SPECIALReports

F-35 2.0: Introducing the Concept

As the F-35 is not a multi-mission asset; it is a multi-domain warfare platform.

How best to leverage the new platform?

How-to set-in motion changes in other platforms which can generate a fifth-generation combat force?

This is F-35 2.0 a concept which is being acted upon by the US and key allies as they introduce the aircraft.

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F-35 2.0 AND CHANGING THE DEFENSE ECO-SYSTEM

By Robbin Laird

We have argued for more than a decade that leveraging fifth generation aircraft allowed for the re-norming of airpower. With the evolution of the F-35 and with the buy of the aircraft by several key allies, those allies are starting to introduce the aircraft into their forces, but are doing so with an eye to the overall transformation of their force structure.

They are leveraging the multi-domain aircraft as a trigger for overall transformation of their force and are looking at concurrent or follow on developments to facilitate such change.

There is no better example of this than the Royal Australian Airforce and the Australian Defence Force which have looked at the acquisition of the F-35 as the beginning of a longer road of becoming a fifth-generation combat force.

One of the architects of this approach has been Air Vice Marshal (Retired) John Blackburn. In a recent interview with him shortly after my return from Australia, we discussed the approach and the challenges to shaping a transformed ADF.

Blackburn: The acquisition of the F-35 has triggered people to expand their field of view and to start thinking about the whole force and how this can amplify the whole force and what does that mean.

“In other words, instead of just focusing on the airplane itself, we are focusing on the ecosystem of change associated with the aircraft which can provide for defense transformation.

“The real challenge of course, with any great idea, is: "How do you implement it?"

“This requires focusing on the roadblocks to change and to understand how the entire defense eco system needs to change to enable the kind of continuous change which a fifth generation force both needs and facilitates.

“We need to focus upon the roadblocks that will stop us from achieving and implementing this great idea?”

Question: Clearly, the aircraft as a multi-domain asset challenges the traditional notions of C2 and ISR being located in specialized platforms or managed horizontally.

One challenge is that a number of services are still focused on fifth gen as if it was a multi-mission rather than a multi-domain asset and putting into a legacy box, rather than expanding the aperture and transforming the force.

The problem is that the plane, from the beginning, gets pushed into a box that doesn't actuate the capabilities of the air system itself, and then the question ... we should be focusing on F-35 2.0 in terms of: "What are the barriers to really changing the rest of the force?"

And that's what you're talking about.

How do you go about getting a shift in focus?

Blackburn: You highlight a change in language and concepts in discussing the way ahead.

"When Secretary Wynne generated the idea of fifth gen what he clearly focused upon was changing Air Force language thinking. We cannot operate the F-22 or the F-35 like an F-15 or F-16; these are radically different aircraft and we need to operate them very differently.

"But this is a difficult challenge to get services fundamentally to change their concepts of operations to really leverage a breakthrough technology.

"But change has occurred.

"And when our F-22 exchange pilots come back to the RAAF from flying with the USAF, they clearly have understood and have discussed with their peers how fifth generation was a revolution in air combat and had to be treated that way.

"When we generated our Plan Jericho effort we had in mind something similar to what Secretary Wynne did, namely how do talk about our approaches very differently leveraging the new platform?

"We're using that language like Secretary Wynne did to talk now about a fifth-generation force, and we're starting to see some progress.

"Clearly, we need to take a broad view of the dynamics of change. Just buying the platform does not get you where you want to go. We need to focus on a broader innovation by design approach to really create a fifth-generation combat force and this really is a change in the defense eco system.

"When we buy an innovative system, like the F-35, it will not by itself lead to the kind of change which we need. What we need to do is to take a broader look at force design leveraging the aircraft to reconfigure the force.

"If we do not design an integrated force, we are always going to play catch up and do after market integration.

Question: But to do this will require a fundamental change in the defense eco system and how defense operates a procurement and support organization.

How do you view this challenge?

John Blackburn: We are using the business model of the past twenty years when we have acquired standalone platforms and try to figure out how they would work together in the post-acquisition phase.

"But we need to change how the whole organization itself works. The warfighters get what the F-35 drives in terms of change; but this integrative approach is not being replicated on the level of acquisition which is still a stove piped process and world.

"We are preparing to fly fifth generation aircraft in a legacy eco system; this simply does not make sense.

"The design process for the overall force is where significant change needs and can occur.

"What this means is that you look at an effect which you want to create with the overall force and you look at your mix of platforms and determine which can lead the design change to achieve that effect, rather than simply doing additive modernization of every platform.

"You are targeting innovation on a lead platform rather than simply doing innovation by addition.

"The F-35 poses a significant challenge because it delivers weapons, its delivers non-lethal effects, it is an ISR platform, it is a C2 platform, and can itself deliver organic strike or simply delegate to a partner aircraft or system. Such a platform simply blows apart the traditional structure and if you pursue integration it is clearly a driver for change; if you don't you will reduce the aircraft to one of its functions rather than leverage it for multi-domain, cross platform integrated innovation and combat learning.

"We need to take the energy evident at the tactical combat level and inject that into the strategic culture at the top which simply cannot tap into effectively the kind of fifth generation innovation we are seeing from operators.

"This is the first major roadblock, namely, the business model."

Question: You have discussed other roadblocks, namely, in the energy and network space.

How do you view these roadblocks?

John Blackburn: When we focus on the design of the force, clearly a key requirement is energy supply and security. How do we get electricity to a base? How do we support our supply chains? What's the energy aspects of this future force design? Today, there are no future energy concepts or designs in place. What's happened is we have assumed that, somehow, the fuels and energy we need to operate our future force will be delivered by the market, which would be virtually impossible in a crisis in our region.

"With regard to networks, we have a multiplicity of networks and a legacy security system which cauterizes information in ways that make no sense to a rapidly operating fifth generation force. In terms of network design, we don't have a good foundation upon which we can build the fifth-generation force networks.

"Another roadblock is that we do not have yet in place an industrial policy that will provide for all the sovereign capabilities we will need in terms of a severe crisis. Notably, we do not have an appropriate weapons policy. We build traditional ammunition but not missiles. This makes no sense, in terms of the inherent capabilities which we have or could have to develop and build weapons in country. And without weapons, the JSF is not much use.

"If we do not address such roadblocks, we could end that with the platforms that aren't integrated properly, that aren't supported properly, and that's a risk that we've got to really face today, not in five or ten years when we actually get the platforms in service.

The featured graphic on the cover highlights F-35 and Aegis integration, which is an element of F-35 2.0, namely reshaping the role of fires associated with the tactical aircraft.

WHITE SANDS MISSILE RANGE, N.M., Sept. 13, 2016

Two pre-eminent weapon systems, the F-35 Lightning II and Aegis Weapon System, worked together for the first time during a live fire exercise…..

During the Sept. 12 test, an unmodified U.S. Marine Corps F-35B from the Marine Operational Test and Evaluation Squadron 1, acted as an elevated sensor and detected an over-the-horizon threat. The F-35B sent data through the aircraft's Multi-Function Advanced Data Link (MADL) to a ground station connected to the Aegis Weapon System on the USS Desert Ship (LLS-1), a land-based ship. The target was subsequently engaged and intercepted by a Standard Missile 6.

"One of the key defining attributes of a 5th Generation fighter is the force multiplier effect it brings to joint operations through its foremost sensor fusion and external communications capabilities," said Orlando Carvalho, Defense.Info

executive vice president, Lockheed Martin Aeronautics. "Those attributes were successfully proven at White Sands Missile Range in a very realistic demonstration of distributed lethality leveraging a U.S. Marine Corps F-35B and the U.S. Navy's Aegis Weapon System. This only scratches the surface of the potential warfighting capabilities F-35 aircraft will ultimately enable across our military forces."

This capability, when fully realized, will significantly increase the warfighters' situational awareness using Aegis and the F-35 together to better understand the maritime operational environment. Using any variant of the F-35 as a broad area sensor, the aircraft can significantly increase the Aegis capability to detect, track and engage.

THE F-35 AND THE FIFTH GENERATION WARFARE ECOSYSTEM

2015-05-01 Ed Timperlake, editor of the ***Second Line of Defense Forum***, was the last speaker of the day prior to the wrap up of the Danish airpower symposium held in 2015 in Copenhagen.

The title of his briefing was "Early 21st Century Warfighting Trends: Technology, Training and Tactics," and focused on the intersection of the coming of the F-35 with the evolving warfighting environment for the US and its allies.

In effect, he provided a look at the synergy of what John Blackburn discussed through Plan Jericho between the F-35 as a trigger for change, and the evolving approach of the RAAF or what Lt. Col. Berke referred as the disruptive change associated with the F-35 and the evolving eco system associated with fifth generation warfare.

As a Marine Corps pilot engaged in both close air support and air-to-air missions, Timperlake completed his flying career as Commanding Officer of VMFA-321 with over 3000 hours of tactical flying.

Timperlake was looking forward from the perspective of the way ahead for performing the mixture of missions pilots would need to deliver in the coming decade.

A core element of working the evolving future is understanding that even with a disruptive change platform like the F-35, it is intersection of the training and tactics for the platform with the overall capabilities of the force which will drive change. And it is the squadrons and the squadron pilots who are the heart of shaping innovation.

As Lt Col. Berke had highlighted, change was a significant part of what the F-35 was all about for the pilots and their roles.

Timperlake underscored that in visits to the core warfighting centers in the United States associated with airpower – Nellis, Fallon and MAWS-1 – the warfighters had embraced change and were working across the services and with the allies in shaping new combat approaches.

As one who had met John Boyd and sat through his lectures a couple of times, Timperlake focused on how the famous OODA loop was being re-shaped with the coming of the F-35 fleet whereby the "Decide-Act" part of the OODA loop was increasingly important.

The ability of the pilots to share situational awareness across the fleet, and to support one another's operations over significant distance in compressed time meant that the force would have significant capability to deliver kinetic strike either by itself or from other platforms.

And the passive sensing capabilities of the F-35 would introduce innovations in kinetic and non-kinetic strike as well.

One way to understand the evolving eco system associated with fifth generation warfare is the S-cubed revolution.

Stealth, speed and sensors are an interactive dynamic and underlay the emergence of fifth generation warfare.

The sensor-shooter revolution sees as well the emergence of the offensive-defensive enterprise.

Sensors, stealth and speed enable the air combat enterprise to find, kill and respond effectively to the numerous adversarial threats that global powers and pop up forces can present to the US and its allies.

The strategic thrust of integrating modern systems is to create a honeycomb that can operate in an area as a seamless whole, able to strike or defend simultaneously.

This is enabled by the evolution of C5ISR (Command, Control, Communications, Computers, Combat Systems, Intelligence, Surveillance, and Reconnaissance), and it is why Secretary Wynne has underscored for more than a decade that fifth generation aircraft are not merely replacements for existing tactical systems but a whole new approach to integrating defense and offense.

By shaping a C5ISR system inextricably intertwined with platforms and assets that can honeycomb an area of operation, an attack and defense enterprise can operate to deter aggressors and adversaries or to conduct successful military operations.

The F-35 global fleet will help shape the new ecosystem and live off it. Synergy in shaping evolving capabilities to deal with the reactive enemy will be an essential part of the innovations associated with the offensive-defensive enterprise.

Timperlake argued that the warfighting centers were interactively working together and with allies to shape the way ahead.

Each center has an evolving special focus that will carry forth innovation across the entire warfighting enterprise.

MCAS Yuma, MAWTS-1, VMX-22 and the F-35 squadron, were working together to shape an innovative approach to 21st century close air support within which the cockpit display gave the pilot a constant read of the AA and GA threats and in which electronic warfare was part of the CAS capabilities of the aircraft. And with the integration with the Osprey and with the MAGTF, the Marines were shaping a whole new approach to assault forces.

Visiting the Warfare Center at Nellis, Timperlake learned of the central importance of shaping a fleet wide mission data set correlated with the F-35 sensors in shaping wide ranging SA and engagement force decision making. With Red Flag exercises the USAF was leading the way in shaping the intersection of the F-35 with other combat assets to shape an air combat revolution that will help reshape an ecosystem that would evolve with the F-35 fleet.

At Fallon, the Navy is looking to lead the way on shaping a live virtual constructive range which will allow the complexities of a modern battlefield to be both inclusive and wide-ranging.

He saw the new carrier air wing evolving under the influence of the F-35 extending its reach and expanding the capabilities of the maritime force to deliver distributed lethality.

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This is an open-ended learning process, but to use Lt. Col. Berke's language, one which needs to be accelerated and to get on with it.

The systems making up the F-35 cockpit provide convergent capabilities but are driven by separate R and D paths to shape new 21st century capabilities. In other words, the F-35 and its evolving ecosystem are both inherent to change within the aircraft and synergistic with change in the entire air combat force.

The future is in the hands of the squadron pilots across the services, and the allies and change driven by any one service or F-35 nation will be part of the overall dynamic of re-shaping the eco-system.

This is a key advantage that the US and its allies can leverage to shape a more effective combat future and to position themselves effectively against adversaries like Russia, North Korea and China.

He concluded that "countless evolutionary and revolutionary aspects of 21st century combat will be in the hands of the squadron pilots – as it should be!"

RE-SHAPING CONCEPTS OF OPERATIONS DRIVEN BY A MULTI-DOMAIN 5TH GENERATION AIRCRAFT

By Robbin Laird and Ed Timperlake

2/18/16

The F-35 working with robotic elements and with new weapons can empower a distributed operations approach.

This approach is being tested out at various centers of innovation within the U.S. military and will be synergistic with allied partners.

Traditional assets, such as the large deck amphibious ship or th large-deck carrier, will be rethought as the new approach and new capabilities are introduced into the force.

Continuing to invest in past approaches and capabilities makes little sense.

And ultimately, the fifth-generation aircraft and associated systems can drive significant cultural change.

But there is nothing inevitable here.

The United States is at a crucial turning point.

In a stringent budgetary environment and with a demand to shape a post-Afghan military, the crucial requirement is to invest in the future not the past.

But it is not just about airframes or stuffing as much as you can in legacy aircraft.

The new aircraft represent a sea change with significant savings in terms of fleet costs and overall capability at the same time.

The sustainability of the new aircraft is in a world significantly different from legacy aircraft.

Digital maintenance is part of the revolution in sustainability. The sustainability revolution enables a significant increase in the sortie generation rates for the new combat aircraft.

And in addition to this core capability, there is a significant transition in combat approaches facilitated by the new aircraft.

The aircraft can shape disruptive change by enabling distributed operations.

The shift is from linear to simultaneous operations; it is a shift from fighters needing reachback to large aircraft command and control and ISR platforms to 360-degree dominance by deployed decision makers operating not in a network but a honeycomb.

These lessons have been recently highlighted in the Trilateral Exercise held at Langley AFB in December 2015.

If this exercise was held 12 years ago, not only would the planes have been different but so would the AWACS role. The AWACS would have worked with the fighters to sort out combat space and lanes of operation in a hub spoke manner.

With the F-22 and the coming F-35, horizontal communication among the air combat force is facilitated so that the planes at the point of attack can provide a much more dynamic targeting capability against the adversary with push back to AWACS as important as directed air operations from the AWACS.

As General Hawk Carlisle put it:

"The exercise was not about shaping a lowest common denominator coalition force but one able to fight more effectively at the higher end as a dominant air combat force.

The pilots learning to work together to execute evolving capabilities are crucial to mission success in contested air space."

Modernization of assets, enhanced capabilities to work together and shaping innovative concepts of operations were seen as key tools for the U.S. and the allies to operate in the expanded battlespace in order to prevail…..

And as the RAF highlighted:

"Whoever can gather, process and exploit the most information in the quickest time will win the information war and ultimately the fight.

With fifth generation aircraft being able to instantly share data with their fourth generation cousins, the Typhoon can become and an even more effective and capable jet fighter."

Fifth-generation aircraft both generate disruptive change and live off of disruptive change.

Taking a fleet approach, rather than simply focusing on the platforms themselves, highlights their potential for disruptive change.

Properly connected or interoperable with one another, the new aircraft can work together to operate like a marauding motorcycle gang in an adversary's battlespace.

Rather than operating as a linear force, the marauding motorcycle gang creates chaos within the OODA loop of the adversary. In fact, the F-35 is really about shifting from the OODA loop with the machine-man interface doing much of the OO and focusing attention on the DA.

By having an onboard combat systems enterprise able to respond in real time to the impacts that the aircraft are creating in the battlespace, they can respond to the fractual consequences of the battle itself.

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Rather than going in with a preset battle plan, the new aircraft can work together to disrupt, destroy, and defeat adversary forces within the battlespace. It is about on-the-fly (literally) combat system processing power that enables the pilots to act like members of a marauding motorcycle gang.

The fifth-generation aircraft enable the pilots to become key decision makers within the battlespace and, if properly interconnected, shape a distributed operations approach to battle management and execution.

They are key elements of C4ISR D, which is deployed decision making rather than data collection sent back to decision makers for less timely actions. C5ISR D is the core capability that 21st-century military forces need for strategic advantage.

For the United States to have an effective military role in the new setting of regional networking, a key requirement will be effective and assured combined command, control, and communications, linked by advanced computing capabilities to global, regional, and local intelligence, reconnaissance, and surveillance assets (C5ISR).

The services will need to ensure that there is broad synergy among U.S. global forces fully exploiting new military technologies and the more modest capabilities of regional allies and partners.

Indeed, C5ISR is evolving to become C5ISR D, whereby the purpose of C5ISR is to shape effective combined and joint decision-making. The USMC clearly understands and embraces the disruptive capabilities of the fifth-generation aircraft. For the USMC, TAC Air does not simply play a close air support role in any traditional sense.

It is an enabler for distributed operations when such operations are essential to either conventional strike or counterinsurgency warfare.

USMC aviation has allowed the USMC ground forces to operate with greater confidence in deploying within the civilian population in Iraq. Aviation's roles in both non-kinetic and kinetic operations have allowed the USMC to avoid operating within "green zones" so as to facilitate greater civilian-military relations.

Aviation has also provided an integrated asset working with the ground forces in joint counter-IED operations. And quite obviously, battlefields of the future will require the USMC to operate upon many axes of attack simultaneously. Such an operation is simply impossible without a USMC aviation element.

For the USMC thinks ground in the air and the forces on the ground can rely 24/ 7 on USMC aviation forces to be with them in the ground fight.

