

# The Future Combat System: An Overview



8/1/21

A Second Line of Defense Overview on the Standup and Evolution of the FCAS

In this report, we have brought together our FCAS articles from both *Second Line of Defense* and *Defense.info* published since its standup in 2018 and covered through the Bundestag Budget Committee's Green Light on funding for the program in June 2021.

Report Authors: Robbin Laird, Murielle Delaporte and Pierre Tran

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## A SECOND LINE OF DEFENSE OVERVIEW ON THE STANDUP AND EVOLUTION OF THE FCAS

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## PREFACE

The Future Combat Air System (FCAS) is a core initiative of the Macron Administration for both defense modernization and building out defense cooperation with its core Airbus allies, Germany and Spain. The Administration is committed to the modernization of their core combat fighter aircraft, the Rafale, for the next thirty years. But FCAS is designed to deliver a next generation fighter aircraft.

This project is designed to replace both the Rafale and the Eurofighter with a “combat cloud” ready aircraft, that is one designed to work interactively with other air assets in delivering the desired combat effects.

It is a clear response to what the Macron Administration views as the F-35 challenge to European sovereignty. And indeed, European sovereignty is a key part of the Macron version of Gaullism, much like the General launched the independent nuclear deterrent.

At its core, the goal is for Germany and France to work closely together in shaping this new collaborative venture. But the significant disconnect between defense in Germany and France poses a core challenge to the project. And different approaches to arms exports also affects the program and its future.

Even more significant is the pressure of time. Europe is being challenged by Putin significantly. Does Europe have time to wait for enhanced sovereignty in exchange for enhanced defense capabilities in the near to mid-term?

The F-35 is already a significant player in European defense and will steadily enhance its role in the multi-domain defense being shaped by NATO. The interoperability efforts of NATO are a key part of the Macron Administration’s approach to defense as well, so FCAS will be designed to work with core allies as the program evolves.

But there is a major challenge facing networking in defense, as several initiatives are underway to shape secure communications for the combat force, and some of those clearly are designed to leverage new civilian technologies like 5G.

In this report, we provide our assessments of the standup and evolution of the program over the past three and half years.

## THE FUTURE COMBAT AIR SYSTEM: THE VIEW FROM PARIS

By Pierre Tran

November 26, 2018

The French government and industry are in negotiations for a budget to upgrade the Rafale fighter jet to an F4 standard of higher capability, and also funding for architecture and concept studies for a next-generation fighter, a source close to the talks said.

The planned Rafale F4 encountered “a major difference in the negotiations,” said the source, who declined to be identified.

A contract is due to be signed in December.

A benchmark for the F4 budget could be Britain’s £2 billion (\$2.6 billion, €2.3 billion) funding for development of its Tempest future fighter.

### France Leads FCAS Effort

France and Germany plan to sign early in the new year a contract for architecture and concept studies for a next-generation fighter jet to replace Rafale and Eurofighter Typhoon, the defense ministries of the two nations said Nov. 21 in a joint statement.

Dassault Aviation is prime contractor on the Rafale and will also lead on the successor fighter, which carries a project name of Next Generation Fighter.

Spain, which will join that fighter project, expects to see a share of industrial work, the source said.

Germany has agreed France will lead the fighter program.

That future fighter is effectively an attempt to maintain a European industrial capability in response to the arrival in Europe of the Lockheed Martin F-35.

“If we don’t do something, we’ll be toast,” said the source.

“It is a matter of timing.

“We need to define requirements, we need to launch the research contract to have a plane by 2040.”

The budget for the architecture and concept studies for the future fighter is estimated to be worth some tens of millions of euros.

Dassault and the French procurement office, Direction Générale de l’Armement (DGA), declined comment on the budgets.

### The F-4 Upgrade

Meanwhile, the planned Rafale F4 version will be equipped with a Multi-Function Array, combining radar, electronic warfare and communications.

Thales worked on the MFA in a feasibility study for the Future Combat Air System-Development Program.

Other F4 features include satellite communications, internet connectivity and armed with the MBDA Meteor very long-range, air-to-air missile and a midlife upgrade of the Mica air-to-air weapon.

There have been studies for the F4, with “several ideas on the table,” the source said.

The Rafale F4, along with a mid-life upgrade of 55 Mirage 2000D, will form the “legacy” fighter fleet for the French Air Force in an initial phase spanning 2020-2030.

In the 2030-40 period, a key feature will be the planned airborne nuclear-tipped missile dubbed Composant Nucléaire Aéroportée, successor to the ASMPA weapon.

For 2040 and thereafter, there will be a Next Generation Fighter (NGF) and legacy Rafale, with those aircraft flying in a system of systems, dubbed Future Combat Air System.

#### The Next Generation Fighter

France has signed a partnership agreement with Germany on the FCAS project.

Dassault displayed a reduced scale model of the NGF at the Euronaval trade show, held October 23-26.

The fact the model, which is not a definitive and final version, was shown at Euronaval signaled that the French version of the future fighter will fly from an aircraft carrier which will one day replace the Charles de Gaulle capital ship.

France and Germany signed April 26 at the ILA Berlin Airshow a cooperative agreement setting out high-level common requirements for a new fighter jet.

That pact paved the way for French and German officers to work on a government-to-government contract due to be signed in January, the source said, adding that Spain has taken part in the talks.

A task force, formed Jan. 1 and comprising the French Air Force and DGA, submitted its report to the office of President Emmanuel Macron in September, setting out the issues, technology and industrial road map.

Urgency is seen as the F-35 is arriving among European allies.

France is leading on the FCAS project, having agreed to German leadership on a future tank, dubbed Main Ground Combat System, and a planned European medium-altitude, long-endurance drone.

Since the summer, French and German officials have held talks to reach a detailed agreement on requirements and a common road map.

The plan is to launch the Franco-German fighter program in 2020.

France is keen to enlarge as much as possible its cooperation with Germany, beyond building a common fighter, and to agree to a broad concept of a Next Generation Weapon System.

The French Air Force, DGA, Dassault, MBDA, Safran and Thales are working together to study concept of operations, and research and technology.

Concept studies have been drawn up, drawing on DGA technology studies, lessons learnt on the Neuron demonstrator for an unmanned combat aerial vehicle, and work on the Future Combat Air System-Development Program conducted with the UK.

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Those studies focus on missions and threats, pitching systems against systems rather than fighter against fighter.

### A Team Approach to Air Combat Superiority

The concept is that the aircraft will work together, connected and exchanging information over an internet grid.

There will be manned, unmanned aircraft and “objects” flying in the skies, all hooked up on a network.

This focus on an overall system of system is seen as a different approach to the U.S. focus on an aircraft, the F-35, which is hooked up to other units through the network.

A key element of the French concept is a fleet of small drones, dubbed mules, flying ahead to detect and jam the enemy, and clear the way for the manned fighter.

The fighter jet will link up with satellites, AWACs spy aircraft, aircraft carrier, ground troops and command centers.

The planning is based on two conceptual circles, with the first circle comprising Rafale and next-generation fighter, future cruise missiles and future anti-ship missile, unmanned aerial vehicles, unmanned combat aerial vehicles, and “remote carriers,” which will be manned aircraft working with drones.

The second circle will include electronic warfare aircraft, AWACs and its successor, satellites, aircraft carrier task force, ground troops, and command and control centers both airborne and on the ground.

Hooking all these up will require a successor to the Link 16 communications network and the French Air Force is working on how to evolve the existing system to the next-generation FCAS, the source said.

The concept is to share tasks among the mix of aircraft so the fighter does not need to master every mission, the source said.

There will be high degree of stealth.

A British Role?

Meanwhile, the UK has announced its Tempest project for a future fighter, reflecting its air superiority requirement.

Tempest is intended to maintain British industry, said the source, adding that the announced £2 billion budget for development out to 2025 will not be enough.

Britain is expected eventually to be a partner on the Franco-German FCAS project.

“The door is never closed,” the source said.

### Companies and FCAS

Airbus and Thales are reported to be competing to be system architect for FCAS, a key role in shaping the overall program.

France has invested a great deal in Thales, seen as a champion in connectivity and aeronautics, the source said. A formula will be found that satisfies the competing claims. “Each has its capability,” the source added. “Airbus will not lose out.”

Under French leadership, French and German companies have worked together with much effectiveness in the FCAS project, and presented to the authorities of the two nations their ambitions for FCAS, the French and German ministries said in the Nov. 21 joint statement.

The ministries have agreed that Airbus and Dassault will share leadership on a joint concept and architecture study for FCAS, with internet connectivity part of the latter study, the ministries said. The two countries will sign that contract in early in 2019.

Contracts for studies for research and development, and demonstrators will be signed at the 2019 Paris Air Show, the ministries said.

French engine builder Safran will take the lead in developing the engines, with German MTU Aero Engines as subcontractor, business website La Tribune reported.

### F-4 Technology as a FCAS Building Block

Meanwhile, the DGA qualified Oct. 31 an F3-R standard for the Rafale, allowing the fighter to be armed with the Meteor very long-range, air-to-air missile, and carry the Thales Talios laser targeting pod, the procurement office said in a Nov. 8 statement.

The Meteor weapon will be hooked up with the active electronically scanned array RBE2 radar. The Talios pod aims to boost detection, recognition and identification of targets in day and night, seeking to deliver highly accurate air-to-ground strikes.

A laser-guided version of the Safran AASM powered smart bomb will also arm the F3-R, Dassault said in a statement.

Upgrades of the 144-strong Rafale fleet to F3-R began in October, with a first batch of 10 F3-R aircraft to go to the Air Force and Navy for operational trials, the DGA said.

Four of those units will be delivered by the end of this year.

French export sales of the Rafale to Egypt, Qatar and India are based on the F3-R standard.

Work on the F3-R standard drew on operational experience, particularly for fitting the AASM, the DGA said.

Interoperability and regulatory requirements were also factored in. Dassault, Thales, MBDA and Safran signed in 2014 the contract for F3-R, on a budget of some €1 billion.

“The Rafale continuous improvement approach is now looking to the F4 standard, development of which should begin soon, after completion of the ongoing feasibility studies,” Dassault said.

“This future standard will notably improve the connectivity of the Rafale and its ability to operate as part of a network.”

Technology in the F4 is seen as a building brick for the FCAS project.

The UK suspended the bilateral FCAS-DP project with France due to uncertainty over Brexit, Britain's departure from the European Union on March 29, 2019.



## EXTENDING COMBAT AIR CAPABILITIES WITH UNMANNED SYSTEMS: AN AIRBUS DEFENCE AND SPACE PERSPECTIVE FROM THE INTERNATIONAL FIGHTER CONFERENCE 2018

By Robbin Laird

November 27, 2018

At the 2018 International Fighter Conference held in Berlin from November 13-15 2018, one of the topics for presentation and discussion is the European concept and approach to what is being called the Future Combat Air System.

Here the target is to shape a new combat system by 2040, which will drive change in both European industry and force structure.

The presentation by Bruno Fichfeux, Head of the FCAS Programme in Airbus Defence and Space, focused on a key building block in the FCAS trajectory, namely working manned-unmanned teaming.

As Airbus Defence and Space already builds and supports two key non-fighter elements for a 21st century combat force, namely the A330MRTT and the A400M and is working through 2 “big wing” potential contributors to the integrated battlespace, namely: The EuroMALE Unmanned Air Systems and the A320neo multi-mission aircraft, it is clear that a core opportunity for Airbus Defence and Space rests on shaping FCAS as a business approach for legacy as well as newly introduced combat systems.

The manned-unmanned teaming research and approach clearly can do both, namely, build towards a new combat fighter capability in the 2040s and support the evolution of air combat fleets, whether operating legacy or fifth generation assets.

In his presentation, Fichfeux argued that manned-unmanned teaming would be increasingly part of the combat air space and function as remote carriers. The manned and unmanned assets would collaborate in the battlespace and be connected through a combat cloud ecosystem.

At the heart of the ability to shape such a future, software needs to be developed which allows for manned-unmanned teaming and as that software evolves, the capability to manage swarming and its effects would become part of the combat force.

He underscored that although the vision is futuristic, the needs are not.

And he mentioned in his brief that Airbus Defence and Space had recently demonstrated the manned-unmanned teaming approach in a dynamic display to a wider audience in order to visualize the obvious benefits it has for air warfare already today.

After his presentation, I had a chance to sit down with Bruno Fichfeux to discuss the experiment and how that experiment laid down a building block for the future. He explained that Airbus Defence and Space put a core software development team together to work the integration necessary for a manned aircraft to work a team of remotes to execute a variety of missions.

The focus was upon the pilot in the cockpit setting the tasks and passing that task off to the swarm of remote carriers, which then would distribute among themselves and execute the task or mission autonomously.

The team worked for a year preparing for the experiment, which was conducted in the North of Germany over the Baltic Sea and the experiment was conducted a month ago. The team used off the shelf drones and equipment; the focus was on the software development.

Five drones were flown in formation flight with a C2 manned aircraft, which provided real time mission tasking.

“The pilot is not piloting the drones; he is just giving the swarm a High level command which then sort out their mission allocation among themselves. You give the machines the task; and then it executes the task.”

As the tasking requires only a minimum of attention from the pilot the teaming has far more benefits than costs.

Customers were invited to the experiment and invited to set unplanned tasks during the course of the experiment underscoring the flexibility of the software rather than having a scripted pre-programmed event.

The capability demonstrated by Airbus Defence and Space is a core one for them going forward.

Rather than being considered primarily a platform company, with the FCAS transformation process, software development, integration and evolution of a team of combat assets becomes a core focus of attention.

While the tangible part of Remote Carriers is expected to be relatively simple in architecture and as such affordable and potentially attritable, the Remote Carrier’s brain and behavior will be the valuable game changer on the battlefield.

And given the company’s significant capabilities in a variety of lift, tanking, ISR and C2 platforms already, clearly these platforms and their evolution and the formulation of a new platform approach will be informed by this core software development and integration capability.

Teaming capability in the connected battlespace is a core competence being worked by Airbus Defence and Space, and they will work as well to inform Eurofighter evolution as well with these new and evolving capabilities.

In the past, Airbus Defence and Space had worked the Barracuda program, performing the first “European made” Unmanned Air System mission on air which was designed to provide Eurofighter with an unmanned partner.

This experiment built on that effort to extend it to the swarming environment.

Fichefeu underscored the importance of working non-stove piped software approaches so that cross-domain interoperability would be enhanced.

“By developing common cross-domain mission systems software for manned and remote air platforms, we can get the kind of interoperability we need and is a core goal of the FCAS program.

“The platform is much less relevant than the teaming capability and intelligence you put into it; and the way you allocate the performance among the manned-remote capabilities as a system.”

He added a key point:

“Following this rationale, many existing airframes can be transformed into Remote Carriers and taken into real missions where they reduce the risk for the legacy manned assets already tomorrow.”

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## THE FRENCH SHAPE AN EVOLUTIONARY APPROACH TO THEIR FUTURE COMBAT AIR SYSTEM

By Pierre Tran

March 6, 2019

In a story first published on [February 29, 2019](#), Pierre Tran provided an overview on the proposed F-4 Rafale upgrade program.

French Armed Forces minister Florence Parly announced Jan. 14 the award of a €1.9 billion (\$2.2 billion) development contract to upgrade the Rafale fighter jet to an F4 standard, while evoking national sovereignty, operational capability and exports as key factors.

That budget was agreed after close negotiations between government and industry, a source close to the talks said.

