do three sessions in a day because the weather was good and we had the aircraft available. After the third display I was really wasted. One display is OK because the G-protection on the aircraft is phenomenal. Over my career, I have been lucky enough to fly 55 different aircraft and the Eurofighter has the best G-protection I have ever known. It's a quantum leap forward from others I've experienced."

With huge crowds to entertain, fellow professionals watching their every move, the physical and mental demands and routines that take their machines to the max, there's a degree of pressure before each flight. Not surprisingly Geri prepares for each display just like a top class athlete might ahead of a big race. He gets into the zone and blots out the world.

"In the hour before the display I go through a process of calming down, it's almost like meditating. I try hard to blank out the public, the management team and the media interviews. I try to find a quiet corner, to calm down and relax but at the same time think through the manoeuvres and the sequence. I think about the weather, the local topography and the geography around the airfield. >>

"Then when I climb into the cockpit I try to stay relaxed – my mind is on my work, not the crowds. Before take off I don't have any sensation in my body, I just try to achieve a very calm state. I look out down the runway and stay focused. When the burner kicks in, I wake up!

"As soon as you sense the pure power of the Eurofighter on take off you come alive. The after burners fire up, you take off. That's the wake up call.

"The display is like a dance. You get the rhythm, and then you start to do the dance with the aircraft through the skies."

Gaining a seat in a display aircraft isn't easy. Only the very best and most experienced get the call, but one glance at Geri's CV proves he's got the right credentials. Born in Bern, Switzerland, in 1963, he is in fact unusual for a pilot because he didn't have much interest in aeroplanes until about the age of 16.

Then, after reading a magazine article, it became something of an obsession. "All hell broke loose," he says. Despite relatively small numbers of professional pilots in Switzerland, Geri was selected and earned his wings in 1985. An incredibly varied career – taking in a host of roles and aircraft – has followed.

"I am really spoilt. Every day I look out of the cockpit window and give thanks for my life."

That said he doesn't take anything for granted, which brings us to Geri's third guide rule: preparation.

"One key question I have when I am asked to display is what is the airfield like. You need to be aware of everything: the positions of the sun, the noise, whether it's close to mountains and so on. You need to understand what parts of your display might not work in that particular area.

"Then you also have to prepare thoroughly. It starts with simulator training. I would usually book two hour slots each day for two weeks, though it depends on the topography. After the simulator training I carry on the preparations in the aircraft.

"It's all about the 5Ps – Proper Preparation Prevents Poor Performance!"

Display pilots are perfectionists. They try to make sure they never have a wing tip out of place but rarely do they ever feel they were 100 percent successful. In this respect Geri, though hugely experienced, is no exception.

"For me, I will never be satisfied. I came close a couple of years ago when I was given the opportunity to fly six days in a row and the last display was almost perfect. I think I said at the time I couldn't do it better!

"But if I did the same display next year I would have to start from scratch. The more you do it, the smoother it gets, and the more satisfied you become. It is also important not to be too self-confident or satisfied too early into the display. There are some thrills in there, but also a lot of professionalism, otherwise you wouldn't survive. It's only when you land and it's over that you start to see the public and acknowledge them."

Public adulation for the stars of the show is understandable but it's an aspect of the process many pilots feel uncomfortable with. The rock star exaltation isn't what Geri dreams of.

"Unfortunately, it comes with the territory but it's not natural. Outside of the displays, I am just Geri and nobody would recognise me in the street or the park. I don't want fame. For me it's far better to have a beer with my counterparts, talking and having a few laughs."

For a man who dazzles in the skies, Geri is very grounded. Take away the drama and the theatre and what you're left with is a very thorough professional. Who just happens to be doing an incredible job. <<

Flt. Lt. Jonny Dowen (left) and his 2016 successor Flt. Lt. Mark Long

SHOW TIME

Throughout the summer, the RAF Typhoon display team will be wowing the crowds up and down the land. We spoke to two men who know all about what it takes to put on a dazzling display – last year's pilot Flt. Lt. Jonny Dowen and his 2016 successor Flt. Lt. Mark Long.

How do you become a display pilot?

Mark: "Display pilots are drawn exclusively from the RAF's 29 Squadron and selection starts the moment you arrive on the squadron. They look at everything you do – how you are as an instructor, how you are as an individual and how you work with other people. Applications are asked for in summer and there is a discreet interview process, followed by a simulator flying test and finally an airborne flying test. It's a much sought after role and there are always a good number of applicants."

How many manoeuvres do you aim to carry out?

Jonny: "We design a sequence from start to finish and try to incorporate everything you want to do, but the length of time and therefore number of elements for the display is dictated by the fuel. Over the season, as the display gets tighter and you get more competent at it and you have maybe saved 300-400 kilos of fuel, you can then add an extra manoeuvre because you've gained that time."