As Lt. Col. "Chip" Berke, the F-22, F-35, F-16 and F-18 Marine Corps former squadron commander, put it in a presentation on airpower at the Copenhagen Airpower conference last year:

As a JTAC the key requirement is that the airplane show up.

The A-10 pilots are amazing; the plane will not always able to show up in the environment in which we operate; the F-35 will.

That is the difference for a Marine on the ground.

The F-35 will be a "first-generation flying combat system" that will enable air-ground communication and ISR exchanges unprecedented in military history. The pilot will be a full member of the ground team; the ground commanders will have ears and eyes able to operate in a wide swath of three-dimensional space.

But if other airpower leaders simply mimic the operations of older aircraft with the fifth-generation aircraft, the promise of the new air operations will not be realized.

As Robert Evans, a specialist on C2, formerly a senior USAF officer and now with Northrop Grumman put it about the dynamics of change:

If warfighters were to apply the same C2 approach used for traditional airpower to the F-35 they would really be missing the point of what the F-35 fleet can bring to the future fight.

In the future, they might task the F-35 fleet to operate in the battlespace and affect targets that they believe are important to support the commander's strategy, but while those advanced fighters are out there, they can collaborate with other forces in the battlespace to support broader objectives.

The F-35 pilot could be given much broader authorities and wields much greater capabilities, so the tasks could be less specific and more broadly defined by mission type orders, based on the commander's intent. He will have the ability to influence the battlespace not just within his specific package, but working with others in the battlespace against broader objectives.

Collaboration is greatly enhanced, and mutual support is driven to entirely new heights.

The F-35 pilot in the future becomes in some ways, an air battle manager who is really participating in a much more advanced offense, if you will, than did the aircrews of the legacy generation.

And going back to my comment about the convergence of planning and execution, and a warfighter's ability to see and sense in the battlespace … that's only relevant if you take advantage of it, and the F-35 certainly allows warfighters to take advantage of it.

You don't want to have a fifth-generation Air Force, shackled by a third-generation system of command and control.

The result would be that the United states and its allies will repeat the failures of the French facing the Germans in World War II where they had superior tanks with outmoded tactics and command structures, and with the predictable results.

The new aircraft simply do not function in the way the old do.

Indeed, one lesson of Dunkirk needs to be remembered when shaping an innovative military strategy for the decade ahead 21st century: new capabilities without new concepts of operations will lead to strategic failure.

A military force is truly blessed if the combat leaders at all levels in the chain of command have the proper weapons and also the wisdom to employ them against a reactive enemy. History of combat often shows that their not having understood or exploited that advantage can offset one army's engagement-winning weapons.

It is true that weaker forces through brilliant leadership can vanquish the more technology-capable and stronger army. Of course, as Napoleon said, he also wanted a general who was lucky, and all combat leaders know how the great unknown of luck can also determine the outcome.

And to add to the mix is another great thinker, Damon Runyon, who once quipped, "The race is not always to the swift nor the battle to the strong, but that's the way to bet."

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By all static order-of-battle accounting, the Miracle at Dunkirk should have never been necessary, because the British and French had a number of key elements that could have allowed them to win, including superior tanks to the attacking Germans and rough parity in the air.

But the French and British were defeated; the British Expeditionary Force was evacuated and lived to fight another day on to the eventual V-E Day. So betting on the French and the British was the wrong chip to play on the table of the battlefield.

The Germans Blitzkrieg generals down to the lower ranks were all "making their own luck" by exploiting the French and British approaches with the weapons they had.

The fall of France may have some interesting lessons on CONOPS and decision making against a reactive enemy.

And those lessons argue for shaping a transition from legacy air CONOPS to new distributed air operations CONOPS leveraging the F-22 and F-35.

The Germans were a quicker and smarter force that defeated the French and the British. Words echoing from history tell us that story and also can now bring an interesting lesson learned to the current debate on what is becoming known as "distributed air operations."

The shift from "legacy" air operations to distributed air operations is a significant operational and cultural shift. Characterizing the shift from fourth- to fifth-generation aircraft really does not capture the nature of the shift. The legacy aircraft operate in a strike formation, which is linear and runs from Wild Weasels back to the AWACS.

The F-22 and F-35 are part of distributed operational systems in which the decision makers are distributed and a honeycomb structure is created around which ISR, C2, strike, and decision-making can be distributed.

A new style of collaborative operations is shaped but takes away the ability of an adversary to simply eliminate assets like the AWACs and blind the fleet. Distributed operations is the cultural shift associated with the fifth-generation aircraft and investments in new weapons, remotely piloted aircraft, and the crafting of simultaneous rather than sequential operations.

Unfortunately, the debate about fifth-generation aircraft continues as if these are simply aircraft, not nodes driving significant cultural changes in operational capabilities.

In a fascinating book by Hugh Sebag-Montefiore on the courageous men in the British army who fought the Germans to allow the escape from Dunkirk, some of these lessons were highlighted. [ref] Hugh Sebag-Montefiore, Dunkirk: Fight to the Last Man (Cambridge, MA: Harvard University Press, 2008).[/ref]

In writing the book, the author provided significant insight into how the British and French lost to the Germans in the European forests and battlefields.

Comments taken from diaries of the survivors provide significant insight into lessons learned by not engaging in the cultural revolution that one's new technology provides.

The British and French had new equipment, which, if properly used and embedded into appropriate concepts of operations, might well have led to a different outcome at the beginning of the war.

And the first lesson here is simply to develop advanced equipment is not even half the job.

First and foremost: "The campaign showed that politicians must never, even in peacetime, deprive their armed forces of the equipment they need. Complacently assuming that the equipment can be manufactured once war is declared is demonstrably unwise."

A second lesson learned is that if you do not adapt your command structure to the technology, you will lose.

A theme that the author developed was that although the French had tanks, World War I generals who simply were not able to adapt to the tactics of armored warfare commanded them.

These difficulties were aggravated a hundred times by the style of French leadership.

The soldier who should have had most influence on the way in which the first counterattack was mounted was X Corps' commander General Grandsard, who had direct control over the divisions in the Sedan sector.

He was a Corps' commander General Grandsard, who had direct control over the divisions in the Sedan sector.

He was a general of the old school, who had not understood that French strategy must change in line with Guderian's (the German general in charge of the attack) new mobile tactics.

The author when discussing command style introduced a really key term very relevant to the shift from sequential to simultaneous air operations:

"The need to refer back to Guderian was, however, limited by the entrepreneurial culture he fostered:

German officers were expected to make up their own minds on how to achieve the objectives Guderian set and how to act in a crisis."

A third lesson was the importance of getting inside the enemy's OODA loop.

The French command structure was too slow to use information and to act on that information on a timely manner.

The German commanders were allowed significantly greater freedom of action and could act in minutes, whereas the French operated in terms of hours:

"The rapid German response to the threat posed by the counter-attack only serves to underline the slowness of the French . . .

In other words, the Germans began their own counter-attack within 10 minutes of identifying their target, whereas it had taken the French more than 12 hours to launch their troops into the attack."

A clear advantage of the new aircraft is their technical capability to get inside the enemy's OODA loop; but without change in how command structure works, no clear advantage can be realized.

A fourth lesson is the challenge of the enemy exploiting your weaknesses for which he has trained to exploit.

The German tankers confronting superior armor in the advanced French tanks were able to exploit weakness in those tanks because of intelligence about the weaknesses and training to exploit those weaknesses.

From the diary of a German survivor with regard to meeting the superior French tanks:

The tanks' silhouettes were getting larger, and I was scared. Never before had I seen such huge tanks. . . .

My company commander gave clear instructions over the radio describing which targets to aim at, and the enemy tanks were just 200 meters away before he gave the order to fire.

As if they had been hit be lightening, three of the enemy tanks halted, their hatches opened and their crews jump out. But some of the other tanks continued towards us, while some turned. . . .

Presenting their broadsides to us. On the . . . side of the tank there was an oil radiator behind some armor.

At this spot, even our (smaller Panzer 2) tanks' 20mm guns could penetrate the amour, and the French tanks went up in flames immediately after they were hit there. It was then that our good training made such a difference.

The Chinese study of the classic U.S. air battle and the perceived value of targeting USAF or USN large battle management systems such as AWACS reminds one of the need to get rid of the AWACS as a lead element in any offensive operations and sequential air battle and to move to distributed capabilities in simultaneous operations.

A fifth lesson is to develop logistical systems that allow one to exploit advantages of new technology.

The superior French tanks were refueled by trucks and dependent upon truck-provided fuel.

The Germans parked a "farm" of fuel containers to which the tanks came for refueling and could thus keep up the speed of the attack:

They (the key French tanks) could not even be expected in their first assembly area at Le Chesne, fifteen miles southwest of Sedan, until 6 am. It would then take around six hours to fill them with petrol, another two to move the five miles to their positions to the Mont Dieu forest, and two more hours to refuel them again. . . .

In contrast, the Germans overcame their refueling difficulties by transporting petrol to the front in cans. Once the cans were in the vicinity of the panzer divisions, all the tanks nearby could be refueled simultaneously on any terrain.

The French, on the other hand, had the petrol brought to the front in lorries, which, not being tracked, could not be used over rough ground. Even when the French armor was refueled on a road, the vehicles' petrol tanks had to be filled up consecutively rather than simultaneously which took much longer than the German method.

Keeping the old tanker approach in place while you add the new aircraft undercuts the ability of those aircraft to operate in a distributed approach.

By moving the tanker line back significantly, one can refuel almost like the German "fuel farm" and not expect the tankers like the French trucks to come to them.

Even the difference between simultaneous versus sequential attacks was underscored as crucial to the success of the Germans and the negative impact on French morale.

As one French officer commented, "Simultaneous attacks would have been very difficult for us. But attacking in waves in this manner means they lose their courage after seeing their burning comrades."

In short, the core lesson to learn is to buy appropriate numbers of new equipment and to adapt the operational culture, including the logistics systems, to allow the blue team to exploit their advantages.

Unless one wants outcomes such as the French and British experienced in the forests of Europe against the Germans, it is crucial to accelerate the shift to a new culture and capability built around distributed operations.

The old system of sequential air operations built around legacy aircraft, AWACS, and multiple assets needs to be replaced in a timely manner by a well-resourced distributed operations enterprise.

The current Deputy Commandant of Aviation, Lt. General Davis, when CG of 2nd MAW underscored how important he saw the F-35 as a tool in the hands of what he called the I-Pad generation pilots of a USMC shaping a new C2 approach:

I think it is going to be a fantastic blending of not only perspectives but also attitudes.

And what I really look forward to is not the old guys like me, but the very young guys who will fly this fantastic new capability.

The older generation may have a harder time unleashing the power and potential of the new gear – the new capabilities. We might say "why don't you do it this way" when that approach might be exactly the wrong thing to do from a capabilities standpoint.

My sense is the young guys will blend. We've already picked the first Prowler pilot to go be an F35 guy.

He's going to do great and he's going to add perspective and attitude to the tribe down at Eglin getting ready to fly the jet that's going to make a big impact on the F35 community.

I think it's going to be the new generation, the newbies that are in the training command right now that are getting ready to go fly the F35, who are going to unleash the capabilities of this jet.

They will say, "Hey, this is what the system will give me. Don't cap me; don't box me.

This is what this thing can do, this is how we can best employ the machine, its agility its sensors to support the guy on the ground, our MEU Commanders and our Combatant Commanders and this is what we should do with it to make it effective.

LAUNCHING THE SECOND HUNDRED YEARS OF THE RAF: SETTING IN MOTION UK F-35 OPERATIONS

06/16/2018

By Robbin Laird

In early May 2018, I visited RAF Marham where the RAF and the Royal Navy was getting ready to receive their F-35s which have been operating in the United States with the USMC and the US Air Force, the former at MCAS Beaufort Air Station and the later at Edwards Air Force Base.

Those jets arrived at RAF Marham on the anniversary of D-Day, June 6, 2018.

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I had a chance to talk with Group Captain "Cab" Townsend with whom I have I discussed airpower issues with over the past few years.

Group Captain Townsend most recently was the Deputy Lighting Force Commander and has come from that position to be the Station Commander at RAF Marham.

The second century of the RAF is being launched as a new carrier comes to the UK forces along with the F-35 as well as the P-8.

This new century is starting with the RAF in a lead position to drive change throughout the force, notably with flying a fifth generation aircraft off of the new carrier, which itself is driving significant change in the Royal Navy and within the overall force structure as well.

Group Captain Townsend underscored that the F-35 is performing very well and that the UK Lightning Force pilots and crews are working very effectively with the aircraft in the United States prior to its coming to the United Kingdom.

The base at RAF Marham is being rebuilt to operate the F-35 and to shape the transition from Tornado to F-35 as well.

But the challenge is not simply to put in place a 21st century infrastructure and to introduce a new aircraft, it is about shaping an integrated base operational system which enables the F-35 to become a multi-domain combat system driving innovation throughout the force.

Group Captain Townsend noted that he was travelling to France shortly and to view the Maginot Line alongside a group of RAF senior leaders.

The point of this was to focus on getting the right warfighting strategy to go with the right technology to deal with 21st century adversaries.

"The French built the Maginot Line and the Germans built a force which simply operated around that capability.

"The French had a concept of warfare in 1940 that did not meet the reality of the war they had to fight.

"In the past two decades our airpower has been dominant.

"But we do not want to introduce the F-35 as a replacement aircraft operating within the constraints of the legacy system.

"We need a multi-domain capability to ensure that our adversaries do not simply work around a classic airpower template.

"The challenge is to exploit the F-35 as a lever for broader multi-domain combat innovations.

"What we need to make sure is that people don't use multi-domain to go around our combat air advantage but rather to evolve our combat air advantage and make it a core part of our own cutting edge multi-domain capability.

"What we need to be thinking about is F-35 being able to work with any system within a multi-layered combat operation, whether it's airborne, maritime or land-based."

Few of the British military have ever seen an F-35.

The pilots and crew for the RAF and the Royal Navy are well regarded in the United States are at the head of their game.

But coming to the United Kingdom will start a process, not simply of operating the aircraft, but generating change across the combat force.

"While 617 Squadron will come to this Station as a formed unit, the rest of the Station is still not yet F-35 savvy.

"In addition to the physical set up of the base to support F-35, there is a broader conceptual development requirement as well.

"The whole station needs to understand why F-35 is different, so they can become part of that supporting team.

"They are key to F-35 2.0 becoming a reality."

This is especially true when one adds the question of the new carrier and the way the Brits are approaching the pairing with the carrier, a subject which I discussed at length with the Royal Navy when in Portsmouth, which I visited later in the same week in early May 2018.

As the RAF stands up the F-35 at its base at RAF Marham, Group Captain Townsend is clearly focused on F-35 2.0 – how best to leverage the coming of the new system to drive change across the RAF and the UK forces over all.

"We should not overly focus on 4th-5thair systems integration.

"That is too focused on airplanes.

"We need to focus on driving innovation across the combat force as we introduce the new air system."

And standing up the base at RAF Marham for the F-35 is part of a broader transformation of the RAF.

For example, with regard to building the systems to ensure security for the F-35 as an air system is a trigger to a broader set of considerations concerning 21stcentury security in a cyber conflict age.

"We need to just take a step back and understand what security means in the next generation of capabilities."

Preparing the station for the arrival of the F-35 is clearly a major challenge and one which Group Captain Townsend and his team is focused on while at the same time keeping two squadrons of Tornados operating at the base until they are retired in the next couple of years.

But the base is a Lilly pad to support the F-35s operating off of the carrier as the carrier is the mobile base for the UK Lightning Force within the overall air-enabled combat force.

And with the carrier training, there is a broader shift to learning how to support the F-35 as a deployable force.

"The communications and logistics support elements are key players in shaping our way ahead with a deployable F-35 force.

Defense.Info

"Part of the work the Lighting HQ is doing at the moment is making sure we understand how to ensure that we are truly, and rapidly deployable.

"It is going to take some time for us to be comfortable that we are capable of having a rapidly deployable F-35."

"Most of the chess pieces are on the board in terms of RAF transformation. We just need to start playing the game.

"With regard to the F-35, we have familiarity with the air system but we need to take it to the next stage where we are truly operationally capable in a multi-domain sense or are operating F-35 2.0."

AN UPDATE ON LEVERAGING THE F-35 IN SHAPING A WAY AHEAD: THE PERSPECTIVE OF AIR COMMODORE DAVID BRADSHAW

06/19/2018

By Robbin Laird

Air Commodore Bradshaw was appointed as Lighting Force Commander, Royal Air Force Marham in April 2017 and he succeeded Air Commodore now Air Vice-Marshal H. Smyth.

Earlier, I have had the chance to discuss the standing up of the F-35 within the RAF with Air Vice-Marshal Smyth and that conversation in 2016 highlighted the core significance of RAF and Royal Navy collaboration in standing up the F-35 as a carrier based aviation system.

"As an RAF pilot with significant maritime and carrier operational experience, we are shaping a collegiate and joint way ahead with the Royal Navy which brings the RAF domain knowledge of ways to operate in the extended battlespace with the coming of the F-35B to the new Queen Elizabeth class carrier.

Being radical, I think it would make sense to put a picture of the Queen Elizabeth class carrier on our RAF recruiting poster;the RAF and the RN are jointly delivering the UK's future Carrier Strike capability, and a all RAF Lightning pilots will spend some of their time at sea, as I did throughout my 16-year career in Joint Force Harrier – we are forging an integrated approach together, which is incredibly exciting."

This collaborative aspect was driven home during the May 1 2018 visit to RAF Marham by having a chance to talk with both the RAF Lighting Force Commander and his deputy, Captain Adam Clink, Royal Navy.

Air Commodore David Bradshaw is a fast jet pilot with almost 3000 hours flying experience of which 2000 hours were in Harrier GR7 / 9 as a front line pilot, Qualified Weapons Instructor and Display Pilot.

He has seen operational service over the Balkans and Iraq, the latter from both land and HMS Illustrious.

As a group captain, he commanded 904 Expeditionary Air Wing (EAW), Kandahar, followed by RAF Leeming and 135 EAW. Staff roles have included: Group Captain Lightning; Assistant Director (Integration) within the Directorate of Equipment Capability, Deep Target Attack; Chief-of-Staff Strategy within the Air Staff; and as the MoD member of the Prime Minister's Strategic Communications Team during the 2011 NATO intervention in Libya.

Air Commodore Bradshaw assumed command of the UK Lightning Force in spring 2017 and is responsible for generating an Initial Operational Capability in 2018 with an embarked operational capability from HMS Queen Elizabeth in 2020.