“This is a guarantee of our sovereignty,” Parly said on a visit to the Dassault Aviation factory at Mérignac, next to Bordeaux, southwest France.

“This is a chance for our capabilities,” she added.

“It is also a necessary investment to ensure the Rafale’s competitiveness for exports in the coming decades and to safeguard the industrial sector for the fighter jet.”

Parly said she was proud to be the lead advocate for the Rafale in any prospective foreign deal, adding that the upgrade offered further argument in favor of the French fighter.

Dassault, MBDA, Safran and Thales are the four big companies working on the Rafale.

The main modernization features include a connectivity of data links with French and allied forces, greater detection and identification of threats, and fitting upgraded missiles.

A modernization to F4 was in response to the French Air Force’s “evolution of probable threat,” said Etienne Daum, manager for aeronautics, defense and security at think-tank CEIS, based here.

The F4 is important as a step toward to the Future Combat Air System.

The F-4 upgrade is the first technology package which allows the French fighter to fly in a data network until the planned Next-Generation Fighter flies some time after 2035.

That fighter will be a key element in the FCAS, a European project for a system of systems, which will include a mix of piloted jets, unmanned armed drones and smart weapons.

A Rafale upgrade could be seen as a victory of pragmatism over a cultural stereotype of the French character which is said to favor philosophy.

The upgrades are due to be installed in two phases, with a first batch in 2023, followed by a second in 2025, the Armed Forces ministry said in a statement.

That incremental approach is intended to fit the features as soon as they are available, part of a new defense policy.

“The F4 standard is part of the ongoing process to continuously improve the Rafale in line with technological progress and operating experience feedback,” Dassault said in a statement.

The work will also allow more weapons to be fitted to aircraft, including Mica New Generation air-to-air missile and 1,000-kg AASM powered smart bomb.

Planned upgrades of the ASMP-A airborne nuclear-tipped missile and Scalp cruise weapon will also arm the F4.

France will order a further 30 Rafale in 2023, with delivery of 28 due by 2024, Parly said.

Dassault will be industrial architect, the company said.

“We will be responsible for implementing innovative connectivity solutions to optimize the effectiveness of our aircraft in networked combat (new satellite and intra-patrol links, communication server, software defined radio).”

There will be also be upgrades to the active electronically scanned array radar, front sector opto-electronic targeting system, and helmet-mounted display, the company said.

There will a new service contract and a prognosis and diagnostic aid system intended to deliver a predictive capability.

Maintenance will draw on the use of Big Data and artificial intelligence.

A new control unit for the M88 engine will be fitted.

The Spectra electronic warfare system and Talios targeting pod will be boosted, the ministry said.

The Direction Générale de l’Armement (DGA), Joint Chiefs of staff and the service wing — Direction de la maintenance aéronautique (DMAé) – worked together to draw up the F4 requirement, seen as essential to maintain French capability with the introduction in Europe of the F-35 joint strike fighter.

France signed a development contract with MBDA for the Mica NG, the company said Nov. 11, 2018.

The weapons is intended to have greater range and sensitivity in sensors,with lower service cost.

First delivery is due in 2026.

Pierre Tran then added a look at the evolutionary approach the FAF is taking towards FCAS in a story published on [February 25, 2019](#).

Negotiations are being held with electronics company Thales and European missile maker MBDA on joining Airbus and Dassault in a joint concept study for the Future Combat Air System, said a source who declined to be identified.

The industrial partners aim to decide who does what, for how much, and with whom, said the source, adding, “We are not far from an agreement.”

Airbus and Dassault Aviation, which signed a contract Jan. 31, 2019 with the French and German governments, have agreed on their respective roles in the two-year joint concept study.

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French Armed Forces minister Florence Parly, in the company of her German counterpart Ursula von der Leyen, announced Feb. 6 the study, worth €65 million (\$74 million). The ministers were visiting Safran's engine plant at Gennevilliers, just outside the capital.

Parly also announced a €115 million contract for a feasibility study, dubbed Turenne 2, in which Safran will develop new turbine blades for the M88 engine, which powers the Rafale fighter jet.

The new blades are expected to boost the M88's thrust to nine tons compared to the present 7.5 tons.

Safran and its German partner MTU signed, during the ministerial visit, a cooperation agreement to build engines for a Next Generation Fighter, with Paris and Berlin expected to sign this year a contract for an engine demonstrator for the future fighter.

The joint concept study seeks to define architecture and concepts of the Next Generation Fighter, a pack of "remote carriers," and missiles. These elements are due to be hooked up in the Future Combat Air System, a system of systems.

A demonstrator for the new fighter is expected in 2025/26, with the aircraft due to enter service in 2040, the source said.

French, German and Spanish officers gathered Feb. 20 at the offices of Dassault at St Cloud, just outside the capital, in the "kick-off" meeting for the study.

Airbus and Dassault executives also attended.

Spain signed a letter of intent Feb. 15 to join France and Germany, and that is expected to be firmed up to a memorandum of understanding. The Spanish Airbus unit is likely to be the industrial partner.

The partner nations expect to announce at the Paris air show contracts for studies for a demonstrator for the planned fighter, and research and technology for an engine and remote carriers.

Other studies may also be unveiled.

Dassault will take the lead role in the new fighter, which will replace the Rafale and Eurofighter Typhoon.

The new fighter is expected to be in the 30-ton class and be between 15-20 meters long.

The French version will be able to land on aircraft carriers.

For French planners, there are four classes of remote carriers, comprising a large drone weighing several tonnes, a cruise missile, a Smart Glider and a variety of smaller remote systems. That compares with the US, which has drawn up a framework encompassing some 15 different remote carriers.

A remote carrier is an unmanned system which would fly in a first wave of attack and seek to destroy, confuse or disable enemy systems, allowing manned aircraft to fly in.

MBDA unveiled at the previous Paris air show in 2017 its Smart Glider concept, a family of low-cost, unpropelled weapons deployed in "packs" while interconnected with manned aircraft.

The new fighter will be capable of air-to-air, air-to-ground missions and carry a nuclear weapon for the French forces.

Currently, for the Germans, the Tornado can carry the B61 nuclear bomb, with the German government considering the Tornado replacement.

“We, as Dassault Aviation, will mobilize our competencies as system architect and integrator, to meet the requirements of the nations and to keep our continent as a world-class leader in the crucial field of air combat systems,” Dassault executive chairman Eric Trappier said Feb. 6.

Dirk Hoke, chief executive of Airbus Defence and Space, said, “Both companies are committed to providing the best solutions to our nations with regard to the New Generation Fighter as well as the systems of systems accompanying it.”

Officers of the French Direction Générale de l’Armement procurement office, air force and navy, and their German and Spanish counterparts attended the Feb. 20 meeting at St Cloud.

And the at the Paris air show to be held from June 17-23 is where the companies promised to showcase demonstrators.

## MBDA AND FCAS: THE BREXIT CHALLENGE

By Pierre Tran

March 19, 2019

MBDA is in talks with Airbus and Dassault Aviation in the concept study for the Future Combat Air System (FCAS), Antoine Bouvier, CEO of the European missile maker, said March 19.

MBDA’s French and German units are in the discussions on contributing to the study, Bouvier told a news conference on the 2018 financial results.

Airbus and Dassault are the lead partners in FCAS, a European project backed by France and Germany to design and build a new fighter jet and airborne systems, all hooked up to a communications network. The fighter will replace the Eurofighter Typhoon and Rafale.

Remote carriers based on the MBDA Smart Glider concept — a guided bomb to saturate enemy defenses — are among the potential elements, he said.

Another potential MBDA weapon for FCAS would be a cruise missile, a successor to the French Scalp weapon, an MBDA executive said. That next-generation, long-range missile could be based on work done on the Future Cruise/Anti-Ship Weapon (FC/ASW), an Anglo-French cooperative project.

Separately, MBDA has completed its key review for FC/ASW, which is in a concept phase and backed by the UK’s Defence Equipment and Support and France’s Direction Générale de l’Armement, the company said in a statement.

“The conclusion of this key review makes it possible to select the most promising missile concepts in order to meet the requirements expressed by both nations’ armed forces,” MBDA said.

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This allows more in-depth studies to be done on these concepts, with solutions to be selected at the end of the concept phase in 2020, the company said. The British and French requirement is for long range anti-ship missiles, suppression of enemy air defense and deep strike.

The study seeks to allow a drafting of “the road maps for maturing the technologies required, and to launch any follow-on assessment phase,” the company said. Development and production are due around 2024, allowing replacement of present weapons on an agreed schedule.

There would be separate weapons for the cruise missile and the anti-ship mission.

On the issue of US denial of export clearance for components on the Scalp missile sold to Egypt and Qatar, Bouvier said there was no longer a problem.

“This is a government-to-government affair,” he said. “I leave it up to the government to pursue its discussions. For us, the problem is behind us.

“Certain actions were taken, decisions taken, initiatives taken so that today there are no particular problems,” he said, declining to give further details.

The U.S. authorities, under the international traffic in arms regulations, blocked the sale of components for French cruise missiles to arm Rafale fighters ordered by Egypt and Qatar.

French Armed Forces Minister Florence Parly has previously said it was impossible to be fully independent but there was a plan to cut that dependence.

Germany is due to decide by the end of the month whether to renew a unilateral embargo on arms sales to Saudi Arabia, an MBDA executive said.

That decision is critical to the delivery of MBDA Meteor long range missiles, ordered to arm Eurofighter Typhoons from the UK. That fighter deal was worth £10 billion (\$13.3 billion).

Two German MBDA subsidiaries, Bayern Chemie and TDW, build respectively the ramjet and warhead for Meteor, and production has continued since Berlin announced the sanction in January 2019. The Meteor is assembled in a British factory, just north of London.

Germany extended its embargo to the end of March in response to the killing of journalist Jamal Khashoggi by Saudi officials last October.

The sanction also reflects Berlin’s disapproval of Saudi Arabia leading a coalition fighting the Iran-backed Houthis rebels in Yemen.

On Brexit, the planned departure of the UK from the European Union, there may be little concern in the short term, but in the long term there is potential isolation as Europe moves toward greater defense cooperation.

There is doubt whether Britain will be eligible for access to the planned European Defense Fund, which will help finance research and development.

MBDA UK is a significant business, building Meteor, Aster and Storm Shadow weapons.

Britain and France are cooperating on technology studies under the joint Future Combat Air System-Development Program.

London and Paris pledged €100 million for the FC/ASW project, launched in 2017 and set to run for three years.

That project is split 50/50.

MBDA is jointly owned by Airbus (37.5 percent), BAE Systems (37.5 percent), and Leonardo (25 percent).

## THALES AND THE FUTURE COMBAT AIR SYSTEM

By Pierre Tran

June 14, 2019

French electronics company Thales expects to bring greater network connection and speeded up responses as contributions to the Future Combat Air System, a project key to the concept of European defense backed by president Emmanuel Macron.

“Clearly the role that we intend to play, in whatever configuration ultimately the project has, is around ... the notions of augmented, connected, collaborative combat,” Alex Cresswell, executive vice president for land and air systems, told journalists June 12.

That concept of an integrated approach to combat was based on “all the things that enable the immense amount of data that these sensors and systems will collect to be able to be used to make smarter, faster decisions with regard to the application of military force and the organization of military capabilities,” he said.

It was too early to say exactly what Thales’s contribution will be to FCAS but the company has invested heavily in technology which aimed to “flatten command structures and make these assets more useful,” he said.

“So we expect to play a role, and with the level of definition of the project either in France or Germany, or in France and Germany.”

The company has invested heavily as the concept of augmented, connected, collaborative combat is seen as important.

Thales will be displaying at the Paris air show systems which seek to deliver increased smarts and speed, including an upgraded Talios airborne target designation pod and Ground Force 300 land-based radar.

Macron is due to visit the air show June 17, the first day of the showcase for global aerospace, and the head of state is expected to make announcements on a technology demonstrator for a next-generation fighter jet, and research and technology for a new engine, critical parts of the FCAS project backed by France and Germany, with Paris as the leader. Spain is joining that partnership.

Second Line of Defense



Airbus and Dassault Aviation are working on the joint study contract for FCAS, with the former as systems architect while the latter focuses on the new fighter.

Negotiations on who-does-what in the FCAS project have been tough, and announcement of industrial contracts might be made at the end of summer, financial website La Tribune reported June 12.

Dassault, meanwhile, will put on display at the air show concepts for the demonstrator.

“The 2019 Paris air show will highlight how we are preparing for the future: extending the Falcon family (6X), reinforcing our support services, presenting what could be a demonstrator for the next generation fighter (NGF) under the future combat air system (FCAS) and the agreements between Dassault Aviation and Airbus,” Dassault CEO Eric Trappier said in a June 4 statement.

Airbus has the capabilities to take up the role of systems architect, an Airbus spokesman said.

Those skills are to be found in its defense and space unit, which works on military aircraft including A400M, A330 MRTT and Eurofighter Typhoon; drone technology; space including Syracuse and Skynet military satellites; and communications, intelligence and security, which works on C4ISR and systems of systems.

Some 2,000 staff at the Elancourt office, just outside Paris, work on cybersecurity, artificial intelligence and studies on the combat cloud. Airbus completed a flight demonstration of a “connected airborne battlespace scenario, centred on (an) MRTT aircraft,” the company said June 13. The test was part of the development of Airbus’ network for the sky (NFTS) program.

That flight demonstration simulated wideband communication links between ground forces, fighter jet, a multirole transport /transport aircraft, and a combined air operations centre on the ground, the company said.

“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.

Airbus, partnered with Naval Group and Rohde & Schwarz, won last year a contract to update the French Navy’s Rifan 2 broadband communications network to a 2.1 level.

Last year, Airbus, partnered with Atos, won a six-year deal to provide cybersecurity for 17 European Union institutions and agencies.

Meanwhile, Thales will showcase combat systems which draw on technology deemed to be essential to FCAS.

An upgraded Talios pod will equip the planned Rafale F4 fighter with a capability dubbed neural process imagery.

That capacity will allow the pod to process the imagery picked up in flight and deliver target detection to the pilot in real time, while in flight.

The present Talios system collects and stores high resolution visual data in the pod while in flight.

After the pilot lands and data is transferred, image analysts pore over the pictures.

The new pod aims to speed up operations, with the equipment seen as replacing seven or eight image analysts working for a week to find a target for a strike.

Thales will also display GF300, a land radar based on Sea Fire 500, a digital sensor developed for the intermediate frigate for the French Navy.

The DGA, which funded development of GF300, is in talks with Thales for a selection of a new radar to equip the next-generation SAMP/T, an update for a Franco-Italian air defense system with the Aster missile.

GF300 is pitched as having longer range than the present Arabel system and offered at a similar price as the latter, with greater reliability.

A decision on the radar is due by the end of the year, Thales said.

## FUTURE COMBAT AIR SYSTEM: A SPEED RACE BETWEEN DATA AND FIGHTER

By Murielle Delaporte

June 26, 2019

Data fusion and the magic of connectivity have entered the show 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.

Indeed, many [feel that the FCAS \(Future Combat Air System\)](#), only launched a few months ago, is a Mission Impossible when one focuses on how much money — \$4 billion by 2025 is to be jointly allocated by France and Germany.

While Americans are used to spending \$1 billion annually here and there on a single weapons program in a single year, the entire German defense budget planned for 2020 is only 45 billion Euros (roughly \$50 billion), with France expected to spend 35.9 billion Euros (roughly \$40 billion), so almost \$500 million a year is a substantial commitment.

