EUROFIGHTER
PROGRAMME NEWS & FEATURES
MAY 2017

WORLD

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  Inside intercept missions
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  Capability grows

IN THRUST WE TRUST

Eurofighter Typhoon

Title:
On patrol:Two Eurofighter Typhoons of the Tactical Air Force Wing 74

Photo: Geoffrey Lee, Planefocus Limited, UK

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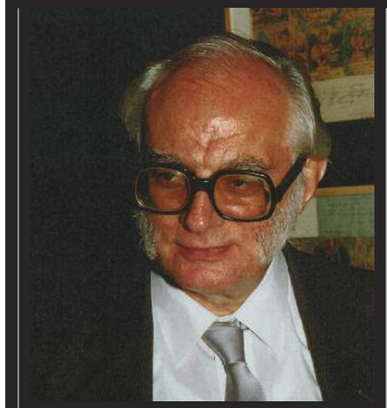


FIRST MANAGING DIRECTOR OF EUROFIGHTER GMBH, **GERRIE WILLOX,** HAS PASSED AWAY

Gerrie Willox, the first Managing Director (MD) of Eurofighter Jagdflugzeug GmbH, passed away on 25 February 2017. Gerrie was our MD since the very beginning of our company in 1986 until 1991.

Frank Gerrie Willox was born in 1929 and educated in Aberdeenshire. After serving in several high-ranking positions, Gerrie was appointed the Director of Projects on the new Military Aircraft Division of British Aerospace in early 1986.

On behalf of the consortium and the Eurofighter Partner Companies (EPCs), we offer our sincere condolences to his wife and family.

Gerrie Willox was one of the Founding Fathers of Eurofighter Typhoon and our company. His great passion, his tremendous energy and his unique commitment for this European combat aircraft programme was outstanding. Supported by his colleagues in the other Eurofighter Partner Nations, Gerrie was in the driver seat moving the programme forward even in times of unforeseen difficulties. We are very grateful for all his achievements.

On the occasion of a historic event in November 2016, Gerrie wrote a personal message to us: “I am very proud that I was the first Managing Director of Eurofighter GmbH and signed the Development Contract. For me Eurofighter Typhoon is the best combat weapon system available on the world market. I am sure the aircraft will have a great future. May I convey my best wishes to all concerned.”

WELCOME

It’s hard to remember a time when the world went through such a period of rapid changes in politics, economies, industries and technologies. Decision-makers surveying the changing geopolitical backdrop are faced with an uncertain and unpredictable environment. But that only means the need for defence and security is more important than ever before.

In times of evolving threats, reliable Air Power plays an essential role in guaranteeing the stability and security of our nations. Well-equipped Air Forces can make substantial contributions towards achieving these targets.

With Eurofighter Typhoon we are able to offer an extremely capable weapon system which is considered as the powerful backbone of many Air Forces in Europe and other parts of the world. In this edition of EUROFIGHTER WORLD, independent security expert Florence Gaub analyses recent geopolitical developments and discusses her views of what they mean for defence and air power.

Focusing on this theme of global threats, we talk to Wing Commander Colonel Holger Neumann of the German Air Force’s Tactical Air Force Wing 74 who have recently returned from a deployment in Estonia as part of the Baltic Air Patrol. We even get an in-cockpit view from Eurofighter pilot Captain Martin Zielinski about just what it’s like to go out on patrol.

Elsewhere in this packed issue, we look for a competitive edge through the eyes of Eurofighter Typhoon Chief Test Pilot Steve Formoso and Olympic sailing legend Sir Ben Ainslie. The parallels between their two different worlds – where split seconds are crucial – makes for a fascinating read.

There’s also a look at how two of our partner companies BAE Systems and Leonardo have been working together to bring the latest capability updates to the aircraft.

In addition, the magazine features an article from Robbin Laird who was given an inside track of life with the 14th Wing at Albacete Air Base in Spain thanks to his Air Force hosts Captain Antonio Duque Polo and Captain Sergio Martinez Pérez. We also travel to Grosseto, home of the Italian Air Force’s IX Gruppo, and follow their preparations for a night flight.

On 11 April 2017, I had the pleasure to attend the delivery of the 500th Eurofighter Typhoon which was handed over to the Italian Air Force in Turin. I would like to express my congratulations to all Eurofighter Partner Companies, the Eurofighter consortium, suppliers, etc. who supported us to achieve this fantastic milestone.

As ever, I hope you enjoy the magazine and welcome any feedback.

Yours,

Volker Paltzo
CEO
Eurofighter Jagdflugzeug GmbH

IN THRUST WE TRUST

"Threat unknown." The alert siren sounds and two Tactical Air Force Wing 74 Eurofighter Typhoon are scrambled...

Photos by: TaktLwG74

An unidentified aircraft has been tracked in NATO-monitored airspace above the Baltic. Calmly but quickly Luftwaffe pilot Capt Martin Zielinski pulls on his G-suit, while his engineers bring his waiting jet to life.

Moments later he's taxiing into position on the Ämari Air Base runway in Estonia. Within a few seconds the Eurofighter reaches 40,000 ft on its way to intercept the target.

Just 20 minutes after the alarm first sounds Capt Zielinski is up close enough to identify the aircraft, he makes eye contact with the pilot and diffuses the situation.

On this occasion, the threat aircraft turns out to be a Russian transporter that had simply strayed off its flight path. Such is the performance gap between the two, the toughest thing for Capt Zielinski is to fly slowly enough to make a visual identification. >>

>> IN THRUST WE TRUST

Kommodore Colonel Holger Neumann

This is Baltic Air Policing in action. With no air defence fighters of their own, Latvia, Estonia and Lithuania are covered by NATO Assurance Measures, which keep the region's airspace secure. Germany is one of several nations which plays its part in this ongoing policing mission, with squadrons working on a four-monthly rotation basis with NATO members, such as Spain, Italy and the UK.

Usually based in Neuburg, Bavaria, the Tactical Air Force Wing 74's main operational task is to have ready a two-ship element of Quick Reaction Alert for NATO and national coverage for southern Germany. It has two aircraft on a 15-minute ground alert, 24/7 – they're ready to get airborne in less than 15 minutes.

The Tactical Air Force Wing 74 took their turn on Baltic Air Patrol rota between September 2016 and January 2017. At Ämari the fighter wing had five aircraft, which were supplemented by a sixth jet on ground alert at Neuburg. The mission was a joint effort by all the German armed forces involving more than 20 different units of the Bundeswehr. In total over 420 tonnes of equipment and material was shipped to Estonia to support the mission.

Wing Commander Colonel Holger Neumann headed the operation. He explains: "The only way for Russian civilian or military aircraft to travel between St Petersburg and Kaliningrad is along a narrow corridor of international airspace and usually everything is OK. But if they don't obey international regulations or fail to put on their transponders then somebody has to take a closer look and that was our job."

In simple terms during a deployment like the Baltic Air Patrol the pilots are only doing what they do on a day-to-day basis – Quick Reaction Alert – but from a different location. However, in reality, because of the sheer volume and nature of the potential threat there's far greater intensity about the mission.

"We conducted 28 scrambles in four months and we intercepted a great variety of bogeys, including state of the art Russian fighters, reconnaissance and transport aircraft," says Colonel Neumann.

To put that into some sort of perspective throughout the whole of 2016 the wing at

Neuburg went out on eight scrambles.

"Over Germany the main reason for what are known as alpha scrambles is a loss of communication between air traffic control and aircraft, and most of the time that involves civil airliners. This can be caused by pilot error, technical problems or even an error by air traffic control. When we scramble, our task is to take a closer look at what's happening.

"Last year we scrambled eight times and if you consider that there are more than 3 million aircraft movements over Germany a year the message is clear – pilots do a great job."

During their Baltic Air Policing Role deployments the crews recognise there is a greater chance of them being called into action as the frequency of scrambles is significantly higher. There's also heightened awareness among the pilots that they are more likely to come across a Russian military aircraft in this line of work.

Says Colonel Neumann: "They know that throughout their shift they have to be ready, just like they do in Germany, but you don't scramble that often in Germany. And when you get the chance to intercept a Russian aircraft, it feels different. It's real. We enjoy >>

"WE CONDUCTED 28 SCRAMBLES IN MORE THAN 360 FLYING HOURS."

that kind of challenge. It's why we chose to be fighter pilots."

"We had one special day around the start of October when there were a lot of scrambles in a short period of time. It was very demanding for the pilots and our maintainers but we were able to cope with it and keep the jets ready.

"The reason we launch is to identify and defuse potential situations, not escalate them. Most of the time the behaviour of the intercepted aircraft was neutral. They acknowledged the presence of Eurofighters. Of course, some pilots decided to challenge the Eurofighter a little bit but that kind of thing is rare. Mostly it was a great experience from both sides. You intercept, you exchange visual signals, you take pictures, salute, then you split and that's it, all good.

"In truth one of the biggest challenges you face is with smaller transport aircraft. There's a huge speed difference between the Eurofighter and the transport aircraft and it's very challenging to take a closer look at the details, like the registration number and so forth. You have to be fast at getting the information."

The demands of QRA activity – patrolling and intercepting potentially hostile aircraft at a moment's notice – requires an aircraft with certain characteristics to get the job done. Something the Eurofighter has proved eminently capable of. The whole cockpit set-up was built for the QRA business," says Colonel Neumann. "All you have to do is flip a couple of switches to start the engines and get airborne. You need little or no notice, let's say, eight or nine minutes after the alert goes off. In a QRA situation you can strap in while the engines are winding up. It's ideal.

"I'd say that the whole cockpit set-up and all the maintenance was created for the alert business. In fact we had a maintenance availability of close to 90 percent in the Baltics which is very high.

"Then there's the performance. Performance simply isn't an issue with the Eurofighter. Even if you go single engine, it has more than sufficient power. The thrust is unbelievable. You can climb to over 40,000 feet within a minute or so and therefore for a QRA mission it's a perfect fit. It's very powerful and well-equipped and we're well-trained."

Luftwaffe pilot Capt. Martin Zielinski agrees: "QRA is always time critical. You need to get airborne really quickly, so the aircraft needs to be very easy to access and easy to actually start up, and that's exactly how the jet is designed. You don't have to waste time flipping each and every single switch, and you're not dependent on external air for starting the engines. As soon as you start the engines, then you're pretty much actually set.

"The Eurofighter is hugely powerful, the engines are very reliable, and they're very thrust efficient which means we can take off using a short distance of the runway – we just rotate and climb up. In Estonia during the alert starts, we're usually going up into the thinner air where we can go fast. If say the contact aircraft showed up between Helsinki and Tallinn you could be in a position to visually identify it within 10 minutes of take off."

Asked to sum up Eurofighter in a sentence he laughs – "I saw a T-shirt with 'In Thrust We Trust' on it. That's a good slogan for Typhoon."

In preparation for the Estonia deployment the deployed Eurofighters were specially adapted. "We boosted our self-defence systems and introduced the A120 AMRAAM to our armament which we don't use here in Germany. We also used wide-angled cameras to have a way of recording the intercept. And we used night vision goggles so we were able to visually identify targets in either dusk or dawn flight conditions."

As for the future, Colonel Neumann is looking forward to additional capability but points out: "The Eurofighter is already a very capable and powerful platform even before whatever is put on it in the future. From our view we just want to be able to train in peacetime as we fight.

