FIAS 2026: MEDIA BRIEFING TRANSCRIPT

Team Tempest - accelerating the development of the UK's future combat air

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Tony Godbold, FCAS Delivery Director, BAE Systems

Thank you. Thank you for taking the time joining our Team Tempest panel. Before we get into anything else, let me just do a quick round of introductions from the panel. So my name is Tony Godwell, I'm FCAS Delivery Director with BAE Systems.

Andrew Howard, Director of Future Combat Air UK, Leonardo

Hi, I'm Andrew Howard, I'm the Future Combat Head Director at Leonardo UK.

Chris Allard, Vice President, FCAS Programme, MBDA

Good afternoon everyone, I'm Chris Allard, I'm the VP for FCAS with MBDA UK.

Phil Townley, Director of Future Programmes, Rolls-Royce

Hi, I'm Phil Townley, responsible for all our UK and international early-life programmes.

Tony Godbold

So just a quick reminder before we get into detail. FCAS, Future Combat Air System, is the UK programme of record for that sixth-generation combat air division. That's what we're all here for and what we're contributing towards as part of our UK national endeavour, and of course supporting the GCAP programme as well. That vision started in 2018 off the back of the Combat Air Strategy, which launched the Tempest partnership that we've been on a journey with since then. It's all aimed at giving UK industry the ability to get match fit and ready for the sixth-generation programme that's coming. That's around pushing boundaries on engineering and manufacturing, progressing new technologies, processes and tools, and developing the people in all of our respective organisations and the wider UK supply chain that underpins everything we're doing.

We've been on that journey since that point and we're making some great progress, which is what we're going to share with you today. That commitment from 2018 was underscored by the UK government, and Mr Streeting spoke about it a little earlier today as well. Since that point, over £5 billion has been invested into the whole FCAS programme. That's also underscored by £800 million of industry investment, again all about pushing UK industry to be match fit ready for a sixth-generation combat air capability and progressing our UK sovereignty to be that world leader in that space for many decades to come. We're building on a rich legacy and history that we have in the UK across many decades, so it's very, very exciting. And again, from Mr Streeting's comments earlier today, we heard about the UK national contract for continuing some of these activities. The £708 million contract is part of that activity off the back of the release of the DIP. So it's helped us progress and keep pushing those boundaries further, again underscoring that UK sovereign aerospace and advanced industry.

So I'll take a few moments to talk about our programme, and I get to go first, which is great. As an engineer by trade and a complete plane geek, having the privilege to be part of a programme that's designing a new fast jet from first principles, pushing and testing a lot of boundaries, is just super exciting, and we've made some really great progress. The phrase I keep using is that we're really at the business end of this programme now.

In terms of the design phase of the aircraft, we're right at the back end of that process. As we stand, over 11,500 parts are designed and released into the manufacturing process, and that represents around 90 per cent of the weight of this aircraft. Many of those parts, more than half of them, are already manufactured and what we call kitted and ready. They've either already been installed into the airframe or are kitted ready to be installed. Those major units, our centre fuselage with front fuselage and rear fuselage, are being manufactured and built out of Samlesbury, one of our sites in the North West. That will all come together as what we call the cigar tube. The front , centre and rear fuselage, the fins and wings, are in build as well out of Warton, and that's been in place for a good 18 months now.

The manufacturing process, the build process, in the second half of this year gets really exciting as the final assembly process now starts. So the second half of this year we'll see us bring that front, centre and rear fuselage together at Samlesbury and get it ready by the end of the year to move it across and come together with the wings and the fins. In terms of how we're doing that, the size, shape and complexity of the platform is quite a challenge. That size and shape, and the design of it to underscore the low-observable requirements we're looking to demonstrate against, yield the need for the largest and most complex carbon panels. These are the largest and most complex panels we've ever designed and then manufactured, particularly on the wing assembly. For wings and fins we're building three of each. That's not because it's a wacky design, it's that one of each unit will be subject to structural testing, which will take place in the second half of this year. Great progress is being made there and we're on track.

Not just in terms of the airframe build, but the systems work across the mission system and flight systems is progressing at pace. We may have talked before on some of the model-based systems engineering work we're doing. So we're already simulating the flight controls of the aircraft using autocoding software-generating techniques to bring to life the actual compute hardware that will be part of this platform, and that's connected to real actuation hardware. So we're actually flying this aircraft now and we've got over 300 flying hours of experience with that. We're using that feedback loop on the ground to mature the design at a much earlier stage and in cycle times much quicker than we've ever done before. That capability is one of the key learning features we're taking forward for GCAP. That flight-standard hardware and software is in place now, and that's what takes us with the build of the aircraft into a very exciting 2027 where the aircraft comes together, and systems integration and testing all comes together as well.

