International Fighter Conference, 2019

12/9/19

By Dr. Robbin F. Laird

This report focuses on the presentations and assessments made from those presentations at the International Fighter Conference 2019, held in Berlin, Germany from November 12-14, 2019.

The theme of this year's fighter conference was "networked lethality" and highlighted the transformation of the fighter aircraft within the overall dynamics of change for the multi-domain combat force.

International Fighter Conference, 2019

BY DR. ROBBIN F. LAIRD

PROLOGUE

September 3, 2019.

Last year's International Fighter Conference provided a chance for the participants and the attendees to focus on the role of fighters in what we have been calling the strategic shift, namely, the shift from the land wars to operating in higher intensity operations against peer competitors.

It is clear that combat capabilities and operations are being re-crafted across the board with fighters at the center of that shift, and their evolution, of course, being affected as well as roles and operational contexts change.

The baseline assumption for the conference can be simply put: air superiority can no longer be assumed in operations but needs to be created in contested environments.

It is clear that competitors like China and Russia have put and are putting significant effort into shaping concepts of operations and force structure modernization which will allow them to contest the ability of the liberal democracies to establish air superiority and to dominate future crises.

There was a clear consensus on this point, but, of course, working the specifics of how one would defeat such an adversary in an air campaign gets at broader and more specific force design and concepts of operations.

The conference worked from the common assumption rather than focusing on specific options.

But the way ahead was as contested in the presentations and discussions as any considerations for operations in contested airspace.

We argue that what the liberal democracies are working to shape in response to the new strategic environment is something we call building an "integrated distributed force."

For example, the new Sec Def, Mark Esper, has prioritized defense efforts in the Pacific as a key anchor to the Great Power strategy. In particular, given the withdrawal from the INF treaty, a key focus is upon the building of new conventional longer-range missiles deployed throughout the US and allied Pacific defense perimeter.

This entails interactive technological, force structure and geographical deployment dynamics. We have argued that a new basing structure combined with a capability to deploy and operate an integrated distributed force is at the heart of the strategic shift, and not only in the Pacific.[1]

This is a key part of the effort to shape a full spectrum crisis management capability whose con-ops is shaped to deal with adversary operations within what some call the "gray zone" or within the "hybrid warfare" area.[2]

The nature of the threat facing the liberal democracies was well put by a senior Finnish official: "The timeline for early warning is shorter; the threshold for the use of force is lower."

What is unfolding is that capabilities traditionally associated with high end warfare are being drawn upon for lower threshold conflicts, designed to achieve political effect without firing a shot.

This means that not only do the liberal democracies need to shape more effective higher end capabilities but they need to learn how to use force packages which are making up a higher end, higher tempo or higher

intensity capability as part of a range of both military operations but proactive engagement to shape peer adversary behavior.

In today's world, this is what full spectrum crisis management is all about.

It is not simply about escalation ladders; it is about the capability to operate tailored task forces within a crisis setting to dominate and prevail within that crisis. If that stops the level of escalation that is one way of looking at it. But in today's world, it is not just about that but it is about the ability to operate and prevail within a diversity of crises which might not be located on what one might consider an escalation ladder.

The presence force however small needs to be well integrated but not just in terms of itself but its ability to operate via C2 or ISR connectors to an enhanced capability. But that enhanced capability needs to be deployed in order to be tailorable to the presence force and to provide enhanced lethality and effectiveness appropriate to the political action needed to be taken.

This rests really on a significant rework of C2 in order for a distributed force to have the flexibility to operate not just within a limited geographical area but to expand its ability to operate by reaching beyond the geographical boundaries of what the organic presence force is capable of doing by itself.

This requires multi-domain SA – this is not about the intelligence community running its precious space- based assets and hoarding material. This is about looking for the coming confrontation which could trigger a crisis and the SA capabilities airborne, at sea and on the ground would provide the most usable SA monitoring. This is not "actionable intelligence." This is about shaping force domain knowledge about anticipation of events.

This requires tailored force packaging and take advantage of what the new military technologies and platforms can provide in terms of multi-domain delivery by a small force rather than a large air-sea enterprise which can only fully function if unleashed in sequential waves.

This is not classic deterrence – it is about pre-crisis and crisis engagement.

The force we are building will have five key interactives capabilities:

- Enough platforms with allied and US forces in mind to provide significant presence;
- A capability to maximize economy of force with that presence;
- Scalability whereby the presence force can reach back if necessary at the speed of light and receive combat reinforcements;
- Be able to tap into variable lethality capabilities appropriate to the mission or the threat in order to exercise dominance.
- And to have the situational awareness relevant to proactive crisis management at the point of interest and an ability to link the fluidity of local knowledge to appropriate tactical and strategic decisions.

The new approach is one which can be expressed in terms of a kill web, that is a US and allied force so scalable that if an ally goes on a presence mission and is threatened by a ramp up of force from a Russia or China, that that presence force can reach back to relevant allies as well as their own force structure.

This year's international fighter conference focuses on a core aspect necessary to be able to be in position to shape an integrated distributed force, namely, namely, what the organizers are calling networked lethality.

THE INTERNATIONAL FIGHTER CONFERENCE 2019: AN INITIAL RETROSPECTIVE

The 2019 edition of the International Fighter Conference is now history.

And it was held in the city of Berlin which earlier in the month was remembering the 30 year history of the Fall of the Wall.

That event ushered in the ultimate collapse of the Soviet Union and the end of the Cold War.

But this fighter conference was being held as the challenge of direct defense has returned to Europe.

The Cold War is over but the Russians are back.

And this time they are not alone.

They have core global authoritarian allies in which the 21st century authoritarian powers are challenging the liberal democracies and working to change the rules of the game rather than simply marginally modifying the "rules based" order.

But fighters are not what they once were.

They are now key players in multi-mission and multi-domain operations.

I argued several years ago that the coming of the F-35 would lead to the "renorming of airpower" in which the first-generation flying combat system would be a driver of fundamental change in air combat operations.

Indeed, the broader wave of change is clearly upon us in which the United States and its allies are building a new C2 and ISR infrastructure within which fighters both generate, and benefit from in the emerging combat world of "gray zones," "hybrid warfare," and contested multi-domain operational space.

If one is looking for a conference which generates a single threat narrative clarifying your thoughts, the International Fighter Conference is not for you.

The strength of this conference is that several lines of thought are put into play, which by themselves may not add up to a single narrative, but spawn several narratives, and several lines of though which requires further examination.

I have come to this year's fighter conference through a long path, quite literally.

It started in Australia where I attended and have written the report for the latest Williams Foundation seminar, this one entitled, "the requirements for fifth generation maneuver." Here the ADF has accepted for some time that they are on the path of building a fifth generation force.

The Head of the Australian Air Warfare Centre has defined fifth generation maneuver as follows:

"The ability of our forces to dynamically adapt and respond in a contested environment to achieve the desired effect through multiple redundant paths. Remove one vector of attack and we rapidly manoeuvre to bring other capabilities to bear through agile control."

Next I went to Bahrain, and participated in BIDEC-19, a conference which focused on the new technologies and technological threats affecting the GCC and its allies going forward.

Second Line of Defense

A key part of the conference was to think through ways to adapt to the new context of conflict and how best to prevail against the 21st century authoritarians.

But clearly, the question being addressed: How best to shape an eco-system for defense modernization and transformation which could enable the GCC states to deal with evolving software and digital revolution?

I mention both of these conferences for the simple reason that many of the same topics were discussed at the fighter conference, something you might not expect if you expected a narrow conversation on the current future pointed nosed assets and their near-term futures.

Rather, the fighter conference frames a much wider array of discussions on the overall threat and combat environment facing the current and future fighter fleets and discusses how they can contribute or better contribute to the evolving combat environment, and to be more effective in incorporating evolving technologies.

In short, the fighter conference is a place to be for those who are thinking about the evolution of the multi-domain combat environment and how best to prepare those flying fighters to prevail in that environment.

AIRPOWER WHEN DIRECTLY FACED WITH THE AUTHORITARIAN POWERS: THE INTERNATIONAL FIGHTER CONFERENCE 2019

There were a wide range of presentations in Berlin at this year's International Fighter Conference. Among those presenting were Air Force officers or industry representatives from countries facing a direct "existential threat" from either the PRC or Putin's Russia.

How are the countries directly threatened by the 21st century authoritarian powers addressing the role of airpower in their self-defense?

The answer as seen in the presentations by speakers from Taiwan, Ukraine, Lithuania and Malaysia was that air power was crucial for their self-defense but an airpower which could be tailored to the specific threat being posed in their proximate neighborhood.

And done so in a manner designed and developed to link with partners and allies to extend the range of their defense as well.

But self-reliance is a key part of the answer, as being as close as they are to the authoritarian powers, and living in their neighborhoods means you have to be able to do what is possible for self-defense in order to buy time for partners and allies to plug into one's defensive system.

Interestingly, none of the these states was focused on a posture which frankly the authoritarian states should find threatening to their own territories, but only threatening in terms of challenging the agendas of the authoritarian powers who believe that playing an away game in support of their domestic territorial, defense, economic and political agendas is their right.

The Case of Lithuania

Col. Dainius Guzas, Lithuanian Air Force Commander, provided a briefing entitled "Developing Capability Against a Peer Opponent."

The challenge as described by Guzas was both the direct threat posed by Russia against the Baltics and the use of political warfare to undercut the core defense of Lithuania – the engagement of NATO allies in Baltic Air Policing and the delivery of air defense to Lithuania via NATO coalition airpower.

Because of the significant number of NATO air policing participants in the Baltic Air Policing effort, Lithuania was a host nation to a wide variety of NATO forces.

This means that they probably have experienced more first-hand knowledge than most of the challenge of operating the range of NATO fighter aircraft at the tactical edge in NATO defense.

This NATO engagement experienced first-hand by the Lithuanian Air Force provides the ground truth for how to defend the Baltics in a crisis

And the Russians have spent considerable time and effort in generating "fake news" to try to undercut the confidence of Lithuanians in their NATO allies.

This form of political warfare is combined with air space incursions to try to test and pressure the Baltic Republics.

The Case of Ukraine

Commander of the Air Command "South" of the Ukrainian Air Force, Lt. General Vasyl Chernenko presented a briefing entitled, Peculiarities of Employment Fighter Aviation and Development of its Future Capabilities According to Ukrainian Air Force Experience of Participation in Joint Forces Operation at the East of Ukraine."

Ukraine of course has experienced war first hand in the 21st century with the Russian seizure of Crimea, and with continued engagement in the rest of Ukraine with the goal of shaping Ukraine's future.

Russia used what analysts referred to as hybrid war as the means both to seize Crimea and to engage in destabilization efforts within the rest of Ukraine.

But what can be forgotten is the nature of the Russian military incursion which was much more similar to the means used by insurgency forces, which, of course, from a military point of view would require Ukraine to have the kind of counter-insurgency capabilities honed by the West over the past two decades in the Middle East.

Put bluntly, Ukraine does not have such capabilities, which poses the question of whether and how the West might provide such capabilities?

Notably, the West would not do counter-insurgency in the Middle East without airpower, and the question is how Ukraine might obtain or develop such capabilities?

According to the presentation, the Ukrainian Air Force is in the process of transition with increased but still very limited pilot training and enhanced readiness for their legacy fighter fleet of MiG-29s and Su-27s.

The speaker highlighted what he labelled "the sabotage-terrorist nature of the enemy's actions," which he argued required the use of fighter aircraft as part of the strike and defense force needed by Ukraine.

And these fighters would need to confront the Russian air defense system moved forward into the areas of interest as well.

He argued that Ukraine was focused on the upgrades of its current fighter force either by indigenous developments or by working with partner nations.
Second Line of Defense

Obviously, the partner nation bit is the challenging part, as the West needs to sort out how to provide military aid to Ukraine but in such a way that it reinforces the defense capabilities of Ukraine without justifying the undoubted claims Russia would make that such efforts are designed to threaten Russian territory.

Clearly, the "fake news" piece discussed by Col. Guzas is not only already happening but would be part of ongoing Russian campaigns against Western efforts to help Ukraine counter Russian agression.

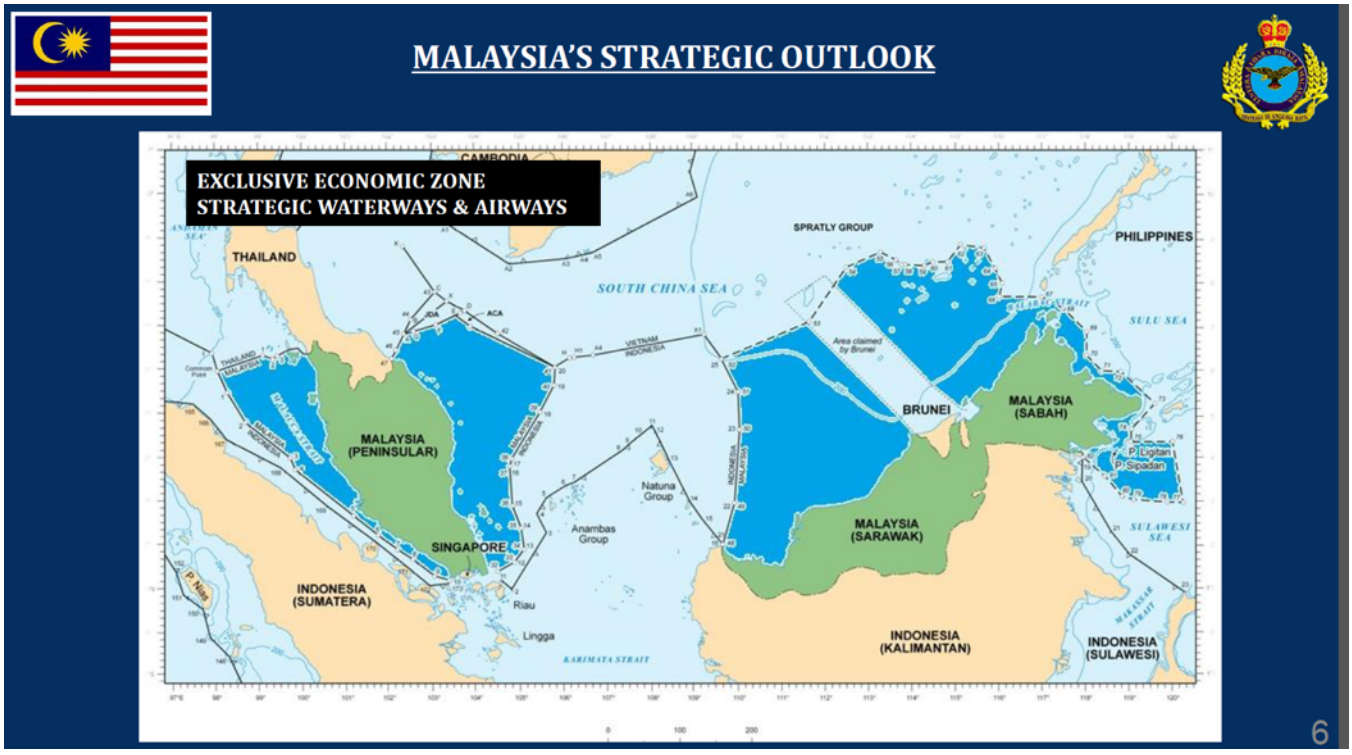
This means that whatever aid programs are generated need to be accompanied by well throughout out political campaigns to support such efforts.

The fact that Ukraine is an unfortunate bystander in an impeachment dynamic in the United States is clearly not a good illustration of how this needs to get done.

The Case of Malaysia

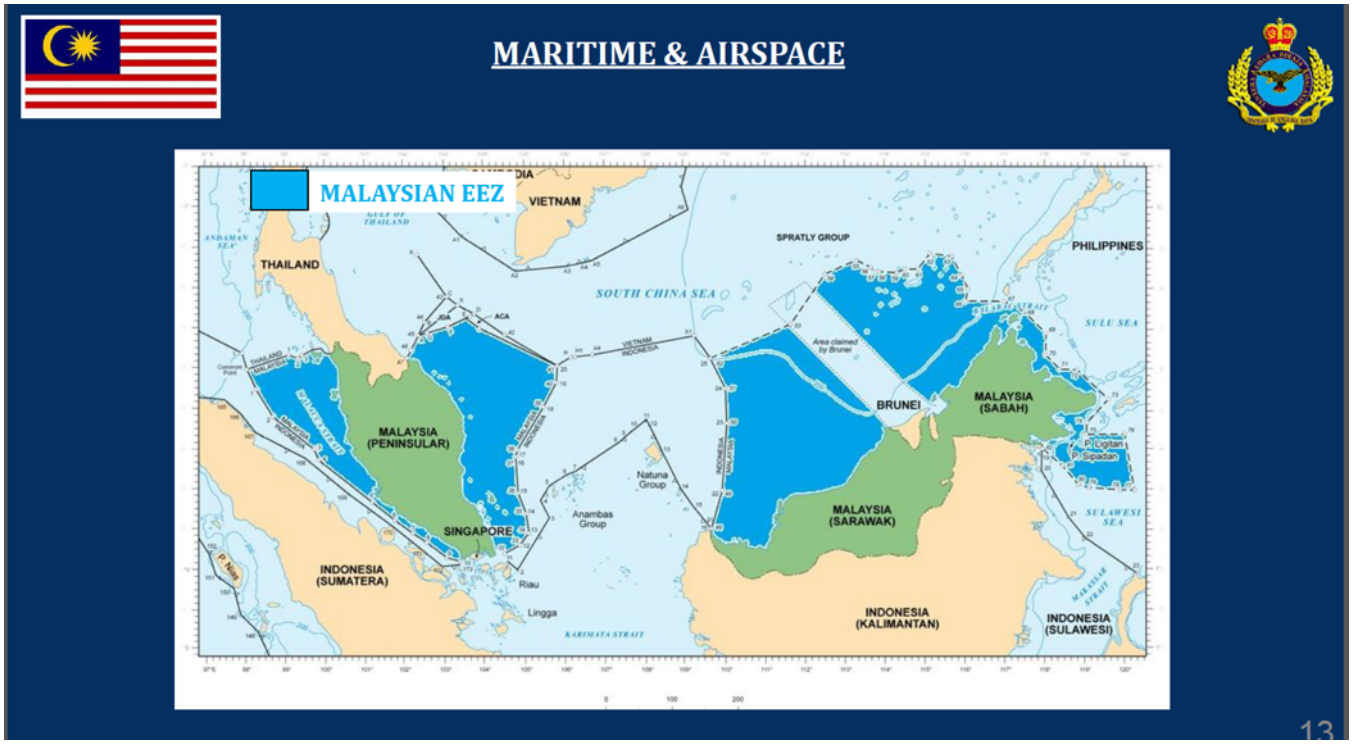
Major General Dato' Muhamad Norazilan Bin Aris, Royal Malaysian Air Force, Chief of Staff, provided a briefing entitled, "Striking the Balance Between Affordability and Capability."