"But amid talk of the future we need to remember it's a very capable platform with a lot of strengths – superior engines, being capable of flying supersonic, super cruise over 40,000 feet easily, a very agile platform." <<

BALTIC AIR PATROL – THE VIEW FROM THE COCKPIT

28-year-old Luftwaffe pilot Captain Martin Zielinski from Tactical Air Force Wing 74 based at Neuburg Air Base has just returned from his second Baltic Air Patrol. Here he outlines what it feels like to take the Eurofighter Typhoon out on scrambles.

Over in the Baltics, when you get an alert you don't know what to expect. You do not know what's going on and initially you are kind of tense all the time. As the days pass you get more laid back because you get into the rhythm and you see how things are.

As a pilot, you are curious because you do not know what aircraft you're about to see, and each time you go on an alert it's always a very interesting feeling. Everybody's excited and wants to take part in alerts. It's always fascinating to see other aircraft, simply flying against say a Gripen or a Mirage is different, because most of the time we tend to fly against the Eurofighter and you get used to it.

Over in Estonia we carried more weapons than we do in Germany, in particular we had AMRAAM missiles and we were also equipped with new self-defence equipment. We had flares and electronic devices to defend us from enemy radars. The whole jet was equipped for this specific mission, far more so than on normal QRA in Germany, but then again here we're not expecting any unfriendly behaviour from an airliner.

In the Baltics if we meet a fighter jet up there, for example, from the Russian Federation, it is different because they have a radar too. If you've got a radar looking at you, it's always an uncomfortable feeling because a radar means 'this guy's carrying some missiles and he could employ them on you'.

When you see a fighter aircraft, it's tough to describe, but even though we are different nations, we are all doing the same job, pretty much. When you meet upstairs you have the same level of professionalism and you experience a kind of comradeship up there. Most of the time.

If ever they do not like any behaviour from our side they will show it. They may do a belly check, a move where they display their weapons, or they will manoeuvre towards our aircraft just to signal, 'Okay, this is now close enough, please keep your distance.' But we always go on each alert with a de-escalating philosophy. We are not there to provoke anybody, or look for trouble.

We always go out there as a two ship, which means I always have my number two backing me up, looking around and checking what's going on. He can give me advice on the radio. We are aware that this situation most probably will not develop, and we do not want to trigger anything.

Our task is just to ID them, take some pictures, look around, check what's going on and understand why the guy isn't talking to anybody.

There's sometimes talk in the media about aircraft violating airspaces, but you have to be very careful how you describe it because it can be misunderstood. We're talking about a very narrow corridor of airspace, in places it's less than one nautical mile across and not every aircraft is equipped with great navigational systems. It's easy for an older transport aircraft to pitch into an airspace without actually wanting to. Therefore, I'd be very careful about calling it a violation. Sometimes it's just something that happens.

But if, for example, a Russian aircraft is violating the airspace by flying into NATO airspace, we get up to them and signal to them that they're not in the airspace that they are supposed to be. We approach them, as we would for a normal airliner, from behind or from the left side and move forward so you end up next to their canopy where they can see us. We want to be as close as possible so it's easy to look around and carry out the identification as quickly as possible.

We usually keep a distance of about 500 feet but I might move closer if I need some more information – tail numbers are sometimes written very small and are hard to read.

Capt. Martin Zielinski

If they are violating the airspace, we wiggle our wings. That's an international signal for "Okay, do you see me, and please follow my instructions right now." He will acknowledge me with the same 'wing rock' and then when I start to turn he will follow me from a safe distance. There's also a common radio frequency called "Guard" that everybody listens in on and I will also try to make contact on that.

What we encountered out there was, most of the time, very peaceful and very cooperative. <<

A VISIT TO THE SPANISH AIR FORCE:

EUROFIGHTER OPERATIONS AND SUPPORT IN ALBACETE

by

ROBBIN LAIRD

When journalist Robbin Laird visited the 14th Wing at Albacete Air Base in Spain, he discovered a joined up team of Eurofighter pilots and maintainers and an aircraft which has become the backbone of the Spanish Air Force. >>

▼ From left to right: Captain Antonio Duque Polo, Captain Sergio Martinez Pérez and Robbin Laird (Photos by: Chloe Laird).

Today Eurofighter Typhoon forms a reliable backbone for the Spanish Air Force and, with capability enhancements coming on stream, the overall operational capabilities for the Spanish Air Force are being enhanced.

The importance of the Eurofighter is clear when you spend time at Albacete Air Base, home of the force's 14th Wing.

From an operational perspective the Albacete's squadrons have deployed to the Baltics and at Albacete they have a Quick Reaction Alert (QAR) squadron, which operates in the Mediterranean to deal with any potential threats. The engagement in the Baltics is in effect a QRA mission further north.

Key to operational effectiveness is an equally efficient maintenance system and here too Albacete scores highly, as the deployment to the Baltics highlighted.

Says Senior Maintenance Officer Captain Sergio Martinez Pérez: "We had a baseline

▲ A Spanish Eurofighter Typhoon on stand-by.
◀ Engine change is not a problem at Albacete.

established from earlier engagements to determine what we needed on the supply side for our Eurofighters. These forecasts worked well. And with our Spanish digital logistic system we were able to order parts directly from Lithuania back to Spain to support the mission as well."

Naturally, as the Eurofighter has matured, the leadership of the Spanish Air Force has placed greater responsibility on the force. Until the arrival of the Eurofighter, the F-18 was the Air Force's key combat asset but as the Eurofighter has developed, the F-18 role has shifted from an air superiority mission to a ground attack mission.

"We have carried out a great deal of modernization on the F-18 and find a very capable compliment to the Eurofighter. And as we gain experience with Eurofighter, its role is >>

>> ALBACETE

being expanded as well. The Baltic Air Policing has been an important mission in this regard," according to Eurofighter pilot Captain Antonio Duque Polo.

The captain points out that the base also hosts a regular exercise for Eurofighter partners shaping greater interoperability within the broader fleet. Spain, Germany, Italy and the UK have all come together under the aegis of the European Air Group to get better operational integration among the participants.

Of course there are essential support facilities for the Eurofighter at Albacete, including a simulation system for training purposes and refresher training.

An upgrade to the simulator is planned and there's a proposal to link it with the simulator at Morón Air Base. "This would expand our capability to train for more complex scenarios as well enhance the quality of our training," adds Captain Duque.

With Spain having received the latest standard of Eurofighter, training is also carried out on a two seat aircraft. This version includes the ability to carry out ground attack missions – indeed the Spanish Air Force has tested the Paveway capabilities – which is part of the upgrade.

Not surprisingly, the maintenance facilities are first class. In one engine maintenance is carried out. Says Captain Pérez: "The EJ200 is engine is a good news story for the Eurofighter. It is very reliable and very maintainable and a significant upgrade over the engine we had on our earlier combat aircraft, the Mirage F-1. It is a next generation engine."

The engine is maintained in a vertical position and the crew can replace modules on the engine for engine repair. The engine bench tests are currently carried out at Morón Air Base near Seville but the 14th Wing is hoping to be able to have their own bench test capabilities in the future which will mean verification can be carried out at Albacete.

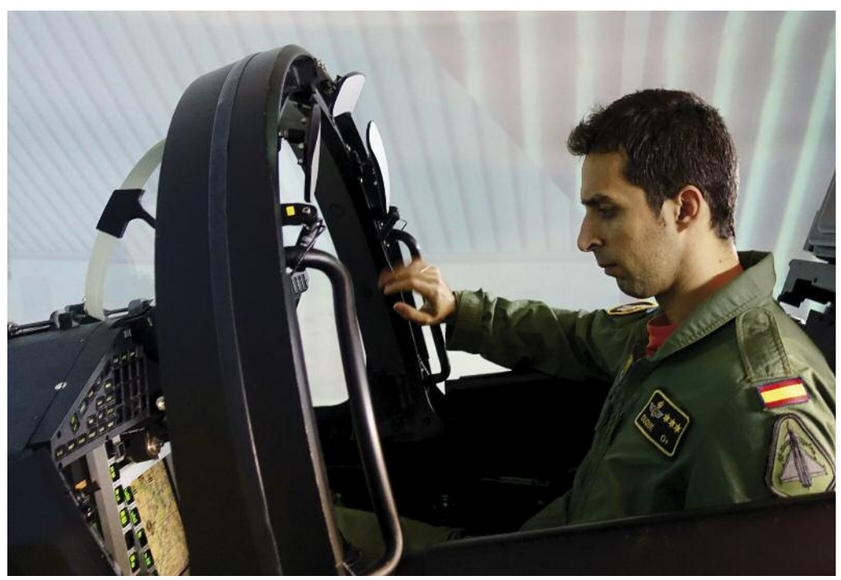
In the second maintenance hangar multiple repairs are carried out. One aircraft involved was a two seat Eurofighter for initial major repairs; and other aircraft where going through regular maintenance inside the facility.

A key asset for the Spanish Air Force is the logistics base, which is paired with the combat base at Albacete. Here the personnel are trained to work on the range of aircraft, which the Spanish Air Force flies. "They are a key asset in keeping the force operational," says Captain Pérez. <<

▼ A Spanish Eurofighter Typhoon on its way for take-off.

▲ Maintenance work is a routine job for the Spanish officers.

◀ Albacete Air Base: Home of the 14th Wing.



▶ Cockpit displays have to be checked carefully.

EUROFIGHTER TYPHOON
THE FINISHING TOUCH

The paint shop at BAE Systems in Warton – containing two 750sq m spray facilities – is the final stop on the journey for each Eurofighter Typhoon during the different build phases. It takes around 11 working days - or around 700 man hours – for each aircraft to go through the entire process, which includes the application of three different paint layers and all the various markings.

DETAILED FINISH

The polyurethane paint contains special properties to protect the aircraft from any environmental exposure. In total, around 35 litres of paint are used in the Top coat. At each stage the Primer, Intermediate and Top coat has to be applied with great skill as each layer has to be less than the thickness of a human hair. The Final coat is known by its trade name simply as 626 Grey.

MAKING A MARK

Once the painting is complete, the graphics are applied. There are around 350 different markings on each Typhoon and they're all produced in-house. Each one is hand painted and applied precisely. Preparing the aircraft at this stage and painting the markings takes about a day.

PREPARING FOR SUCCESS

Before a drop of paint is applied to the aircraft's surface, a great deal of care is taken up with meticulous preparation to ensure a quality finish. In fact, even before surfaces are cleaned and areas masked, the aircraft has to be very precisely positioned in the hangar, all to within 100mm of a number of specific points. This is to ensure the automated spray platforms that the painters work from can move around the aircraft in the correct pre-programmed manner.

A RIVER RUNS THROUGH IT

The paint shop has been designed with the environment and safety in mind. When spraying takes place, 1000s of litres of water gush through a pipe system underneath the floor, while air is fed in from the ceiling. This system helps decontaminate the air in just two minutes. The water is filtered then stored in tanks and recycled during each spraying phase.

EVERY ANGLE COVERED

Each UK aircraft has three coats of paint applied to it. The first is a Primer base coat which has a dark black colour. The second is an Intermediate coat, which acts as a protective coat for the primer during any remedial work when the aircraft is in service. The third is the Final coat. Painting is carried out by teams, four of whom work on hydraulic platforms, or man movers, that dance around the aircraft on a precise pre-set route, which has 37 points. From these the painters can safely operate a pressure-controlled spray and reach right across the aircraft's wingspan with ease.