How do you piece a display together?

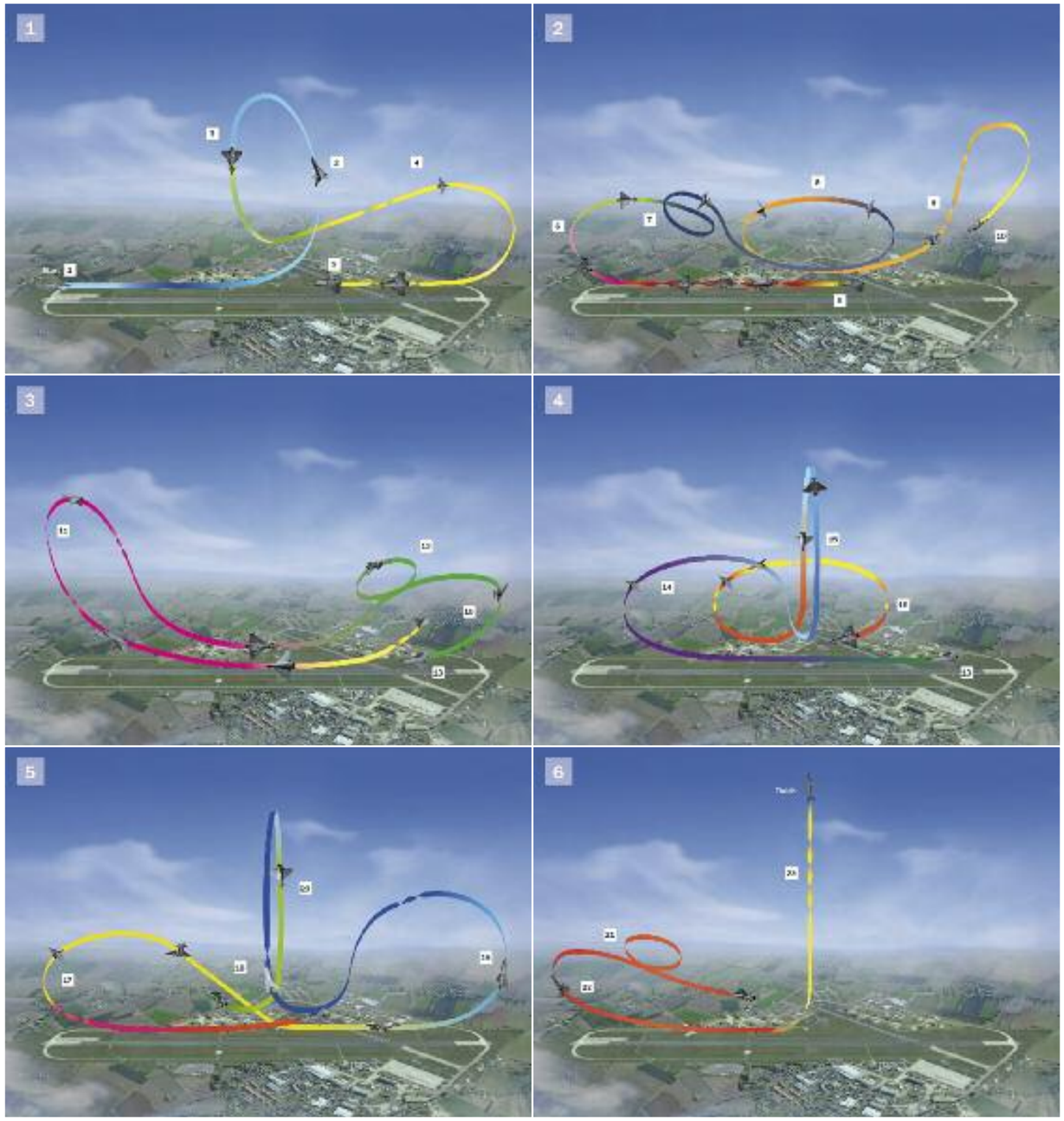
Mark: "It starts off by watching other people display and seeing the crowd react to it. When you are surrounded by people and hear the cheers and gasps, you know it's a manoeuvre that works. Then there's talking to other pilots. I've quizzed Jonny for hours on whether an idea for something would work. Finally, it's a case of piecing together all those different facets into one. My display has evolved ever since I was selected.

"There have been around 10 years of displaying Typhoon and many lessons have been learned about what works and what doesn't. For me it's about taking pieces of the puzzle and putting them together in a different way. My favourite display of the last three years was Jonny's. But I am not going to fly his display, I will put my personality on it. My aim is to put on a free-flowing display. I want the start of the sequence to the end to be one whole manoeuvre and I'm keen for people to be able to see how it links all together and flows."

Do you feel under pressure to perform?