With Next Gen Fighters Come Next Gen Engineers

FCAS will be built brick by brick on a five pillar foundation:

- The fighter will be built by Dassault
- Airbus and Thales are the prime integrators
- Drones and missiles will be built by Airbus and MBDA
- Safran and MTU will probably build the engines
- Airbus and Thales will handle training and simulation.

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”. At Dassault, there is a saying that “what is beautiful flies well.” 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, which means nuclear for the French) and joint with the Navy, but with a clear focus on maintaining air superiority in an increasingly contested and anti-denial environment.

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

Second Line of Defense

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 has been made.

Indeed, Neuron has been an attempt to gather what Europe does best technology-wise : Spain, Greece, Sweden, Switzerland and Italy all join France to find solutions together with just a 400 million Euro budget.

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 intact and to make sure that they are today ready for the future — and FCAS.

### The Challenge of Speed

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

The challenges are many, since 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 source, is to be able to operate in a degraded environment, hence the focus on space and 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 is familiar conceptually, but it seems to have finally come to life at this year's 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 the Airbus booth).

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

## AN UPDATE ON THE FUTURE COMBAT AIR SYSTEMS PROGRAM: FEBRUARY 2019

By Pierre Tran

February 25, 2019

Negotiations are being held with electronics company Thales and European missile maker MBDA on joining Airbus and Dassault in a joint concept study for the Future Combat Air System, said a source who declined to be identified.

The industrial partners aim to decide who does what, for how much, and with whom, said the source, adding, "We are not far from an agreement."

Airbus and Dassault Aviation, which signed a contract Jan. 31, 2019 with the French and German governments, have agreed on their respective roles in the two-year joint concept study.

French Armed Forces minister Florence Parly, in the company of her German counterpart Ursula von der Leyen, announced Feb. 6 the study, worth €65 million (\$74 million). The ministers were visiting Safran's engine plant at Gennevilliers, just outside the capital.

Parly also announced a €115 million contract for a feasibility study, dubbed Turenne 2, in which Safran will develop new turbine blades for the M88 engine, which powers the Rafale fighter jet.

The new blades are expected to boost the M88's thrust to nine tons compared to the present 7.5 tons.

Safran and its German partner MTU signed, during the ministerial visit, a cooperation agreement to build engines for a Next Generation Fighter, with Paris and Berlin expected to sign this year a contract for an engine demonstrator for the future fighter.

The joint concept study seeks to define architecture and concepts of the Next Generation Fighter, a pack of "remote carriers," and missiles. These elements are due to be hooked up in the Future Combat Air System, a system of systems.

A demonstrator for the new fighter is expected in 2025/26, with the aircraft due to enter service in 2040, the source said.

French, German and Spanish officers gathered Feb. 20 at the offices of Dassault at St Cloud, just outside the capital, in the "kick-off" meeting for the study.

Airbus and Dassault executives also attended.

Spain signed a letter of intent Feb. 15 to join France and Germany, and that is expected to be firmed up to a memorandum of understanding. The Spanish Airbus unit is likely to be the industrial partner.

The partner nations expect to announce at the Paris air show contracts for studies for a demonstrator for the planned fighter, and research and technology for an engine and remote carriers.

Other studies may also be unveiled.

Dassault will take the lead role in the new fighter, which will replace the Rafale and Eurofighter Typhoon.

The new fighter is expected to be in the 30-ton class and be between 15-20 meters long.

The French version will be able to land on aircraft carriers.

For French planners, there are four classes of remote carriers, comprising a large drone weighing several tonnes, a cruise missile, a Smart Glider and a variety of smaller remote systems. That compares with the US, which has drawn up a framework encompassing some 15 different remote carriers.

A remote carrier is an unmanned system which would fly in a first wave of attack and seek to destroy, confuse or disable enemy systems, allowing manned aircraft to fly in.

MBDA unveiled at the previous Paris air show in 2017 its Smart Glider concept, a family of low-cost, unpropelled weapons deployed in "packs" while interconnected with manned aircraft.

The new fighter will be capable of air-to-air, air-to-ground missions and carry a nuclear weapon for the French forces.

Currently, for the Germans, the Tornado can carry the B61 nuclear bomb, with the German government considering the Tornado replacement.

Second Line of Defense

“We, as Dassault Aviation, will mobilize our competencies as system architect and integrator, to meet the requirements of the nations and to keep our continent as a world-class leader in the crucial field of air combat systems,” Dassault executive chairman Eric Trappier said Feb. 6.

Dirk Hoke, chief executive of Airbus Defence and Space, said, “Both companies are committed to providing the best solutions to our nations with regard to the New Generation Fighter as well as the systems of systems accompanying it.”

Officers of the French Direction Générale de l’Armement procurement office, air force and navy, and their German and Spanish counterparts attended the Feb. 20 meeting at St Cloud.

And the at the Paris air show to be held from June 17-23 is where the companies promised to showcase demonstrators.

## MBDA AND FCAS: BUILDING WEAPONS FOR THE “COMBAT CLOUD”

By Pierre Tran

June 19, 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 [F-35 fighter](#).

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 [Tempest](#) new air combat systems project.

These displays give a glimpse of weapons which might be used to outsmart the [anti-access, area denial systems](#) 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 self-defense 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 [Meteor missile](#) 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.

## THE COMBAT CLOUD AT THE HEART OF THE FUTURE COMBAT AIR SYSTEM

By Pierre Tran

June 19, 2019

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.

Second Line of Defense

“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 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 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, maneuverability 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.

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.”

Second Line of Defense



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.

## BUILDING THE FCAS COMBAT CLOUD: COMING TO TERMS WITH THE 2 FIVES – FIFTH GEN AND 5G

By Robbin Laird

February 28, 2020

At the heart of the Franco-German launched Future Combat System is the combat cloud.

Rather than focusing on building a replacement fighter — although clearly this is being done to hold off the F-35 to the extent possible by a Franco-German program – FCAS is also about being able to build and deploy an integrated combat force.

And this force will be designed from the ground up to encompass technological changes coming to the multi-domain force, such as remotes, both platforms and weapons, as well as the growing role of artificial intelligence within decision making.

There are clearly questions of how feasible a strictly Franco-German program even with the coming of the Spanish is to build, deploy and modernize the FCAS shaped around a combat cloud.

But if we bracket such questions and assume that such a Franco-German inspired combat cloud will be built, the creators and developers of this effort face from the outset the challenge of dealing with, leveraging and coming to terms with the two 5s – fifth generation in the military world and 5G in the commercial world.

### Fifth Generation C2/ISR Dynamics

With the building of the [CNI and the integrated systems onboard](#) of the F-35, the fifth-generation aircraft is clearly playing a forcing function for reshaping C2/ISR into what can be considered a fifth gen C2/ISR system.

With the [MADL wave form](#) and the ability of a four-ship formation of F-35s to integrate as a combat unit at new levels with the 360-degree sensors, sensor fusion and CNI integrability, the four-ship formation of F-35s delivers new capabilities in air combat.

And the operational experience of the F-35 fleet and its impact on the legacy force, lays down the foundation for father transition in multi-domain combat.

It is forging a path to shaping an integrated distributed force which will be built out through new C2/ISR capabilities able to direct the operations of platforms and payloads in an integrated battlespace.

Second Line of Defense

But the tool sets or foundation built to deliver CNI to the fifth gen platform can be considered as key tools sets, or foundational elements which can be leveraged in the build out of an advancing C2/ISR system.

And this advancing system can be seen as enabling the operations of a distributed integrated force.

The distribution of combat power which can be combined through C2/ISR integration allows for a significant transition from a fifth generation enabled legacy force to a force able to be tailored to global crisis management, and to do so as a scalable force.

A key enabler in this evolution will be the proliferation of C2 hubs able to empower distributed force combinations yet able to provide for scalability and integratability to deliver the combat power of a larger combat force.

## The 5G Challenge

The FCAS approach is designed NOT to go through the fifth-generation transition but shape a different launch point.

And that launch point needs to come to terms with other big 5, namely, 5 G.

A combat cloud to operate in contested air space must be a low latency system; the 5G will build out low latency systems in the commercial space.

This means that for the FCAS combat cloud to work, it is crucial to determine how Europe will build its 5G system.

This puts into key question the role of the European Union in defense and security.

Rather than worrying about how to use operational military forces, the European Union has a fundamental responsibility to shape robust infrastructure with security built in and providing key elements for 21st century defense infrastructure, including the kind of C2/ISR “highway” which advanced forces will need to use in the direct defense of Europe.

This puts the question of China and its 5G global assault into a key strategic context: Can Europe build a 5G system leveraging technologies already being built by some key European companies, and to find ways to leverage such a European 5G system to enable the building of a FCAS combat cloud?

It is clear that the coming of the 5G revolution is upon us and poses both opportunities and risks for the defense and security systems of the liberal democracies.

The controversy over China’s Huawei 5G systems has highlighted the challenges of simply taking a narrow commercial view of the coming of 5G.

Given the nature of 5G systems, which connect a country’s data and communications system into an information grid, it is not unimportant what happens in the commercial sector with regard to the build out of 5G systems.

Michael Shoebridge, a leading Australian defense analyst, has highlighted the challenge as follows:

*A country’s 5G network will be the nervous system that connects its economy, carries its data and for the first time bridges the gap between internet-connected systems and ‘operational technology’ (in places like factories, power stations, utilities, railways and airports) that right now is mainly air-gapped from the internet.*

*That's what the long-promised 'internet of things' is about. It will also enable telemedicine, driverless cars and drone delivery systems to become realities, with all the economic and security implications this will bring.*

*So, who can control, distort, disrupt or harvest data from your 5G network becomes more important than for any prior telecom network—4G or fixed line.*<sup>1</sup>

But the significant changes involved with 5G will provide a virtual revolution in tying data with communications into a global IT grid, so it is not enough to highlight the dangers which China poses by marketing its low-cost Huawei solution.

It is crucial for commercial investments be made in the liberal democracies to ensure market competitiveness and even leadership, otherwise the investments being made on the defense side in C2 and related technologies will simply fall behind the dynamics of change unleashed by the 5G revolution.

In short, while all the analyses of the FCAS approach have focused on its launch or its feasibility in terms of the capability of France and Germany to actual build such a program, there is another key aspect: how will the FCAS combat cloud come to terms with the two 5s – fifth generation in the defense domain and 5G in the commercial domain.

## REWORKING THE FRANCO-GERMAN ARMS EXPORT POLICIES: A CRUCIAL CHALLENGE FACING FCAS

By Pierre Tran

April 19, 2019

France and Germany need to update a 1972 joint agreement on arms exports, a bilateral pact which has economic bearing on a planned European fighter jet, the future combat air system or FCAS.

Eric Trappier, chairman of GIFAS, highlighted the challenge at the GIFAS press conference held on April 18, 2019.

The French and German clearance for the foreign sale of weapons should be “harmonized,” he said at a news conference on the 2018 results of Gifas.

“French companies are calling for a revision of the Debré-Schmidt treaty,” he said.

That update would address the export outlook of the fighter jet in the Future Combat Aerial System, an ambitious Franco-German project.

That bilateral treaty refers to an agreement signed in 1972 by the then French defense minister Michel Debré and his German counterpart Helmut Schmidt, adopting a cooperative approach to selling arms abroad.

Despite that accord, French concerns have risen in recent years over a reluctance in Berlin to clear the sale of German equipment for French weapons, holding up exports for France.

The “German problem” on exports stems from differences between the coalition partners, Trappier said.

Britain and France are relying on German clearances for equipment, he added.

In France, there is broad political consensus on backing arms exports, with defense ministers and presidents promoting French weapons when abroad.

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“At a certain time, at the start of development, the issue of exports arises,” Trappier said.

“There is an economic reality.”

The “internal” European market is not big enough for European companies to recover investment, unlike the U.S. market, which is large enough for American firms working on the F-35 fighter to make money, he said.

“There need to be rules of the game if we are to cooperate,” he said.

The rules will cover operational requirements, which will include some specific capabilities, and also exports.

France bans all foreign arms sales, so companies must apply for government clearance from an inter-ministerial committee, dubbed Commission Interministérielle pour l’Etude des Exportations de Matériels de Guerre (CIEEMG).

“It’s complicated,” he said.

But despite the need, it was unlikely France and Germany will come to a common export agreement in the near future, according to Thomas Gassilloud, deputy of the La République En Marche (LREM), a center right party launched by French president Emmanuel Macron.

Perhaps the two countries could form a “common consultative governance body,” Gassilloud argued in a Feb. 2 interview with *La Tribune*, a business website.

That organization would deliver advice on whether or not to approve French and German arms sales.

France takes into account the German “interest and opinion” on exports and the planned Franco-German tank, dubbed Main Ground Combat System, he said.

On the prospects for Britain later joining the FCAS project, Trappier said, “It is a question of timing.”

Britain is tied up in talks on Brexit, on whether or not to leave the European Union, whether on hard or soft Brexit terms, during or after summer, he said.

Whether the UK leaves the EU, the country has its role in European defense.

British companies are members of AeroSpace and Defence Industries (ASD), he said.

ASD is a European trade association in Brussels, lobbying on behalf of aeronautics, space, defense and security companies.

Those British companies are considered European, he said.

“We have told those firms: even if Britain leaves the EU, you will still be considered European,” he said.

“The hand of French and European companies absolutely will be held out to you.”

It is up to the British and French governments to pursue the 2010 Lancaster House defense cooperation treaty.

“It is the responsibility of France and Great Britain to continue to cooperate” he said.

Britain has announced its project for Tempest, a potential British rival to the Franco-German fighter in the FCAS project.

Dassault will be prime contractor for the new European combat aircraft.

France plans to announce contracts for a fighter technology demonstrator at the Paris airshow, which opens June 17.

Airbus and Dassault are equal partners on a study on concept and architecture of the demonstrator.

Thales, an electronics company, will have a key role in the demonstrator project, French defense minister Florence Parly has added as well.

“I have plans to sign contracts between now and the middle of summer on this demonstrator: in this system of systems, Thales, thanks to its capabilities as an integrator, will play a full role in building the dialogue between the objects connected in this system of collaborative combat,” she said April 15.

Parly was visiting a Thales radar factory at Limours, just outside the capital.

Gifas reported a 1.2 percent rise in 2018 sales to €65.4 billion (\$ billion), of which 23 percent was in defense. That compares to sales of €64.2 billion in the previous year.

Exports accounted for 85 percent of sales.

Orders fell 17 percent to €58.2 billion, of which military accounted for 28 percent.

Gifas booked orders worth €68.2 billion in the previous year.

Some 4,000 jobs were created last year, with 15,000 new posts expected this year.

## PUTTING FCAS INTO A BROADER EUROPEAN POLITICAL CONTEXT

By Pierre Tran

September 18, 2019

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.

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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.

## FRANCE, GERMANY AND NEW DEFENSE PROJECTS: FRAMING THE CHALLENGE

By Pierre Tran

September 18, 2019

France and Germany need to resolve political, industrial and operational differences hanging over projects for a new fighter jet and a new tank, a French senator said Sept. 13.

A New Generation Fighter is key to the planned Future Combat Air System, backed by France, Germany and Spain, while Berlin and Paris are also looking to develop and build a new tank in the Main Ground Combat System.

French parliamentarians, chiefs of staff and top industry executives at a plenary session of a Sept. 12-13 conference heard a summary of problems hanging over the two arms projects seen as cornerstones for future European defense.

The conference, dubbed summer defense university, was organized by CEIS, a consultancy, and backed by Dassault Aviation. The event was held at Bourges and Avord airbase, central France.