THE HEAT IS ON

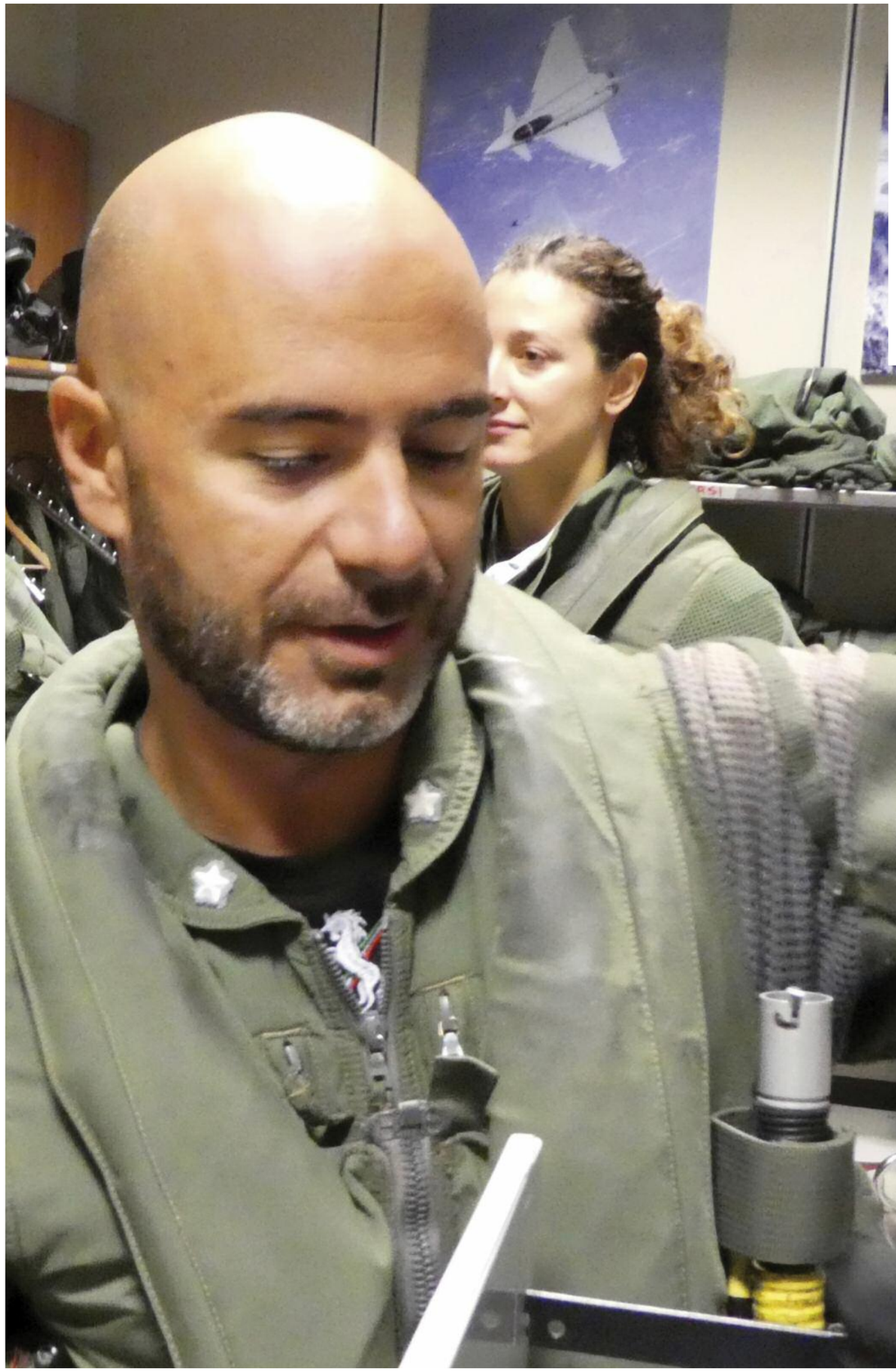
The final coat of paint is left to dry for around six to eight hours. To ensure an even finish the spray shop is usually kept at 23 degrees Centigrade but the booths can be heated up to speed the drying process. Once dry, the surfaces are cleaned and the quality of finish is checked.

COMBAT EDGE

The leading edges on the wings, the intakes and the foreplanes are given a number of coats of a special erosion-resistant coating, which protects them from the elements at high speed. These are the part of the aircraft which take the most impact of high speed flight.

GROSSETO AIR BASE

IDEAL FOR **QRA**



Lt. Col. Federico S. talks about Quick Reaction Alert and his challenging job as the Commander of the 9th Squadron at Grosseto. >>

LT. COL. FEDERICO S.

9th Gruppo Commander for the Italian Air Force

We're in the crew room of the IX Gruppo (9th Squadron) at Grosseto Air Base, home of the 4° Stormo (Wing), the most experienced Eurofighter Typhoon unit of the Aeronautica Militare (Italian Air Force). It's approaching the business end of the day and the final preparations are being discussed ahead of a night flight training exercise. We're in the inner sanctum – the pilots' family home. A space where they can share food and conversation.

It's a room that tells its own story. The squadron celebrates its centenary in 2017 and pieces of history and memorabilia are dotted around the walls. There are photos, paintings, trophies, and aircraft parts everywhere that celebrate one of Italy's oldest and most elite fighter groups. It has been furnished with a sense of history, pride and a touch of fun. The central dining table, created using the wing from a F-104 Starfighter, has four ejector seats around it!

IX Gruppo was the first Italian Air Force squadron to receive the Typhoon and the first in the Eurofighter community to carry out air policing when it flew during the 2006 Winter Olympics in Turin.

IX Gruppo Commander Federico and five of the squadron's pilots are eating sandwiches and drinking cola ahead of their night mission. It's closing in on 7pm local time and, as the day turns into night, the mood subtly changes. The final details of preparation are discussed with serious expressions >>

>> IDEAL FOR QRA

replacing the smiles and banter. They're a team gearing up for action. Outside the Tuscan sky has already turned an inky black and the ominous presence in the crew room is the clock.

'RIGHT, IT'S TIME."

The pilots grab one last bite of food knowing it will be after midnight when they return to the base. Then they head off to the briefing room where details of the mission are talked through one last time.

The banter is replaced by a real sense of purpose. No nerves but this is clearly important stuff with a serious objective because the day-to-day work of IX Gruppo is crucial to the air defence of the country. The squadron looks after Quick Reaction Alert (QRA) for the north of Italy.

Just a stone's throw from the crew room there's a concrete half pipe shelter and inside stands a Eurofighter Typhoon. This is the beating heart of the world of Base Aero Grosseto. The aircraft is silent, with the open canopy tilted to the heavens – there's no-one in the cockpit and no-one tending the aircraft. All is calm. But don't be fooled by the silence, the aircraft is primed and there's a team close by, ready to spring into action at a moment's notice.

The work here never stops. Never. Christmas Day, festivals, holidays all pass but work for Quick Reaction Alert crews goes on round the clock. Each member of the QRA shift is on duty for 24 hours in a constant state of readiness. At the sound of the siren pilots rush to the aircraft, strap in and they're away.

En route to the briefing Federico explains the importance of the work: "Our squadron provides crews for QRA shift who are on shift for 24 hours a day, 365 days a year. We also provide training to get the pilots QRA-ready. From Grosseto we take care of QRA from the centre up to the north part of Italy. We also deploy in Slovenia as part of an agreement between the two nations."

The IX Gruppo has a huge amount of QRA experience. It provided Baltic Air patrol support in Lithuania between December 2014 until the end of August 2015.

"That was a huge operational proving ground for Eurofighter capability, especially in the cold weather. A couple of years prior to that, in August 2012, we had been operating in Kuwait in desert conditions where the temperatures were plus 55 degrees. Despite that we had 100 percent reliability, which is fantastic. Operating in conditions in excess of 50 degrees is something that's very hard for an electronic jet to sustain. But it was the same in terms of capability in the cold weather. In Lithuania when we arrived in December we experienced temperatures as low as minus 28 but we were still able to get QRA-ready.

"The aircraft is ideal for QRA – in fact the only limit is the time it takes for the pilot to get ready and all they have to do is get to the aircraft, strap in, close the canopy and the jet is ready. It's very easy. Then when you're airborne a huge strength of a Eurofighter is the engine performance. It's very easy to reach supersonic flight in a few amount of seconds. For example, when doing a flight check, you start from 0.9 Mach and you reach 1.6 in about 90 seconds at 40,000 feet and I don't know any other jet that is capable of doing something like that."

Tonight Federico and his men and women are helping one of their colleagues with one final crucial piece in their training schedule. Once airborne, somewhere over the north east of the country, their six Typhoons will break into two groups – red and blue and undertake a simulated mission.

From the briefing room the group arrives in the kit room. Rows of flying suits and helmets are neatly laid out. There's a flurry of activity as the pilots are helped into their anti-G-suits – the modern-day fighter pilot's suit of armour. Then, minutes later, suited, booted and carrying their helmets, they climb aboard a minibus. The chatter starts to dry up as we ride out to the hangars alongside the runway. Then under the cloak of darkness, the transporter deposits its human cargo one at a time.

We reach a final stop and the pilots slide the van door open and climb out grabbing the bags that contain their helmets. We're handed ear protectors and follow one into the hangar. He inspects the aircraft, walking around it with real purpose. He's in work mode. He checks the airframe, looks down intakes and examines the tyres before heading up the steps and into the cockpit.

"Compared to say the F-16 the Eurofighter really helps you out," one told me earlier. "It's easy to fly and easy to work with because you don't have to think that much about the basic conduct of the jet. It's a huge step forward in terms of technology and human-interface machine. Inside the cockpit of the Eurofighter you're very comfortable and everything you need is right there – without you having to think about anything, It's really easy."

The canopy comes down and the raw fury of the twin EJ200 engines is unleashed. The hangar walls and floor vibrate and then he gets the signal to move.

One by one the pilots roll their Eurofighter Typhoons up to the start of runway 21. They line up, then hit the power. Take off. As they climb they hit the afterburners and the night sky is pierced by two fiery jets, that rapidly fade into the far distance.

It's an incredible sight and sound but just another night and another mission for the men and women of the IX Gruppo. <<

▼ Ready to go: Final preparations for take-off.

A WORLD IN DISORDER

DR. FLORENCE GAUB

Senior Analyst at the European Union Institute for Security Studies (EUISS) in Paris

Analysing the geopolitical and military developments around the world and evaluating the strategic state of affairs, one could argue that two observations seem to prevail: uncertainty and unpredictability. Dr. Florence Gaub, Senior Analyst at the European Union Institute for Security Studies (EUISS) in Paris, takes a closer look at these developments and explains their potential impact on defence and air power. >>

Uncertainty and unpredictability are not new or unique in politics. However, only 10 years ago, the EU noted in its security strategy that "Europe has never been so prosperous, so secure nor so free. The violence of the first half of the 20th Century has given way to a period of peace and stability unprecedented in European history."

And only six years ago, NATO noted that "the Euro-Atlantic area is at peace and the threat of a conventional attack against NATO territory is low". Today, nobody would feel bold enough to write such words.

In its Global Strategy, released in summer 2016, the EU was much more muted: "The purpose, even existence, of our Union is being questioned... Our wider region has become more unstable and more insecure... We live in times of existential crisis, within and beyond the European Union. Our Union is under threat."