The discussion with Air Commodore Bradshaw focused on standing up the Lightning Force at RAF Marham but in such a way that the RAF and Royal Navy could work together to shape innovative ways to pursue combat innovation in the period ahead.

Much of the effort currently under way at RAF Marham is to set up the F-35 while continuing to operate two squadrons of Tornados, but the infrastructure is being put in place to reach beyond that point and to shape the kind of multi-domain combat learning essential for effective 21st century operations.

Recently, I visited RAAF Williamtown and talked with Air Commodore Kitchner about the RAAF rebuild of the base and the transition in the next couple of years from Hornets to F-35s. My conversation with Air Commodore Bradshaw started with his comparing the RAF approach to that of the RAAF.

Air Commodore Bradshaw: "The RAAF at Williamtown have carved out an entire part of their airfield and have created a hugely impressive F-35 enclave in which everything needed to support the air system is clustered.

"We have taken a different approach, in part because we are operating two squadrons of Tornados at RAF Marham through the transition period but mainly to make best use of existing infrastructure to keep costs as low as possible while still delivering a Main Operating Base fit for the future.

"You can see going around the base the build up of our new F-35 infrastructure but see the Tornados flying over head.

"We need to manage both and we are leveraging Tornado infrastructure in part as well as we draw down the Tornado Force.

"For example, we are reusing Tornado hardened aircraft shelters from which to operate F-35s in the future."

The Dambuster squadron arrived on June 6, 2017 and thereby began its operational life at RAF Marham. As Air Commodore Bradshaw noted: "We are building out a standard squadron infrastructure that you expect but one modernized to exploit the best of F-35 and meet the security requirements as well."

They are also building what they call "Freedom of Action" facilities to ensure UK sovereignty over their operational aircraft. Such a facility is the stealth finishing facility to ensure maximum stealth performance of the aircraft in operational conditions.

But the UK is building out from outset an approach to leverage the F-35 as a driver of combat innovation, something I like to call F-35 2.0.

This is how Air Commodore Bradshaw put it. "The F-35 Integrated Training Center is the jewel in the crown of the F-35 effort at RAF Marham.

"We are working from the start to leverage the synthetic training environment enabled by the ITC, to provide a foundational capability that can empower our broader effort.

"We call this broader effort the Defence Operational Training Capability (Air) Core System.

"This approach will be to link the various key warfighting elements together to innovate and train for the evolving 21st century battlespace."

"With the DOTC system, we are looking to work F-35 with Typhoon, with AWACs, with Type 45 Air Warfare Destroyer and our JTACs, to shape a multi-domain warfare approach.

Defense.Info

"We are building the ITC as a key element not just to empower our use of the F-35 but to leverage its information and C2 capabilities to drive change throughout the force."

The UK has built an all-F-35 fast jet carrier. This makes it the only one in the world.

Although the US carrier community has certainly been a key partner in helping the UK stand up its new carriers, a point made often in discussions with the RAF and the Royal Navy, they are clearly going down a path of doing something a bit different.

This is how Air Commodore Bradshaw put it:

"We have designed the Lightning Force from the very beginning to be joint. My deputy is a Royal Naval officer. The entire Lightning Force is a mix of light and dark blue.

"From the outset, we have a different view to many other Air and Naval forces about how we will use our F-35s.

"Taking our unique joint approach either to a deployed operating location or onto the Queen Elizabeth Class carrier, we need to exploit the opportunity to do it the right way for the UK and not necessarily slavishly follow another model that might exist elsewhere in the world."

Obviously, with the political changes underway in Europe and elsewhere, the UK is looking to shape partnerships which protect its interests and provide strategic opportunities to shape its capabilities going forward.

And flying a force of F-35s and Typhoons provides them with an interesting opportunity to work with Europe going forward.

"With the F-35, we will have unique opportunities to work with our Northern European allies, including the Norwegian, Danish and Dutch Air Forces as well as out USAF neighbors at RAF Lakenheath.

"And with the Typhoon, we have good opportunities to work with the Germans, Spanish and Italians.

"And with the Italians flying a mixed force of F-35A, F-35B and Eurofighter, we have great opportunities to work together as well."

In short, shaping a new operating base at RAF Marham and working with the two Queen Elizabeth carriers provides a significant opportunity for shaping air combat innovation, including in the sustainment area.

LEVERAGING THE F-35 AS PART OF DANISH DEFENSE TRANSFORMATION: THE PERSPECTIVE OF THE NEW CHIEF OF STAFF OF THE ROYAL DANISH AIR FORCE

I first met Major General Anders Rex at the Danish Airpower Conference in 2015. There he provided a significant presentation on the key focus within the Danish Air Force on how to work effectively within coalitions.

Being a good coalition partner takes practice.

We have a core group in the Danish Air Force, which has done several coalition operations, and when we are not doing that we participate in multinational exercises.

This is a core competence that the Danish Air Force has developed, and as we do so we work to find the gold in each coalition operation…..

A key focus of effort among the Allied air forces is clearly upon how to make the most of a coalition and to work more effectively together.

He coined the term "coalitionability" and set a goal for allied and partner Air Forces ways to shape higher levels of "coalitionability."

https://sldinfo.com/2015/04/coalition-operations-are-in-the-danish-dna-finding-the-gold-in-coalitions/

He has become COS of the Royal Danish Air Force as they prepare for the introduction of the F-35 and as core allies in the region are doing so as well, notably, the UK (onboard the Queen Elizabeth), the Dutch and the Norwegians. The coalition opportunity clearly is right in front of these partners, and in the UK case, the UK has not flown the same aircraft with the Nordic Air Forces for a long time indeed.

At the earlier seminar, Major General Anders noted that the USAF being as large as it was had less opportunity to work "coalitionability."

Of course, the USAF is a much larger force than that of Denmark's.

But Major General Rex underscored that "it's so big that if you look at the rate of coalition training opportunities per airman I'm sure it's a lot lower than an air force like the Danish one."

For the operations which we undertake "It's really important to know and understand how to make the most out of a coalition, how to dig out the gold."

In an interview I did last year with then head of the USAF at RAF Lakenheath, Col. and now General Novotny underscored how important he saw the coalition aspect of the standup of the F-35 in the region, notably the UK and the US based at Marham and Lakenheath, respectively:

"I see there is great potential for two countries to develop in concert, side-by-side, and to set, set the model for joint operations.

"As we get this right, we can bring in the Danes, the Norwegians and Dutch who are close in geography and the Israelis and Italians as well to shape the evolving joint operational culture and approach.

"Before you know it, you've got eight countries flying this airplane seamlessly integrated because of the work that Lakenheath and Marham are doing in the 20 nautical miles radius of the two bases."

https://sldinfo.com/2017/04/raf-lakenheath-prepares-for-the-future-usaf-f-35as-and-f-15s-combine-with-raf-capabilities-to-provide-a-21st-century-deterrent-force/

As important as this might be for the USAF overall, for the Danes and the Nordics it is the coin of the realm.

To be blunt: to leverage every aspect out of the F-35 as a common coalition aircraft will be essential to defense in the Nordic region and the transformation of their forces to deal with the direct Russian threat.

This means leveraging common pilot training, leveraging pilots across the enterprise in case of shortages within a national air force, common logistics stores in the region, common maintenance regimes, common data sharing, and shared combat learning.

This clearly is a work in progress and what one might call F-35 2.0.

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F-35 1.0 is getting the plane and operating it in squadrons; F-35 2.0 is leveraging the aircraft as part of an overall transformation process.

In my discussion during a visit to Copenhagen in October 2017, I had a chance to talk again with ERA (his call sign).

And he was clearly focusing on F-35 2.0, probably in part because the new Danish defense agreement in process if clearly focused on countering the Russian A2/AD strategy in the region.

"When I talk with F-35 pilots, the same message is drilled into me – this is not a replacement aircraft; this is not like any aircraft you have flown before.

"The aircraft enables our air combat forces to play a whole new ballgame.

"And from my discussions with Australians, the Norwegians, the Dutch and the Brits, it is clear that the common drive is to shape a fifth generation combat force, not simply fly the current 256 F-35s as cool, new jets."

He clearly had in mind working on F-35 2.0 to trigger a broader transformation.

And this makes sense, because in large part the F-35 is not simply a fighter which you define but what it does by itself organically, but, rather by what it can trigger in the overall combat fleet, whether lethal or non-lethal payloads.

"We need to focus on the management of big data generated by the F-35 and other assets that will come into the force.

"How do we do the right kind of command and control within a rich information battlespace?

"We need to build self-learning systems as well.

"The F-35 is a revolutionary man-machine system and sets in motion not only the challenge of new approaches to working information and C2, but new approaches to combat learning.

"How do we get there?

"That is what generating a fifth generation combat force is all about."

It is clear that the F-35 is part of a significant culture change.

"We need to be open to significant culture change.

"Many Danish F-35 pilots will be converted from 16s and will learn the new ways of operating.

"At the same time, s new generation of pilots will have F-35 as their first combat aircraft and have no operational experience on legacy aircraft and are open to radical changes in how the jet can be used and in working with the other combat assets.

"We need to facilitate and channel such open ended learning as well as we build out or force transformation with those pilots with F-16 experience and the new F-35 pilots as well.

"Part of that is captured by the notion of integrating legacy aircraft with the F-35, but that is too narrow of a concept.

"We are really looking at shaping a different kind of force, F-35-enabled but which incorporates the old which remains valuable and adds new systems which can expand the combat effectiveness of the evolving fifth generation force."

"How do we make sure that we don't settle with the reality that the F-35 is better than anything out there and it makes the fourth gen better?

"That will not get us to a fifth generation combat force.

"We need to leverage it to drive continuous transformation to ensure that we have the kind of capabilities which our demanding strategic environment requires."

MEETING THE CHALLENGE OF INTEGRATED HIGH INTENSITY OPERATIONS: A NORWEGIAN PERSPECTIVE

2017-02-24

By Robbin Laird

During the Norwegian Airpower Conference held at Trondheim in early February 2017, I had a chance to discuss with the new Chief the Royal Norwegian Air Force, Major General Tonje Skinnarland, and Brigadier General Jan Ove Rygg, chief of the National Air Operations Center (NAOC) their perspectives on the way ahead.

https://sldinfo.com/new-head-of-the-norwegian-air-force-in-a-period-of-significant-airpower-transition/

The Chief of the Royal Norwegian Air Force set the tone for much of the discussion during the Conference by focusing on the Norwegian Air Force in transition and the challenge of shaping integrated defense capabilities for the defense of Norway.

Norway being a small country with a large geography and a large neighbor on its border obviously needed to shape a defense capability highly interactive with its allies to ensure deterrence in depth for Norwegian defense

The perspective of the Chief of the Royal Norwegian Air Force on the F-35 was that this was not at all a replacement aircraft, but a strategic asset when properly integrated with the national defense force and NATO forces.

The Air Force is in the throes of significant modernization with the addition of the F-35, the P-8 as well as new helicopters, and the overall challenge was to ensure integration of these platforms into a joint force able to operate in the integrated battlespace.

And she made it very clear that it was preparation for and training to ensure effective capabilities for the high-end fight, which was the core focus of attention.

She highlighted the need to reshape concepts of operations for Norwegian defense and to work across the Norwegian defense structure for integrated C2 which was crucial.

She also highlighted that with the F-35 distributed operations were possible so in reforming C2 part of the challenge was what is called mission command, namely, authorizing pilots for missions, rather than providing for overly centralized tactical operational control.

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I asked both senior Air Force officers the same question to start the conversation, namely, the Air Force is in a period of significant transition, how do they view the challenges and the opportunities?

Major General Skinnarland: "We are clearly modernizing our platforms but we need to transform our force, our culture and our processes as well.

"The strategic decisions made in the long-term investment will make us, even though small, one of the most modern air forces in the world in some years to come.

https://forsvaret.no/en/newsroom/news-stories/new-long-term-plan-for-the-armed-forces

https://www.regjeringen.no/en/topics/defence/ltp/ny-langtidsplan-for-forsvarssektoren/langtidsplanen-for-forsvarssektoren-er-vedtatt/id2520659/

"At the same time, the security situation is challenging. After the annexation of Crimea and the buildup of Russian capabilities over the last years has made us understand that we have need to revitalize the concept of actually defending Norway in high intensity operations.

"It is not just about adding new platforms; it is about shaping joint capabilities for the defense of Norway in a high intensity operational setting.

"To achieve integrated defense and joint operations will not be easy and certainly will not happen simply by adding new platforms.

"There are a lot of different tasks to be done ranging from getting all the spare parts, logistics, the training, and, of course, shaping the national defense plan.

"As we get all these new systems, which will make us even more capable of handling the current situation and current threats together with other allies and partners, there is another challenge."

How best to be able to manage the process of change?

"A key challenge will be on the human capital side.

"How do we best train and task our people in shaping our new integrated force? For it will depend on them to actually bring such a force into being.

"When it comes to opportunities in the new systems and particularly in the F-35, the conference has alluded a lot to this, the capability in the aircraft itself with weapons technology and networking will come.

"But how do we make sure that we are able to utilize these technologies fully and effectively?

"We must shape the correct competencies, the correct concepts of operations, and develop and execute effective plans for joint operations as well."

Brigadier General Jan Ove Rygg then answered the same question from his operational responsibilities.

"If I address the same question, but from my perspective, the challenge is to get the joint processes in Norway to the point where we can do targeting efficiently.

"We need to build an effective national command and control capability which seamlessly works with core allies who are crucial to defense operations in the High North.

"What makes this particularly challenging is what we are taking about is national integration and C2 for national defense ground, sea and air operations, which can operate with core allies in extended defense operations"

Question: Clearly, with core allies in the region operating similar platforms, notably F-35 and P-8, there are significant opportunities for interoperability built in, but obviously these potentials need to become realities.

How best to ensure that happens?

Major General Skinnarland: "With the UK, the US, the Danes and the Dutch operating the same combat aircraft, there are clear opportunities to shape new common operational capabilities.

"Also crucial is to shape a strong European F-35 sustainment base to ensure that we get the kind of sortie generation capabilities inherent in the aircraft, but you need the right kind of logistical support to achieve the outcomes you want.

"The P-8s operating from the UK, Iceland, and Norway can shape a maritime domain awareness data capability which can inform our forces effectively as well but again, this requires work to share the data and to shape common concepts of operations.

"A key will be to exercise often and effectively together.

"To shape effective concepts of operations will require bringing the new equipment, and the people together to share experience and to shape a common way ahead.

"In this sense, we see Trident Juncture 2018 as especially important in shaping effective national C2 and working towards more integrated operations with allies coming to Norway for the exercise.

"We should plug and play in terms of our new capabilities; but that will not happen by itself, by simply adding new equipment.

"It will be hard work.

https://forsvaret.no/en/exercise-and-operations/exercises/nato-exercise-2018

"We have regular exercises in Norway like the Arctic Challenge Exercise, which is an exercise building on the weekly trilateral fighter training between Finland, Sweden, and Norway.

"In May/June 2017 this invitex will see more than one hundred fighter aircraft from 8 nations, including the UK and US, participating in high quality training in the Nordic countries.

"You also have other national exercises which are important in shaping our concepts of operations.

"We need to enhance engagement with core NATO allies, such as expanding our working relationship with allied airpower operating in Norway during exercises.

"We would love to see a UK F-35B squadron and a USAF F-35A deploy to Norway during an exercise and operate in the northern part of Norway under Norwegian command and control to see how we can get them to work together.

"They might fly either from home bases with air-to-air tanker or stage from Norway, and work on how we effectively can integrate those squadrons during joint operations."

Defense.Info

Brigadier General Jan Ove Rygg: "The C2 issue is really a strategic one.

"We are very good at the tactical level in operating in a joint context with our C2; we need to be as capable at the strategic level.

"With the fifth generation force, you have capabilities to off-board weapons and to direct fire from sea or land as well as air.

"When you try to do targeting and actually engage targets with different resources it is a challenge.

"How do we shape a C2 structure, which can take advantage of this capability?

THE WAY AHEAD FOR NORWEGIAN AIRPOWER: THE PERSPECTIVE OF THE VICE CHIEF OF THE NORWEGIAN AIR FORCE

During my visit to Norway in April 2018, I had a chance to meet with and discuss the Norwegian way ahead on airpower with Brigadier General Aage Longva, Vice Chief of the Norwegian Air Force.

We met at his office at Rygge Air Station south of Oslo.

The BG has lived through and been a key participant in the standup and evolution of the F-16 as the backbone Norwegian fighter. He began his training on F-16 at Sheppard Air Force base in Texas and has been part of the migration of Norwegian F-16s from being an air-to-air platform to becoming a multi-mission platform.

He noted that at the time of the Balkan operations by NATO, the Norwegian Air Force was able to participate but only in an air-to-air role.

With the acquisition of new targeting pods and weapons, the Norwegian F-16s evolved into an air-to-ground fighter as well so that when the initial NATO operations in Libya began, the Norwegians were there from the beginning.

He also noted that the Norwegian commitment to F-16 modernization led their aircraft to get levels of modernization even more advanced than the USAF was flying at the time of the Libyan operation.

The Cold War experience has been foundational for the Royal Norwegian Air Force. After its official founding during World War II, the Norwegians in the Cold War were at the cutting edge of dealing with the Soviet threat operating from Kola and moving out into the Greenland-Iceland-UK gap.

After the end of the Cold War, the skill sets of NATO were redirected and several of those were attentuated.

During my visit last year to Norway, my interview with the Chief of the Norwegian Navy underscored however that Norway was more focused than many in NATO on the remaining threats which Russia could generate and kept capabilities alive to deal with these threats.

For example, the Norwegians did NOT redirect their P-3s towards overland missions; but kept them focused on ASW.

In my interview with the Chief of the Norwegian Navy, he underscored the importance of this focus:

The Rear Admiral noted that the Norwegians have never stopped flying their MPAs, in this case their P-3s, over their areas of interest in the North. They did not send their P-3s to the Middle East, nor did they retire their MPAs as did other P-3 users in NATO.

"We have kept this competence not only alive but focused on the key areas of interest to us in the region."

The P-3s have been "critical to understand the underwater domain for our forces.

"We are buying the P-8 because of its capability and the priority to focus upon this capability."

https://sldinfo.com/2017/02/the-norwegian-navy-and-shaping-air-sea-integration-for-norwegian-defense/

For the Norwegians, and this point was clearly driven home in the interview with Brigadier General Longva, there is a clear sense of urgency to enhance Norwegian defense capability and its ability to work effectively with allies in the post-Crimea political-military environment.

