



June 21, 2019

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Visiting the Paris Air Show: The Challenge of Viewing the Future of Air Combat Capabilities

06/14/2019



By Robbin Laird

In 2012, I wrote a piece for *Breaking Defense* which focused on the <u>Bold Alligator Exercise</u> that year and how the image of change was difficulty to see.

The coming of the Osprey was about to totally change amphibious operations, but because it was an amphibious exercise, folks were looking at the beach and waiting to see the assault forces come across the horizon.

The problem was that assault had already occurred over their heads and had reached deep inland.

I wrote: "Instead of assaulting the beach, the forces aboard the seabase are maneuvering within and over the battlespace inserting, moving and withdrawing forces. This is a far cry from just looking at <u>photos of the landing ships and assault vehicles.</u>"

A similar challenge is now being posed by the coming of the F-35 for airshows.

The F-35 is a harbinger of fundamental change in terms of the concepts of operations for airpower, in which a multi-domain aircraft is able to exercise decision-making at the tactical edge and is a driver of fundamental change. The F-35 is hardly the end of history with regard to air combat innovation but it is a page turner.

When I visited Marine Corps Air Station Beaufort in April, my host was the Commanding Officer for the Warlords, Lt. Col. Adam Levine. Lt. Col. Levine has been flying the F-35 for more than seven years and has witnessed first-hand the software roadmap taking shape from block 1A through 3F.

Lt. Col. Levine underscored that the evolution onboard the Hornets flown by the Marines compared to flying the early variants of the F-35 did not demonstrate the generational differences which now are evident with the 3F. According to Lt. Col. Levine:

"There is simply no comparison between a 3F F-35 and a legacy aircraft. They are in different worlds"

He encouraged me to stay and see the F-35B flying with 3-F software which has unleashed new agility for the aircraft and which was clearly visible at the Beaufort Air Show.

But he drove home the point which really is what makes viewing military planes flying at airshows much more difficult.

He noted: "But of course you cannot see or demonstrate at an air show what the real difference the F-35 delivers to the combat force."

From my perspective, the Lt. Col. highlighted the problem now in attending air shows and looking to understand more effectively the evolving nature of air combat systems.

What is becoming ever more salient to the air combat force are the effectors and their ability to operate together in an integrated manner with an ability to attenuate disrupters like electronic warfare or cyber threats.

This means that viewing the evolution of capabilities in the domains of C2, electronic warfare, cyber defense, providing secure linkages, and the development and integration of remotes or unmanned systems is crucial to understand the evolution of 21stair combat capabilities.

They are building out from the epicenter of fighter aircraft.

In other words, it is crucial to not just look at the pieces of the evolving effector capabilities but to consider how those capabilities are part of evolving concepts of operations for air forces operating throughout the spectrum of conflict.

It also reminds me of the differences between the world I grew up in and the world now with regard to automobiles.

As a boy growing up in the 1950s, I looked forward each year to the new models and how different they would be from last year's models. Obviously, I am not doing that in 2019, where the combination of what the frame of the car can deliver aerodynamically interacts with what is now inside that car to deliver the performance I would wish to buy.

Something similar is happening in the fighter world, where data fusion built into the F-35 is a game changer, but the impact of game changing is only really delivered by the effectors and their ability to be integrated into the battlespace.

At the <u>Fighter Conference</u> held in Berlin last November the former head of the Royal Australian Air Force provided a good sense of what the challenge is in understanding the future of air combat and what to look at when watching a fighter jet fly.

"Our Navy has just started deploying our air warfare destroyers but we have already demonstrated CEC interoperability with the US Navy.

"We will put CEC on our Wedgetails to be able to provide weapons quality tracks to our ships, hence enhancing significantly the range for the strike capability of our fleet.

"And as we go forward we will find ways to directly link our F-35s with the fleet as well.

"Our Navy and Army are now focused on fifth generation communications with their platforms as well, which is why having the F-35 in the force can drive change in the strategic direction in which you want to go.

"You fly a legacy asset you cannot drive the kind of change the Australian Defence Force needs in the near to mid-term."

But how do you see this at an Air Show?

What is required now is that when visiting the Pavilions or Stands of manufacturers building items like missiles, UAVs, or C2 systems one needs to look not just at the cool capabilities the piece of equipment might provide or does provide, but focus on how that capability can be folded into a combat air force.

This is a much more significant challenge for the visitor, but crucial to understanding the way ahead of the world's air combat forces.

This article was first published on <u>Breaking Defense</u> on June 14, 2019.

The Combat Cloud at the Heart of the Future Combat Air System

06/19/2019 By Pierre Tran



Paris – A ministerial signing ceremony at the June 17 opening of the Paris air show marked Spain's joining France and Germany in the Future Combat Air System project, as the industrial partners made an offer for a study for demonstrators for a stealthy new fighter, drones and an advanced network of systems.

President Emmanuel Macron, in dark blue suit and tie, stood just behind the French, German and Spanish ministers as they signed the three-nation pact, the high point of the official opening of the Paris air show at Le Bourget airport.

The official diary of Macron showed the head of state was host at the Elysées presidential office for dinner with top industry executives, on the eve of the show, which seeks to showcase the global aeronautical and space industry.

Airbus and Dassault Aviation have submitted a joint proposal for studies in the first demonstrator phase, expecting to sign a contract with the French and German procurement offices in the fourth quarter of 2019, the companies said in a statement.

"We have submitted this morning a proposal to the French and German procurement officers... for the study for a technology demonstrator," Eric Trappier, Dassault chief executive, said in a press conference with Dirk Hoke, chief executive of Airbus Defence & Space. The briefing was held in open air next to a life-size model of the future fighter.

The study for the first demonstrator phase is worth around 100 million euros (\$112 million) and runs for 18 months, said Trappier, who declined to give a figure for the total budget for the FCAS program.

Negotiations can begin on the study, with an aim of flying a demonstrator fighter in 2026.

The demonstrator study will examine how best to design and build the new generation fighter, UAVs dubbed remote carriers, and a system of systems. Those manned and unmanned aircraft will be interconnected, key elements in a cybersecure network dubbed combat cloud. The aircraft will also be linked to commanders on the ground.



The projected new fighter as seen at the Paris Air show, 2019.

The industrial partners pitch FCAS as a means to maintain European sovereignty and autonomy, requiring government support with industry sharing risk.

Airbus and Dassault are keen for the demonstrator project to take off promptly, and hope France and Germany will agree on common export rules to allow foreign sales.

France and Germany welcomed Spain into the FCAS project, with the three defense ministers signing a framework agreement.

That signing ceremony, soaked in sunshine, took place just next to a a life size mock up of the fighter, which had just been unveiled before the ministers and Macron, and a patient crowd of spectators and journalists.

"This signature sets in marble a key step in the construction of European defense, marrying technological excellence, political will and industrial cooperation," the French armed forces ministry said in a statement. Florence Parly, Ursula von der Leyen and Margarita Robles respectively signed for France, Germany and Spain.

The model was to show what the fighter might look like, with much depending on the demonstrator, which will explore stealth, manoeuvrability and other key factors.

"That is not the definitive shape but it will resemble something like that," Trappier said.

Models of two concept weapons were displayed next to the fighter, with one from Airbus, the other from MBDA.

"The minister just reconfirmed five minutes ago a demonstrator should fly in 2026,"

Hoke said. "That is the aim for the studies."

The first part of the demonstrator project will run from 2019 to mid-2021 and study four areas: the new generation fighter, the engine, the system of systems, and the remote carriers – or drones. There will also be study on simulators for working out operational scenarios.



An FCAS Enabled UAV as envisaged at the Paris Air Show, 2019

Teaming agreements have been drawn up with companies including Thales, an electronics company, and MBDA, a missile maker which has worked on drone concepts.

French engine maker Safran and its German partner MTU have signed up to build a new engine, which will eventually power the planned European fighter.

The demonstrator fighter will initially fly with an engine already in operation, which might be a version of the M88 or similar, Trappier said.

The demonstrator fighter will be "very different from a Eurofighter and Rafale," he said, adding that the plans for the fighter to fly "into denied areas, designed with stealth and manoeuvrability."

Hoke said, "It is important we start (on) different modules also, what we call combat cloud to define the system of connectivity and also the standard of communication."

Besides stealth features to evade air defense systems, the fighter will rely on remote carriers flying ahead, seeking to jam defenses, detect and relay information to pilots and ground commanders, Trappier said.

The fighter will be larger and stealthier than the Rafale or Eurofighter, with radar to give 360° coverage, an internal weapons bay and the "capability to be part of the combat cloud," he added.

There will be onboard artificial intelligence to process big data, inform and present options to the pilot.

"Stealth is one of the key concepts, not the only one, but it is one of the most important," he said. There will be single seat and two-seat versions, with the latter for complexity of missions, particularly strike missions, rather than solely for training.

The French version of the fighter will be able to carry a nuclear-tipped missile, the successor to the present ASMP/A, and also operate from an aircraft carrier.

Sales of the fighter to other European nations were expected once the fighter was flying, as it would be "better to have this plane than the planes presently flying," Trappier said. France would pitch the plane to Egypt and Qatar at some point.

Those two countries have ordered the Rafale, along with India.

"Export is a fundamental part of the determination of the two companies and the two nations to boost the production numbers," he said. "We do not have a domestic market as big as the US, even if there are several countries in Europe."

Hoke, asked about the German minister calling for a European set of export rules, said, "We favor agreeing first French-German rules. If that serves as a model for Europe, then that is fine.

"It is important to have the rules right from the beginning," he said. "We need to speed up, but if we agree rules by the mid-2020s, that could be resolved. If we don't get a bilateral agreement, there will be problems entering the demonstrator phase. We need clarity in exports."