Malaysia's' strategic outlook was highlighted in this slide from his briefing.



The need for airpower is clearly rooted in terms of the need for two theater operations just to defend their own territory, and the Navy and Air Force need to be capable of addressing the challenge of defending and/or being engaged in the Malaysian EEZ.

The scope of that challenge can be seen in the slide below from his briefing.



The role of Light Attack Aircraft in playing multiple roles for the Air Force, which could deliver a mix of capability and affordability to the Air Force.

This is the near-term effort with the fighter replacement program after that.

The Major General was asked about the challenge of working with partner Air Forces, notably with regard to the Australian Air Force and Navy (RAAF and the RAN).

And he underscored that a key requirement was building out its Link 16 capabilities to do so much more effectively.

This answer highlighted a key point made by the various presenters from countries living in the neighborhoods of the authoritarian power, namely, the need to be connectable to allies and partners in times of crisis.

The Defense of Taiwan

With the People Republic of China's reach into the Pacific, including building bases in the South China Sea, clearly the question of the defense of Taiwan is becoming a more pressing issue.

And the Republic of China has focused on its own self-defense, making it a much harder piece of democratic real estate for the authoritarian Chinese regime to grab.

And clearly, efforts by Taiwan need to be supported and reinforced by core allies, as is being done with the United States sale of new F-16 fighter aircraft to Taiwan.

The new variant has the Block 70 combat systems onboard, which include an advanced Northrop Grumman Radar.

The APG-83 SABR draws on F-35 technologies and provides greater capability for the F-16 to work in a complex battlespace.

Second Line of Defense

The greater bandwidth, speed, and agility of Northrop Grumman's APG-83 SABR enables the F-16 to detect, track and identify greater numbers of targets faster and at longer ranges. In addition, the radar can operate in hostile electronic environments and features all-weather, high-resolution synthetic aperture radar mapping, which presents the pilot with a large surface image enabling precision target identification and strike.

At the International Fighter Conference, there were two presentations highlighting ways ahead for the defense of Taiwan.

The first was by Colonel Li-Chiang Yuan, ROC Air Force, Assistant Director, Taipei Representative Office in UK and the second by Dr. Yu-Jiu Wang, Chairman and CEO of Tron Future Tech. Inc.

Col. Yuan highlighted that the PRC reach into the Pacific was now presented Taiwan with an encirclement challenge.

And this is why the new F-16s would be deployed to the eastern side of Taiwan.

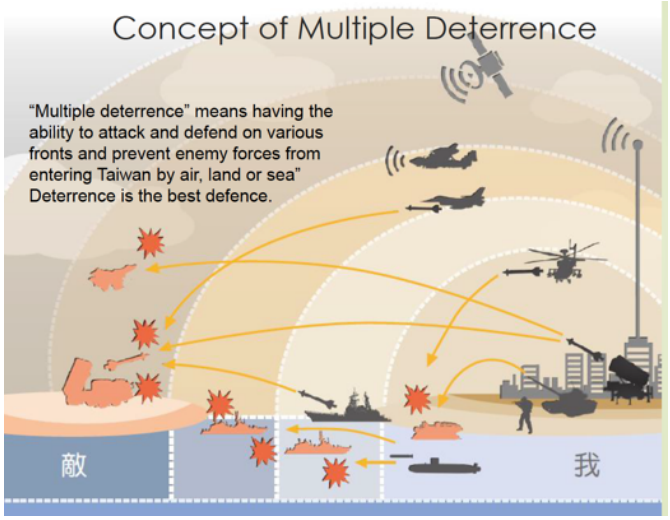
He underscored as well the strategic direction of Taiwanese defense which is to create an integrated defense force able to link active defense, with air defense, and an ability to provide a more effective "dig in force" which can withstand initial attacks from the mainland in case of conflict

He also highlighted the need for airpower to adjust to the threat and to be able to operate aircraft from a variety of locations.

He noted that recent exercises operated Taiwanese aircraft from highways and not just regular airfields.

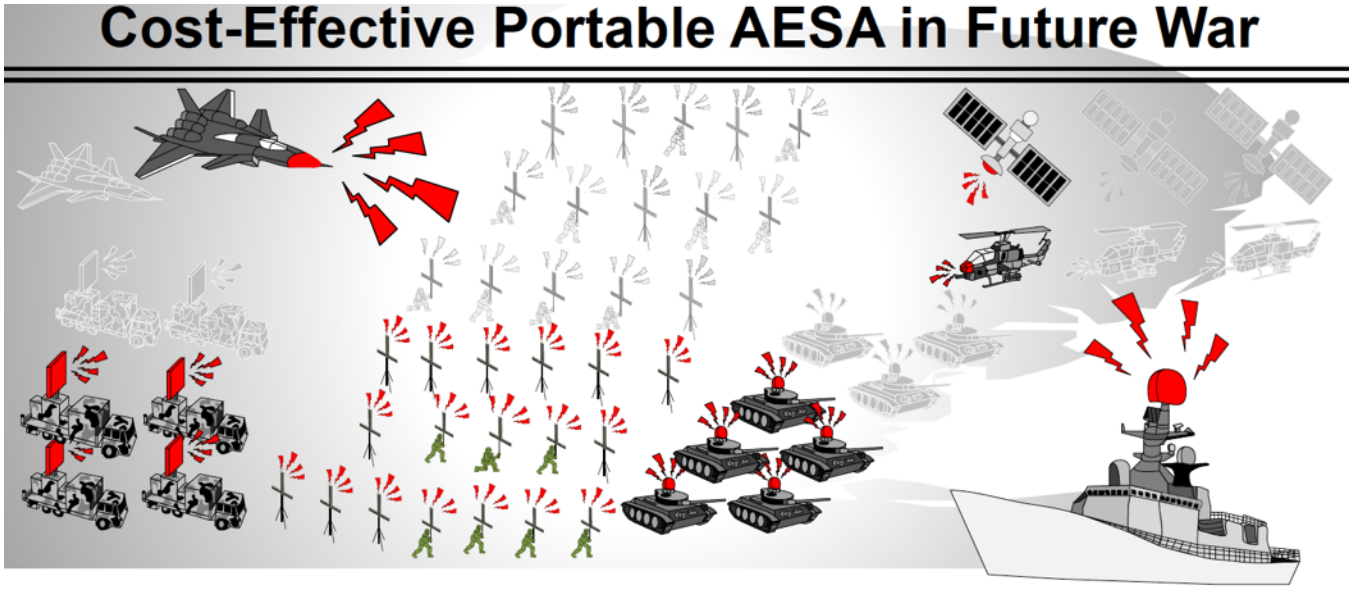
As the Finns have demonstrated, airpower dispersed is a crucial defense capability when living adjacent to an aggressive authoritarian power. It is part of the deterrence equation.

The approach of multiple deterrence was highlighted by Col. Yuan as the way ahead for Taiwan in its self-defense, which was conceptualized in the slide below from his briefing.



The second presentation was by a Cal. Tech graduate and now head of Tron Future Tech, Inc., based in Taiwan, a company focused on the development of new AESA technologies.

Dr. Wang provided a fascinating overview of the evolution of AESA technologies and their integration into current and future platforms which could contribute to the kind of C2 and ISR integration crucial to the multiple deterrence concept highlighted by Col. Yuan.



We have argued earlier that as Taiwan enhances its C2 and ISR grid that provides the opportunity for allies and partners of Taiwan to engage in a deterrence in depth strategy which would complement the multiple deterrence approach of Taiwan.

The kinds of technology which Dr. Wang projected going forward is precisely the kind of capability which an allied integrated distributed force could integrate with in times of crisis and to provide for the kind of deterrence in depth the Russians and Chinese would have to take seriously.

Conclusion

An advantage of the wide range of presentations provided at the International Fighter Conference is to provide an opportunity to appreciate the challenges faced by a wide range of allied and partner air forces.

Notably, one can learn or be reminded of the challenges facing air forces operating in the context of every day existential threats from authoritarian powers.

And as the allies of these countries which operate at greater distance are learning is that the kind of dispersal of airpower, the need to have more flexible force packaging, an ability to connect under duress are not just required by the air forces in the authoritarian power neighborhoods but becoming core necessities for the allied and partner air forces as well.

Notably, when coming into the neighborhood, there will be no uncontested airspace.

And that is something at odds with more than 30 years of the post-cold war experience.

Second Line of Defense

TELESCOPING OF GENERATIONS AND NEXT GENERATION AIRPOWER: RAF PERSPECTIVES AT THE INTERNATIONAL FIGHTER CONFERENCE 2019

There is very little question that the impact of the F-35 global enterprise is a significant one.

Those Air Forces flying F-35 have grasped the fundamental point that its impact is strategic in character, and are changing how they redraft their air combat forces, notably with the objective of shaping new multi-domain integrated force capabilities.

It is also not the end of history with regard to air combat development.

And one impact of the F-35 is the telescoping of generations of combat aircraft to sort through what a blended but integrated fleet will look like in the mid-term, and how that force blend will set in motion the "next generation" airpower capability.

In other words, rather than speaking of sixth generation fighter aircraft, it is more accurate to talk about next generation air combat capability which will be driven by the dynamics of change generated by the impact of fifth generation aircraft on the legacy fleet.

At the International Fighter Conference 2019, such a perspective was clearly highlighted by the presentations by senior RAF officers.

When I was in the United Kingdom this past May, I had several meetings with senior RAF officers who precisely focused on this transition which in many ways is how they interpreted Project Tempest.

While much focus has been upon the ultimate fighter which might come out of the Project Tempest effort, it is clear that for the senior RAF officers I interviewed, they had in mind the telescoping of generations, and working through the blend to reshape almost cultural revolution like the evolution of combat airpower and at some point consider what a new fighter platform might look like.

In other words, a reversal is underway.

What is being considered is the nature of the C2/ISR infrastructure being crafted to empower the blended air forces, and then to consider what platforms might look like that will embody the "next generation" of the C2/ISR infrastructure.

In my summary of the findings from the May visit regarding Team Tempest, I reached the following set of conclusions:

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

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

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

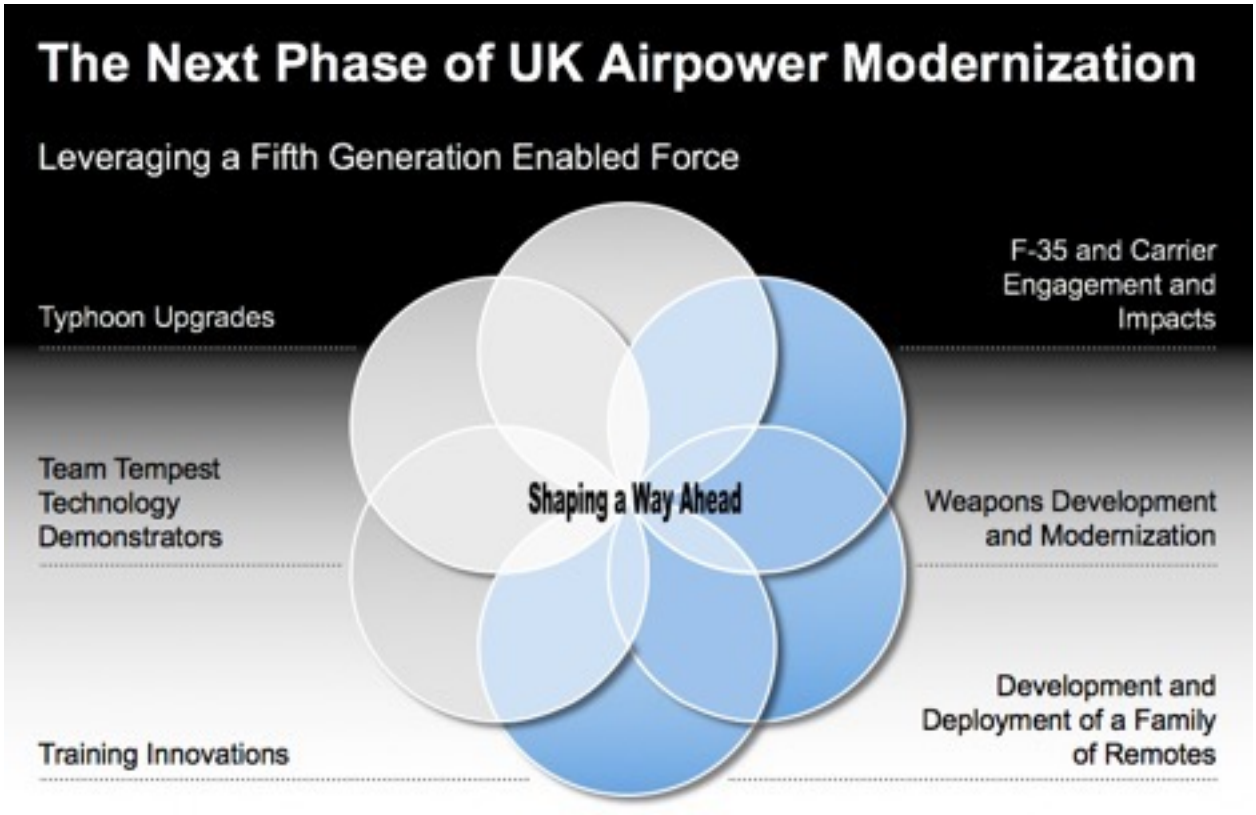
It was pointed out in private meetings that the UK was following what they saw as the USAF lead whereby the USAF was not committing itself to a sixth gen aircraft but to leveraging fifth gen with unmanned with the legacy fleet and weapons modernization to sort out what comes next.

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

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

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

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



At the IFC 19, one senior RAF officer underscored that the F-35/Typhoon integration was being undertaken while "in direct contact with the adversary."

Put bluntly, it was not about shaping a set of briefing charts about the next generation aircraft, but shaping a blended capability driven by the introduction of the F-35.

And this was being done by working with other key F-35 partners.

Second Line of Defense

For example, this officer noted that the UK's F-35Bs had operated off of Cyprus while working directly with USAF F-35As operating in the Eastern Mediterranean.

This type of exchange is facilitated by the missing capability of the F-35 not discussed at the IFC 2019, namely the CNI.

There was much discussion about the coming combat cloud, but a key enabler of a machine-to-machine capability along these lines already exists thanks to the sensor fusion inside each F-35 and the ability to work with clusters of F-35s through the multi-layer security integrated CNI system.

What exists TODAY is the foundation for generating enhanced integrated distributed combat power in the near to mid to longer term futures.

It is not about going backwards to building from federated systems to work through networks; it is not about building out sequential airpower operating through hand-off networks.

It is about packages of forces working together to integrate with their ability to operate a forward moving combat cloud.

The core point again is integration.

For integration has generated both the requirement and capability to provide for an integrated security solution for data generation and communication processes.

And as we anticipate manned-unmanned teaming it is clear that such integration is a foundational element for moving forward.

What the MADL data link connecting the projected four ship formation of F-35s allows for four computers working across that "combat cloud" associated with the four-ship formation to fuse data using FOUR computers rather than just what an aircraft can do with its organic onboard systems alone.

With the Link-16 connection to the legacy fleet, the F-35 pilots can send targeted information relevant to other elements of the air combat force situational information relevant to make them more lethal or survivable.

At the IFC 19, Air Commodore Dan Storr, Head of Combat Air Acquisition Programme, provided an overview of the current UK combat air strategy and the approach of MoD to delivering the next generation air force.

He underscored the importance of shaping core partnerships in the effort to shape next gen capabilities, and clearly the UK has done this by being a Tier One partner in F-35, building, maintaining and flying the most advanced Eurofighter operator in the world, and by launching an innovative rethink which is being worked by Team Tempest.

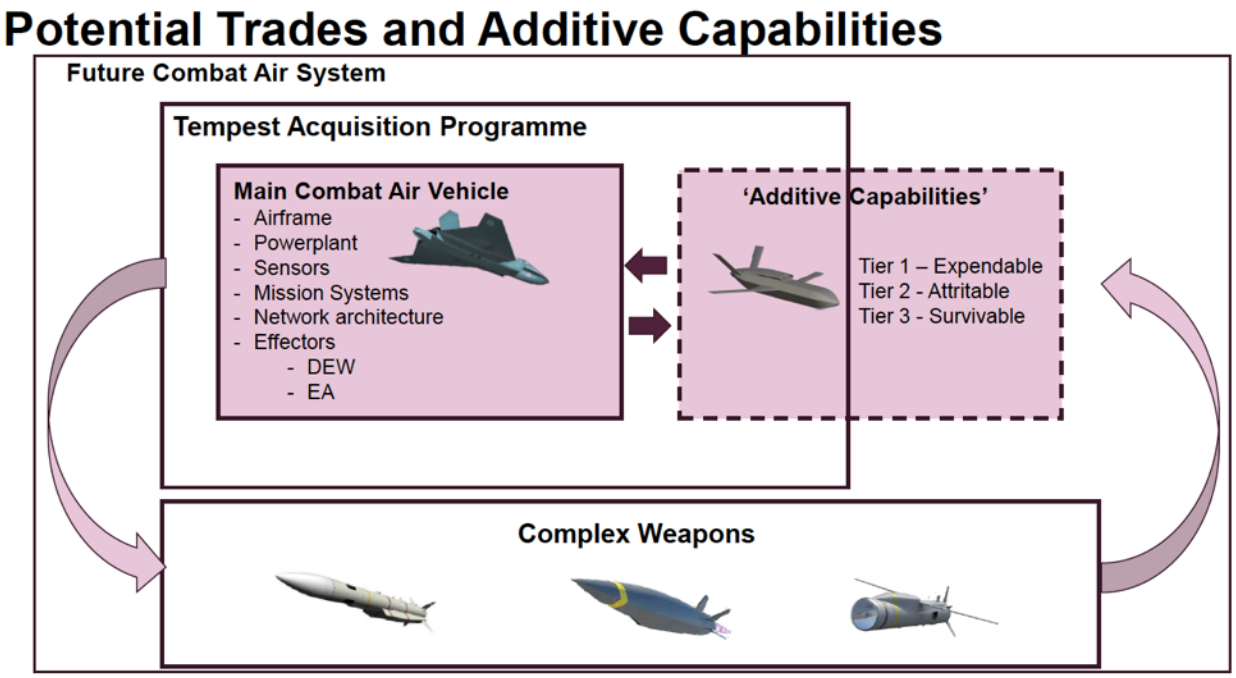
And recently, Sweden has joined Team Tempest which means that the UK has a capability to combine the synergy of the Swedish cost-effective design and build excellence, with the formidable cross-evolution of the F-35 with Typhoon.