Jonny: "Yes, but the biggest pressure is self-induced. You become almost your own worst critic. Every pilot wants a display to be >>

>> DANCING IN THE SKY



absolutely perfect. But actually to the guys on the ground it makes no difference. All they want is lots of noise, lots of speed and a mix of a few manoeuvres."

What have you learned in training?
Mark: "Stepping down from 5,000 to 1,500ft was mind-blowing. It was akin to when I first flew Typhoon – you notice the performance is insane. I was talking to Jonny non-stop for about half an hour after the first time I did it. There's even more power available because of the air density – so your acceleration is a little bit quicker; the roll rates are a little bit quicker. It's amazing.

What advice have you given Mark?
Jonny: "The biggest thing is to enjoy every weekend and take the chance to do everything that comes your way, because before you know it you will be looking back on it. The public interest took a little while for me to get used to. You'd pitch up at an event and there'd already be a queue of people at the PR trailer and you'd be mobbed for hours. People want to talk and get autographs. That was surreal from going from a 'day job' where the display flying is just another extension of what you are doing to suddenly being public property."

What does it all prove?
Mark: "The qualities that make Typhoon such a good display aircraft are also the qualities that make it a great combat aircraft. We showcase the agility and power of the aircraft and these are things that are crucial to air combat scenarios or multi-role tasks. So the characteristics that the Eurofighter displays so well on the air show circuit are the ones that ensure it does so well in other theatres of operations."

Do you take anything from display flying back to the day job?
Jonny: "I'd say two things. One, airmanship. In our normal day-to-day we go in and out of RAF Coningsby, but with display flying every weekend you are taking the Eurofighter away to a different airfield and flying in busy international air space. All the time you are looking after your team of engineers. The second thing is performance. Display flying means you get to really understand the jet's limits and see exactly what it can do. That's especially true as you start to fly low level. You start to notice a big performance difference once you drop below 5,000ft and at display heights the performance seems to almost exponentially go up. Developing that appreciation then travels into some of the combat scenarios. You have the confidence because you know exactly what the aircraft can do and how tight it can turn." <<

EUROFIGHTER TYPHOON AIR DISPLAY IN NUMBERS

2.8 TONNES OF FUEL IS BURNED BETWEEN TAKE-OFF AND LANDING

8 TOTAL NUMBER OF MINUTES THE TYPICAL AIR SHOW DISPLAY LASTS

100 MAXIMUM NUMBER OF MILES TRAVELLED DURING A DISPLAY

QUICK GUIDE TO MORÓN AIR BASE

with
CAPTAIN JOAQUIN DUCAY DE LA RIVA
Spanish Air Force

About 35 miles to the southeast of Seville in the southwest of Spain, Morón Air Base plays a key strategic role in the defence of European and NATO airspace.The base covers Spain's needs, NATO's and also fulfills Quick Reaction Alert duties. This is currently the base's main mission.

Given Morón's location on the western edge of the Iberian Peninsula, its QRA forces are kept relatively busy.

Built in 1940 and opened in 1941, Morón was used as a main base for the US Air Force during the Cold War, and throughout the base's life it has often been used as a 'stopping off' point for friendly countries when they are deploying overseas or for relief work, particularly for operations in Africa.

Today the base is home to the Spanish Air Force's Ala 11 Eurofighter Typhoon fighter squadron and a maritime patrol squadron.

ALA 11 SQUADRON

The Ala 11 (11th Wing) had its origins in the Spanish Civil War when it became the nation's first official combat squadron, though its first home base was in Manises, Valencia. Even though combat flights had been made prior to the creation of Ala 11, it quickly became Spain's most decorated and has evolved into a modern fighting squadron.

Following the closure of Manises Air Base, the 11th Wing was taken to Morón Air Base which at the time was also home of the 21st wing. From then, the 11th Wing adopted two of the 21st Wing squadron's patches which now are the 111SQN and 113SQN.

Today there are around 37 aircraft assigned to the wing, with more to come. The squadrons boast 15 pilots plus the commander in the 111SQN, and there are seven instructor pilots in the 113SQN. Student numbers in the 113th vary over time. In addition, there are a number of key support personnel serving the 11th Wing, plus maintenance and mechanics. All told, this adds up to around 400 people. >>

>> MORÓN AIR BASE

Captain Joaquin Ducay de la Riva

CAPTAIN JOAQUIN DUCAY DE LA RIVA SPANISH AIR FORCE

How is the Eurofighter's performance and capabilities regarded among the pilots?
The best word to describe it is 'worship'. And the unfortunate fighter pilots who don't fly it, still admire and respect it deeply, even though they might still fly incredible machines. It never fails to astonish those who have never operated alongside it, when they get a chance to learn about their capabilities.

What do they most like about it?
I'd probably say the engines, the radar, and the tremendous situational awareness pilots gain out of all its systems.