In this sense, not only is the F-35 not simply a replacement aircraft for the F-16, it is a strategic asset around which Norway will build out core capabilities to deal with the evolving challenges in the region.

In building out the new base for the F-35 at Ørland Air Force Station, where he was the Wing Commander prior to coming to his current position, the Norwegians are building a base that is built to operate during crises and conflict.

They are focusing on base protection, rapid repair capabilities, hardening of shelters and other means to ensure that the base can operate in difficult conditions.

And with the revival of the total defense concept, Norway is looking as well at ways to operate in conditions where leveraging capabilities to operate in other manners is possible as well.

The standup of the F-35 is different from the F-16 in an important way:

"We are standing up the aircraft at the same time as the USAF. We are training in a squadron made up of Norwegian, Italian and USAF pilots.

"We are on the ground floor working with the USAF to shape the concepts of operations for the aircraft with the USAF.

"And the USAF has been very open in working with us as well."

Operating in Norwegian conditions is challenging; and the potential threat is there every day generated from the Kola Peninsula.

"It is not like operating from Luke; when we fly, we see and can engage targets on a daily basis."

His perspective was very reminiscent of what the former Chief of the Israeli Air Force had to say about flying his F-35 in his region:

Major General Eshel was then quoted as underscoring a unique quality of what the aircraft provides the IDF.

"When you take off in this plane from Nevatim [base], you can't believe it.

"At 5,000 feet, the whole Middle East is there for you in the cockpit.

"You see things, its inconceivable.

Defense.Info

"American pilots who visit us haven't seen anything like it, because they fly over Arizona or Florida, and here they suddenly see the [entire] Middle East as a combat zone – the threats, the different players, at both close range and long range.

"Only then do you grasp the enormous potential of this machine.

"We're already seeing it with our eyes"

https://sldinfo.com/2018/01/the-israeli-air-force-declares-ioc-for-its-first-f-35-squadron-writing-the-next-chapter-in-airpower-history/

The Norwegian version of this challenge is clearly the bastion posed by the Russians on the Norwegian border.

The Russians have modernized and are modernizing their air and sea capabilities as well as enhancing their ground missile defense and attack capabilities on the Northern borders of Norway.

How to deal with the bastion threat and to have a credible response?

"One of the rationales for acquiring F-35 is that we are not able to use the F-16 against the Bastion threat in ways we need to.

"The F-35 will allow us to do so."

The F-35 is a key element in building out that response and working with allies as well.

Notably, the UK is now flying the same aircraft as Norway, the P-8 and F-35, and can work with other allies in the region and shape a foundational F-35 enterprise as part of the driver of change and innovation necessary to provide a credible crisis response capability in the region.

Brigadier General Longva focused on the IOC process for the F-35, which was targeting having a QRA aircraft able to be supported and to operate in a sovereign manner.

There are clear challenges to standing up the first F-35 squadron in Norway, but they are doing so as the Royal Air Force and Navy do so in the UK and the US will be doing at RAF Lakenheath.

And from the BG's perspective, this is a work in progress but when in which the allies are working through similar problems at the same time and are providing cross-learning in the process of standing up the new air system.

"We are not that far behind the USAF; we are advanced to the point where we can make our own mistakes to learn from as we standup the aircraft."

He emphasized that the strategic goal with regard to the F-35s operating in the region is to have as much of a common approach as possible.

For it is through a common approach that costs are reduced and capability enhanced.

The sustainment side of this is broadly challenging as the US has built the aircraft with a global supply chain and working with a number of industries in Europe.

And with a shift from a traditional approach towards a more global one, working through the details will be both important and difficult.

But at the end of the day, Norway's strategic location and the threat it is dealing with is central to the US and NATO, and how the Norwegians stand up their F-35 squadrons and build out from them to shape other capabilities will clearly be important and not just to Norway.

An interesting piece of this is the development and acquisition of the Norwegian Joint Strike Missile, which will be deployed on air, ground, and naval systems and can provide a significant missile capability, which can be leveraged by the F-35 as the sensor-shooter lead.

And because the missile is compatible from the ground up with other F-35As, partners in the global enterprise, notably Japan and Australia are joining into the opportunity to work with Norway on the Joint Strike Missile as well.

In short, Norway is working defense modernization in a way symmetrical to deal with the core threats facing it. And in so doing, will generate lessons learned for other allies in Europe and beyond.

STANDING UP THE F-35 AT ØRLAND AIRBASE: PREPARING IOC AND WORKING TOWARDS F-35 2.0

During my visit to Ørland Airbase,we discussed the coming of the jet and working a way ahead for the combat force in the defense of Norway.

As the plus up the aircraft at Ørland and prepare for IOC, they have the opportunity to fly and work with the navy as they operate over Norwegian sea and land space.

With the deployment of the NASAM ground based system, they can work with the Army and with the coming of the Joint Strike Missile there is an opportunity to share a joint sensor-shooter working relationship.

Major Morten Hanche: "We are working from the outset on working together and creating multiple sensors and multiple shooters as we leverage the F-35 in Norway.

"For instance, we've been out practicing with Norwegian frigates and corvettes and providing target data for the NSM (Naval Strike Missile), which is the younger brother of JSM (Joint Strike Missile).

"It is not as complex to do this as some think. We can leverage the aircraft as flying sensor system to work various ways to enable shooters.

"We can practice and work this with our joint force partners as we fly the F-35 in the course of preparing IOC as well.

"And the flexibility which we can achieve leveraging the F-35 will be significant as part of shaping a way ahead.

"The F-35 can play a variety of roles.

"It could be a sensor for an external system or could be the shooter.

"Or both.

"Or maybe neither; it might simply provide the jamming capability to enhance the survivability of the missiles we are using to engage the adversary."

The interesting thing about the stand up of the F-35 in Norway is clearly it is happening in a strategic location.

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And because the Norwegians are focusing a significant part of their indigenous defense industrial capabilities on the missile side of the house, they are standing up the F-35 as they evolve the missile capabilities for the joint force.

And these capabilities can provide reach out with other allies, such as Australia and Japan who are clearly interested in the Joint Strike Missile.

The joint strike missile will be able to be fired from the air, ground or sea.

And because they are acquiring a combat aircraft, which can operate in a very flexible sensor-shooter, working relationship with the air, ground and sea force, signifcant joint force innovation can be unlocked as well.

Unlocking this kind of joint force integration is what I am calling F-35 2.0, or how to leverage the aircraft as part of a broader force transformation effort and design process.

F-35 1.0 is getting the plane and operating it in squadrons; F-35 2.0 is leveraging the aircraft as part of an overall transformation process.

And such an approach will be accelerated if the aperture of the acquisition side of the house is opened, in order to tap into significant innovations as well with regard to the development of strike systems as well.

This is a work in progress, but one inherent in leveraging the F-35 and the F-35 as a global enterprise.

For example, the USMC is a regular visitor to Norway and will operate F-35Bs from the sea base or perhaps operate ashore within the Norwegian basing structure in a crisis. The UK carrier will provide a mobile base from which to support operations in defense of Northern Europe as well.

It is clear that sharing of data across a deployed allied with the Norwegian F-35 forces can provide significant reach to support a diverse strike enterprise to provide for extended deterrence of the Nordic region as well.

Working through security arrangements to share data across the UK, US and Norwegian F-35 enterprise, as well as Denmark and the Netherlands, can provide a very significant foundation to provide for extended reach for an offensive-defensive enterprise in the defense of NATO's Northern region.

And it all starts with standing up the F-35 at Ørland Airbase and learning from the outset how to operate the aircraft as an enabler of a 21stcentury approach to deterrence in depth.

NAVIGATING THE WAY AHEAD FOR A FIFTH GENERATION-ENABLED COMBAT FORCE: THE PERSPECTIVE OF MAJ. GENERAL MORTEN KLEVER

The Royal Norwegian Air Force is transitioning from an F-16 to an all F-35 air combat force as part of both Air Force modernization and overall defense transformation for the Norwegian forces.

The coming of the F-35 and the interaction between the standup of the F-35 and shaping a way ahead for the RNoAF was laid out and discussed.

In my conversation with the Norwegian head of the F-35 program, Major General Morten Klever, we had a chance to discuss key elements of shaping a way ahead, which would optimize the contributions of the air system to the transformation process.

We started with a base line reality as seen from Norway.

Major General Klever: “The plane is performing very well.

"The capabilities are superb.

"The feedback we have from the pilots is excellent and we are clearly looking forward to the impact of the aircraft or more accurately, the air system can have on RNoAF, and more generally upon the Norwegian armed forces.”

He underscored that it would take time as well because moving beyond legacy thinking and legacy cultures is part of the transition challenge.

Yet “pilots are already starting to work with the Navy and the Army and to explore ways they might work the F-35 with the ground and maritime forces.”

As the standup of the air system is put in place, it is important to generate best practices to ensure that the innovations, which the air system might allow, are realized.

Or put another way, it is important to lay a foundation that goes in the right direction rather than constraining the air system with regard to antiquated practices or legacy thinking that will reduce the impact, which the new air system can have on the combat force.

One key aspect of change, which is crucial for the F-35 weapons system itself, is expanding the ability to rapidly add capabilities, based on emerging threats.

Major General Klever: “We need to find ways to speed up the software development and insertion processes and to allow the warfighting experience of the entire range of partners to shape that software development process as appropriate.”

Another key aspect of change is to ensure that an enterprise approach can be instituted from the performance of the software on the aircraft to its replication in the simulators.

This is especially important as the training dimension for fifth generation enabled combat will require expanded training spaces.

And even though Norway has significant air space in which to operate, there is little interest in letting potential adversaries learn how coalition F-35s will work together to empower and extend defensive and offensive force.

Virtual integration of aircraft and simulators across the enterprise and between partners will enhance daily training, and turn out to be a force multiplier in operations.

Major General Klever: “This means that we will still need to train in the United States and elsewhere, but even more importantly we will need to find ways to connect our air forces across key coalition partners to shape extended live virtual constructive training as well.”

And the infrastructure supporting the F-35 as a global air system needs to be shaped effectively.

This means that a global sustainment approach, grounded in an effective regional support structure, is established so that fifth generation aircraft can fly to the crisis rather than having to move large amounts of equipment prior to setting up and operating.

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Major General Klever underlined the central importance of such an effort and expressed his concerns with the way ahead.

“The USAF is taking over the global sustainment approach as early as 2019.

"And currently, the USAF is continuing its legacy approach, , where the USAF transports its support equipment and parts to the fight, rather than relying on a more agile support structure.

"And even though they have an excellent PBL in the C-17 program, generally they do not do performance based logistics, and that is what is needed for this program.

"The USAF is currently too committed to a strategy of organic ownership of parts.”

Major General Klever argued that the partners did not sign up for such an approach.

Under the leadership of JPO, all partners and services have designed a global sustainment concept to be implemented and from this standpoint the USAF could learn from partners, notably UK and the RAF and their approach to aircraft availability.

My visit to the UK the week after this interview highlighted how significantly the RAF is innovating with regard to Typhoon support and how those innovations are clearly relevant to the F-35 2.0 approach to sustainment.

And during that visit, the RAF maintenance community highlighted a visit of then then head of the Joint Program Office, Lt. General Bogden, who kept focusing on the legacy question of trust: how could I know the part was there when I needed it.”

During a visit to RAF Coningsby a few years ago, he repeatedly asked that question to the RAF maintainers who all had the same answer: that is the wrong question. We will ensure that the aircraft going into combat has parts priority and we have set up a system to ensure that that happens.

And for Major General Klever, the key is getting the right support to the right aircraft at the right time, at the right place.

That will NOT happen unless there is a global sustainment approach with an established management structure supported by agreed business rules to ensure priorities are supporting the needs of the warfighter.

Major General Klever underscored that Norway has had an excellent experience with Pratt and Whitney with regard to a PBL contract on F-16 engines and P&W is currently standing up a support structure in Norway for the F-35.

He believed that the some US services could learn from the partners on this issue; and more to the point, this is what the partners and services signed up to; not a legacy maintenance and support structure for their F-35s.

And with allies flying as many F-35s as the US in the next few years, clearly the U.S. needs to pay attention to this approach.

And beyond that, if the F-35 will enable the kind of military transformation necessary to turn adversary anti-access and aerial-denial bastions into Maginot Lines, an ability to provide combat sustainment at the point of critical interest is the key.

The image put by one analyst in a discussion about the shift highlighted that when United Airlines flies to Australia it does not have a cargo plane carrying parts to ensure that it can fly back.

Major General Klever concluded: “How often have you missed a flight because of unavailability of aircraft due to maintenance?

"The commercial world has taught us a significant lesson about the way ahead.

"In the end, this boils down to affordability, and subsequently increased operational effect.”

MASTERING THE RESHAPING OF THE JOINT FORCE CAPABILITY PUZZLE: THE PERSPECTIVE OF AIR MARSHAL DAVIES OF THE ROYAL AUSTRALIAN AIR FORCE

2016-04-01 By Robbin Laird

During my March 2016 visit to Australia to attend the Airpower Conference on Multi-Domain Integration and the Williams Foundation Seminar on New Approaches to Air-Land Integration, I had a chance to meet with Air Marshal Davies throughout those sessions and then to meet at his office on March 21, 2016 to do a proper interview.

When we met at his office on March 21, the theme of the intersection between the RAAF and joint innovation was a key focus of the discussion. But what Davies argued was that this is a very dynamic and interactive and open-ended process.

“It is like a jig saw puzzle.

You have these really nice pieces to the puzzle sitting in the container, but until you begin to look at the picture your trying to create through the overall puzzle, you do not know which bit goes where.”

With regard to F-35 as an example, Davies argued the following:

“I think Joint Strike Fighter on its own, a fifth-generation air combat aircraft, could be regarded as just an air combat aircraft.

“If you want to shoot the bad guy down, if you want to defend the battle space for a land maneuver or for a maritime strike, that’s fine.

“But what we’re beginning to appreciate now is that it’s not just an air combat asset it is also an ISR node.

“If you were to then put two more pieces of your puzzle down and go, “Well that’s starting to form a bit of a picture here,” in the center of your puzzle. ”

“What else could I do if it was truly an ISR node?

“How do I manage that asset differently than if it was just going to shoot down another fighter?”

Although the puzzle analogy suggested an overall approach what he really was focusing on the interaction between the evolving bigger picture, and relooking at what each piece of the puzzle might be able to do in fitting into a new puzzle big picture so to speak.

“How would you operate the air warfare destroyer differently as you add a Wedgetail, a P-8, a Triton or an F-35 to its operational environment?

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And conversely, how could the changes in how the destroyer would operate as you evolve systems on it, affect how you operate or modernize the other pieces of the evolving puzzle?"

Plan Jericho is about opening the aperture on thinking both about the pieces and the various puzzle pictures, which can be created.

Davis saw two key drivers for change as well in terms of the younger members of the RAAF would rethink how the RAAF could integrate more effectively and industry partners helping inform the RAAF about the art of the possible.

This clearly affects thinking about platforms.

The shift from a platform centric world is not about platforms not mattering; they do; but what is crucial is now evaluating how a new platform contributes in a multi-mission, or multi-tasking and specialized effect for the evolving force.

The government as well as the services working more effectively to shape how their particular new platform contributes to both the service's core missions as well as the effects desired for the extended battlespace.

Air Marshal Davies argued that when buying platforms going forward, a key consideration beyond their basic functional contribution or task to determining how "integratable" those platforms might be going forward.

"I know it's a little unfair, but we would probably rethink the combat system on Tiger if we were to buy an armed reconnaissance helicopter tomorrow. Having flown the airplane, I don't have any issue with the airplane that is Tiger. But how do you integrate it? At the moment it is less than ideal in terms of integration."

He argued that it was crucial to have a realistic and broad view with regard to force design in mind as one thinks about adding platforms, and a large portion of that force design needs to revolve around "integratability."

"For example, we are having a long conversation inside Air Force around how would you use a KC-30 better than we currently do?

Well you would integrate it.

So what does that mean for tanker?

It means that we spend a long time in the airspace providing fuel to aircraft. What's it doing in between the refuels?

It's flying racetracks or patterns or getting to the next place that gas is needed airborne. What's it doing while it's doing that? Why can't it collect some form of ISR data to be turned to knowledge?

The legacy perspective would be to say: "No it's an in mid-air refueler and a transport aircraft."

The new perspective is to think about how the KC-30 can become a communications node for platforms and systems other than fighters. Perhaps you're able to relay information to soldiers on the ground, or with regard to the new amphibious task force, perhaps you might, from a couple hundred miles off the coast, be able to relay information during the time the tanker is on station.

That makes a lot of sense to me, and a lot of it can happen without the crew having to do one extra bit of work other than provide the node."

Clearly, as the RAAF brings the F-35 into service it views its value as an asset which it wants to wring as much "integrability" as they can from the "flying combat system."

"I view the F-35 as a key catalyst of change not just for the Air Force but the entire ADF.

But to get there, we need to focus on our ability to work with the ADF and remain connected.

We can explore; we can provide options.

We can provide core functions for the evolution of the ADF, but we have to make sure that we are able to stay connected, and paced properly."

And the regional side of the ADF operations was increasingly critical as well for the RAAF.

"This is not just about an Australia/US or just about an Australia/UK connected effort.

This is about being able to work with partners in the region such as we are doing with Fiji on HADR. We need to be able to still do all of those pieces."

In short, one needed to focus upon "integrability" as the platforms interactively evolved and the missions adapted to threats and technologies.

THE WAY AHEAD FOR THE RAAF IN AN INTEGRATED DEFENSE FORCE: THE PERSPECTIVE OF THE NEW AIR COMMANDER AUSTRALIA, AIR VICE-MARSHAL ZED ROBERTON

2017-08-21 By Robbin Laird

During the visit to Australia in August 2017, I had a chance to talk with the newly appointed Air Commander Australia, Air Vice-Marshal Zed Roberton.

I have had the chance to talk with him before so this meeting was more in the mode of continuing the conversation and shifting to the focus of his new responsibilities.

And that is where we started the interview.

Question: You have gone from being the head of the fighters in the RAAF (Air Combat Group) to now dealing with the entire sweep of the RAAF (Air Commander Australia).

What is the major difference for you as you shift positions?

Air Vice-Marshal Roberton: I am going from making a contribution to shaping a fifth-generation air force to ownership of the transition.