We'll embark on what will become the flight certification approach, which has started in earnest. We're working in conjunction with the MOD and the Typhoon Airworthiness Authority to plot that path, and exercising a lot of new and novel techniques. This will be the first time for both parties that we'd have gone through the process against the MAA regulations for a fast jet from first principles since those regulations came into force. So the learning here for both parties is significant. That plan is in play as we move through a process of power-on around the middle of next year, then moving forward to engine ground runs, taxi trials and all those sorts of things that naturally build up to first flight. We're on track to get the aircraft ready for the end of next year. We're harmonising with the MOD now and with GCAP around the flight test schedule we want to achieve. We have a plan that will commence in the early part of 2028 to achieve those test points and demonstrate a significant amount of capability that's all there to be leveraged into the GCAP programme. So it's great progress and a really exciting time. There's a real aircraft coming together in the North West, which, as a plane geek, I find super, super exciting. So yes, great times on the demonstrator programme.

Andrew Howard

Thanks Tony. I think you're all really excited it. It's great to be part of it.

Right, so given the nature of the conversation we're having today, each of us had areas of demonstration technology expertise to try and get ready for the sixth generation. When we embarked on Tempest, we didn't fully know what that meant, and I guess we have the benefit of hindsight now, plus a better appreciation of what we're building towards. The picture behind me is essentially the finished flight test aircraft that we call Excalibur. That test aircraft is, as you know, a 757. It's really been designed to provide a very advanced flying laboratory that can house the full set of sensors that a future sixth-generation fighter aircraft is going to require. It will essentially be the flying base for all of the TDPs that Leonardo UK has been developing for the last six years. So as you'd expect, there'll be a radar and a range of new-generation sensors across all of the things you typically expect to see.

The aircraft is currently operating out of Boscombe Down. The aircraft is complete. It's now getting ready for the next phase of its journey, which at the moment is still flying essentially in an empty test basis. So it's now waiting to start work as a TDP demonstrator. That's the next step along the journey, where we start to embody equipment to really unlock the value of what we've designed here. Many of you saw the photographs we shared maybe 18 months ago, when we did some flight work without the nose. The completion of the addition of the fighter nose onto the aircraft was a really major engineering task. We had to split the pressure hull at the front and essentially re-engineer the whole front end. There was a massive change to the COG of a 757 with the nose change, because there's quite a lot of structural work behind it to create the strength you'd need to house the radar. The chin provides a test space where we can work with different types of array and different types of sensor. So the combination of the chin and the nose were really challenging things for us to work through.

The people who've flown the aircraft have been very complimentary about the handling characteristics, and about the very significant side pods and underbelly pods. There was an understandable concern, notwithstanding the good modelling that had been done, that the flying characteristics might be very difficult. That's not proven to be the case. The general view is that the 757 absorbed those significant structural modifications really, really well. It performs and handles as you'd like it to, predictably, safely and reliably. There's been no real concern about the flying characteristics of the modified aeroplane.

So the backdrop to Excalibur was to create the airborne laboratory with our partner 2Excel. The work's taking place largely at Lasham in Hampshire at the 2Excel engineering facility, and it'll operate out of Boscombe as a test base as we move beyond into the next phase of the programme.
The expectation is that it has very long-term utility. If I briefly talk about the GCAP programme, the expectation is that one of the ways our technology can remain relevant, as some of us spoke about yesterday, is through very significant spiral. So the challenge we have within Excalibur and within GCAP is to deliver very strong hardware engineering that has very long-term utility, to allow the software to maintain relevance over time.

What we're expecting to do is essentially complete a period of test flying with the aircraft, largely using the UK TDPs as they start to mature and get embodied onto the platform. That will help us understand better about sensor fusion and the connections we're trying to create between the various sensors, which is different from what we've done before on a Tornado or Typhoon-generation platform. Once we've got that optimised, that will put us in a really strong position to start transitioning that technology into a GCAP space.