Trappier said, "We will try to be ITAR-free, not to be dependent on a third country. We need a certain autonomy."

That was a reference to the US international traffic in arms regulations, which require Washington authorization on sale of equipment to foreign nations.

"It is also a question of sovereignty," said Hoke. Europe has a right to which system they use, where they use it."

A lack of common set of export rules also applies to KNDS, the joint venture between Nexter and Krauss-Maffei Wegmann, which will build a new tank, dubbed main ground combat system, which will replace the Leclerc and Leopard 2.

Asked whether Britain might one day join FCAS, Trappier said, "It is a little bit too early to say. Maybe one day. I don't know, it's not yet decided. We need really to start the work." The priority was to have the demonstrator fly in 2026, he added.

Hoke said, "It depends of course largely on how Brexit develops. So it would be premature to discuss this at this stage."

The UK is pursuing its Tempest program for a future fighter, in which Sweden is showing strong interest as a replacement for its earlier model Gripens, said Sash Tusa, analyst at Agency Partners, a financial research office.

The UK government is investing £2 billion in the fighter project, with industry is putting in around £1.5 billion, he said. That government funding might be found by cutting the order for the F-35 joint strike fighter to 48 units from 136, saving some £8 billion.

"Tempest is an alternative to maintain UK national sovereignty in combat aircraft," he said, adding that it was reasonable to support two European fighters.

For Richard Aboulafia, analyst at Teal group, the prospect of two new European fighters recalled the early 1980s, with the Tornado and Mirage, while the F-16 came from the US. Back then, there was no pressure from Brexit. Today, there is the F-35 arriving, two new European fighters planned and "compressed time pressure," he said.

The 20 years of development for FCAS sparks some concern, as this is effectively an additional five years of cost compared to Tempest, increasing the budgetary burden, Tusa said.

The 20 years of development for FCAS sparks some concern, as this is effectively 20 years of cost, raising a budgetary burden, Tusa said.

Trappier said the industrial partners have proposed technology packages, with responsibility clearly set to show what is possible.

"We will be ambitious, we will eliminate risk. The demonstrators will be a way of de-risking," he said.

"There will be a feasibility study. It will, in theory, take more time but ultimately it will be faster, cost less because there is less risk, easier to fix than to launch full series production and then solve problems," he said. Industry asked for more room and flexibility, which the governments have granted.

"Industry will assume some of the risk," he added.

Airbus and Dassault signed in January as joint prime contractors for a two-year joint concept study worth €65 million for FCAS. In France, Thales, Safran and MBDA signed up for the study, while in Germany, Hensoldt, ESG, Diehl Aero, MBDA and Rohde & Schwarz, and MTU signed.

The featured photo:

Emmanuel Macron, President de la Republique, Florence Parly, ministre des armÈes francaises, Ursula von der Leyen, ministre de la defense de l'AllemAgne, Mararita Robles, ministre de la defense espagnole, Eric Trappier, President du GIFAS, PDG de Dassault Aviation, signature d'un accord cadre pour la construction d'un systeme complet d'avions de combat et de drones, revelation de la maquette en taille reelle du SCAF, futur avion de combat europeen

53eme Salon International de l'Aeronautique et de l'Espace

Editor's Note: It is not often that one is at the launch of a concept but I did so with regard to the combat cloud.

In a 2014 visit with the then head of the Air Combat Command, General Hostage, along with Lt General (Retired) Deptula, in our discussion launched a concept — the combat cloud. For the ACC Commander, this was his way of discussing how the fifth gen aircraft were impacting the USAF and a way ahead with regard to 4th and 5th generation integration.

Now the FCAS launch is being built around this concept with the emphasis being placed on connectivity as this recent Airbus press release has highlighted.

Airbus tests its Network for the Sky on a MRTT aircraft

13 June 2019 – Airbus has successfully completed a flight demonstration of a connected airborne battlespace scenario, centred on a MRTT aircraft. The test was carried out as part of the development of Airbus' Network for the Sky (NFTS) programme. This follows on from last August's demonstration in Canada of secure mobile communications using a stratospheric balloon to simulate a HAPS (High Altitude Pseudo Satellite), such as Airbus' Zephyr UAV (Unmanned Aerial Vehicle).

NFTS combines various technologies – satellite and ground communications, air-to-ground, ground-to-air and air-to-air tactical links, 5G mobile communications and laser connections – in a resilient, unified, secure, highly interoperable, mesh network. Aircraft, UAVs and helicopters currently use networks with limited bandwidth and interoperability, and often little resilience. NFTS will allow them to form an integral part of high-speed military networks.

"This unique demonstration is a significant milestone in realising our vision of secure connectivity, which will enable the future air combat cloud and enhance real time execution of military missions," said Evert Dudok, Head of Communications, Intelligence & Security at Airbus Defence and Space.

The demonstration scenario simulates the establishment of multi-Mbit/s, wideband communication links between ground forces operatives, a fighter jet, a MRTT, and a combined air operations centre (CAOC) on the ground. Both the operatives and jet fighter had to send video in real time to provide enhanced real-time situational awareness and receive instructions from the CAOC in return.

The operative located in Getafe (Spain) was equipped with a standard handheld radio for NATO forces (ROVER). The fighter was deployed to obtain imagery of the area of interest and act as a communications node between the operative and the MRTT flying at 30,000 feet within a 150 km radius in secure airspace.

Communications were thus relayed between the fighter jet and the MRTT, via a wideband LOS (line-of-sight) data link. The MRTT then routed the video along with its own communications via a wideband satellite link to a space teleport near Washington, D.C. The communications flow was then returned to Europe via a terrestrial link to the CAOC.

This complex scenario demonstrates the real-time operation of secure end-to-end communications across different networks and technologies: ground-air tactical link, air-air wideband link between two aircrafts, air-satellite relay and terrestrial networks.

This type of configuration, known as a 'hybrid network', represents the future of military communications and meets the needs of armed forces to be able to use a wide range of networks while allowing these to be managed dynamically and transparently.

The solutions developed by Airbus thus allow secure IP (Internet Protocol) communications to be established, links to be reconfigured in real time and the available bandwidth to be allocated to data links based on operational priorities.

For this demonstration an MRTT aircraft has been equipped with Janus, Airbus' new tri-band (Ku-Ka-MilKa) satellite antenna, as well as the latest version of the Proteus satellite modem, which is highly resilient against interference and jamming, and Airbus' aircraft links integration management system (ALIMS).

This exercise paves the way for the development of the core capability for SMART MRTT connectivity, which will allow the MRTT to act as a high-end communication node. Network for the Sky (NFTS) sets the foundation for the connected airborne battlespace, with the objective to offer a full operational capability by 2020. The NFTS programme is part of Airbus' Future Air Power project and is fully aligned with the development of the European Future Combat Air System (FCAS).

During a 2014 visit to the ACC at Langley Air Force Base, the combat cloud concept was the focus of the discussion.

In an article published on <u>February 23, 2014</u> I discussed the visit and followed up with Lt. General Deptula with regard to his thinking about the concept.

No platform fights alone. Technology is increasingly playing a forcing function for significantly greater integration among combat elements in shaping core combat capabilities.

The digital enablement of key combat platforms – missile defense, combat air, unmanned systems, ground force connectivity via data links – is providing a forcing function role upon the next phase of the evolution of 21stcentury systems.

For the technological potential to be unlocked, it is necessary to change approaches to organization, procurement, and concepts of operation (CONOP). The decade ahead will see significant technological pressure upon traditional approaches and, at the same time, provide openings for significant organizational, procurement, and CONOP innovations.

One way to understand the dynamics of change is to examine the emergence and evolution of what might be called the aerospace or air combat cloud. Here various aerospace assets can work more effectively together to shape combat capabilities in, through, and across all domains. It is about enabling ground, air and maritime concepts of operation, focused, and joint.

Key platforms are fifth generation aircraft that can accelerate change in creating the aerospace combat cloud.

In <u>an interview with the Commander of the Air Combat Command, General Hostage</u>, the interaction between fifth generation aircraft (as fleets) and the opportunity to change concepts of operations were highlighted.

The core image, which the General put on the table of where the transition needs to go, is the ability to shape a "combat cloud" as a key element of the battlespace within which the various deployed aircraft interact together to shape air dominance to achieve joint force objectives.

This combat cloud would be enabled by fifth generation aircraft and include the deployment of F-22s, a substantial number of F-35s and the ability to link to legacy aircraft. This capability would then define the approach to any systems added thereafter, such as the long-range ISR/strike aircraft.

According to Hostage: the fifth generation aircraft will enable the air combat cloud and allow me to use my legacy assets differently.

Many of my 4th Generation fighters can be used to extend the network of linked systems providing reinforcing fires, and I can focus on the fifth generation assets as the core nodes shaping distributed joint capabilities.

And when we come to the evolution of "next" generation systems, the form factor could stay quite similar as we evolve the capabilities within the planes or in terms of how the flying systems can interact and operate together.

Rather than thinking of 6th generation aircraft in form factor terms, we can operate the new air combat cloud and leverage that moving forward.

To further explore the concept and the building blocks for an aerospace combat cloud capability, I talked with one of the innovators in developing such a concept, Lt. General (retired) Dave Deptula.

Deptula is Dean of the Mitchell Institute for Airpower Studies of the Air Force Association. The Institute is beginning a look at the cross service efforts to shape this new approach to airpower in the decade ahead.

In this interview, Deptula discusses some of the key elements of the approach.

Deptula: A way to think about this is the shift from the industrial age of warfare to the information age of warfare. Technology has a piece in this; organization has a piece in this and concepts of operation have an even larger piece in the evolution of cloud combat capability.