The conference is run on Chatham House reporting rules which ask for anonymity of speakers.

“Today, there is concern over FCAS,” said the senator, pointing out that France wants to pursue “operational capabilities,” while Germany seeks industrial content for its companies in a drive for economic gain.

There is also a German call for close parliamentary oversight of the FCAS program through a release of funding in small tranches. France leads on FCAS, with Dassault Aviation as prime contractor, while Germany steers the MGCS tank project and a planned European medium-altitude, long-endurance unmanned aerial vehicle.

FCAS and MGCS may be separate projects but they have become closely related, as German parliamentarians have linked supervisory approval of one to the other.

Progress on FCAS depends on Berlin finding work to be assigned to Rheinmetall in Germany’s 50 percent in MGCS, the senator said. A US pension fund holds a large stake in Rheinmetall, the senator added.

The assumption had been family-owned Krauss-Maffei Wegmann would hold the German stake in MGCS, with state-owned Nexter holding the French 50 percent.

Talks are still going on for how to share out the work between KMW and Rheinmetall, and it cannot be assumed there will be a 25 percent stake for each company, a European official said on the sidelines of the conference.

Rheinmetall supplies the turret, while KMW works on the chassis on the Leopard 2 heavy tank.

A senior French executive, also speaking on the sidelines, made it clear it was only “certain parliamentarians” which were holding up FCAS rather than the full German Bundestag parliament.

An operational issue to be resolved is how the new fighter jet will be able to carry the French nuclear missile and NATO atomic bomb, as the German air force flies the latter, supplied by the US, the senator said.

A further concern is need for an agreement between Berlin and Paris on arms exports, as FCAS will need foreign sales to help fund its program, the senator said.

An export agreement will soon be reached, a senior French official said at the plenary session, declining further comment.

President Emmanuel Macron and chancellor Angela Merkel reached an agreement at the G-7 summit at Biarritz on Franco-German arms export policy, with Berlin foregoing a right of approval if there were less than 20 percent of German content in value in a French weapon being sold abroad, afternoon daily Le Monde reported.

France wanted a lower level of German content, as that would have given Paris more latitude in pitching French arms in overseas markets.

That 20 percent threshold also applied for French oversight of German arms exports.

“When there is a big deal, like a fighter jet, it has to be discussed,” said François Lureau of EuroFLconsult. “There should be rules, but it is hard to generalize and foresee the situation in 30 years time,” he added.

There should be discussion and compromise, he said, adding that the Debré-Schmidt agreement on foreign arms sales had never been observed. That was a Franco-German pact dating back to the 1970s.

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Lureau is a former procurement chief.

The arms export deal was included in a Franco-German treaty signed Jan. 22 at Aix-la-Chapelle, magazine Der Spiegel reported Feb. 15.

French executives point up a tardiness of German delivery of components, seen as a bid to slow sales of French weapons. France and Germany compete in the world arms market.

There was a deafening silence at the conference on the UK's pursuit of its Tempest project, despite the Sept. 11 announcement British companies had signed a statement of intent with Italian partners on cooperation for a new fighter.

The senior French official, however, did predict there would be cooperation with the British on the new fighter programs.

It made no sense to have two new European fighter programs and it was likely there would be a merging of the projects, a British executive said.

BAE Systems, Rolls-Royce, and the British units of Leonardo and MBDA signed statements of intent with Avio Aero, Elettronica, Leonardo and MBDA in Italy to work on a "concept and partnership model," seeking to share knowledge, product definition and technology development for development of a future combat air system

That industrial agreement followed Italy and the UK committing to work together closely on combat air capabilities including Typhoon, F-35 and Tempest.

There was no surprise Italy teamed up with the UK as both nations operate the F-35, a French executive said. It remained to be seen whether there would be funds for Tempest in view of the acquisition of F-35.

Italy had shown no interest in joining FCAS, and there is doubt whether Rome had sufficient funds, a French officer said on the sidelines of the conference.

On the proposal for the European MALE UAV, there is a vast difference between industry's offer and what the governments are willing to pay, the officer said.

Armed forces minister Florence Parly said in her June 17 speech at the Paris airshow that industry needed to cut the price of the UAV.

"I say to them — and the companies know it — that this program will not get off the ground unless the drone they are proposing is competitive," she said.

That pricing was not just for the launch nations —France, Germany, Italy and Spain — but prospective export clients, she said. An intensive negotiation was opening up, which she hoped would lead to announcement of a launch contract this year. Airbus and Dassault are industrial partners, with the former in the lead on the UAV.

The French air force staged an extensive flying display of Rafale fighter, A400M transport plane and Puma helicopter at the airbase on the opening day. There was a display of ground troops attacking insurgents, supported by a low pass by Rafale and helicopter evacuation of a wounded soldier.

On the ground, there was display of armored vehicles including Jaguar troop carrier, high mobility vehicle, AMX10 RC fighting vehicle and Leclerc tank. The airbase supports the fleet of AWACS.

In a vast hanger, alongside an AWACS plane, there were many stands showing military programs and equipment. Parly attended the conference.

## AN UPDATE ON THE FUTURE COMBAT AIR SYSTEM: INTERNATIONAL FIGHTER CONFERENCE 2019

By Robbin Laird

November 22, 2019

At last year's International Fighter Conference, the Future Combat Air System or FCAS was introduced as a new Franco-German Initiative.

At this year's IFC, an update on the program was provided by the French Air Force, the German Ministry of Defence and Airbus Space and Defence.

A key development has been the addition of Spain to the program.

The objective is to replace the current core European industrial produced fighters, the French Rafale and the Eurofighter.

Since last year, industry leaders have been identified for the FCAS program; industrial agreements have been signed; a Joint Concept Study was awarded earlier this year, with the second phase launched this Fall. A Combined Project Team has been established with Spain to join in early 2020.

The focus has been to shape joint understanding of operational needs and national concepts, to identify relevant key operational requirements, to build tools to work at the classified level and above all to build confidence between governments, among governments, and among and with industry.

And the goal is to shape a more integrated approach which can deliver incremental products along the way.

The focus is upon generating new capabilities that will deliver an increasingly connected force able to operate by leveraging data from a "combat cloud" and to do so up to and including contested airspace.

The new fighter needs able to work effectively in a multi-domain environment and to share C2 in the battlespace, one in which situational awareness is shared through the combat cloud.

Clearly, one challenge is to ensure that the current efforts to modernize Eurofighter and Rafale do not go on parallel paths or as one French Air Force officer put the challenge: "We don't want to diverge before we converge."

This same French Air Force General highlighted that from the FAF's perspective they would be flying Rafale for four more decades.

Then the question is how the system of systems was being put in place.

This means that in the decades ahead to being able to operate the new FCAS fighter, a number of key capabilities would need to be delivered.

Among these capabilities: To be able to provide a balance between interoperability and sovereignty; to be able to do collaborative warfighting engaging manned systems with remotes; and to build out a cognitive air

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battle management system in which new man-machine relationships and new digital transformation was generated.

He highlighted as well the need for France to be able to work with allies to be able to engage and fight in “intense digital conflict” as well.

He argued that collaborative collaboration between manned and unmanned platforms clearly would require mastering how artificial intelligence can be built into new C2 systems.

He saw the F-4 standard of the Rafale as the test bed for a number of these new capabilities going forward for the FAF.

In the presentation by Airbus Defence and Space a key target was seen that by 2025, that significantly greater C2 integration can be generated by the two aircraft.

The objective is to have a new communication standard by 2025-2030.

The French Air Force is focused on the build out of a new variant of the Rafale, the F-4, which will make the aircraft more software upgradeable, and clearly, one objective clearly is to ensure that it can work effectively with the F-35 being introduced into Europe as well.

The French approach also is focused on the F-5 variant of Rafale which is being developed to carry next generation nuclear weapons in support of the evolving capabilities of the French nuclear deterrent.

The very fact that the French Air Force has been tasked to deliver air-delivered weapons in the European theater of operations, makes France a distinctive player in FCAS for sure.

And another distinctive aspect is that the new fighter will need to be operate off of French carriers, and getting a low observable aircraft which by necessity needs to be built from composites to be able to do so is no easy task.

That is why the F-35C is quite different from the F-35A.

As for Eurofighter, briefings were provided on the approach to modernization, which I will discuss in a separate piece, but for the Airbus Defence and Space presenter, the focus was on how Eurofighter as a platform, could become the launch point over time for several of the “technology streams” being generated by FCAS, up to and including manned-unmanned teaming.

That discussion is highlighted in a separate interview with the head of FCAS in Airbus Defence and Space.

A number of the key capabilities which FCAS is targeting are the focus of non-FCAS air forces currently flying fifth-generation aircraft.

Clearly, how the latter sort through how they will do some of the key tasks identified with FCAS will interact with and shape the approach of FCAS itself.

And this cross-learning will be a key driver of change among allied air forces.

Indeed, the combat cloud was introduced in [an interview](#) I did with Lt. General (Retired) Deptula, and then head of the Air Combat Command Mike Hostage.

In that interview, the focus was very much on how fifth generation aircraft were part of what Hostage referred to as the combat cloud transition affecting the USAF which he labelled the coming combat cloud.

With allies focused on a common target, namely the next generation connected force, and one operating probably more accurately with combat clouds than a single combat cloud, significant operational experience and investments in new ISR and C2 technologies will lead to significant change in concepts of operations.

FCAS can clearly contribute to this effort, notably, as the effort is defined as incremental in nature, and driven to a significant part of a very busy operational air force, namely the French Air Force.

And FCAS is not being done alone by the FAF and its sister Air Forces and European Industry.

The other partner in the French led approach is clearly the French led NATO Transformation Command.

Even though Norfolk is not close to Berlin, the work of NATO's Transformation Command clearly is with regard to the FCAS thinking and approach was as the change being driven by fifth generation systems.

Shortly after the Fighter Conference was meeting in Berlin, Col. Cécile Marly, acting branch head for Federated Interoperability at Supreme Allied Command Transformation, was telling a [AFCEA's Military Communications conference in Norfolk, Virginia](#) that the NATO Industry Advisory Group (NIAG) is readying its recommendations on how NATO members can build interoperability into next-generation airpower systems.

"The industry advice is aimed at helping NATO "build standards for tomorrow" to enable "interoperability by design," rather than as an add-on to incompatible platforms, Marly told AFCEA's Military Communications conference in Norfolk, Virginia."

In short, FCAS is a focused European effort but occurring in the context of a broader NATO military transformation effort.

## THALES AND THE FUTURE COMBAT AIR SYSTEM

By Pierre Tran

June 14, 2019

French electronics company Thales expects to bring greater network connection and speeded up responses as contributions to the Future Combat Air System, a project key to the concept of European defense backed by president Emmanuel Macron.

"Clearly the role that we intend to play, in whatever configuration ultimately the project has, is around ... the notions of augmented, connected, collaborative combat," Alex Cresswell, executive vice president for land and air systems, told journalists June 12.

That concept of an integrated approach to combat was based on "all the things that enable the immense amount of data that these sensors and systems will collect to be able to be used to make smarter, faster decisions with regard to the application of military force and the organization of military capabilities," he said.

It was too early to say exactly what Thales's contribution will be to FCAS but the company has invested heavily in technology which aimed to "flatten command structures and make these assets more useful," he said.

"So we expect to play a role, and with the level of definition of the project either in France or Germany, or in France and Germany."

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The company has invested heavily as the concept of augmented, connected, collaborative combat is seen as important.

Thales will be displaying at the Paris air show systems which seek to deliver increased smarts and speed, including an upgraded Talios airborne target designation pod and Ground Force 300 land-based radar.

Macron is due to visit the air show June 17, the first day of the showcase for global aerospace, and the head of state is expected to make announcements on a technology demonstrator for a next-generation fighter jet, and research and technology for a new engine, critical parts of the FCAS project backed by France and Germany, with Paris as the leader. Spain is joining that partnership.

Airbus and Dassault Aviation are working on the joint study contract for FCAS, with the former as systems architect while the latter focuses on the new fighter.

Negotiations on who-does-what in the FCAS project have been tough, and announcement of industrial contracts might be made at the end of summer, financial website La Tribune reported June 12.

Dassault, meanwhile, will put on display at the air show concepts for the demonstrator.

“The 2019 Paris air show will highlight how we are preparing for the future: extending the Falcon family (6X), reinforcing our support services, presenting what could be a demonstrator for the next generation fighter (NGF) under the future combat air system (FCAS) and the agreements between Dassault Aviation and Airbus,” Dassault CEO Eric Trappier said in a June 4 statement.

Airbus has the capabilities to take up the role of systems architect, an Airbus spokesman said.

Those skills are to be found in its defense and space unit, which works on military aircraft including A400M, A330 MRTT and Eurofighter Typhoon; drone technology; space including Syracuse and Skynet military satellites; and communications, intelligence and security, which works on C4ISR and systems of systems.

Some 2,000 staff at the Elancourt office, just outside Paris, work on cybersecurity, artificial intelligence and studies on the combat cloud. Airbus completed a flight demonstration of a “connected airborne battlespace scenario, centred on (an) MRTT aircraft,” the company said June 13. The test was part of the development of Airbus’ network for the sky (NFTS) program.

That flight demonstration simulated wideband communication links between ground forces, fighter jet, a multirole transport /transport aircraft, and a combined air operations centre on the ground, the company said.

“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.

Airbus, partnered with Naval Group and Rohde & Schwarz, won last year a contract to update the French Navy’s Rifan 2 broadband communications network to a 2.1 level.

Last year, Airbus, partnered with Atos, won a six-year deal to provide cybersecurity for 17 European Union institutions and agencies.

Meanwhile, Thales will showcase combat systems which draw on technology deemed to be essential to FCAS.

An upgraded Talios pod will equip the planned Rafale F4 fighter with a capability dubbed neural process imagery.

That capacity will allow the pod to process the imagery picked up in flight and deliver target detection to the pilot in real time, while in flight.

The present Talios system collects and stores high resolution visual data in the pod while in flight.

After the pilot lands and data is transferred, image analysts pore over the pictures.

The new pod aims to speed up operations, with the equipment seen as replacing seven or eight image analysts working for a week to find a target for a strike.

Thales will also display GF300, a land radar based on Sea Fire 500, a digital sensor developed for the intermediate frigate for the French Navy.

The DGA, which funded development of GF300, is in talks with Thales for a selection of a new radar to equip the next-generation SAMP/T, an update for a Franco-Italian air defense system with the Aster missile.

GF300 is pitched as having longer range than the present Arabel system and offered at a similar price as the latter, with greater reliability.

A decision on the radar is due by the end of the year, Thales said.

## AN UPDATE ON EUROPEAN DEFENSE INDUSTRIAL GENERATED SYSTEMS: JANUARY 2020

By Pierre Tran

January 12, 2020

Industrial partners Airbus and Dassault Aviation last month cut an offer to between €7 billion-€8 billion (\$7.8 billion-\$8.9 billion) from a previous price tag of some €10 billion, to win a production contract for a European medium-altitude long-endurance drone, an industry source said Jan. 9.

The partners slashed the price of their bid to build a twin-engined unmanned aerial vehicle after the four client nations — France, Germany, Italy and Spain — made it clear the initial price tag was too high, the source said.

Airbus is prime contractor, with French Dassault and Italian Leonardo as partners.

The new price is seen as acceptable and opens the debate on who and how an announcement will be made, the source said.

The program manager, European agency OCCAR, or the French arms procurement, Direction Générale de l'Armement, could announce the deal, the source said. Another possibility was for industry to make an announcement.