Beyond that is this idea of spiral. One of the features of Excalibur is that it has significant onboard computing capability. It has seats down the back that would be familiar to someone who's been in an AWAC or a Nimrod-type aircraft, but they're configured in such a way as to allow real-time engineering in the air. There was a real recognition that the modelling was probably taking us to very high 90 per cent confidence, but there was still a gap around in-air the airborne performance of some of the sensors, where the modelling wouldn't necessarily get us to the 100 per cent accuracy we need to create the fidelity of integration we're trying to achieve. The seats in the back of the aircraft allow for real-time adjustments of various sensors to optimise that integration task more quickly. The other expectation for Excalibur is that it's a key part of our longer-term schedule challenge, which is that it's going to help us unlock the readiness of the sensors in the timescales it's required. By virtue of the pods being as yhey have been, they're not designed very specifically for individual sensors. They're designed to accommodate different designs and changes of designs over time.

So although TDP into GCAP is a natural progression, there's a lot of focus today on CCA programmes and other considerations of that nature. Clearly they all have different sensors, different sizes of sensor and different sensor needs. We're really optimistic that the Excalibur design has real utility on a multi-platform basis beyond the core purpose. Some of you have heard me say this before, but we're quite pleased, and there are two things I want to reiterate. We feel that the TDPs we pursued in sensing terms have proven to be the right things. We now know, four or five years later, a bit more about what sixth generation is going to require in terms of the combination of sensors on the platform and the relative prioritisation of those different sensors. It feels like, for the most part, the TDPs were good choices.

The choice of the 757 as the donor platform to become the flying laboratory was always based upon some quite simple things that have proven really effective. It has a mechanical flight control system. It's a steel aircraft. It has lots of ability to be adapted. It hasn't got a composite shell and it wasn't electronically controlled. It sits on a high undercarriage, so you've got lots of room underneath it when it's landing. It's got quite good performance and quite good range, and quite a lot of excess power in the engines. So there's a lot of scope to drive onboard sensing and onboard computing, in addition to the obvious task of flying. So the early period of tests we're now completing has been really positive validation of a good choice of platform and a good partner in 2Excel. They've done a good job in delivering the aircraft modification activity. And the reconfigurability of the pods, the underwing and belly pods, the chin and the nose, gives us an awful lot of flexibility to try different things in the time ahead.

So it's got a really busy period coming up. Flying with the Typhoons was an important milestone for the aircraft. It gave a real sense of reaching maturity. I like Tony's phrase, we're at the business end now. Getting a mothership platform ready is really just the first step in the journey. It becomes really valuable now, when you start to apply the test activity that comes next. But that's where we are. As we move through the second half of this year and into the early part of next, the technical challenges and technical relevance of the Excalibur platform, as the basis of sixth-generation sensing know-how in the UK, will really come to the fore. So it's a really positive update. The Excalibur aircraft is there, it's flying. Many of you have seen it out of Boscombe Down. The engineering challenge of the nose has been overcome. The interior is fully fitted out. On this note, I'm going to handover.

Chris Allard

Thank you, Andrew. Just for those who are a couple of minutes late, my name is Chris Allard. I'm the VP for the FCAS programme, FCAS Tempest and GCAP, in the

UK. So what I want to talk to you about today is a broad overview of the work we're doing inside MBDA within the FCAS programme and particularly within Tempest.

As you'd expect, the work inside MBDA is utilising our history and pedigree in both complex weapon design and complex weapon integration. Most recently on Project Centurion, where we integrated a large suite of our complex weapons into the Typhoon aircraft. What we're looking at doing in Tempest in FCAS is utilising that experience gained in the UK with BAE Systems, but also on other fourth and fifth-generation platforms both inside and outside the UK, to try and transform the way we design and integrate complex weapons into sixth-generation capability. We're clearly doing that with BAE Systems, Leonardo and the UK MOD.

What I want to go through are two of the key pillars of work we're doing inside MBDA in FCAS. Those two key pillars are, firstly, effects optimisation and, secondly, digital weapon integration. So effects optimisation, what does it mean? From an MBDA perspective, when we say effects optimisation, what I'm talking about is providing the best threat response deployable at the optimum moment that maximises overall mission effectiveness. So how can we bring together all of the complexity in the platform and in the mission system sensor suite to deliver, from a complex weapon perspective, that best sixth-generation capability. What we're doing inside Tempest is utilising our experience across the domains of air, land and sea. We're looking at our experience in mission systems design and weapon system design, working alongside BAE Systems in the core battle and alongside Leonardo to really improve that capability from a weapon perspective. So rather than having just a simple weapon, how do you bring that all together as an effects system?