The U.S. military is now at a juncture where the speed of information, advances in stealth and precision strike, nextgeneration sensors, and other technologies will permit it to move beyond a combined arms warfare construct of segregated land, air, and sea operations.

This shift will not come easy, as many in the U.S. military have been inculcated with a belief in the combined arms approach and, in some cases, continue to adhere to the anachronistic belief that airpower should only be used as a supporting arm of land and sea operations.

In lieu of adhering to linear, industrial age operational approaches that mass forces to wage wars of attrition, DoD could create a new joint operational concept for combined effects warfare that integrates the functions of ISR, precision strike, maneuver, and sustainment to achieve desired effects across all operating domains.

This joint concept should explain how the U.S. military could link information-age aerospace systems with sea and landbased weapons systems in ways that will enhance their combined effectiveness and compensate for the vulnerabilities of each.

A resulting ISR, strike, maneuver, and sustainment complex could be described as a "combat cloud" that uses information age technologies to conduct highly interconnected, distributed operations.

The combat cloud concept is somewhat analogous to "cloud computing," which is based on using a network (e.g., the Internet) to rapidly share information across a highly distributed system of systems.

Instead of combining the computing power of multiple servers, however, a combat cloud would capitalize on C4ISR networks to rapidly exchange data across an all-domain architecture of sensors and shooters to increase their effectiveness and achieve economies of scale.

If enabled by secure, jam/intrusion-proof connectivity, a combat cloud may be capable of employing fewer modern combat systems to achieve higher levels of effectiveness across larger areas of influence compared to legacy operational concepts.

For example, instead of relying on traditional approaches that mass fighters, bombers, and supporting aircraft into major strike packages to attack particular targets, a combat cloud could integrate complementary capabilities into a single, combined "weapons system" to conduct disaggregated, distributed operations over a fluid operational area.

A distributed, all-domain combat cloud that is difficult to attack effectively and nearly self-healing if attacked would also complicate an enemy's planning and compel it to dedicate more resources toward its defense.

Question: When we met with General Hostage, he highlighted the importance of fifth generation aircraft to the next phase of airpower seen from the could perspective, and how would you highlight their impact?

Deptula: Although the F-22s and F-35s are labled "Fs," or fighters, they are not classic "fighters" as what we labeled fighters in the industrial age at all. They are flying sensor nodes that also have the capability to employ weapons, either air to air or air to surface.

They have the ability to penetrate and operate in contested and denied air space and in many cases we will probably value them more for their ability to operate in contested air space, collect information, transmit it back to the other combat elements which can then use that information in developing their operational responses.

These systems are leading us into an era where we can create a cohesive, war fighting complex not just limited to air operations, but to the maritime and land domains as well.

Question: Technology facilitates this capability but organizational redesign is crucial. Could you elaborate?

Deptula: The services are currently not aligned to shape a common aerospace combat cloud. Alignment to achieve this capability is crucial at this point in the evolution of airpower. We need to realign our research and development approaches with the cloud, rather than continuing to follow the segregated, stove-piped approaches that have been the hallmark of military organization since the days of Clausewitz.

We need to think beyond a very narrow traditional, "requirements-based" approach and focus upon aligning contributions to an ISR—strike—maneuver—sustainment complex or a "combat cloud."

We need as well to put an end the separation of kinetic and non-kinetic capabilities as we rethink the future of weapons development enabled by the aerospace combat cloud.

Question: Obviously, what you are talking about embraces both rethinking joint as well as coalition perspectives. And this can embrace significant change in how we think about leveraging assets bought as a coalition. What is your perspective on the coalition possibilities?

Deptula: For example, if we take a consortium approach to security strategy we should consider the integrated application of capability resident in partner nations. We may be able to achieve much more capable outcomes than we otherwise achieve by pursuing traditional weapon system acquisition.

Question: This will lead as well to thinking about different concepts of operations to achieve mission objectives. What is your thinking on this challenge?

Deptula: We really need not just new conceptual constructs; we need to embrace truly joint organizational constructs that will actualize the combat cloud architecture. There needs to be a convergence of capability that will result in the design, development and actualization of a combat cloud by the different service components.

This is the challenge, but also the opportunity for a significant enhancement in 21st century relevant combat capabilities.

Robust, reliable anti-jam, anti-tamper methods of communication are key elements of the effort.

I do not just limit this to, I should say, methods of communication as opposed to links because there are ways to share information without relying on traditional links, and that will be part of the combat cloud design function as it evolves.

Again this concept is not just based on technology. It is also based on organization and the distribution of knowledge and understanding of guidance for how individual units might play so that you can have graceful degradation if the entire system is not operating with 100 percent contribution of each element.

In other words, it is not just about data-links or net-centricity, it is about a concept where even if you have degradation of your optimal information sharing construct you are still operating in a venue where you are very, very effective.

Deptula then went on to develop these propositions in various speeches over the past few months and this appendix has pulled together several of these propositions into a single statement.

Appendix: Lt. General (Retired) Deptula: An Assessment of the Nature and Importance of the Evolving Aerospace Combat Cloud

The U.S. military is now at a juncture where the speed of information, advances in stealth and precision strike, nextgeneration sensors, and other technologies will permit it to move beyond a combined arms warfare construct of segregated land, air, and sea operations.

This shift will not come easy, as many in the U.S. military have been inculcated with a belief in the combined arms approach and, in some cases, continue to adhere to the anachronistic belief that airpower should only be used as a supporting arm of land and sea operations.

In lieu of adhering to linear, industrial age operational approaches that mass forces to wage wars of attrition, DoD could create a new joint operational concept for combined effects warfare that integrates the functions of ISR, precision strike, maneuver, and sustainment to achieve desired effects across all operating domains.

The future needs an agile operational framework for the integrated employment of allied military power. It means taking the next step in shifting away from a structure of segregated land, air or sea warfare that has come to be know as combined arms warfare, to integrated operations based on the four functions of ISR, strike, maneuver, and sustainment to achieve desired effects—or combined effects warfare.

We're at a critical juncture in history—at the center of an Information in War Revolution—one where the speed of information, advance of technology, and designs of organizations are merging to change the way we operate. This change has dramatically shortened decision and reaction times, and reduced the number of systems it takes to achieve desired effects.

However, we can fail to realize the full potential of airpower, based on how we look at it. Just as we label the F-22s and F-35s with a traditional naming convention as a fighter—even though they are much more than that—we tend to view remotely piloted aircraft in terms of how well they can observe and destroy targets. This is a combined arms perspective.

Airpower provides us much more than simply combined arms platforms. To fully exploit its versatility, we need to pay more attention to combined effects. This paradigm shift will not come easy, as thousands of years of history has inculcated us with a combined arms approach. But we know that precise targeting does not always give us precise effects. So we have to anticipate second, and third, and higher orders of effect in the employment of every aspect of airpower.

For example, look at the observer effect that remotely piloted aircraft have extended to modern warfare. The simple act of observation has caused strategic disruption of terrorist adversaries. When we observe an enemy—and they are aware of the precision effects that can be immediately employed when seen—we dramatically change their behavior.

We know that aerospace systems give us more tools, but they don't automatically give us better answers. That's why humans need to stay in the technology loop. We know remotely piloted aircraft provide us reams of ISR data, but we need real-time analytic processing to make better decisions.

Similarly, we need to anticipate threats beyond those posed by combined arms, because our adversaries use any available means at their disposal. A short list would include cyber attacks, crowd sourcing, and distributed command and control—online.

Desired effects should determine our engagement methods, and force application is only one of a spectrum of options. In fact, an effects-based approach is a springboard for better linking military, economic, information, and diplomatic instruments of power to conduct security strategy in depth.

If we focus on combined effects warfare—the end of strategy, rather than force-on-force—the traditional means to achieve it, what we have become accustomed to calling combined arms warfare—we can consider more effective ways to accomplish the same goal more quickly than in the past, with fewer resources, and most importantly, with fewer casualties.

This joint concept should explain how the U.S. military could link information-age aerospace systems with sea and landbased weapons systems in ways that will enhance their combined effectiveness and compensate for the vulnerabilities of each.

A resulting ISR, strike, maneuver, and sustainment complex could be described as a "combat cloud" that uses information age technologies to conduct highly interconnected, distributed operations. The combat cloud concept is somewhat analogous to "cloud computing," which is based on using a network (e.g., the Internet) to rapidly share information across a highly distributed system of systems.

Instead of combining the computing power of multiple servers, however, a combat cloud would capitalize on C4ISR networks to rapidly exchange data across an all-domain architecture of sensors and shooters to increase their effectiveness and achieve economies of scale.

If enabled by secure, jam/intrusion-proof connectivity, a combat cloud may be capable of employing fewer modern combat systems to achieve higher levels of effectiveness across larger areas of influence compared to legacy operational concepts.

For example, instead of relying on traditional approaches that mass fighters, bombers, and supporting aircraft into major strike packages to attack particular targets, a combat cloud could integrate complementary capabilities into a single, combined "weapons system" to conduct disaggregated, distributed operations over a fluid operational area.

A distributed, all-domain combat cloud that is difficult to attack effectively and nearly self-healing if attacked would also complicate an enemy's planning and compel it to dedicate more resources toward its defense.

The "air combat cloud" requires treating and equipping every platform as a sensor as well as a "shooter" (defined as an ability to achieve a desired effect).

It will require a command and control (C2) paradigm that enables automatic linking as does cell-phone technology today (moving from one cell zone to another is transparent), and transfer of data seamlessly, and without need for human interaction within and/or between the air combat cloud nodes, plus it must be reliable, secure, and anti-jam proof.