There are at least two sources for profound uncertainty and unpredictability across the globe. The first is one that challenges the system as it is. It ranges from the cyber world which changes our understanding of the world as we know it; to the Islamic State to US President Trump who has appeared to question the very purpose of NATO; from the Brexit movement and its counterparts elsewhere in Europe questioning the European Union as a project to NATO, which suffered severe disagreement over Libya; to Russia which defies the laws of sovereignty in Ukraine and those of warfare in Syria.

What all these actors and events have in common is that they challenge the overlapping systems we have created for over 300 years: be it the Westphalian state system, the European order, the transatlantic order, or even the global order.

Why does someone question an existing system and create uncertainty? Because laws and norms and systems are created to generate certainty – hence someone questioning said system creates uncertainty. But rules and laws do not only create certainty – they also increase predictability.

And this is the second source of anxiety: unforeseen events. Over the last five years, several events have created the impression that the world is full of strategic surprises that nobody could have anticipated before. The annexation of the Crimea by Russia, the Arab >>

>> A WORLD IN DISORDER

Spring, the financial crisis, even the unreliable polling before Brexit or the US elections or the new technologies all create the impression that we no longer control the events – they surprise us, challenge us, and threaten us.

Why concern ourselves with these psychological thoughts? Because Strategic Thinking has three major enemies. The first is wishful thinking: mistaking hope for fact. The second is catastrophic thinking: mistaking fear for fact. But as my grandfather – himself a pilot – said: fear is never a good advisor.

Take Donald Trump and his comments on NATO. Widely interpreted as him shunning, even threatening the Alliance altogether, they are none of this. Instead, Trump reiterated a regular American point about low European defence spending. His statement was not new. What was new was the tone.

NATO is not over. Trump might not be a diplomat, but the value of NATO is irreplaceable. European allies might not spend enough, but they are still on the American side more than any other region in the world. Trump knows that. If anything, he wants a stronger NATO.

Demography, for instance, is a problem only when the cohort of under 30 displays unemployment rates of over 30% - then you have an increased probability of unrest. Arab states, for instance, not only had but still have high rates, need to create 80 million jobs by 2025 to maintain current levels. In France, Belgium, the Balkans and Greece, we also have dangerous levels.

Just by looking at these mega-trends, instability in the Middle East is likely to continue for the foreseeable future, unless governments mitigate these effects.

There are also a few operational and even positive trends: conflicts continue to be less lethal than ever – less civilian victims than in the 1970s and 1980s – but more and more internal with related consequences: no appropriate legal framework for civil wars, no international mandate, no military expertise. We can therefore expect an international move for more legal regulations on warfare within a country.

Another trend is that there is a shift towards Air Power (and its siblings, the air defence). There are several reasons for that: Europe does not want casualties. The perception is that air wars are less lethal, more clean. In the Middle East and North Africa, states are eager to display their power through Air Force.

Whether Egypt in Libya, Saudi Arabia and the UAE, even Jordan in Iraq or Yemen, Arab Air Forces take on increasingly muscular roles. Even civil war in Syria or in Libya was decided by the use (or interdiction of use) of Air Force; Russia engaged mainly with its Air Force.

Beyond questioning our fears, let's try to reduce uncertainty and unpredictability. Because the third enemy of strategic thinking is not doing your homework – and there are ways to do this.

The first way to do this is to look at strategic trends: first megatrends - those trends that are too big to be turned around by humans – and then at the game changers: those areas where humans can make a difference and consequently they should focus on.

Megatrends play a role in futurology because they delineate the future in which we will operate in. Because the best we can hope to do is mitigate the effects of megatrends, we have to deal with them. And, we know what they are. There are five megatrends: demography, the internet penetration of the world, climate change, literacy rates, urbanisation. Why do they matter? If you want, megatrends are the strategic window through which we have to fly – and, they can serve as an early warning system.

So what can we change? There are at least five strategic game changers:

- 1. Being part of someone else's strategy is not a strategy. Foreign policy is not development policy. Example Syria: desired outcome announced, but not backed with the necessary means. In the same way that isolationism is not a foreign policy. The European bubble, free of conflict and hesitant to engage in conflict, is under threat. Solving conflicts, enforcing rules and defending our values will not happen by drilling wells. This is the time for a fearless foreign policy.
- 2. The utility of force. The way we conduct war needs to be re-thought. Our military forces are not just peacekeeping and stabilisation forces; they have to be quipped to conduct a whole range of kinetic operations.
- 3. Political leadership capable of convincing a population, rather than catering to it. World War II cost the United States 37% of its GDP; Korea and Vietnam roughly 10%; Afghanistan, Iraq and Gulf War cost 4 – 5%. 23 out of 28 allies do not even contribute 2% of their budgets to defence – let alone make an effort to convince their populations that it might be necessary to do so.
- 4. Develop mechanisms capable of conducting foresight analysis. None of the recent events were unpredictable. Take the Arab Spring, for example: the rising oil price led to rising food prices. This was foreseeable.
- 5. Study conflict. Why they unfold, how they can be prevented and ended. Most European declarations on the Syrian war are at odds with what research says about civil wars.

Conclusion:

The latest political developments in the US, the Middle East and Russia created the impression that our world seems to be in disorder. Indeed, the political landscape across the globe has changed and may change even more so. Therefore Europe should restore its political vitality, its economic power and become a strong player in world politics again. The future of this continent is at stake. <<

Disclaimer:
The views expressed in this article are those of Dr. Florence Gaub as an independent security analyst.

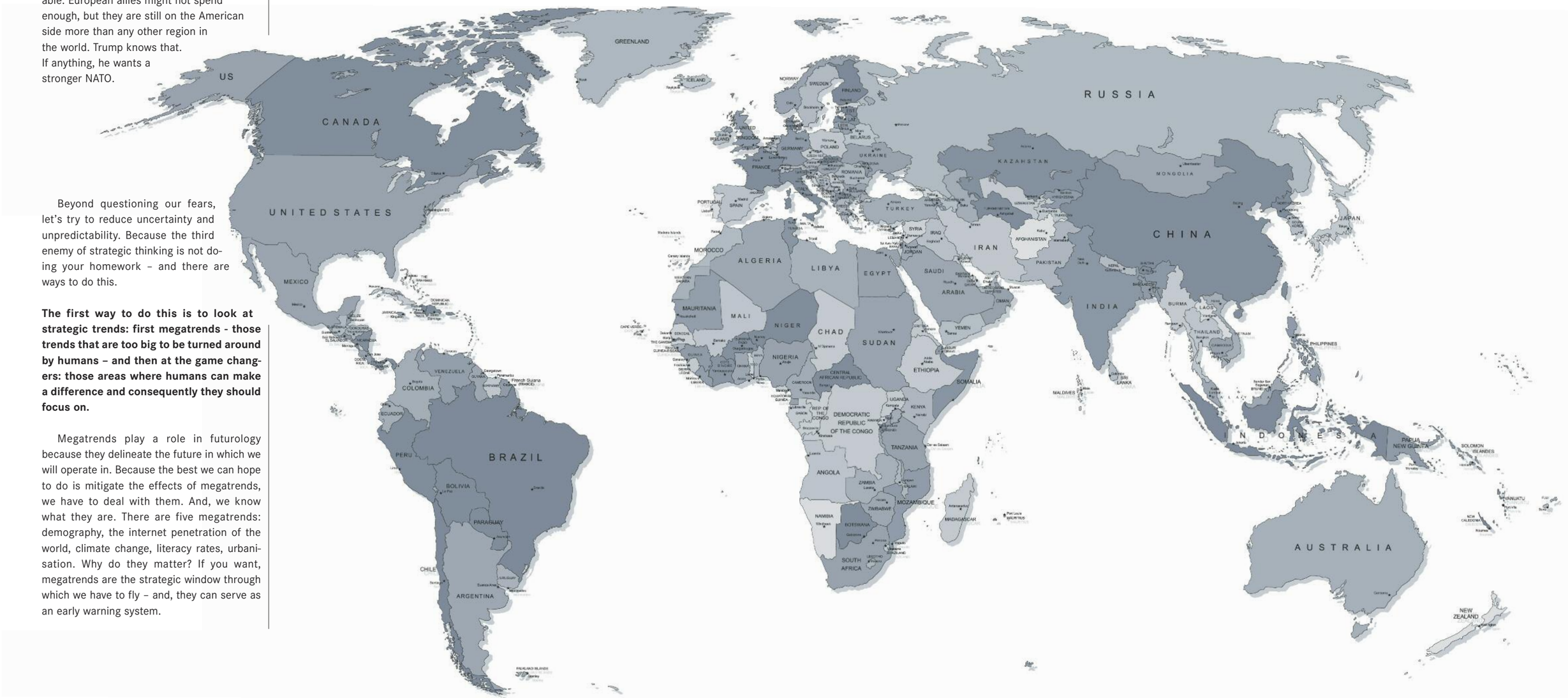


Photo: Dr. Andreas Zeitler

SIR BEN AINSLIE

STEVE FORMOSO

THE RACE FOR **PERFECTION**

Photos by: Ben Ainslie Racing (BAR)

In sport – particularly in highly technical worlds like cycling, sailing and rowing – performance directors are constantly searching for the tiny fractions that will give their athletes the winning edge. The same is true in the world of combat aircraft where the Eurofighter Typhoon continually evolves to keep its air forces ahead of the curve. We speak to BAE Systems Chief Test Pilot Steve Formoso, and five-time Olympic medallist Sir Ben Ainslie – the most successful Olympic sailor of all time and currently leading the British challenge in the America's Cup – about the search for 'marginal gains'. >>

When the margins are fine everything counts: split seconds, fractions of a heartbeat, tiny movements, they all make a difference. The race is always on to achieve. There's a constant need to go faster, be lighter, be more efficient, have greater endurance, cut down the reaction time. And it's all to gain the edge over your opponent ... one per cent at a time.

Incremental gain is not just theory – it's crucial to staying in front.

When you are working to seize an advantage and when every split second counts, how much is that down to seeking marginal gains?

Sir Ben Ainslie: In sailing we are constantly working to find marginal gains in every area. We need to ensure that the design configuration we choose is working at the absolute optimum, but we also have to cover the possibility of a breakthrough technological advance that will significantly improve performance.

The boats that we are racing have only been introduced for this 35th edition of the America's Cup, so there's a real possibility that someone could come up with a conceptual advance in hydrofoil or control systems design that will jump them to another league. If anyone does it, we need it to be us.

Steve Formoso: Everything you do with the fighter aircraft like Eurofighter Typhoon relies on having that edge. Incremental gain is not just theory – it's crucial to staying in front. If you're in an Air-to-Air engagement then you're trying to get your weapon off faster than your adversary.

You're also trying to stay as far away from your adversary as possible. That's why incremental gains are so vital. Those fine margins – how quickly you can detect something, how quickly you can target something, how quickly you can get the weapon system to support a weapon – make a real difference. In the fighter jet world split seconds can be important because two aircraft closing in on one another can be doing a combined speed of up to 30 miles a minute.

What are the small differences you've introduced that help keep you successful?

Sir Ben Ainslie: We've worked with BAE Systems on on-board communication headsets, developing a bone conduction system that's significantly better than what we had before. When you are doing in excess of 40 knots, with constant spray coming across the boat, being able to communicate clearly and without shouting to someone 10 feet away is a big advantage – but not easy to achieve.