It is only changing one word, but it is a big change.

The focus changes from working the F-35 / Growler / Super Hornet mix that air combat group has to contribute, to the transition of the entire RAAF into a fifth-generation joint force.

A key challenge is recruiting and training the new force; how to target the right people and how to train them.

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We focus on things like categorization schemes, which is our way of accrediting and giving mission assurance for our people.

For example, a section lead, which is our category C, is significantly different for an F-35 pilot than it was for an F-18 pilot. Fundamentally different.

And this is true for Growler and other aircraft types as well.

Question: You have raised the question of the shift in recruitment and training with regard to your pilots.

How would you regard the shift on the demand side for the pilot?

Air Vice-Marshal Roberton: You go from having to manage a package to being a node, a sensor, and a shooter in a network.

We are no longer operating as little bespoke package and building block of a force.

If you're doing this properly to prepare for a fifth-generation fight, you start them in the middle of the web, and our warfighters understand what they can contribute and where they can draw upon to be a sensor and a shooter in that web.

And that's not just airpower, that's across the entire joint space.

This requires us to fundamentally change our exercise approach to train aviators in the kill web. It is a fundamental in dealing with the kinds of adversaries we find in the real world.

We cannot take yesterday's "block and tackle" combat aircraft approach to train to be the kind of distributed mission commanders we need in the future air combat force.

We need to focus on the sensor-shooter relationship in which we can deliver distributed kinetic and non-kinetic effects.

And this comes from within the kill web.

Put another way, you are training for autonomy in all of the weapon shooter nodes and crafting the overall impact accordingly.

Our decisive advantage is going to be in our ability to operate in high-tempo ops, fully networked.

That's what will make it a completely unfair fight.

It's not going to be about mass and numbers; that will always have a part to play.

But our decisive advantage has to be our ability to just run our kill web at high speed.

We have parts of our organization that are now thinking at the tactical and operational level in fifth-generation sense, but we are yet to exercise the enabling and support function in that same mindset.

That's a challenge for us.

Question: One of your first tasks as Air Commander Australia was to participate in Talisman Sabre 2017.

What was your role and what did you find during the command post segment of the exercise?

Air Vice-Marshal Roberton: I was a month and half in the job when I had the chance in July to work as the deputy CFACC to General O'Shaughnessy at PACAF for the exercise.

I was on the CPX side, and the scenario was good for a couple of reasons.

Firstly, it commenced on day 42 of a war, assuming established air superiority.

Then the exercise transitioned where a near-peer country came into the war and we had to reestablish air superiority.

It was challenging to deal with the problem.

It was absolutely fascinating to observe asset distribution, and where did you put your fifth gen contributors.

This was fifth gen fighters and systems to reestablish air superiority.

That old metaphor: *air superiority is like oxygen; when you've got it you never even think about it. But when you haven't got it, you cannot think about anything else.*

And so the surface combatants' commanders became fascinated with our ability to reestablish air control, and that was fundamentally driven by the disposition of fifth gen assets in the exercise region.

In the Pacific theater, the USAF has F-22s which is great.

However, the US are well behind several other countries in getting F-35s in their orbat.

When we had to reestablish air superiority, the discussion was no longer: where do we put our mass?

It actually became: where is our fifth-generation effect?

And that drove the fight, driving the entire operational design for the campaign.

And it was immensely successful.

We lost air superiority for minimal time with the introduction of a near-peer adversary.

Question: The F-35s are already in the Pacific with the Marines and you soon will have some in Australia.

How do you view this transition in terms of where you want to go with the entire combat force?

Air Vice-Marshal Roberton: The Marines actually have a very modest number of F-35s here now but they are quite critical in certain areas.

I have a great affinity for the Marines having done an exchange with them.

They are making a great contribution.

There's no hiding that stark difference between legacy and fifth generation aircraft.

When you actually see it, or don't see, as the case may be!

And when operators see the difference the reaction is very clear: "So now I get it.

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"Imagine what we could do with those systems if they were working with our ground forces, our ships, with our other aircraft like the Wedgetail."

And that is a major challenge: to work together to take advantage of the new assets to shape an overall fifth generation force.

For example, we're doing a command-and-control futures study at the moment.

We are trying to get folks to think about how to command-and-control in a higher tempo, contested environment with a fifth-generation force?

We are sponsoring it through our Air Warfare Center, but we're involving the other services and components.

We are not going to be an effective force unless our army and navy joins the RAAF on that fifth-generation journey.

A 21ST CENTURY APPROACH TO AIRPOWER: THE ITALIAN AIR FORCE AND THE F-35

2013-12-09 By Robbin Laird

Recently, Lt. General (Retired) Deptula chaired a key fighter conference in London.

He underscored that a new innovative approach to thinking about the future of airpower was needed.

According to Deptula "the future needs an agile operational framework for the integrated employment of allied military power."

And he added: "multi-nationality may be the only way to meet our fighter force requirements."

Clearly, some key U.S. allies feel the same way.

One of these is clearly the Chief of the Italian Air Force.

Lt General Preziosa laid out his perspective during my October 2013 visit to Italy.

He started by underscoring the nature of global change. He saw the period through World War II to end of the first decade of the 21st century as having more in common than different. He saw this as a period, which saw significant disruption and then growth built around building up continental focused growth and development. Global regions grew and financial systems largely supported those regions in their growth and development.

Airpower has been largely linear during this period, in which new planes have been added, but they have essentially replicated what we asked planes in World War II to do. Bombers and fighters have over time gotten better, but essentially, they work in a linear strike and defense pattern in shaping an approach towards longer-range operations.

With the information age, he sees a different type of development, globalization in which the focus is upon inter-continental growth and development. In this phase, we have to meet the challenge of new growth and development models, shape new financial systems and deal with new defense and security challenges.

"Partnerships are changing; continents are working to get closer and to work more effectively with one another. But there is a governability shortfall in managing the new challenges, and in such areas of shortfall

the problems appear. There are continuing conflicts within and among continents but there are also new patches of emerging challenges within the seams of the global system whereby terrorists, organized crime or forces of instability grow and disrupt."

With the range and distance of erupting threats, and the need for global cooperation or coalitions to deal with them, airpower needs to be modified.

"We now need to have assets which operate in a distributed manner with coalitions engaged to deal rapidly with problems. The advantage of airpower is its reach, speed and mobility. The challenge is to coalesce capabilities to put resources rapidly up against threats and challenges early enough to deal with them."

More by chance, than by design, the F-35 is entering the global scene at this moment in global history.

"This is an information warfare airplane which can share data across a fleet of global players. The reach of the F-35 means that my planes operating in the Western Mediterranean can receive data from throughout the region. And it is a plane with coalition designed into the aircraft."

The plane is an information warfare aircraft, or an aircraft built to operate very differently from legacy aircraft.

"We will start with the plane and operate in a more traditional manner. But the new pilots will learn how different it is and will shape new approaches. When I started with an F-104 and then we transitioned to the Tornado, we applied the F-104 tactics to the new Tornado. We did not focus on the presence of the second man in the cockpit, the navigator, and needed to shape new approaches to use the new capabilities built into the Tornado. It will be similar as we transition from legacy aircraft to the F-35."

The difference is that the change will even be more disruptive and more radical.

"Command and control capabilities are built into every cockpit of the F-35; the challenge will be to leverage those capabilities and the distributed decision making capabilities inherent in a fleet of F-35s."

He underscored that a strategic shift towards pockets of defense and security challenges around the European, African, Mediterranean and Middle East regions meant that Europe, the United States and others needed to shape collaborative approaches to insert airpower when appropriate rapidly.

And the F-35 as a key distributed force asset was the right match for meeting distributed challenges.

"The fusion system built into every cockpit will allow shared coalition decision making that is required for the kinds of multi-national operations which are becoming the norm. We are not fighting in mass; we are applying tools rapidly and directly to discrete problems and challenges."

He saw the approach at Cameri where it is part of a global production and sustainment system as symmetrical with the new strategic realities as well.

"Australia, Japan, Italy, the UK, the U.S. and others will share their production and sustainment capabilities for the F-35 and learn how to apply lessons learned from the use of a coalition aircraft in dealing with the evolving 21st century problems. This is not yesterday's aircraft being applied to the challenges of the next 30 years; it is about reshaping concepts of operations for coalitions meeting the evolving new challenges and operational requirements."

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He emphasized that the presence of Australia in Afghanistan demonstrated that a country far from a geographical area moved force into deal with a threat identified by a coalition with which it worked. And airpower has been central to Afghan operations.

"We use airpower for virtually everything to support the guys on the ground. They rely heavily upon airpower to deliver the ordinance to protect them and to engage the enemy."

He argued that: "We will discover the new dimension of airpower using this type of aircraft."

The coalition quality of the aircraft is built in was a key theme of his discussion.

"Interoperability is built into the aircraft; we use the same combat systems; we fuse data the same way; we have the same symbiology in the cockpit. It will be up to the new generation of pilots and squadron leaders to figure how to maximize these inherent advantages."

He emphasized the importance of cultural change.

"We older pilots adapted to the information revolution. The new pilots are native to that revolution. They will learn differently and this plane is designed for them."

We closed by looking at some final issues.

The first issue is the question of why the Italian Air Force was mixing its fleet between As and Bs.

"We studied the issue carefully and for the kind of missions we face we needed the flexibility which the B can add to the fleet. We need to go to the mission not the airfield. We will operate in many areas where there are only short runways; the B allows us to operate in those conditions.

"We can mix the fleet and operate at sea on land, on our own ships or own others. It is the kind of flexibility, which we see as crucial to a 21st century setting.

"I will give you an example of what we don't want. We planned to operate with the USMC in Afghanistan. But we were three months later in the deployment than we intended because our Tornados could not operate in the same conditions as the USMC. We had to take three months to build out the air base from which we would operate with them.

"Time is crucial to many of the missions in which we will be engaged. The Bs give me a more rapid insertion aircraft."

The second issue is the impact of the F-35 on the legacy fleet. Although the F-35 provides for a new approach, clearly the Italian Air Force and every other F-35 partner will look to use their legacy aircraft for a considerable period ahead, and seek to use them more effectively as the F-35 fleet becomes a reality.

"This is an important issue. One way to think about the way ahead is to continue to use 4th generation aircraft in surging mass to more classic airpower situations. One would use the F-35 as the key asset up against the distributed operational settings or for operations in denied air space.

Another way to look at it will be to find ways to gain more synergy between the F-35 and the legacy fleet. How can we better utilize our older assets during the process where the F-35 fleet becomes a reality?

Shaping combinations of 4th generation with the F-35s will be a mix and match opportunity in tailoring airpower to the missions ahead.

This is a challenge; but it is a key task within which the F-35s will make the legacy aircraft more effective; and the 4th generation aircraft will add support and strike capabilities to an F-35 enabled air power force."

He then added that when he was speaking of airpower, he was not simply speaking to the question of an air force. All of the services are enabled by airpower.

"The Navy is not defined by its ships but by its operational reach and this comes with airpower. The Army tends to think of airpower in terms of their helicopters, but Afghanistan teaches a different lesson. Continents are working together; why not the services?"

He concluded by emphasizing that the line between those countries that operate in the fifth generation and those that don't will be more than just a line in the sand.

"It will first of all be about survival. Do you want to be the Eagle or the Chicken in an airpower confrontation?

And there is the key question of the cultural revolution associated with the aircraft. With an aircraft with coalition capabilities built in, one will need to learn to operate differently, and this difference is central to the new phase of airpower. One needs to get on with it."

AN UPDATE ON THE EVOLUTION OF AIRPOWER: A DISCUSSION WITH LT. GENERAL PREZIOSA ON THE WAY AHEAD FOR THE ITALIAN AIR FORCE

10/12/15

By Robbin Laird

On September 29, 2015, I had a chance to meet with and to discuss with Lt. General Preziosa, his perspectives on the evolution of 21st century airpower.

This is the **third time** I have had the opportunity to meet with the Italian Chief of Staff, and to engage in a brisk dialogue on the way ahead for 21st century airpower.

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

For Lt. General Preziosa, the close relationship with the RAF was important in working through the way ahead with regard both to Eurofighter modernization and working with the F-35.

"There is no point in having to repeat lessons which have been learned by one Air Force or the other."

In the Italian case, the new Cameri facility is a key element for the Italian Air Force, which not only will see the build for the Italian Air Force but for the Dutch Air Force as well.

And then the facility will serve as a key maintenance and sustainment facility for the F-35 global enterprise.

In fact, Italian industry is well positioned as a member of the Eurofighter consortium, the F-35 global enterprise, and the builder of a new trainer aircraft and related training facilities.

The industrial base is well positioned to support 21st century air operations.

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We started by focusing on the recent first flight of an **Italian built F-35 flying in Italian airspace**.

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."

For Preziosa, the F-35 is really a different type of plane, probably not well captured by the term fifth generation aircraft.

The F-22 and the F-35 are called fifth generation aircraft, but really the F-35 is the first airplane built for the digital age, we are rapidly moving from the dog-fight concept to the data-fight evolution of the broad utilization of air power.

It was conceived in and for that age, and is built around the decision tools in the cockpit and is in fact a "flying brain."

And that makes it different from other aircraft.

It is a multi-tasking aircraft, and fits well into the I-phone age.

Other aircraft – with the exception of the F-22 – are built to maximize out as multi-mission aircraft, which execute tasks sequentially and directed to do so.

The F-35 fleet thinks and hunts and can move around the mission set as pilots operate in the battlespace and leverage the data fusion system.

It is a battlespace dominance aircraft; not a classic air superiority, air defense or ground attack aircraft.

It changes the classic distinctions; confuses them and defines a whole new way to look at a combat aircraft, one built for the joint force age as well.

The Army and the Navy will discover, as the F-35 fleet becomes a reality, how significant the F-35 is for their combat efforts.

Lt. General Preziosa highlighted as well the unique functions, which an F-35 fleet will be able to do as well as its intersection with the legacy fleet.

"The passive sensing capabilities of the F-35 fleet is largely ignored in the public discussion of the F-35; but this unique combat capability will be crucial in the period ahead to establish air dominance and the kind of combat effects we want to shape and execute.

Related to and separate from this is what can be called the "off-boarding revolution" whereby the F-35 operates in the battlespace and enables the payload deliverers whether in the Air, Sea on Land to deliver the kind of kinetic effect we would want."

For Lt. General Preziosa, the Eurofighter is an excellent aircraft but will be modified to work more effectively with the F-35 in operating in the 21st century battlespace.

The payload evolution of the Eurofighter is significant, and weapons modernization will support both the F-35 and the Eurofighter in providing new tools for the tool kit for air operations.

In effect, the two planes will work together in shaping along with other allied assets a 21st century air combat choreography within which weapons modernization and other assets will be woven in over time for the US and its allies to remain ahead in the inevitable competition with adversaries.

"There is nothing static in airpower; there is always a fluid dynamic, and the F-35 provides a benchmark for now for air power excellence and for several decades moving ahead we will leverage the decision tools and multi-tasking capabilities of the F-35 as well add capabilities to our Air Forces….."

FACING CORE THREATS IN THE NORDIC REGION: REVERSE ENGINEERING THE RUSSIAN A2/D2 THREAT TO DENMARK

10/19/17

During my past visits to Denmark, I have had the opportunity to talk with the current head of the Danish Royal Military Academy, Rear Admiral Nils Wang.

During past discussions, we focused on the evolving Nordic Defense Zone from the Arctic to the Baltics.

With the Russian actions in Crimea and the Middle East, the Russians are demonstrating a clear military activism in support of Russian national objectives.

The Danish government has just recently released their defense agreement proposal to parliament, and this agreement highlights the need for increased Danish expenditures and focus on defense, in light of regional developments.

During my visit in October 2017 to Denmark, Admiral Wang focused on what he believes is the nature of the Russian military threat to Denmark as well as the importance of integrated air-naval modernization to address what he called a "reverse engineering" approach to deterring the Russian A2/AD threat throughout one might call the Nordic Zone of Security.

He discussed a briefing he gave last month to the Parliament' s Defence Committee which addressed the question of whether investing in the Danish submarine force was a priority.

According to an article written by Anders Puck Nielsen and published September 21, 2017:

The Defense Commission of the Danish parliament yesterday conducted a hearing on the question of whether Denmark should reintroduce submarines and sea mines in the naval arsenal.

Both were phased out in 2005 but especially the importance of submarines has been a question of intense debate ever since.

Rear Admiral Nils Wang, commandant of the Danish Defence College, made some headlines in local newspapers with a statement from the hearing that an investment in submarines would be "a flagrant waste of money".

Wang's argument was that a military conflict in the Baltic area would encompass a Russian invasion of the Baltic states and a subsequent Russian defensive posture in the Eastern part of the Baltic basin.

Denmark would thus find itself in a position where the navy must play the offensive role in a mission to escort troops to the Baltic states under the support of allied forces counting several carrier strike groups located in the North Sea.

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In this scenario Wang primarily sees a need for area air defense, land attack strike missiles, a range of anti-submarine warfare (ASW) assets, and mine counter measures (MCM).

However, Wang does not see a role for submarines in this scenario as, supposedly, they do not give any particular advantage in ASW in littoral areas.

https://romeosquared.eu/2017/09/21/danish-admiral-says-submarines-are-flagrant-waste-of-money/

In our discussion, Rear Admiral Wang contrasted how he saw the Soviet-Warsaw Pact threat as opposed to the contemporary and evolving Russian threat.

The Soviet-Warsaw threat was one of invasion and occupation and then using Nordic territory to fight U.S. and allied forces in the North Atlantic.

In many ways, this would have been a repeat of how the Nazis seized Norway during a combined arms amphibious operation combined with a land force walk into Denmark.

In such a scenario, the Danes along with their allies were focused on sea denial through use of mines, with fast patrol boats providing protection for the minelayers.

Aircraft and submarines were part of a defense in depth strategy to deny the ability of the Soviets to occupy the region in time of a general war.

He contrasted this with the current and evolving situation in which the Russians were less focused on a general war, and more on building out capabilities for a more limited objective, namely controlling the Baltic States.

He highlighted the nature of the arms modernization of the Russian military focused on ground based missile defense and land and sea based attack missiles along with airpower as the main means to shape a denial in depth strategy which would allow the Russians significant freedom of maneuver to achieve their objectives within their zone of strategic maneuver.

A core asset carried by the Russian forces is the Kalibr cruise missile, which can operate off of a variety of platforms.