According to Air Commodore Storr: "We are looking ultimately for the right balance between the F-35 and something else.

"And we are looking for partnerships across the spectrum of efforts, including unmanned systems and subsystems as well."

Air Commodore Storr made the very reasonable projection that what he called "additive capabilities" would come clearly in advance of any new fighter.

In a slide from his briefing where he discussed the question of platforms and additive capabilities, it is clear that the conjunction of weapons development and loyal wingman develops are crucial in the mid-term horizon.



One aspect is clearly highlighted by the work in the complex weapons program, where SPEAR 3 is maturing as a new capability which can provide more data connectivity plus autonomy, in many ways in migration to the new generation of remote carriers envisaged in the UK, European, Australian and U.S. approaches.

In addition, the UK has launched the LANCIA project earlier this year, which is the functional equivalent of the Australian Loyal Wingman program.

According to the MoD project release:

The Ministry of Defence (MoD) is undertaking pre-sourcing activity for a potential future requirement for the preliminary system design and assessment of cost-capability trade-offs for a low-cost Unmanned Combat Air System (UCAS) demonstrator.

This UCAS would see a significant reduction in its cost and development time compared to traditional combat air systems, and a potential future requirement would include the development and manufacture of the proposed design, and the conduct of a limited flight test programme.

This is something which I have discussed at length in both Australia and the UK where there are quite convergent perspectives on the way ahead.

And I highlighted those convergencies in a report published earlier this year:

https://defense.info/special-reports/2019/06/australia-the-uk-and-shaping-a-way-ahead-for-military-transformation/

Second Line of Defense

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

Second Line of Defense

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.

ARE EUROFIGHTER AND RAFALE MODERNIZATION PATHS CROSSING CUTTING OR PARALLEL?: PERSPECTIVES FROM THE INTERNATIONAL FIGHTER CONFERENCE 2019

We had three different sets of presentations throughout the International Fighter Conference 2019 which discussed how the capabilities of the French, German and Eurofighter operating forces in. the years to come will evolve.

Namely, the new Future Combat Air System, Rafale and Eurofighter modernization.

But the core question is how convergent these paths are or are not?

With the Future Combat Air System approach and target goals, cross-cutting modernization is crucial to reach a convergent outcome for a new fighter in 2040.

With regard to Eurofighter modernization, the full consortium that has built, and generates modernization for the Eurofighter is not in FCAS, and indeed, the most modern of the Eurofighter operators, the RAF, has already generated significant modernization outside of the usual modernization channels, and is operating the F-35 and is focused on a unique path which is being framed as Team Tempest.

This means that convergence between FCAS and Eurofighter is already challenged by the question of how much overlap between the two approaches, FCAS development and multi-national Eurofighter modernization strategies will occur?

Then we come to the French and the Rafale.

There is no question that France is committed to the modernization of Rafale and seeks to export the airplane as it can, and will leverage new Air Forces operating Rafale to support an overall modernization process.

But because France operates Rafale on carriers, and has a unique European air delivered nuclear role, several aspects of Rafale modernization will be unique to the French Air Force.

And there is little doubt that the FAF is clearly tracking how to integrate with the F-35s CNI capability (and MADL), and is more than interested in going beyond the text messaging associated with Link 16.

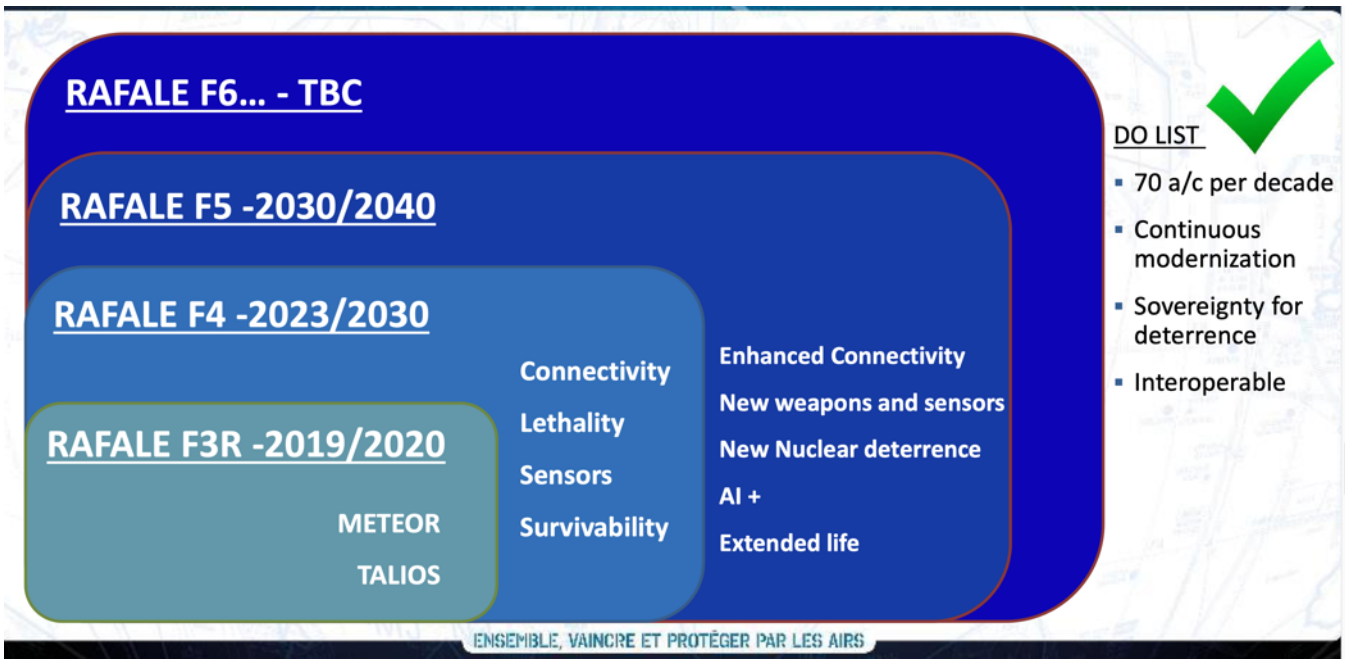
The Future of Rafale

Major General Fred Parisot, head of FAF Plans and Programs, laid out a long-range plan for Rafale modernization with the goal of supporting a new FCAS fighter in 2040.

The Rafale is projected to be in operation for several decades ahead and will embody major upgrades in the F-4 software and hardware changes, which are designed to enhance the capability of the aircraft to be more software upgradeable, but also more lethal in terms of the weapons it can carry and leverage in the connected battlespace.

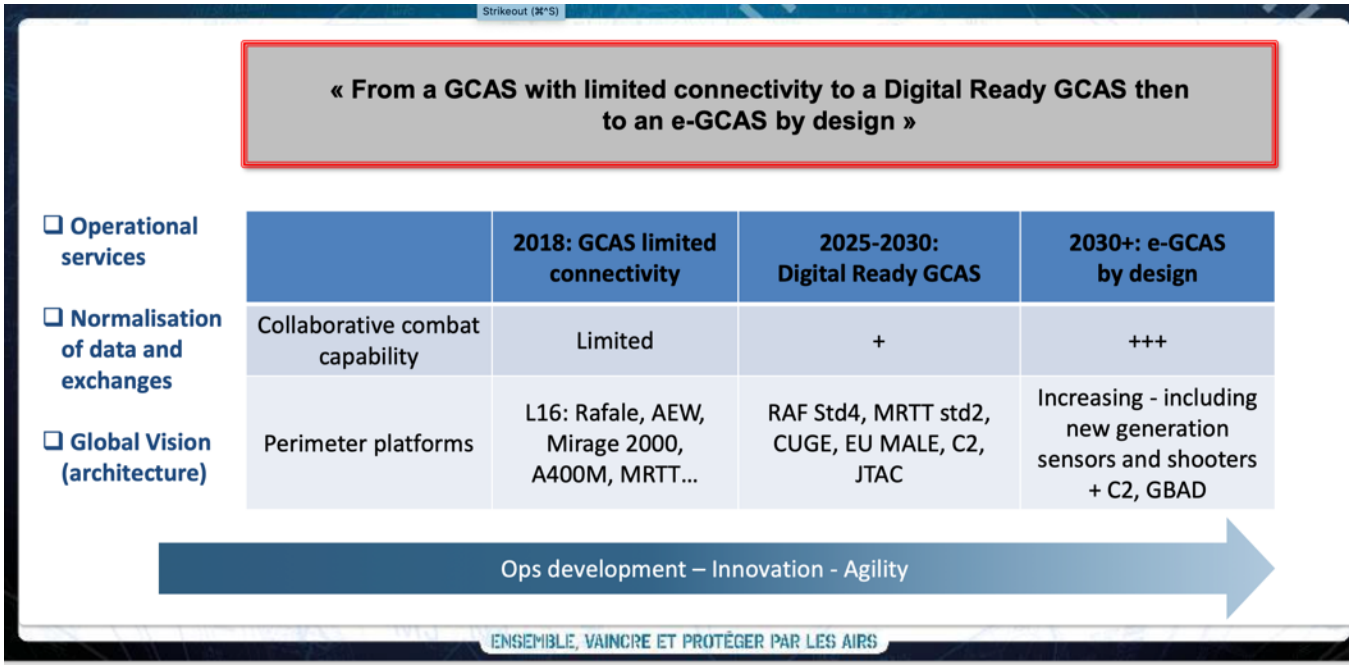
And there is a clear focus on the upgrade of the Rafale to be able to carry the next generation nuclear capable weapon as a core national requirement.

The following slide from Major General Parisot's presentation highlight the way ahead which is envisaged by the FAF:



At the heart of these changes will be a focus on building a more connected force which will overtime go from additive connectivity to connectivity by design built into the new platforms for the air combat force.

The following slide from Major General Parisot's presentation highlights the way ahead which is envisaged by the FAF with regard to connectivity:



As Gareth Jennings noted about the discussions of Rafale at IFC 19:

France has laid out the upgrade path it intends to rollout for the Dassualt Rafale to keep the multirole combat aircraft in air force and naval service through to about 2070, a senior service official said on 13 November.

Speaking at the IQPC International Fighter conference in Berlin, Major General Frederic Parisot, Deputy Chief of Staff, Plans and Programmes, French Air Force (Armée de l'Air: AdlA), said that there will likely be a further four upgrade phases for the platform beyond the latest F3R configuration currently being rolled out, and that it is the country's plan for the Rafale to serve as the force-multiplier alongside the New Generation Fighter (NFG) currently being developed with Germany and Spain as part of the wider Future Combat Air System (FCAS)/Système de Combat Aérien Futur (SCAF).

The Rafale's current F3R configuration features major software and hardware upgrades that include the integration of the MBDA Meteor beyond-visual-range air-to-air missile (BVRAAM) and the latest laser-guided version of the Sagem Armement Air-Sol Modulaire (AASM) modular air-to-ground precision weapon; the Thales RBE2 active electronic scanned array (AESA) radar; the Thales TALIOS long-range airborne targeting pod; and automatic ground collision avoidance system (Auto-GCAS); an improved buddy-buddy refuelling pod; as well as the Spectra electronic warfare system.

The F4 standard plans to operate between 2023 and 2030, and it adds enhancements to the Thales RBE2 active electronic scanned array (AESA) radar, the TALIOS pod, and the Reco NG reconnaissance pod; upgrades to the aircraft's communications suite; improved pilot helmet-mounted displays; a new engine control unit; and the ability to carry new weaponry such as the Mica Next-Generation (NG) air-to-air missile and 1,000 kg AASM. Further to the software and hardware improvements, the F4 upgrade will include a satellite antenna, as well as a new prognosis and diagnostic aid system designed to introduce predictive maintenance capabilities.

The Future of Eurofighter

Here the challenge is that there is no single Eurofighter but there are national Eurofighters which share commonality.

Indeed, the European Air Group has set up a working group to address ways to enhance the capability of Eurofighters to become more congruent among the national air forces.

This effort is a key one and a harbinger of success for either FCAS or Team Tempest.

With regard to mid-term modernization of Eurofighter, Airbus recently announced the launch of a new version of Eurofighter focused on delivering new electronic warfare capabilities to the force.

At the International Fighter Conference in Berlin Airbus and its partners introduced for the first-time concrete details of the new Eurofighter electronic combat role (ECR) concept. This role will enlarge Eurofighter's multi-role capabilities and further increase the survivability of coalition forces in hostile environments.

Collaborative electronic warfare capabilities are essential for future combined air operations.

Initial Eurofighter ECR capability is expected to be available by 2026, followed by further development steps and full integration into the future combat air system (FCAS) ecosystems.

Eurofighter ECR will be able to provide passive emitter location as well as active jamming of threats, and will offer a variety of modular configurations for electronic attack (EA) and suppression/destruction of enemy air defence (SEAD/DEAD). Latest national escort jammer technology will ensure national control over features such as mission data and data analysis. The concept also features a new twin-seat cockpit configuration with a multi-function panoramic touch display and a dedicated mission cockpit for the rear-seat.

The concept is driven by the leading aerospace companies Airbus, Hensoldt, MBDA, MTU, Premium Aerotec, Rolls-Royce and supported by the German national industry bodies BDSV and BDLI. It specifically targets the German Air Force requirements for an airborne electronic attack capability. Furthermore it is the single opportunity to deliver such capabilities on the basis of national sovereignty, whilst also securing key military technologies within Germany.

A presentation by Brigadier General Christian Leitges of the Luftwaffe made it clear why launching a new variant of the Eurofighter was needed certainly by the Luftwaffe.

He underscored that Germany had made a NATO commitment to expand its EW capabilities for the common defense.

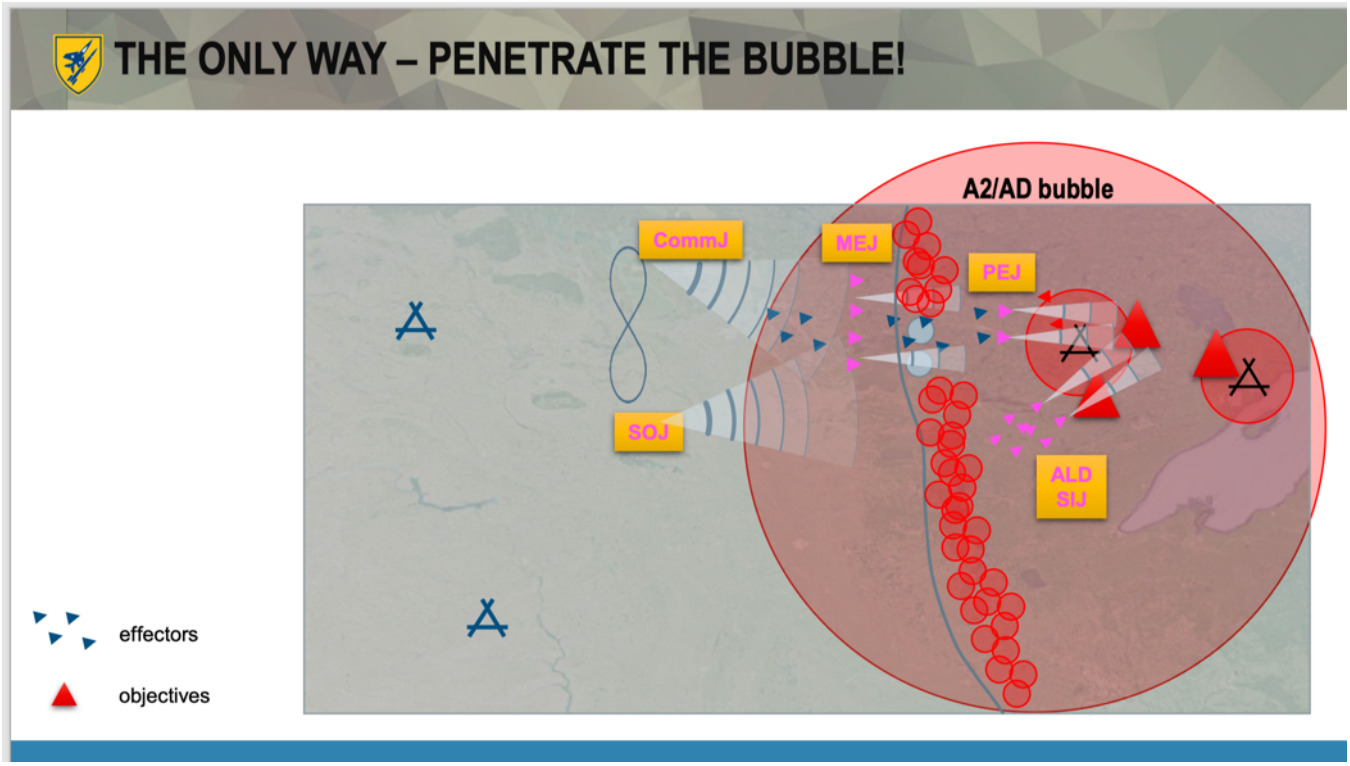
Brigadier General Leitges argued: "We need to assure, that airborne assets can operate effect based in the whole spectrum of air operations against current and future hostile weapon systems.

"That means to prioritize the build up of capabilities that haven't been focused on in the past, e.g. Airborne Electronic attack."

Brigadier General Leitges looked at the evolution of EW over time and underscored that the Luftwaffe had been organized I the past to penetrate ED "fences" but that the new challenge is to penetrate not simply fences but the A2/AD bubble.

The following slide from his presentation highlighted his perspective on the challenge:

Second Line of Defense



Brigadier General Leitges noted that the HARM missile was becoming AARGM which is an upgrade for the German Air Force in terms of anti-radiation missiles.