The DGA declined comment.

Industry presents the UAV as one of the key cooperative projects to boost European arms capability and boost autonomy. France has made it clear that a big price cut was needed to secure the deal.

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“There is a major problem on price,” said a Nov. 21 parliamentary report from French senators Cédric Perrin and Hélène Conway-Mouret.

“It appears that there is a spread of close to 30 percent between the price set by the client states, in view of the specifications set in 2017, and the price offered by industry,” said the report on the 2020 budget from the committee for foreign affairs, defense and the armed forces.

In view of a price too high, the partner nations might buy a foreign UAV off the shelf and install a national payload, the report said. That might spark opposition but the fact was that the price sparked sharp debate.

“Industry and the DGA must reach an agreement before the end of the year, otherwise the program will be compromised,” the report said.

An offer has been submitted to OCCAR, Eric Trappier, chairman of GIFAS, the French trade association for aeronautics and space, said at the new year press conference.

“This is a major contract,” which will cover research and development, production and delivery, he said. The project might interest other European nations, he added.

There had been many meetings for negotiations all through 2019, he said, adding that it was important for Europe to acquire this equipment, which he hoped would be backed by financial support from the planned European Defense Fund.

Meanwhile, there was close prospect of a contract for a technology demonstrator for a New Generation Fighter, a key element in the Future Combat Air System.

“Call me an optimist, but the contract for the first phase should be signed in the next few days,” he said.

“We are in the process of notification. There is no problem.”

That was a deal which should have been sealed in 2019, as industry had submitted an offer in June, he said.

Work started in the last quarter of last year to bring Spain into the fighter project and engineers in the three partner countries — France, Germany and Spain — should start soon, he said.

A budget for the development project had yet to be agreed, he said.

The new fighter is due to operate in 2040, with the demonstrator expected to take off in 2026.

“We are right at the beginning,” he said. That is of “fundamental” importance as there was not a program if there was not a start, he added.

Trappier said he constantly told the DGA there was need to build a demonstrator, to cut risk to the program. Such a de-risking could not be done simply on paper and required “the reality of flight” to test the technology.

Now it was time to “mobilize” the budget, energies, and agree the industrial work share, he said. Cooperation between Airbus and Dassault — the lead industrial partners — was not easy but they managed, he added.

It was also important to factor in the supply chain in France, Germany and Spain.

On a new engine for the fighter, Safran and MTU said in a Dec. 3 joint statement the partners had agreed the French company would be prime contractor. The agreement resolved an attempt by the German partner to take a leading role on the project.

The pact referred to the letter of intent signed in February 2019 which said Safran would take the lead in engine design and integration, with MTU leading in engine services.

“In the framework of the contractual scheme defined by France and Germany, Safran Aircraft Engines will be the prime contractor and MTU Aero Engines the main partner for the first phase of research and technology (Phase 1A),” the joint statement said.

The two companies will set up a 50/50 joint venture by the end of 2021 for development, production and service of the new engine.

On the proposed €13 billion for the European Defense Fund, that amount might fall as the overall multi-year budget of the European Union will shrink with the departure of the UK, Trappier said.

France and Germany said in a joint statement at the Oct. 16 bilateral summit in Toulouse, southwest France, the two nations reaffirmed their support for industrial cooperation, in particular the Next Generation Weapons System/Future Combat Air System and Main Ground Combat System programmes.

The latter refers to a system of systems comprising a new tank and a network of manned and unmanned land vehicles.

## THE NEXT PHASE FOR FCAS: THE FRENCH AND GERMAN GOVERNMENTS COMMIT DEVELOPMENT FUNDING

By Pierre Tran

February 14, 2020

France and Germany launched Feb. 12 a technology demonstrator project for a Future Combat Air System, signing contracts for development work on a new European fighter jet, engine, command network, and drones, the industrial partners said.

“The governments of France and Germany have awarded Dassault Aviation, Airbus, together with their partners MTU Aero Engines, Safran, MBDA and Thales, the initial framework contract (Phase 1A), which launches the demonstrator phase for the Future Combat Air System (FCAS),” the companies said in a joint statement.

Funding for that initial phase is worth some €150 million (\$163 million), to be shared among the six companies, an industry source said.

Berlin and Paris are each contributing €77.5 million, with a total of €148 million of funding and an optional tranche of seven million euros, business website La Tribune reported.

Meanwhile, Airbus reported Feb. 13 2019 net loss of €1.36 billion, dragged down by a €1.21 billion charge for weak export outlook on the A400M military airlifter, and a €221 million hit due to German suspension of arms exports to Saudi Arabia.

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The biggest dent was €3.6 billion of penalty payments to Britain, France and the US to settle corruption charges on previous sales of Airbus airliners around the world.

The first stage phase 1A of the contract runs for 18 months, followed by phase 1B in which Spain and other firms will join the project, the joint statement said.

Spain's entry will bring Indra into the partnership, requiring further sharing of the work load. Airbus was reported to have hoped Madrid would pick its Spanish subsidiary as the industrial partner but those hopes were dashed with the selection of Indra.

The powerful budget committee of the German Bundestag parliament approved funding on Wednesday afternoon for the critical first phase, in part steered by a sense of courtesy as French president Emmanuel Macron was due to attend the Munich security conference this weekend, said German senior parliamentarian Rainer Brandl, AFP news agency reported.

That parliamentary approval also reflected the need to foster close ties with France.

French minister of the armed forces, Florence Parly, said on her Twitter account the German parliament had just approved a "crucial step" for the FCAS, which will equip the French, German and Spanish air forces.

"There is green light to develop a prototype fighter jet, which will fly in 2026," she said.

The German parliamentary committee, among its conditions, tied its approval to funding for the FCAS demonstrator to progress on the Franco-German project for Main Ground Combat System, said Gaëlle Winter, associate researcher at think tank Fondation de Recherche Stratégique, based in Paris.

The MGCS project includes a new tank and related manned and unmanned vehicles.

The budget committee approved funding for FCAS on condition there should be "parallel" progress on MGCS, and that there be close and interconnected parliamentary supervision of both programs and their impact on industrial policy, she said.

There will be a parliamentary review on MGCS March 4, followed by a review of both FCAS and MGCS on June 17.

On FCAS, the companies said they will examine "the main technological challenges" on the key elements, namely the next generation fighter, remote carrier drones, a command and communications network dubbed combat cloud, and a new engine.

## DASSAULT: LOOKING FORWARD TO A EUROPEAN MALE UAV AS FCAS BUILDING BLOCK

By Pierre Tran

February 27, 2020

Paris. Dassault Aviation is backing its industrial partner Airbus in budget negotiations for a planned European medium-altitude, long-endurance drone, Eric Trappier, chairman and chief executive of the aircraft builder, said Feb. 27.

"It is Airbus which leads the negotiations," he told a news conference on 2019 financial results. Those talks relate to analysis and mitigation of risk on an unmanned aerial vehicle.

Dassault "will provide support for Airbus," he said.

Airbus is due to make a March 2 detailed presentation to the French ministry of the armed forces, setting out the case for a budget in the order of €7.1 or €7.2 billion (\$7.7-\$7.8 billion), explaining how the company reached the figure, an industry source said.

Dassault will attend that meeting in a support role, a second source said.

Industry had previously sought a budget of €8-10 billion, higher than the four client nations had deemed to be acceptable.

Airbus is prime contractor on the UAV project, with Dassault and Leonardo of Italy as partners. France, Germany, Italy and Spain are the client nations, with European procurement agency Occar managing the project on their behalf.

Industry seeks to explain to the government the need to factor in provision for risk, as the program is complex and might turn out to be more expensive, take longer and need know-how not readily available, the first source said.

The government wants to set a budget and stick to it, while industry seeks to include provision to cover the "just in case" bases.

A parliamentary source said, "there is some doubt," on the European UAV project in view of cost and lengthy development, while there is "an immediate operational requirement."

Airbus declined comment.

The procurement office, Direction Générale de l'Armement, was not immediately available.

There is a view in Airbus that the support from Dassault is highly valued and reflects a close cooperation between the two companies.

That link is seen to be unusual in the light of past record, in which the two firms kept distance from each other.

For Dassault, the UAV project posed the question either cooperation between two companies, or one company striking a lone path with little prospect of reward.

Industry sees the risk of governments opting for the General Atomics MQ-9B SkyGuardian, an upgrade to the Reaper, rather than launching a European program.

France set a maximum budget of €7.1 billion for development and production of 21 systems, comprising 63 UAV units, financial website La Tribune reported, drawing on sources who spoke to the financial website in November.

Second Line of Defense

“It is to be hoped that this dossier is favorably concluded, as the European MALE UAV is intended, in a future version, to be part of FCAS,” French senators Cédric Perrin and Hélène Conway-Mouret said Nov. 21 in a parliamentary report on the 2020 defense budget.

France estimates €8 billion to be spent by 2030 on development of a Future Combat Air System, AFP has reported, based on a briefing by the private office of the armed forces minister.

On export prospects for the Rafale, Finland and Switzerland are expected to decide next year which fighter jet to pick, Trappier said.

There are talks in India with the air force and navy, and there are other sale prospects, which he declined to disclose.

In Finland, Boeing F/A-18, Dassault Rafale, Eurofighter Typhoon, Lockheed Martin F-35 Lightning, and Saab Gripen are in competition.

In Switzerland, those fighters are in a tender, except for the Gripen.

Dassault reported 2019 adjusted net profit of €814 million, up 20 percent from a year ago, on sales of €7.3 billion, up 44 percent. The net profit margin was 11.1 percent of sales, compared to 10.8 percent on a comparable basis.

Dassault expects profit margins to fall, reflecting increased research and development on its Falcon business jet. The company plans to announce this year launch of a new version of the Falcon, which competes with Gulfstream and Bombardier.

The company spent €527 million of own funds on R&D, up from €392 million, reflecting work on its Falcon 6X, due to enter service in 2022.

Orders rose to €5.9 billion from €5 billion, with defense orders accounting for €3.4 billion.

The order book fell to €17.8 billion from €19.4 billion.

Dassault delivered 26 Rafales to export clients, and none to France.

The company expects to ship 13 Rafales to foreign clients this year, and resume deliveries of the fighter jet to France in 2022.

There remains the fifth batch of Rafale orders to be placed in the multi-year budget law, with their deliveries due in 2027.

## AN FCAS UPDATE: JUNE 2020

By Pierre Tran

June 24, 2020

The French, German and Spanish air chiefs signed two key cooperative documents on the Future Combat Air System and interoperability of the present fleets of fighter jets, the French air force said in a June 19 statement.

“General Philippe Lavigne, general Ingo Gerhartz and general Javier Salto, respectively chiefs of staff for the French, German and Spanish air forces, signed two documents relating to cooperation on the Future

Combat Air System (FCAS) program and on national programs for fighter jets prior to FCAS, which will mark the way ahead,” the service said.

In the first document, signed soon after a high-level May 7 virtual meeting, “the air chiefs set out their vision on the priorities for the missions” on the Next Generation Weapon System, said general Jean-Pascal Breton, French air force program manager for FCAS.

The Direction Générale de l’Armement (DGA) procurement office also fields an FCAS program manager.

These priorities set out a definition of the common operational criteria, such as success of a mission, acceptable level of loss, and allows the evaluation of risk.

“That evaluation of risk allows an evaluation of architecture,” he said.

Industry will propose concepts of potential architecture for the Next Generation Weapon System, which will consist of a Next Generation Fighter, remote carrier drones, and the combat cloud, a network linking up the manned and unmanned aircraft.

The work on architecture stems from a joint concept study awarded to Airbus and Dassault Aviation, industrial partners on FCAS. That two-year contract began Feb. 20 2019.

A couple days after the signing of the first accord, the air chiefs signed a document on a Common Understanding of Connectivity, which seeks to boost interoperability between the present fighters flown by France, Germany and Spain, and those flown by Nato and multinational partners in European defense.

Sweden, while outside NATO, is a European ally and flies the Gripen fighter.

That interoperability document for the NGWS combined project team “also seeks to pave the path to NGWS/FCAS with respect to connectivity,” the air force statement said.

That interoperability aims to boost communications between the French Rafale and the German and Spanish Eurofighter Typhoon. Spain also flies the Boeing F-18.

Interoperability will also be sought for the replacement for the German Tornado fighter.

There are expectations the work on interoperability be supported by the planned European Defense Fund, a European Union project to part-finance research and development in the arms industry.

On the studies of remote carriers, there are more than seven types of disposable and non-disposable drones being considered. The studies have been running for more than a year and seek to draw up categories of unmanned air vehicles, to fly with manned aircraft.

Regarding work on the FCAS, Onera, a research and development organization, is in talks with the DGA for contracts, but any direct work for the procurement office was not expected before 2021, Bruno Sainjon, chairman of Onera, said in Challenges business magazine June 22.

Onera has a small contract with Dassault on the FCAS, but the aerospace research office hopes it will win more contracts, he said, adding that it seems the DGA has asked other companies to contract work with Onera.

A perceived lack of government support for Onera has stirred political debate, with a view that France was slipping behind Germany in research for FCAS.

Second Line of Defense

Members of the French senate expressed concern Dec. 5 on the government planned annual funding for the research office of €110 million (\$124 million) respectively for this year and 2021, compared to €106 million and €107 million previously planned.

That planned increase was too small, senators on the foreign affairs and defense committee said.

That French funding compared to the €200 millions of financial support DLR, its German equivalent, received from Berlin, the senators said. The DLR had already signed research contracts for the German national FCAS program, while the French DGA had yet to award contracts to Onera.

Airbus displayed a life-size mockup of a remote carrier resembling a cruise missile next to a concept model of a next generation fighter at the Paris air show last year.

MBDA, a European missile maker, is also working on concepts for remote carriers.

## FCAS ODYSSEY: JULY 2020

By Pierre Tran

July 16, 2020

The unofficial estimated cost of the Future Combat Air System project could be €50-€80 billion (\$57 billion-\$91 billion), with much depending on whether the planned Next Generation Fighter will be manned or unmanned, French senators said July 15.

“The total cost of the programme is valued by certain analysts to be in a range of €50-€80 billion,” said the 85-page report titled 2040: the FCAS Odyssey, drafted by senators H el ene Conway-Mouret and Ronan Le Gleut.

Much of the uncertainty of the cost stemmed from whether the new fighter jet would be manned or unmanned, the senators told reporters.

For now, the planned fighter jet was understood to be a manned aircraft, bearing in mind a manned aircraft cost more than an unmanned system, a specialist said.

The FCAS project comprised a new stealthy fighter jet, flying in a swarm of remote carrier drones, and a communications and command network, dubbed combat cloud, with links in air, sea, ground and space.

“This is an existential project,” Conway-Mouret said, pointing up the importance for industry and the collective interest. Strategic autonomy and support for the national and European defense industrial and technology base were seen as key factors.

France, Germany and Spain were backing the project, which would be an alternative to the F-35 fighter and compete with the UK Tempest fighter project.

### Program cost

The cost would depend on whether the new fighter jet will be manned or unmanned, the senators told reporters ahead of the publication of the report. There was for now little information available on the nature of the fighter.

That high cost pointed up the need for trilateral cooperation between France, Germany and Spain, even though the former has much of the critical technology needed to build the fighter, the senators said.

Work on the FCAS, equally shared between France and Germany, was expected to cost €4 billion by 2026, when the demonstrator fighter was due to fly, and climb to €8 billion by 2030, the report said. There would also be the cost of production lines.