With a dense missile wolf pack so to speak the Russians provide a cover for their maneuver forces. They are focused on using land based mobile missiles in the region as their key strike and defense asset.

Rear Admiral Wang quoted the open source Danish intelligence judgment that the Russians can mobilize quickly to seize and hold the Baltic states if they choose to do so.

And the Russians have developed cruise missile which make it difficult for allied navies to operate in the Baltic and adjacent waters to contribute to Baltic defense.

“The Russian defense plan in the Baltic is all about telling NATO we can go into the Baltic countries if we decided to do so.

“And you will not be able to get in and get us out.

“That is basically the whole idea.”

Rear Admiral Wang then argued for what he called a reverse engineering approach.

“When people are talking about the Cold War as reoccurring, they are completely wrong.

"They are missing the whole picture because we are in the complete different situation than we were during the Cold War

"If the Russians are neglecting NATO's deterrence deliberately or by accident?"

"Then we are in a situation where we go from a defensive to an offensive dynamic because NATO then need to kick them out again.

"If we are going to cope with that situation, the first thing we need to do is to neutralize the mobile missile batteries in the woods of Kaliningrad and along the borders of the Baltic nations.

"And you don't do that with submarines unless they have strike capability.

"You do that with F-35s and with strike missiles.

"And you do that with Danish frigates together with a US aircraft carrier, or a Brit aircraft carrier, and whoever wants to come too.

THE REVERSE ENGINEERING CONCEPT OF ADMIRAL WANG AS INCORPORATED IN HIS BRIEFING TO THE DANISH PARLIAMENT.

"One needs to create air superiority, or air dominance as a prerequisite for any operation at all, and to do that NATO would need to assemble all the air power they can actually collect together, inclusive carrier-based aircraft in the Norwegian Sea.

"This is where the ice free part of the Arctic and the Baltic gets connected. We will have missions as well in the Arctic at the northern part of Norway because the Norwegians would be in a similar situation if there is a Baltic invasion."

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He argued as well for a renewal or augmentation of ASW capabilities by the allies to deal with any Russian submarines in the Baltic supporting the operation, notably any missile carrying submarines.

He saw a focused Danish approach to frigate/helo based ASW in the region as more important than buying submarines to do the ASW mission.

"There is a fundamental misperception by many in Denmark that the best weapon against a coastal conventional submarine is another coastal conventional submarine.

"And that is simply not the case.

"And especially not in the Baltic Sea where you can hide in the salt layers, where there is so much background noise that you are not able to hear anything in the same moment you start to accelerate yourself in your own submarine.

"The best weapon is a combination of Maritime Patrol Aircraft, ASW ships/ helicopters, satellites working together to destroy the Kilo class missile launchers in the Baltic."

Rear Admiral Wang saw the "reverse engineering" approach as combing several key elements: a combined ASW, F-35 fleet, frigate and land based strike capabilities, including from Poland as well.

The Admiral's position is based in part on the arrival of the F-35 and notably the F-35 as a core coalition aircraft with a capability to work closely with either land based or sea based strike capabilities.

An alternative view to that of the Admiral was provided by a German naval officer who argued both that submarines were crucial for the operations he envisaged in the area as well as crucial to have a European autonomy in dealing with the Russians.

But without an F-35 force or without an ally with a flexible and significant nuclear force, it is difficult to see how the German naval officer's view would square with dealing with the threat as described accurately, I would add, by Rear Admiral Wang.

Whereas the German officer was clearly focused on the Cold War threat, where certainly aircraft working with submarines were key elements in deterring an amphibious strike force, what Wang focuses on is an ability to go after mobile missiles in the area of interest supporting Russian occupation of the Baltics and operating via its offensive and defensive missiles at area denial of the Western forces.

EVOLVING THE CAPABILITIES OF THE MAGTF: THE CASE STUDY OF THE F-35 AND HIMARS

11/1/17

By Robbin Laird

The Marine Corps is being shaped for the transition from a slow-motion ground war to higher intensity warfare.

This reshaping is being driven by the new aviation assets, the introduction of broad range digital interoperability within the MAGTF and by evolving concepts of operations associated with distributed warfare.

At the heart of the transition is an ability to leverage all of the key combat assets, ground, sea or in the air and to deliver a force able to operate in the distributed battlespace.

Last August, Lt. General (Retired) Davis, former Deputy Commandant of Aviation, highlighted the nature of the transition as applied to the electronic warfare case.

He described the USMC transition from a core aircraft delivering an EW effect to building out the MAGTF to include ubiquitous access to non-kinetic electronic warfare capabilities.

The core approach going forward is very clear.

"MAGTF EW transitions the Marine Corps from a focus on low density/high-demand EW platforms, to a distributed, platform-agnostic strategy – where every platform contributes/ functions as a sensor, shooter and sharer – to include EW."

"Under MAGTF EW the Marine Corps is leveraging emerging technologies and integrating multiple platforms, payloads, nodes, and capabilities to provide commanders with an organic and persistent air and ground EW capability."

Davis underscored that with the changing nature of warfare and how the Marines operate, shaping a distributed strategy was a necessity, not an option.

"We operate on ships, from ships to shore and ashore."

"We cannot simply have an on call EW asset.

"We can confront the threat requiring an EW capability anywhere we operate."

https://sldinfo.com/lt-general-retired-davis-focuses-on-distributed-electronic-warfare-capabilities/

An additional case study of the evolution was evident in the Weapons and Tactics Instructor Course held in April 2017 by MAWTS-1 at Yuma Air Station.

During the exercise, the F-35B was being integrated into the overall MAGTF operations including integrated target identification and fire support to the new HIMARS system.

According to the USMC, the High Mobility Artillery Rocket System is described as follows:

HIMARS is a C-5 transportable, wheeled, indirect fire, rocket/missile system capable of firing all current and future rockets and missiles in the Multiple-Launch Rocket System Family of Munitions (MFOM).

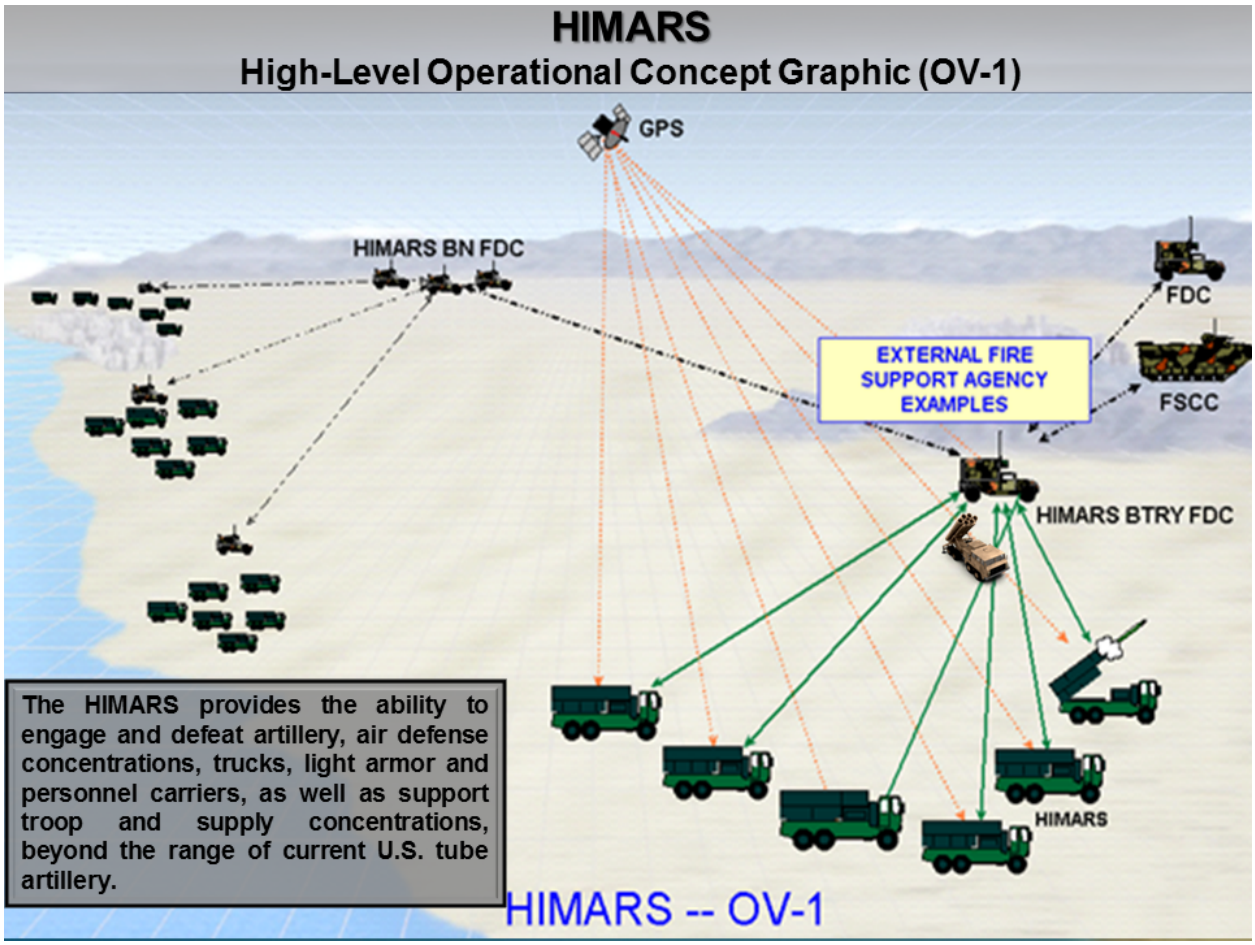
The HIMARS launcher consists of a fire control system, carrier (automotive platform), and launcher-loader module that performs all operations necessary to complete a fire mission. The basic system is defined as one launcher, one resupply vehicle, and two resupply trailers.

HIMARS addresses an identified, critical warfighting deficiency in Marine Corps fire support. HIMARS employs the Guided Multiple Launch Rocket System (GMLRS) rocket to provide precision fires in support of the MAGTF.

HIMARS is a transformational, responsive, general-support/general-support reinforcing precision indirect fire weapon system that accurately engages targets at long ranges (in excess of 40 miles) with high volumes of lethal precision fires in all weather conditions and throughout all phases of combat operations ashore.

Defense.Info

https://marinecorpsconceptsandprograms.com/programs/fire-support/high-mobility-artillery-rocket-system-himars



But this is a platform-centric description not one which indicates how it can contribute to the fight in a distributed battlespace.

For the Marines, HIMARS can be used ashore or as they have just demonstrated can be fired from an amphibious ship as well during Dawn Blitz.

In the photo below, U.S. Marines with Battery R, 5th Battalion, 11th Marine Regiment, 1st Marine Division are seen launching a rocket from a High Mobility Artillery Rocket System (HIMARS) off the USS Anchorage (LPD-23) during Exercise Dawn Blitz, Oct. 22, 2017.

Dawn Blitz 17 allowed the amphibious force to integrate the F-35B Lightning II and HIMARS into the exercise to validate a capability with platforms not traditionally used at the Marine Expeditionary Brigade/Expeditionary Strike Group or Marine Expeditionary Unit/Amphibious Ready Group levels.

In the most recent WTI exercise, the F-35 continued to develop tactics, techniques, and procedures (TTPs) for HIMARS firing.

This development can be missed or simply look like legacy aircraft support to a ground firing capability.

But it is not.

The F-35s sensors provide significant range and ability to target discriminate which can be shared with the ground force to guide their operational trajectories as well as, in the case of HIMARS, a key target to destroy.

Due to F-35 sensor fusion, F-35 pilots can identify key targets to support ground fires and can themselves add weapons to the fight.

In other words, rather than just doing close air support, the F-35 is capable of integrating air and ground fires into an overall distributed strike force that was not possible with 4th generation platforms.

HIMARS integration with F-35 and the shipboard firing are case studies of the transition of the USMC, not simply case studies of more advanced ways to do what they have been doing.

On October 23, 2017, I spoke with the Commanding Officer of MAWTS-1, Col Wellons, and one of his officers involved in the WTI course.

In an earlier interview, we discussed how the Marines were looking at the impact of the F-35 on the MAGTF:

Question: How does the integration of the F-35 into your operations, change how you think about those operations?

Col Wellons: A lot of that can be quickly become classified but let me give you an example, which does not fall into that category.

Historically, when we could come off of an L class ship with MV-22s, CH-53s, H-1s and AV-8Bs we would be faced with a serious AAA or MANPADS threat that would force us to avoid part of or an entire objective area.

With the F-35, we can leverage its increased survivability over 4th generation platforms in contested environments to accomplish the mission.

In Afghanistan and Iraq we have not had prohibitive interference in our air operations. However, that cannot be assumed in other areas of operation due to the proliferation of double digit SAMS. The F-35 allows us to operate in such areas.

The situational awareness (SA) that the airplane provides is a game changer for us.

In the past, we would receive input from the Senior Watch Officer on the ground with regard to our broader combat SA. That type of information is now resident within the cockpit of the F-35. The F-35 pilot can share information, that situational awareness, with other airborne platforms and the ground force commander in ways that are going to increase our operational tempo and allow us to do things that historically we wouldn't have been able to do.

The ability of the F35 to be able to recognize, identify, and kill the types of prohibitive threats that would prevent us from putting in assault support platforms and ground forces is crucial to the way ahead.

The F-35 can do this now, not some future iteration.

https://sldinfo.com/the-way-ahead-for-usmc-con-ops-the-perspective-of-col-wellons-co-of-mawts-1/

During the recent interview, we discussed further work on F-35 integration and the expanded role of digital interoperability within the MAGTF as exercised in the WTI course.

Question: The Marines are operating the F-35 in Japan and are standing up other squadrons as well.

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That is what I would call F-35 1.0; you are focusing on F-35 2.0 at MAWTS, namely how the asset is part of the overall transformation of the MAGTF, both as cause and consequence.

Can you describe what you are doing with regard to F-35 2.0?

Col Wellons: "We have expanded the hot loading capability of the F-35, which is part of our distributed operational approach.

"To date, we have hot loaded GBU-12s and 32s and most recently have done so with AIM-120s.

"That process has gone very well.

"With the next block of software which is coming shortly, we will load weapons externally as well which will expand the envelope.

"All this is part of an overall distributed approach. We are using MV-22s to bring ordnance and fuel to remote sites in order to rearm and refuel F-35s, increasing sortie generation.

"What this means is that we can bring fifth generation capabilities to the fight by deploying from FARPS throughout the battlespace, rather than having to operate from a fixed airfield.

"When you combine the ability to operate from ships moving at sea with distributable FARPS on land, we are providing for a powerful distributed, survivable, and unpredictable force to support the Commander's objectives in the battlespace.

"This capability is going to enable aviation operations, in an anti-access / area denial (A2/AD) scenario.

"We'll be able to take an MV-22, fly it into a FARP somewhere and have the F-35s join.

"The MV-22s provide fuel and ordnance to the F-35s.

"We can do the hot load, hot refuel, and you're in and out of there in a very short period of time."

Question: Can you now describe the HIMARS integration with F-35?

Col Wellons: "This class we continued the learning process.

"We were able to validate and verify, via ground testing, the ability of the F-35 to share digital targeting information with a ground node

"But I will ask my Aviation Development, Tactics and Evaluation Department Head, LtCol Ryan Schiller, to further discuss the process."

LtCol Schiller: "Utilizing the targeting capabilities of the F-35 and its inherent survivability as a 5th-gen fighter combined with the standoff range and capability provided by HIMARS gives us a key capability to fight and strike in the A2/AD environment.

"We are clearly expanding the aperture of our focus on how to leverage the F-35 for the MAGTF.

"With regard to HIMARS we are looking to shipboard use in certain scenarios as well.

"It is important to expand the adversary's sense of uncertainty as to how and when we might strike, generating capabilities that support a distributed force will help us reach that objective

"We intend to continue developing TTPs for HIMARS integration with F-35.

"During the next WTI class, we plan to fire a HIMARS using digital targeting information passed via an F-35."

Question: How did the last WTI course provide a way forward on the digital transformation approach?

LtCol Schiller: "This was the first WTI class in which we integrated digital interoperability, in the form of the Marine Air Ground Tablet (MAGTAB), into every single event.

"Digital interoperability is about distributed situational awareness to the force and the new platforms and new capabilities we are developing are key to the way ahead.

"We are shaping a fifth generation MAGTF, a MAGTF where important and time sensitive information can be distributed throughout the force in order to compress the OODA loop and be proactive vice reactive on the battlefield.

Col Wellons: "Digital interoperability is one of the most important things we did in this WTI course.

"We have the ability to have a networked MAGTF, where Marines in the air and on the ground are able to see real-time position location information of friendly forces, watch sensor feeds, synchronize execution checklist items, publish 9-lines, and chat, among other key items.

"It is being fielded now although refinement continues."

The TALD is an expendable glide vehicle that can mimic the heat and radar signatures of a full-sized aircraft.

"You can't shoot an air-to-air missile unless you have something to shoot at," said Donovan. "the TALD is just a glider that comes off of the Harrier and then it glides straight and the Harrier moves out of the way."

This hot-load exercise is to verify theory and validate publication and give the Marines involved a chance to load live ordnance while the aircraft is still hot.

While the F-35B has been loaded hot before, this is the first time it has been conducted with these air-to-air missiles.

"Decreasing aircraft turnaround time and increasing sortie generation due to the aircraft not having to power down, receive maintenance and start up again," said Staff Sgt. Kevin Knight an Aviation Ordnance Technician with VMFA-121.

"It's critical in developing our expeditionary capabilities."

During WTI, VMFA-121 will also use GBU-12 and GBU-32, laser and GPS guided 500lbs bombs in their F-35B's.

This combat themed training will provide the training and practical application to project Marine Corps air power on the battlefield.

http://www.jsf.mil/news/docs/20170926_Marines_heat-up_F-35B_Hot_Loads_training_with_AIM-120's.pdf

Defense.Info

WORKING F-35-HIMARS INTEGRATION: SHAPING A WAY HEAD FOR A 21ST CENTURY DISTRIBUTED SHOOTER-SENSOR CAPABILITY

06/19/2018

By Robbin Laird

During my latest visit to MAWTS-1 in May 2018, the work of the MAWTS-1 team during WTI-18-2 was the focus of attention.

MAWTS-1 is working on reshaping Marine Corps approaches to moving forward from a primary focus on counter intersurgency.

