EUROFIGHTER

# WORLD

PROGRAMME NEWS & FEATURES
FEBRUARY 2015

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## IN FULL SERVICE
### IN THE MIDDLE EAST

Eurofighter Typhoon


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**Climbing high in the Middle East - a RSAF Eurofighter Typhoon**

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**Jamie Hunter**

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February 2015






# WELCOME

There's a quote in this edition of Eurofighter WORLD from one of my colleagues, who describes the Eurofighter Typhoon as 'a living machine'. It's a great phrase, one that got me thinking. For me it perfectly expresses both the technical advances embodied in the aircraft and the human effort behind them.

It is difficult to divorce the two because great engineering is the product of great engineers. And in this issue of the magazine we hear all about both. There's a fascinating feature from one of our Test Pilots on why the new Captor E-Scan AESA radar is so special, and we also look at how that development fits into the wider Eurofighter Typhoon capability journey. At the same time we get a progress report on how our latest Eurofighter export customer, Oman, is gearing up to take on its first delivery in 2017.

I was particularly interested in the story about ASTA. It was interesting to learn how – thanks to our world-class simulator – pilots with no flying experience in Eurofighter are able to make their first live flight in the real aircraft a solo one.

Our aircraft is often described as complex, but the story describing how an engine is fitted shows just how well designed it is. We also take a look at the NATO Air Policing operation in Estonia and the major role played by Eurofighter Typhoon.

Just to complete the picture we meet some of the people who help make the Eurofighter organisation tick. People like Quentin D'Arcy, Eurofighter's Manager of Joint Flight Operations, Aurora de Castillo, our Vice President Pricing, and Flight Test Co-ordinator Reyes Carrion.

So yes, I think my colleague was spot on because throughout the pages of this issue of Eurofighter WORLD, we show how the Eurofighter Typhoon is truly a living machine.

I hope you enjoy it and, as always, I'd welcome any feedback you may have.

**Alberto Gutierrez**
CEO Eurofighter Jagdflugzeug GmbH

# FLEXING ITS MUSCLES

Laurie Hilditch Eurofighter's Head of Future Capabilities, believes this current phase of development represents the most significant part of the aircraft's journey to date. >>

**LAURIE HILDITCH**

When the Eurofighter Typhoon went into service more than a decade ago it made headlines around the world. Here, at last, was an incredibly agile and sophisticated fighter, packed with possibilities.

But now it's growing up and unleashing all its inherent potential, thanks to a series of capability developments that are transforming the aircraft into a world beater.

At first the Eurofighter story was all about it taking to the skies and it notched up a series of early milestones.

Very soon after that it was given extra responsibilities, transforming it from a gifted air-to-air fighter into a true swing role aircraft in what's been dubbed the 'Paradigm Shift'.

And now it's limbering up to add even more, with a development path being mapped out that will take the Eurofighter Typhoon into the 2020s and beyond, making it ever more relevant. Meteor, Brimstone, Storm Shadow and Captor-E radar are just a few of the highlights.

Laurie Hilditch, Eurofighter's Head of Future Capabilities, believes this current phase of development represents the most significant part of the aircraft's journey to date.

"Without doubt this is the most important and exciting phase of its life. The aircraft was conceived in the 1980s, developed in the 1990s, entered service in the 2000s, came of age in the 2010s, but it's now getting ready for the 2020s," says Hilditch.

"Getting into service is important and there was a huge buzz around when that was achieved, but you have to put that into context. That stage – historic and memorable as it was – was simply the initial outing of a very new weapon system.

"In actual fact in many ways what happened after that was the aircraft started flying in what I would call a training mode.

"It then moved to an initial air-to-air, it could carry out Quick Reaction Alert and it was able to perform some basic air-to-air missions. But in those early days it had no air-to-surface capability at all and we still had to add the data link to air-to-air.

"So looking back, this initial period between 2003 and 2005 was a time when the aircraft was still getting into service. That operation is not just the first flight, that's only the start of a process that lasts for several years."

The next key period was what Hilditch describes as the 'Paradigm Shift'.

"At this point we were changing the focus of the aircraft's abilities. At first it entirely centred on air-to-air with a little air-to-surface. The move then was to make it far more capable, if not equally capable, on both fronts.

"This is the maturing process. If you look at it as though it's a human then for the first five years, from birth to nursery, is the entry to service period where the platform is just growing up.

"Then from primary school to secondary, which is basic education, we were concerned with sorting out where they're going and that's what led us into P1E. Now we've just got to the stage where we are getting ready for university.

"What we're about to do now is say we know what we're good at, what we want to work on and how we want to mature. It's the maturing bit, the growing up and focusing >>

## >> FLEXING ITS MUSCLES

and bringing in the other things so you come out the other end as an adult.

"So we are now right in the middle of one of the most important phases of the aircraft's life. For me it's definitely as important as the start of service, and actually more important.

"This latest phase builds on all the investment that we have all put into Eurofighter Typhoon and will ensure it stays relevant well into the future."

It's worth pausing to consider just what's happening right now. In addition to an E-Scan radar development programme which was announced in November 2014, the Eurofighter Typhoon Phase 1 Enhancements (P1Eb) programme is an upgrade which has brought full air-to-surface capability onto the Tranche 2 aircraft. It has already been installed on a number of UK RAF aircraft.

Meanwhile a number of future upgrade packages are being planned in the shape of P2Eb, P3E and P4E.

P2E is a collective badge for the integration of the Meteor and Storm Shadow weapons, as well as a series of other changes which have been dubbed Enhancement Package 2.

Says Hilditch: "Meteor represents the main meat of P2Eb. P2Ea also has Storm Shadow and the Enhancement Package 2, a range of in service evolution changes to the weapon system.

"P3E is a UK only programme and its main aim is to put Brimstone 2 on the aircraft. But, while Brimstone is a UK request, P3E is actually an international development program for Eurofighter. So, while we will be delivering a capability package that is to be used by just one customer, the other three nations are all involved, using all four development sites, the rigs and development aircraft.

"This new way of working is significant in its own right. We've shown we're reacting to the needs of our customers by being more flexible, being able to move from a nationally initiated piece of work, to deliver it with international resources to one customer. We're all working on it, however the output only goes to the UK. The other three nations are looking on with interest while waiting for P4E.

"I believe there is a really good lesson in there. The way we are operating shows we are reacting faster, because we have more flexibility. We don't have to do everything internationally, we can do a mix. When we need to we can do things nationally, then when we need to we can move from a national initiative to an international initiative. In fact we can move from an international initiative for one nation and fold that into an international clearance within the next international package. Like Brimstone going into P4E."

P4E is noteworthy because it is the key to keeping Eurofighter Typhoon relevant.

"This package will include everything the customers need to change by 2020 to keep their aircraft viable. It will focus on the things that are changing in the operational and air traffic world. Of course if an aircraft has been in service since 2003, then 17 years later in 2020 you'd expect the world around it to have changed.

"For example the 'old' crypto algorithms that are used in the radios for secure communication and secure work, are being withdrawn.

"This obsolescence means that we're moving to a new key system. When you do that the avionics boxes that use that cryptographic material have to change too. Inside them there are cryptographic chips that know how to decode the old cryptographic keys. But if you put in new crypto keys then you get gobbledygook, so you have to change them.

"There's a host of other things in P4E that we're doing we will also bring in EP3, which are more changes mainly relating to the DASS, MIDS and networking."

The significance of P4E is hard to overstate. Says Hilditch: "If you don't carry out those mandatory changes you will become irrelevant within a few years, if not sooner. P4E matures the aircraft and increases its relevance to the world.

"The thing about modern aircraft, the majority of the capability comes from inside the aircraft, because of the speed and power of the computer and rewritten software.

"But if you look at the Eurofighter Typhoon you can't tell the difference between the one that went in service in 2003 and the one that will be sitting there in 2023. You won't be able tell it has E-Scan radar inside and all the other upgrades we've been discussing. With older aircraft you can see the differences, for example the F16A and the Block 60 look different.

"The only change on the aircraft is a bit of a bump and it would take a phenomenal geek to see it and even then they probably couldn't tell the difference!

"It's sometimes hard to tell the story because it's hard to get too excited about new IT but in truth it is an exciting stage of the Eurofighter story. The aircraft doesn't advertise itself externally but that's testament to the design work of the team back in the 1980s, and shows where they started from can't have been that bad."

So the Eurofighter is growing up and now it's flexing its muscles.

"We're not the new kid on the block any more, we've changed into the proper swing role aircrafts, that itself is maturing with smarter weapons coming along in the shape of Storm Shadow, Brimstone, Meteor and so on. The aircraft now has a more rounded capability. It's got an exciting present and a truly relevant future." <<

# GAME CHANGER

There was a time when air force pilots regarded flight simulators as a necessary evil. Synthetic action simply couldn't compare to the real thing, live flying. But, in the Eurofighter world, ASTA Simulators are rapidly changing the entire landscape. >>

Let's be honest, a pilot will almost always chose a real flight over a simulator, says Erik Heinzmann, Eurofighter's Operational Factors Senior Manager. "But now we have reached a point where there are times when pilots actually prefer to go in a simulator if they want to train for something that they know they cannot do or are not allowed to do in their aircraft.

"We also have examples now of pilots with no flying experience in Eurofighter who go into the simulator and who are then able to make their first live flight in the real Eurofighter solo. That's how good the simulator is."

With every air force looking to achieve an effective blend of live and synthetic training, the ASTA simulators represent the ultimate in training devices. In fact it's not one device but two: a Full Mission System (FMS) and Cockpit Trainer plus their accompanying training systems.

IT'S ONE OF THE FEW SIMULATORS IN THE WORLD THAT REPLICATES THE WEAPONS SYSTEM BY USING THE REAL AIRCRAFT SOFTWARE

With these, ASTA simulators provide the air forces of Germany, the UK, Italy, Spain and Austria a full spectrum of Eurofighter Typhoon training tasks on their own bases.

***But what makes ASTA so special?***

"It's one of the few simulators in the world that replicates the weapons system by using the real aircraft software at the current standard being flown by the air forces it serves," says Erik.

"It has a unique system environment offering an incredible degree of realism. All the opponents or your allies are very realistic in their behaviours. They behave extremely closely to what you would see from a real opponent. It is rare for simulators to achieve this accuracy. All the weapons work in the electronic warfare environment as they would in the outside world, in terms of range, flight behaviours and so on. They react like weapons or bombs would react. The system will check if there is a loss of communication, if the GPS is jammed or not, all of these scenarios are considered by the system. This is what makes it so unique.

"To get to this level of complexity has taken time. ASTA has been more than 10 years in development and the whole thing is an investment in triple digit millions."

Erik was an instructor pilot and weapons instructor for many years and has over 3,000 fast jet flying hours to his name – in total he's flown more than 4500 hours. But his role now is to ensure the ASTA simulators can fulfil the operational requirements of the pilots. It means he's in daily contact with the pilots to get an accurate understanding of their needs and the training needs of the air forces.

The use of synthetics is growing among the air forces and they now play a crucial role in the training of pilots.

WITH A SIMULATOR YOU CAN TRAIN TO USE THESE WEAPONS WITHOUT USING A LOT OF MONEY

For example the UK Royal Air Force has 75:25 blend for every front-line Typhoon pilot, with 15 live flying hours to every five synthetic. This move towards more virtual flying is not solely about saving money, though that is one of the more obvious benefits.