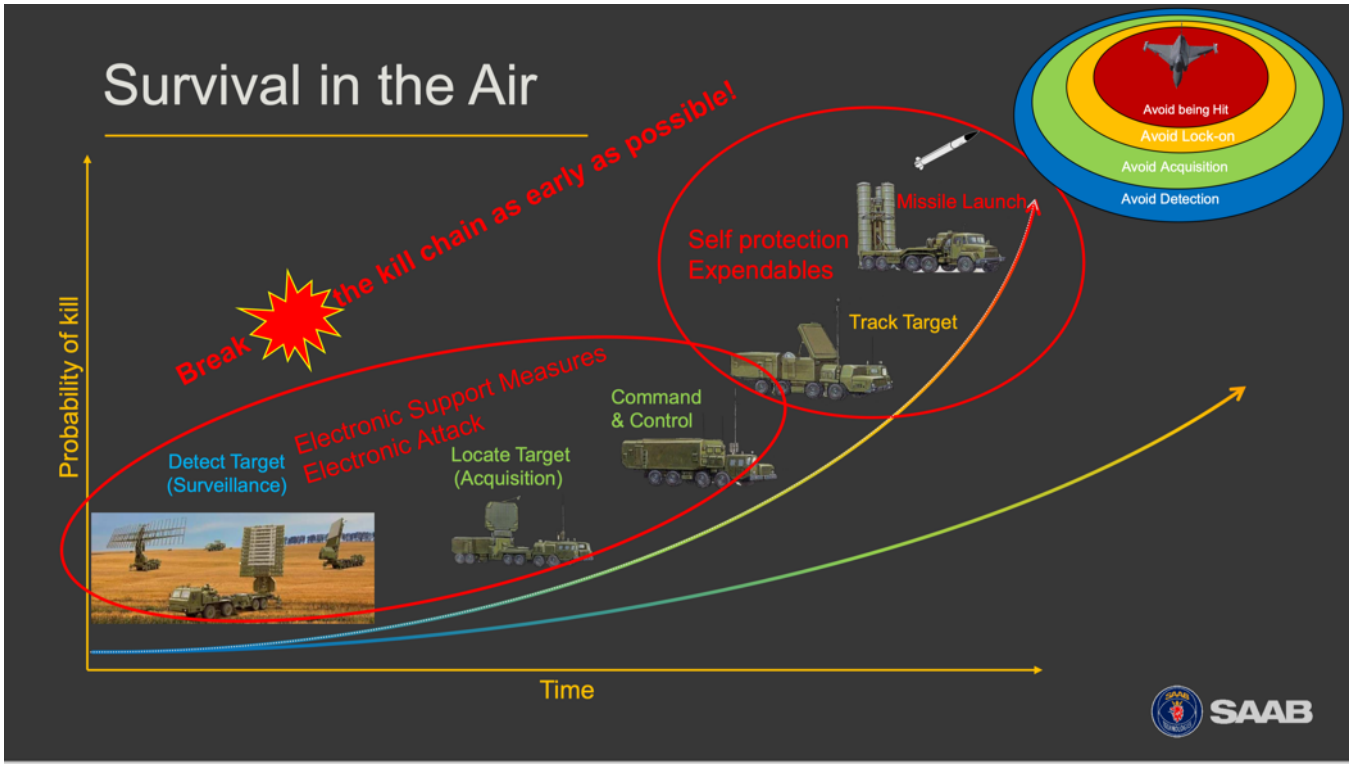
He also noted that adding a new AESA radar to the Typhoon was a key capability enhancement which was clearly a step ahead as well.

Electronic Warfare Capabilities as Near to Mid Term Focus: A SAAB Perspective

Jonas Grönberg from SAAB provided his perspective on "Outsmarting threats: enabling mission success in an A2/AD environment."

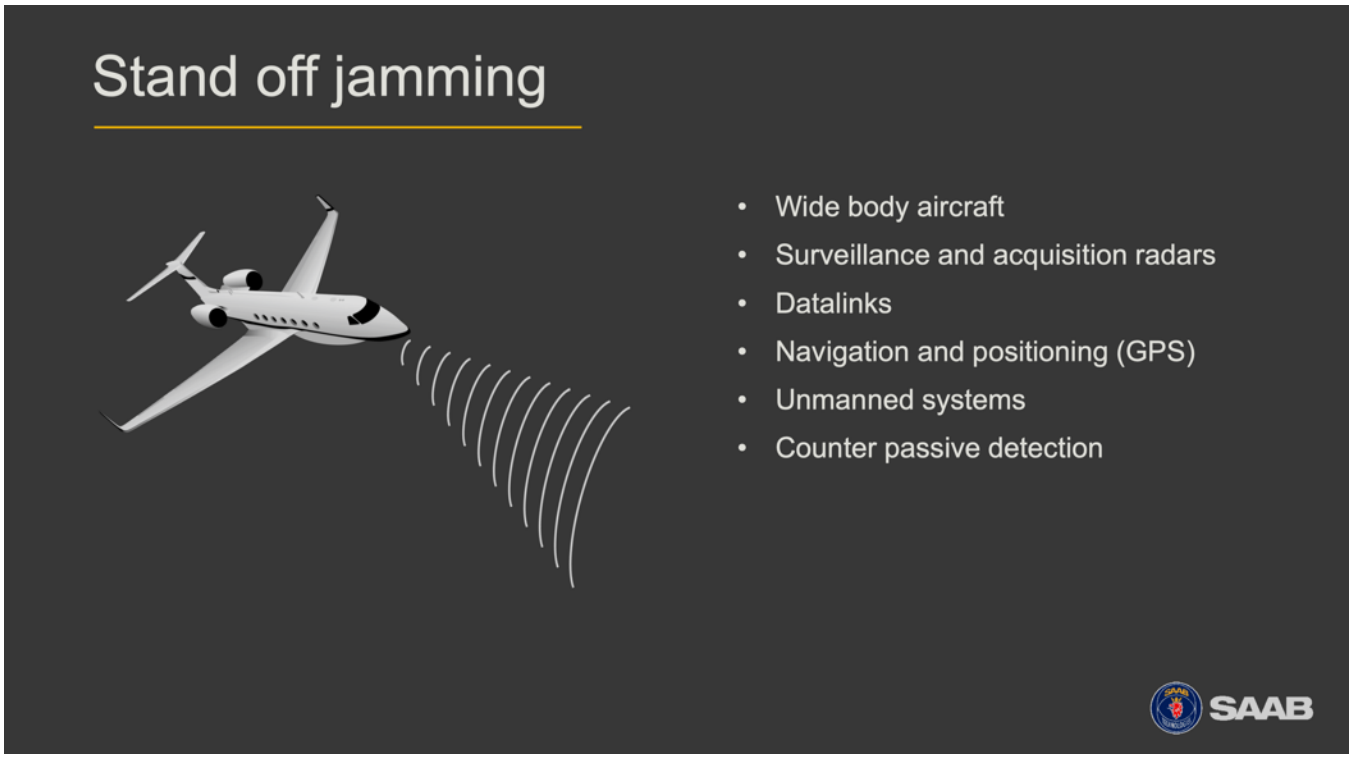
He focused on the importance of having a wide range of EW capabilities which would allow one to influence the adversaries kill chain and defenses in a variety of ways and in a variety of time settings.

He conceptualized survival in the air from the perspective of electronic support and EW measures as follows:



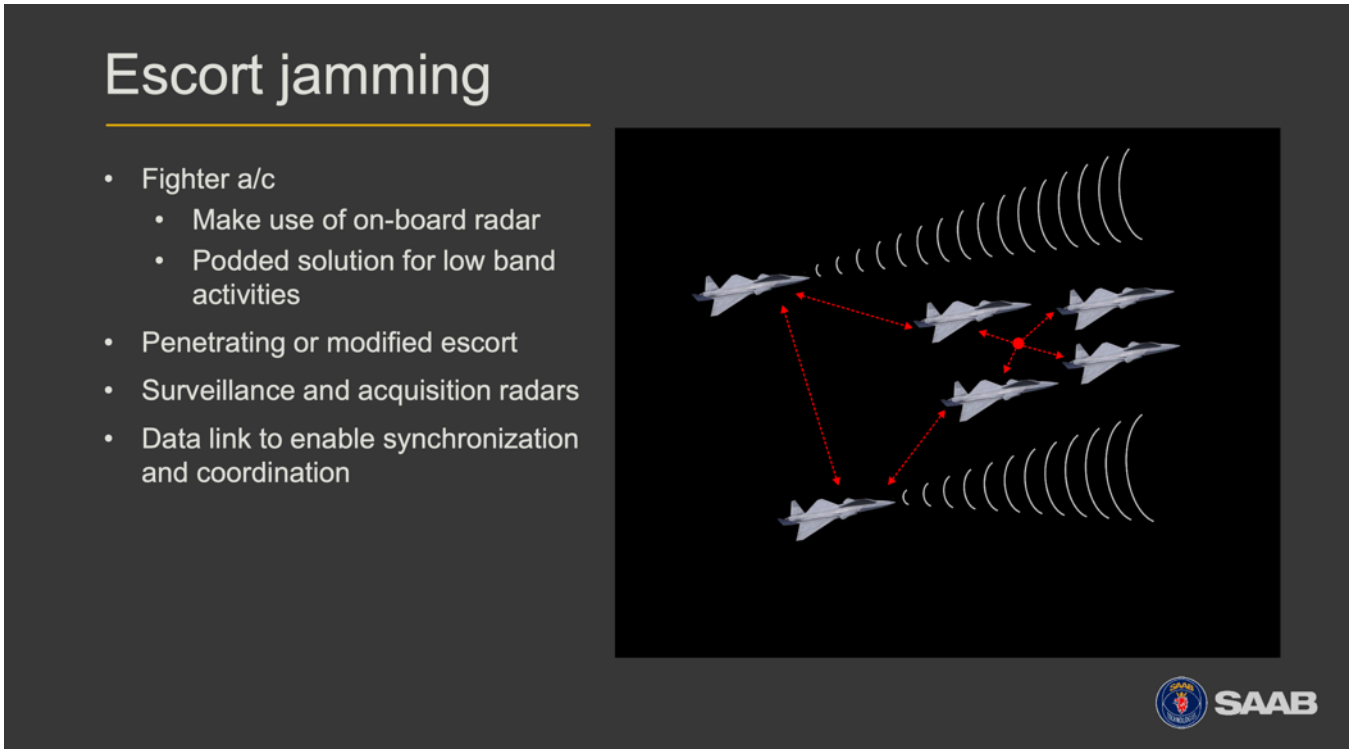
He then focused on a variety of ways to deliver the EW effect.

The first was standoff jamming.



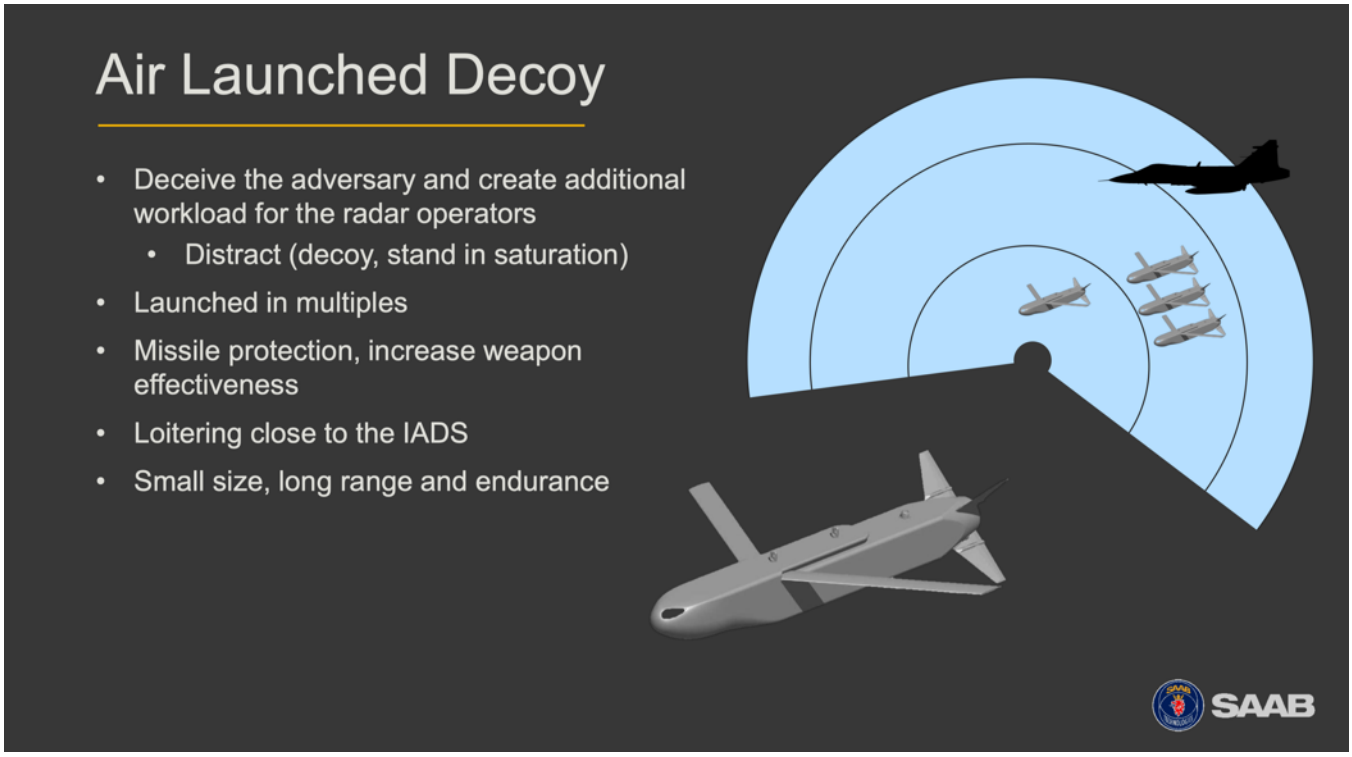
The second is escort jamming.

Second Line of Defense

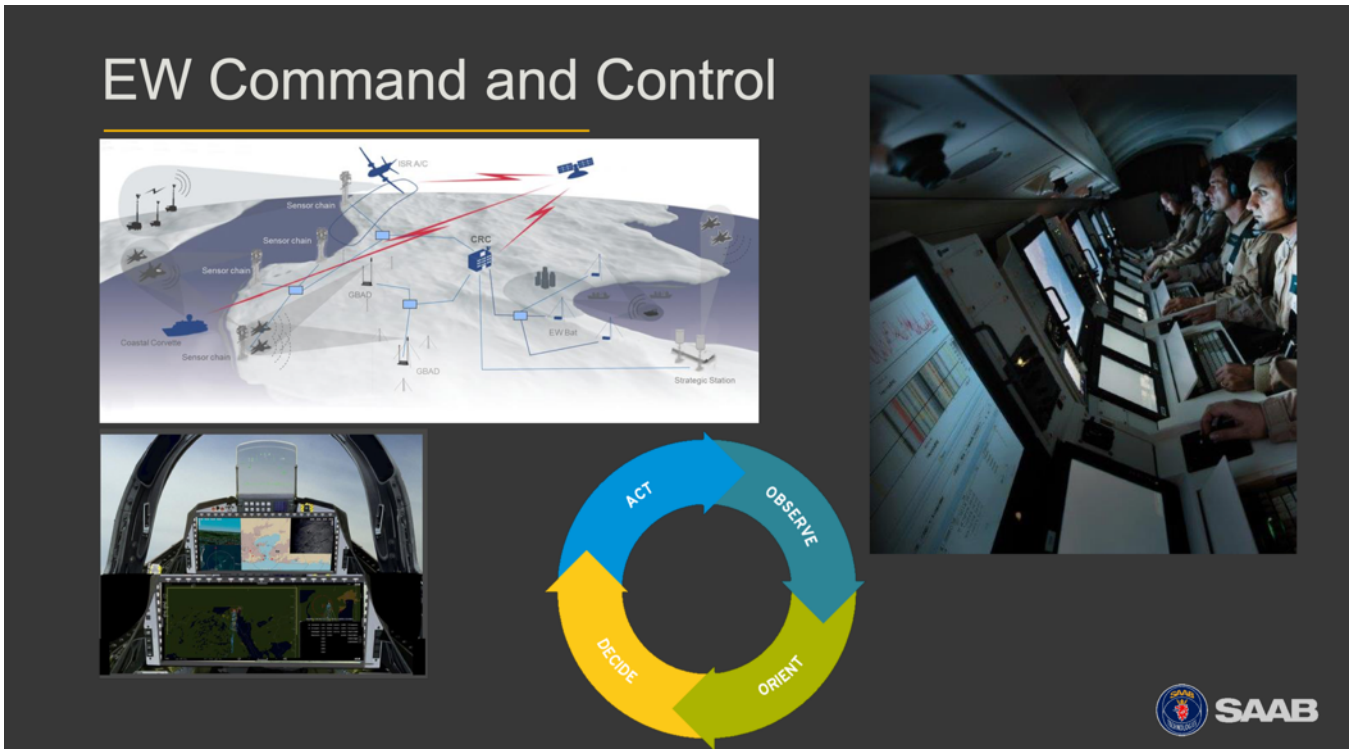


The third is to generate multiple false target radar jamming.

The fourth is to air launch a decoy.



And, of course, these assets need to be blended into a combat package with effective C2.



He underscored that SAAB was proceeding along these lines with its Gripen fighter aircraft, with a recent test of an electronic attack jammer pod on November 4, 2019.

Second Line of Defense

Conclusion

There is a clearly a challenge to sort out ways to ensure as much convergence as possible to reach a common outcome.

But as a senior RAF officer put it: "We are working F-35/Typhoon integration while in direct contact with the adversary."

And certainly, the FAF being one of the most active of Air Forces, will not have the luxury to think about the future of airpower while it is busily trying to keep its planes flying, and operating an diverse range of settings, and clearly modernizing based on that operational experience.

That gets at a significant challenge facing the major air forces.

There is no down time.

Modernization is being generated on the fly (sorry about the pun) and the challenge then is to ensure how modernization of any particular national force enhances or detracts from the ability to work together.

This is a general problem facing all of the active major air forces, but a general challenge to any multi-national efforts, such as FCAS, Eurofighter or the F-35 global enterprise.

How this challenge gets met or not, will determine the actually operational capability which can be delivered to the allied air forces working together.

ANOTHER ITALIAN FIRST WITH THE F-35: AN UPDATE ON THE NATO ICELAND AIR PATROL MISSION PROVIDED AT THE INTERNATIONAL FIGHTER CONFERENCE 2019

The Italians have had a number of firsts with regard to the F-35 global enterprise.

As I wrote in 2015:

At the beginning of the 20th Century, Italy was a pioneer in combat aviation.

Although different at the beginning of the 21st century, Italy has again emerged as an important player in military aviation.

They are key players in the two key 21st century multinational military aviation industrial coalitions, Eurofighter and F-35, as well as establishing a center of excellence for pilot training along with introducing one of the best 21st century trainers, the Aermacchi M-346…..

The Italians like the British are undergoing a double transition, whereby the Eurofighter is being modernized in two ways, namely, subsuming Tornado missions and replacing the Tornado and adding a new AESA radar to the airplane and introducing the F-35 to help shape joint force transformation.

The Italians have built a significant facility at Cameri air base to build the F-35, wings for F-35s and to provide sustainment for the operational fleet throughout the region as well.

The first Italian F-35 left the factory at Cameri in March 2015.

Earlier this Fall, the first F-35 came off of the Cameri line and flew successfully in Italian Air Space.

The facility was built in only four years and the first flight was ahead of schedule.

On Sept. 7, the first F-35A assembled outside the US, made its very first flight from Cameri airbase.

The aircraft, designated AL-1, is the first of eight aircraft currently being assembled at the Final Assembly and Check Out (FACO) facility at Cameri, in northwestern Italy.