The strategic shift from counter-insurgency to contested operations was the focus of the most recent seminar of the Williams Foundation provides a baseline examination of the strategic shift.

At MAWTS-1, one can see the focus on the key building blocks for shaping a capability appropriate to mastering the strategic shift.

The shift is a significant one, which requires reshaping approaches, leveraging new capabilities, and integrating those capabilities into the overall evolution of the MAGTF.

It is a work in progress, and one driven by technology, combat experience and cross-learning from other US services as well as allies.

An example of the work in progress is providing a capability for an advanced ground based strike missile to operate with greater lethality when guided by a low observable air combat system which identifies targets beyond range of sight and not identified by the systems organic to that ground based strike system.

This is an example of how the sensor-shooter relationship needs to evolve when operating at greater distance and in a contested battlespace.

The core approach is to find ways to leverage the F-35 to provide an expanded aperture of support for the Ground Combat Element when executing the ground scheme of maneuver in a peer-to-peer conflict.

As the F-35 operates in its low observable mode and generates through its DAS and integrated sensors a battlefield situational awareness 'map,' targets can be identified deep within the enemy's operating area.

Targeting information can be generated to the Marines or to other joint forces to provide for precise fires targeting.

It is clear that the F-35 has an extraordinary sensor capability and sensor system integration, which can empower C2 in the operational battlespace.

In visits and discussions, I have had with allied air forces flying the F-35 the use of the new systems was already evident.

In one case, an Air Force was using sensor data from its aircraft to provide significant SA to that ally's navy as well as other capabilities for the fleet as well.

In another case, an ally is flying a single F-35 along a border where low flying threats are crossing the border regularly with drugs, weapons and other undesirable deliveries onto that ally's territory.

The F-35 is providing coverage of the entire border area and delivering that information including guiding border forces to mission success.

The aircraft qua aircraft is part of the "renorming of airpower," but the capability of the aircraft's ultimate benefit is to leverage it as part of an information dominance capability, which is what I am calling F-35 2.0.

The Marines are clearly among the most inventive of forces in pursuing ways to leverage the F-35 as a multi-domain flying combat system.

But this is not simply going to happen without work of the aviation with the ground communities working closely together as they do at MAWTS-1.

For the Marines, working F-35 integration with HIMARS as one of the building blocks in F-35 2.0.

Last Fall, I discussed progress on this effort with the then Commanding Officer of MAWTS-1, Col Wellons, and one of his officers involved in the WTI course.

Question: Can you now describe the HIMARS integration with F-35?

Col Wellons: "This class we continued the learning process.

"We were able to validate and verify, via ground testing, the ability of the F-35 to share digital targeting information with a ground node

"But I will ask my Aviation Development, Tactics and Evaluation Department Head, LtCol Ryan Schiller, to further discuss the process."

LtCol Schiller: "Utilizing the targeting capabilities of the F-35 and its inherent survivability as a 5th-gen fighter combined with the standoff range and capability provided by HIMARS gives us a key capability to fight and strike in the A2/AD environment.

"We are clearly expanding the aperture of our focus on how to leverage the F-35 for the MAGTF.

"With regard to HIMARS we are looking to shipboard use in certain scenarios as well.

The progress continued at WTI-2-18 and I had a chance to discuss the way ahead with Major "Doctor: Buxton, MAWTS-1 Air Office Department, Major Andrew Crist, Fixed Wing Offensive Support Specialists, and Major Joshua Freeland, a Direct Air Support Control Officer.

What these officers described was a clear work in progress, one which will relied on leveraging software upgrades on the F-35 but concurrent progress with regard to the software and hardware evolutions of the data link systems as well.

From this point of view, the F-35, much like the Osprey before it, is playing a forcing function within the USMC for change.

With the Osprey, significant change was driven in how the Marines operated in the land wars, and in how they approached counter-insurgency operations.

The F-35 has come precisely at the point when the strategic shift is underway and it is clear that the US and the allies are using the F-35 as a trigger point for broader transformation as well.

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And through this effort, the Marines are looking at broader issues of the F-35 and its role within the overall effort to shape greater digital interoperability for the force as well.

The GCE fires elements use a data link communication system, which operates by sending what is called K messages.

The immediate challenge was to find ways to work the F-35 systems with an ability to work with the data links used by the GCE.

The data links for the GCE are being reworked to be more effective in its operational integration with the Air Combat Element.

As the GCE receives new software and hardware systems and as the F-35 evolves to its 3-F configuration an ability to link systems more effectively in the distributed battlespace will be possible.

But the Marines are working the opportunity to do so prior to arrival of the optimal situation.

As one Marine put it: "We are looking to build in surface fires capability into the F-35.

"We started by looking at ways we could use CAC2S as a gateway to enable us to move in this direction."

CAC2S is the USMC's C2 system designed to provide for integration between the ACE and the GCE. It like the F-35 is a work in progress

As the Marine Corps has defined CAC2S:

CAC2S will provide a complete and coordinated modernization of Marine Air Command and Control System (MACCS) equipment.

CAC2S will eliminate current dissimilar systems and provide the MAGTF Combat Element with the hardware, software and facilities to effectively command, control and coordinate air operations integrated with naval, joint and/or combined C2 units.

CAC2S will comprise standardized modular and scalable tactical facilities, hardware and software that will significantly increase battlefield mobility and reduce the physical size and logistical footprint of the MACCS. CAC2S Phase 1 successfully completed its Initial Operational Test and Evaluation (IOT&E) in 2011.

Subsequently, Phase 1 received its full deployment decision on 25 Oct 2011 and limited deployment capability in February 2012.

Phase 2 successfully achieved Milestone C decision in 31 Mar 2015 and IOT&E in Apr 2016.

A Fielding Decision Review (FDR) was conducted on 11 Aug 2016 and ADM signed on 25 August 2016.

As the Marine Corps gets its updated versions of CAC2S, they are looking to the new capabilities to provide an effective gateway between the message set capabilities of the platforms.

The DASC or the Direct Air Support Center is where the translation and validation occurs on the battlefield and where Link 16 messages from the F-35 would then be translated into K messages for the GCE.

As another Marine put it: "Link 16 J series messages received by the DASC will then be translated into the K series format which the GCE utilizes to generate fire missions and is passed along to fires approval authorities with airspace clearance"

During WTI-2-18, the Marines used a new VIASAT radio as part of the firing sequence for the F-35/HIMARS tandem.

And with a handheld radio able to handle Link 16 messages, and the team was able to use a Link 16 data link from the F-35 to enable a HIMARS firing.

But it was clear that working the integration was a hard task, one that needs to become much simpler to be effectively operational on the battlefield.

What is impressive for sure is seeing the Marines work the process and in a way that can inform both the upgrade processes on the F-35 as well as with regard to HIMARS and related equipment.

Clearly, working the data links and communications is a key part of being able to operate on the distributed battlefield.

Although a work on progress, it is clearly working in the right direction towards the threat envelopes central to the nation.

THE USMC SHAPES A WAY AHEAD: THE PERSPECTIVE OF THE COMMANDING OFFICER OF MAWTS-1

06/01/2018

By Robbin Laird

MAWTS-1 plays a unique role within the USMC and in the joint force.

In our book on the reshaping of Pacific strategy and the role of new technologies and concepts of operations, we highlighted the role of the warfighting centers in the development and evolution of US forces, for which MAWTS-1 has played a key role with the Marines first introducing Ospreys and then F-35s into the warfighting force.

MAWTS pilots and trainers are looking at the impact of V-22 and F-35 on the changes in tactics and training generated by the new aircraft. MAWTS is taking a much older curriculum and adjusting it to the realities of the impact of the V-22 and the anticipated impacts of the F-35.

MAWTS is highly interactive with the various centers of excellence in shaping F-35 transition such as Nellis AFB, Eglin AFB, the Navy/ Marine test community at Pax River, Maryland, and with the United Kingdom.

In fact, the advantage of having a common fleet will be to provide for significant advances in cross-service training and CONOPS evolutions.

Additionally, the fact that MAWTS is studying the way the USAF trains combat pilots to be effective flying the F-22 in shaping the Marine F-35B Training and Readiness Manual is a testimony to a joint-service approach.

This is all extremely important in how MAWTS is addressing the future.

An emerging approach may well be to take functions and then to redesign the curriculum around those functions.1

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What we forecast in our book is certainly happening.

During my recent visit to Yuma Marine Corps Air Station in May 2018, I had a chance to discuss the recent experience of Marines shaping and participating in the latest warfighting exercise or WTI Course.

The course is a seven-week training event hosted by the squadron's cadre. The squadron provides standardized tactical training and certification of unit instructor qualifications to support Marine aviation training and readiness and assists in developing and employing aviation weapons and tactics.

The role of the WTI was described in an article by Sgt. Sarah Fiocco and published on April 21, 2015 as follows:

In a seven-week period, the cost of sending one Marine through Weapons and Tactics Instructors course is comparable to the cost of a four-year education at an Ivy League university.

Sponsored by Marine Aviation Weapons and Tactics Squadron 1, the cost to graduate one certified weapons and tactics instructor from the course is $200,000. A cost, which puts each candidate through a full range of advanced aviation operations.

The course serves to train the best pilots in the Marine Corps to return to their units as training experts. This process requires countless hours from the MAWTS-1 instructors and staff to ensure they are sending exceptionally-trained WTIs back to the fleet Marine force.

"These students will be the people, who the commanding officer looks to when it comes to handling the training plan of an entire squadron," said the Academic Department Head, WTI, MAWTS-1. "He looks at them to be the guy, who says, 'We're good to go to combat.'

He's the guy the CO will trust."

Before pilots can even attend the advanced course, they must fulfill a slew of prerequisite certifications, to include low-altitude tactics instructor and air combat tactics instructor. Pilots achieve most of these certifications from their units, building their experience base in order to qualify them for the WTI course.

"These pilots are already instructors before they come out here," the Academic Department Head said. "We also go see these Marines fly three to six times a year before they come to WTI.

"We can say, based off our experience, if a Marine we observed is ready to go to WTI, or if they need to work on something."

On the first day of class, the pilots receive a 50-question inventory test. This is followed by nearly two months of classroom instruction, flight simulators and piloting training flights on their specific aircraft.

The course begins with instruction exclusive to each student's aircraft then expands to advance training that incorporates other platforms and units.

The students will graduate as experts on their particular aircraft, with the knowledge of how to plan and how to train others. These skills acquired from the course will ultimately be applied to their fleet units and Marine Corps operations as part of the Marine Air Ground Task Force.

"During the final exercise, everyone is working together. From close air support, to battalion lifts, the whole MAGTF is involved," the Academic Department Head said. "When we get to that final exercise in WTI, it's all on

the students. They know how to put together a plan and execute, so we are sitting back for the most part just being safety backstops."

Much like the selection process for the students, the staff is selected for the high-level of expertise they bring to course. WTI instructors' contribution to training and standardization of coursework is what makes WTI the valuable asset it is to the Marine Corps.

"All the instructors, who teach here are handpicked," the Academic Department Head said. "We do everything we can to ensure the fleet is getting back the best instructors possible."

The Weapons and Tactics Instructor Course is a seven-week course consisting of advanced tactical aviation training designed to produce weapons and tactics instructors.

The course will serve in key training officer billets to act as a training expert in the fleet, ensuring that Marine aviation units continue to train effectively and to a standard across the Marine Corps. It is courses like WTI, which reinforce the Marine Corps' role as our nation's force in readiness.

WTI has become especially significant as the Marines are going through the strategic shift from a predominant counter-insurgency and stability operations period of warfare to preparing for higher-intensity, peer-to-peer conflict.

It means as well that crisis management in a counter-insurgency operations is clearly different from those involving higher levels of conflict and potentially including peer competitiors.

And as the Marines have already introduced the F-35 into the MAGTF and are adding the CH-53K and other new capabilities, there is a clearly a shaping and learning process underway for the USMC and the joint force.

MAWTS-1 is clearly at the center of this process.

During this visit, I had a chance to talk with the outgoing CO of MAWTS, Col. Jim Wellons about his time at MAWTS.

With the coming of the F-35, the Marines have led the way at the outset for the US services which has meant that the Marines have been working closely with the USAF as that service brings its F-35s into initial operating capabilities.

According to Col. Wellons: "We have always had a close relationship with the US Navy.

"We are after all Naval aviators.

"I cannot over-emphasize our close working relationship with the US Navy and Top Gun, where we have always had several USMC aviators filling highly sought-after exchange tours.

"We have some challenges but also many opportunities.

"Top Gun has a strong emphasis on Super Hornet and are just beginning to roll out their F-35C course, which we intend to support.

"We have legacy F/A-18s but do not fly the Super Hornet and the USMC has been leaning forward on the establishment of the full spectrum of F-35 tactics, having already executed five WTI classes with the F-35B.

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"Recently we have made huge strides in establishing ASLA joint communications standards and we are closer now than ever before to aligning all the service standards with joint communications – all the service weapons schools have been cooperating in this effort.

"With regard to working with the USAF — over the past decade, as we operated together during the wars in Iraq and Afghanistan, we became much closer and better integrated across the service weapons schools.

"But the advent of the F-35 has really accelerated our close working relationship with the USAF.

"The standup of F-35 was "joint" from the very beginning, and the USMC has been aggressive with the stand up of our operational F-35s – the first of all the services to declare IOC, deploy overseas, and conduct weapons school courses with the F-35.

"As a result, we have been at the forefront of lessons-learned with the aircraft in terms of sustainment, deployability, expeditionary operations and tactical employment."

"We currently have a former USMC F/A-18 instructor pilot flying F-35As on an exchange tour with the USAF Weapons School, and we will soon have the first USAF F-35 exchange pilot coming to Yuma for a tour as instructor pilot in the F-35 division at MAWTS-1.

"We are all learning about employing, supporting and sustaining the F-35, and deploying it to places like the Western Pacific, where VMF-121 has been in place now a year."

Question: During my time in Australia earlier this year, the Commander of the 11th Air Force raised a key question about the need for the USAF to ramp up its mobile basing capabilities.

How has the USAF interacted with the Marines at Yuma with regard to working through a new approach?

Col. Wellons: "Within the USMC, expeditionary operations are our bread and butter. In a contested environment, we will need to operate for hours at a base rather than weeks or months.

"At WTI we are working hard on mobile basing and, with the F-35, we are taking particular advantage of every opportunity to do distributed STOVL operations.

"It is a work in progress but at the heart of our DNA.

"We will fly an Osprey or C-130 to a FOB, bring in the F-35s, refuel them and load them with weapons while the engines are still running, and then depart. In a very short period of time, we are taking off with a full load of fuel and weapons, and the Ospreys and/or C-130s follow close behind.

"We are constantly working on solutions to speed up the process, like faster fuel-flow rates, and hasty maintenance in such situations.

"Of course, we have operated off of ships with our F-35s from the beginning, and that is certainly an expeditionary basing platform.

"We have been pleased with what we have seen so far in regard to F-35 readiness at WTI.

"For example, in the last WTI class we had six F-35s and we had five out of six up every day, which was certainly as good as anything we have seen with legacy aircraft.

"During the most recent class, F-35s supported us with over 95 sorties and a negligible cancellation rate.

"Our readiness rates at WTI are not representative of the fleet, where we continue to work on enhancing overall readiness goals with F-35."

We then discussed the F-35 and USMC operations beyond MAWTS-1.

Col. Wellons: "This is still an early variant of this airplane.

"It is the early days for the F-35 and we are working things like software evolution.

"Yet the aircraft has already had an impact in the PACOM AOR.

"We can put this airplane anywhere in the world, sustain it and fly it and get a key deterrent impact, as we have already begun to see…."

Footnotes:

1. Laird, Robbin; Timperlake, Edward; Weitz, Richard (2013-10-28). *Rebuilding American Military Power in the Pacific: A 21st-Century Strategy: A 21st-Century Strategy* (Praeger Security International) (pp. 258-259). ABC-CLIO. Kindle Edition.

THE F-35, THE IRON DOME AND SAVING LIVES

07/11/2018

By Edward Timperlake

As Herman Kahn once noted: "Anything that reduces war-related destruction should not be considered altogether immoral."

There is now the demonstrated promise of advanced weapons systems integrated together in an offensive and defensive enterprise to actually save the lives on innocents on both sides of combat action.

The Israeli Defense Force is pioneering such lifesaving con-ops of reducing the term "collateral damage."

Collateral damage is a euphuism that can capture two parts of the loss of life.

Often in so called "friendly fire" incidents, which is actually not "friendly," one's own forces come under attack by their own forces.

The second, and most widely used expression for collateral damage, is hitting non-combatants with munitions.

Tragically in global war, at times, "collateral damage" really isn't a mistake in ordinance delivery but rather a deliberate direct targeting of a civilian population to achieve a strategic outcome.

The Cold war debates about how to fight and win a nuclear war had two building blocks of strategic thinking that defined a generation of intellectual turmoil and weapons development.

The two words on how to target one's opponent was "counter-force" (CF) and "counter-value. (CV).

At times many vicious debates were engaged in by very smart people on the issue of CF or CV targeting and Herman Kahn tried to always bring enlightened thinking to that intellectual debate.

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Fortunately, those very public strategic debates had a desired effect of actually freezing the use of nuclear weapons by the USA and of our nuclear armed allies against the USSR and to a lesser extent the PRC.

Inside that construct President Reagan and his defense and foreign policy team prevailed and the Wall came down.

Sadly the proliferation of nuclear weapons to places like North Korea and Pakistan, and the growth of PLA arsenal now complicates deterrence thinking and in not a good way.

The rumored removal of devices from South Africa, the actual removal from Ukraine and the IDF's strategic ambiguity is often seen as positive steps but in different ways.

Hopefully the process of dealing with North Korea will led to de-nuclearization, and Iran can be dealt with effectively to abort completely its quest for a workable weapon system a warhead married to a delivery vehicle, aircraft or missile.

Inside the issue of debating nuclear deterrence, since 1945, conventional wars and flash point combat engagements have clearly continued.

Tactical wars with strategic implications flourished from the dawn of the nuclear age to this day.

Combat engagements, including terrorism in the name of religious ideology sadly have followed the lyrics of a song "and the beat goes on," from the 20thCentury into this one.

But unlike the counter-force and counter-vale debates at a strategic nuclear level there has been so far an unspoken, for the most part, merging of 21st Century offensive and defensive conventional tactical weapon systems that have allowed for reduced collateral damage with the context of defending key interests against adversaries.

And this approach saves lives.