What's the aircraft's main role for the Spanish Air Force?
In Spain the role is air defence and QRA, that's the primary role that the aircraft currently has. A good example of our work would be the 2015 role in the Baltic Air Policing mission. The 11th Wing undertook this role from Estonia, and is also now being managed by the 14th Wing Eurofighters from Lithuania. However, we are also proficient in the air-to-surface role. In fact, by the end of this year our fleet will be upgraded to SRP12 and Litening 3 PODs will be fitted.

How important is Eurofighter for the Spanish Air Force?
It's THE future, no question. Not only because of its growing capabilities and potential for never-ending upgrades, but also because of what it means for Spanish industry and the nation's aeronautical expertise.

How do you see Eurofighter operating alongside other aircraft?
The Eurofighter was designed, and all its upgrades have been developed with the same principle, to operate alongside other NATO members. The aircraft's capabilities are perfectly interoperable with any other modern NATO jet, in any campaign.

What has been the value for the Spanish Air Force of being part of the Eurofighter programme?
From my experience it has been, and hopefully will continue to be, a great ride.

FIRST GERMAN EUROFIGHTER **WEAPONS INSTRUCTORS** QUALIFY IN UK

by

ALAN WARNES

During a three-week exercise at RAF Coningsby, UK, five Luftwaffe Eurofighter pilots completed their Qualified Weapons Instructor (QWI) course. They were the first Luftwaffe Eurofighter pilots to do so, as previous QWIs had come from the F-4F or Tornado.

▲ Lt. Col. Gero Finke is the Base Commander at Wittmund, which will soon see its Eurofighters flying in TLG 71 marks.

Six Luftwaffe Eurofighters arrived at the Lincolnshire base, home to the RAF's Typhoon Operational Conversion Unit 29(R) Sqn, earlier this year. They were there as part of Exercise Cobra Warrior 16-1, a Combined QWI course focusing solely on the Eurofighter Typhoon.

COBRA WARRIOR 16-1

The first Luftwaffe Weapons Instructor Course started last September at Laage in northeastern Germany, where the Luftwaffe Fighter Weapons School (FWS) is located. It comprised 24 flying sorties but for the last seven, the mission employment phase was covered in the UK. Their qualifications mark another stride in the Luftwaffe's Eurofighter evolution.

Lt. Col. Julius. Kurbel, Head of the Luftwaffe Fighter Weapons School, said: "Each mission started with a day of classroom and we would fly the sortie on the second day, as well as execute the debrief. The five students flew both defensive counter-air and offensive counter-air missions.

▼ A Luftwaffe/TLG 73 Eurofighter taxis towards the end of the runway as a 29(R) Sqn Typhoon prepares to depart. All photos, Alan Warnes

"They experienced some large Combined Air Operations while working with a selection of fighters, tankers, slow movers – like helicopters and transports – and ISR aircraft like the RC-135s and Shadows."

Some of the exercise's Blue Force packages could comprise 30-35 aircraft, while the opposing Red Force around 10-15 jets.

The RAF Officer commanding the QWI Course (QWIC), a squadron leader who in line with the new RAF security policy cannot be named, spoke about the exercise: "We had four pilots on the course although we usually have two Air Battle Managers from an E-3 Sentry or a ground control unit.

"This course marked the first time we have organised two in a 12-month period, although this one was focused only on the Typhoon.

"Having the German pilots here is a step change for us and we hope they will come for future courses and attract the Spanish and Italian Air Force Eurofighter pilots for what could be an annual event."

TLG-71

Leading the Luftwaffe detachment was Lt. Col. Gero Finke, the Base Commander of Wittmund in northern Germany. The base is currently home to Taktische Luftwaffengruppe (TLGrp) 'Richthofen' which on July 1 was due to stand up as a wing - Taktisches Luftwaffengeschwader (TLG) 71 - with up to ten of its own Eurofighters.

LT. COL. GERO FINKE

Luftwaffe Detachment Commander Lt. Col. Gero Finke, the Wittmund Base Commander, was among the ten pioneering Eurofighter pilots who trained at Manching in September 2003 under the Luftwaffe's Service Instructor Pilot Training (SIPT) programme.

He has close to 1,000 hours on Eurofighter, which he admits isn't much considering he has been flying the aircraft since early 2004: "But being a squadron commander twice, a group commander twice and a station commander, as well as a tour in Air Force Headquarters, it does that to your flying hours!"

At RAF Coningsby, he led 130 personnel – most came from Laage, although the pilots were from Neuburg and Nörvenich.

Around 75 per cent of the pilots manning the Quick Reaction Alert (QRA) at Wittmund are based there, while the remainder deploy from the other three wings – TLG 31 'Boelcke' at Nörvenich, TLG 73 'Steinhoff' at Laage and TLG 74 at Neuburg.