"Of course in this day and age cost is an issue for most air forces – for example, firing an air-to-air missile is not cheap – and then to consider doing so in a variety of different electronic warfare scenarios adds up. With a simulator you can train to use these weapons without using a lot of money.

"But there's a lot more to it. I was in Gelsenkirchen the other day talking to the pilots and they were saying they'd come back from a 12-hour flight where they'd had two intercepts. When I was flying we would have had 100s of intercepts in that kind of timeframe. That kind of thing just illustrates how few aircraft are actually flying these days. You are limited to what you can do, how often you can fly with other assets and so on.

"Whereas with ASTA you can carry out lots of complex work with multiple aircraft every day of the week. It's a very valuable tool which is needed because of a lack of training capability. When air forces want to train with eight or more aircraft it's difficult logistically and costly – with ASTA you can do it every day. You can train for night flying, bombing runs and so on so that if the pilot was called on to carry out a real life mission they'd be able to make the sort of spilt second decisions because they would have trained for them. You can train in close combat formation and introduce more and more other elements, like more aircraft, or you could fly with a tanker to carry out refuelling."

Not surprisingly with this level of precision the pilots very quickly are immersed in the missions.

Says Erik: "They sit in their real flight gear, if they fly inverted their straps tighten and the pilots feel them. It works very well. They come out and they are sweating. The immersion factor is high. All the guys who work with you on a regular chain of command can be also linked in and talk to you. On top of all this the enemy behaves just as the enemy would and not like in some simple computer game. The accuracy of the visual and the motion system working together mirrors the precise behaviours of the aircraft."

## WHAT IS ASTA?

AIRCREW SYNTHETIC TRAINING AIDS

This high quality, high fidelity training system is an integral part of the Eurofighter Typhoon system. It has been designed to support mission readiness training and cater efficiently and cost effectly for the most demanding training needs.

It is been designed, from the outset, to cover all envisaged roles for the Eurofighter Typhoon while on deployment, or on active service.

While no ground-based machine can match the real danger of flying, the pilots are placed under real stress, in part because of the FMS experience – which has motion cuing and 360 degree visuals – and in part because every move they make is monitored by instructors.

"There's a brief before each flight and a debrief afterwards. The pilots work with an instructor and debrief on any move they carried out," says Erik. "I've seen debriefings that have lasted for more than six hours, far longer than the actual mission, where people can go into real detail. This is for special missions but the debrief is always an essential part of the training.

"The thing is in the simulator you can debrief much better because there are so many more elements monitoring the pilots and aircraft. ASTA is unique in that we can debrief things that were not even seen during mission runs. For example, you could have had someone shooting at the aircraft but no-one noticed where and when and why. So you can go back and look at all the different elements and focus on it and find out why the pilot hasn't seen it."

***So what does the future hold?***

"In the future we will be able to link networks together. We will be able to train together with other ground control stations, other aircraft and so on.

IT'S ALL ABOUT ENSURING THE TRAINING DEVICES ARE ABLE TO MATCH UP TO THE OPERATIONAL REALITY

"In real life you'd definitely fly with all these so you need to train with them too.

"One of the things that's missing in any fast jet simulator right now is the G-force element. But working under G-forces so the pilots feel them affecting their body is something that's being planned for the future."

It's all about ensuring the training devices are able to match up to the operational reality. And with his close contact with the air forces that's a reality Erik never loses sight of. <<

# BALTIC PROTECTION

ÄMARI AIRBASE

High on the shoulder of Europe, a short ferry-hop from Scandinavia, nestles the proud and beautiful country of Estonia. Rich in history and generous in spirit it is a magical place to visit. It also happens to be right next door to Russia. Eurofighter WORLD went to Estonia to witness the work of the NATO Air Policing operations in the Baltic States. There we met with the Luftwaffe who were just coming to the end of a three-month tour which involved four Eurofighter aircraft 'on base' and another two on '96 hour' standby.

Policing operations are very much a part of the history of the Baltic region and recent events have heightened the sense of awareness of just how important it is to make clear where borders begin and where they end.

A dawn drive across the windswept plains between Estonia's capital Tallinn, and the Amari Air Base, home to the Luftwaffe for the last 12 weeks, revealed a country that felt palpably vulnerable to the might and the whims of the nations that surround it. Close to the air base, almost hidden in the pine forest, there was a stark reminder that this had once been Russian territory. Here among the trees is an aviation graveyard, complete with tombstone tailfins and images of those who had died on mission.

Estonia is a relatively small country, with a population of just 1.3 million, a population whose ancestors have been ravaged by war on all fronts. It was only in 1988 that Estonia declared independence from the USSR. It joined NATO in 2004. Now described as a Baltic Tiger because of its improving economy, it became part of the Eurozone in 2011 and is considered to be punching well above its weight.

COL. **JAAK TARIEN**
COMMANDER
OF THE ESTONIAN
AIR FORCE

At the Amari Air Base there is a real sense of pride about the work that is being carried out there. NATO-approved, and recently refurbished, this is now the most modern and high capacity military air base in the Baltics. There is good reason for it. Recent world events have challenged the integrity of borders and transgressions into foreign airspace have risen dramatically.

The Eurofighter Typhoon is at the centre of operations. The task of policing the airspace of the Baltic States under NATO began in 2004. Rotational deployments typically last three months each involving 50 to 100 personnel. NATO has now decided the Eurofighter Typhoon Quick Reaction Alert capability should last at least through 2015. It's a testament to the aircraft.

While initially the patrols began from the Lithuanian air base of Šiauliai, latterly the Amari Air Base is taking a greater role, and in September 2014 it too, became a centre for Baltic Region Training Events. Now, after what the Commander of the Estonian Air Force, Jakk Tarien, described as a 'breathtaking' year, the Amari base has been scaled up to full 24/7 operational capability.

It was against this backdrop that the German Air Force began its tour of duty – a tour which since September has involved 255 sorties – a number of which have been classified as what are known as Alpha sorties. These are reactive response flights rather than scheduled policing patrols, or Tango sorties as they are known.

Commander Tarien explained that the incursions into NATO airspace were not seen as aggressive acts, but more 'cutting a corner' as Russian aircraft flew over the Baltic Sea from Leningrad and St Petersburg. However, he also noted though, that there had been a number of occasions where Russian bombers have been intercepted flying over Baltic.

The Commander said that in the past they had often seen fighters, transport and surveillance aircraft over the region, but never the Tu-95 – the Bear – something for which he said there was 'no operational need' and which was 'a definite show of force'.

"What we do is crucial for deterrence and sending a signal letting everyone know that this area is part of NATO. Deterrence is in the head of your potential opponent and, if he believes that the rest of NATO will stand up and defend Estonia, Latvia and Lithuania, then this reduces the threat of it actually happening. We don't want any miscalculation that Russia can get away with a bilateral conflict here and NATO will not get involved. We don't want this to materialise.

"As for the little border violations, well if there was no NATO air policing, and if we allowed them to fly wherever they wanted, they would probably be more aggressive. It is the fact of what they are not doing that reflects the effect of what we are doing."

With that, Eurofighter WORLD was taken to the apron at the side of the Amari airstrip to see one of the two regular 'Tango sorties' swing into operation. Against a backdrop of grass-covered former Russian bunkers and with a flourish of cold spray, two German Air Force Eurofighter Typhoon roared into a cold Estonian morning. They were on one of the two daily regular patrols that makes it absolutely clear to everyone that NATO is alive and well. <<

The German Air Force Eurofighters left the Amari Air Base in January handing over the baton to the Spanish Air Force – the Italians and the British will follow with similar rotations taking place in Lithuania. As the backbone aircraft of many air forces, Eurofighter Typhoon is operation on Quick Reaction Alert and as a policing deterrent in both the Northern and Southern hemispheres. It's high kinetic capability and its air superiority make it the default choice of many.

# THE QUICK FIT **FITTERS**

The Eurofighter Typhoon has always been synonymous with speed. Thanks to leading-edge engine technology, a Eurofighter Typhoon can go from brakes off to supersonic in under 30 seconds.

However, there is far more to the Eurojet EJ200 engine than just world-leading performance. Did you know, for instance, that it's also possible to fit a Eurofighter Typhoon engine in less than an hour? Bob Goth, part of Team 1 in Typhoon Final Assembly at BAE Systems' Samlesbury site in the UK, tells us how. >>

A Eurofighter Typhoon engine removal and refit in the field will typically take two people half a shift to complete. There have been certain time studies carried out where it has been done even quicker than that – it just depends what level of preparation is carried out first.

It is literally a case of releasing two pit pins and one bolt, and then dropping the engine. Then it's the same process but in reverse for putting an engine back in again.

Here's my step-by-step guide to fitting a Eurofighter Typhoon engine.

## STEP 1

We receive the engines from Rolls Royce and store them in transport stillages at our site at Samlesbury. When we are ready to fit an engine, we wheel it under the aircraft on a trolley and then winch it up with a forward and aft winch. Because this is the initial fit of the engine, we have to set the aircraft to the engine, which involves aligning the engine to the gearbox using an alignment tool. We then remove the engine and set the adjustable links at the forward end. Once they are set for the life of the aircraft, we then put the engine back in again and attach the ancillary items - the fuel inlet pipe, the power transfer shaft, and the high pressure air valve.

From start to finish this whole process takes around 100 hours of fitting time. However, the important thing to understand is this is for the initial fit only.

Once we have initially installed an engine, the airframe is then interchangeable with any engine. That means when the aircraft is in service, an engine can be removed and replaced within a matter of hours, meaning the aircraft could be ready to fly again that same day.

The Eurojet EJ200 is one of the most reliable engines in the world so thankfully the need to carry out refits is rare. But the fact you can do this so quickly should the need arise is one of the many reasons why customers choose Eurofighter Typhoon.

## STEP 2

In essence there are only three things mechanically holding a Eurofighter Typhoon engine in place: a link at the forward left part of the engine, a link at the forward right position, and an attachment lug at the aft end of the engine.

Fitting an engine after the airframe has been set is therefore an extremely efficient process, mainly because it has been designed with the serviceability in mind. We can literally go from the engine being on the floor in the transport trolley to it being in the aircraft in less than 60 minutes! And there is no particular science behind what is a left-hand engine and what is a right hand engine as the engines are exactly the same. We do have to dress certain components on to the engine, which helps to make it more aerodynamic at the back end. Basically, we put certain titanium fairings on to the engine so that it fits hand in glove with the aircraft. However, these can be fitted to either engine so it doesn't make a difference whether it's on the left or right.

## STEP 3

Once all of the aircraft systems have been tested, we then take the aircraft to an engine running facility, where we strap it down and the Rolls Royce team perform the installation runs, which tests the aircraft through its whole envelope of performance. Once that is complete, it's then up to BAE Systems to test the aircraft, using the engine to power all of the systems. That's what we call Stage C testing. At that point we've tested the engine independently, and we've tested the aircraft running off the engine power, so it's then ready for its first test flight. <<

# MAKING AN EXHIBITION


**JOHN FEARNLEY**
EUROFIGHTER'S
HEAD OF FAIRS &
EXHIBITIONS

It's pure theatre – the aircraft roars past the awestruck crowds at low level before suddenly soaring skywards at 90 degrees. Two red blasts from the after burners pierce the blue, while down at ground level a sea of car alarms start a wailing chorus. On the balcony of the Eurofighter pavilion the moustachioed man in mirror sunglasses and full air force dress uniform turns to his colleague, raises an eyebrow and nods approvingly. >>

JOHN FEARNLEY
**FACT FILE**

- John travels more than 41,000 km in a typical year that ends in an odd number
- Around 250 invited guests and delegations, excluding general trade and public were entertained during the 2014 Farnborough International Air Show
- John consumed more than 12 litres of tea and coffee before and during the show
- His average show day is minimum 14 hours

It's curtain up time at the air show and, as the Eurofighter Typhoon is put through its paces, a very select audience is enjoying one of the best views in the business. This is the balcony where deals are discussed and key contacts forged.