We need to realize and exploit the advantages of modern aerospace and information age technology to build new costeffective concepts of operation. However, one of our challenges is that people still tend to view cost in terms of individual unit cost, as opposed to cost per desired effect that better reflects real value—and that is where we need to move the discussion and decision space.

We need to realize and exploit the advantages of modern aerospace and information age technology to build new costeffective concepts of operation. However, one of our challenges is that people still tend to view cost in terms of individual unit cost, as opposed to cost per desired effect that better reflects real value—and that is where we need to move the discussion and decision space.

We need to think beyond the constraints that traditional military culture imposes on new technology. For example, 5th generation aircraft such as the F-35 are termed "fighters," but technologically, they are not just "fighters"—they are F-, A-, B-, E-, EA, RC, AWACS-35s. They are flying "sensor-strikers" that will allow us to conduct information age warfare

inside contested battlespace whenever we desire—if we fully exploit their "non-traditional" capabilities to the degree that those capabilities become accepted as the new "traditional.

This will require leading-edge networking capabilities, and different approaches to solving our data bandwidth challenges. For example, to solve the explosion in data growth from new sensors, instead of building bigger pipes to transmit all the collected data, we ought to process the data on-board and only transmit what's of interest to the users. This approach inverts the way we do intelligence, surveillance and reconnaissance processing today—and it has the potential for doing so quicker, better, and cheaper.

To fully capitalize on these capabilities will require a new way of designing our force. We need to also realize that innovation can be applied to organization as well as from technology. We have to think outside of the organizational constructs that history has etched into our collective psyche. Network-centric, interdependent, and functionally integrated operations are the keys to future military success.

Airpower allows us to do that. It can be intertwined with, and contribute to all elements of power—diplomatic, informational, military, economic and social. But it requires a broader perspective than traditionally applied to airpower in the past—beyond a supporting arm in the combined arms equation. We need to seek being able to integrate aerospace forces with each of these elements in an interdependent manner.

We need to link aerospace and information-age capabilities with sea and land-based means to create an omni-present defense complex that is self-forming, and if attacked, self-healing. This kind of a complex would be so difficult to disrupt that it would possess a conventional deterrent effect that would be stabilizing to whatever region it is deployed.

The central idea is cross-domain synergy. The complementary vice merely additive employment of capabilities in different domains such that each enhances the effectiveness, and compensates for the vulnerabilities, of the others.

This combined effects approach is about integrating existing and future aerospace capabilities within an agile operational framework guided by human understanding. It's an intellectual construct with technological infrastructure.

The Evolving Dynamic Missile Threat: A European Response

06/17/2019

By Pierre Tran

Paris – Western allies face the threat of a wide range of Chinese and Russian ballistic missiles and cruise weapons, while North Korea and Iran look to their missile capability to back up claims to regional power.

The nature of the development of Chinese and Russian missile capacity is seen by some in European industry as threatening Western parity, by shifting the geostrategic and operational balance.

Ballistic missiles tipped with conventional warheads and designed to fly in an evasive terminal flight can be used as political and strategic tools as a factor affecting crisis management even without being fired.

Besides missiles to hit targets on land and at sea, Moscow has invested heavily in anti-access area denial (A2AD) or defense in depth, designed to hinder Western combat aircraft looking to strike Russian targets.

There are some in Europe who consider that enemy air defenses should be considered as a key challenge to be dealt with when France announces at the Paris air show a project for a technology demonstrator for a Future Combat Air System, which includes a new fighter jet.

The Paris Air Show is due to open June 17.

The West redeployed its combat aircraft in Syria out of harm's way when Russia sent its S400 surface-to-air missile to the Middle Eastern country. That was seen by some as a shift in the balance of power in Syria, with Russia winning the advantage point.

Moscow dispatched its advanced Triumph weapon system to Syria in response to Turkey, a Nato ally, downing in 2016 a Russian fighter jet.

China and Russia are both seeking to boost ballistic strike capabilities with development of faster missiles with greater range and maneuverability to overwhelm air defense systems and hit targets.

Those weapons can be launched from warships, submarines and fighter jets, intended to hit command centers and airbases.

A Chinese ballistic anti-ship missile, dubbed Dong Feng-21D could be fired against key naval targets such as aircraft carriers.

Russia is working to boost anti-access area denial (A2AD), with greater networks of detection and tracking to enlarge the geographical coverage of anti-missile defense.

Such a missile defense concept can be likened to the China Wall or Hadrian's Wall, built to protect the home territory from outside encroachment. Building up that Russian A2AD makes it harder to mount a surprise attack by stealthy enemy aircraft.

Meanwhile in Europe, France and Italy are upgrading the Aster 30, a land-based, surface-to-air missile, to the Block 1 NT version, to deliver a greater range of interception.

Other European air defense projects are understood to be planned.

On the strike side, Russian president Vladimir Putin said March last year that Russia was working on a nuclear-powered, hypersonic missile.

CNBC reported March 22 that Russia has been working on development of that weapon, dubbed Skyfall, since the early 2000s, drawing on a gasoline-powered motor for take-off and a nuclear-powered engine for flight.

But that missile will need work for another decade to be "combat ready," according to a US intelligence report, CNBC reported.

For countries seeking to secure regional power, ballistic missiles of short, medium and intermediate range are an affordable alternative to developing a jet fighter to counter Western air superiority.

One of the developments which has raised the threat is the shift to solid fuel from liquid propellant, as that makes it faster to prepare and launch the missile.

The short-range SS-26 missile uses solid fuel and is compatible with the intermediate-range nuclear force (INF) treaty.

Russia declared the 4-ton SS-26, dubbed Iskander, operational in 2007. That domestic version can fly 480 km, while the export model has a range of 280 km. Variants of the SS-26 arm China, Iran and Pakistan.

That missile is able to change course some 20-30 km from target to avoid interceptors, flying by its built-in guidance systems.

The SM3 has been deployed in Poland, with that US missile deemed to be capable of intercepting the SS-26 in certain parts of the country.

Meanwhile, French Air chief of staff Gen. Philippe Lavigne May 15 told the defense committee of the lower house National Assembly that France has "holes in its raquet" as its air defense system lacked capability against drones and other new threats.

The Nato program for an integrated Air Command and Control System (ACCS) is late, he said.

A plan, backed by France and its Air Force, has been drawn up to tackle the problems.

But those countries which opted for the F-35 joint strike fighter have not backed that plan, he added.

Nato has asked its Allied Command Transformation office to draw up options, so a decision on the ACCS program could be made by the middle of 2019.

ACCS is intended to link up into one network the various national command and control systems of some Nato members in Europe.

The featured photo is taken from the following source:

https://www.armyrecognition.com/russia russian missile system vehicle uk/s-400 triumf sa-21 growler missile russia air defense system.html

MBDA and FCAS: Building Weapons for the "Combat Cloud"

06/19/2019

By Pierre Tran

Paris Air Show 2019

MBDA, a missile builder, displayed at the Paris air show life-size models of concepts for cruise missiles and tactical smart weapons as options for the Future Combat Air System, a European plan for a new fighter jet and other weapons.

A Spear missile was also on show at the MBDA exhibition chalet, signaling the European company's targeting sales to operators of the <u>F-35 fighter</u>.

The UK's development contract for the air-to-ground weapon opened up a global market on the joint strike fighter and prospects on the British <u>Tempest</u> new air combat systems project.

These displays give a glimpse of weapons which might be used to outsmart the <u>anti-access, area</u> <u>denial systems</u> deployed by enemy forces.

For allies planning a deep strike mission, there are mock ups of concepts for subsonic and supersonic cruise missiles, potential replacements to the Storm Shadow/Scalp British and French weapons.

The former would weigh around one ton, fly more than 1,000 km to hit hard targets such as concrete bunkers and command centers.

The latter would have speed of Mach 2 and more, and offer agility in flight.



For tactical strike, there are models of Smart Glider and a powered version, Smart Cruiser.

The former would not have an engine and would be guided by a targeting system of infrared, laser and GPS. The latter would have a motor and range of some 200 km.

Both these would be part of the FCAS combat cloud, connected to fighter pilots and ground control, loaded with artificial intelligence for a target designator, with their use set by rules of engagement.

These weapons could be used as a "swarm" to saturate air defense systems such as the S300 or S400 missile.

The destructive power of warheads could be scaled up or down according to operational need, with the weapons small enough to fit six units on a contact point. That would allow up to 18 weapons on a Rafale, or four units in each of the internal weapons bay on the FCAS fighter.

MBDA invested company funds on studies for the Smart Glider, and a couple of countries are interested in ordering the weapon, an executive said.

There are also two types of small drones weighing 150 kg and 250 kg, dubbed remote carriers. These are derived from Smart Glider, and designed to carry sensors and "effectors" such as electronic warfare payloads to confuse or hit an integrated air defense system.

Such a powered, low-cost drone might emulate a Rafale, tricking the defense system and act as decoy. Speeds of Mach 0.75 to 0.9 on a small turbojet are envisaged.

Another type of concept weapon consists of a small anti-missile missile, a last chance "ultimate defense" a pilot would fire against an approaching missile.

This could be a "hard kill" weapon working on kinetic strike, and would be a complement to selfdefense tools such as chaff, flares and electronic jamming.

There could be at least four of these weapons, each weighing less than 10 kg and less than one meter long. MBDA is pitching the concept to Airbus and Dassault Aviation for the FCAS fighter.

The <u>Meteor missile</u> is also on show, and the reach of this long-range weapon could be extended. There are studies for an upgrade with a multimode seeker for future models.

MBDA signed up as a partner on the FCAS joint concept study led by Airbus and Dassault.