Steve Formoso: While on the outside the aircraft looks pretty much the same there have been constant enhancements >>

Photo: Mark Lloyd

SIR BEN AINSLIE **FACT FILE**

Sir Ben Ainslie is the most successful Olympic sailor of all time. At his first Olympic Games, aged 19, he won an Olympic silver medal and went on to establish himself as the world's best by winning consecutive gold medals at the next four Olympic Games.

Following his success in the 2012 London Olympics, he turned his focus to the next challenge, competing with Ben Ainslie Racing (BAR) on the 2012/13 America's Cup World Series. In the summer of 2013, he went on to join ORACLE TEAM USA on board for their defence of the 34th Cup. He helped the American team win the event, 9-8, against Emirates Team New Zealand and in doing so was instrumental in one of the greatest comebacks sport has ever seen.

Now he is Land Rover BAR Team Principal, Ben is leading the British entry into the 35th America's Cup.

CAREER HIGHLIGHTS

- **2013: Winner of the 34th America's Cup, San Francisco – USA with ORACLE TEAM USA**
- **2013: Broke the 'Round the Island Race Multihull record' with J.P. Morgan BAR in the AC45**
- **London 2012 Olympic Games: Gold Medal**
- **Beijing 2008 Olympic Games: Gold Medal**
- **2007: Winner – Louis Vuitton Cup, Valencia – Spain with Team NZ**
- **Athens 2004 Olympic Games: Gold Medal**
- **Sydney 2000 Olympic Games: Gold Medal**
- **Atlanta 1996 Olympic Games: Silver Medal**
- **11 times World Champion**
- **Nine times European Champion**
- **Four times World Sailor of the Year**

Photo by: BAR

>> THE RACE FOR PERFECTION

Photo: Mark Lloyd

throughout its life that continue to keep Typhoon ahead of the pack.

One of the most striking developments has come with the helmet. Its capabilities have progressed a long way. It has changed the way you use the weapon system, makes many things a lot quicker and allows you to utilise the aircraft to the limits of its capability far more effectively. From having to interpret what you see by looking at a display and then potentially matching up what you see with the outside world, you can simply look at a target and if it's within the weapon system's field of regard, then you can put that target straight into the weapon system.

All the time we're developing Typhoon and, at each enhancement, we also improve the man machine interface. That's important because it's all about allowing the pilot to use the capability that Typhoon gives them as quickly and as effectively as possible.

How much is the America's Cup a test of boat and sail design as well as sailing skills?

Sir Ben Ainslie: Traditionally it's always been as much about the boat and sail design as about the sailors and that hasn't changed with the new design of foiling multihulls.

If the America's Cup is a test of boat and sail design as well as sailing skills, how much is your world a test of the engineering skills or the piloting skills?

Steve Formoso: Every time you use the aircraft operationally it's a test of the whole team. But it's not just about the pilot in the cockpit, it's also about all of the background work that gets the aircraft airborne and keeps that aircraft airborne. Can we make the aircraft quicker to turn around, can we make it easier to maintain, and so on? All of these things are looked at and refined constantly.

That's how you get a much more effective product. The quicker you can turn the aircraft around, the quicker it becomes available again and hence the more effective it is for them.

How do you ensure each element– the crew, the designers, the boat builders – stay at the top of their game?

Sir Ben Ainslie: In the last two years we have gone from a small core team to more than 130 people. It's a lot of growth to manage while keeping everyone motivated and at the top of their game. We've relied on good communications within each department and having an open and honest feedback policy. If there is an issue we get through the issue together as a team, work through it together and make changes together.

Steve Formoso: This process is all about the whole team coming together. It's not just about having the aircraft there and the guys going off flying. It's about the various design teams understanding how the aircraft is used and then being able to exploit the weapon system to its optimum. Then we make further incremental gains to improve the performance. And it's a process that's going on all the time.

There's no point in a pilot simply jumping in an aircraft and going for it. To exploit any improvements properly, you have to be trained. And I'm sure that's the same for Sir Ben and his crew. So, we're always working on a training solution in parallel with what we do with the aircraft design. We train so that we're comfortable with what we need to do to exploit the weapon system to its best advantage.

How does the feedback loop between designers and sailors or pilots work?

Sir Ben Ainslie: We have a couple of people who work on both teams, and they, along with the coaching and performance analysis teams, are the main bridge between design and sailing. But we also have a capture meeting after each day's sailing and testing that includes everyone with an interest in what happened from either the design or the sailing side.

Steve Formoso: It goes on all the time as we look to refine the product. People sometimes get the wrong idea about the role of a test pilot. Yes, just getting in and flying an aircraft to its absolute limits would be nice but you're not going to get much out of it. You need to know exactly what you're trying to achieve before you start out each test flight. You need to know where the improvement is in the weapon system and how to exploit it.

Throughout the design phase we work with the operators, like the RAF pilots who will fly the finished product. We get them involved because they look at the operational tasks the aircraft might be asked to do so at every stage there's a pilot in the loop.

How do you test the effectiveness of the changes you want to introduce and how quickly can you implement these?

Sir Ben Ainslie: We have put a lot of resource into simulation processes to test ideas without having to build everything. These include the normal Computation Fluid Dynamics that you'd expect on a design that relies so heavily on aero and hydrofoils, but extends to bespoke race modelling that we have developed internally.

How quickly we can implement something depends a lot on what it is. Our hydrofoils are very sophisticated items and take a long while to build so the whole design strategy is planned out a long-time in advance whereas something like a control system's software change can be done overnight by our engineers. In between we have partners that help us with rapid prototyping for smaller items in metal additives and these can be turned around in a few days.

Steve Formoso: We look at how we do things all the way through the process. Initially we talk something through and see if it makes sense. If it does, we model it and take a first look at it as a general concept. We'll end up modelling those and seeing if they work, demonstrating gains and improvements, then we'll actually put it into code.

If, for example, it was an avionics change then we'll look at that on a rig before putting it in the aircraft and seeing what it does in the baseline operating environment.

We may go back and refine it during the process. We'll also get the RAF Test and Evaluation team to look at it in as close to the operational environment as they can get. Then we will refine it further as much as we can.

How important – in terms of winning and losing – is the marginal gains approach? Are there examples in previous America's Cup races that you can discuss?

Sir Ben Ainslie: I think we won the 34th America's Cup with Oracle Team USA in 2013 because we were willing to keep developing right through the competition. We went from having a significant speed deficit in some areas to a clear advantage and that was because we kept chipping away at it, one marginal gain at a time.

And for you Steve – just how important is making marginal gains?

Steve Formoso: Incredibly important. We've always got to strive to make those gains because everyone else is doing it. In our world it's the person who can make those capability improvements the quickest, that wins. That's not just winning in the context of a dog fight but it's also about aircraft sales and the utility of the aircraft for a customer as well. A good example is the Defensive Aids Sub System, which we are always looking at refining the performance, but it goes across the board, it really does. Even with the Phased Enhancements we are always refining those as we go through and we learn from our experiences. We're always taking the lessons learnt and trying to improve.

In your view, what areas are most important – human factors or technology innovations?

Sir Ben Ainslie: They are both essential and inextricable to the process of winning the America's Cup.

Steve Formoso: The human factors are all important because if you can't use a technology innovation, or if it's difficult to use, then it doesn't give you any advantage. So, it has to be usable and the only way you can do that is with effective human factors. It's about being as efficient as possible right from the design to the human in the cockpit and I'm sure it's the same with Ben and his team.

Do you ever look outside the world of sailing to see if there are any things you can introduce – whether that's diet and nutrition or advanced engineering and specialist technologies. Can you give us any examples of this?

Sir Ben Ainslie: I've already mentioned the bone conduction communication system developed with us by BAE Systems, but there are plenty more examples. I believe that Britain leads the world in some areas of engineering like aviation and motorsport and we've made big efforts to reach out to those people and see if what they are doing can help solve our problems. So we have extensive technology partnerships with everyone from title partner Land Rover, to metal additives specialist Renishaw.

Steve Formoso: We have an advanced engineering relationship with some automobile manufacturers and look at advances they've made. We've looked at that in terms of the baseline aircraft designs as well as potential production improvements.

So, just as our team spends a lot of time refining how we test the aircraft, I know >>

BONE CONDUCTION TECHNOLOGY GIVES AINSLIE'S TEAM CUTTING-EDGE

BAE Systems is adapting cutting-edge bone conduction technology for Sir Ben Ainslie's British Land Rover BARs sailing team, as it seeks to boost the team's bid to win the America's Cup in 2017.

The technology, which uses the body's natural ability to transmit sound through bone conduction, is being applied at Land Rover BAR as a way of dramatically improving communication between crewmates and support boats.

BAE Systems' expertise in bone conduction technology, used elsewhere to aid armed forces personnel on the battlefield, has allowed it to develop a communications device that enables users to keep both their ears free so external sounds can be heard, whilst providing the ability to communicate clearly with crewmates despite the harsh and noisy conditions.

The prototype headset creates physical vibrations from an audio signal, which travel through facial bones into the inner ear, which then translates these vibrations into nerve impulse signals sent to the brain allowing the user to hear audible sound.

>> THE RACE FOR PERFECTION

the production team spends a lot of time refining how they produce the aircraft to ensure we have a serviceable aircraft as quickly as possible.

We've also got links with universities and other technology companies. We're always looking at how innovations and emerging technology might be useful. We can't rest on our laurels or just work in a little bubble of the combat aircraft. You have to look outside. If you're the first company to take advantage of a new technology, then that might give you the operational advantage in the longer term.

If you're forever incrementally pushing the boundaries to gain that extra 1% – when are you ever satisfied?

Sir Ben Ainslie: I don't think we are, that's the way we're going to win the America's Cup.

Steve Formoso: You can never really be satisfied. It's a never-ending race for perfection and our adversaries – be they a terrorist on the ground, a hostile aircraft, or a commercial competitor – are always making iterative changes to what they do. If you don't develop what you do, if you stand still, then you risk losing any advantage you may have enjoyed and it can go the other way.

As this article looks at the parallels between how marginal gains are applied in the military fast jets world and the world of sport, what could pilots learn from sportsmen and vice versa? Ditto the engineers from both areas?

Sir Ben Ainslie: We don't have anyone shooting at us, which makes quite a difference. But we still have plenty of pressure to perform in an environment which requires split second decision making and tiny differences in performance. So I would imagine that the physical and mental requirements are quite similar for pilots and America's Cup helmsmen, and we could spend a lot of time profitably comparing notes about how we go about improving our own performances.

We have a structural engineer working with us, seconded from BAE Systems' Military Air business, and he's been teaching us a lot about refining our manufacturing processes. And from talking to him, I think he's been learning from the speed with which we have to react. We are a much smaller organisation so that makes it easier, but we will design, build, launch and sail four test boats and one race boat in three years. I understand it took a lot longer to design and build the Typhoon.

Steve Formoso: It's a difficult one because I don't know too much about Sir Ben's world but I'd guess we probably operate in similar ways. I think a lot of it is in the mindset and know-how. In our world we try and package what we do so that we always know what we're going to do next and have a very structured view on how that's going to work. It's about knowing the best way to exploit your machine and you train to a high level.

It's much the same approach as a sportsman. You don't just go down to the running track and decide you're going to be the 100 metre sprint man. It's going to take you years of practising, training and improving things. It's the same for pilots and it's the same for us as a business.

What do you consider the parallels between industry and sport to achieve optimum performance? For instance, the use of simulators for training and other technologies and techniques.