Showcasing the Eurofighter cause demands a certain presence – a wow factor to match the product. The audience needs to be looked after. To be fed, watered and given access to key people and answers to crucial questions in an environment that speaks volumes about the brand. This is where the Exhibitions team comes to the fore.

At its head is John Fearnley, who has been working the air show circuit since the late 1990s.

This is his life. John has come to consider the years in odds and evens. When he plans ahead he looks forward at least 12 months. And, very often his journey to work takes him thousands of miles from home. John's job is to make sure the Eurofighter presence is eye-catching, high quality and a functional base for entertaining key delegations during shows.

On average he attends six to eight a year during years that end in an even number, and around 10 to 12 in the years that end with an odd. 2015 is an odd-number year, so it will be a busy one for John, though much of the planning and logistics work was carried out months before you read this.

"My main role is to plan and manage the Eurofighter events in support of "prospect" and campaign activities at air and defence shows around the world promoting the full gamut of the Eurofighter Typhoon," says John, who lives on adrenaline and spends the equivalent of several days a year in airports.

"Traditionally the biggest shows were Berlin, Farnborough and Paris but now we are becoming more export focussed across Europe, Middle East and Far East where there are a number of key shows and the logistics for these are demanding."

The secret he claims is simple. It boils down to three words: 'planning, planning and planning.'

In fact the groundwork for many of the events has to start 12 months in advance. So, that far out, how does John know what will be required?

"It comes down to experience," says John, who started his career at BAE Systems as a graphics and technical illustrator. "You know you will need some floor space and it's therefore vital to reserve it early and then at least you have secured the best area you may require. Then you liaise with the 'customer' (either within Eurofighter or lead industry partner) to get advice on what level of attendance is required. Over the years the consortium partners have grown to respect our expertise and our knowledge so they are certain they will have the high quality, cost effective product they require.

"Once the requirement is identified, then we look into things like: which technology assets and equipment is required, how big the stand needs to be; including what facilities; whether we need a chalet and outdoor exhibits. When we have all the answers we contact our suppliers and transportation companies and start the arrangements."


▲ Pilots on Parade – outside the Eurofighter E-Cube at Radom in Poland

The key display asset is the Eurofighter Typhoon cockpit demonstrator (ECD) which allows the pilots in the team to showcase the aircraft's latest capabilities to anyone from air force chiefs and pilots, government officials, the media or the general public.

"Our competitors have similar devices but we were one of the first and it has been extremely effective," says John. "We started out with four monitors hung on a wall, a desk, keyboard and a joystick to represent the cockpit, but now, it has evolved into a fully functioning cockpit simulator with a 170° wraparound screen for high fidelity outside world projection. It is really impressive."

In fact we have developed a competition called the "Mach Loop" challenge. It involves high speed, low level flying through the Welsh Valleys. It's like the Red Bull Air Races but in an operational environment and in a fighter aircraft – a tough flying skills challenge and a lot of fun for pilots and visitors alike.

Another important piece of the exhibition jigsaw is the Eurofighter Typhoon full-scale replica (FSR). Mostly, it's stored in sections in a warehouse, or it's in transit. Because ironically, when required for show duty, the FSR takes the slow boat, which means John and >>

▼ Chris Friel, Simulation Engineer with the Eurofighter Cockpit Demonstrator

## >> MAKING AN EXHIBITION


▲ The Display at the Farnborough International Air Show 2014



Vice President Jusuf Kalla Listening to Explanation about Eurofighter Typhoon in Indonesia ▶


▲ The Eurofighter E-Cube which set new standards from the day of its debut...

the team have to allow up to a couple of months to guarantee its arrival. In fact there are two FSRs, one belongs to BAE Systems and the other Eurofighter GmbH. Making sure the FSR looks its best during the shows is crucial and, down the years, it has undergone a number of improvements and paint jobs.

While the FSR is always a crowd pleaser, John also has to ensure there's a place where key delegations can be entertained. Sometimes Eurofighter has a stand presence in a hall and at other times, particularly the bigger events in the calendar, it arrives on site with its own building – the Pavilion. It boasts all the facilities you have in an office environment plus facilities for presentations, meetings and hospitality.

"It's one of the best investments we have ever made. We used it primarily at Berlin, Farnborough and Paris, and we've also transported it to Dubai on several occasions. It looks like a permanent structure and covers some 250sq metres, making it bigger than many houses.

"It is a high-quality structure that we know is well recognised and it has given us an identity. That Pavilion says 'Eurofighter Typhoon'. The value of the Pavilion really kicks in when the FSR is placed alongside it. It allows us to focus all our show activities in one area and that in turn allows us to control the brand image and the look and feel."

When not in use, the building is broken down into parts, which fit into containers for shipping and which are stored in the UK. A large part of John's job is to look at future requirements and, rather than just come up with a solution for a specific show, consider reusability.

Other assets include the E-Cube which is all about creating an impressive visual impact.

"The E-Cube was originally a concept devised by Eurofighter's Export Director Joe Parker. He saw a need for a small but big impact outdoor presence — one that's strength was its visibility. The original concept was to have a cube 7 metres by 7 metres which was partly glass – so people could see what was going on in there. Then on the outside we had a wraparound LED screen which covered the four upper sides of the building, and on that we presented key messages and dynamic film of the Eurofighter Typhoon in action. It is quite a jewel and has real impact."

Ensuring all this kit is in the right place, working, and can cope with the demands of thousands of visitors, requires a huge checklist, plenty of time and lots of pairs of hands. For a big show, like Farnborough, there is usually a three-week build-up to prepare the Pavilion, over a week for the chalet, and three days set-up time for the FSR and ECD. The core team required to make the event work is around 35 people, and there can be others in the background.

"I tend to arrive on site 10 days before the show opens, and the show itself runs for a week so it's a good 18 days of solid work," says John.

With a guest list that could include royalty and leading politicians from across the globe, along with leading air force personnel and industry figures – the stakes are high.

"There are always lots of snags and issues during the course of the build-up period. I have to be certain it looks good, the customer will be happy with it, and everything works as planned. It is exhausting but fortunately I am surrounded by like-minded people and I have a great team to work with and the best teams supporting us.

"They all help ensure it all comes good for the opening day. I am most nervous just before the show opens. That's when the adrenaline peaks. It's a mix of emotions."

One of John's finest hours was the Dubai Air Show in 2013 where months of painstaking preparation were put to a real test.

"We made a lot of changes to the Pavilion there, including creating a viewing gallery on the roof of the building. It turned out to be a great success but a challenging show – in fact, the last day was a washout with torrential rains, sandstorms and high winds.

"Fortunately our pavilion withstood the test which all came down to getting the fundamental issue right – quality. You have to be on your guard spotting potential problems before they happen. I am looking for the smallest things that could go wrong because I want to maintain the highest quality possible – you cannot afford to become complacent."

With so much time travelling and being away from home for weeks on end it's clearly a job that demands a huge degree of commitment.

"I really enjoy the life but like any job there are downsides – you have to work over weekends and public holidays, travel at silly times, through different time zones, suffer flight delays and live out of a suitcase. It is an adaptation to a 'normal' way of life, but its all part of the job. All that obviously has an impact on the people around you too – I am lucky to have a very understanding wife and family.

"Having said all that, I must admit I start to become restless if I am in the office for more than three weeks. Once you have the taste for this job, you need that buzz. It's all about the challenges...sorry I have to go now, the next show is calling!" <<

Eurofighter Head of Media Relations Simon Shrouder found there was far more to the Captor-E AESA radar then he anticipated when he sought out the expert's opinion.

# RADAR LOVE

**It's one thing hearing someone claim that they have a unique competitor advantage – but it is another believing it.**

**I work in PR, so it's my job to find the good in what we do and then promote it. It would be unprofessional to do anything else. So when I asked exactly why the Eurofighter Typhoon Captor-E AESA radar was so special, I was ready to do the usual. I was not ready for what I heard.**

**Paul Smith is an experienced Eurofighter Typhoon pilot. As a serving RAF Officer, he worked extensively on the development of Eurofighter Typhoon capability – so he knows his stuff. He now works for us.**

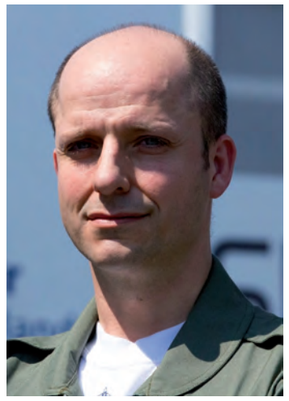
**It was Paul, who in the space of 30 minutes, changed my view forever on the capabilities of the aircraft I spend my life promoting. He looked me in the eyes, saw some serious investment of time and energy was needed and then, in a whirl of flipcharts, hand gestures and rich metaphors, changed my world. This is what he said:**

**Paul Smith:** "To fully understand the advantages of our radar you need a little background on AESA concepts. AESAs should generically give you five principle benefits over traditional M-scans:

- High reliability, with graceful degradation in performance
- Increased power
- 'Extreme beam agility' – this is the feature most closely associated with AESAs and means the beam can almost instantaneously change direction
- Enable Radar Cross Section (RCS) reduction
- Greater flexibility (you have more control over the transmitted signal – leading to extra utility, options for employment and multi-tasking).

## HIGH RELIABILITY

All traditional M-scan radars and hybrid PESAs (Passive Electronically Scanned Arrays) such as those used in Flankers require a central Travelling Wave Tube (TWT – colloquially pronounced - 'twit') and hi-voltage power supply to generate the radar signal – this accounts for a high percentage of the failures in airborne radars. In an AESA their function is subsumed by the hundreds of Transmitter Receiver Modules (TRMs) – intrinsically extremely reliable and up to 5% can fail before any performance degradation is noticed.



**PAUL SMITH** IS AN EXPERIENCED EUROFIGHTER TYPHOON PILOT

## INCREASED POWER

There are a number of reasons why an AESA should deliver more power than an M-scan of a comparable size, but the most obvious is due to the elimination of losses in the antenna feed system. If you look at the mass of tubes that connect a TWT to an antenna it is self-evident some signal is going to leak out. In an AESA all of these connections are within the TRM.