The phase 1B in the framework contract for development of FCAS is expected to be worth €2 billion. Phase 1A of that contract, signed in February, was worth €155 million and ran for 18 months.

Funding from Spain had yet to be fixed, but this was expected to match the French and German contributions, the report said.

Although international cooperation would increase the non-recurring cost of research and development, that cross-border link also allowed sharing of costs and cut the amount paid by each country, the report said. Orders would rise, lowering the unit price and operating costs through shared maintenance.

A budget for the FCAS will compete with funds for a new aircraft carrier, while defense will rival education, health and other civil sectors in an economy weakened by coronavirus.

That tough outlook showed the need to win support from the proposed European Defense Fund and other European initiatives, Conway-Mouret said.

## FCAS vs Tempest

In drafting the report, the rapporteurs held a virtual meeting with the British defense procurement minister, Jeremy Quin, to be briefed on the Tempest project.

The UK was seeking partners, having agreed technology studies with Italy and Sweden, and approaching Saudi Arabia, Turkey and Japan, the senators said. That search for partners contrasted with the FCAS, which took a highly structured industrial approach based on “who does what” rather than an overall view.

This was not a “European” project but a restricted three-strong group of partner nations, a senator said.

That reflected a lesson from the A400M airlifter program which required consensus among the seven partner nations and the “juste retour” principle of funding effectively buying a project management and learning on the job. That approach led to heavy costs.

There appeared to be a “real” UK political determination to pursue Tempest, the report said, adding that British capabilities in fighter jets were “indispensable,” and it was to maintain that competence the UK would enter joint US programs.

There was close UK cooperation with the US, which brought access to American satellite intelligence and a 15 percent share of F-35 export sales, but there was also a “dependence” which the US could use to block development of a potential competitor, the report said. The UK’s share of F-35 sales financed its acquisition of the Lightning II fighter.

The Brexit factor and consequences of coronavirus set a tough financial outlook for Tempest, with the UK’s “integrated review” of defense, security and foreign policy postponed to the end of the year or early next year, the report said. That meant the budgetary consequences would only be known later rather than sooner.

The £2 billion (\$2.5 billion) budget to assess Tempest technology to 2025 seemed too low, raising pressure to find partners, but the UK sought a “massive” domestic industrial return, making it hard for foreign cooperation.

## Second Line of Defense

There was a complete lack of cooperation between FCAS and Tempest, and any “reciprocal interest” would decline, the report said. Any cooperation would become more difficult if the UK gathered foreign partners, and a sharing of tasks among industry leaders — such as Airbus, BAE Systems, Dassault, Leonardo and Thales — in the one program would be “highly complex.”

The two fighter projects would likely be in direct competition, hurting the building of a European defense industry and technological base, and increasing export competition, making the economic consequences of coronavirus all the more difficult, the report said.

The Tempest was scheduled to fly in 2035, five years earlier than FCAS, giving the former a competitive advantage in the world market, the senators said.

### Stealth Assignment

On the FCAS demonstrator, a company was due to be appointed this year to lead the work on stealth, the report said. The principle was the “best athlete” approach, with the most advanced company managing rather than the country which contributed the most funds.

There was little known on the stealth work, which was important in strategic, operational and industrial terms, the report said. “Mutual confidence” was needed to decide which company would take the lead on this highly sensitive area.

Airbus unveiled Nov. 5 at a trade media briefing, work on stealth with its Low Observable UAV Testbed, which had been classified since the German defense ministry ordered work in 2010, the report said. The anechoic chamber, at Manching, southern Germany, was used to lower the acoustic, IR, and radar signature, and sought visual discretion.

In France, the Direction Générale de l’Armement procurement office said Feb. 20 the flight test campaign was concluded on the Neuron demonstrator for a stealthy unmanned combat air vehicle.

Of the €155 million on phase 1A research and technology work, €90 million was earmarked for the fighter, €18 million for the engine, €20 million for remote carriers, and €15 million on the combat cloud, the report said.

The planned new fighter is expected to carry remote carriers of various functions, capable of long range and a large internal missile bay to boost its stealth.

### Cultural difficulties

Cultural and institutional differences were among the factors raised by the report, which referred to a Jan. 14 study observing that France and Germany “do not speak the same language.”

Berlin and Paris shared the political will to back the FCAS and could find agreement on divisive topics such as arms exports and the perceived threat, but difficulties lay in the German view there were close links between the French government and industry which put Germans at a disadvantage, the report said.

The Franco-German study was titled Consent, Dissent, Misunderstandings: the Problem Landscape of Franco-German Defense Industrial Cooperation.

A separate study, published Sept. 16, pointed up the institutional and judicial oversight which made the German approach different from the French, and gave a greater role for industry to set technological trends

in weapons. That report was titled “Defense Industrial Policy in Germany: The State Caught in the Play of Glass Beads.

## 14 recommendations

Among 14 recommendations, the non-binding report called on the three nations to sign in first half 2021 a framework contract covering delivery of the demonstrator by 2025/26 rather than a series of contracts, requiring repeated political approval, slowing down the project.

The timing was important as next year sees German elections, and French elections in the following year, slowing down the project.

Other recommendations include:

- The partner nations drawing up a joint industrial strategy agreement
- Speed up the FCAS timetable, to win funding under the French national recovery plan after the coronavirus crisis, and fly the aircraft before 2040
- Germany sign an export agreement with Spain, similar to the deal reached with France
- The demonstrator should fly with an M88 engine. There had been talk of fitting the EJ200 motor, which powers the Typhoon, but that was shot down by backers of the M88, which powers the Rafale fighter.
- The combat cloud should carry the same level of importance as the new fighter and new engine, and link the combat cloud to the SIC command and control network in the French Army’s Scorpion program
- ONERA should have a full role in FCAS, and companies should be encouraged to subcontract work to the aerospace research agency
- after the 2026 demonstrator flight, sign up other partner states and seek support from European Union defense initiatives.
- -Take into account the Tempest program as a competitor and the parallel existence of the two fighter projects.

The authors chose the title of the report to echo the science fiction novel by Arthur C Clarke and film by Stanley Kubrick, *2001: A Space Odyssey*. Homer’s work, *The Odyssey*, recounted the 10 years Odysseus took to find his way back to his home on the island of Ithaca, perhaps a time of travail the three partner nations are keen to avoid.

## AN UPDATE ON THE FUTURE COMBAT AIR SYSTEM: DECEMBER 2020

By Pierre Tran

December 12, 2020

Five options for the architecture of a planned Future Combat Air System were handed over in September to the authorities, marking a major step toward definition and development of an ambitious European project, Bruno Fichfeux, head of FCAS at Airbus Defence & Space, said Dec. 9.

“We submitted also our selection, after extensive operational and technical assessment of potential FCAS architecture...in September, the five best architectures,” he told journalists in a livestream link up from Airbus DS office at Manching, southern Germany.

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Those five options were selected from 10 architectures, and will be reduced to two by summer next year, said a source with knowledge of the project. The final architecture will be based on continuous analysis of work on the technology demonstrators.

That overall architecture included the combination of a next generation fighter and remote carrier drones, and will be fundamental for the following phases, Fichfeux said. The air chiefs of France, Germany and Spain – partner nations of the FCAS project – recently “validated” the selection of architecture options.

Those architecture options followed 18 months’ work on a joint concept study, and there is a further year’s work, he said. The companies were in intense talks with governments on the next phase, with work next year worth billions compared to the “few millions” so far.

Fichfeux declined to say how just how many billions.

A parliamentary report, titled 2040: The FCAS Odyssey, said there would be work worth an initial €2 billion (\$2.4 billion) under the second phase of a demonstrator contract, with a total €4 billion to be won by 2026, when technology demonstrators were due to fly.

Those amounts were close to the official figures, the source said. There will be one demonstrator contract with two phases spanning 2021 to 2026/7.

That compared to a phase 1A contract on the demonstrators, worth €155 million, signed July 12, shared between six companies and lasting 18 months. Airbus and Dassault began the joint concept study in February 2019. Indra was working on the study, following Spain’s joining the FCAS project.

“It’s a massive step forward we want to initiate next year with support of the governments,” Fichfeux said. “The timeline is very tight. We need to reach this point of commitment and funding...to give perspective to industry and the program.”

There was a “very tough road map,” consisting of definition, development, production, flight test and entry into service in 2040, he said.

### Seven Pillars of Wisdom

The European FCAS plan differed from the UK Tempest fighter jet project as the latter sought to fly a prototype in 2035, effectively the first in series, the source said.

That was distinct from a demonstrator of the FCAS next generation fighter due to fly in 2026, along with other elements of the European project.

The official date for the demonstrators was 2026, but there was scope for slipping to early 2027, the source said.

The FCAS plan was to field a network of present and future fighters, and remote carriers, all linked up to ground, air, sea, and space in a system dubbed multi domain combat cloud.

The partners sought to de-risk and to mature technology before inserting it in development of the new fighter, remote carriers, combat cloud, sensors, and engine, Fichfeux said.

The phase 1A was for demonstration in 2026/27 of seven key elements, namely the new fighter, remote carrier, combat cloud, engine, sensors, low observability and simulation.

The latter was effectively a war game to consider the different performance of the architectures. Along with simulation, there was also work on linking up the seven “pillars” under phase 1A.

Indra has joined Airbus and Dassault on the joint concept study. The Spanish partner will also lead work on sensors, working with Dassault and the German FCMS consortium.

Demonstration of first operational capabilities was due in 2030, with full capabilities and entry into service in 2040, said the Airbus DS presentation.

Full capacity of the demonstrators is expected in 2030, with initial operating capabilities in 2040, the source said.

Airbus, Dassault and other partners were applying a digital design, manufacturing and services approach, helped by Dassault Systèmes, Fichfeux said. The aim was to shorten “feedback loops” and speed up the process. The joint concept study looked at how DDMS could “disrupt” the development phase.

Airbus said Feb. 6 2019 the company would install Dassault Systèmes’ 3DExperience software “to a move from sequential to parallel development processes.” That was intended to accelerate bringing new products to the market and boost customer service.

### Ideas from the civil world

Airbus and the German defense ministry looked to the civil sector for bright ideas in a project dubbed Innovations for FCAS, the company said Dec. 9 in a statement. Eighteen partners including start-ups, small and medium companies, and research institutes, applied themselves in the pilot phase to work on 14 FCAS projects, including combat cloud, connectivity, the new fighter and remote carriers. The ministry funded the project.

On interoperability with the British Tempest fighter, there was need for “common European endeavour,” but it was up to governments to decide, Fichfeux said. For industry, it was important not to lose time.

The communications network in the combat cloud would be critical for “collaborative engagement” with Tempest, FCAS, and Nato forces, pointing up the need for standards and connectivity, he said.

Stealth was significant, a core technology in the demonstrator for the new fighter jet, intended to mature, test and prove in flight. There would be stealth in remote carriers, engine heat signature, sensors and communications in the demonstrator phase.

The budget for stealth in the phase 1A study was fairly small, the source said.

“The irreversible path for FCAS development is flight of the demonstrator in 2026, opening way to development,” he said.

“For that we need speed.

“We need funding and we need a strong political commitment, which we see we have today and need to maintain into the future.”

There has been call for a joint timetable for the FCAS project, amid concern over French and German elections holding up decisions and funding over the next couple of years.

“What worries me more than COVID 19 is the sequence of events,” Eric Trappier, executive chairman of Dassault, told May 14 the defense committee of the lower house National Assembly. Dassault is prime contractor for the fighter jet, the critical element in the next generation weapon system.

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“We cannot wait for 2022 to start work on the rest of the program,” he said. “It is just not possible.”

## NEXT GEN FIGHTER: FRANCO-GERMAN DEBATES AND PERSPECTIVES

By Pierre Tran

March 21, 2021

The public got a glimpse of the tough industry talks on the industrial organization for a European next generation fighter, with two televised hearings of senior executives of Airbus and Dassault Aviation appearing before the defense committee of the French senate.

The upper house called in the executives following media reports of deep dispute over work share and program management of a technology demonstrator for the fighter jet, the key element, or pillar, in a future combat air system backed by France, Germany and Spain.

Airbus strategy director Antoine Bouvier and Airbus Defence and Space chief executive Dirk Hoke appeared March 17 before the committee, a week after Dassault executive chairman Eric Trappier told March 10 senators his side of the problems holding up contracts for phase 1B and 2 to build the demonstrator.

Airbus and Dassault are essentially divided over whether there should be a prime or lead contractor – which is what Dassault seeks; or a joint approach with partners of equal rank – as sought by Airbus.

There is also disagreement on the French share of work packages classed as sensitive and of strategic importance.

France is the lead nation on the FCAS project, with Dassault lead manager on the fighter.

Each of the partner nations is due to inject a further €1 billion into the next FCAS phases, with most earmarked for the fighter. But first, the contracts must be agreed and signed.

The stakes are high, Bouvier said. There were three European fighter programs in the 1980s, with total sales of 1,500 units, while the US had the F-16, with sales of 4,500. Now there is the F-35, sales of 3,500 and eight European clients.

FCAS is a chance for Europe to catch up and “mobilize our strengths,” he said.

The two issues which need to be resolved are governance – how decisions are taken on the work packages even where there is a lead contractor; and agreement on who leads on six strategic work packages, said Hoke.

The senate committee will call in the head of the Direction Générale de l’Armement procurement office to speak on the planned fighter jet, the committee chairman said.

### Cultural Discord

The view in Germany is the French want to lead the project while expecting Germany to fund it, and the view in France is talk of Germany wanting to steal French technology, Bouvier said.

Time is pressing, as Germany goes to the polls in September, and France follows in April next year. Without the contract, incoming administrations will review the project, further slowing down the project, which has already slipped back flight of the demonstrator by a year to 2026.

Agreement needs to be reached by May, or June at the latest, Hoke said, as any deal needs German parliamentary approval. After June, any arms deal worth more than €25 million (\$30 million) requires detailed parliamentary approval.

German state elections on March 14 in Baden-Württemberg and Rhineland-Palatinate saw the conservative Christian Democratic Union, led by the outgoing chancellor Angel Merkel, lose respectively to the environmentalist Green party and center-left Social Democrats. Those states had long been strongholds of the CDU.

There are two competing business models vying for control of FCAS.

The business model for Airbus is the Eurofighter, with joint prime contractors in the four-nation consortium, Bouvier said.

Trappier told senators the business model of Neuron, a demonstrator for an unmanned combat air vehicle. France paid half the €450 million budget, and Dassault led as prime contractor, working with companies from the five country partners: Greece, Italy, Spain, Sweden, and Switzerland.

### How Airbus Sees It

Airbus and Dassault agree on two basic principles, Hoke said, namely an effective organization allowing partners to take the right decisions and meet targets on time and on budget, and there should be a prime contractor with the “levers” needed to deliver on the tasks.

However, Airbus does not agree that the prime should have full control and take program decisions on its own, Hoke said. The prime was the first along equals, and there should be partners rather than subcontractors.

Intellectual property rights on critical domains would be respected.

Airbus was ready to accept that Dassault, as lead on a work package, should act as arbitrator, to ensure timetable, cost and performance targets were met.

Airbus would also accept sharing of responsibilities critical for maiden flight, with Dassault taking lead on systems integration, flight control, and test flights.

Airbus, meanwhile, would work as partner on key systems which would be integrated into the aircraft, with Dassault as the prime.

Dassault would lead on four of the six strategic work packages, with two packages for Airbus – one in Germany and one in Spain. The client nations were asking for share of work in return for their funding the fighter project, reflecting a principle seen in the other FCAS pillars led by Germany and Spain, Hoke said. The French Direction Générale de l’Armement procurement office has asked for a strategic role for Thales in the combat cloud pillar, in which Airbus is the lead contractor.