Sir Ben Ainslie: The use of simulators is a clear parallel, I'm sure both groups utilise simulation and simulators to improve performance. But there are much broader similarities in that we must develop a full-grown business to conduct our challenge for the America's Cup. We have design, research, marketing, communications, administration, finance and commercial departments just like many other medium-sized businesses and we have to learn the best practice in all those areas as well as the sporting side. And as America's Cup teams become much bigger organisations we can absorb a lot of lessons in management and the way people design and develop cutting edge technologies in aviation and motorsport.

Steve Formoso: I guess for me it boils down to the pursuit of excellence. The Holy Grail is the perfect performance. That's what we're always striving for.

You've got to try to get the best performance you can out of an aircraft. A lot of that is the practice, the rehearsal, the visualisation. For example, we use simulators a lot and practise events before we do them. That way, even before we've climbed into the cockpit we've got the muscle memory and we've learnt the control inputs, we've learnt what it's going to look and feel like long before we actually see it.

Do you think there are any similar challenges that engineers have to tackle when developing technologies for sailing boats and combat aircraft?

Sir Ben Ainslie: If we look at the structural engineering, then both groups are pushing for the lightest possible structure that will do the job. Of course, just defining what the job is – i.e. the physical stresses that the boat or aircraft will be subject to – is hard enough, and then you have to find innovative ways to engineer and build it. In the case of something like the Human Machine Interface (HMI) – another area that BAE Systems have helped us with – then the problems are very similar. The pilot and helmsman must both have ways to control the machine that minimise the mental effort. The easier it is to fly or sail, the more time you will have to worry about the opponent.

Steve Formoso: There are some fantastic contributions going on in hangers that could be described as marginal gains: in the production process, in the logistics side. These all contribute.

The pilot is just one part of it but to focus purely on him or the engineering would be wrong because there is a massive pyramid of incremental gains going on. It's about being as efficient as possible right from the design to the human in the cockpit. It's the same with Ben and his team I'm sure. And it's all about a much broader team. Just as it would not be possible for Sir Bradley Wiggins to win the Tour de France on his own, it wouldn't be possible for a pilot to operate to his best without the whole of the team working alongside him. <<

Q&A: RAFFAEL KLASCHKA

Last year, after a career as a pilot in the German Air Force, **Raffael Klaschka**, or Klax to give him his Air Force nickname, joined the Eurofighter Marketing team. This is his story.

Raffael Klaschka
Marketing Manager at Eurofighter in Hallbergmoos

FIRST SOLO FLIGHT?
It was in a glider and it was a remarkable experience. I was a 14-year-old and after a few months' training, I was flying alone and responsible for getting on the ground again. It was a pretty big step and a great feeling.

FIRST MILITARY FLYING EXPERIENCE?
During training, I went to the US and had three months in Arizona training with propeller aircraft followed by six months in Texas for undergraduate pilot training in a T-37. From there I graduated to the T-38, a supersonic trainer that requires faster reactions because of its speed.

AFTER GRADUATION?
After getting your pilot's wings you learn more about what it means to be part of a fighter squadron – the discipline, how to behave, what kind of flying is expected. This meant 10 months in New Mexico at Holloman Air Force Base where I was flying the Phantom.

FIRST SQUADRON?
Back in Wittmund, I joined the Fighterwing 71 Richthofen. Initially I was flying the F-4F Phantom. I became an instructor pilot (IP) with barely 500 hours on the jet. Then I was selected to become an exchange pilot in Spain.

Photo: Dietmar Fenners

WHY SPAIN?
Well, the chance to fly the Spanish Air Force's Multirole F-18 was an attraction, plus the exchange offered a whole new perspective to the role. I was the only German in my wing, so I was talking Spanish from the first day. I was quite young when I went to Spain – I was still a first lieutenant.

SPANISH LESSONS?
The basic stuff in Spain was the same, the flying procedures, but like every country, they sometimes had a different approach to finding a solution. That may be different than it would be in Germany or the UK, but this was one of the things which made the whole experience interesting and it was really no problem to adapt to it. The impressive thing was the bond between the pilots because they were a strong band of brothers.

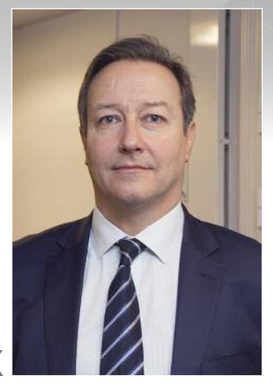
Photo: Aviation Photocrew

FIRST EUROFIGHTER FLIGHT?
I went back to Germany and started conversion training on the Typhoon in 2012. Eventually I completed 4 years of flying in the aircraft and was involved in several operations, including in air policing in the Baltic. Another highlight was bringing the wing known as 'Bavarian Tigers' into the famous NATO Tiger Association.

HOW DOES TYPHOON COMPARE?
Eurofighter was a huge step forward in respect of its general capabilities – especially the pure kinematic performance. The F-18 was a capable, well equipped but old airframe, the Typhoon is very much a pilot´s aircraft, with massive performance in different areas. The most obvious difference between all three generations of aircraft I've flown is the pilot workload. Typhoon's flight controls look after much of the physical flying effort, you're more of a decision maker dealing with the information offered by the aircraft and concentrating on mission success.

LIFE AFTER FLYING?
After almost 2500 hours on fighter jets in 2016 I joined Eurofighter's marketing team. Everyone has to stop flying one day but I'm still close to the system, close to the Eurofighter and close to the fighter aircraft world and that's great because this has been my life. It's not just a job, living this life is an attitude. In my new role I can give an unfiltered view to certain projects from an operator´s perspective. I can give insights into why the military has certain requirements for capabilities and why they're important. Credibility is an important characteristic of good marketing and I'm careful to make sure this is our guiding principle. <<

EUROPEAN ROUTE MAP



MARK PARKINSON

In recent months Europe has become increasingly prominent with respect to future military aircraft sales in Belgium, Finland, Switzerland and Poland.

The UK is leading the campaigns in Belgium and Finland, while Germany is the primary for the activities in Switzerland. At the same time the Germans and Italians are taking the initial steps in planning ahead of a campaign phase in Poland.

We spoke to **Mark Parkinson** who heads the BAE Systems teams about the prospects for success in both Belgium and Finland. >>

The market for fast jet sales around the world is hugely competitive. When the different offers are being analysed, the capability and characteristics of each respective aircraft are important, but this is not a simple game of Top Gun Top Trumps. There are a host of other factors at play too – budget, geography, politics, industrial and political relationships.

Look at a map of Europe and you'll easily begin to understand that Belgium and Finland might have different needs. These are two completely different countries in terms of landmass and proximity to fellow European neighbours. And that's before you start delving into history, politics and national culture.

It stands to reason, therefore, that when it comes to fighter aircraft campaigns the two might have different priorities. Understanding what these are, what weight to give them and then coming up with the right answers is crucial. Welcome to Mark Parkinson's world. As Regional Director for Europe in BAE Systems' Military Aircraft Division Mark has to navigate through a demanding process and keep each campaign on track.

"There are differences and there's no wrong and right on either side. It's just the way that each country decides to enact a procurement process. They're driven in part by the different environments in which they exist. What is common to both is that the purchase is a hugely significant one.

"When I try to summarise the two campaigns I'd say the Belgian process is much more about analysing what is available and what relationships will follow through their choice.

"They want to buy an aircraft that has multiple operators with resultant economies of scale and which also allows them to provide their contribution to NATO.

"The Finns are much more focused on the operational capability of the weapons system and how it can meet what they see as their threat environment in the future.

"The process is air force and defence driven and, while of course there will be a political element to their decision, the Finns are being much more forensic in their understanding of the weapon systems to make sure that they meet their anticipated needs for the future."

History, geography and politics all play their part in shaping the demands.

Says Mark: "The Belgians are a member of NATO and have got its security blanket – plus they are located in western Europe. Their air force is a significant component of their contribution to NATO and therefore having a more expeditionary capability, as well as looking after their own country, is important to them.

"The Finns are not in NATO, though they are in the EU, and they're located on the east of Europe and therefore they have a different role. The purpose of their air force is to protect Finland."

While the spotlight is very much on Belgium and Finland, Mark says BAE Systems also has a role to play elsewhere.

"We want to be able to support our partners Airbus and Leonardo on the other campaigns, in Switzerland and Poland, as they start to move forward.

"The timescales of Poland are not very clear at the moment but the timescales for Switzerland seem to be aligning with those of Finland. We like to think there's a great opportunity there for the Eurofighter programme in the years ahead.

"The challenge is to create the right value proposition for each of these potential customers."

CAMPAIGN FAQS BELGIUM

What's the requirement?

Belgium is the most advanced in terms of process timetable. The Belgians have a programme to replace their F 16s called the Air Combat Capability programme (ACCap). They want to buy 34 new aircraft and they're going to run a competition.

The unique thing about the process is that Belgium is going to issue something called a Request for a Government Proposal (RFGP) because they want the proposal to come from the government and they want a contract with a government at the end of the day. Unlike some countries where we agree a government to industry contract, this one will be a government to government contract.

What's the timetable?

They issued a Request for Information in 2014 and Eurofighter replied to that. Since then the UK has been running the campaign. We're working very closely with the UK government to create a solution for the Belgian customer.

The next step is for the Belgian MOD to issue the RFGP. We are assured that it's going to be coming shortly. They want to place a contract by the middle of 2018 – if they don't, then they head off into another election cycle. But this is a very important programme and they want to make sure they get on contract which would enable them to start to receive aircraft in 2023, when their F-16 fleet starts to run out of life.

What would you describe as the key issues?

Relationships – military, political and industrial. They have stressed this all the way through our engagements to date that the relationship is fundamental to them. The challenge for us is how we ensure the right relationship at all those three levels.

Capability is also clearly important. Belgium is a relatively small country, with a population of 10.5 million people and the air component represents a significant proportion of the country's commitment to NATO.

That all sounds like Eurofighter's well positioned then?

As a European solution, with five operators in Europe, a sizable operational fleet and the potential of a relationship with the UK government and the RAF, we are being taken very seriously.

In terms of the capability what is the key message?

They're looking very much for an all-round capability because the Belgians will have one asset. It will have to be capable of performing a number of different roles – though air policing and the air defence of Europe is important.

Former RAF Typhoon pilot Paul Smith explains how the aircraft works.

Given the importance placed on relationships, could Brexit be an issue?

It's important to remember that while the UK is leading the campaign they are doing so on behalf of a wider European partnership. I think Belgium still sees the UK as being important to the defence of Europe and it also enjoys strong relationships with Germany.

The truth is our programme is a NATO programme, rather than an EU one. The UK may be leaving the EU but it is not leaving Europe and the defence of Europe is very important to the UK.

Clearly, as we go through the next couple of years, there could be some backlash – people may become emotive about various aspects of what Brexit means – it's an issue we recognise for the campaign and we're trying to ensure that we mitigate it as much as we can.

But, for example, when the Belgian Parliamentary Defence Committee looked at the Eurofighter, Brexit was mentioned but the briefing was really focused on the aircraft, how it is operated and the opportunities for Belgium to join the programme and work closely with the Royal Air Force.

But equally Belgium is an expeditionary air force, and very much like the RAF. In the future they want to be able to continue to play a role in those expeditionary activities and obviously you need a multi-role weapons system to do that.

Who are the rivals?