Despite this, a larger, well-designed M-scan antenna will still transmit and receive more power than a smaller AESA antenna. A fact born out in customer evaluations of Captor-M against competitors with smaller AESAs; due to its greater power output and reception, Captor-M invariably detected and tracked target aircraft at greater ranges. >>

>> RADAR LOVE

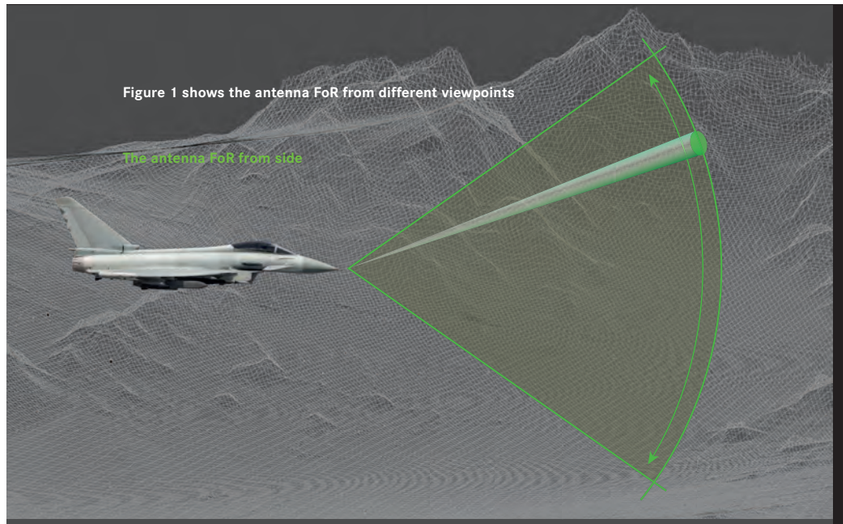
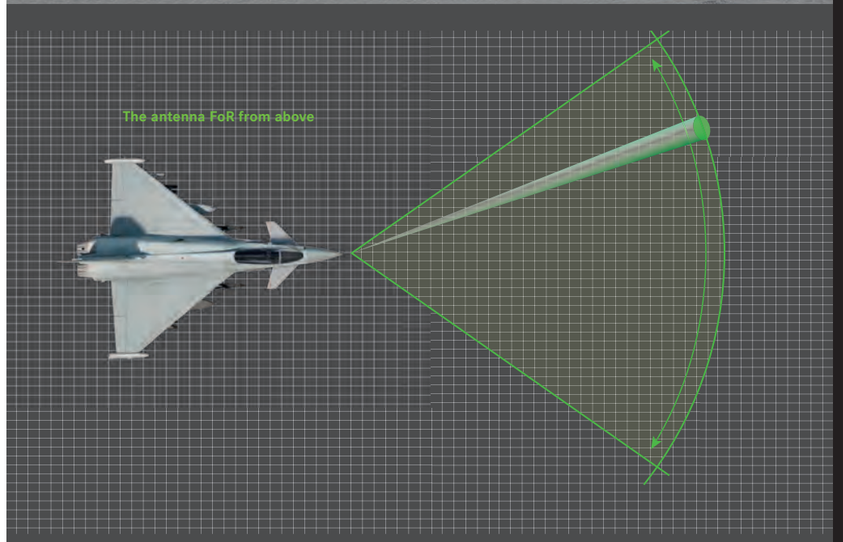
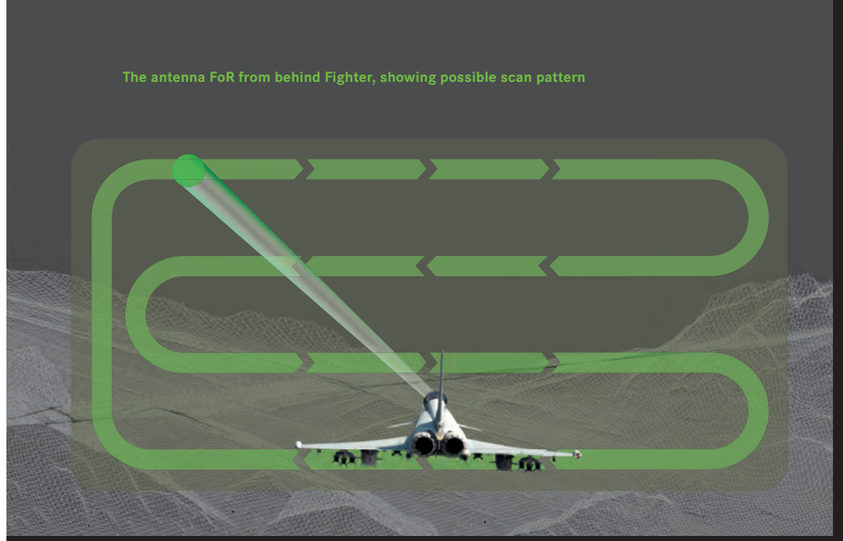



Figure 1 shows the antenna FoR from different viewpoints




## EXTREME BEAM AGILITY

The next thing you need to know is how an E-Scan radar scans compared with an M-Scan. People consider a radar's full Field of Regard (FoR) but often forget that its instantaneous view is like a torch pencil beam.

Figure 1 shows the antenna FoR from different viewpoints.

M-Scan works in a similar way to the old cathode ray television sets. It scans a horizontal and vertical area across the horizon and gradually builds a picture. There are smart antenna scanning patterns but ultimately the antenna head is driven mechanically around the sky – the clue is in the name!

With an AESA the antenna is usually fixed in orientation and the beam steering is done electronically – but to fully understand the advantages of Captor-E it is worth understanding how this is done a little better. See figure 2.

Let me use a wave machine at one end of a big swimming pool as an analogy. At one end of the pool there are 10 wave generators. If all 10 pulse at the same time, then the wave travels straight across the pool perpendicular to the poolside. If however, the wave generators sequentially offset their pulses, then the wave-front will not be perpendicular to the poolside but offset by an amount proportional to the time delay. As can be seen on these diagrams on the right, this is the principle on which AESAs steer their beams.

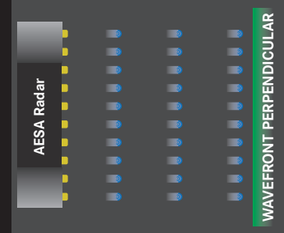
It is self-evident that, even for routine scanning, this will offer benefits, but when a radar is tracking an aircraft to get the best target data it needs to look at that target more often than a normal scan allows.

These 'out of scan' excursions give an M-Scan radar problems. There is mechanical inertia, the physical time to reposition, the radar may leave a hole in its scan pattern to achieve the excursion most efficiently – but there is always going to be some lag. Conversely the TRMs can do this in less than a millisecond! The payback is even greater when tracking multiple targets.

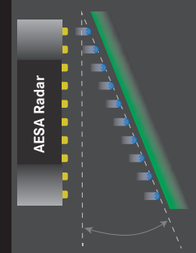
## THE DRAWBACK OF EXTREME BEAM AGILITY ACHIEVED VIA A FIXED AESA

The main drawback is a limitation on FoR and a reduction in effective power at the edges of the FoR (also known as power or gain fall-off). This occurs for many reasons but the prime reason is the reduction in the effective aperture (or cross sectional area of the antenna). Flipcharts one more time – see figure 3. Transmitted and received power is directly proportional to antenna aperture. That's why large antennas such as Captor have an innate advantage. But as is clear from figure 3, as the look angle is moved away from the antenna datum, the effective aperture width (and consequently area) is reduced. At 60° off antenna datum the area is half that at datum; along with other factors this makes an AESAs maximum FoR 60-70°.

Figure 2 Electronic beam steering

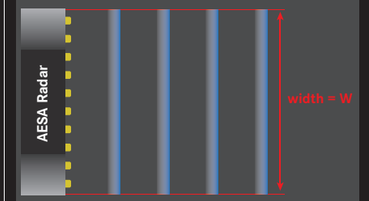


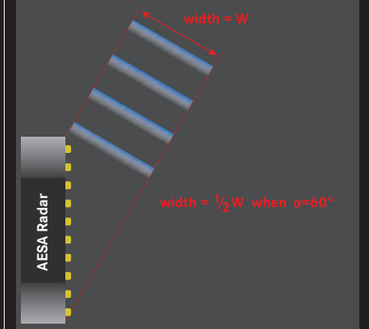

Case 1:
Pulses transmitted simultaneously




Case 2:
Sequential time delay in pulse transmission

Figure 3 Reduction in effective aperture




## RARAR CROSS SECTION (RCS) REDUCTION

People often consider that RCS is an absolute – you are either stealthy or you not. This is not the case. There are fighters with a relatively large RCS like the F-15 and Flanker; at the other end of the scale the F-22. Eurofighter Typhoon and Gripen sit somewhere in the middle, with high composite structures giving a balanced relatively low RCS but stores mounted externally. But what many do not realise is that one of the principle reflectors back to an enemy aircraft is your own fighter antenna.

When we look at a fighter jet what we see is an aerodynamic masterpiece: a sleek nose; a wafer thin profile, and the reflection of many hours of work by thousands of talented people. That's not what an enemy radar sees. Consider that the aircraft nose is designed to be completely invisible to radar. It has to be, for the aircraft's radar to work. What their radar sees is, more often than not, a huge reflection straight back off an antenna pointed straight at them.

Think of it like this and, instantly, you have a different image of the world of fighter-jets – each flying around with a massive reflector on the front saying 'I'm here, shoot me first!'

Now many of the most recent AESA antennas are tilted up or down 30° from the horizontal. As a result, most of an enemy radar's incoming energy is harmlessly reflected away from the enemy aircraft. This gives a big reduction in effective RCS.

Examples where the AESA antenna is still mounted vertically are either older designs (F-15), or aircraft whose nose size only enables a smaller antenna (F-16 and Rafale). If you already have a small antenna an additional 15% reduction in power (roughly the loss to the aperture at 30°) to achieve an RCS reduction is probably a poor pay-off.

For Eurofighter Typhoon this is not an issue, our antenna is big enough to mount well over 1400 TRM's on a large swash-plate.

Now you might think that a big reflector may make us vulnerable. Well it would do if the swash-plate didn't allow us to angle the plate to minimise its profile to enemy eyes. None of our serious competitors with a decent sized antenna, are able to move their radar arrays. They are fixed, usually at about 30° facing upwards and forwards - the usual position for a fixed plate AESA radar.

Ours though has a unique range of movement on the swash-plate which maximises its effectiveness and which can minimize vulnerability. You need to consider that we now have a large moveable radar array which has significant reach and which has the best field of regard of any radar out there. It gives us a major advantage.

## UNIQUE COMBINATION OF FEATURES

If you draw together those factors and put them in a war-fighter's context. In particular, the FoR, radar power and power fall-off. I want to detect the enemy at as long range as possible; once I have launched my missiles I want to minimize my closure with him (usually by turning my aircraft partially away from the enemy aircraft) whilst maintaining radar tracking.

We have more TRMs than most, which means more power transmitted and more sensitivity for detection – a double whammy that maximizes enemy detection and tracking. We have all the advantages of an AESA, extreme beam agility and flexibility, but we can minimize power fall-off whilst reducing our closure with the enemy. If I turn away 60° from the enemy; rather than being at half power like a fixed plate AESA, I'm still at approximately 85% power (this might be tactically advantageous to track a lower RCS, or jamming target). If I want to minimize closure then I can manoeuvre to 90° to the enemy and give him radar tracking problems whilst still tracking him with my antenna.

This offers the Typhoon pilot significant tactical advantages that, when allied with Typhoon's platform performance and latest mix of Meteor, AMRAAM and IR missiles will deliver air dominance for the foreseeable future. <<

# LAYING THE GROUND WORK

TWO years ago the Sultanate of Oman became the seventh country in the world, and the second in the Middle East, to place an order for Eurofighter Typhoon, joining the air forces of the United Kingdom, Germany, Italy, Spain, Austria and Saudi Arabia. With the first aircraft due to be delivered to the customer in July 2017, we caught up with **Sir Simon Bryant,** Vice President of BAE Systems in Oman and one of the leading figures heading up the Oman programme, for a progress report. >>

**SIR SIMON BRYANT**
VICE PRESIDENT OF BAE SYSTEMS IN OMAN

**14:00 hours;**
**November 26th, 2012;**
**Ministry of Defence, Muscat, Oman.**

After months of careful negotiations, we have a breakthrough.There is a flicker of a smile, a slight nod of the head, then His Excellency Mohammed bin Nasser Al Rasbi, Under Secretary for Defence in Oman, thrusts out his hand to shake on a deal that has been four years in the making.