During the flight, that lasted about 1,5 hours, the F-35A was escorted by a Eurofighter Typhoon.

As Secretary Wynne, the man who started the talks on building the Italian facility with the Italians put it with regard to the importance of the event:

"This flight makes the F-35 truly an international program."

Lt. General Preziosa noted "the quality of the aircraft which has come off of the Italian line clearly demonstrates the competence of our industry and the importance of our strategic partnerships with U.S. and global defense industry. The fact that the Dutch Air Force will buy planes from the Italian line is also a recognition of the quality of the Italian effort……

After the first flight of an F-35 built outside of the United States, came the first flight of an Italian pilot of an F-35 at Luke AFB.

On November 5, 2015, Italian pilots flew a USAF F-35A and an Australian F-35A, becoming the first Italian pilots to fly the airplane….

Then the First F-35 built outside of the United States has been officially delivered to the Italian Air Force customer

Next up was another first, the first F-35 flown across the Atlantic.

On Feb. 5, 2016, the Italian Air Force's first F-35, AL-1 with code "32-01" and markings of the 32 Stormo Wing landed at Naval Air Station Patuxent River, Maryland, at the end of the JSF's first ever transatlantic flight.

The aircraft was piloted by "Ninja,"an Italian Air Force test pilot, belonging to the Reparto Sperimentale Volo (Test Wing) from Pratica di Mare, and who had successfully completed his initial F-35 flight training at Luke AFB in November 2015.

To put this in perspective, the pilot had only 50 flight hours of F-35 flying experience.

And the Lightning II which Ninja flew across the North Atlantic in winter had only 15 flight hours on before he took off on his historic flight. 32-01was the first plane to came off of the Italian assembly line at Cameri Italy.

And this was done in the middle of winter, flying in and out of cloud layers over the turbulent North Atlantic against 120-knot headwinds. It was remarkable flying.

And then in 2017, the first F-35B ever built outside of the United States rolled out of the factory to a Ministry of Defence sponsored ceremony.

According to a press releases published on May 5, 2017:

The first Short Take-Off/Vertical Landing version of the F-35, or F-35B, assembled outside the United States rolled out of the Final Assembly and Check Out (FACO) facility here today.

Second Line of Defense

The rollout exhibits the ongoing strong partnership between the Italian Ministry of Defense, industry partner Leonardo and Lockheed Martin.

The Italian FACO is owned by the Italian Ministry of Defense and is operated by Leonardo in conjunction with Lockheed Martin with a current workforce of more than 800 skilled personnel engaged in full assembly of the Conventional Take-off/Landing F-35A and F-35B aircraft variants and F-35A wing production.

Gen. Claudio Graziano, Italian chief of defense, Gen. Carlo Magrassi, secretary general of defense/director of National Armament, Adm. Mathias Winter, deputy program executive officer at the F-35 Joint Program Office, Filippo Bagnato, Leonardo Aircraft Division's Managing Director, and Doug Wilhelm, Lockheed Martin F-35 Program Management vice president, spoke at the milestone event.

"Italy is not only a valued F-35 program partner that has achieved many F-35 program 'firsts', but is also a critical NATO air component force, providing advanced airpower for the alliance for the coming decades," Wilhelm said.

"Italian industry has participated in the design of the F-35 and Italian industry made components fly on every production F-35 built to date."

BL-1's first flight is anticipated in late August and it is programmed to be delivered to the Italian Ministry of Defense in November. In addition, two Italian F-35A aircraft will deliver from Cameri this year, the first by July and the second in the fourth quarter.

To date, seven F-35As have been delivered from the Cameri FACO; four of those jets are now based at Luke Air Force Base, Arizona, for international pilot training and three are at Amendola Air Base, near Foggio on the Adriatic coast.

The Aeronautica Militare (Italian Air Force) has already flown more than 100 flight hours in its Amendola-based F-35As.

After a series of confidence flights from Cameri, an Italian pilot will fly their first F-35B jet to Naval Air Station Patuxent River, Maryland, early in 2018 to conduct required Electromagnetic Environmental Effects certification…..

https://sldinfo.com/2017/05/another-italian-first-the-first-f-35b-built-abroad/

The latest Italian first was highlighted at the International Fighter Conference 2019.

Col. Stefano Soreafuco, CO Task Force Air (TFA) 32nd Wing, briefed the participants on the first NATO deployment of F-35s on a NATO mission.

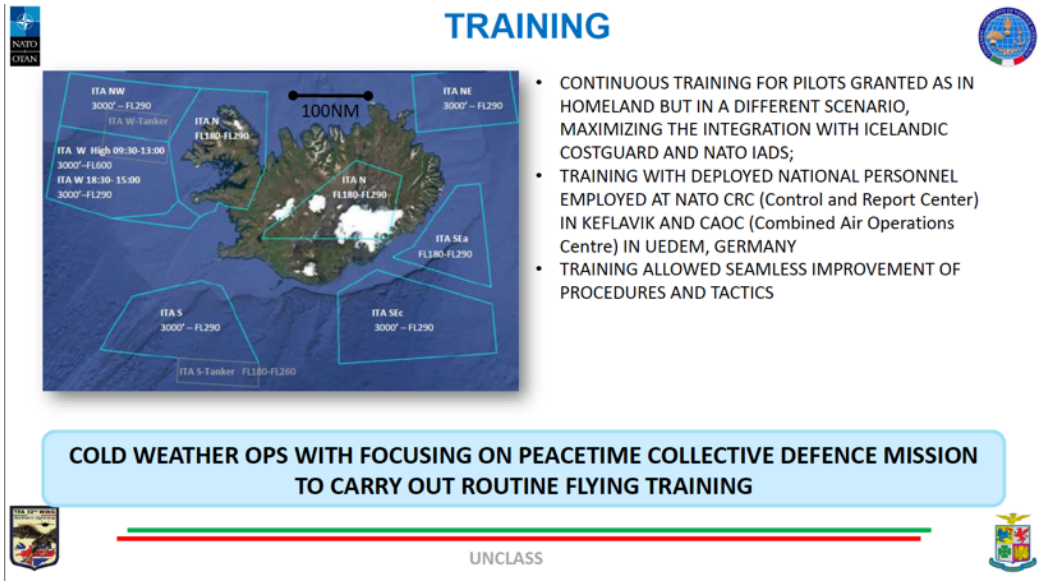
The Air Policing Mission to Iceland was to provide an air defense capability for Iceland.

The F-35 team prepared for the mission by leveraging lessons learned from an earlier Italian deployment, that one done by Italian Eurofighters.

In his briefing Col. Soreafuco highlighted three key operational tasks: Performing cold weather scramble operations; executing an alert recall plan activated by the Icelandic Coast Guard, and executing full integration with the NATO air defense system, including Link 16 real time information sharing and providing digital control for the C2 leadership process.

During the mission 103 sorites were flown, with 14 at night. 159 flight hours were expended in support of these sorites. There were 8-10 planned sorties per day, with six jets available for advanced missions. There were six tango scrambles tasked from the CAOC at UEDEM. And there were two slow mover intercept training missions.

The training mission was highlighted in the slide from his presentation seen below:



The logistics side of the mission went well as they were able to verify the operational capability and sustainability of the F-35s in the mission in terms of cold weather operations.

The logistical support provided to the six jets was facilitated by the supply chain support being transferred to the deployment base.

A key discriminator for the F-35 clearly is its integratability of the F-35 into the C2 process to deal with advanced threats as well which was highlighted in the following slide from his presentation:

Second Line of Defense

He argued that the F-35 was an "omnirole" weapons system which required no aircraft "customization" for its various roles but due to its integrated capabilities would operate seamlessly across the operational spectrum.

It was able as well to share its core tactical information through its various digital capabilities, including Link 16, MADL and VMF.

As Paolo Valpolini put it in his report on the briefing at the IFC 2019:

Talking of the advantages of the new fighter deployed by the Italian Air Force the TFA32 CO, he underlined the huge advantage of gathering information while delivering effects in different domains, all at the same time, as well as helping legacy assets to convey those effects in a better way.

Another key element was the capacity of the jet to provide valuable and very reliable information and data along the command chain, permitting decision makers to provide the right commands to the effectors according to established Rules of Engagement, all in near real time.

The F-35 showed very good interceptor characteristic, the amount of fuel carried avoiding the need of external fuel tanks.

Coming to connectivity, the Italian detachment exploited considerably the Link 16 capabilities, for connecting with the CR and the CAOS, as well as the Multifunction Advanced Data Link (MADL) that allows direct links among the F-35 community.

As no land assets were available for air-to-ground training, the Variable Message Format (VMF) was not used.

The Iceland operational deployment was based on a build-up approach that saw Italian Air Force Lighting II deployed in Great Britain, Greece, and other European countries for training, bringing the 32nd Wing to become fully start real operations around one year after having received its IOC status.

In short, the Italians delivered on this first NATO mission as they have throughout their record of firsts in the F-35 global enterprise.

AIRBUS DEFENCE AND SPACE WORKS AN INCREMENTAL APPROACH TO MANNED-UNMANNED TEAMING: INTERNATIONAL FIGHTER CONFERENCE 2019

At last year's International Fighter Conference, the team working on the Franco-German Future Combat System program provided an overview on the launch of the effort. At this year's conference, the team provided an update on progress over the first year, and underscored key timelines into what was called an incremental approach to building a new fighter by 2040.

And now Spain has joined the program as well.

A key element of building the connected force is clearly the question of the nature and capabilities of remote carriers to work with manned systems in the air.

Remote carriers will become part of the evolving combat force in the near to mid-term.

This has become a key dynamic associated with the changes in C2 revolving around enhanced artificial intelligence built into the force, but a clear need to both evolve data linked weapons – which after all are the first round of manned-unmanned teaming already in the sky.

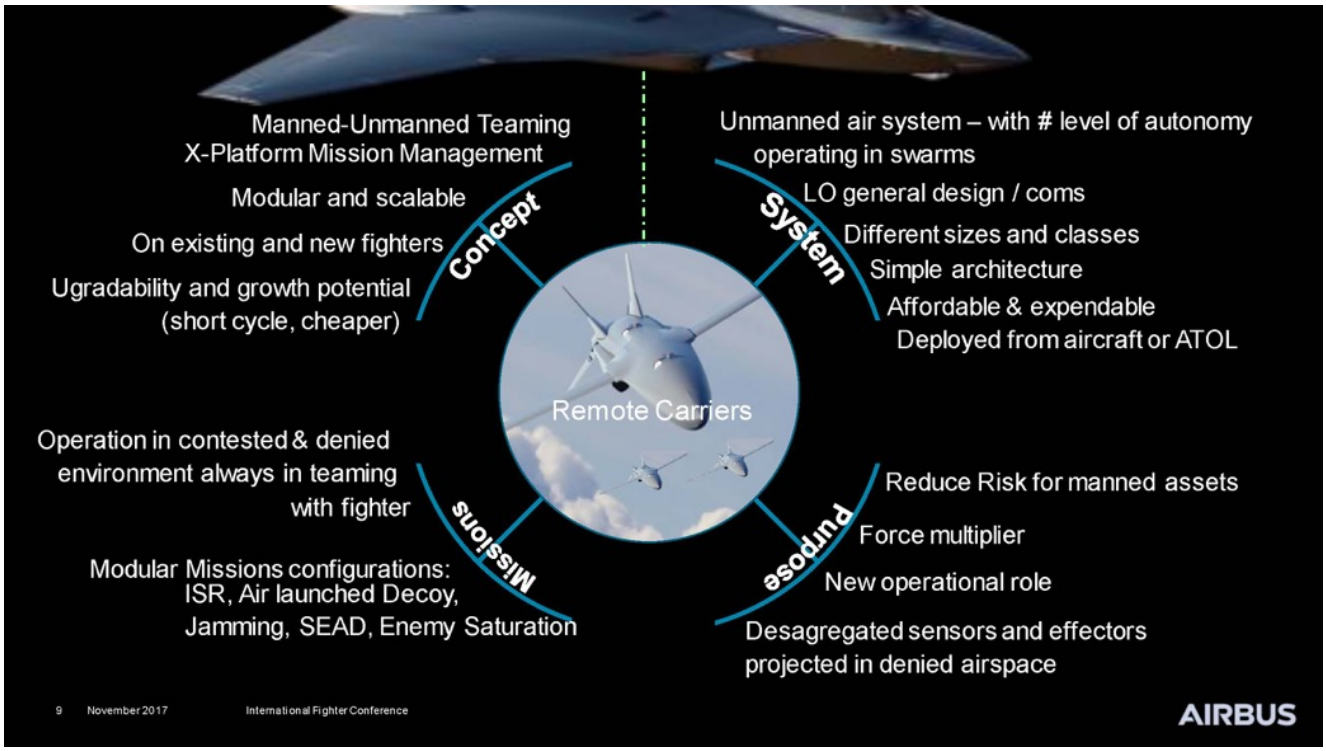
Remote carriers are coming with the various loyal wingman approaches as well within which current fighters work with evolving remote capabilities to deliver a combat effect from the teaming capability.

It is clear that remote carriers will become key force multipliers and shape new concepts of operations going forward as they are added to air combat fleets.

During the conference, I had a chance to continue my conversation began last year on this topic with Bruno Fichefeux, Head of FCAS for Airbus Defence and Space.

From my perspective, Airbus has already delivered two key 21st century air platforms – the MRTT tanker and the A400M airlifter – which should provide useful launch points for the redo of air combat along the lines envisaged by the FCAS.

And doing so makes business interest for Airbus, and not just for those air forces flying Rafale or Eurofighter.



To highlight the opportunities, in an interview I did last year at Amberley Airbase in Australia, the Wing Commander charged with operating the KC-30A or the A330MRTT, a la Australian, focused on how he saw the future of that tanker.

According to Group Captain Steve Pesce, Officer Commanding 86 Wing, comprising the RAAF's C-17, KC-30A, B300, CL604 and B737 fleets, in a conflict against a "near-peer" adversary the RAAF and allied forces may not have the luxury of secure tanking in uncontested airspace.

Second Line of Defense

Air forces will gain transient advantage rather than total control of the air and will support surface assets that will be more dispersed across a larger Area of Operation (AO). Demand for AAR (and air mobility in general) will increase as the survivability of a large tanker is reduced.

Distributed operations in contested airspace will become a norm, and that means in his view the end of the classic larger tanker operations. The manned tanker will operate further away in the battlespace and become the mother ship for tanking remotes operating as refueling nodes to expendable assets deployed forward,

"My view of the future battlespace is that sensors and shooters will be more proliferated, integrated and reach further and with greater precision.

"There will be a natural move towards dispersion to improve survivability and delivery of fuel will be critical.

"The future of a large tanker will be to support more distributed and dispersed operations and we will be looking at small tactical refuelers providing fuel to tactical air combat assets – these tactical assets will likely be cheaper, unmanned and more expendable.

"That is where A3R comes in.

"I see an advantage in the automatic boom because it reduces the workload on the operator who in the future may be managing or controlling formations of UAV during AAR.

"As we learn to use this technology, it will be part of shaping the skill sets to transition to the next phase, of a large tanker replenishing smaller, automated tactical refuelers…."

As Airbus Defence and Space is a global business, it would make sense as the FCAS program generates manned-unmanned teaming capabilities that such capabilities would be made available to its global customers in the tanker program, for which there are many, and for the A400M program which there are fewer but certainly more than the core participants into the FCAS program itself

Bruno Fichefeux confirmed that this proposition is being studied within Airbus Defence and Space.

He argued that there were two ways in which Airbus Defence and Space was addressing the opportunities within and eternal to the FCAS program.

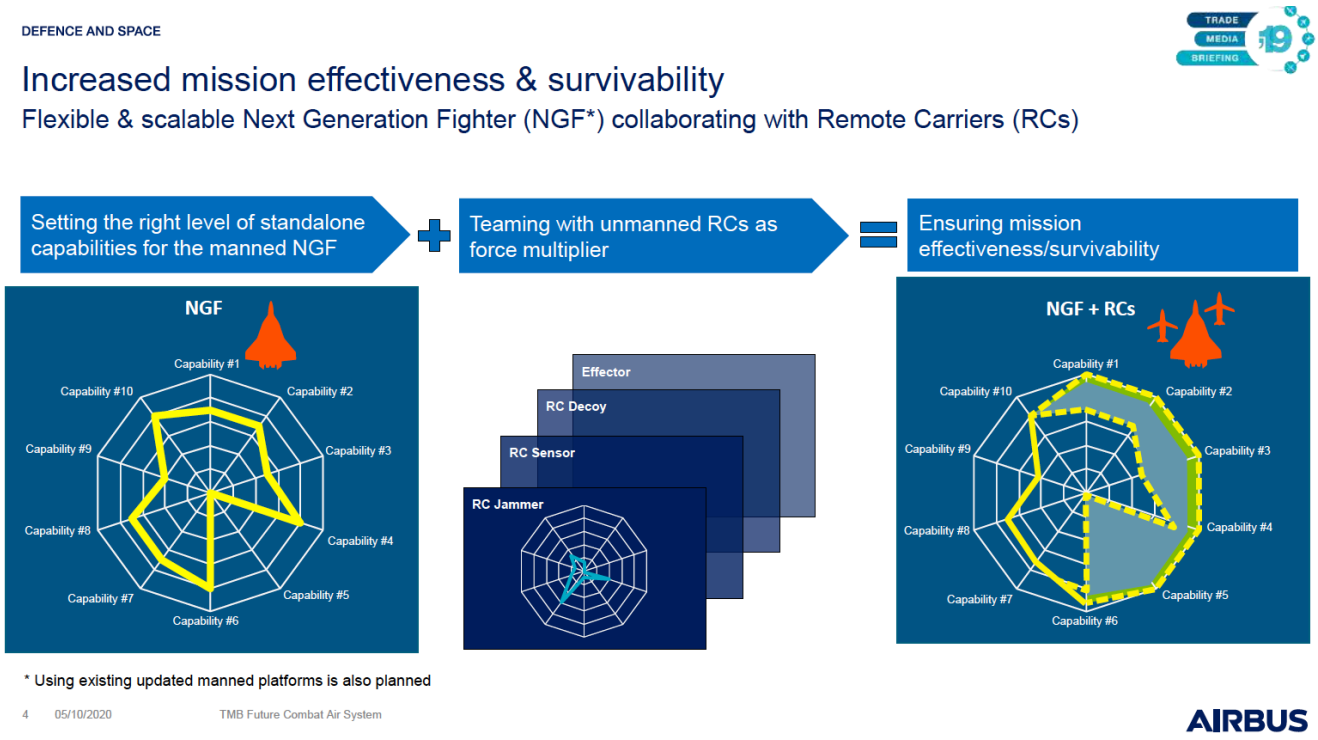
First, for each of its key platforms such as tanker and A400M, they were shaping road maps for the development of the platforms which highlighted ways to enhance their capabilities within an integrated and connected battlespace.