With his allegiance to TLGrp 'Richthofen' he had the unit's badge put on the nose of the aircraft within days of them arriving. After all he was in command of them now.

The Luftwaffe is now introducing the Tranche 3 Eurofighters into service, with ten delivered so far to TLG 31. They are being equipped with laser designator pods (LDPs) as the wing is specialising in the air-to-surface role. Their older aircraft will be distributed among the other wings.

▲ Luftwaffe pilots wore the Helmet Equipment Assembly on their missions.

▲ The solitary TLG 31 Eurofighter taxis out during the final sortie, with a TLGrp 71 badge under the nose.

▼ The Luftwaffe has two helmet-donned Crew Chiefs for each jet.

THE MISSION

At 8am an 8 Sqn E-3D Sentry AEW1 left RAF Coningsby. It climbed into position, and prepared for the 'war' to begin, 90 or so minutes later. As the airborne warning and control (AWAC) asset, controllers onboard would supervise the fight.

Over an hour later, the Cobham Aviation Da20 bristling with electronic warfare pods departed. Onboard systems operators there to test the Typhoon pilots' electronic warfare (EW) skills, including 'spiking' their aircraft's systems.

Then came the first of 12 RAF Typhoons and the six Luftwaffe Eurofighters, which departed in a 45 minute window. Most of the action took place over the North Sea. The GAF jets flew for over two and a half hours and carried out at least one air-to-air refuelling sortie.

Upon their return, the Eurofighter's cassette which records the sortie's action was taken out and downloaded in one of the Luftwaffe's temporary workshops for mission review and for pilot debriefing. <<

2040 AND BEYOND

STEVE DEBONNAIRE
BAE Systems' UK Availability Director

In November 2015, the UK Government made a significant announcement.

It was extending the service life of its Eurofighter Typhoon aircraft from 2030 to 2040. But what exactly does that mean? >>

"I HAVE NO DOUBTS EUROFIGHTER WILL BE ABLE TO REACH THE 2040 DATE AND EVEN BEYOND IF THAT'S WHAT THE CUSTOMER WANTS."

How did this decision come about? What factors were taken into account and how is the aircraft kept serviceable? BAE Systems' UK Availability Director Steve Debonnaire knows more than most about just what it takes to keep the Eurofighter in the skies.

There are several factors behind the Government's decision, but one keyfactor is having a successful support and maintenance operation in place.

LEARNING FROM THE PAST

Eurofighter designers have recognised many of the lessons from the earlier generation platforms. Steve says: "Its airframe and systems have gained the benefit from the latest technologies and maintenance thinking. Typically, on the Eurofighter there are much longer periods between component removals and planned maintenance because the aircraft is clearly designed to be more resilient to the environment it faces.

"The other key difference is the sheer wealth of data the Eurofighter provides the maintainer when it lands. We can pull out from its supporting systems lots of information that give us real clues about how best to optimise the aircraft. We have also learnt to see inside operational data and help the forward engineers identify where aircraft are exhibiting similar trends and recommend a course of action to them.

"Those types of approaches allow us to reduce the ageing characteristics which inevitably mean less maintenance as it ages."

LEARNING FROM EACH OTHER

Worldwide the Eurofighter fleet has now clocked up more than 340,000 flying hours, which in turn means an encyclopaedic amount of facts, figures and information is available to the maintainers. In addition, this is shared and pooled with end users at the Munich-based International Weapon System Support Centre (IWSSC) who provide an invaluable service. For Steve all this collective knowledge is power in the hands of the teams who deliver the support services.

"Compared to a civil airliner, a military aircraft as it enters service is typically conservative in terms of its maintenance policy. We are able to use the operational data with much more certainty than you could at the design stage, which means you can afford to stretch out the intervals between regular maintenance. You can also use that data to search for risks where we might want to inspect something more frequently.

"A couple of years ago we moved the maintenance schedule from 400 flying hours to 500 and we are planning to move that to 625 hours by the end of 2017. The four core partner nations are working on that step together.

>>

"But as far as I am concerned 625 hours is just the next step. In the future we can move beyond that and that makes a tremendous difference to both the support cost and the availability of the aircraft to the respective air forces. Rather than having aircraft undergoing maintenance they will be available to fly."

So for Steve moving the out of service date in the UK to 2040 is not an issue. He says: "I am very confident that Europe tends to design very resilient products. Tornado is already at two and a half times its original design life and it is still flying very well and consistently. I have no doubts Eurofighter will be able to reach the 2040 date and even beyond if that's what the customer wants. The trick is to use the operational data to really do very effective air worthiness management."

ADAPTING TO CHANGE

For the service and maintenance people at the sharp end, the Eurofighter presents a number of challenges, not least because it's forever changing. Steve explains: "It is completely different compared to previous aircraft types – in some ways it's easier, for example the Harrier engine was in the middle of the aircraft and changing an engine was a major undertaking. On Eurofighter it can be done in less than an hour.