By agreeing a multi-billion euro contract for 12 Eurofighter Typhoons and eight Hawk aircraft, the Sultanate of Oman has just become the seventh member of the Eurofighter family.

However, this is not simply an agreement to supply the Royal Air Force of Oman with a fleet of new aircraft: the Omanis want to join the world's elite in terms of overall capability.

The contract, negotiated by BAE Systems because of the UK's historical links with Oman, is highly complex, with three constituent parts:

- The building of the Eurofighter Typhoon aircraft
- The building of the Hawk aircraft
- The provision of a 5-year Availability Service for the Typhoon aircraft, including the design of the Typhoon Technical Facilities.

Arguably the most challenging aspect of the Programme is the need to develop an airstrip located in a remote area near Adam Village, a 90-minute drive from Muscat, into an airbase for the Typhoon aircraft.

That ingredient alone makes this Eurofighter project unlike any that has gone before it.

So two years in, how are we faring? Do we remain on course to deliver on our promises?

"The progress we've made so far has been excellent. We are running exactly according to plan," says Sir Simon.

"The process was kicked off by the Commander of the Royal Air Force of Oman initiating the first metal cut on Typhoon and the build on the aircraft at the sub-assembly stage is going very well. The mating of the centre and forward fuselages is happening exactly as we had planned, and we are seeking to ensure that the Omani customer has significant visibility of everything that is going on back at BAE Systems in Samlesbury and indeed with production in our Eurofighter partner network around Europe in 2015. We hope this will be supplemented with visits to a number of those locations in the coming months to see this progress first hand and to admire the high quality of the work.

"The Eurofighter variant that Oman has chosen is a Tranche 3 M-scan P1EB, the standard currently being flown by the UK Royal Air Force. It will be the most modern version of the Eurofighter Typhoon aircraft in-service when they receive it in the middle of 2017.

"Moreover, in our constant effort to delight the customer we are seeking to make the most of opportunities that we can exploit in the build line to enhance the product, and we are on track to deliver something that is even better than the Omanis were expecting, through the flexible incorporation of a few modifications that will enhance what is already a very impressive aircraft. Examples include improvements to the canopy assembly, operation and maintenance and enhancements to the assembly and maintainability of the brake pedal transducers."

Although the Omanis are not due to take delivery of the first aircraft until 2017 a lot of the groundwork has already been done by way of preparation for Eurofighter's eagerly-anticipated arrival, most notably at the site of the new airbase.

"Adam is now a significant construction site," explains Sir Simon. "What we currently have is an international standard runway with navigation aids, which is now being moulded into a RAFO Typhoon base. Construction teams have been on site for some months now working on the Typhoon Technical Facilities and supporting networks.

"Over the coming weeks that work will expand to deliver the full range of facilities required on a modern operational base. It's a significant infrastructure project but it is being extremely well managed to ensure the timelines needed to enable the timely delivery of the aircraft are met."

So what can the customer expect once the airbase is fully operational and all 12 of the Eurofighter Typhoons are in-service?

"This is ultimately about delivering capability," explains Sir Simon. "The aircraft in their own right aren't the end game: what we've got to have is the aircraft, with appropriate stores, trained air and ground crew, facilities and networks that are fit for purpose and an underpinning support system to ensure that the Royal Air Force of Oman are delighted with their acquisition.

"It's a big challenge, but it's also a fantastic opportunity and the programme will absolutely confirm that Oman remains in the Premier Air Force League. They have a very proud pedigree as aviators, and they are highly respected in the region, but Defence and Security is a competitive business and you can't afford to stand still."

This project is also crucial to Eurofighter's continued development too. By extending the Eurofighter family to seven members, and thus increasing our global footprint, we are building a critical mass of satisfied customers that will help to drive future sales of the platform.

"We already have a significant success story in this part of the world with the aircraft that are operating from Saudi Arabia," adds Sir Simon. "And with a second nation from the region coming on board that sense of a centre of gravity for Eurofighter Typhoon is reinforced.

"In short it is a really exciting Programme which is going very well and I am privileged to be part of the story which will see Eurofighter Typhoon emerge as a key component of Oman's impressive Armed Forces." <<

**ANDREA NAPPI**
EUROFIGHTER'S
CHIEF OPERATING
OFFICER – CAPABILITIES



# THE JOURNEY ALONG THE CUTTING EDGE

Eurofighter Typhoon is at the very cutting edge of technology, which brings with it a whole host of challenges for the engineers tasked with pushing back the boundaries. In this edition of Eurofighter WORLD we talk to **Andrea Nappi,** Chief Operating Officer – Capabilities, about how Eurofighter's unique mix of skills comes together to continually develop solutions and keep the aircraft at the forefront of military air power. >>

***What would you say are the individual parts - the crucial DNA elements - that make Eurofighter Typhoon so unique?***

I would start with the Flight Control System. The Eurofighter Typhoon is an aerodynamically unstable platform and that in itself means a significant challenge that has created all sorts of headaches for the engineers during its developing and testing phases. But it is a great innovation. Before Typhoon we had Tornado and it was designed to accomplish a certain task, namely air-to-ground attack. Whereas Eurofighter was originally conceived with an air superiority role in mind and therefore the manoeuvrability of the platform played a major role in its development. The development of such a critical system, aerodynamic instability, was a major challenge but successfully accomplished.

From the Flight Control System I would then say the overall Weapon System. It is complex and fully integrated to the extent that even small changes might have significant impacts on other systems which need to be very carefully addressed before being proven on a flying platform.

As you can imagine we carry out a huge amount of testing on the rigs before we test anything on the aircraft. But this level of testing is also the reason why we have such an excellent safety record. We lost only one aircraft and thankfully no pilots in the whole development phase, which is a major achievement. If you look at other similar programs the historical records indicate an average of two or three aircraft losses with at least one casualty.

Clearly if we had to use the Weapon System facing an imminent threat from an enemy we could do things much faster. Libya is a great example of this where the success rate of the sorties was very close to 100%. And if you consider how complex this machine is and what short notice was given for the deployment, that's an amazing statistic.

Another good example was in 2012, when the Italian Air Force supported the export campaign in Kuwait. Two aircraft were taken in country and flown for four consecutive days, four sorties each day, in July. This was to demonstrate how the system operated in extreme environmental conditions. The temperatures were up to 52° (Celsius) so at the very edge of the qualified limits for the Weapon System. However, each aircraft successfully completed all missions with 100% reliability. That's a great success for the programme, a great success of industry, and a great success for the Italian Air Force. I'm very proud of that.

***How do you describe the Eurofighter Typhoon aircraft and its development phases?***

It is a living machine. Throughout the years the Eurofighter has changed. For example, the Tranche 3 aircraft is very different from its Tranche 1 predecessor. New sensors and >>

## >> THE JOURNEY ALONG THE CUTTING EDGE

technologies have become available since the basic development began, and there is a continuing challenge to integrate all of this into the existing Weapon System.
And our latest challenge is the development and integration of the E-Scan radar, which in turn requires substantial changes to the overall Weapons System. But this is just 'the current' challenge.
In addition to the new radar, there is already a plan to integrate further capabilities that are becoming available from the technology market. These include weapons, sensors, communication systems, interoperability with other platforms, and will secure significant development activities in the years to come.

***So how does the lifespan of the product impact on the thinking of the teams working on its development programmes?***
Longevity is inherent in the Programme. In Eurofighter we are developing a product that is designed to be operational for 25 years and therefore the aircraft could still be in operation well beyond 2040. When you consider that it was conceived in the mid-1980s then you could say that the whole development programme life is about 60 years.
If you look at it from that 'lifespan' perspective it's a big challenge because it's the equivalent of two individuals' consecutive complete careers.
This presents another challenge because you very seldom go through the same issue twice. In the big scheme, you go through phases. Initially Development is the main driver and everything is focused on leading to the development of the aircraft's systems and capabilities.
Then there is a phase where Production becomes the bulk of the contract and this is eventually overtaken when the main focus shifts to the Logistic Support element. At the moment our main efforts are aimed to extend the Production phase, mainly through the acquisition of further export orders.

***It's often said that the Eurofighter Typhoon is greater than the sum of its parts. Is that a premise you'd agree with?***
Definitely. There are lots of reasons that show it's true. For example, diversity delivers far better results than doing things individually. I think doing things in isolation never delivers an optimal result. Whereas doing things jointly - the Eurofighter way - improves the end result because people bring new ideas to the table and offer different perspectives on addressing the same problem. Of course this creates a parallel management challenge but out of it all there is an opportunity to extract a positive outcome.

***So you feel that it's often the case that two, three or four heads are better than one?***
Yes. If you look at a problem, big or small, from a single perspective you may struggle to achieve a thorough solution. However, if you look at the same problem from multiple perspectives, also supplemented by the individual cultural backgrounds, this allows you to have a more comprehensive perception of it. This is the first step to ensure a proper and better solution is developed, particularly, if you are able to streamline these different attitudes towards a common approach.

***So how does this work in a Eurofighter context where there are four different core nationalities working together?***
Well, for example, the Germans have a very structured approach but often need to know exactly what will happen next before they make a step. By contrast Latin people are more prepared to adapt to different situations. Each approach is valid (or not) depending on the contingent situation. But by having these different cultural backgrounds in the mix and being able to use them at the most appropriate time creates real value for the company, the organization, the partner companies and for the overall programme as well.
I think the Germans we see today are significantly different to those we dealt with 20 or 30 years ago, and the same is true for the Spanish, the British and the Italians. Each has learned that the others are different but everyone brings valid attributes and we can take advantage from each other. It may sound optimistic but this could be seen as a test bench for true European integration.
Now when you add in the Internet and global communications access to any part of the world a much more dynamic cultural environment has been created. It's a fascinating melting pot. However, you need to be able to streamline this conglomerate to work properly toward a defined target. And that's what Eurofighter has been able to do and is set to continue to do for many years to come.

***So this 'melting pot' makes for a better product then?***
Clearly. But it's not a new idea. If you look at the history of the aerospace industry there has always been a trend of collaboration and cooperation, and then conglomeration. If I look at the Italian experience, in the 1920s, there were probably 15 aeronautical companies and these subsequently merged into bigger but far fewer companies, and finally into Alenia Aermacchi. In the UK it was a similar story leading to BAE Systems and a similar experience also took place in Germany leading to Airbus-DS.
This isn't just interesting history – it's a must. Growing the size allows the industry to address larger and more challenging technical programmes. Our collaboration started with Tornado and each company brought their own legacy experience. Each concentrated on some aspects of the Weapon System and became more expert in those areas. But then together we all had visibility of what the others were doing and this created a faster expansion of the individual companies' know-how.

***So this model has helped shape the technology in the aircraft?***
Back to the 1980s when we originally sat together with the Nations to discuss the Eurofighter Typhoon a lot of the requirements were based on technology elements that were either not yet available or just over the horizon. It therefore took time to develop the aircraft as most of the Weapon System is based on the integration of Leading Edge technologies that are being developed concurrently. The latest example of the E-Scan Radar is just another step in this process.