We're competing with F-35, Rafale, and Gripen from Saab. We're familiar with each of the competitors and each has their strengths and weaknesses. There's a general recognition that most of the aircraft in the competition are very capable. So, once you get past the argument about the respective aircraft and weapons, you get into the broader value proposition being offered where we have to play to our strengths at all levels.

What's the general mood among the people involved in the Belgium campaign?

It's interesting and, depending on who you talk to, you can get two extremes. At one end you have people who point to the fact >>

that Europe is a very difficult market for us. It's one where we don't have a recent history of selling aircraft, apart from through collaborative partnerships.

It's highly competitive and recent history of those air forces who have bought aircraft have bought American. So it's fair to say that there's a recognition that it's a very challenging environment.

At the other end of the scale, we have got the weapons system capability that the Belgians want and can offer them the kind of relationships they are looking for through a European programme.

How confident are you?

We wouldn't be doing this if we honestly didn't think we had the ability to give the Belgians a value proposition that was capable of being successful. We and the UK government are taking it very seriously.

34 aircraft is not an insignificant number. The last export deal was 28 aircraft to Kuwait and prior to that 12 aircraft to Oman. Though I hate to use the word export because it really doesn't feel like an export – it feels more like we're inviting another partner to join the programme.

That's interesting. I guess that neatly sums up what you're selling – the idea of becoming one of the partners and helping to share the future programmes.

Yes, very much so. There's no way that a new country can join the programme in the same way that the four original nations did because time has passed but they can join now and there is the ability to have an accession agreement to NETMA or have an association agreement with NETMA that gives them a relationship and the ability to participate in the programme going forward.

BELGIUM

- The Belgian Air Component (BAC) has a requirement to replace 54 F-16 multi-role fighters through the ACCap (Air Combat Capability) Successor programme from 2023-2029.
- The F-16s were procured in the 1980s under the European Partnered Air Forces model (EPAF – Norway, Netherlands, Belgium, Denmark).
- Belgium Defence (BD) issued an RFI in June 2014. An RFI response on behalf of the UK Government was delivered in November 2014 outlining a suggested Eurofighter Typhoon solution.
- A Request for Government Proposal (RFGP) is currently awaited. Contract award is expected in 2018.

CAMPAIGN FAQS FINLAND

Where are we now?

Finland's in a much earlier phase of its campaign lifecycle than Belgium. They don't intend to place a contract until 2021, with delivery running from 2025 through to 2030. However, it's a sizeable market. The Finns currently have 62 F-18s and the numbers are important because they've got a big country that they need to cover.

Which in turn means it represents a sizeable opportunity. We're not saying they're going to buy 60-plus aircraft in the future, but they are going to buy a significant number.

What's happened so far?

Through 2016 we replied to a Request for Information (RFI) which, in my experience, was the most comprehensive RFI that we've ever received. The last time we had such a sizeable and complex document to respond to was the Request for Proposal from Japan.

We replied to the RFI and followed it up with a joint presentation led by the British Ambassador and involving ourselves and the RAF on 30th November in Helsinki.

What's next?

This year they will carry out an initial flight evaluation and we are anticipating a Request for Quotation (RFQ) in 2018.

The difference here is that they're going to ask us to quote for what they want, rather than ask us to propose them a solution. Following the RFQ they will continue to make their assessment and are expected to announce a Down Select decision around 2019/2020, with a contract award in 2021.

Who are we up against?

Again the competitors are the usual suspects, apart from this time the list also includes the F-18 Super Hornet alongside the F-35, Gripen and Rafale. The Finns currently operate F-18s, and Boeing will be a strong competitor in Finland.

Will the RAF lead the flight evaluation activity?

Yes. We are anticipating two weeks of evaluation, one at RAF Coningsby and one at Warton in the simulator. But the whole thing will be coordinated by the RAF and the MOD, though, of course, we will play our part in it.

Why do we feel Typhoon represents the right option for Finland then?

Well, Finland is looking for a multi-role asset. It has a number of operational scenarios that it needs to address which include both air superiority and Air-to-Surface capability. Typhoon can provide a solution to all their operational scenarios.

▲ On the record: Paul Smith talks to Finnish journalists.

The other thing that's important to the Finns is their ability to be able to operate independently. In a time of conflict, the Finns see themselves as an island and it's very important to them to be able to operate independently. From an industrial and technology point of view, we think that we can provide them that capability.

What's important to them?

The Finns place an awful lot of weight on the operational capability and the air force will have a significant say in the selection of the weapon system. In contrast, a lot of countries make a political decision but in Finland the operational aspects have a very high weighting and it would be unusual for the air force not to get the aircraft they want. That's not to ignore the politics though!

Given that, is the marketing campaign emphasising Typhoon's strengths?

Yes, but it's not only about the capabilities of today. When we replied to the RFI, we talked about the aircraft we envisage and the capabilities that that weapon system will have by 2030.

Of course, some of that we know is firm, because there's work that's being done today through the Phase Enhancement Programme. But some of it is projected on the basis of what we think will be in Future Enhancement Packages. It's interesting to have to write about that far in the future.

Indeed, the Finns are not only interested in what happens by 2030. They want to know, what are you going to do beyond that?

A key thing we've been highlighting is that we have a commitment to continually maintain the weapons system at the forefront of capability. Our capability route map is really important. Of course, it's important to any air force, isn't it?

Is the industrial package important over there?

Yes. Indigenous capability, or the ability to operate independently for a period of time and an industrial capability that supports that autonomy is crucial. What they're looking for is a solution that supports sovereignty over the platform, but equally it's attractive to them to be able to participate in a broader programme and ensure they get the economies of scale out of that.

How are you going to win there?

Clearly, we've got to demonstrate the capability of the aircraft today and convince them about the future capability route map delivering the platform for tomorrow which will be able to deal with the known and emerging threats of the future. We also have to demonstrate the commitment of the existing nations to the programme.

Then through transfer of technology and intellectual property, we have to show how we can give the Finns the ability to operate independently in times of crisis, and offer security of supply.

Is the European element of Typhoon attractive?

Europe and the EU is important to Finland. They're not a NATO member but they are a member of the EU and they see strength through the various clauses that are in the EU's Treaty of the Functioning of the European Union, which has similar clauses in it to Article 5 in NATO around mutual support.

There is a concern over Brexit but, having said that, the UK is already demonstrating its support to the defence of the Eastern Baltic through Typhoon operations in Estonia.

FINLAND

- Finland Defence Forces (FDF) launched a programme to replace an existing fleet of 62 F/A-18 multi-role Hornet fighters during the period 2025-2030 – known as the HX programme.
- A Request for Information (RFI) was issued by the FDF to respective government agencies on 21st April 2016 and responses were submitted on 22nd November 2016.
- The RFI will shape a Request for Quotation (RFQ) expected in 2018, with Contract Award scheduled in 2021 and deliveries commencing in 2025.
- The UK Government is leading the Eurofighter Typhoon campaign in Finland, with BAE Systems as the industry lead.

GOVERNMENT OUT IN FRONT

The Belgium and Finland campaigns represent a sea change in the way campaigns are executed. The government – which previously played an important supporting role – is now at the forefront. Both campaigns are being led by the UK government, with industry in the shape of BAE Systems (and on behalf of our Eurofighter partners) playing the support role.

Lessons were learnt from the French a few years ago when they achieved multiple successes with Rafale. "Their campaigns were being led by the French government, rather than French industry," says Mark Parkinson. "We quickly realised that we needed to redefine the roles in our campaigns and reinforced the importance of the government role.

"We all agreed that both government and industry needed to work much more closely together but with the government in the lead."

IT WAS A FUNDAMENTAL CHANGE

Says Mark: "Now before any campaign is initiated, the government has to make it clear it is prepared to lead the campaign and industry has got to commit its resources to support them. In both Belgium and Finland, BAE Systems told the UK government that if they were prepared to lead the campaign, the company was prepared to invest.

"In reality, the UK government is leading the campaigns on behalf of the four European partner nations and we, BAE Systems, lead on behalf of the three industrial partners."

In practice this means that the primary point of interface for the Belgian and Finnish project teams is the UK government and, in particular the MOD Export Policy team.

"All of which means we now have a much stronger government focus and ownership of the campaigns. We look forward to this bringing a successful outcome to our campaigns in the future." <<

▲ Missile check: A pilot looks at the missiles before he climbs in his cockpit.

TEAM TRIAL WINNERS

Running a complex operation like a flight test programme comes with its own very demanding set of potential headaches. >>

The clock is always ticking but slots at test ranges are limited; the logistics are challenging as the ranges are in difficult to reach areas; the weather is unpredictable and often unhelpful; and then there are security considerations that have to be taken into account.

Then, even if you get all those ducks in a row, the technical aspects of the trials are often far from straightforward. So imagine picking all this up and transferring it to another country, one where they speak a different language.

This was the challenge facing a team from Leonardo during the weapons integration test work to bring Storm Shadow and Meteor missiles to the aircraft. How they managed it is a classic example of this collaborative working.

Leonardo's Alessandro Bianco, Kuwait Chief Engineer, who was the P2E Technical Manager coordinating the activities on Storm Shadow integration and James Glazebrook, BAE Systems Head of UK Centurion & Eurofighter Capability Programmes, were key players in making sure the joint working was a success.

"The relationship started when Leonardo were conducting the Storm Shadow trials," says Alessandro. "At the time there were a number of challenges around the use of the range in Italy so we started to look at alternatives and one solution was to move the trials over to the UK.

"When it became clear we could not use the range in Italy as originally planned then we made a quick decision. Rather than trying to find work arounds we recognised that the best thing to do would be to move the trials to the UK. But we knew we couldn't do it without help. So we I contacted James."

When the operation turned from possibility to reality, Alessandro and James sat down and mapped out how they were going to make things work. Workshops in Warton and Turin looked at every aspect – the logistics, the flight operations, the aircraft support, the ground crew, the armaments and engineers.

"It took less than three months from the time the decision was taken to when IPA2 was operating in the UK, which is a relatively short timescale and that in itself is a demonstration that this cooperation was the right thing to do."

There are so many moving parts to a hugely complex operation like a flight test programme and each is a potential headache. All the while the teams are driven to achieve key milestones by target deadlines. That's why the two companies working together was beneficial in terms of keeping the timings on track. As James explains: "The companies in the Eurofighter consortium generally work in partnership, but the key difference here was rather than BAE Systems conducting the trial, it was Leonardo bringing their aircraft and their organisation over to the UK to conduct the trials at a range in the UK. BAE Systems' role was to collaborate with them and use our relationships with the customer to unblock things for the Leonardo team."

Leonardo took a full team of around 30 people, including their test aircraft and ground equipment and tools to BAE Systems' Warton base. Their UK counterparts understood the task they faced and did everything they could to smooth out the path. James says: "BAE Systems had already conducted a number of trials around the ranges at Aberporth in Wales and the Hebrides in Scotland. We had also deployed up to Stornoway to help with early Meteor trials. So we understood the detachment aspects of operating out of a commercial airfield on Stornoway."

The first step was for engineers from BAE Systems and Leonardo to take a look at the range in order to understand all the different aspects of the trials.

James says: "We shared a lot of our best practice and explained about the lessons we had learned about how best to do things in both of the ranges."

For the Leonardo team that insight was invaluable. As Alessandro says: "Being >>

>> TEAM TRAIL WINNERS

▲ A Meteor missile is fired-off a Eurofighter Typhoon during test flight.