SAMI at the Paris Air Show 2019: Highlighting an L3 Partnership

06/19/2019



Saudi Arabian Military Industries (SAMI) has come to its first major air show by having a chalet at the 2019 Paris Air Show.

According to Arab News in an article published <u>June 12, 2019</u>:

Saudi Arabia Military Industries (SAMI) will participate in the 53rd edition of the International Paris Air Show, the world's premier and largest event dedicated to the aviation and space industry. The event will take place from June 17 to 23 at the Paris Le Bourget Exhibition Center in Paris, France. It will be officially inaugurated by French President Emmanuel Macron. The exhibition will be attended by SAMI's board members, executives and senior management.

Featuring an exhibit indoor booth and an outdoor chalet at the show, SAMI will showcase its portfolio of military products and services spanning four business divisions, namely aeronautics, land systems, weapons and missiles, and defense electronics. The company will also explore new business and investment opportunities and the possibility of forming new partnerships and agreements at the trade show, which is expected to attract nearly 350,000 visitors, as well as 2,500 exhibitors who will put their latest defense industries solutions and technologies on display.

And according to the <u>SAMI website</u>:

The vision for SAMI is as follows:

To be among the top 25 military industry companies in the world by 2030, combining the latest technologies and the best national talent to develop military products and services at par with international standards, and achieve the Kingdom's self-sufficiency in military industries.

And the mission is described as follows:

To develop cutting-edge technologies, manufacture world-class products, and provide high-quality services to scale up the military industries sector and secure necessary supplies for our clients

Second Line of Defense attended a major event involving SAMI in which they signed a keystone agreement on June 18, 2019 with L3 to work together on developing joint capabilities with Saudi Arabia. The SAMI officials at the ceremony highlighted the importance of the agreement and also the incremental approach to working on building out local capabilities in conjunction with L3.

According to the <u>Press Release</u> which followed the signing ceremony:

LE BOURGET, France

L3 Technologies (NYSE:LLL) announced today that it has signed a joint venture agreement with Saudi Arabian Military Industries (SAMI) to collaborate on electro-optical and infrared (EO/IR) and special mission systems projects within the Kingdom of Saudi Arabia (KSA). The contract was signed on June 18 in the SAMI Chalet during the Paris Air Show.

In February 2019, L3 and SAMI announced the signing of a Memorandum of Understanding (MoU) relating to the joint venture.

"Through this partnership, L3 will further establish a long-term presence within the KSA," said Christopher E. Kubasik, L3's Chairman, Chief Executive Officer and President.

"This venture with SAMI, which includes research and development, manufacturing, training and sustainment activities, represents a key milestone in the further development and execution of L3's international growth strategy."

"We are pleased to partner with L3 as we move towards our goal of creating a Center of Excellence in the Kingdom," said H.E. Ahmed Al-Khateeb, Chairman of SAMI.

"As we continue to support objectives tied to Saudi Vision 2030, this long-term partnership with L3 will help grow the sensor and mission systems industry while creating a comprehensive through-life support structure for our military customers."

L3 Technologies designs and manufactures industry-leading multi-spectral and multi-sensor EO/IR imaging and targeting sensor systems in addition to fully customizable mission systems for air, land and maritime vessels.

Together, L3 and SAMI will indigenously design and implement these advanced technologies and solutions for a variety of customer-specific applications from a Center of Excellence that will be established in the Kingdom.

This ceremony was a follow-up to the February 2019 L3 and SAMI announcement of signing a Memorandum of Understanding with regard to their joint venture on elector-optical and special mission systems projects within the Kingdom of Saudi Arabia.

With the coming of the new L3/Harris combined company, the SAMI partner can bring additional prospective capabilities to the evolving partnership.

The Ch-53K at the Paris Air Show: Preparing for Its Global Role

06/20/2019



By Robbin Laird

On June 18, 2019, the President of Sikorsky, Dan Schultz, himself a former CH-53-E pilot, provided an overview brief on the CH-53K and their offering for both Germany and Israel.

He was joined by John Rucci, Senior Experimental Test Pilot, who was in the Lockheed chalet, working with reporters on the CH-53 K flight simulator and by Beth Parcella, the Director of the International CH-53K program.

The briefing to reporters started with a focus on how the aircraft could perform in brownout and degraded conditions.

The video and the discussion by both Schultz and Rucci highlighted the capability of the aircraft to operate in very difficult operational conditions in a way neither the Chinook nor the E could do.

This is due to the fly by wire system onboard the aircraft and other digital tools which allow for stable flight in a wide variety of operational conditions.

This is crucial for the Marines as they transition from the land wars to operating in all climes globally and flying to the crisis rather than primarily focusing on Middle East operating conditions.

My visit to <u>MAWTS-1</u> last year in Yuma Arizona highlighted how significant the transition which the Marines are undergoing to deal with the strategic shift facing the United States and its allies, and clearly the K is being relied on as a key piece of the combat capability allowing the Marines to operate and prevail in contested combat operations.

The digital nature of the aircraft was highlighted in terms of how "big data" life cycle support was a key part of CH-53K operations.

Schultz noted that the Sikorsky experience with the S-92 was especially important in terms of providing the kind of reliability through data which the Ch-53K has as well.

The CH-53K has a built in HUMS or health management system which provides real time data on performance and maintainability, which provides the military customer with a significant advance over mechanical systems like the Chinook or the E, and which provide built-in operational and sustainability advantages.



I visited the <u>S-92</u> global management operation, and clearly, the S-92 has provided Sikorsky with key abilities to understand how to provide global support to operating aircraft in very different geographical situations as well.

Schultz spent some time highlighting the advantages of the K from the standpoint of maintainability or sustainability.

He noted that, for example, even though the gearbox on the K is much more powerful than that of the E, it operates with 40% less parts.

He noted as well that the aircraft was designed to make it more flexible in a number of ways.

He mentioned that because the flight controls are built into the seat, the aircraft adjusts to the pilot, rather than the pilot having to adjust his seat to operate the flight controls.

He mentioned as well the capability of the aircraft be carried by a large lift aircraft like the C-17 and being able to re-assembled much more quickly than a legacy system like the E.

With regard to international partners, the aircraft was very adjustable to the needs of new partners.

It is a digital aircraft with software upgradeability built in, and when I visited the Sikorsky facility in Connecticut last year, I talked with software engineers about the flexibility of adapting software to partner needs.

The offering to Germany provides an F-35 like partnership in which German partners would be providing parts not just to the German CH-53K but to the overall global program.



For Germany, the K clearly would be part of how they might adjust flexibility to the strategic shift facing the liberal democracies in dealing with the Russians.

For example, Germany needs to rapidly reinforce their Baltic brigade or move forces forward to reinforce Poland in a crisis.

Compared to Chinook, the K goes further, faster and brings a significantly greater combat load to the fight rapidly.

And flying with the A400 M or the C-130J, the ability to carry standard pallets means a rapid movement of cargo from an airlifter to the K to move support within an area of interest.

And the K is changing as well the meaning of what a support helo really is.

It is in an information or C2 asset through the nature of the cockpit and how information can be managed within the cockpit or delivered to the combat soldiers onboard the aircraft.

This means that for Germany, the K is already FCAS enabled, or able to operate in a combat cloud in a way certainly neither the E nor the Chinook can do.

In Germany, Sikorsky is partnered with Rheinmetall, a company with demonstrated capability to support ground combat forces, and which is investing in transferring that capability to the helo support domain.

The German MoD is looking for the replacement helicopter for the legacy CH-53s to be part of launch to a new sustainment approach.

The MoD is looking for innovative new approaches to sustainment, and certainly this is something which the US Navy and Marine Corps are investing heavily in, as evidenced by the <u>log demo</u> <u>team</u> operating in USMC Air Station New River.

In short, the US Navy and the USMC working with Sikorsky are making available to our core allies a significant 21st century combat platform, one which is tailored to work the concepts of operations required to support effectively the strategic shift which are forces face when facing 21st century authoritarian competitors.

For a look at our archive of CH-53K articles, see the following:

https://defense.info/system-type/rotor-and-tiltrotor-systems/ch-53k/

French Investments in Laser Weapons: ONERA at the Paris Air Show 2019

06/14/2019

By Pierre Tran

Paris – France is poised to invest 10s of millions of euros into research and development for laser weapons against space and land systems, with the funds to be directed to aerospace research office Onera and industrial partners.

"It is urgent for France to devote substantial and ambitious investments for the breakthrough and innovative technologies necessary for the realization of a laser weapon," Franck Lefèvre, director of defense programs at Onera, said June 12.

That funding for R&D would be for about five years, allowing first trials of a "pre-operational" laser weapon around 2025 if the research project received backing from the Direction Générale de l'Armement procurement office.

France ordered studies on lasers some 20 years ago and has since shown little interest. Onera, however, continued its studies and drew on its own funds until the DGA financed research four years ago.

The US and China have invested heavily in laser weapons technology, he said.

France now seeks to conduct studies for a laser which could used against spy and communications satellites, and the technology could also be used against land systems.

A French laser weapon might have a range of 400-600 km and be used to disable rather than destroy optical or communications satellites. The beams could be used to burn out solar panels and dazzle onboard cameras.

Onera has studied lasers using infrared beams, which are invisible.

The interest in lasers reflects a shift in French policy, with the armed forces minister, Florence Parly, pointing up the Russian space spy threat.

In a carefully prepared media event, Parly last year accused Russia of flying its Luch-Olymp satellite close to Athena-Fidus, to listen in on the Franco-Italian spacecraft used for military and emergency services communications.