But we got there.

Eurofighter Typhoon is the latest product of a long history of military aerospace programmes. It is cutting edge technology with the objective to push the limit even further. <<

# Q LOOKS ON THE BRIGHT SIDE OF LIFE

**QUENTIN D'ARCY**
EUROFIGHTER'S MANAGER OF JOINT FLIGHT OPERATIONS

There's a rather silly song by the cult British comedy group Monty Python called 'Brave Sir Robin Ran Away'. The ditty mocks the actions of a fictitious knight who, when faced with a foe, turns on his heels and flees the scene. As the title suggests Sir Robin's battle strategy is summed up in the line 'bravely he ran away.' >>

That tactic may seem like a classic oxymoron but according to one who knows, it's exactly what's called for in the art of air-to-air combat.

"It's the key to air-to-air capability. You fire your missile at the target and then, as soon as you as you know it will be successful, you run away bravely in order to defend against incoming hostile missiles," says Quentin D'Arcy, Eurofighter's Manager of Joint Flight Operations echoing Monty Python.

The serious point the former RAF navigator, who goes by the nickname Q, is making is that a pilot has to ensure he gets out of range of the bad guy's missiles as soon as he knows the missile is successfully on its way.

In theory this is all very straightforward. Of course, in the heat of battle, the practicalities of ensuring weapon, aircraft, cockpit displays and pilot are all perfectly synchronised is a little bit more complex. Especially when you factor in that each type of weapon has its own characteristics - range, seeker, speed, profile and so on.

To understand this world better you need to have a grasp of what's happening in the aircraft during a dogfight. A key display for the pilot is the MIFL (Missile in Flight List), complex and highly dynamic, it provides the pilot with an instantaneous display of what his air-to-air missiles are targeting and their progress through different phases towards a successful impact.

"The point being if the TV screen in the cockpit doesn't show the pilot what it is doing, then the weapon is useless to him."

On release, an AMRAAM behaves differently to a Meteor and consequently the information needed by the pilot to ensure a successful shot, and when and how to 'run away bravely' for each missile is very different.

Explains Q: "Both AMRAAM and Meteor missiles can be carried by the aircraft at the same time, but Meteor (which was contracted in July 2013 and will see delivery in 2017), requires a different display to AMRAAM."

In short, you can't 'run away bravely' if you can't see the whole picture.

Enter Q and the newly formed JCORD, which stands for Joint Flight Operations and Customer Operator Review of Designs. The group comprises test pilots from the four Eurofighter Partner Companies (EPC) along with their counterparts from customer nations air forces and NETMA.

"I came from NETMA and I realised that industry doing things in a vacuum doesn't really work," says Q. "So much can happen after a capability is signed to contract: technology may change, the customer may change his mind, NATO standards may change, the world moves on and so on. The best way to get around this is to work together constantly, to talk regularly and openly, and jointly agree on approaches and solutions to emerging issues seen in the design process.

"As Joint Flight Operations Manager my job is to regularly talk with the Industry test pilots from EPCs. JCORD takes this a step further to involve the customer in order to give coordinated operational advice and recommendations for future designs." >>

## >> Q LOOKS ON THE BRIGHT SIDE OF LIFE

This operational recommendation is then fed into the Eurofighter-NETMA decision-making meetings. It's an approach that could neatly be summed up in one expression; it's good to talk.

"It's a way of guiding the overall programme towards a solution that the frontline actually wants."

Talk, however, is cheap; and the MIFL is a good example of the group coming up with a positive action.

"There was a heated debate in the JCORD – quite rightly – before we agreed on a new MIFL design which would give the pilot all the information he required, for all his missiles in a timely and eye-pleasing manner."

The very idea of working together in such an open and transparent way with the end user and discussing sensitive issues halfway through a product lifecycle might raise eyebrows in some quarters and Q admits that when JCORD was first mooted there was some scepticism. But the results are there for everyone to see.

"People have very quickly got used to the fact that these meetings have to happen, and they are enjoying the fact that we are delivering solutions to things before they turn into problems."

Another example of the customer and industry working jointly at JCORD to improve the delivered product, concerns the MIDS (Multifunction Information Display System). The MIDS transmits and receives tactical information over a data link to share time-critical data with other friendly forces, everything from other Eurofighters, to AWACS, to fighters and ground forces from other allied air forces. MIDS is a serious 'capability multiplier' as it enables all players to benefit from the best available data. Just imagine an edition of Who Wants to Be a Millionaire with MIDS beaming the answers from the entire audience direct into the ear of the contestant.

During the development phase Cockpit Group at BAE Systems in Warton had spotted that the MIDS design in Eurofighter was displaying targeting information in accordance with the P2E contract, but that this way of showing the information went against the NATO Standard; this could have lead to a pilot believing a hostile fighter was being targeted when it wasn't. This potentially dangerous display anomaly was spotted, discussed, and a solution agreed. It was then briefed back into Eurofighter and NETMA who manage the delivery of the programmes.

Q says: "What these examples show is that working together across the circle can deliver solutions, sometimes years early. Rather than taking delivery of the product, spotting the problem, then agreeing and contracting a solution for delivery at some point in the future, you produce a product that is already fixed on delivery.

"There is a real acceptance that in designing future Eurofighter capabilities we are operating at the leading edge of today and tomorrow's technology. When you are halfway through the development process you often come to a fork in the road where you have to decide to go right or left; and that the direction you choose won't necessarily be in accordance with the original contract. This process enables us to recommend changes."

"JCORD attendance is a very interesting combination. Our Industry test pilots tend to have very detailed knowledge of the design and how the future standard of Eurofighter. By contrast the customer pilots have a very tactical perspective and they know what end capability their air forces really want.

"The customer has flown more than 250,000 hours on Eurofighter Typhoon whereas industry has less than 10,000 flying hours; moreover, the customer's flying experience is tactically more relevant because it is done 'in the wild'.

It's a melting pot for ideas that clearly produces results but it can from time to time reach boiling point.

"The challenge comes in marrying the industry pilots' experience, detailed understanding of testing and the product under development, with the frontline pilots' currency and extensive tactical experience. The customer pilots are the ones who are driving the new capabilities – and exactly how they want to use them. They tell us things like 'When I am lead of a 4-ship of Eurofighters against a hostile 8-ship I want to have full SA by 70 miles, with no.s 1 and 3 dragging early to decoy'. Industry pilots may have used different tactics in their air forces a few years ago.

It's not that the two camps are forever at odds – rather two different perspectives coming together. Operators are familiar with the concept of a 'harsh debrief': a frank, open and honest exchange of views followed by an acceptance of the majority decision.

"The pilots come from different viewpoints but are both trying to answer the same exam question, mostly as set by the Cockpit Group. People who have flown fast jets have a common bond, they have a common language and will overcome the colour of their flags and uniforms in order to achieve better capabilities for the Eurofighter."

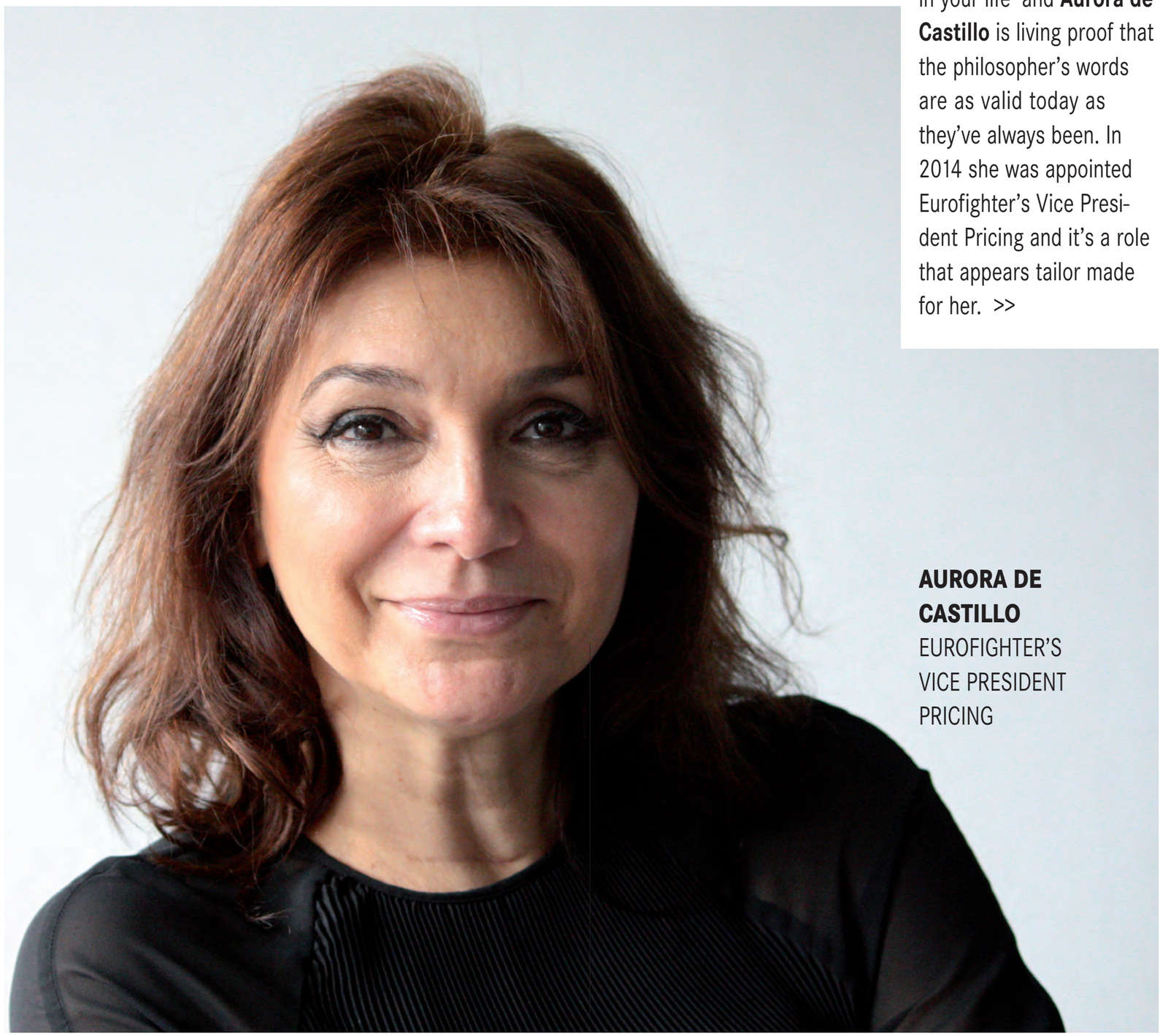
Q is not someone who is going to run away, bravely or otherwise, from a challenge. And, thanks to the work of JCORD he's got a really powerful weapon at his disposal.

"I walk into Eurofighter meetings being able to say 'right you've got a problem and here's your solution' and it's agreed by both industry and customer pilots as well."