▼ The Meteor missile is carefully fixed on to the aircraft.

given this inside knowledge, right from the start, was very important for us. Obviously, we were completely unfamiliar with the ranges – they were just names on a map – and we had no experience of the people there either. That's why it was very important to have the support when we visited the sites. James' team was able to introduce us to the people and help us understand how to manage each range. If we were just trying to relocate to the UK without having any help it would have taken at least twice as long just to settle everything.

"The detachment itself was something we are able to manage – we're used to it – but it was also a matter of managing the different areas, different languages and the distance from home.

And that combination was naturally the biggest threat to the test timetable. That potential difficulty was alleviated by the support because BAE Systems were the first interface with QinetiQ and with MOD UK, so this was great.

"On the other side of the coin, at that point of the programme, we already had a great deal of Storm Shadow integration expertise and therefore we were able to cover all the technical aspects. That's how we were both able to work as a team – they brought their experience on the range and we brought our experience on weapons integration."

James agrees that from the BAE Systems perspective it was a win-win. "As Leonardo had previously carried out Storm Shadow trials on Typhoon they were already familiar with the handling procedures and the whole integration trials. We learned a lot working alongside them that was useful when we subsequently carried out our own trials with Storm Shadow. We were able to go into them having already picked up a lot from our experience because we had seen up close how they managed the integration process and the lessons they learned fed directly into our work. It was a real sharing: of experiences, of our connections and relationships in the UK with the range, with the MOD and the kind of export license, with the operation of the jet and even with dealing with the commercial airfield at Stornoway.

"It was also about our two teams being able to build personal relationships and connections. We shared information every day by phone, by mail and face to face. We had a combined team working together in the same office on the issues. Whenever a challenge came along the two teams worked collectively to get things resolved so that the trials happened as quickly as possible."

Not long after the successful completion of the Storm Shadow trials, BAE Systems' weapons test team was working on trials of the Meteor missile. It looked like they might have hit a hitch when the test aircraft they'd hoped to use was allocated to another flight test campaign. But the partnership with Leonardo was fired into life again. The Meteor trials had to take place in the UK because of the size of the range required and Leonardo had an aircraft available to help make them happen.

Says James: "The fact that the Italian team had previously come to the UK for Storm Shadow demystified things. It made the transition of Leonardo picking up Meteor firing campaigns much smoother. By then working together was second nature. It meant Leonardo were able to come to the UK and get to work firing missiles very quickly and efficiently."

Alessandro recalls: "The reaction time on the Meteor trials was definitely improved due to this knowledge that we already had under Storm Shadow. Of course it was still challenging, not least because from a technical point of view the Meteor task was far more complex than the Storm Shadow one. But because we already knew the ranges and the people, it allowed us to concentrate on the task itself, rather than worry about the logistics."

With all the variables around each trial there's an awful lot of preparation required to pull each day off.

James says: "The complexity and the level of detailed planning just to get through a trial day is immense, and all the team pushing in the same direction is key. The first thing you've got to sort out is availability – do you have the air traffic controllers; do you have the assets available because we have to have targets.

"With a Meteor test targets are drones and we need to organise operators for those. There's an air traffic controller for the drone and an air traffic controller for the aircraft. You then have to make sure that the range is made safe and cleared of any traffic – that's air and sea traffic. In this case, Leonardo were operating out of Stornoway, so they were working with the airfield there to coordinate a timing slot on the range.

▲ 17 Squadron Typhoon with Meteor missiles. Photo: Chris Ryding, Copyright: BAE Systems, Warton.

"When we think about the weather, we're not solely concerned about the weather conditions for the trial itself but also the safety aspects of being able to recover the drones from the sea. You have to try to make sure the sea state is okay for that. So the team uses a separate aircraft to check the sea state which adds to the complexity.

"When you have put everything in place you then need the pilot, and the team who are supporting him who are reading all the measurements, to hit a specific position at a specific speed and press the fire button at precisely the right time."

Alessandro explains: "The number of 'thumbs ups' you need for each test is huge. You've got the range, air control, Stornoway Airport, the pilot, the flight test operation, the supplier of the weapon (they are there to monitor the performance of the weapon), and the weapons integration team. Everybody needs to be happy before we can say, 'Okay, let's take off.'"

Assuming everything goes to plan and the trial is successful you then have to repeat the process. For each weapons integration programme a number of trials are carried out with weapon releases at different speeds and altitudes. Engineers are trying to gather enough data so they can then give the weapon clearance for as wide a range of use as possible.

Once the missile has been released it's then about the weapons system integration. The team looks at how the missile tracks and how it shares information with the aircraft. Again different trials are conducted where different manoeuvres are carried out at different speeds and altitudes. Essentially the team is testing the boundaries of the weapons system, to ensure they can be confident about its performance and also fully understand what it brings in an operational sense.

James says: "The customer plays a large part in helping the team agree what the test scenarios should be because they're very interested in them being representative rather than a benign trial. They start off relatively simply and become ever more complicated. For example, the Meteor firing campaign was due to end with a paired firing, which means two missiles fired at two targets, each of which is tracked independently but at the same time.

The level of detailed planning required to achieve a successful programme underscores the value of the partnership between the two companies. And, as they shared the workload, they also jointly celebrated its success too.

Alessandro says: "The feeling that we had at the end of each shared task with everyone from Leonardo and BAE Systems was positive. There was real openness, information was shared and there were no boundaries between us. It's the way it should be done. That's the reason everything worked well. The fact that the tasks we performed were completed on time, perfectly in line with a programme that had been generated months before, was clear evidence that it was a successful partnership."

The lessons learned are now being shared afresh with teams from Airbus Spain following in Leonardo's footsteps by travelling to the UK to carry out their own trials. It's clearly in the spirit of cooperation that is a hallmark of the Eurofighter programme. <<

SUCCESSFUL DUAL FIRING MARKS MAJOR MILESTONE ON METEOR PROGRAMME

- **DUAL FIRING OF METEOR FROM TYPHOON AIRCRAFT, COMPLETING DEVELOPMENT TESTING ACTIVITY OF THE WEAPON**
- **OPERATIONAL EVALUATION WITH UK ROYAL AIR FORCE DUE TO BEGIN LATER IN 2017**

EUROFIGHTER TYPHOON CAPABILITY GROWTH **BEYOND VISUAL RANGE CAPABILITY**

METEOR

Meteor provides Eurofighter Typhoon with a superior active radar-guided Air-to-Air capability against manoeuvring fast jets, unmanned aerial vehicles and cruise missiles at extreme range.

A RAMJET POWERED guided missile with an **ADVANCED SEEKER** able to operate in a heavy electronic countermeasure environment.

TWO WAY DATALINK will allow a new level of **SITUATIONAL AWARENESS** for the pilot enhancing **COMBAT EFFECTIVENESS.**

A Eurofighter Typhoon successfully completed a simultaneous firing of two MBDA Meteor Beyond Visual Range air-to-air missiles as part of a major programme of work to integrate the weapon on to the aircraft.

The test was conducted using Airbus Defence & Space Instrumented Production Aircraft (IPA) 4 with the support of BAE Systems, Eurofighter GmbH, MBDA and the UK's Ministry of Defence.

The trial was used to test successful engagement of targets and the simultaneous two-way data link between two missiles and the aircraft. The data gathered follows a series of six successful Meteor firings conducted from Eurofighter Typhoon in 2016.

Following loading activity at BAE Systems' Military Air & Information site, in Warton, UK, the trials took place over the UK's Hebrides Range.

It is the latest successful flight trial conducted by the Eurofighter Partner Companies as part of a major programme of work to add additional capability on to Eurofighter Typhoon, ensuring it is ready to meet the threats of the future.

Andy Flynn, Eurofighter Delivery Director for BAE Systems UK, said: "This is another major milestone on the Meteor programme and the first successful test of a dual firing. Meteor brings to Eurofighter Typhoon an unparalleled air-to-air engagement capability and this successful trial – following on from a series of firings last year – is further evidence of how the Eurofighter Partner Companies are working together to deliver major enhancements to Typhoon's multi-role capabilities."

Customer Operational Evaluation and Training with Meteor is due to take place with the UK Royal Air Force later this year. <<

500TH EUROFIGHTER TYPHOON
DELIVERED TO THE ITALIAN AIR FORCE

Turin, April 11, 2017 - The 500th Eurofighter Typhoon has been delivered to the Italian Air Force during a special ceremony held at Leonardo Aircraft Division's Turin site. Lt. Gen. Gabriele Salvestroni, Logistic Commander of the Italian Air Force, took delivery of the aircraft in the presence of Filippo Bagnato, Leonardo Aircraft Division's Managing Director, Volker Paltzo, Chief Executive Officer of Eurofighter Jagdflugzeug, Peter Schmidt, Deputy General Manager of NETMA, and representatives from the Eurofighter partner nations and partner companies.

Volker Paltzo, Chief Executive Officer of Eurofighter Jagdflugzeug GmbH, said: "The 500 strong Eurofighter Typhoon fleet represents one of the largest and most capable fighter fleets in the western hemisphere, and will be the backbone of European airpower for decades to come. Today's handover is a great testament to the programme's success, and I firmly expect to see the fleet grow further as our partner companies continue to pursue opportunities for more orders internationally."

Filippo Bagnato, Leonardo Aircraft Division Managing Director, said: "We are very proud to deliver the 500th Eurofighter Typhoon produced to the Italian Air Force. The Eurofighter Typhoon is the largest collaborative industrial programme in Europe, it is a successful and significant contributor to the nation's economic wellbeing, employing high-skilled workers and generating thousands of high-value manufacturing and engineering jobs. We are now fully committed to completing deliveries to the Italian Air Force, to develop the capabilities of the aircraft, and to the activities envisaged by Kuwait's contract, while continuing to pursue a number of significant market opportunities around the world."

The first Eurofighter was delivered to the UK Royal Air Force at the end of 2003. The 100th Eurofighter was delivered to the UK Royal Air Force in September 2006. The 200th aircraft was handed over to the German Air Force in November 2009. The 300th aircraft was delivered to the Spanish Air Force in October 2011, and the 400th to the German Air Force in December 2013.

The aircraft has demonstrated, and continues to demonstrate, high reliability across the globe in all climates. It has been deployed on multiple occasions on Baltic Air Policing duties with the Spanish, German, Italian and UK air forces and has been combat proven during operations in Libya, Iraq and Syria.

Through a series of continual enhancement steps, new capabilities are being added to the aircraft, with test and integration activity currently underway for advanced beyond visual range air-to-air missile Meteor, the precision guided cruise missile Storm Shadow and the precision attack missile Brimstone. The integration of these weapon systems will ensure Eurofighter Typhoon maintains its position as the most capable, agile and reliable swing-role fighter available on the international market today. <<

- **With 599 aircraft ordered, Eurofighter Typhoon is currently the largest collaborative industrial programme in Europe**
- **Eight customers have already ordered the Eurofighter Typhoon worldwide**
- **Almost 400,000 flying hours achieved worldwide**

WORLD ECONOMIC FORUM

AUSTRIAN EUROFIGHTERS' SWISS ROLE

Earlier this year Eurofighter Typhoons from the Austrian Armed Forces played an important role during the World Economic Forum 2017 in Switzerland.

The Eurofighters were tasked with securing the skies during the event at the prominent ski-resort Davos. The Forum brought together more than 40 heads of state and government, as well as 3,000 other leaders from politics, business and society. <<

◀ Photo: Geoffrey Lee, Planefocus Limited, UK

▲ Photo: Markus Zinner, BMLVS

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