"Trying to listen to your neighbours is not just unfriendly," she said Sept. 7 at the CNES French space agency, in Toulouse, southern France. "It is an act of espionage."

Parly also visited Airbus and Thales, which compete to build military and civil satellites.

MBDA is particularly strong in laser weapons, Lefèvre said. The missile maker is part of a consortium led by French laser specialist Cilas to conduct studies in a project, dubbed Tactical Advanced Laser Optical System (Talos), backed by the European Defense Agency. Cilas is part of Ariane group, a joint venture between Airbus and Safran.

The Talos research project may lead to European forces armed with laser weapons by 2027, said Antoine Bouvier, the then MBDA chief executive, business daily Les Echos reported Feb. 19. The funding may be small but the work is significant, he added.

The British unit of MBDA has a strong track record in lasers, Lefèvre said, while the French unit has teamed with Alphanov, a laser technology center, to set up a test bench at Bordeaux, southwest France.

MBDA and Alphanov formally opened March 27 a "vulnerability test facility," to fire adjustable laser power at various materials, the missile company said. The tests examine the best way to use lasers against threats such as aircraft, missiles, drones and warships.

MBDA is leading a British consortium to build a technology demonstrator for a laser weapon, dubbed Dragonfire, for the UK forces. The partners include Leonardo and QinetiQ.

France has some ground to catch up, as China, Russia and the US have pursued lasers and space military equipment for some time. Jamming satellite signals, burning out sensitive equipment, and using extendable arms to damage satellite equipment are among the weapons which could be used in space.

A laser weapon can be seen as part of the French bid to boost space military capability. The 2019-25 military budget law has earmarked €3.6 billion (US \$4.1 billion) for satellites for reconnaissance and communications intercept, and ground-based radar for tracking satellites.

Meanwhile, Onera has won work to upgrade Graves, allowing the ground-based radar system to track smaller and a greater number of satellites. The research office will also add an optical system to allow visual identification of spacecraft detected and tracked by its radar.

Onera will showcase its research skills at the Paris air show, which opens June 17. Among its exhibits will be a model of Dragon, a concept project for a "hybrid" electric and turbine-engine airliner, flying Mach 0.8 and carrying 150 passengers.

The research office secured 2018 business worth \notin 236 million (\$267 million), comprising \notin 105 million from government contracts and \notin 126 million of work for companies and organizations, \notin 1 million more in the latter in 2017.

That business flow was largely stable, with net profit of &2.6 million, helped by cost cutting, chairman Bruno Sainjon said in the 2018 annual report. Work for foreign clients, with a strong European presence, brought in &31 million, up from &24.1 million.

Onera secured €47 million of funding from the European Investment Bank to upgrade its wind tunnels, notably its large-scale, high-speed S1MA facility located in the Alps.

French Air Force's Renaissance

06/14/2019

By Murielle Delaporte

As the Paris Air Show gets ready to open its doors next week, one can only welcome the long-awaited sense of reconstruction the French Air Force is championing right now.

After decades of losses and base closures in the name of post-Cold war peace dividends and public policy optimisation, the sense of hope is palpable as defense budgets have been a bit steadier, while a neo-gaullist political support allows French Airpower to project itself in the XXIst Century with confidence.

Political Boost

The Future Air Combat System (FCAS) is of course at the center of the vision of the French Chief of staff of the Air Force, General Philippe Lavigne.

If such a project failed in the past to mature as a Franco-British cooperation one, the hope has been under President Macron to federate it at a European level with a Franco-German pillar as the foundation.

Since the letter of intention about the FCAS signed a year ago by French and German ministers of defense, Florence Parly and Ursula von der Leyen, several milestones have been completed.

The highlight occured last February with the granting of a joint contract for Dassault and Airbus to conceptualize the global architecture and the signing of an agreement between Safran and MTU to design a common engine for the next generation fighter.

Facing the F35 competition among European partners, the fact that Spain is being interested in joining FCAS is good news for the project, not only because of the political dynamics it embodies, but also because with a minimum of three partners, funding for parts of the long-term project can be triggered as part of the European Defence Fund.

Of course, we all know with European cooperation that the devil lies in the details, and only the future will tell what concretely comes out of the current political good will, given the recent European elections, the change of political actors and a slow economy.

However. no matter what happens over the course of the next twenty years when FCAS is supposed to be completed, the FAF trajectory – or "Flight Planning" as the French Chief of staff has labeled his strategy – is crystal clear and is on its way to reach a new scale.

Changing Scale

Like other advanced Air forces in the world, this « change of scale » is enabled by various "bricks," with space resiliency as a sine qua non condition for such a system of systems to operate.

Connecting the next generation fighter, first-line combat and/or jamming UAVs, missiles, various combinations of tankers and transport aircrafts, as well as ground and sea-based assets requires space-based reliance and autonomy as well as other non-space based communication and ISR redundant means.

The other crucial brick is the role of the new generation tanker, the one some French officers nicknamed the "Rolls Royce of all tankers," i.e. the Phenix A330 MRTT.

Having already being tested by the FAF through various exercises (such as last year's Pitch Black 2018 held in Darwin), exchange of pilots and on the battlefield in the Middle-East with her British and Australian counterparts, the new tanker is now part of the "31e Escadre aérienne de ravitaillement et de transport stratégiques (EARTS)" at Istres Airbase and is to be delivered to reach a full fleet of fifteen aircrafts by 2028.

Such an upgrade has been designed over the past years within the context of the French airbone nuclear component modernization, as the French tanker force is traditionally dedicated to the French Strategic Air Forces Command (CFAS for "Commandement des forces aériennes stratégiques").

But with the new tanker comes far more than a mere replacement for a forty year old fleet of C135. It actually kills three birds – or should we say "three enemy targets"—with one stone – flight – !...

It is meant to replace the French strategic transport fleet of A310 and A340; it is meant to replace the C135; but thanks to the cockpit configuration and hyper-connectivity revolution, it can also welcome aboard not only ISR experts (transferring in France from the world of Mirage F1 /Rafale reconnaissance aircrews), but also a true C2 capability.

As early as next year and with the delivery of the third Phenix, the new "Standard 2" which includes the L16-JRE constitutes a first step towards the future connected FAF and FCAS.

The simultaneous arrival of long-awaited tactical capacities on new generation air assets, such as the A400M, change the con-ops for the French Air Force.

As the Commander of the 31e Escadre, Colonel Sébastien, explained in my interview with him : "With the current developments under way (such as HD SATCOM), new Con Ops can be imagined by playing for instance on the complementarity of the A400M as a "tactical tanker" and the MRTT as a "strategic tanker". (...)

But these new capabilities can also allow the President to be directly in contact with the pilots during a long-range, long-endurance raid.»

Such an evolution – whether for an expeditionary raid (such as in Mali in 2013 or Syria last year) or ultimately a nuclear one – gives the political authority the option of reversibility, which is in itself a game changer in terms of credibility, and in the end, as far as the ambition for French sovereignty is concerned.

Talk about shrinking the OODA loop !

The featured photo shows a Rafale involved in the 2018 Pitch Black exercise.

An article published by the French Embassy in Australia last year highlighted the FAF involvement in Pitch Black 2018:

From the 27th of July until the 17th of August 2018, the French Air Force will participate to an Australian Biennial exercise called "Pitch Black". To get to the Oceania region, three Rafale of the French Air Force have covered more than 14,000km to arrive in Darwin, North of Australia, on Tuesday 24th of July. Recap of a four days journey.

D-Day: Departure from Al Dhafra

Arrived on the 20th of July on the Air base 104 of Al Dhafra in the United Arab Emirates (EAU), and escorted by a French C-135 tanker aircraft from Istres, the French Rafale started making their way to Singapore on the 22nd of July in the morning.

The crew formed of 4 pilots from Mont-de-Marsan Air Base & 8 pilots and navigators from Saint-Dizier Air Base were ready to leave. The other 40 airmen, in which, mechanics, commandos, logistics specialists, accompanied by a doctor traveled in an Australian KC-30 MRTT landed the night before on the Emirate Air base.

In the framework of a long-term co-operation between Air Forces of both nations, Australia has assigned a tanker aircraft to the French crews to participate to the travel of French Rafale from the EAU to the air base of Darwin where airmen of 16 different countries will train together.

At 6.30am (local time), the OK is given to the aircraft to take off. An early morning departure explained by technical reasons: "In the case of a long distance travel such as this one; the departure time is decided depending on the outside air temperature and the petrol carried in the tanker" explained Group Captain Arnaud Brunetta, Commander of the French contingent inside the "Pitch Black" exercise.

In total, more than seven and a half hours of flight have been necessary to the crew to reach Singapore. Carrying 5 tons of air freight and 44 military personal on board, with extreme temperatures, the KC-30 MRTT demonstrated an incredible endurance. In spring 2018, the Air Force will welcome its first MRTT which Operational Capability is schedule in 2019. This aircraft will replace the C135.

During the travel, three air-to-air refueling were successfully realized by the pilots of the 4th & 30th fighter squadron, the last one being realized in the Indonesian air space and a total of 31.5 tons distributed to the fighter aircrafts. It was a first! "In the past, Rafale have realized hundreds of air-to-air refueling on the Asutralian KC-30A, but only during war missions inside the Joint Operation Area of the Middle East and not as part of a convoy mission" explains Colonel Brunetta.

In order to ensure the safety of the flight and the smooth air-to-air refueling, the Commander Antoine, pilot of the Rafale and chief of the French detachment "fight" during the exercise, was supervising the manoeuvres side by side with the Australian crew in the cockpit, by being in constant radio contact with the French pilots.

Arriving in the Australian Territory

Tuesday 24th July: Last step of the convoy mission: from Singapore to Darwin. After an important briefing between French & Australian crews which allowed to determine different procedures.