By offering solutions into the programme JCORD, like Monty Python, always look on the bright side of life. <<

# DIVERSITY **IS GOOD**

Confucius said 'Choose a job you love, and you will never have to work a day in your life' and **Aurora de Castillo** is living proof that the philosopher's words are as valid today as they've always been. In 2014 she was appointed Eurofighter's Vice President Pricing and it's a role that appears tailor made for her. >>



**AURORA DE CASTILLO**
EUROFIGHTER'S VICE PRESIDENT PRICING

A graduate in aeronautic engineering, Aurora de Castillo has enjoyed a hugely successful 25-year career in aerospace logistic management, thriving on the challenges that have come her way.

"I really love this kind of work," she says. "I am fortunate because I have enjoyed all my jobs throughout my whole career. That's not to say it has been without stress, sometimes I have had to do difficult things and take tough decisions. Leading people is not always easy but I enjoy these challenges."

In fact, Aurora's first love was Space and immediately after her degree she started work on a satellite programme, spending three years there before moving on to aerospace logistic management.

"Space is a very interesting subject. You are dealing with very peculiar and extreme environmental conditions; heat, cold, tremendous stresses on the airframe. You also have to deal with the fact you are operating kilometres away from the earth, which helps to make it a very fascinating world."

Back on terra firma, Aurora has held a variety of senior positions and throughout she's been a big fan of the Eurofighter model. She has seen at close hand the Eurofighter project when the first aircraft arrived in Spain. Aurora played a key role, responsible for spares, repairs, maintenance, ground equipment, technical equipment and training. "Everything that makes an aircraft fly was part of my responsibility. As product support manager for the Integrated Logistics Support (ILS) programmes I was accountable for logistics and that meant 90% of my job was for Eurofighter.

"It was a very interesting time because the Spanish Air Force started training their air and ground crews and flying the aircraft from our premises in Getafe. In total we spent 18 months together working directly with the customer and we formed a really good team. We all learned together. We had to get to a position where the air force could fly the aircraft every day but to achieve that was challenging. We worked day and night together with the first group of pilots and the first ground crew team as they both trained to use the aircraft."

That period in her career was recalled in 2013 when she gave a lecture to a group of Spanish university under-graduates on multinational programme management. Still working for EADS at that time, Aurora chose to focus on Eurofighter and she singled it out as a classic example of good working practice.

"The reason I chose Eurofighter was because the programme is a great example of how multi-nation programmes can make things happen faster and better," she said.

"Different cultures, sometimes different religions, different laws working together always provide added value and create so many good things."

She has seen this co-operation and culture mix at close quarters since September 2014 when she took up her position in Munich.

"I really enjoy it because we are all working together for the same goal and supporting each other. I feel I can learn a lot from my colleagues from other companies and from their experience."

In her eyes the product of the Eurofighter melting pot is a powerful benefit for the customer.

"For me diversity – ideas, cultures, work practice – is a real force for good. It always gives value, if you know how take advantage of it."

In her own way she is living proof of diversity being encouraged. She was one of the first women leaders in the sector.

"When I started working in defence I think I was the first female ILS manager and I have had to break down many barriers. It was not easy at that time for women in the defence world but now I don't see it as an issue. In fact I never saw being a woman as an issue. I believe it may have been for some men but it never was for me. The thing is women expect men to accept us. I believe we are different in the way we manage people and the way we lead people. We are perhaps more natural in front of men than they are in front of us. But different does not mean better or worse – just different.

"Things have changed and more and more women are in leading roles, which is good because diversity is a good thing."

Another big change she's seen at close quarters has been the economic downturn, which has transformed the way she has had to work: "During the last few years it has been very difficult. The world economic crisis has meant that many air forces have a lot less money and consequently it has been a difficult time supporting them.

"Some have had to cope with budget cuts of more than 30 per cent and yet they still have to keep their fleets flying. As a programme manger we had to work with a lot less income but you still had to ensure margins and profits. It was very challenging. You really want to do a good job for your customer because you know the pressure they are under.

"But I had a good team. In fact the challenge helped build the team. For me a team is not built by laughing and having fun, because when life is good everyone is your friend. Teams are forged when you are suffering. When you go through difficult times you find out who is part of the team and who isn't."

Her job now is to price and prepare bids. It means compiling prices for the partner companies, harmonising prices, developing bids and securing bid approval.

"I am still relatively new to this programme but it's my perception that in the future we will have to change and focus more on value and support for the customer. We need to be able to demonstrate value for money. Every person, in every partner country has contributed to this programme and we have to show we are delivering value."

While that may sound like a challenge, Aurora de Castillo is certain to be up for it. <<

# NEW TYPHOON'S A DIRECT HIT

The Royal Air Force's No 1(Fighter) Squadron, based at RAF Lossiemouth in Scotland, has been living up to its name after becoming the first to take the truly multi-role version of the aircraft into service. Combat Aircraft's **Jamie Hunter** joined the squadron as it took the Eurofighter Typhoon into the next generation. >>

**Delta Hotel**! comes the call from the range tower at the Cape Wrath Training Area as Wg Cdr Mike Sutton, Officer Commanding No 1(Fighter) Squadron, cranes his head and looks down at the impact of his Paveway IV bomb on this craggy lump of rock off the remote northern tip of Scotland.

It's a direct hit (DH). One that heralds the arrival of the latest standard of Eurofighter Typhoon for the Royal Air Force.

Wg Cdr Mike Sutton, Officer Commanding No 1(F) Squadron drops the first live Paveway IV from an in-service Eurofighter Typhoon

▲ Wg Cdr Sutton pre-flights the Paveway IV bomb ahead of the first mission

▼ The so-called P1EB upgrade combines a seamless integration of the Paveway IV and the Litening III laser designator pod (LDP)

Phase 1 Enhancement (P1E) is the fairly anodyne nomenclature for what most recognize as the most significant upgrade for this fighter to date. It marks the start of a truly swing-role Eurofighter Typhoon.

Wg Cdr Sutton, followed by Sqn Ldr Adam Rogers, pounded the remote weapons range with a live Raytheon Paveway IV precision-guided bomb (PGB) on November 25 2014, with the squadron completing a subsequent total of eight Paveway IV drops during that week with a mix of profiles including GPS and laser guidance; pre-planned and target of opportunity using the pilot's Helmet Equipment Assembly (HEA); and employing both impact and airburst fusing settings on the weapon. >>

▲ Wg Cdr Sutton pre-flights the Paveway IV bomb ahead of the first mission

▲▲ Armourers load insert Paveway IV bombs for the subsequent releases in November


▲ Transiting over the Moray Firth from RAF Lossiemouth to the ranges for the first drop

Post-debrief, Wg Cdr Sutton said: "The successful weapon drops are a reflection of the dedication and achievement of everyone who has been involved in this capability enhancement."

Wg Cdr Sutton's squadron is the lead unit for the introduction to the RAF of the P1EB-standard Eurofighter Typhoon and specifically the addition of the much-lauded Paveway IV.

## GOING MULTI-ROLE

Although earlier RAF Tranche 1 Typhoons received a precision-strike capability as far back as 2007 to add to the Eurofighter's undoubted air-to-air prowess, it was very much a bolt-on application of the Litening III Laser Designator Pod (LDP) and the older Enhanced Paveway II (EPW2) bomb. Wg Cdr Sutton was involved back then as he is now with the latest capability. "We had EPW2 on the aircraft and with the Litening pod we could self designate those bombs. That capability was proven over Libya during Operation Ellamy in 2011."

However, an improved and better-honed swing-role capability was always envisaged for the newer Tranche 2 Typhoons and this is what P1EB is all about. "What we have now is a much more potent, accurate and discriminate capability with the Paveway IV."

Broadly, the P1EB upgrade brings a wider air-to-surface capability for the Tranche 2 Typhoon, but it goes beyond simply adding Paveway IV, it additionally injects enhancements to the Litening III and to the HEA so the two can be used seamlessly to visually identify air tracks at long range, as well as identifying, tracking and targeting points on the ground. The Eurofighter Typhoon can also now release four weapons on different targets in a single pass.

Flt Lt Ben Durham is a Qualified Weapons Instructor (QWI) on No 1(F) Squadron, and is part of the squadron's P1EB Implementation Team. He added: "From someone who flew in Libya in Tranche 1 Typhoons with EPW2, there are some marked differences in P1EB. With the Paveway IV we can now select weapon impact angles and lines of attack, as well as change fuse settings in the cockpit. With that much flexibility we are much more useful to a commander."

Comparing the old standard with the new, Flt Lt Durham said: "If we are told about a target, with P1EB I can look into the target area with my HEA, slew the pod to my helmet, use the pod to generate the target coordinates, and that is accepted straight into the jet and passed to the weapon. With P1EB we can do lots of tasks simultaneously."

As well as the increased functionality for air-to-ground missions, the new standard brings increased air-to-air capability and genuine swing-role missions.

Wg Cdr Sutton added: "You can, with the HEA, look on the ground but you can also slew the LDP to air-to-air tracks for long range visual identification. In P1EB we have a true, proven, swing-role capability, we can genuinely flick between using our AIM-120 AMRAAM and the Paveway IV – so we can switch from air-to-air to air-to-ground in a fraction of a second."

Former Tornado GR4 pilot Flt Lt Dan 'Danjo' Jones echoed the positive sentiments on the swing-role attributes of the Eurofighter. "Coming from the GR4, the integration with P1EB is logical and intuitive. You can have the LDP looking at a ground target, confirming what it is, plus you can be in air-to-air mode monitoring and manipulating the radar. It's one button to transition between the two."

## TESTING THE TECHNOLOGY

Of course, bringing the advanced swing-role capability online and also ensuring the Typhoon Force is ready to make full use of it is a complex business. With fighter assets in short supply, the RAF's senior officers are all too aware that this is a matter of national interest. Getting the Eurofighter Typhoon and its team just right is what this is all about, and it's all about building the force for the future.

With P1EB ready on an industrial level by the four Eurofighter Partner Nations, it was handed over to the RAF to set about testing, proving and evaluating. Wg Cdr Sutton explained: "We have been working closely with No 41(R) Test and Evaluation Squadron (TES) who have been doing trials and tactics work out in the USA with our own pilots embedded, plus working with industry – this has been a real joint effort between those communities." >>

This effort culminated in Exercise 'Cerago' in November 2014 ahead of the live drops in Scotland. This included a combination of flight trials in an academic environment at NAWS China Lake, California, with 'very specific trials points' and a subsequent period of operational evaluation of P1EB at Nellis AFB, Nevada, working alongside the US Air Force's elite 422nd TES and against the Nellis-based aggressor squadrons to see how the P1EB-standard Eurofighter Typhoon worked and interacted with – and stacked up against – other types to effectively rubber stamp the new standard.

Flt Lt Durham was part of the team detached to the US. "P1EB is rare in that the front line took delivery at roughly the same time as the TES. We were also exposed to the initial P1EA standard, which was an interim standard for about 12 months. So pilots from our squadron's P1EB Implementation Team had the privilege of joining the TES to support them during their trials in the USA – focusing on P1EB air-to-surface weapon employment, and enhancements to the subsidiary systems such as the DASS (Defensive Aids SubSystem).

"Once the academic trials were completed at China Lake, the time spent flying on the Nellis ranges tied it all together. We were flying in composite air operations to evaluate if we could fight with the aircraft, drop a bomb, defeat a Surface to Air Missile – to effectively stamp the aircraft standard for the front line.

"It was good for us to work with industry, the very people who designed it, to answer any of our questions. Everything we needed was right there."

Indeed, during the detachment Flt Lt Durham and his team wrote up the RAF's new P1EB tactics manual!