Progress has been really good over the last few years inside Tempest and FCAS. We've matured a large number of algorithms, building up the algorithm readiness level, as well as integrating that into software and bringing that software up through the system readiness levels and the technology readiness levels. We've demonstrated and tested that in the lab and on hardware. What we've been able to do most recently is test that in some of our facilities in Stevenage, both with an operator in the loop and through broader operational analysis, to really see what those benefits in effects optimisation will bring to the user in that sixth-generation capability.

The second area to talk about is digital weapon integration. This is something you'd obviously expect us to talk about. What we're trying to achieve here is to really transform the way we integrate weapons in the future, both from a capacity perspective, so how can we increase the number of weapons through the platforms in the same period of time, but also from a time perspective. How can we reduce the time it takes to integrate weapons, which can take years, down to 18 months? We're clearly looking forward to working with BAE Systems, the UK MOD and the regulatory authorities to bring some key technologies and techniques to achieve that.

There are three areas I wanted to touch on today. Firstly, exploitation of digital simulation and modelling, secondly, virtualisation and thirdly, AI and machine learning.

So firstly, digital modelling and simulation. As you'd expect, as we progress through the decade, the ability to model and to simulate is significantly improving on where we've been in the past. One area, just to bring it to life a little, is around electromagnetic capability testing. As you'd expect, when we integrate a weapon onto a platform, there's the electromagnetic environment it experiences from the platform and also that it gives off to the platform. It's really important to understand that that weapon can operate safely in that environment, can be carried and can be fired. What we would normally do is a large number of tests. We put design-specific missiles into chambers, and we have a lot of aircraft testing time. What we're looking at doing through Tempest and FCAS and beyond into GCAP is reducing that time using really sophisticated, complex computer modelling. We're basically reducing significantly the amount of on-aircraft and in-chamber testing time and doing most of that through simulation and modelling. We believe that can reduce one element of integration significantly.

The second aspect is virtualisation. When I say virtualisation, what I'm basically talking about is trying to get rid of the hardware, the platform hardware and the missile hardware, and turn that into COTS, so off-the-shelf software we can use. One of the things we really struggle with is integrating the missile into the mission system, both ends of the integration. So how can we minimise the reliance on hardware from a mission system perspective and really work from a virtualisation perspective to reduce the time for integration? We've successfully deployed that in one of our sectors in MBDA in one of the examples. Effectively, that really tries to reduce the time in terms of the integration of the weapon into the platform.

The last area to touch on is AI and machine learning. As you'd probably expect, historically we do lots of testing, we conduct lots of trials, we write lots of reports, people read lots of reports, people make mistakes in lots of reports, we rewrite reports, and so on and so on. What we have around us now is AI and machine learning. I can see that the phone in front of me is literally transcribing what I'm speaking as I'm speaking. So why can't we use that in weapon integration? Why can't we use some of the AI and machine learning techniques to analyse the results of the test, to analyse some of the software trials, to bring all that together to write the report for us, to review the report for us and actually provide that evidence to the regulator and through into the platform authority. That would reduce significant on-aircraft time, and time spent analysing and writing reports, to really significantly reduce the time to bring those weapons into service.

Central to all of this is close working relationships with BAE Systems and with the MOD. As we move forward into GCAP, along with our GCAP partners, we're looking at how we can bring these tools and techniques to rapidly reduce that cycle. One of the key things we're looking at doing is building on the aircraft demonstrator that Tony mentioned earlier. What we're looking at doing, in conjunction with BAE Systems and the authorities, is to test and trial some of those techniques I just mentioned, in conjunction with the normal way of integrating weapons, to prove that some of the simulation and modelling does work, that it's robust, and that we can then use that evidence and move it forward into both GCAP and into other programmes, as Andrew mentioned. So we're really looking forward to Tony and his team completing the aircraft, being able to fly and then conducting those real-life supersonic release fires.

Before I finish, I wanted to touch on the supply chain we've been working with. Within Tempest, from an MBDA perspective, we've been able to work with different suppliers and different companies than we would normally work with, because we're trying to do things slightly different to in the past. It's opened up lots of avenues. So we're working with a number of SMEs and also academia, including sponsoring some PhD students in some of the weapon integration techniques I mentioned. That's really helping MBDA, the UK as a whole and the whole economic benefit of Tempest to move us forward as we transition through to sixth generation.

So finally, just a brief summary of what I've been saying. I hope it gives you a bit of a flavour of the work we've done inside Tempest over the last few years. Two key themes, effects optimisation and digital weapon integration, and then how we're collaborating with BAE Systems through the Combat Air Demonstrator to really prove some of the techniques. Thank you very much.