"That said, the sophistication of the jet continues to change and some of the new technologies can be complex, but overall the true measure of the aircraft is that in operation it performs extremely well with a relatively small support team.

"It's about understanding the complexities. The aircraft can give you an awful lot of data and you have to be able to see the wood for the trees – and see which pieces of information are most meaningful.

"Since it was first introduced into service, the Eurofighter has transformed into a very capable swing-role aircraft. But most military aircraft change over their lives. That's one of the biggest differences between civil and military aircraft maintenance and support. The customer is buying a through-life support service for an aircraft that it is constantly adapting to meet the latest threats. So we have to be able to adapt too."

PART OF THE TEAM

In the UK, BAE Systems has provided support to the RAF under an availability contract – which in essence sees the company agreeing to ensure ongoing operational requirements are met. In order to do that, industry and air force employees work closely together in partnership to meet their common goals. Steve says: "We are privileged to have a position within the force's Headquarters team with access to a lot of operational data which allows us to fulfil our mission – trusted to anticipate – which is key.

"If the customer gives you enough access to that data, they expect you to do something intelligent with it. We are trusted to act too, because there is no point in anticipating something if you don't do anything about it. We are also trusted to deliver on time."

To ensure the partnership runs smoothly, the BAE Systems teams at RAF Coningsby and RAF Lossiemouth are embedded with the RAF to provide aircraft maintenance and support. Steve explains: "What that really means is we are jointly accountable for planning the fleet, understanding the customer's forward training exercise and the strategic intent of the fleet, as well as generating the tactical fleet and the maintenance plan behind that."

BAE Systems has 700 people at RAF Coningsby and within the hangar and the other areas working alongside 300 RAF employees. The company has also moved all its business to the air base.

"We did that because our customer expects us to be agile. It is very difficult to be agile if you're 300 miles away. The other thing we have learned is that in order to optimise a support solution you have to be able to understand what's going on. To know that you have to be on the ground and close to the action."

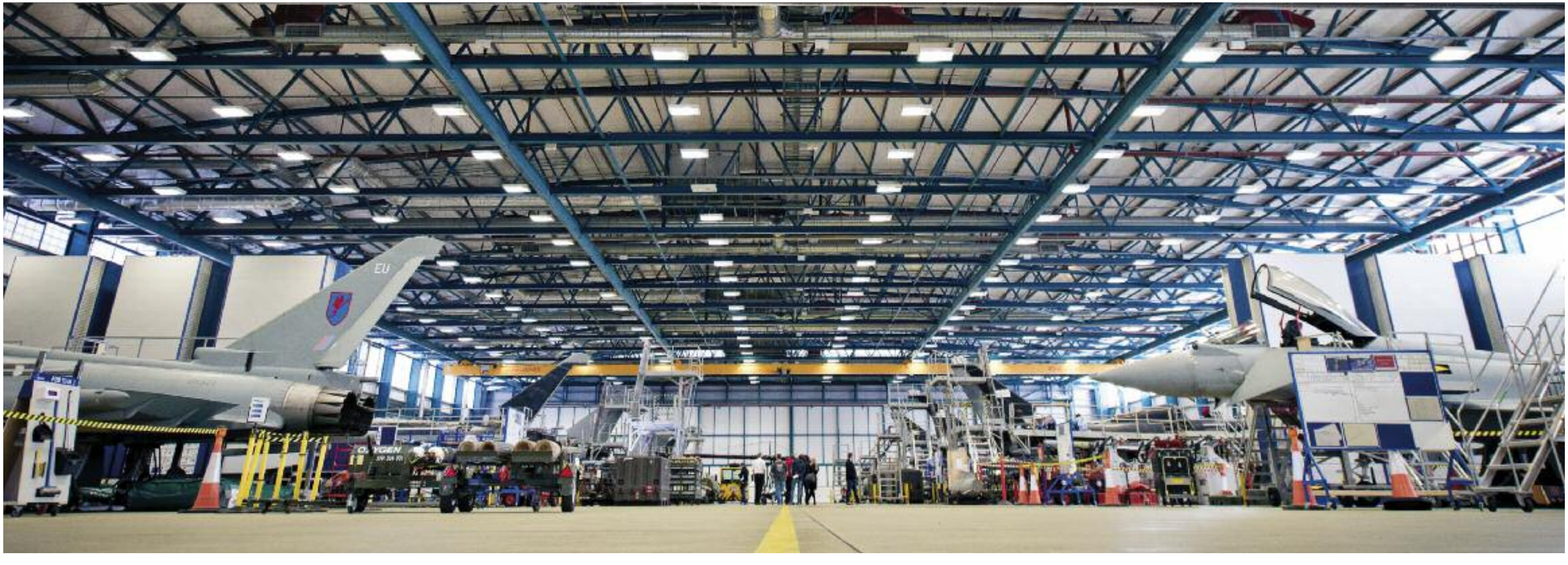
TRUST IS CRUCIAL

This approach to delivering support means there's an awful lot of trust between the industry and end user. That's key to ensuring outcomes are met. "It is like any other relationship; trust has to be built up over time.