## THE FINAL PROVING GROUND

"We are exposing as many pilots as possible to P1EB," said Wg Cdr Sutton. "We have proved that the front line is capable of employing the Paveway IV and now we are going to give as many people on the Force as much exposure as possible."

The squadron rolled straight into Exercise Tartan Flag during the first two weeks of December, the final work up before deploying to the USA in January for the ultimate test of the new-standard Typhoons – a full-up Red Flag at Nellis.

"There is a real sense of momentum on the squadron. During Tartan Flag we were flying large 20 vs 20 missions; eight Typhoons from Lossiemouth plus other aircraft from Coningsby, USAF F-15s from Lakenheath and the RAF Sentinel R1s from Waddington. It is true swing-role training – an air-to-air sweep, fighting to our targets, dropping multiple weapons and fighting our way out."

The Stateside deployment to 'Red Flag' is the final stage in rolling out this latest standard of jet to fulfill an Interim Force 2015 milestone.

## SWING-ROLE TO THE FORE

The ever-increasing range of missions conducted by the Typhoon squadrons is set to grow further in the future as the type effectively replaces the Tornado GR4 by the end of the decade. This in itself presents challenges for the men and women flying and maintaining these complex aircraft. Not since the F-4 Phantom has the RAF been flying multi-role fighters, and now its pilots are moving away from single role types such as the retired Harriers, Jaguars and Tornado F3s, to the single seat Typhoon, with a raft of missions and roles.

Wg Cdr Sutton says: "While the Typhoon has been doing the core role of QRA and multi-role sorties for a number of years, we now have a true swing-role fighter. Swing-role competency is challenging; we cannot dedicate as much time to a single skill set as dedicated legacy platforms. So there is a lot for the pilots to learn, and multiple skill sets to remain current on – from offensive counter air, though air combat, to close air support; day and night, and in all weathers. This is a challenge and while we have to be comfortable operating the aircraft in all environments, one of the keys to successful swing-role competency is to reduce unnecessary complexity where we can.

"The benefits are clear, and with a single aircraft we can exceed the combined capability of what a Harrier and Tornado F3 used to do, and due to the advanced avionics of the Eurofighter, we can operate in a contested environment. But while this is impressive, we must also remember that the threat aircraft are evolving too, and our capabilities must be seen in that context – there is no room for complacency. As a result we have to continually evolve both tactical competency and our weapons systems in order to remain at the leading edge.

"We have to be ready to conduct QRA missions one day, drop a Paveway IV the next and then roll into an 8-ship night offensive counter mission. While the Typhoon is a much easier aircraft to fly than say a Jaguar or a Harrier, the complexity comes with operating it tactically. It requires a lot of training to remain competent."

Flt Lt Jones added: "The knowledge base is encyclopedic; you have to keep reading up on the aircraft and memorizing it. By the time you've memorized it all chances are it has all changed again. We are constantly spinning plates."

Looking further ahead, things can only become more complex as much more is on the cards for the Eurofighter Typhoon. The Storm Shadow cruise missile is now in flight test, with the advanced Meteor BVRAAM and Brimstone anti-armour weapon also planned – not to mention a potent new Active Electronically Scanned Array (AESA) radar now in development.

"When the GR4s are retired Eurofighter needs to be able to pick up the slack," says Sutton. 'The AESA is going to be critical to the Typhoon, that's how the Meteor will operate best and it is how we will also have our greatest effect in the SEAD (Suppression of Enemy Air Defences) role as well." <<

*Report and photos: Jamie Hunter*

Flt Lt Ben Durham is a qualified weapons instructor on No 1(F) Squadron

Transiting over the Moray Firth from RAF Lossiemouth to the ranges for the first drop

Pilots outbrief at the engineering control desk at No 1(F) Squadron for their first Paveway IV releases


Mission accomplished. A No 1(F) Squadron Typhoon skirts the beautiful beaches of Northern Scotland as it heads back to RAF Lossiemouth

Paul's demonstration to Air Marshall Ida Bagus Putu Dunia

# EUROFIGHTER'S 'LEPAS LANDAS' IN INDONESIA


**Welcome to Indonesia, a densely populated and thriving archipelago with drive and ambition and an overriding need for security. A country ideally suited to the protection and security that can be offered by the Eurofighter Typhoon.**

At Indo Defence in late 2014, Eurofighter unveiled a comprehensive initiative aimed at helping Indonesia with both its central security concerns and its ambition for growth and development.

Keen to renew its defensive airpower, Indonesia is currently examining a number of options which it believes offer promise. After the case was presented for Eurofighter at Indo Defence in Jakarta there is little doubt that there is an enthusiastic groundswell of interest in the key offering from Europe.

Known as the 'social media capital of the world', Indonesia has a young and educated population with a thirst for knowledge and discerning eye. In fact, when Eurofighter showcased its aircraft on the streets of the Indonesian capital on a carnival-like 'Car-Free Sunday' – the crowds of aviation enthusiasts very quickly made it clear that this was somewhere special.

Eurofighter Export Director, Joe Parker, and Capabilities Manager and former RAF Eurofighter Pilot, Paul Smith, were rapidly surrounded by young Indonesians demanding to know more about what they recognised as a hugely potent fighter which could be of substantial service to their country.

The sticky 34° Celsius heat and 90% humidity did nothing to deter the crowds who, before long, were huddled around the Eurofighter ambassadors as they gave an impromptu 'masterclass' on the virtues and assets that come with this incredible aircraft. It was well received.

Eurofighter believes the aircraft offers Indonesia air superiority; air-to-land/sea strike capability and non-traditional intelligence, surveillance and reconnaissance capability and this was certainly a message that resonated.

## INDONESIA LEPAS LANDIS

The intelligence and inquisitiveness of the Indonesia people is a national characteristic.

The Eurofighter 'INDONESIA LEPAS LANDIS' strapline caught the mood in Indonesian as the country once again prepares for 'take-off' (Lepas Landis is a phrase for 'take-off' used in a previous economic revival) on the back of growing economic opportunities and a strong desire for greater independence and security.

Recognising they need the fast, agile flexible fighter-power that comes with tangible and scaleable industrial benefits without the stranglehold of constraints, the Indonesians saw in the Eurofighter Programme a construct which, by its very nature, demonstrates that effective industrial transfer is possible and that true international collaboration can bring big benefits.

At a major press briefing, Eurofighter's Chief Executive Officer, Alberto Gutierrez explained what he believes to be the nature of the 'fit' between this captivating country and the world's most capable fast-jet fighter. The conference was attended by over 30 journalists from 22 different media houses. On the exhibition stand, during Indo Defence week, the story was much the same – intense interest followed by intelligent questioning.

The Indonesian Vice President, Jusuf Kalla found time to visit the Eurofighter stand as did the four ambassadors of Italy, Germany, Spain and the United Kingdom. Significant numbers of senior defence officials also came to hear more about the fighter with many spending time in the Eurofighter Cockpit Demonstrator to see for themselves exactly what the aircraft is capable of and why it makes sense for an archipelago nation such as Indonesia.

While news of Eurofighter's activities on the streets of Jakarta before the opening of the Exhibition made the Financial Times, during the event itself it was TV crews that became the focus as Trans TV; TV ONE and Bloomberg TV all took an interest in the story.

In every case the message was the same: Eurofighter had travelled to Indonesia to provide the evidence that it has the experience and track record to demonstrate that, if Indonesia were to opt for a Eurofighter solution, the benefits to the Nation would go far beyond the important and vital issue of national security, they would extend across a wide range of other areas too.

## SAFEGUARDING THE ISLANDS OF INDONESIA

As Eurofighter's CEO said during his visit: "Safeguarding the islands of Indonesia is a massive undertaking. In terms of airpower you need an asset that is fast, can fly high, has staying power and which is versatile and reliable enough to effortlessly take on a number of key roles. We believe the Eurofighter Typhoon is that asset."

He also made it clear that he understood the importance of fostering and developing indigenous capability. He told delegates he recognised that Indonesia needed to be freely able to transfer know-how and develop its own highly-skilled workforce to enhance and develop further capabilities over future generations.

Eurofighter Partner Company Airbus is already active in Indonesia working closely with PT Dirgantara Indonesia (PTDI) the Indonesian state owned enterprise who supply and manufacture parts for a number of key programmes - both civil and military. There's history here.

Eurofighter understands the fundamental ethos behind 'Indonesia Lepas Landas' – it's that indefinable 'sparkle' in the nation's eye. In Jakarta there is little doubt that the sparkle is well and truly there. <<

# MARA SHOT WOWS THE JUDGES

‘Vividness’ and ‘precision’ were the keys to success for Italy’s Mara Angelosante – winner of the Eurofighter Typhoon Amateur Photography

Mara’s prize-winning image of the world’s most advanced swing-role/multi-role fast jet fighter was taken at RAF Fairford in the United Kingdom during the Royal International Air Tattoo, one the United Kingdom’s most popular air shows.

Mara’s photo perfectly captured the Eurofighter on full reheat in the azure blue skies of a sparkling air show.

Up against some of the most talented amateur enthusiasts in the world, Mara’s image wowed the competition judges, who commended the picture saying it was a photo of ‘vividness’ and ‘precision’ which had an ‘real impact on the imagination.’ The image appears on the front cover of the 2015 Eurofighter Typhoon calendar and is also available for download on our website www.eurofighter.com.

The second prize went to Brett Critchley, whose stunning photo captures the Eurofighter Typhoon from above as it shoots through the valleys of the famous Mach Loop in Wales, a favourite hunting ground for fast jet pilots.

Third was Peter Busby, whose entry featured an RAF Eurofighter Typhoon at AIR 14 Payerne Switzerland. His dramatic image shows the Eurofighter bursting through the clouds.

Last but not least the special category prize for Children went to Jaden Shillingford aged 16. Jaden’s photograph shows the Typhoon from beneath.

Competition Judge Martina Schmidmeir said: “Many thanks for all the great entries we received this year from all around the world.”


Brett Critchley


Peter Busby


Jaden Shillingford

# SWISS ROLE FOR AUSTRIAN EUROFIGHTERS

In January Eurofighter Typhoons from the Austrian Armed Forces played an important role during the World Economic Forum 2015 in Switzerland.

The Typhoons 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 2,500 other leaders from business and society.

Alberto Gutierrez, Chief Executive Officer (CEO) of Eurofighter, said: "In addition to their daily air surveillance in Austria, Eurofighter Typhoons complemented the security arrangements for this high-ranking international conference in Switzerland. We are proud that Eurofighter Typhoons can demonstrate their capabilities in case of airspace violations."

All 15 Eurofighter Typhoons stationed in Zeltweg in Styria, have undergone an upgrade programme in 2013. They have been equipped with an enhanced hardware and software so that they conform to the latest capability standard for Tranche 1 aircraft.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## IN OUR NEXT ISSUE...

Don't miss the next issue of Eurofighter World for more in-depth features, great pictures and select interviews. We will feature:

- Special reports from the IDEX, Air India, and LIMA in Malaysia
- The latest updates in the Eurofighter Typhoon capability story
- And give you an inside view of life here at Eurofighter

# 250K+ / 571 / 400+

**250,000+ FLYING HOURS / 571 ORDERED / 400+ DELIVERED**

# TOTAL PARTNERSHIP

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## Benchmarking Excellence

- **Effective:** being the most powerful and reliable swing role fighter
- **Proven:** in global operations with highest operational statistics
- **Trusted:** to deliver performance, political and industrial partnership

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