It's 9am when the Rafale depart from the civilian airport of Singapore, followed by the KC-30 MRTT. "It's during this briefing that air-to-air refueling amounts are calculated, depending on potential alternates (landing site planed in case of emergency) and of course the safety procedures are reminded to everyone", added Captain Thomas, Rafale pilot.

At 10.10am happened the symbolic crossing of the equator. After a four and a half hour flight without issues over the Indian Ocean, the airmen landed on the Royal Australian Air force Base in Darwin, North of Australia. Only 2 air-to-air refueling were necessary to the aircraft to reach the Australian continent. They joined the CASA CN235 of the transport squadron 52 "Tontouta", of French Armed Forces in New-Caledonia also deployed for Pitch Black as well as other airmen who have arrived before in order to prepare for the exercise.

This article was first published on Breaking Defense on June 13, 2019.

Raytheon and Northrop Grumman Developing Hypersonic Cruise Missiles

06/19/2019

By Colin Clark

PARIS AIR SHOW

Imagine a swarm of up to 30 hypersonic scramjets the size of cruise missiles, launched from air, land and sea. They share data with each other, correcting their flights, perhaps changing targets midcourse. And they can be manufactured relatively quickly and for much less cost than most of the hypersonic vehicles that have been built so far.

If you were China or Russia, would you be uneasy?

"The Raytheon-Northrop Grumman team is quickly developing air-breathing hypersonic weapons to keep our nation ahead of the threat," Tom Bussing, Raytheon's VP for advanced missile systems, said in a statement.

That swarm description is what a new teaming agreement between Raytheon and Northrop Grumman, announced here today here, may lead to. This air-breathing scramjet will use aviation fuel, which is used in the Air Launched Cruise Missile. And Northrop Grumman has come up with technology and materials to 3-D print (additive manufacturing to the people who do it) the entire engine (the combustor), Beach Wilcox, VP for advanced programs at Northrop, told me today.

That should make for faster and significantly less expensive manufacturing. Of course, the missile has not flown yet. However, Bussing said the weapon has completed ground testing and will fly soon. How soon, he wouldn't say, saying the flight schedule is classified.

Aside from the much smaller size and different fuel on this hypersonic system, there is one other notable difference from most hypersonics work that has been done in the United States. "One of the things we've done is design this as a weapon from the beginning," Bussing said. That means they don't have to find space and power for sensors, guidance systems, data buses and warheads. Those are planned for and should be relatively easily integrated.

This was published by Breaking Defense on June 19, 2019.

Leonardo Unveils Falco Xplorer UAS at Paris Air Show 2019





By Andrew McLaughlin

Italy's Leonardo has unveiled the Falco Xplorer UAS, the largest remotely piloted system it has ever designed, at the 2019 Paris Airshow.

The Xplorer is the latest addition to the company's Falco line of UASs, and features a 350kg payload and an endurance of more then 24 hours.

It features SATCOM for beyond line of sight communications, and a maximum takeoff weight of about 1,200kg.

Leonardo says the air vehicle, sensors and mission system have been designed entirely in-house, and that the system is readily exportable without restriction and without being subject to International Traffic in Arms Regulations (ITAR) restrictions.

"Leonardo invests continuously in new capabilities to ensure we position the right products in the right markets", Leonardo CEO Alessandro Profumo, said at the Xplorer's unveiling in Paris.

"The Falco Xplorer is designed to be extremely competitive in its category, building on the experience we've gained working with Falco family customers over a number of years and our Company's strengths in the unmanned domain.

"By understanding and being able to meet our customers' needs, we expect to increase our share of the unmanned systems market."

Leonardo plans to certify the system to operate in non-segregated airspace and to meet NATO STANAG4671 for operation in NATO militaries, and is pitching it to military as well as civil agencies such as coast guards and emergency responders.

This article was published by Australian Defence Business Review on June 19, 2019.

The Challenge of the KC-46

06/19/2019 By Colin Clark

PARIS AIR SHOW

While Air Force acquisition chief Will Roper says he's confident that Boeing's leadership is serious about fixing the problem with foreign objects being found in the KC-46 planes, he made clear to reporters that the company must persist and change at a cultural level.

"You can't just issue a memo," and expect workers to make decisions to stop a production line, something that costs the company money, Roper told reporters yesterday. Boeing needs to offer bonuses to employees who act to stop the line <u>when</u> they find FOD and reward them in other ways, he said.

Production of the airplane, which the Air Force very much wants to fly in numbers, is down from three per month to a little over one per month. Also, Roper said it will be "several years" before solutions to the flawed Remote Vision System, used by tanking crew to steer and manage tanking, will be ready.

He also indicated talks are ongoing with Boeing about who will bear what costs and how high those costs will be. Most cost overruns — over \$3.5 billion so far — on the KC-46 will be borne by Boeing under the fixed cost contract it signed, including the RVS.

However, the Air Force had to make requirements changes for the boom. Those are likely to be borne by the government since the service changed the requirements.

This was published by Breaking Defense on June 18, 2019.

Future Combat Air System : A Speed Race Between Data and Fighter

By Murielle Delaporte

Data fusion and the magic of connectivity have entered the Paris Air Show's arena with a fury this year.

Sliding touchscreens and demos at Dassault, Airbus and Thales all make one feel as if one is part of a « Mission Impossible » debrief.

And indeed, many could feel that the FCAS, only launched a few months ago, is Mission Impossible when one focuses on the resources to be jointly allocated by France and Germany, i.e. 4 billion dollars by 2025, in comparison to the very large US defense budget.

With Next Gen Fighters Come Next Gen Engineers

The concept however allows to « *build on what already exists till 2025 in order to evolve towards the Next Generation Fighter or NGF by 2040* », as pointed out by a Dassault executive.

What exists at this time is the ability to construct FCAS brick by brick on a five pillar foundation :

- The fighter itself with Dassault as leader;
- The system of systems with Airbus and Thales;
- Remote carriers (such as drones and missiles) with Airbus and MBDA;
- Propulsion with Safran and MTU probably;
- And simulation with Airbus and Thales as well.

The first phase for Dassault is to go ahead with the upgrade of the Rafale towards the F4 standard by 2025 and evolve, in Dassault's view, towards a « super Rafale » / « super F22 » crossbreed.

At Dassault, there is a saying that « what is beautiful flies well.»

And indeed, the model displayed at the Dassault military stand is a true beauty.

The NGF, meant to replace the old Mirages 2000 and early Rafales, but also – it is hoped – the German Typhoon Eurofighters, as well as the Spanish F/A-18, is to keep the Rafale spirit and polyvalence/

It will remain multi-mission, and for the French including nuclear) and joint with the Navy as a playoff of the next gen aircraft carrier, but with a clear focus on maintaining air superiority in an increasingly contested and anti-denial environment.

The NGF must therefore be more poweful than the Rafale and remain manoeuverable. Hence the choice to keep two small tail fins, a compromise made with the willingness to increase stealth.

Regarding the latter, it is thanks to the research made around the Neuron UCAV program (done in cooperation between France, Spain, Greece, Italy, Sweden and Switzerland) in the past decade that serious progress are said to have been made.

It is also thanks to the Neuron program that Dassault has been able, in spite of all the lean years at the end of the 2000's, to keep its designer and engineer teams alive and to make sure that they are today « ready for the future » and the FCAS.

A welcome program also from that point of view, as being able to hire next generation engineers ensure the renewal of the current one soon to retire...

The Challenge of Speed

What is new at le Bourget this year is however the new awareness that, well, « *the times, they are a-changing* » and that FCAS is not only about the NGF, but about the connectivity between everything that can fly.

The challenges are of course multiple, as the tactical combat cloud must allow the shooter to react faster – or at least as fast as – the speed of the data flow coming to him at an increasing speed.

The other challenge, highlighted by an Airbus commentator, is of course to be able to operate in a degraded environment, hence the focus on space and remote carriers such as drones which could be launched from an A400M as a first line of offense to neutralize enemy air-to-air or jamming capabilities.

A system of systems approach already familiar conceptually, but which seems to finally come to life – full speed indeed - at this year's Paris Air Show with the display of key elements, such as the Phenix MRTT (the second one that the French Air Force is about to receive and that can be visited in its EVASAN configuration at Airbus static booth).

FCAS does not look like Mission Impossible anymore, as long as the European players do not self-destruct and replay the 1980's all over again.

The Next Phase of Airpower Transformation for the UK: Putting Team Tempest in Perspective

06/17/2019

By Robbin Laird, Research Fellow, The Williams Foundation, Canberra, Australia

At the Farnbourgh Air Show last year, then Defence Secretary Gavin Williamson, highlighted the new UK Combat Air Strategy and with it the launching of Team Tempest.

The focal point of his presentation on July 16, 2018 was the goal of developing a next generation fighter.

The UK MoD story published that day explained the initiative.

The concept aircraft has been put together by British firms including BAE Systems, Leonardo, MBDA and Rolls-Royce, which have joined together with the RAF Rapid Capabilities Office to form 'Team Tempest' to pursue the opportunity.

Team Tempest brings together the UK's world leading industry and sovereign capabilities across future combat air's four key technology areas: advanced combat air systems and integration (BAE Systems); advanced power and propulsion systems (Rolls-Royce); advanced sensors, electronics and avionics (Leonardo) and advanced weapon systems (MBDA).

The MOD will now set up a dedicated team to deliver the combat air acquisition programme.

They will deliver a business case by the end of the year, and have initial conclusions on international partners by next summer – with engagement with potential partners beginning immediately.