FCAS was an historic event, Hoke said. “We are close to an agreement.”

Bouvier said there really was no plan B. There were alternatives, such as updating fighters, buying a US fighter, or launching a program with subcontractors rather than joint partners.

But these alternatives would fail to deliver the principle of European “strategic autonomy” which underpinned the FCAS project, he said.

Second Line of Defense

And industrial cooperation was rather like Winston Churchill said of democracy – the worst form of government except for all those other forms that have been tried.

### And How Dassault Sees It

Christian Cambon, chairman of the senate defense committee, gently interrupted Trappier's opening remarks and asked for a minute's silence for the death of Olivier Dassault, who died March 7 in a helicopter crash near Deauville, north of France. Dassault, son of the late Serge Dassault, had been a senator.

Trappier said he had hoped for an agreement by the end of 2020 but talks have since dragged on in search of a deal.

The situation was difficult, but the patient was not on the death bed, he said.

Dassault seeks to reach an acceptable deal, but if that failed, there was a plan B, he said, on which he gave the briefest of outline under questioning by a senator.

"My plan B is to find a system of governance which will allow bringing in European partners, but not under the rules agreed today, because "that will not work," he said.

Trappier did not say which European companies would be approached under plan B, but did speak of the Neuron UCAV demonstrator, in which Dassault worked with partners Airbus DS in Spain, HAI in Greece, Leonardo in Italy, Saab in Sweden, and Ruag in Switzerland. Rolls-Royce Turbomeca supplied an Adour engine. That project has been concluded.

The sharing out of one third of the work to each of the three client nations means Dassault will get one third of the work, while Airbus will get two thirds, he said.

There are 92 work packages proposed, or 46 percent of the project, which are joint work shares, shared evenly between the industrial partners, without a prime contractor.

Then there is 54 percent of packages with sensitive technology, with the prime and a partner, he said. Of these packages with a prime, Dassault would get 40 percent, while Airbus would get 60 percent.

Dassault had accepted that work organization as there had been pressure to reach agreement.

Then at the start of 2021, Dassault saw the 40/60 work split was not acceptable, as it was now seen as important to have a prime.

There needed to be a lead partner "to pull the levers," he said.

The rule of thirds was seen as undermining the interests of France and Dassault, he said.

"We are in a three-way marriage," he said." If I give something to Germany, I have to give one to Spain. If there were a dispute, the case would go to the procurement offices of the three client nations, where there would two against one, and "I will be in the wrong," he said.

"How do we protect our leadership in that type of organization?"

Dassault has talked to the French administration and has the support of the armed forces minister on a recasting of the industrial organization, he said.

“These are political decisions,” he said, adding that he needed the support of parliamentarians to point up the “lack of balance.”

Trappier ruled out the prospect of working with the British, which are forging ahead on the Tempest project to fly a new fighter jet in 2035.

### What the defense minister Says

The armed forces minister, Florence Parly, told March 17 the senate defense committee that she and her German counterpart, Annegret Kramp-Karrenbauer, had asked the companies to find an agreement on the fighter demonstrator.

“It is an essential phase and a phase which must absolutely adhere to the basic principle that we agreed in 2017: appointment of leaders in each phase of the program, as well the principle of “best athlete,” she said.

This is a principle which would not be abandoned, as “performance” should guide the choices to be made, and the forces should be equipped with the best weapons possible, she said.

Parly told March 11 the afternoon daily Le Monde that she and Kramp-Karrenbauer had asked the companies to find a solution, based on two principles: there should be a lead company running the packages, and the most qualified company should take leadership, rather than political selection.

Parly evoked the problems of the A400M military transport plane as a case in point.

## ARTIFICIAL INTELLIGENCE, THE FUTURE COMBAT AIR SYSTEM AND SHAPING A WAY AHEAD

By Pierre Tran

May 27, 2020

Cultural differences between France and Germany may pose problems over Airbus writing ethical concerns into artificial intelligence for the planned Future Combat Air System, a virtual introduction to a panel of experts heard May 14, 2020.

Airbus in Germany has set up a panel to consider ethical, legal and social aspects of building AI and automation into a planned FCAS, combining a new generation fighter, unmanned aircraft, and existing fighter jets in a complex network dubbed air combat cloud.

That panel was formed last year with Fraunhofer, a research institute, drawing on staff from the German defense and foreign ministries, institutes, universities, and think tanks. Those on the panel are not paid for their work.

The virtual presentation introduced panel members, who spoke of some of the issues to be examined, which included the cultural difference between France and Germany on armaments and AI.

“In many ways, FCAS represents a great leap forward,” Dirk Hoke, chief executive of Airbus Defence and Space, said in a May 14 statement.

“But there are also ethical and legal challenges which we have to address.”

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Reimund Neugebauer, president of Fraunhofer, said FCAS would be the first time Germany would see “technical implementation of basic ethical and legal principles — ethical and legal compliance by design.”

Ethics were important but companies needed to win exports to stay competitive, Hoke said.

Ethics and moral standards were part of Airbus’s decision making, he said on the FCAS Forum website set up by Airbus and Fraunhofer to address those issues.

Equipment was sold to European armed forces to ensure security, and programs such as FCAS needed economies of scale to pay for high level effort and expenditure, he said.

“In other words, it must be possible to export the system, otherwise it will be incredibly difficult for European business to keep up with global competition,” he said. “This means all those involved need to be aware of the requirements and objectives from the outset and to examine each relevant issue as thoroughly as possible.

“After all, there’s a lot at stake,” he said.

Those who logged onto the May 14 presentation of the panel heard that the aim was to hold discussions with the greatest transparency, with the FCAS Forum website to air the debate.

Arms programs sparked tension in the German parliament and the general public, said brigadier general Gerald Funke of the defense ministry, head of section planning and FCAS project leader.

It was important for civil society to have an ethics debate, in the context of the crises in health, budget, security threat, and climate change, said Ellen Uesberschär, who holds a doctorate in theology and specializes in ethics, digitalization and transformation of society.

“The deepest humiliation is to be killed by a machine,” she said.

“We have to go deeper into the question of risk, rights and responsibilities.”

There was need to ensure sufficient human control in weapons, said Bohn Rudiger, a senior diplomat.

There was an “excellent opportunity” for a European contribution on industry standards on AI and weapons, he said. There was debate in the European Union on liability on AI in civilian applications such as driving and liability in car crashes.

There was need to reconcile differences among the European partners, said Ulrike Franke, policy fellow at the European Council for Foreign Relations, a think tank. France, Germany and Spain were partners on FCAS, and other European nations may join the project.

There were “pronounced divergences” between France and Germany, with the former more open to on AI and autonomy, while the latter was more cautious, she said. The panel could explore the issues, which spanned compromise and setting red lines.

Transparency toward the public was a key factor and public opinion needed to be part of process, she said.

It was crucial to have a human as a “circuit breaker,” as there was real risk of escalation when working at machine speed, said Frank Sauer, a specialist in arms control and military use of AI. It was important to uphold the political will to involve humans, and incorporate that principle at the technical level in weapons, he said. It was important for Europe to get it right.

For Airbus, the duty was to “turn the technical vision into reality,” said Thomas Grohs, Airbus D&S chief architect for FCAS.

Funke said, “It is up to us” to design the red line, decide the role of human in the loop and on the loop, how to make sure humans have meaningful control.

Grohs said rules of engagement and concept of operations would serve as “tool sets,” reflecting legal and safety requirements. There were few ethical requirements for now and the forum would establish the requirement list.

In AI and neural networks, there could be a flexible, modular approach offering different modules to be loaded, reflecting ethical rules of the various users, he said.

Grohs was replying to a question on the engineering point of view from Wolfgang Koch, computer science professor at Bonn university.

There was need for humans in the loop, with humans as circuit breakers, Koch said. There was need for engineering to be “ethically compliant,” with digital systems used in a responsible way, in political and social terms.

Asked on how to regulate on autonomous weapons and deal with nations which do not observe regulation, Bohne said it was complex, but a step-by-step approach could be taken, leading to a regulated autonomy in weapon systems. It was important to take a prescriptive approach to get human control over autonomous systems.

On FCAS and NATO, Funke said the weapon would be “interconnected,” with the planned system designed to work with NATO systems.

Grohe said on the technical design, there was strong desire to work with NATO.

The ethical debate is presently on a national level and will be extended to a transnational discussion, the forum panel heard. The next panel meeting will be held in October.

In France, FCAS comes under the purview of an ethics committee on AI formed by the armed forces ministry, air force general Jean-Paul Breton said on his LinkedIn social media account. Breton heads the French operational study on FCAS.

The ethics committee has been asked to “contribute reflection on ethical issues taking into account the emergence of new technologies in the defense field such as the use of artificial intelligence,” he said. That reflection will start as a national study.

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The first meeting of the ethics committee took place Jan. 10, the armed forces ministry said in a Jan. 14 statement.

Bernard Pêcheur, a senior civil servant, chairs the committee, which comprises 18 members, including lawyers, professors, researchers, doctors, engineers, scientists and historians.

The French and German Airbus units needed to conduct the ethical debate on a transnational basis, a researcher said.

“This has to be done together,” said Jean-Pierre Maulny, deputy director of Institut des Relations Internationales et Stratégique, a think tank.

“If not, there will be incomprehension.”

That cross-border dialog on ethics and arms looked likely to be difficult, in view of the difference in French and German culture.

France was already late in AI and needed to catch up, he said.

The need for dialog with Germany may complicate that French bid to speed up on the AI dossier.

Airbus is partner with Dassault Aviation on the FCAS.

## Dassault and the Future Combat Air System: March 2021 Update

By Pierre Tran

March 7, 2021

Dassault Aviation has agreed to accepting a third of work share on the planned future combat system and its next-generation fighter jet, but there is dissent on working without a prime contractor on key systems such as flight control, executive chairman Eric Trappier said March 5.

There is need to resolve differences over the planned work packages as contracts need to be signed for phase 1B and 2 of the FCAS, a project seen as critical for French ambitions to maintain a military capability spurred by European sovereignty.

There is difficulty in accepting there would be joint work packages — without a prime contractor — on “sensitive, strategic” systems such as flight control, he said in a virtual news conference on the company’s 2020 financial results.

“If there is no prime, it is not possible,” he said. “It cannot work. A leader is needed.”

Airbus agreed that Dassault should have a prime contractor role in those key work packages, and it is up to the three partner nations to agree, he said.

“We are still in talks,” he said.

France is the lead nation on the FCAS, with Germany and Spain as partner nations. Dassault will be prime contractor on the new fighter, which is due to replace the Rafale and Eurofighter Typhoon jets in 2040.

Work packages on the FCAS and the fighter will be shared out in thirds, as there are three partner nations, he said. Airbus is the lead company in Germany and Spain, so that company will get two thirds of the work packages, leaving one third for Dassault.

“That is the first difficulty, but it is a difficulty that Dassault has accepted,” he said.

Then there is the principle of joint work packages, proposed by Airbus, in which the partner companies work together and there is not a lead company, he said. About half the work packages are on that joint principle, with the other half shared out in a “fair way,” he said.

Dassault has also agreed to that, he said. It is the lack of a prime on the strategic systems which has placed a spanner in the contract works.

Agreement on the work packages is needed to allow contracts to be signed for the phase 1B and 2, needed for a fighter jet technology demonstrator to fly in 2026.

Getting the work packages right is seen as key, as they could set out the industrial structure of a European arms program estimated to be worth €100 billion (\$120 billion).

An agreement could be reached, he said, but a company chief needed to have a plan B in case plan A failed, while working hard to get plan A.

### What price cooperation?

What price for the three nations if the program were pursued just for the sake of cooperation, Trappier said. France has the industrial capability with Dassault, Safran, Thales and MBDA to build and arm its own fighter.

President Emmanuel Macron and the outgoing German president, Angela Merkel, launched in 2017 the project for a European fighter jet. That fighter is part of the FCAS, which includes a communications network dubbed combat cloud, and remote carrier or drones.

On intellectual property rights, Dassault had no problem with sharing its future technology with Airbus on the FCAS, he said. Dassault would not pursue a US-style sealed black box approach on its work, as that was technology in the “foreground.”

But the “background” knowledge of Dassault’s more than 70 years of aeronautics would not be handed over, he said.

There would not an IPR problem as governments could look inside the black box on the European project, he said. The problem was the governments recognizing Dassault’s claim for prime contractor status in some of the work packages.

On exports of the fighter, there may be “a difference in perception” in France and Germany, but there would not be a governmental problem as there is an extension of the Debré-Schmidt agreement on foreign arms sales, he said, with Spain joining the partnership.

France and Germany signed a cooperation treaty on Jan. 22 last year, which included an arms export agreement, allowing either country to veto a prospective deal if its national content exceeded 20 percent of value. That pact extended the Debré-Schmidt agreement reached in the 1970s.

### An Update on the Future Combat Air System: March 2021

Second Line of Defense

By Pierre Tran

March 5, 2021

Paris – Thales will have a major role in the upcoming phase 1B in development of a technology demonstrator for the European future combat air system, including work on sensors and the combat cloud network, executive chairman Patrice Caine said March 4.

“We are one of the big partners in this initiative,” he said at a virtual press conference on the company’s 2020 financial results. “We are very much involved in at least two pillars – the sensors pillar and the pillar for the system of systems – or combat cloud.”

France has designated Thales as the “national champion” for studies on sensors and combat cloud, so much of the French spending in these two areas will flow to the electronics company, he said, declining to give any figures.

There are seven areas of work, dubbed pillars, on research and technology on the FCAS demonstrator, namely: a next-generation fighter; engine; remote carrier, or drone; command and communications network, or combat cloud; simulation; sensors; and stealth.

The Direction Générale de l’Armement signed a contract with Indra, with the Spanish company leading a three-nation consortium on the phase 1 study on sensors, Thales said in a Nov. 23 joint statement with its industrial partners.

Thales is the French partner in that consortium, along with the German FCMS group, comprising Diehl Defence, ESG, Hensoldt, and Rohde and Schwarz.

That phase 1A concept study for sensors ran for 12 months, with a possible extension of six more months, the statement said. The French procurement office signed on behalf of France, Germany and Spain.

The companies will work on the design of concepts for “a connected and distributed architecture of sensors,” including design of future sensor architectures and maturing of associated sensor technologies, the statement said.

Airbus, working out of Germany, is the lead company on study of the combat cloud, with Thales and Indra as partner companies.

The partner nations and companies are due to move on to phase 1B of the R&T work, perceived to be vital to building a demonstrator to fly in 2025/26.

France and Germany are each expected to pledge respectively some €1 billion (\$1.2 billion) for phase 1B, with Spain due to commit a similar amount, a defense analyst said. Such a commitment has raised doubt on whether Madrid would be able to find funds to join a project for a European unmanned aerial vehicle.

There has been much public debate on contracts for work in phase 1B, with Dassault Aviation reported to be seeking to protect intellectual property rights on work on the next-generation fighter, while Airbus seeks full access to sensitive information.

A Jan. 2 research note from the SWP German Institute for International and Security Affairs pointed up the need to resolve the issue of IPR.

“A crucial question that arises at this point concerns the protection of emerging or existing intellectual property: to what extent should companies disclose their processes and know-how, to what extent will technical specifications be made available to the other partners later?”

Resolving dispute over IPR is seen as vital for progress on the FCAS project and has an impact on other issues, said the note, titled Future Combat Air System: Too Big to Fail.