Second, they are shaping technology streams which are designed to deal with the different challenges within manned-unmanned teaming.

Those technology streams can be drawn upon to shape developmental opportunities for the existing or new platforms envisaged in FCAS.

With regard to the first, the focus of what has been called the smart tanker program is precisely designed to shape ways ahead to use the space within the tanker for enhanced contributions to the integrated battlespace.

It must be remembered that the fuel carried by the A330MRTT is carried in the wings, which leaves the large cabin free to do other missions, which now are largely devoted to movement of warfighters and support staff or to carrying cargo.



Role of Remote Carriers as envisaged in briefing to Trade Media Event 2019.

According to Fichefeux: "Smart MRTT is focused on how to make use of all the internal space and to leverage it for the other platforms in the combat system and to increase their situational awareness and to handle data transfers."

Another example is the A400M and its potential role as a remote carrier.

According to Fichefeux: "We have initiated a series of design studies looking at how we can operate the A400M as a launcher and recovery platform for remotes, and operating as a mother ship so to speak.

"In this sense, the A400M becomes the wingman for the fighter fleet, but by functioning as a mother ship to launch and recover remotes which can go deeper into the battlespace to provide broad support for the tip of the spear of the air combat force."

In addition to working to study capabilities of its two core new air combat assets, namely the tanker and the A400M, Airbus Defence and Space has launched a series of "technology streams" examining how to develop a manned-unmanned teaming capability."

According to Fichefeux: "We have launched generic technology streams, where we are looking to mature technologies around swarming, around level of autonomy, around the teaming intelligence, around how do we display this teaming for future fighter cockpit. How does the fighter pilot and the drones work together?

"We are running these technology streams concurrently with developmental streams and are targeting the introduction of remote carriers on the Eurofighter platforms to extend the range of its capabilities and to fill the combat gaps."

And to my earlier point that in many ways data linked weapons are the precursor of the manned-unmanned teaming envisaged with regard to UAVS, fighters, lifters and tankers working together, he underscored the working relationship between Airbus and MBDA.

Second Line of Defense

Fichefeux underscored that they were working on the spectrum of unmanned platforms with various size and operational characteristics to think through a technology and development tree to introduce such capabilities into the combat force.

For example, with regard to the smaller remotes, they have teamed with MBDA to leverage MBDA's experience in operating data link weapons.

"In the design of remote vehicles of a smaller size category, Airbus and MBDA are working together which allows us to leverage their experience and gives them access to our thinking and developments with regard to remote carriers which will carry evolving sets of weapons in the future".

And, of course, the overall technology developments are clearly affecting thinking about new platforms.

In no case is this clearer than the European MALE RPAS program.

When Airbus Defence and Space presented their focus on European MALE RPAS few years ago at the last Airbus Defence and Media day, clearly the European MALE RPAS one saw glimmers of such thoughts.

But with the FCAS launch these glimmers are becoming solidified in a programmatic sense.

In short, Bruno Fichefeux laid out the incremental approach of Airbus Defence and Space in the crucial area of manned-unmanned teaming and the importance of integrating new remote platforms within the concepts of operations of air combat fleets.

While the strategic objective of FCAS is clearly to deliver a new combat fighter, the focus is very much on delivering key building blocks along the way.

And new remote platforms are such a building block.

Airbus Defence and Space are looking to add new remote platforms which can work with existing air combat platforms, including fighters as well as other air combat assets, such as air lifters and airborne tankers.

In conclusion, they are looking to deliver a System-of-Systems, connecting platforms, operating across domains, and being fully interoperable with allied forces instead of "only" targeting a new combat fighter qua a new platform.

GERMANY'S HEAVY LIFT HELICOPTER CHOICE: SEEN FROM THE PERSPECTIVE OF THE INTERNATIONAL FIGHTER CONFERENCE, 2019

I have just returned from Berlin.

I attended the International Fighter Conference 2019 and visited Checkpoint Charlie and shared thoughts with German friends of the thirty-year anniversary of the Fall of the Berlin Wall.

Both events had much in common – the Cold War is over but the Russians are back.

And this faces Germany and its trans-Atlantic allies with major challenges in rebuilding their military forces and their over-arching deterrent strategy.

Earlier this year, I visited Munich, Bonn, Hamburg, Frankfort and Berlin, and met with and conducted interviews with a wide range of recently retired Bundeswehr officials, journalists and strategists to discuss the challenge

facing both Germany and the Alliance to deal with the new challenges posed by the 21st century authoritarian powers, including conflicts in what are being called, "gray zone" and "hybrid warfare" conflicts.

The nuclear threat clearly remains, and as the European Union and NATO confront internal disagreements as well as differentiated modernization, the challenge will be to ensure that the nations meet their Article III national defense obligations as they come to the table to the defense of their NATO allies in terms of crisis, conflict or war.

This is occurring at a time of profound change in military technologies and the overall nature of the security and defense threats and challenges as well.

For example, the International Fighter Conference 2019 focused on the challenges facing the fighter forces as they adjusted to the new context of multi-domain threats in a full spectrum crisis threat environment.

Much of the fighter conference was a clear recognition that the role of the fighter force was changing significantly in terms of how they would play various roles in a multi-domain force.

This meant that much of their combat focus would be within the changing context of the tailored force packages which would need to operate against discrete and specific threats facing the alliance.

It is about how to shape an effective combat package which can operate within a contested environment and to do so rapidly enough to make a difference.

What this means for any new platforms coming to the combat force that it is crucial that they are the best choices available to deliver the kind of combat capability which can be anticipated in a crisis environment.

It is about having connected platforms which can work together to deliver the combat effect needed in a particular crisis, recognizing that within Europe there is no such thing as uncontested operational space likely in a major crisis.

What this means for Germany as they start the process of recovery in terms of Bundeswehr capabilities that new platforms need to be building blocks which pull the force in the right direction, that is shaping an integrated distributed force.

Key allies of Germany and NATO overall are placing a priority on cross-domain operational capabilities within an integrated force able to distribute C2 to operate in a manner which the adversary would find credible.

Building a Relevant Force Structure

I have published a report which has dealt with the German defense challenge and have written extensively on what I have termed the integrated distributed force.

Those reports can be read as background to this article.

But I would summarize the main findings as a baseline by which to address the case study of German's coming selection of a heavy lift helicopter.

The force we are building will have five key interactives capabilities:

Enough platforms with allied and US forces in mind to provide significant presence;

A capability to maximize economy of force with that presence;

Second Line of Defense

Scalability whereby the presence force can reach back if necessary, at the speed of light and receive combat reinforcements;

Be able to tap into variable lethality capabilities appropriate to the mission or the threat in order to exercise dominance.

And to have the situational awareness relevant to proactive crisis management at the point of interest and an ability to link the fluidity of local knowledge to appropriate tactical and strategic decisions.

I would add a specific German requirement as well as they build out what the call along with the French and the Spanish, a future combat air system.

Here the approach is to build a new fighter aircraft by 2040 but do so through the process of creating a more integrated force able to operate by drawing data from a common combat cloud, and to do so by ensuring that integration leads to great force lethality and effectiveness at the distances which European combat forces will need to operate.

And given the twin expansion of the European Union and NATO to which Germany has been a key driver, this means a much larger combat space than the Bundeswehr had to cover in the days of the Cold War.

In the Cold War, direct defense was largely about territorial defense and support of core allies operating from German territory or from other NATO territories in supporting defense of the Central Front.

Now the area German forces need to GO TO is much further than envisaged in the Cold War.

The map at the beginning of the article highlights the dangerous route the Germans need to take to reinforce Poland and the Baltic Republics in times of crisis.

It is not primarily about reinforcing force strength within West Germany; it is about moving force rapidly over distance to the crisis point and making a difference by being interoperable and connected with the relevant allies engaged in dealing with the crisis.

The Key Role of the Heavy Lift Program

The selection of a new heavy lift helicopter is a near term decision for the Bundeswehr which can move it forward towards the force it needs, or can stay within the genre of replacing what it had bought for the Cold War period.

It is a key decision which will either move Germany forward towards the integrated distributed force envisaged in its European focused Future Combat System program or in its most recent NATO commitments to modernize its forces in a way that can support the NATO that has been shaped in the post-Cold War period.

As I argued in my report on German defense published earlier this year:

But key questions facing Germany are very clear.

How will Germany pump money rapidly into the Bundeswehr to repair its severe readiness problems in a short period of time?

Rumsfeld always argued that you have to fight with the army you have, so how will the government take seriously the need to repair an increasingly hollow force?

NATO now has the longest border in its history.

Germany is no longer garrisoning the inner-German border, where are the forces that can project power rapidly to reinforce the Baltic states, the Poles and other NATO allies to the East?

Repairing the Army, you have and preparing for serious engagement forward are the two most immediate tasks facing Germany.

During the Cold War Germans spent 4% on defense; where are they now?

Russia directly threatens a core German value – multilateralism.

Putin clearly has a divide and conquer strategy and if Germany is to counter this, then the Bundeswehr needs to be built for force mobility throughout Europe.

This will take significant defense investment delivering capabilities in the midterm; it is not about the long term or an FCAS in 2040.

Preparing for the long-term is important but there needs to be a sense of urgency or there won't be a long-term or at least one that supports the "European" values one hears so much about in Germany.

To take an example, in the recent Trident Juncture 2018 exercise, Germany committed 8500 of the 50, 000 troops in the exercise, which is a clear declaration of intent.

But to do so, the entire Bundeswehr had to be cannibalized and one clearly could ask how sustainable forward any such German engagement could be in a real conflict?

It is clear the German MoD is looking to its heavy lift helicopter replacement program to set in motion a new approach to how operations and sustainment are to be addressed, clearly in part because the new helicopter is expected to operate over a wider area within Europe than its heavy lift helicopters did in the Cold War.

The approach is built around selecting a single contractor responsible for delivering and sustaining the new build helicopter throughout its operational life. In the past, the sustainment part was done by one company and the build and delivery of the helicopter by another.

But the MoD has understood that in a 21st century platform, this makes less sense as there is a continuous modernization process envisaged in the operational and sustainment process, seen as an integrated whole.

According to the MoD's Industry Day held in Koblenz, Germany on February 28, 2018, the new approach was articulated and explained to those wishing to compete for the program.

The briefing underscored that the new heavy lift fleet would operate and be sustained from two main operating bases, one at Schönewalde and the second at Laupheim.

These are the two current air bases from which the Luftwaffe operates its rotary wing aircraft. The first is located not far from the "new" European nations of NATO.

It is located South of Berlin and not far from the Polish border.

The Luftwaffe has purchased in common with France, a squadron of C-130Js and is building a new airlift fleet around the A400M European heavy airlifter.

And given the evolution of airlifters, seen in terms of the KC-130J for the Marines in terms of the Harvest Hawk version, and in terms of the projected use of the A400M in the FCAS program of the ability to launch remote carriers, a new heavy lift helicopter should clearly be able to work seamlessly with these other lift

assets and to be able to integrate into the evolved concept of what kind of support lift can provide in the future, up to and including working the sensor-shooter relationship across a distributed force.

With the shaping of a new force structure within the context of the current and projected security context for Germany, it makes sense that each new platform or program be made with regard to where Germany is headed in terms of its 21st century strategic situation, and not be limited by the thinking of the inner-German defense period.

How then do the considerations identified in this section affect the heavy lift helicopter choice?

Evaluating the Options

The German approach was laid out in a military aviation strategy paper published by the German Ministry of Defence in early 2016.

The overall approach was defined as launching the Next Generation Weapons System or the Future Combat Air System in which a system of systems approach would be developed with European partners, and provide for the successor to the Tornado and build out the role of unmanned systems or what are now referred to as remote carriers within an overall combat cloud driven system of systems.

The heavy lift helicopter choice will come into being prior to a fully developed FCAS but clearly will be not only affected by the FCAS approach but should be a contributor to the new approach.

This means that it should have connectivity and C2 capabilities which can anticipate the strategic shift envisaged with the FCAS.

Indeed, in the recently held International Fighter Conference 2019, a senior defense industrial official involved with FCAS highlighted the need by 2025 to have significant communications integration between the French and German forces, and that connectivity collaboration was a key element of the FCAS approach.

This would mean as well that the heavy lift helicopter needs to be capable of being part of the connectivity collaboration dynamic as well.

In that same 2016 paper, the German MoD indicated that the MoD had shortlisted the CH-53K from Sikorsky and the CH-47F Chinook from Boeing as the potential successors to its aging fleet of CH-53 heavy-lift helicopters.

According to the paper, the new helo would increase the air mobility of the ground forces as well as contribute to medical evacuation, the support of special forces and to personnel recovery missions.

As of December 2015, the Luftwaffe had 75 CH-53s in its fleet, with some of these being converted to an upgraded version. But the new build helicopter is clearly not just a heavy lift asset but part of a combat assault force necessary to insert German combat capability into the German neighborhood in response to future crises in the neighborhood.

The FCAS commitment provides a framework for rethinking what a support asset can do, as envisaged clearly by what is anticipated by the A400M and its role in launching remote carriers and supporting the networked weaponized force.

It makes sense to consider the heavy lift helo as part of this shift in what is anticipated from the lift fleet as well.

The two options, the Chinook and the CH-53K, provide significantly different options for the Luftwaffe.

The first is provides significant continuity with the past and the legacy requirements; the second provides a significant upscaling of capabilities in line with Germany's new neighborhood combat engagement requirements and in line with the FCAS strategic trajectory.

There are stark contrasts between the two platforms.

The Chinook is a legacy platform limited in its upgradeability with the older nature of federated systems upgrades; the CH-53K is a key asset in the strategic shift of the USMC to a digital interoperable force similar in many ways to the FCAS approach going forward.

The CH-53 K is built from the ground up as a digital aircraft, and has the kind of C2/ISR infrastructure built in which will allow for the kind of connectivity and combat cloud upgrades envisaged in the FCAS approach.

In other words, the CH-53 K provides an expanded aperture for what support means to a combat force.

The nature of this change associated with the coming of the CH-53K into the integrated combat force was highlighted in a piece which I published earlier this year.

The CH-53K is shaping a new paradigm for heavy lift but it is doing so in the context of a new paradigm of warfare as well, or in the context, of a shift from the land wars to full spectrum crisis management.

Crisis management is evolving significantly. And the Marines as the US's premier crisis management force is evolving along with the changing demand set.

The Marines are reshaping their force structure to enable it to operate as an effective modular force with scalable force capabilities, which can be tailored to a particular crisis.

The CH-53K is a key part of this modular force.

The aircraft brings new capabilities to the force which are in no way the same as the CH-53E. One of those capabilities is the new cockpit in the aircraft and how digital interoperability and integration with the evolution of the MAGTF more broadly is facilitated by the operation of a 21st century cockpit.

The cockpits are very different and fit in with a general trend for 21st century aircraft of having digital cockpits with combat flexibility management built in. Because the flight crew is operating a digital aircraft, many of the functions which have to be done manually in the E, are done by the aircraft itself.

This allows the cockpit crew to focus on combat management and force insertion tasks. And the systems within the cockpit allow for the crew to play this function.

This means that the CH-53 K and its onboard Marines and cargo can be integrated into a digitally interoperable force. This means as well that the CH-53 K could provide a lead role for the insertion package, or provide for a variety of support roles beyond simply bringing Marines and cargo to the fight. They are bringing information as well which can be distributed to the combat force in the area of interest.

The fly-by-wire system onboard the CH-53K enables the crew to focus on mission management rather than devoting the majority of their attention to simply being able to fly the aircraft and to control the hover process in landing and taking off with the aircraft and its load.

The fly by wire system onboard the aircraft and other digital tools allow for stable flight in a wide variety of operational conditions. And the fly by wire system essentially lands the helicopter on its own – meaning the Second Line of Defense

pilots can focus on the mission at hand or evading a threat, or can safely land in a sandstorm or other degraded conditions.

This approach sounds very convergent with the German MoD's commitment to shaping a future combat system and a connected, integrated force which can insert combat capability at the tactical edge in Germany's neighborhood.

In addition, to the core digital capabilities built into an upgradeable-built in to the CH-53K, the aircraft has greater speed and range with much larger payloads than the Chinook.

And this is without even considering the external loadouts which the CH-53 K can carry which are three times the payload weight which the CH-53E can carry currently.

With the USMC completely committed to fielding a logistically sound heavy lift helicopter, they have stood up a logs demo team at New River Marine Corps Air Station in North Carolina which is maturing the sustainment system PRIOR to its IOC. This is a significant difference from when I saw the Marines introduce the Osprey in the 2005-time frame.

This means that even though it is a "new" combat system, it will be thoroughly sustainable aircraft prior to its first combat deployment.

The Marines at 2nd MAW are completing a very successful Log Demo where they have validated and verified the maintenance procedures, maintenance publications and tool requirements and refining them in order to be prepared to main and support his 21stCentury aircraft when it reaches the fleet in 2021.

Given the German MoD's interest in combining operations and sustainment in their operating bases, the Marines will be maturing a system which is capable of meeting this strategic objective for the German procurement.

In addition to having significantly less range than the CH-53K, the Chinook also has two key shortfalls which would be revealed in a combat insertion scenario in Germany's neighborhood.

The CH-53K is air refuellable; the Chinook is not.

And the CH-53 K's air refuellable capability is built in for either day or night scenarios.

An additional consideration is that the CH-53K operates standard pallets which means it can move quickly equipment and supply pallets from the A400M or C-130J to the Ch-53K or vice versa.

This is not just a nice to have capability but has a significant impact in terms of time to combat support capability; and it is widely understood that time to the operational area against the kind of threat facing Germany and its allies is a crucial requirement.

With an integrated fleet of C-130Js, A400Ms and CH-53Ks, the task force would have the ability to deploy 100s of miles while aerial refueling the CH-53K from the C-130J.

Upon landing at an austere airfield, cargo on a 463L pallet from a A400M or C-130J can trainload directly into a CH-53K on the same pallet providing for a quick turnaround and allowing the CH-53K to deliver the combat resupply, humanitarian assistance supplies or disaster relief material to smaller land zones dispersed across the operating area.

Similarly, after aerial refueling from a C-130J, the CH-53K using its single, dual and triple external cargo hook capability could transfer three independent external loads to three separate supported units in three separate landing zones in one single sortie without having to return to the airfield or logistical hub.

The external system can be rapidly reconfigured between dual point, single point loads, and triple hook configurations, to internal cargo carrying configuration, or troop lift configuration in order to best support the ground scheme of maneuver.

If the German Baltic brigade needs enhanced capability, it is not a time you want to discover that your lift fleet really cannot count on your heavy lift helicopter showing up as part of an integrated combat team, fully capable of range, speed, payload and integration with the digital force being built out by the German military.