Early decisions around how to acquire the capability will be confirmed by the end of 2020, before final investment decisions are made by 2025. The aim is then for a next generation platform to have operational capability by 2035.

The UK is already a world-leader in the combat air sector, with a mix of skills and technologies unique in Europe, supporting over 18,000 highly skilled jobs. The sector delivers a turnover in excess of £6bn a year and has made up over 80% of defence exports from the UK over the last ten years.

Investment in combat air technology, combined with the strengths of UK industry, has resulted in the UK being the only Tier 1 partner with the US on the F-35 Lightning II programme, with British industry delivering 15% byvalue of every F-35 built. The UK has been able to help define the operational capabilities of the aircraft, while reinforcing UK industrial capability, critical skills and supporting wider economic prosperity.

The UK also continues to lead the way in combat air power as one of the four partner nations in the Eurofighter Typhoon programme. With more than 20,000 flying hours on deployed operations to date, the Typhoon delivers world leading capability, unparalleled reliability and proven interoperability with our allies. The MOD will continue to invest in the Typhoon for decades to come, with the best technologies being carried forward on to next-generation systems.

The F-35 Lightning II and the Typhoon are two complementary multi-role combat aircraft that will make up the RAF's combat air fleet, placing the UK at the forefront of combat air technology – with the Typhoon expected to remain in UK service until at least 2040.

The problem posed by having at the vortex of this launch a new combat aircraft is that really the main thrust of the way ahead for the decade ahead is not really about that – it is about evolving new capabilities which flow from the Typhoon-F-35 integration effort and from the work with global F-35 partners on weapons and remotes.

At some point, I am sure a new combat platform will emerge from this, but the focus here is clearly quite different from the Franco-German announcement which focused clearly on the need to launch a new fighter and to use that launch point as the iron magnet to draw together the strands of airpower modernization.

In meetings last Fall and this Spring in London, it became apparent that the British approach to FCAS is very clear – leverage the Eurofighter/F-35 dyad to figure out what to do next in the air combat development area. it is clearly about leveraging the dyad of Typhoon and F-35 to shape a decade or two of innovation and to leverage that UK, allied and partner development process to deliver what is to come next.

It was pointed out in private meetings that the UK was following what they saw as the USAF lead whereby the USAF was not committing itself to a sixth gen aircraft but to leveraging fifth gen with unmanned with the legacy fleet and weapons modernization to sort out what comes next.

The Brits with whom I met underscored that Team Tempest was not necessarily targeting a new build combat air frame, but really trying to leverage the innovations of the next decade to position UK industry to build, shape and craft the capabilities needed in the 2030s and 2040s.

Rather than having a clear commitment to a future combat fighter, it was a commitment to building out air combat capabilities to the point where new platform decisions could be taken.

But these decisions would be taken as the only Tier One partner in the F-35 with a 15% stake in the global program. This is a very different approach being proposed by France and Germany and allows Britain as well to work with the very significant F-35 global community, which might well join in a broader leveraging strategy with the RAF.

In my view, the core thrust of UK efforts to shape a way ahead are a function of six interactive efforts or dynamics which can be seen in the graphic below.



I will focus on each of these key aspects in separate pieces, but start in reverse, namely by looking at the Team Tempest dynamic.

TEMPEST PROGRAM SPONSORED TECHNOLOGY DEMONSTRATORS: THE NEED FOR A UK PLAN JERICHO

In effect, Team Tempest is focused on generating effective technology demonstrators from UK defense industry working closely with the government. Although identified as focused upon replacing Typhoon at some point, the reality is that leveraging the Typoon-F-35 dyad is really the point.

And the evolution of the effectors flowing form this dyad in my view will define what comes next in terms of a fighter aircraft. The potential advantage which the UK has comes through its two, coalition developed and operated aircraft.

On the one hand, Typhoon allows for reachback into the continent and working relationships with Italian, German and Spanish industry. And provides ways to work with the Franco-German FCAS imitative.

On the other hand, the F-35 global enterprise fits much better the "Global Britain" thematic which comes out from the Brexit dynamic.

As sense of what <u>Team Tempest</u> is about was provided by an announcement of a Team Tempest Industry Day in Farnbourgh.

Companies from across the UK defence industry came together in the first opportunity for suppliers to engage with the Government and Team Tempest partners over the future of Combat Air System development in the UK.

The event in Farnborough was launched by Minister for Defence Procurement, Stuart Andrew, and saw 300 delegates including SMEs and technology-led organisations attending to build connections and take part in a series of briefings outlining the capabilities and skills needed to shape the future of Combat Air System delivery in the UK.

The Tempest programme aims to harness and develop UK capabilities that are critical for Next Generation (NextGen) Combat Air capability and to retain the UK's position as a globally competitive leader through understanding of future concepts, technologies and capabilities.

Hosted by Team Tempest (a co-funded technology initiative bringing together the Royal Air Force Rapid Capabilities Office, Dstl, DE&S, BAE Systems, Rolls Royce, Leonardo and MBDA) and facilitated by ADS, the event offered a briefing for UK industry to better understand the Tempest programme and its role in supporting the UK MoD's Combat Air Strategy and was followed by a separate, classified briefing.

The Tempest programme will directly inform the UK's acquisition programme to succeed Typhoon. Representatives of the acquisition team were on hand at the event to explain their programme and how it interacts with the Tempest programme.

ADS Chief Executive, Paul Everitt, said: "The UK's future Combat Air capability is essential for our national security and the long-term health of the UK defence industry.

"It is great to see Team Tempest reaching out to the wider UK industry and ensuring this important project is a genuine national endeavour. The UK has world leading capability and a diverse range of businesses with the experience and expertise to support this important work."

Obviously for a post-Brexit Britain, the financial and working relationships necessary to achieve a broader global success will be challenging.

And the launch of Team Tempest around a next gen fighter model was nice, but I would argue also perhaps a bit ahead of itself.

I would argue that the Typhoon-F-35 dyad and leveraging that dyad through innovations in weapons, remotes and training will be the key definer of the way ahead.

This would suggest that perhaps complementing or supplanting Team Tempest might be a UK focused Plan Jericho.

The brilliance of the Aussie Plan Jericho launch was precisely because it was NOT technology centered. It has been focused on how to build a fifth-generation force; how to build an integrated, fifth generation enabled force. It is con-ops oriented interactive with considerations of technology and organizational innovation.

The danger is that the defense industrial base will drive the options, rather than the UK force transformation necessary for the force driving what one would want from a defense industrial base undergoing significant change with the twin impacts of Brexit and the F-35 global enterprise underway.

Precisely because the carrier is a disruptive technology and seriously challenges the UK's ability to integrate air-sea and insertion forces, and certainly raises fundamental questions with regard to how the civilian leadership will use such a capability in a crisis, the focus needs to be on how to manage a way ahead with the 0-5 military or rolling FYDP as the military builds near term capabilities which prepare it fight more effectively rather than more graphics or mock ups on what the next generation fighter might look like.

The blunt fact is that the next two decades of leveraging the F-35 global enterprise will be a key driver in whatever comes next.

And frankly, neither I nor anyone else really knows where the successes and failures will be and the openings which will have to be filled in real world combat.

Putting FCAS Into a Broader European Political Context: The EU, Brexit and Shaping a Way Ahead

06/20/2019



By Pierre Tran

Paris – French and German defense ministers attended an unveiling of a mock-up of a new fighter jet at the Paris air show, even as the two countries compete to fill top jobs in the European Union, and the UK Conservative party limps toward selecting a new prime minister to steer an exit from the EU.

French president Emmanuel Macron and German chancellor Angela Merkel are attending June 20 an EU summit of the European Council in Brussels, seeking to agree on a series of key appointments in leading EU institutions.

Previously, France and Germany agreed to support the same candidates but Macron and Merkel are jostling to field their respective candidates.

There is much to play for, as these senior posts will steer future EU policy, which includes European defense.

This will be the last EU summit for Theresa May, who is stepping down as British prime minister and handing over the task of negotiating Brexit to her successor.

The political appointment is widely expected to be Boris Johnson, who has garnered the most votes in a secret ballot by Conservative party legislators. Paid-up members of the Conservative party, estimated at 160,000, will then get to vote on the two candidates.

That raises the prospect of Johnson moving into 10 Downing Street as the next prime minister, and becoming the political decider on issues such as whether to cooperate with European military projects pursued across the English Channel.

Johnson has campaigned as a fervent supporter of Brexit, insisting on leaving the EU on Oct. 31, whether there is a negotiated deal or not.

Then again, Johnson has also, in a televised debate with Conservative party contenders, fudged on whether he would indeed observe that deadline for departure.

Johnson might one day be asked to consider whether London will bring the British Tempest future fighter jet project closer to the future combat air system (FCAS), in which Berlin, Paris and Madrid have signed up to build a new European fighter.

The competition between France and Germany to appoint senior EU officials includes presidents of the European Commission, the executive arm; European Council, the political forum; European Central Bank; and European parliament.

There are also top jobs to be filled at the EU foreign policy unit and the EU's recommendation for the next NATO secretary general.

The EU is gearing up to take an active role in defense and security, with the creation of the European Defense Fund, intended as a means to channel investment into research and development of military technology.

The European Parliament will have a word to say as the European members of parliament, fresh from elections last month across the 28 member states, have to the right to endorse the selection of the European Commission president. That endorsement grants political power to the EP, in a bid to respond to criticism of a "democracy deficit."

British voters took part in the European parliamentary elections last month, and the UK is due to leave on the date which coincides with Halloween.

The featured photo is taken from this source:

https://www.euractiv.com/section/eu-elections-2019/news/france-and-germany-still-wrestlingover-eus-future-top-jobs/