A related issue was whether maintenance and repairs would be reserved to the lead manufacturer, or would there be access to documents which allowed the armed forces to service the kit, backed up by industrial partners?

“If only the manufacturer can and is permitted to carry out certain parts of the maintenance, this might also affect operational readiness,” the note said.

A Feb. 16 research note from the Institut des Relations Internationales et Stratégique, a think tank, said a compromise was needed to allow a signing of the phase 1B agreement, as not a single European nation could afford such a complex program on its own.

“A destructive competition between our companies would lead to the loss of our industrial capability in military aeronautics,” the note said, adding that the stakes at risk on FCAS were not just European but of worldwide importance.

## FCAS Next Steps: May 2021

By Pierre Tran

May 19, 2021

France, Germany and Spain have agreed the industrial organization for development of a future combat air system, including a demonstrator for a new generation fighter to fly by 2027, the defense ministers of the partner nations said May 17 in a joint statement.

“The industrial organisation of the program has been set up appropriately to ensure the consistency and the efficiency of the project...within a balanced, broad and deep partnership,” the ministers said.

There was a race against time on reaching that political agreement, which needs the German parliament to authorize a budget reported to be worth €3.5 billion (\$4.3 billion), before the Bundestag retires in June for the summer recess ahead of the Sept. 26 general election.

The partner nations will each contribute an equal amount toward that budget, which will cover phase 1B over 2021-24, weekly magazine Air & Cosmos reported, following a briefing by the office of armed forces minister Florence Parly. That funding allows industrial partners Airbus and Dassault Aviation to build a technology demonstrator for the new fighter, and Safran and MTU to work on a new engine.

An agreement was reached on the key issue of intellectual property rights at a May 14 meeting of the three nations and the key companies, namely Airbus, Dassault, Safran, and MTU, the report said. A failure to agree on protection of intellectual property rights would have led the project to crash and burn.

France and Germany agreed the new fighter will lack a black box to protect sensitive commercial technology, after failing to meet a deadline at the end of April and needing extra time to agree on intellectual property rights, Reuters reported.

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On intellectual property rights, “the contractual clauses negotiated on this subject suit everybody,” Parly said May 14 in La Tribune, a financial website. Intellectual property rights were extremely sensitive when cooperating in large programs and close attention was needed to make partners feel “comfortable.”

A budget for phase 2 to build and fly the prototype fighter in 2026-27 was still under discussion, Air & Cosmos reported, with that timetable having slipped to the right. There were three designs for the twin-engine prototype fighter, and six for remote carrier drones, spanning an upgraded cruise missile to a combat drone.

The demonstrator fighter will fly with the Safran M88 engine, after the French partners shot down a German attempt to fit the EJ200, built by Rolls-Royce, an industrial partner on the rival UK Tempest project for a new fighter.

Besides tough talks over intellectual property rights, Airbus and Dassault had spent months seeking agreement on the industrial work share on the new fighter. The latter is prime contractor on the new fighter, but there was dissent over the former gaining a larger share of the work, as Airbus is lead partner in Germany and Spain. Dassault wanted the final say on work packages on which it was the lead partner.

The new fighter is due to fly in 2040 as replacement of the Rafale and Eurofighter Typhoon. The planned fighter is the first pillar of the seven pillar FCAS project. The engine is the second, remote carriers the third, combat cloud or an extensive communications network the fourth, simulator the fifth, sensors the sixth, and stealth the seventh.

France sees the FCAS project as essential for European sovereignty and a means to maintain industrial and military capability in a market dominated by the US and Russia, with China increasing its reach.

“The implemented cooperation scheme offers an unequalled opportunity to strengthen the technological assets of the three participating countries, while ensuring the best competitiveness of the future system,” the ministers said.

“The discussions conducted by DGA, BMVg and DGAM during the last months allowed to achieve a balanced agreement between the different partners for the next step of the demonstration phase of the program.”

That statement referred to respectively to the French, German and Spanish procurement offices, Direction Générale de l’Armement, Bundesministerium der Verteidigung, and Dirección General de Armamento y Material.

## THE FCAS INDUSTRIAL PACKAGE: THE SAGA CONTINUES

By Pierre Tran

June 15, 2021

France, Germany and Spain said last month they had reached agreement to launch a long awaited development phase for a European future combat air system, but it has emerged there were still industrial and political issues to resolve.

What has emerged is that the key companies Airbus and Dassault Aviation may have reached an industrial agreement, and the three nations may have reached an intergovernmental agreement, but industry and government have yet to agree the budget.

The date on program managers' diary is June 23, when the powerful finance committee of the German parliament considers the budget for launch of phase 1B to develop the FCAS, in which a new generation fighter is a major element.

There are still be industrial issues to be resolved, but there has also been negative press coverage, threatening a project which is effectively a European bid for strategic autonomy, said Jean-Pierre Maulny, deputy director of Institut des Relations Internationales et Stratégiques, a think tank.

"The problem is that today the Cassandras on both sides of the Rhine are at work," he said Feb. 16 on the IRIS website. Some reports drew almost a caricature account of nice French and nasty Germans, or vice versa, he said.

The three partner nations said May 17 in a joint statement they had reached consensus on phase 1B, which seeks to fly a technology demonstrator for the fighter jet and remote carrier drone in 2027.

An absence of government agreement with industry may lie behind the French armed forces ministry declining to comment May 21 on whether the three nations were asking industry to cut costs by five percent, or close to €200 million (\$242 million), as reported in business website La Tribune.

Some companies are ready to cut their offer by three percent, but Airbus has declined so far, business weekly Challenges reported May 25, leaving an €80 million gap between what industry was offering and the overall budget.

The budget for phase 1B, due to run 2021 to 2024, is worth some €3.5 billion, with €990 million from France, €970 million from Germany, and €940 million from Spain, the report said.

"There is presently no agreement between the governments and industry," Eric Trappier, executive chairman of Dassault, told May 18 daily Le Figaro. "Discussions are continuing."

Dirk Hoke, chief executive of Airbus Defence & Space, agreed with that, the daily reported, adding the French defense ministry said there was lack of agreement on prices pitched by industry.

A spokesman for Dassault, which owns Le Figaro, confirmed the report.

The timing of the announcement of government agreement reflected time pressure, an industry source said.

With the German parliament on a tight timeline before closing for the summer break and ahead of the September general election, the governments needed to submit a budget proposal for approval by the Bundestag.

There were issues still to be resolved, but talks were continuing in a bid to reach full agreement in time for approval by the German parliamentarians.

On the German side of the Rhine, there was a report from the Federal Office of Bundeswehr equipment, information technology and service support, which criticized the amount of work which would be assigned to French industry, leaving German companies in a weaker position, weekly news magazine Der Spiegel reported last weekend.

The report showed a divided Germany defense ministry, with the defense minister Annegret Kramp-Karrenbauer seen as the main target in a pre-election period, and the FCAS as collateral damage, La Tribune reported.

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There was also a part of the defense ministry favoring the US, and that included the F-35 over the planned European fighter.

There were some in Germany who referred to FCAS as the “French Combat Air System,” reflecting hostility to a perceived greater role for French industry, Challenges reported.

Meanwhile, there is still discord over intellectual property rights, and access sought to “background” technology acquired on Dassault’s work on Mirage and Rafale fighters, and the Neuron demonstrator for an unmanned combat aerial vehicle, the magazine reported.

Intellectual property rights are important to Dassault and underpin its industrial competitiveness, but taxpayers funded the technology through government spending on research and technology, Maulny said.

“Compromise needs to be accepted,” he said.

“Companies have to give up something they used to do.”

The joint announcement of the three partner nations said a far reaching agreement had been reached.

But much remains to be resolved to reach the final agreement.

Or as American reggae singer Johnny Nash sang in 1972,

“There are more questions than answers

“And the more I find out the less I know.”

## FRENCH, GERMAN AND SPANISH AIR CHIEFS RECEIVED FCAS INDUSTRY BRIEFINGS

By Pierre Tran

June 21, 2021

Paris – The French, German and Spanish air chiefs were briefed June 17 and 18 by three companies leading the industrial effort on a European Future Combat Air System, the three nations said in a joint statement.

The official visits were made just days before German parliamentarians were due June 23 to decide on authorization of a €3.5 billion budget for phase 1B development work on the three nation FCAS project.

French general Philippe Lavigne, German lieutenant-general Ingo Gerhartz, and German general Javier Salto Martinez-Avial received updates on concept studies while visiting Indra in Madrid, Spain, Airbus in Manching, Germany, and Dassault Aviation in Saint Cloud, France, the June 18 statement said. A combined project team at Arceuil, just outside the French capital, also briefed the officers.

The meetings reviewed operational aspects of a next generation fighter and remote carrier drones, dubbed Next Generation Weapon System, the statement said.

NGWS will be the core element in the future combat air system, which seeks to deliver a “combat cloud” network to hook up aircraft including Rafale, Eurofighter Typhoon, a European unmanned aerial vehicle, MRTT inflight refueling tanker, C295 and A330M transport aircraft.

That FCAS will also seek to be interoperable with the F-35 and F-22 fighters, and AWACS aircraft.

“The three air chiefs continue to meet on a regular basis in order to keep track of progress within the project NGWS and provide their command level operational perspectives,” the statement said.

The officers received “detailed project information” from military experts and company executives.

The NGWS concept draws on a “joint all-domain” warfare capability, the statement said, leading to a complexity that “exceeds everything that has ever been imagined and produced in a European cooperation project so far.”

Development of the technology demonstrator is seen as a milestone in maturing technology and cutting risk on NGWS, the statement said, which will be operationally superior and a system of systems offering interoperability.

“The air chiefs are already looking forward to see the project entering the next phase and subsequently to receive the results of the first real life demonstrations,” the statement said.

The demonstrators of the new fighter and remote carriers are due to fly in 2027.

That demonstrator is expected to be based on a Rafale rather than a Eurofighter Typhoon, reflecting the program management role of Dassault.

That air chiefs pointed up the value and importance of trilateral work in operational and technical areas, allowing national views and priorities to be factored into the project, the statement said.

A European capability was seen as important for autonomous sovereignty.

Development of European technology is “crucial to achieve independence and resilience to maintain security in Europe,” the statement said.

That three-nation project effectively competes with the Tempest program led by the UK, teamed up with Italy and Sweden, to deliver their new fighter and unmanned aircraft in 2035.

That is five years earlier than the entry into service of the Franco-German-Spanish fighter and remote carriers in 2040.

The French, German and Spanish companies had been reported to be in negotiation with the governments, which had been seeking a cost cut of five percent.

The talks also were reported to include industry calls for respect of intellectual property rights.

The need for German parliamentary approval had effectively set a hard deadline for reaching agreement on the budget and IPR.

While the French procurement office was confident of a green light by the German parliamentary finance committee, there was less optimism for approval of spending for a Main Ground Combat System – a Franco-German project for a new tank, upgrade on the Tiger Mk3 attack helicopter, and a Maritime Airborne Warfare System (MAWS), business website La Tribune reported.

The latter will to replace the Atlantique 2 and P-3C Orion maritime patrol aircraft flown respectively by French and German navies.

Funding for those three projects will likely have to wait until after German general election results are counted in September, returning a new government and a new parliament.

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## THE BUNDESTAG BUDGET COMMITTEE'S GREEN LIGHT ON FCAS

By Pierre Tran

June 25, 2021

The German parliament approved Berlin's share of a budget worth €4.5 billion (\$5.4 billion) for development work on a European Future Combat Air System, an industry source said June 24.

That long awaited June 23 vote by the Bundestag budget committee authorized funding for the German share of work on phase 1B of a technology demonstrator for FCAS, and funding for additional national work, the source said.

French and German defense ministers welcomed the parliamentary approval, along with the outgoing chief executive of Airbus Defense and Space, and the chief executive of MBDA, a European missile maker.

That parliamentary approval came with conditions which signaled a determination for close political control by the powerful Bundestag.

France, Germany and Spain are partner nations on FCAS and its Next Generation Weapon System, a core element comprising a next generation fighter and remote carrier drones.

FCAS includes a command-and-control network dubbed combat cloud, to link up manned and unmanned aircraft, and hook up aircraft including a medium-altitude, long-endurance UAV, A400M transports and MRTT inflight tankers.

The exact nature of the funding appeared to be rather complicated, as there was €1 billion beyond the €3.5 billion expected to be authorized. The three partner nations had been expected to contribute roughly a third of the core €3.5 billion.

The funding will apply to development work between 2021 and 2024. The industrial partners, Airbus for Germany, Dassault Aviation for France, and Indra for Spain were expected to sign contracts in the coming weeks.

The parliamentarians attached conditions for budgetary approval, a source close to the German side said, including insisting that intellectual property rights on key German technology be maintained.

That was intended as "a strong political signal to industry" in the integration of European defense industry, the source said.

Dassault has made French headlines, insisting on protecting IPR on the planned fighter jet. The family controlled company, which will be prime contractor on the fighter jet, has said it would share technology on the new program but has resisted calls from Airbus to share know-how on previous programs.

The parliamentarians called for work on FCAS and NGWS to be kept in close parallel lines and for industrial partners to speed up agreement on the program structure.

There are estimates the overall budget for FCAS could be some €100 billion.

A further condition was for parliament to review industrial proposals before granting funds for phase 2, which will allow production of a technology demonstrator of the new fighter. That phase 2 is due to run 2024 to 2027, with the demonstrator fighter jet expected to fly in 2027.

There was relief for the German government, which had negotiated last minute revisions with the Social Democrats to win parliamentary backing.

France welcomed the German parliamentary approval.

“The Bundestag has just approved a crucial step for the construction of the FCAS and our future European fighter aircraft,” French armed forces minister Florence Parly said on a social platform. “Together, we continue to build a strong and concrete European defense.”

Airbus Defense and Space said on a social platform, “Big milestone achieved!” and tipped its hat in tribute to its outgoing chief executive, Dirk Hoke: “Chapeau, Dirk!”

Hoke is leaving Airbus DS July 1 and will pursue opportunities outside the aerospace company.

That Bundestag backing was “a key step towards contract award for a seamless and on-time continuation of this important European program,” Hoke said on his social platform account.

The FCAS project would boost “European operational and technological sovereignty,” he said.

“With our partners, we are committed to build the Future Combat Air System that will contribute to the European defences and its sovereignty,” said Eric Béranger, MBDA chief executive.

Dassault declined comment.

The armed drones and nuclear weapon capability of FCAS presented problems for the Greens party, said a March 19 research note from European Council on Foreign Relations, a think tank. The ecology party is expected to hold a position in the next German government coalition,

“For the Greens, as for the Social Democrats (SPD), autonomous weapons are a big ‘no,’” the note said. “Both see today’s remotely piloted armed drones as only one step removed from tomorrow’s fully autonomous weapon systems.”

The German air force flies the Tornado fighter, which carries US built atomic gravity bombs, and if Berlin dropped out of sharing a Nato nuclear capability with the retirement of the Tornado, there would be no need for a new fighter to carry nuclear weapons, the note said.

Even financing development of a nuclear capable system would jar with the treaty for prohibition of nuclear weapons, which the Greens have called for Germany to sign, said the note, titled “How Germany’s Greens could spell the end for the Franco-German fighter jet.”

There is a young “realistic” part of the Greens party, said the source close to the German side, indicating there would be backing for the FCAS.

Germany goes to the polls in September. The parliament closing for the summer break meant there was urgency for the Bundestag approving funding for FCAS.