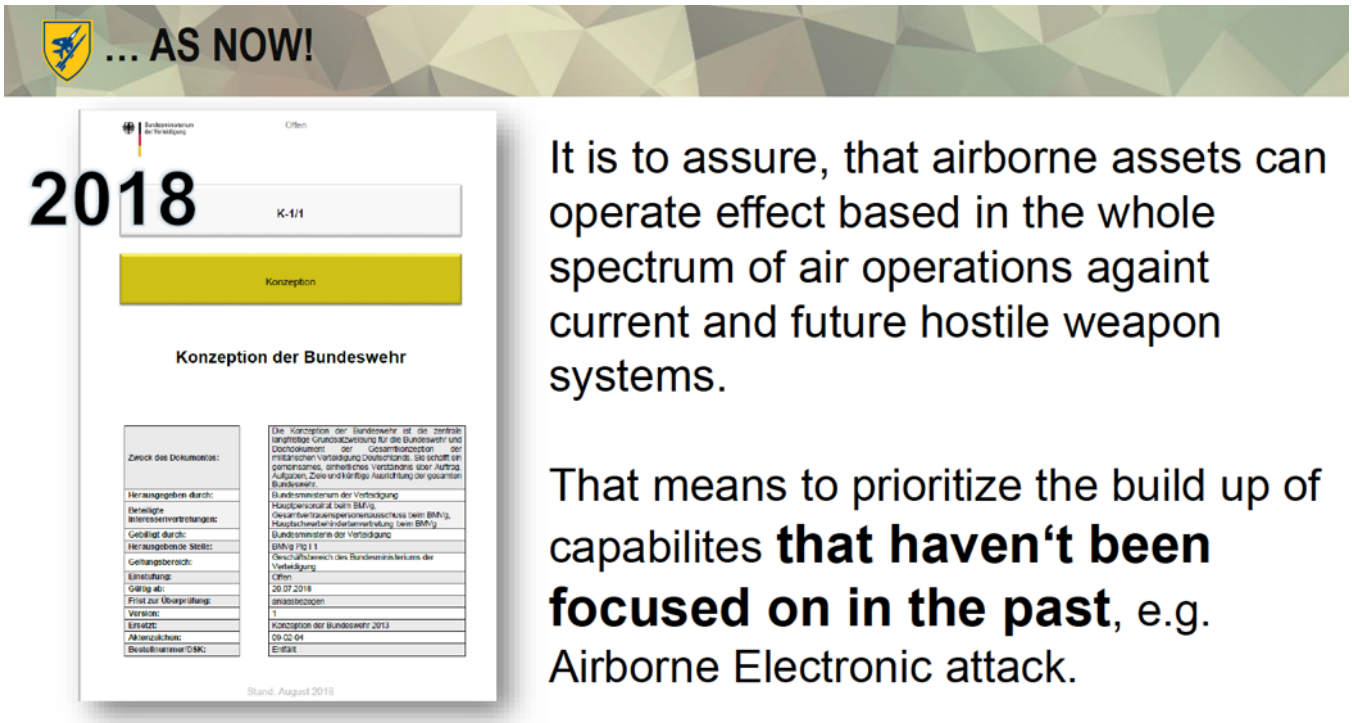
An Additional Insight from the International Fighter Conference, 2019

In effect, Germany needs to project power into the Poland-Baltic corridor in times of crisis with Kaliningrad as the flash point or speed bump along the way.

This is a corridor in which mastering the electromagnetic spectrum will be crucial to being able to intervene effectively in a crisis.

At the recent International Fighter Conference held in Berlin, senior Luftwaffe officers underscored that a major commitment of Germany to NATO in the near to midterm is to deliver new capabilities to fight in the electro-magnetic spectrum. And given the Kaliningrad enclave located along the routes to reinforcement of defense of Poland and the Baltics, such capability is clearly required.

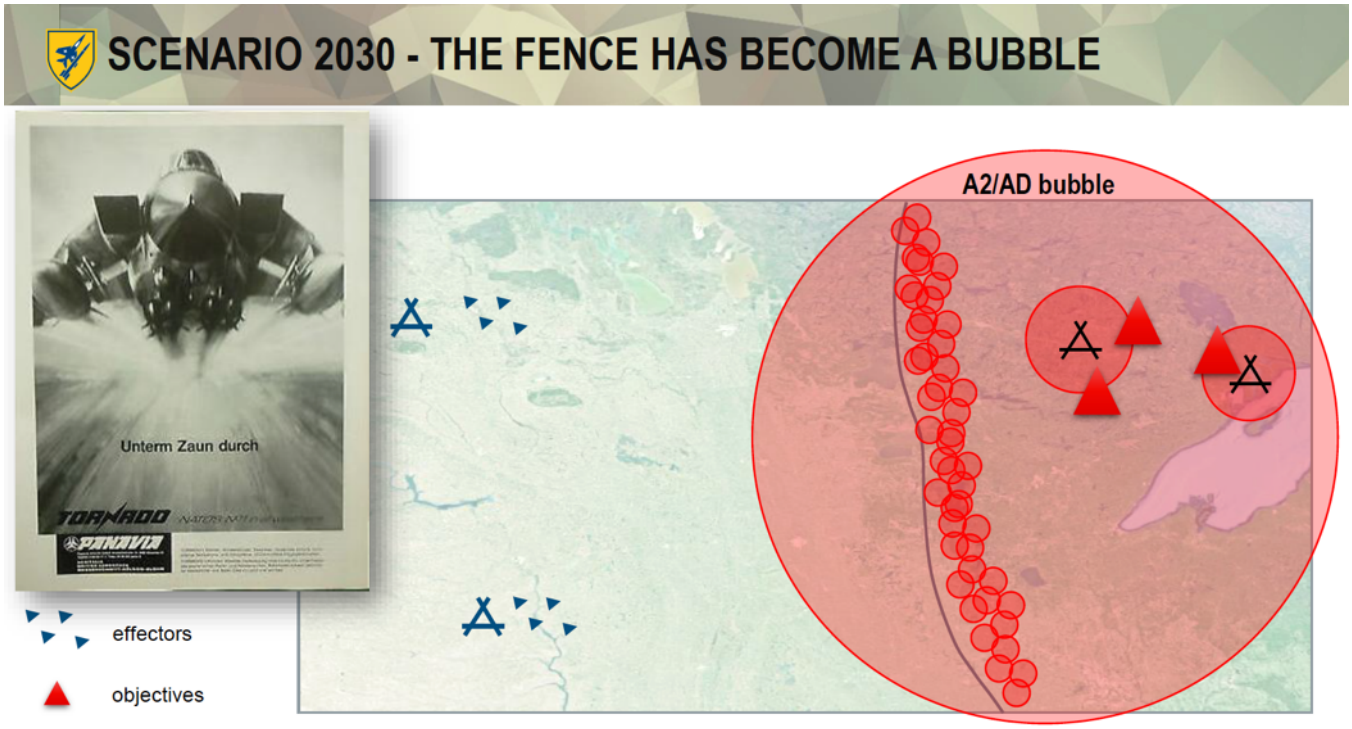
In the presentation by Brigadier General Christian Leitges, the German commitment was highlighted in the slide below:



Second Line of Defense

And obviously, this is not just about attack about an ability to operate a combat force in this environment as well.

The bubble pictured here is Kaliningrad, which from the offensive side is about breaking down the bubble; but from the standpoint of reinforcing the Polish-Baltic corridor, it is about being able to operate in the environment being generated by the A2/AD bubble.



Here the fact that the CH-53K is a marinized helicopter provides a plus in terms of its ability to operate in a different electro-magnetic environment.

In an interview which I conducted in the headquarters of the Deputy Commandant of Aviation in 2016, that aspect was highlighted.

Question: The CH-53 K is a marinized helicopter as well.

While we are at it, could we discuss the differences between an Army helicopter landing on a ship and a marinized helicopter landing on a ship, before the strategic community gets carried away with the notion that the Army can transfer its air assets to ships?

Answer: That is a good point. There are significant differences here.

The first is simply the point about electronic systems; the ship has to turn off many of its systems to allow Army helos to land on ships.

Electromagnetic hardening of the aircraft is crucial so that the electronic components in the aircraft can be protected from radars and other ship-board electronic systems, when it operates aboard naval shipping.

This is especially critical if you are operating a fly-by-wire system.

A recent exercise highlights the challenge if using the Chinook versus the CH-53K to move capability into the corridor.

In the Green Dagger exercise which occurred earlier this year in Germany, the goal was to move a German brigade over a long distance to support an allied engagement.

The Dutch Chinooks were used by the German Army to do the job. But it took them six waves of support to get the job done. Obviously, this is simply too long to get the job done when dealing with an adversary who intends to use time to his advantage. In contrast, if the CH-53K was operating within the German Army, we are talking one or two insertion waves.

And the distributed approach which is inherent in dealing with peer competitors will require distributed basing and an ability to shape airfields in austere locations to provide for distributed strike and reduce the vulnerabilities of operating from a small number of known airbases.

Here the CH-53K becomes combat air's best friend. In setting up forward operating bases or FOBs, the CH-53K can distribute fuel and ordinance and forward fueling and rearming points for the fighter aircraft operating from the FOBs.

And in the 2016 interview mentioned earlier, the intersection between the unique capabilities of the CH-53K and the support for FOBs was highlighted.

Question: I know that Germany among other allies is considering the K as an addition to their force. And currently, the competition seems to be between the Chinook and the K. How would you compare them?

Answer: It is basically 1960s technology versus 21st century technology with the implications for capabilities, maintainability and flexibility being weighed heavily favor of the K.

The mission is one of lift; and there is no comparison between the two helos.

The max gross weight on the K is 88,000 pounds; the Chinook is 50,000 pounds, they are not even in the same rotorcraft weight classification.

You get to the area of interest faster, safer and with the flexibility of deploying in support of multiple FOBs given the three-hook system.

In short, Germany faces a choice.

It can run in place and add Chinooks to its inventory.

Or it can grasp the future outlined in its Future Combat Air System and in its requirement to engage rapidly in case of crisis in its neighborhood in support of its allies, and introduce the CH-53K and leverage its introduction to move in the new strategic direction which the German MoD has indicated it wishes to go.

It is not just a platform choice; it is a choice for Germany's defense strategic future.

Clearly, it has been designed, built and sustained as a 21st century combat system for an integrated distributed force.

And it is more survivable, reliable and maintainable than any other heavy life helicopter entering service.

Second Line of Defense

HOW TO BEST TRAIN A MULTI-DOMAIN PILOT?: PERSPECTIVES FROM THE INTERNATIONAL FIGHTER CONFERENCE 2019

The International Fighter Conference 2019 provided a venue where a number of key aspects shaping the way ahead for combat airpower could be discussed.

Notable issues include: how to best integrate the force as new platforms and technologies are introduced?

How to transition most effectively to multi-domain operations?

How to best connect the force to deliver higher levels of integration to give the force greater combat effect?

And underlying all of this is the key question: how to train pilots to do all of the above?

The transition is a significant one: from the legacy force in which multi-mission fighter training was the key focus, to a focus where warfighting was broadening to require mission command capabilities for pilots operating in a multi-domain combat environment.

Obviously, this is a work in progress and requires new training templates, new technologies, new ways to operate on ranges, new ways to link ranges globally and new ways to combine live with virtual training capabilities.

A key presentation on the comprehensive challenges being addressed was by Major General Kevin Huyck, Director of Operations at the USAF's Air Combat Command.

The ACC has been focused for a number of years on working ways to leverage the introduction of fifth generation platforms into the force and conducting training exercises for the transition from the legacy fleet to a fifth generation enabled combat fleet.

I have conducted several interviews over the years at ACC and at Nellis AFB with the Air Warfare Center, which reports to the Commander of the ACC.

And those visits and interviews highlighted the significant changes underway in working the transition from the legacy force to a fifth generation enabled one.

The training side is challenging in a number of ways.

First, there is the question of mastering what sensor fusion and machine to machine integration across an F-35 force requires of the pilot.

Second, there is the question of how to leverage the CNI capabilities and its multi-security integration to shape connectivity strategies with other members of the air combat force to shape new task force operational concepts?

Third, there is the question of how to leverage offboarding of weapons from other platforms, or how to operate as an integrated distributed force, as in the case of F-35/Aegis integration?

And notably, how does one train for a combat force which can operate over much greater distances to shape tailored combat effects?

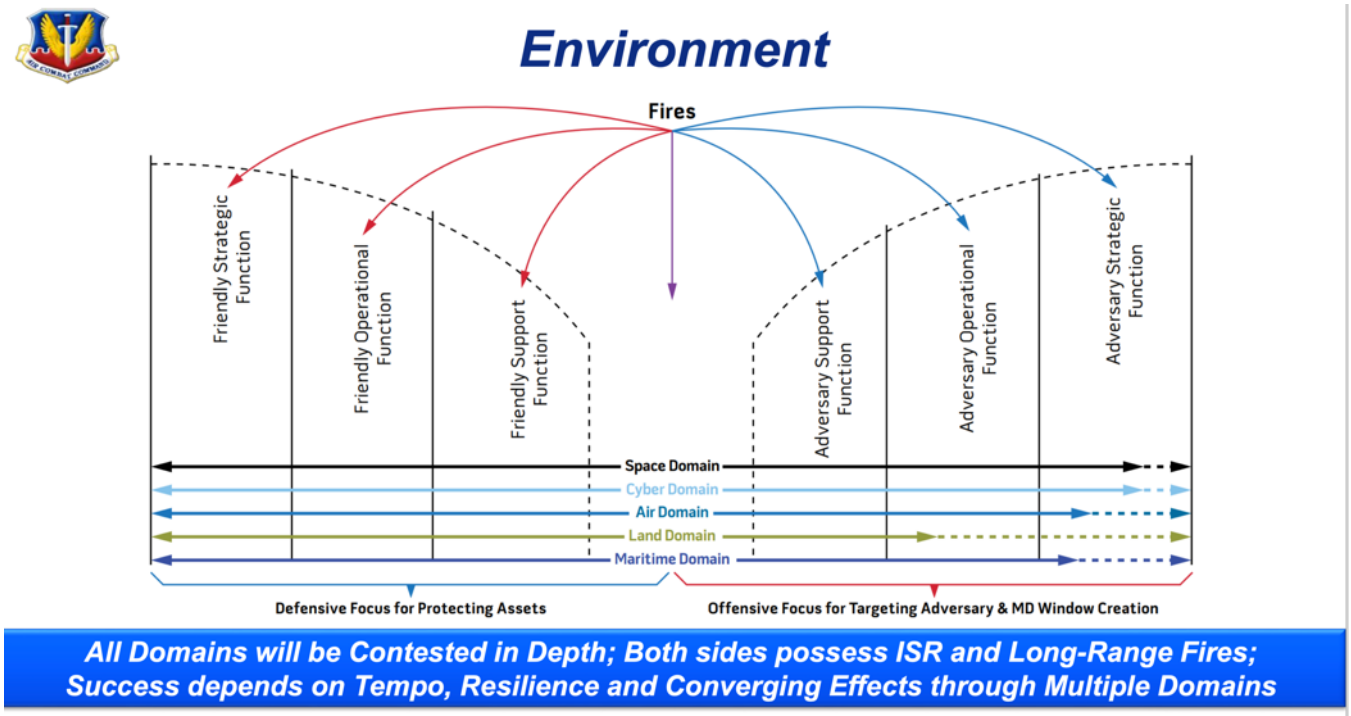
When ranges the size of Nellis, or Fallon can no longer train the force because the combat effects to be delivered are over much wider ranges of activity, how best to train?

Major General Huyck discussed how the training approach was changing to deal with such challenges.

He argued that the training approach at ACC was focused on more rapid assimilation of combat skills and enhanced operational readiness to be delivered by the training and exercise process.

The title of his brief: "Air Combat Command Vision: Advanced Training and Operational Readiness for Contested Environments.'

The complexity of the demand side and the need for a C2 structure which enabled mission command by the combat pilot was highlighted in his slide on the evolving combat environment:



His emphasis was upon meeting the challenge of training and equipping airmen to enable joint operations in a modern, contested environment.

To do so is requiring a major shift in the USAF to the readiness mission, which is how the training focus needs to be considered.

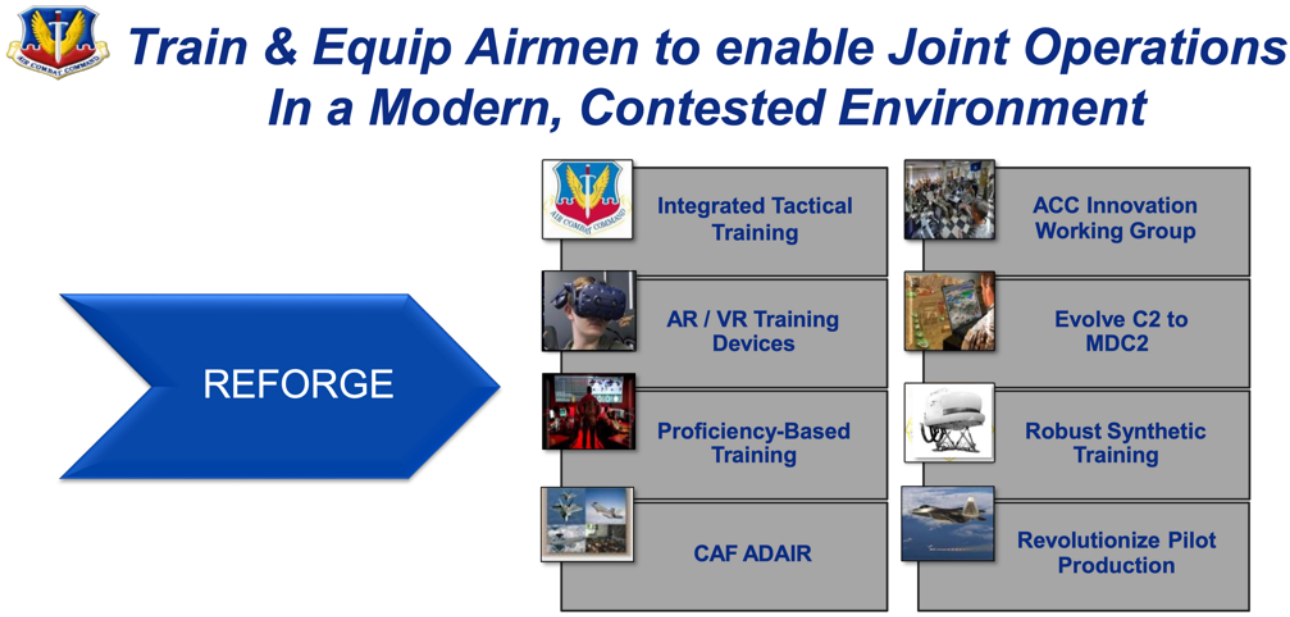
It is not about training to fly the aircraft, or to operate in classic wingman formations, but looking to become able to do reconfigurable task force integration to have the maximum combat effect in a contested environment.