Like people say in a marriage – it is difficult to build trust but very easy to lose it. There are a lot of personal relationships that have been developed over time and they are key to maintaining good rapport.

"What drove the idea in the early days was tremendous pressure on the affordability of military air support. There was a recognition that we were really mutually dependent on each other.

"The targets we are set are often very challenging – like a 30 percent cost reduction – but we tackle them in a partnered way. What this means is that the customer recognises that for us to achieve that scale of optimisation, we have to have access to an awful lot more operational data than we used to." <<



THE HUMAN FACTOR

Designed to help the pilot and aircraft communicate efficiently, the Eurofighter cockpit is the culmination of years of testing, valuable feedback from operational pilots and high end engineering. The result is a highly automated cockpit, one that gives pilots the correct information, at the moment it's required, with the minimum of fuss. >>

The way the cockpit is designed is no accident. It represents clever consideration of all the human factors – allowing the human and machine to operate in harmony. The aircraft responds to voice, throttle and stick commands, that are instant and instinctive. Thanks to this, and coupled with the Eurofighter's carefree handling, the flying element is relatively straightforward.

The real point of such intuitive prompting is that the pilot is freed up to concentrate on the main job – mission management. Instead of looking for a particular switch he is able to monitor the world around him and plan his next moves.

While there's an expectation of a certain level of airmanship, and it's no exaggeration to say that Eurofighter pilots are among the most highly trained in the world, the essence of the cockpit design is all about making the act of flying as natural as possible.

The most crucial interface is the Hand On Throttle and Stick (HOTAS). It does what it says on the label. The pilots use their hands and fingers to control the aircraft and engines. They have a number of options to select on the stick so, rather than prodding at the dashboard, the pilot makes mission-related selections quickly and instinctively.

There is a limiting factor of course, the pilot only has four fingers and a thumb on each hand! That said, there are more than 20 permutations available, allowing for intuitive defence or offence actions, like switching DASS modes, weapon systems and so on.

IT'S GOOD TO TALK

There is however another way. Direct Voice Input (DVI) allows the pilot to manage systems and operational tasks. One of the Typhoon's key cockpit systems, DVI gives the pilot speedy and easy voice control for aircraft systems such as radar, displays and navigation.

The idea is to help reduce the pilot's workload but it is not used for any flight or weapons safety-related functions.

All the DVI functions are available by other means but, thanks to DVI, one simple word is converted into a command. The system has a vocabulary of more than 100 commands, meaning a pilot can do things and find out information without taking a hand off the HOTAS.

For anyone doubtful about the effectiveness of DVI because of issues trying to get a smartphone to understand basic commands, don't worry. Each aircraft is 'trained' to recognise the voice of its particular pilot. Unlike smart phones that come with pre-embedded software that can only deal with a finite range of voices, dialects and accents, each Typhoon pilot has their voice recorded and that is plugged into the aircraft. Essentially the pilot's voice is templated.

The system needs to be robust enough to cope with both the noisy in-flight environment and the high-G stresses, which can affect the pilot's voice and speech.

DVI can be used for a number of tactical tasks, including the following:

- Displaying information
- Selecting the radio
- Navigation route tasks
- Identifying Friend or Foe
- Controlling sensors
- Requesting fuel status

It's not just a case of the pilot talking to the aircraft. By coupling the DVI system with the warning system voice outputs, the pilot can simply ask for fuel-state and bearing to base, and the cockpit voice will respond.

In addition to the pilot giving voice commands, the aircraft provides safety related warnings to the pilot by voice. These include high or low airspeed and ground proximity warnings.

There are a series of subset commands under each top level command. The following examples are top level commands. When the system recognises a command it 'listens' for the next level command in its vocabulary. >>

>> THE HUMAN FACTOR

HEAD UP DISPLAY (HUD)
An angled semi-reflective screen that sits directly in the pilot's eyeline through the forward canopy, the HUD gives the pilot flight critical data. Everything from basic information such as aircraft altitude, velocity, heading, weapons mode, right through to specific targeting and systems information is available to the pilot.

HEAD DOWN DISPLAYS (HDD)
Three full colour multi-function head down displays are used for presenting the overall tactical situation, the attack situation, attack formats, map displays and air traffic procedures, in addition to system status and checklists. There's a standard default set-up for each monitor giving the current mission status but pilots can configure each display to show the information they prefer. Surrounding each display are a number of soft touch programmable function buttons enabling access to different display configurations and systems.