Phil Townley

Three really impressive narratives that are going to be really tough act to follow, because you can see the impact Team Tempest has made. I want to come back to that phrase, Team Tempest. It's not called Tempest, it's called Team for a reason.

Myself, working for Rolls-Royce, we can design the best gas turbine power system the world has ever seen. But it's nothing on its own. It needs the best sensors, the best effectors, and it has to be integrated in a world-class manner to deliver what our air force needs for next-generation combat. That's why we're here. That's why, as companies, we put our money where our mouth is and we invested hundreds of millions back in 2018. I was there at the start. We recognised that, as the UK, we weren't match fit. We needed to develop our technology and develop our people. If you look back at the Combat Strategy, the challenge was set down, and what you've heard already gives you evidence points to say the UK has delivered on that. I'm going to give you some more.

So, picking a few of the highlights, and as you can imagine there are hundreds and hundreds of successful demonstrations, I could spend the rest of the day here and you'd all be asleep.

Take the flying demonstrator. That's a moment the nation will be proud of. And our role in it - we've not got a new engine for that flying demonstrator. We're using two existing engines, the EJ200. It's a fantastic product, reliable engine. We're tricking that engine using some clever control-system algorithms so that when it's flying in this new aircraft, it thinks it's in a Typhoon. That's what we have to do to make sure it can operate and be stable, because it knows how it operates in a Typhoon, and you want to make sure it thinks it's in a Typhoon. But it's not as simple as that. If you look at a Typhoon, the proximity from the front of the engine to the outside air is very close, very open. This is going to sit behind a long duct. We knew next generation is going to have embedded engines within the aircraft. So we've worked closely with our partners, BAE Systems. Several years ago we talked about the duct that was fabricated on our test bed, proving out our digital models and validating them for real-life testing, knowing that we're good and de-risking that programme. That's getting us ready to fly, teaching the next generation of engineers how to work in partnership and integration of complex challenges that will stand the test of time and get us ready for the next programme that comes.

Working closely with our friends in Leonardo, we understand the power demands. Same with MBDA. We understand much better what kind of power they need, not just the amount. So at the start of Tempest, we talked about a twin-spool power generation solution. We've further developed that throughout the programme. Early on we saw that as a game-changing concept where we can really ensure that the future power needs of this air vehicle can be delivered. We've matured that technology with a better understanding of what kind of power signal do my customers need. As we keep saying, this isn't just an engine, this is a flying power station in the sky. We're not just going to propel the air vehicle, we're going to power it too.

There are technologies that have spun off too. We're really proud of our combustor, that is a world-leading digital and additive manufacturing capability. Quite recently in Bristol we opened up a new digital additive cell, one of the largest cells in the world, which is going to print our combustor for this programme. Those technologies have been proven out. We can operate the combustor now to temperatures we didn't think were possible before with that amount of material. So we're therefore making it lighter, we're making it smaller and we're making it more powerful, which means the engine can be more compact, which means the air vehicle can be more compact. This is really game-changing technology, proven out through Tempest, and, importantly, engineers are learning their tools of the trade on this programme, which we'll then bring to bear on the next generations that come through.

We've worked on new composites and worked with SMEs in the UK. How do we find a new composite supply chain, taking existing companies that are traditional fabric suppliers, and teach them how we can work together in partnership? So whereas they used to make clothing, they're now making composites for gas turbines. We've looked at innovating our supply chain. This isn't just us four companies up here that have benefited from the investment. All of the UK ecosystem has, from universities through to the catapults, SMEs and mid-sized companies. Everyone has benefited from the investment and technology we're pulling through. Orpheus, a new class of small engine, spun out of these technologies. It was an early idea of concept that it's not just about the technology, it's about the way you can work. We proved we could bring things clean sheet to whole engine design and onto test in 18 months, in half the time it used to take and with half the people, spun out of Tempest. It's critical to the success.

Where I want to finish is by saying that technology development is interesting and it's great. Lots of our teams love doing it. It's why they go to university, it's what inspires them. But it's there for a purpose, and the primary purpose we're developing these technologies for is GCAP. Because of the announcements made in the DIP, and the announcements made through the Defence Review, we know there are alternate solutions out there that are going to rely on technology. The people, the universities, the SMEs and all the infrastructure we've put in place ensure that we can deliver this game-changing capability at the pace they need. So whether it's a CCA or a large air vehicle like GCAP, the foundations of Tempest are what's going to deliver that. Thank you, thank you very much.

ENDS