To do so requires looking at shaping new approaches in a number of areas, and to do so interactively over time.

It is not about "finalizing" an approach; it is about building the right templates and allowing those templates to evolve based on combat experience.

He conceptualized the key elements of the new approach in the following slide from his presentation:

Second Line of Defense



Purpose built Combat Air Forces trained to prevail in competition or conflict…maximize readiness & enable integration of forces…ensure Joint Force ability to compete, deter, fight, win wars.

He characterized the advanced training environment as requiring pilots to operate in complex scenarios with dense kinetic and non-kinetic defenses requiring integrated, converging effects from multiple multi-domain force elements.

And such training required live, virtual, constructive fourth and fifth generation red air and surface forces engaged in the training environment.

Translated into English this means that the air combat force needs to be able to draw on the capabilities of the maritime, land, space, cyber, and non-fighter air combat elements to prevail in a contested environment and to deliver the combat effects required.

And even more challenging, the pilots need to work in combat teams able to do expeditionary operations.

In the United States, the masters of expeditionary air operations are the USMC, and not surprisingly as the USAF is now re-learning these skill sets one can find them visiting MAWTS-1 in Yuma MCAS.

A major shift from the land wars to operating in a contested environment where being able to master crisis management skills is crucial is the basing component.

In a 2018 comment, USAF Commander, Lt. General Kenneth Wilsbach, highlighted the nature of the challenge requiring the shift to mobile basing as follows:

“From a USAF standpoint, we are organized for efficiency, and in the high intensity conflict that we might find ourselves in, in the Pacific, that efficiency might be actually our Achilles heel, because it requires us to put massive amounts of equipment on a few bases. Those bases, as we most know, are within the weapons engagement zone of potential adversaries.

"So, the United States Air Force, along with the Australian Air Force, has been working on a concept called, Agile Combat Employment, which seeks to disperse the force, and make it difficult for the enemy to know where are you at, when are you going to be there, and how long are you are going to be there.

"We're at the very preliminary stages of being able to do this but the organization is part of the problem for us, because we are very used to, over the last several decades, of being in very large bases, very large organizations, and we stove pipe the various career fields, and one commander is not in charge of the force that you need to disperse. We're taking a look at this, of how we might reorganize, to be able to employ this concept in the Pacific, and other places."

The new context was highlighted in the following slide by Major General Huyck.

The challenge quite frankly is not just technology or new training tools and systems, but space as well.

If you plan to operate in a larger combat space and to draw on the relevant ground, maritime, and non-fighter forces, how do you master such an approach?

So where are you doing this?

The challenge is that live training not just computer aided reality three-D glasses in the simulator training is required.

And indeed, if the simulators are going to be accurate you better have the right real-world data fed into them as well.

And that gets at the big challenge – what training ranges do you now need?

Also, they need to be located where our little Russian and Chinese friends do not have proximate access.

Second Line of Defense

This means that that the ranges in Australia, Canada and the United States become central to advanced training for what I have labelled the integrated distributed force.

And this in turn poses the question of how will Team Tempest or FCAS for that matter train the force they envisage to deliver the right development processes for the right outcomes?

For training and development are not separate worlds any more.

In an interview I did with Air Vice Marshal (Retired) John Blackburn, the opening aperture on the development and training dynamic was highlighted.

The discussion underscored how significant the changes to the training dynamic needs to be to deliver the combat capability of what the Aussies call fifth generation warfare and I refer to as integrated distributed combat force.

Defence is procuring a Live/Virtual/Constructive (LVC) training capability.

But the approach is reported to be narrowly focused on training. We need to expand the aperture and include development and demonstration within the LVC world.

We could use LVC to have the engineers and operators who are building the next generation of systems in a series of laboratories, participate in real-world exercises.

Let's bring the developmental systems along, and plug it into the real-world exercise, but without interfering with it.

With engagement by developers in a distributed laboratory model through LVC, we could be exploring and testing ideas for a project, during development. We would not have to wait until a capability has reached an 'initial' or 'full operating' capability level; we could learn a lot along the development by such an approach that involves the operators in the field.

The target event would be a major classified exercise. We could be testing integration in the real-world exercise and concurrently in the labs that are developing the next generation of "integrated" systems.

That, to my mind, is an integrated way of using LVC to help demonstrate, and develop the integrated force. We could accelerate development coming into the operational force and eliminating the classic requirements setting approach.

We need to set aside some aspects of the traditional acquisition approach in favor of an integrated development approach which would accelerate the realisation of integrated capabilities in the operational force.

The scope of the change and the demand side on the training ranges was also highlighted in an interview I did with Air Marshal (Retired) Geoff Brown earlier this year with regard to the kind of training needed for a fifth generation enabled force, or for the projected FCAS force or the Team Tempest enabled force for that matter.

"Today's Western military is an information-dependent force, one that is wholly reliant on information communication technology (ICT) for current and future military operations.

"The adaptation and integration of ICTs into weapons platforms, military systems, and in concepts of operation has put the battle for information control at the heart of what we do!

"Now while the use of ICT exponentially increases the Western military's lethality,

"The dependence on these technologies, in many ways, is also a vulnerability. Competitors and adversaries—most notably Russia, China, Iran, and North Korea—recognize this reality.

"Each state plans to employ a range of cyber capabilities to undermine the confidentiality, integrity, and availability of Western allied information in competition and combat."

Because of this situation several key training questions need to addressed and answered.

The three key questions for Brown are as follows:

How to train in Battlespace saturated by adversary cyber and Information attacks?

How to exploit the advantages of cyber in multi-domain operations

Do we have the tools and key infrastructure to train in an appropriate manner?

"I believe it's safe to say it is impossible to deny an adversary entirely of the ability to shape aspects of the information environment, whether it's through spoofing or sabotaging ICT-based warfighting systems. As a result, our goal should be to sustain military operations in spite of a denied, disrupted, or subverted information environment."

He underscored the challenge this way:

"The requirement is that warfighters need to be able to fight as an integrated whole in and through an increasingly contested and complex battlespace saturated by adversary cyber and information operations. But how to do this so that we are shaping our con-ops but not sharing them with adversary in advance of operations?"

"The battle for information control needs to drive our training needs much more than it does at the moment. We need to provide warfighters with the right kind of combat learning…."

"One of the foundational assumptions I've always had is that high quality live training is an essential to producing high quality war fighters but I believe that's changed

"Even if you don't take cyber into account, and look at an aircraft like an F-35 with an the AESA radar and fusion capabilities, the reality of how we will fight has changed dramatically.

"In the world of mechanically scanned array radars. a 2v 4 was a challenging exercise — now as we have moved more towards AESA's where it is not Track while you Scan but its search while track , it's very hard to challenge these aircraft in the live environment.

"And to be blunt about it, the F-35 and, certainly the F-35 as an integrated force, will only be fully unleashed within classified simulations.

"This means that we will achieve the best training outcomes for aircraft like the F-35 only if we have a more comprehensive virtual environment."

If we do not do this we will fly fifth generation aircraft shackled by legacy air combat approaches; and we will not unleash the kill web in terms of its complexity and lethality unless we shape a training approach which allows the F-35 working with other key force elements to deliver a kill web outcome.

Second Line of Defense

RECRAFTING THE FIGHTER ROLE

02/16/2019

Robbin Laird, Front Line Defence

https://defence.frontline.online/article/2018/6/10980-Recrafting-the-Fighter-role

It's clear that combat capabilities and operations are being recrafted across the globe and, as operational contexts change, the evolution of the role of fighters is at the center of that shift. This year's International Fighter Conference held in Berlin provided a chance to focus on the role of fighters in the strategic shift from land wars to higher intensity operations. The baseline assumption for the conference can be simply put: air superiority can no longer be assumed, and needs to be created in contested environments.

Competitors like China and Russia are putting significant effort into shaping concepts of operations and modernizing force structures which will allow them to challenge the ability of liberal democracies to establish air superiority and to dominate future crises.

There was a clear consensus on this point, but, of course, working the specifics of defeating such an adversary brings in broader concepts of force design and operations. While the air forces of liberal democracies all face the common threat of operating in contested airspace, the preferred solutions vary greatly from one nation to another, so the conference worked from that common assumption rather than focusing on specific solutions.

The coming of the F-35 global enterprise is a clear force for change. In one presentation, a senior RAF officer outlined how the UK would both contribute to and benefit from the F-35 global enterprise. "The future is now," he began, as he laid out how he saw interactions among F-35 partners in shaping common and distinctive approaches to air power modernization driven by the introduction of the F-35.

F-35

Echoing the "future is now" sentiment, former Chief of Staff of the RAAF and now Chairman of the Williams Foundation, Geoff Brown, provided an overview of how the selection of the F-35 and its introduction in the force is part of a significant shift in the Australian Defence Force to a fifth-generation force. The retired Air Marshal argued that buying an advanced plane and "getting on with it" is both crucial and cost-effective. "70% of your cost is about maintaining, supporting and modernizing your airplane. Why would you want to do that with a legacy jet when you can buy a fifth-gen jet?"

A senior USAF officer involved with F-35 integration highlighted the efforts in working integration both on the level of the MADL-enabled F-35 force, and that force with the legacy force. His baseline point was that the F-35 is operating globally now, and that the USAF is working with its service and global partners on both the ability of the F-35 as a unique fleet to operate together as well as through its link capabilities, notably generated by the software designed and enabled CNI system to work with other assets as well.

He affirms it is clearly a work in progress and that the "sensor fusion" of the force is in its infancy, in terms of being informed by, and driven by, the F-35 as a combat aircraft. In his words: "The aircraft works well in terms of sensor fusion," and says they are focused on "the journey to mature its effects as an air system on the overall force."

Scott "Shark" McLaren, an experienced USAF test pilot, explained what sensor fusion means to the combat pilot. The combat-proven F-16 pilot had shifted to the F-35, and ably addressed the core question of: What does situational awareness look like for the F-35 pilot, and what does it mean for his combat prowess?

In simple terms, the 4th generation pilot fuses the data from his on-board systems to operate against a specific combat task, and is dependent on what his network can deliver in terms of broader sensor fusion.

The F-35 pilot, on the other hand, has SA provided from sensor fusion machines on-board his aircraft rather than having to rely on networks and he focuses on shaping tasks crucial to missions in the combat space. That pilot can then work with the integration from the unique data network provide for the low observable jet through the MADL data system to then operate as a core combat force. The cluster of F-35s can then provide networking enhancement to other aircraft in the force or, when low observability is not the primary requirement, can leverage broader networks.

What becomes clear, is that the evolution of legacy fighters (mostly referred to as fourth-generation) is a key part of the evolution of the response to operating in contested airspace. This is a major focus of attention for any of the air forces introducing the F-35, and is clearly of concern for a legacy force like the French Air Force which does not intend to buy an F-35.

The question becomes, how will the different legacy fleets adapt to the F-35, and what will their tactical and strategic contributions be as they adapt to the evolving strategic environment? There is also a key dynamic of change for what are referred to as the "big wing" aircraft such as AWACS and the various ISR aircraft. Generally, there is a major shift in how command and control (C2) will be done as fighters and their connected brethren work together to deliver the desired effects in the 21st century contested battlespace.

Key Questions

Where is sensor fusion done? Where will decisions be taken? Who will deliver them? How will different air forces connect in distributed operations in contested airspace? With what systems and means?

As multi-domain operations (the ability to deliver effects throughout the entire combat force with fighters playing various roles, C2, ISR, strike) come to dominate, will platforms be designed to enhance overall capabilities of the combat force?

Put another way, how will legacy aircraft evolve to the challenge of dealing with contested airspace while also contributing to multi-domain operations that is becoming a primary driver of change for the air combat force?

A European counter-perspective was juxtaposed to the fifth-generation shift, and this was the idea of preparing for a new combat fighter for 2040, which the French and the Germans refer to as a Future Combat Air System.

The FCAS approach can be looked at two very different ways. One is to look at the end state as a target on which modernization is focused. Here the notion is that the system or the networks will provide multi-platform and multi-node capabilities to deliver the combat effects required to operate and prevail in contested airspace.

The focus is less on what organically can be delivered by a proposed new fighter than on its ability to interact with other platforms to deliver the desired combat effect.

Second Line of Defense

A second but correlated way to look at it is to shape a building process whereby key elements are identified, designed and built through the next 20 years, and operationally introduced into the relevant European combat force in anticipation of the fighter to be designed through an open-ended process with the design closure affected by that learning curve.

A case in point was provided by Bruno Fichefeux, Head of the FCAS Programme in Airbus Defence and Space. The broad point is that, in the future, the manned fighter will be working with remote combat systems and teaming capability as the core competence. This requires developing and evolving sophisticated software and teaming concepts of operations to work with any future fighter.

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

The focus was on 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 autonomously. The team worked for a year preparing for the experiment, which was conducted about a month ago over the Baltic Sea. The software development team used off-the-shelf drones and equipment.

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.”

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 asked 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 will be a core one for them going forward.

RCAF of the Future

It is within this general focus on operating in contested airspace and the strategic shift in airpower to operate in new conditions that a senior Canadian Air Force addressed the Canadian approach of Canada. Chatham house rules were followed at the conference and unless I did an interview with a particular speaker, the speakers remain unnamed.

The Canadian officer clearly embraced the core point of the conference, namely, the need to operate in a much different combat air environment. He underscored that the operational environment was becoming more lethal and complex, in which advanced fighters would need to be able to operate in an anti-access area denial surface-to-air missile environment, with cyber threats, contested control of the electro magnetic spectrum, and in the presence of the proliferation of technologically advanced equipment.

Canada faces a number of funding and commitment challenges to deal with the new strategic situation.

To operate in this environment with its allies and to contribute to NATO capability, as well as to defend Canada, the RCAF would clearly need an upgrade across the force, both the joint and the combat air force.

This new force would consist of several new platforms, which clearly would need to operate in a teaming context such as described by both the F-35 and Airbus representatives.

The RCAF of the future is projected to consist of 88 new advanced fighter aircraft; a next generation multi-mission aircraft (CP-140 replacement); a next generation air-to-air tanker transport; new utility transport aircraft; a range of remotely piloted systems; and integrated space capabilities within the combat force (global satellite communications, surveillance of space and ISR).

Interestingly, this officer focused on a key challenge – one that is often overlooked, but where the RCAF can lead the way, not just for Canada but in terms of working with the British, the Americans and Pacific allies in terms of training for operations in the extended battlespace. He noted that the Canadian Forces Aerospace Warfare Centre (CFAWC) is currently developing the RCAF way ahead related to exercises and training – with Live Virtual Constructive Training being key to this. And they are doing so in an intelligent fashion, starting with near term virtual add-ons to Exercise Maple Flag, and laying the foundation for a continuing transformation effort for training of Canadian and allied air forces.

He identified a number of opportunities that can be developed and leveraged by the RCAF. These included: Cold Lake Air Weapons Range project, the Future Lead-in Trainer project, the Future Fighter Capability Project, the Future Aircrew Training (FAcT) project (mentioned elsewhere in this edition), and leveraging the Distributed Mission Operations Centre.

In short, significant innovation will characterize the way ahead as peer competitors confront each other and adjust to each other's capabilities and performance in combat. The decade of innovation ahead will clearly lay the foundation for the next.

VISITING CHECKPOINT CHARLIE: VETERANS DAY, ARMISTICE DAY, AND THE 30 YEAR ANNIVERSARY OF THE FALL OF THE BERLIN WALL

November 11, 2019

I am in Berlin today for the International Fighter Conference 2019 which starts tomorrow.

I took the opportunity to revisit Checkpoint Charlie.

It is now a museum, but also a testament to the will of the West to defend liberal democracy against the Soviet Union.

I often visited West Germany in the 1980s when the political warfare over Euromissiles was a dominant reality.

The U.S. President was hardly popular and when you visit the Checkpoint Charlie museum it is easier to find remembrance of JFK's visit than the historical moment when President Reagan challenged the Soviet leaders to "teardown that wall."

I set up a working group in the mid-1980s at the Institute for Defense Analysis to discuss the prospects and how to shape a possible German reunification.

It was not a widely attended effort, but did prepare the way for the historical events.

The key agreement of the group was that if the new Germany was not part of the Western institutions, the European Union and NATO, then any agreement with the Soviets would not be worth the effort.

Second Line of Defense

The concept in those days was that only an agreement that yielded a real outcome which could fit into the values of the liberal democracies really mattered.

Simply having an agreement to look like progress was being made was the wrong way to go because it would only help the authoriarians working to undercut consensus in our societies.

Seems a long time ago.

There was no desire to have a Soviet veto power over the future of Germany.

The Russians frequently insist that they had promises with regard to the fate of sovereign states in Europe; that somehow they had a veto power over which states could work with the West and which could not.

That simply is not true.

And that brings us to Berlin, East and West.

West Berlin was a fragment of liberal democracy in a sea of Soviet and East German authoritarianism.

The Stasi was a prevalent force and provided the atmosphere for any Western visitors to the "workers paradise" which could could be seen in East Berlin.

My first job in the Pentagon was to work for a man who had just served as the Brigade Commander in Berlin.

BG William C. Moore
25 Aug 1978 – 01 Aug 1980

According to Wikipedia:

"The Berlin Brigade of the United States Army was a separate brigade based in Berlin. Its shoulder sleeve insignia was the U.S. Army Europepatch with a Berlin tab, later incorporated."

I functioned as his tutor on things Soviet and we had many discussions about his time in Berlin.

What impressed the most was the dedication of the Brigade.

As the General put it: "We are a speed bump which would be crushed as the Soviets prepared to move against the inner German border. But we need to do so in a way that would remind them that the United States was not going to yield an inch of German territory without a fight."

Put in simple terms: "We are going all to die in a conflict; we need to do so with and for a purpose."

That kind of courage and dedication can be forgotten when visiting Berlin today.

Turning Checkpoint Charlie into a museum is clearly a reminder of what U.S. servicemen and women contributed to the future of Germany.

But turning it into a museum and remembering the 30 year anniversary of the Fall of the Berlin Wall also recalls the lessons learned from the Armistice Day being remembered in Europe.

The "war to end all wars" didn't.

And the Fall of the Berlin Wall did not end to the East-West conflict.

And the 2008 and 2014 territorial seizures by Russia are clearly a reminder, that there are no wars that end all wars.

Checkpoint Charlie may be a museum; but it is a reminder that the East-West conflict is hardly over.

2014 is as significant as 1914 but simply has not been recognized as such.

Second Line of Defense


US ARMY CHECKPOINT