VOICE, THROTTLE AND STICK (VTAS)
The combination of (DVI) and (HOTAS) is what's now known as VTAS or Voice, Throttle and Stick. It's this intuitive mix of ingredients that enables a single pilot to control operations, even in the most demanding of scenarios. The pilot controls the mission making inputs via his hands and voice and is given feedback from the aircraft through his eyes and ears. While VTAS is the primary input into the aircraft, the primary output back to the pilot comes from the Head Up Display (HUD) and the Head Down Displays (HDD).

WARNING PANEL
On the right hand side of the cockpit there's a warning panel which flashes a colour-coded alert and pilots also get an audio warning which activates if something is amiss.

HELMET MOUNTED SYMBOLOGY SYSTEM (HMSS)
Eurofighter Typhoon uses a unique Helmet Mounted Symbology System (HMSS) which provides flight reference and weapon data aiming through the visor. It is fully compatible with night vision aids using light intensification and Forward Looking Infrared (FLIR) imagery. It offers pilots a significant competitive advantage. The helmet is composed of an outer helmet, inner helmet, optics blast/display visor, oxygen mask, night vision enhancement camera and head position tracking system.

SOME EXAMPLES OF COCKPIT COMMANDS

PIGEONS	Requests the range and bearing to the next waypoint
SQUAWK	Prepares system for various IFF commands
RADIO	Prepares system for various radio commands
CONTENTS	Requests current fuel state
DEST	Prepares system for a change of destination

Luftwaffe

60 YEARS

Eurofighter congratulates Luftwaffe on its 60th Anniversary >>

On 2 January 1956 the first volunteers for the Luftwaffe reported to the Nörvenich Air Force Base. The date is regarded as the foundation of the Luftwaffe which today is considered as one of the world's leading Air Forces around the globe.

A special celebration event to mark the Luftwaffe's 60th Anniversary was held at Neuburg Air Force Base in Bavaria, the home base of the Tactical Air Wing 74.

In addition to the Luftwaffe's 60th Anniversary, visitors also celebrated the 55th Anniversary of Tactical Air Wing 74; 10 years of deployment of Eurofighter Typhoon at Neuburg, and the German Armed Forces Day.

The main event in Neuburg attracted more than 20,000 visitors, among them the Luftwaffe's Chief of Air Staff, Lieutenant General Karl Müllner, as well as a number of other high-ranking guests.

Eurofighter CEO Volker Paltzo attended the ceremony and congratulated the Air Force on this historic milestone. On behalf of the consortium and its Eurofighter Partner Companies, Paltzo said: "We are pleased to congratulate the Luftwaffe on its 60th Anniversary. The Air Force has an impressive history which deserves our great respect. The Luftwaffe, and all its employees, can be proud of this anniversary.

"The Luftwaffe delivers significant contributions to the security and defence of Germany and Europe. Today, Eurofighter is the solid backbone of the Luftwaffe and will remain so for decades to come. Eurofighters from Neuburg will be deployed to the Baltic States in summer 2016 as part of NATO's Baltic Air Policing exercise. I am sure they will do a great job."

To commemorate its 60th Anniversary, the Luftwaffe commissioned a special livery for one of its Eurofighter aircraft (markings 30+68). The livery was designed by the artist Walter Maurer. The aircraft was the focus of the celebrations in Neuburg. It flew a stunning display and attracted about 300 plane spotters, all keen to get the best photo.

This jubilee Eurofighter also joined the flying display during the Berlin Air Show (ILA2016), among several other Eurofighters which the Luftwaffe had deployed to Berlin. The aircraft impressed with its agility and manoeuvrability and was one of the major attractions at ILA.

The Neuburg Air Base in Southern Germany currently employs about 820 men and women. The workforce is set to grow to around the 1,000-mark in the coming few years to support the operation of a total of 35 Eurofighter Typhoons. The base is close to the Manching site where Airbus Defence and Space operates a final assembly line for all Eurofighters scheduled to be delivered to the Luftwaffe.

Luftwaffe Eurofighter Typhoon at ILA 2016
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>> 60 YEARS DEUTSCHE LUFTWAFFE

Above: Luftwaffe Eurofighter Typhoons on a training sortie; Picture by: Dr. Stefan Petersen, Luftwaffe
Below: A Eurofighter Typhoon with Anniversary-Livery from Tactical Air Wing 74, Neuburg/Donau at ILA 2016; Picture by: Carsten Vennemann

IN OUR NEXT ISSUE...

Don't miss the very latest news on Eurofighter Typhoon including:

- Special focus on the aircraft's future capability.
- Coverage from the airshow season.

Picture by: Dr. Stefan Petersen, Luftwaffe

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