Conceptually, this can be understood in terms of changing how to execute the payload-utility function of warfare. A distributed kill web can deliver a combat effect with reduced collateral damage and has the tremendous promise in saving the lives of innocents in a limited conflict.

Employing OODA loop thinking can capture the two elements of fleet wide payload utility (Pu)and it is very simple to explain and difficult to execute:

Observe/Orient (OO) is essentially target acquisition, and Decide/Act (DA) is target engagement.

Thus there is a very simple formula, better and better TA and TE =more effective employment of all payloads available to the battle commander.

The Israeli Defense Forces are on the cutting edge of understanding, developing and employing advanced payload utility kill web capabilities.

The new capabilities begin with their Iron Dome.

The Iron Dome missile defense system, designed and developed by Israel and jointly funded through the United States, is a response to the threats Israel faces from short and medium-range rockets and mortar shells fired by Palestinian terrorists in Gaza.

The system has the capability to identify and destroy such projectiles before they land in Israeli territory and is considered one of the most effective anti-missile systems in the world.

Iron Dome is comprised of three key components:

(1) the design and tracking radar, built by the Elta defense company;

(2) the battle management and weapon control system, designed by the mPrest Systems software company; and,

(3) the missile firing unit, manufactured by Rafael Advanced Defense Systems Ltd.

One of the most advanced features of Iron Dome is its capability to determine where an incoming rocket will land and to only intercept such projectiles that pose meaningful threats to populated civilian areas.

Note the emphasis on directly focusing on threat to populated civilian areas.

A few years ago I was given the opportunity to be part of a press call by a senior supporter of the IDF/Iron Dome and he made a brilliant point. Because their Iron Dome resulted in fewer deaths of innocent Israel citizens, included targeted schools, the IAF could more accurately target their counter strikes to the identified point of origin.

The counter force strike had the potential for collateral damage because their very nasty opponents often launched from high value civilian areas where it was almost guaranteed innocents would die.

But with the introduction of the most accurate bombing aircraft to ever fly, the F-35, a new chapter in fighting in civilian –military conventional hybrid-wars is opening.

The Iron Dome not only saved Israeli lives but gave the IDF much more accuirate aim points in their appropriate retaliation.

Enter the F-35 or as the IDF calls it the Adir or "Strong One"

Israel has struck targets in the Middle East with the F-35 Adir jet twice, making the Jewish state the first country to use the stealth fighter in a combat role in the region, Israel Air Force Commander Maj.-Gen. Amikam Norkin announced on Tuesday.

"We are flying the F-35 all over the Middle East. It has become part of our operational capabilities.

"We are the first to attack using the F-35 in the Middle East and have already attacked twice on different fronts," he said during the IAF Senior Air Force Conference in Herzliya.

https://www.jpost.com/Israel-News/IAF-commander-Israel-first-to-use-F-35-jet-in-combat-558030

For the first time in history, individual IAF F-35 pilots will have the best database of real time knowledge in the history of combat aviation.

And all of this is internal to their cockpit and enabled by advances in computer processing and sensor information fusing.

Each F-35 pilot combined with human sensing (seeing visual cues outside the cockpit) will be enabled by machine driven sensor fusion to allow combat "situational awareness" (SA) better than any other opponent.

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Concurrent with their ability to look-see, which is limited by physical realities, the F-35 pilot will be able to "see" using cockpit electronic displays and signals to their helmet allowing them not to just fight with their individual aircraft but be able to network and direct engagements at significant range in 360 Degrees of 3-dimensional space out to all connected platforms.

A fleet of F-35s has the inherent capability **to share** their fused information displayed at the speed of light to other aircraft and other platforms, such as ships, subs, satellites, and land-based forces, including UAVs and eventually robots.

Marrying the Adir with Iron Dome is the dawn of this next chapter of 21stCentury Kill Web integrated war fighting that will actually save lives on innocents on both sides.

Today over the skies of the Middle East a "tactical" aircraft is evolving into a key technology for strategic operations and impacts.

The Payload-Utility dynamic executed within a distributed kill web is leaving the legacy kill chain in the rear-view mirror

Payload utility as practiced by IDF/IAF can be a driver for understanding the future development of combat systems.

It is the process of understanding the huge complexities in such a simple Payload/Utility formula that is the challenge.

Understanding the technology and human dynamic through an analytic filter of a Payload Utility function consisting of weapons (kinetic and TRON) and the dual components of Target Acquisition (TA) and Target Effectiveness (TE) effectiveness in a fighting fleet engaged in high or low intensity combat in the unforgiving cauldron of battle and mitigation of unfortunate collateral damage maybe a war winner.

Either in one platform, or melded into a unified fighting force to bring all different types of appropriate "weapons on" for the kill shot is a powerful concept.

America must always appreciate that no platform should fight alone if the Wynne Doctrine, named for 21st Century Secretary of Air Force, is employed: "If it is a fair fight someone failed in planning."

A very simple filter to look at platform and weapons development within the integration of current weapon systems and platforms is asking the largest questions possible and pursuing force design and operational answers to these questions:

What does weapon or system add to fleet Payload/Utility?

How does this system help in TA?

How does this system help in TE?

What is the best weapon for the highest Pk against the target?

Is the TA, TE and Weapons (kinetic and Tron) carried together F-35 or separate?

So far every nation flying in the F-35 global enterprise can learn from the IDF combat leaders merging the Iron Dome and F-35 into a demonstrated and formidable building block in Kill Web con-ops, while saving lives or otherwise known by the military acronym, "collateral damage."

EUROPE PREPARES FOR FIFTH GENERATION TRANSFORMATION: THE EUROPEAN AIR GROUP WORKS THE CHALLENGE

3/27/18

By Robbin Laird

The European Air Group has been an incubator for change within the European air forces. The EAG flies below the radar but is a key asset for the Air Chiefs of 7 major European Air Forces in shaping ways to work more effectively together and to get the best value they have from legacy and new assets at the disposal of those forces.

They clearly have grasped the point of the Ben Franklin moment: We all hang together or we hang separately!

"We need to learn to work more effectively together to ensure that our individual national air capabilities are maximized in their effectiveness," as one EAG official told me a few years ago.

The head of the EAG is rotational among the Air Chiefs, with the current COS of the Italian Air Force now the head of EAG. The Chiefs meet once a year to shape an agenda and to determine the way ahead based on the work performed by the EAG or being shaped for the EAG. There is a small permanent staff, headed by a Deputy Director and a Chief of Staff for the EAG, with its headquarters at RAF High Wycombe, UK.

The seven European Air Forces involved in the EAG are the following: the UK, France, Italy, the Netherlands, Belgium, Spain and Germany.

Two notable achievements of the EAG are working through the terms of reference and the approach to establishing the European Air Transport Command and the European Personnel Recovery Centre.

In 2014, I first visited the EAG and presented a briefing on how to think about the integration of 4th and 5th generation aircraft as European airpower is transformed under the impact of fifth generation operations.

In 2016, the EAG held a working group session and conference on the opportunities and challenges with leveraging fifth generation transformation.

The 2016 two-day 4th 5th Generation Integration Information Forum was held at the home of the EAG, RAF High Wycombe, at the end of April 2016.

With national 5th Generation aircraft programs maturing and the need to integrate 4th and 5th generation aircraft into future coalitions acknowledged the forum is providing a vital conduit to keep information flowing between both EAG nations and external partners and increase the awareness of nations about the challenges to come.

The first day saw experts from academia and industry set the scene with their interpretation of the technological and political developments that are going to shape the future of air power and more specifically the challenges of integrating 4th and 5th generation multi-national air forces into that vision.

The second day opened the floor to a discussion between the individual EAG nations present, Tactical Leadership Program (TLP), Joint Air Power Competence Centre (JAPCC); European Union Military Staff (EUMS) and the USAF that was being represented for the first time at an EAG 4th 5th Generation Forum.

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The debate focused on the specific challenges being experienced at a national program level whilst also providing an overview of the future Air Force compositions.

The identification of the common challenges being experienced with this cutting edge evolution of the approach to, and employment of, air power is key to the development of future collaborative solutions.

National representatives were able to take away key areas for further consideration and investigation that when resolved will be fundamental to enhancing interoperability between the nations.

The 4th 5th Generation Integration Information Forum will continue to provide a crucial communication channel between the EAG nations as the next generation of combat aircraft are brought into service in Europe.

Since then, the work on 4th 5th Gen integration has progressed considerably and the Integration Forum has been absorbed within a dedicated program that has been launched by the EAG in 2017.

During my most recent visit to the EAG in February 2018, I had a chance to talk with the Deputy Director of the EAG, Air Commodore Robert Adang of the Royal Netherlands Air Force, and to get an update on the effort to leverage fifth generation capabilities.

As he noted in our discussion, as a young student he saw the first F-16 ever to visit the Netherlands fly over his school and head for a Dutch Air Base. Now, he is on the ground floor as the F-35 enters European Air Forces, and is a force for change in reshaping the overall concepts of operations and combat capabilities of European Air Forces.

The EAG is addressing the question of how to shape an interoperable 4th-5th generation air force. They are addressing the question of "interoperability gaps" and how to attenuate them.

The EAG has developed a program, which they call the Combined Air Interoperability Program (CAIP) guiding the overall effort. The EAG Steering Group mandated in 2016 that there was a need "to develop a plan to solve the interoperability challenges that result from integrating 5th Gen with 4th Gen systems."

The EAG is clearly not working this alone but is also providing operational intellectual capital to core organizations working the challenge in Europe, including USAFE, the Joint Air Power Competence Centre and NATO HQ Air Command.

As Air Commodore Adang put it: "the objective is plain and simple. It's to create the optimum conditions for future combined training, exercise and operations by resolving interoperability issues that result from 4th and 5th gen integration."

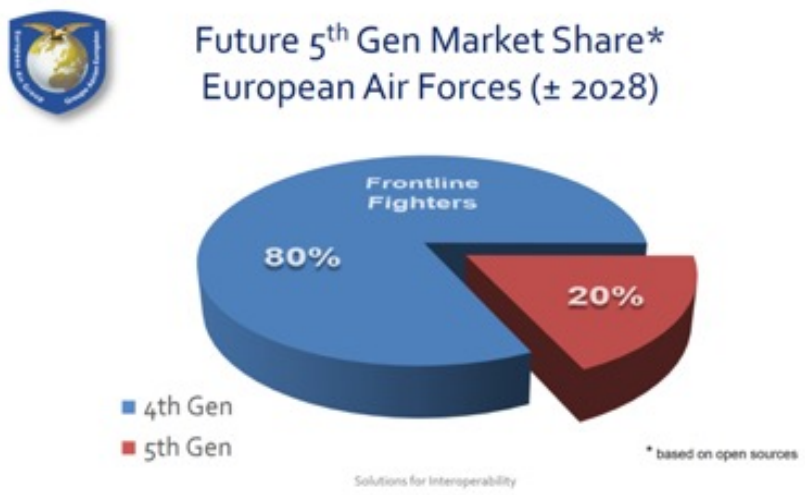
The baseline point is that F-35s will be a part of the force but not the dominant part numerically.

As Adang underscored: If I look at European air forces, current plans, when you total the projected number of F-35s in about ten years' time, say 2028, and you compare it to the number of 4th gen fighters that will be used at that time still, then you're looking at about 20% fifth gen systems and 80% 4th gen systems, not including any F-35 or F-22 US forces.

"And the total number that makes up that 20% of F-35s is too small to create the total effects that you need in a major combined air operation.

"You need the missile carrying capabilities and other attributes of the 4th gen fighters to ultimately be successful. So it's only through a combination of 4th and 5th gen that we can be successful in future air operations.

"And this is the trick."



WORKING THE MIX OF FIFTH GENERATIONA WITH 4TH GENERATION AIRCRAFT. CREDIT: EUROPEAN AIR GROUP

Several dynamics of change are being addressed to generate a transformation process.

The first is shaping new training capabilities.

"How do we integrate the F-35 in the European theatre? We're working on that between the nations and associated organizations.

"How can we establish red forces capability that's relevant for a 5th gen force?"

The second is to build out airspace training ranges within Europe as well.

"There is a clear need for training airspace and ranges that are suitable for accommodating training with 5th gen weapon systems."

The capabilities of the fifth-generation sensors and how the sensor-shooter relationship will operate over larger areas of airspace clearly requires reworking airspace training options. And to do so will require working with the civilian authorities responsible for handling the common airspace.

"When you've identified this common idea of where these chunks of training airspace are going to be, then you have to start looking at how that aligns with Single European skies. It's the aim of Single European Skies to optimize civilian air transport. Integrating military training airspace is not a primary objective, and needs to be addressed effectively.

Third, is working the synthetic training environment and cross linking the various European efforts, including reaching out to the US forces in Europe as well.

"When I look at synthetic training, what I see is these national networks being developed bit by bit. I see some initiatives to connecting F-35 simulators multinationally. We clearly need to have some multinational training network that enables interoperability training in a synthetic environment – or rather a live, virtual and blended environment – in addition to live training.

"And I think that from a technological point of view it will be relatively easy to connect F-35 simulators from different nations in a multinational network, but then connecting that network to 4th gen capabilities for 4th Defense.Info

gen nations is going to be where the challenge is, not only because of technological differences but also from a security perspective. But in the end, that's where we have to go.

"If in ten or fifteen years' time, we don't do a substantial part of our multinational training in a synthetic environment, we've done something wrong."

More broadly speaking with regard to transformation, the European air combat fleet under the impact of fifth generation is forcing changes, which are congruent with where technology, C2 and concepts of operations are headed.

Air Commodore Adang treats the F-35 as a first-generation information dominance aircraft. The fifth-generation approach lays the foundation for preparing for the future while current capabilities are transformed as well.

"By now most people agree there's a future of military operations come to be about information, not about systems. And the only way to be successful in these information-centric operations is when all the capabilities that you have are networked together seamlessly, or as seamless as possible. And those networks will see an increasing number of distributed centers and effectors operating in unison through the network. These sensors will give us an improved situational awareness if we prove to be capable of exploiting all the information that they're gathering, that's one of the biggest challenges that we will be facing in the future."

Put simply: a different approach to airpower and the fifth-generation transformation is clearly driving change in this direction and the EAG wants to both help shape a way ahead for integration of the legacy with the new fleet, but lay down the foundation for the kind of combat learning which such a 21st century air combat foundation can enable.

"How can we educate people in 5th gen awareness, make them aware what 5th gen warfare means?"

The EAG is working within a network of organizations to foster innovation and to provide cross organizational learning which can facilitate transformation as well. "We want to take the best ideas and approaches within the European airpower network and apply those throughout the European airpower system."

In short, the EAG is proving pragmatic intellectual leadership in the European airpower environment to shape a way ahead for a more capable 21st century combat force.

ALLIES AND 21ST CENTURY WEAPONS SYSTEMS: THE CASE OF THE COMING OF THE F-35 TO EUROPE

5/16/17

By Robbin Laird

A key dynamic with the shift from the land wars to shaping a 21st century combat fore is the crucial opportunity the US and its closest allies have to learn from each other thanks to the number of core weapons systems being bought at the same time.

Almost hidden in plain view is the emergence of a significant driver of change –-flying the same aircraft at the same time, and cross learning from each other.

A case in point is the F-35.

There was much recent press on the arrival of USAF F-35s in Europe, landing at RAF Lakenheath and operating from there and then some of those aircraft going to Estonia and then Bulgaria. SACEUR himself showed up at RAF Lakenheath and underscored how significant the arrival of these aircraft was for a training mission in Europe.

For example, in an article by Robert Wall entitled "US jet fighters flex muscle amid Russia tensions" published in The Wall Street Journal, the arrival of the USAF jets in the UK and in Europe is highlighted. It is noted that the U.S. does not intend to permanently deploy the jets in Europe until 2020, and that "several allied air forces, are also buyers."

https://www.wsj.com/articles/new-u-s-jet-fighters-flex-allied-muscle-in-europe-1493977219

But missing in plain view or perhaps plane view is the reality of the F-35 global enterprise being laid down prior to the arrival of any permanent U.S. deployment, and that global enterprise is being laid down by allies, not the U.S. simply by itself.

To take the key case, look at the United Kingdom.

Hidden in plain view is the fact that the UK is standing up its F-35 base PRIOR to the United States. And that the first squadron for the UK and Australia for that matter is being trained and equipped in the United States prior to their arrival in each of their countries. This is a case of the pilots and maintainers learning common approaches from the ground up PRIOR to standing up the new F-35 bases.

And not only that, but the facilities being established in Europe can provide a key sustainment and operational enterprise which the US as well as allies can leverage in common.

Or put bluntly, the U.S. if its follows an innovative sustainment model can gain significant savings and operational advantages from leveraging the European infrastructure, rather than flying in parts and other materials to support ITS jets. The impact of savings to the lift and tanking fleet for the USAF could be very significant indeed from coming up with a 21st century approach to sustainment, support and sortie generation.

It is not just about the US sending advanced jets to Europe; it is about the US being smart enough to embed its jets in a broad scale renorming of airpower associated with the coming of the F-35 to a significant part of the allied combat fleet at virtually the same time.

In 2016 I visited RAF Lakenheath and then in 2017 visited both RAF Marham and RAF Lakenheath to discuss the progress in standing up F-35 bases at both facilities.

The F-35 is a data rich aircraft and needs to see a 21st century basing infrastructure built to support it as is the case of with some other aircraft like Wedgetail, P-8 and Triton. The UK and the US are rebuilding in common their respective bases from which they will operate their F-35s.

During my visit to Marham 2017, I toured the new facilities and discussed the way ahead with senior staff.

There is a staff of 17 at the Lightning Force headquarters supporting the operational standup with nine specifically focused on the infrastructure aspects. They are busy simply in order to have the base ready next year to receive their first contingent of F-35Bs from their current base, which is in the United States.

The base will have a fully operational, training and support capability. Training, maintenance and various centers are being stood up. At the heart of the effort will be the National Operations Center in which logistics and operations are collocated and the U.S. will have personnel in this center as well.

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There are multiple synergies involved with the F-35 and the standup of the Marham Air Base, two of which highlight the US-UK working relationship.

The first is the synergy from America to the United Kingdom and back again. The UK has operators at Pax River, Edwards, Eglin and Beaufort Marine Corps Air Station. The planes coming from Beaufort will provide the standup for the first RAF squadron, namely,. 617 squadron.

The second synergy is between the standup among bases and lessons learned. Marham is being stood up and generating operational lessons learned back to the United States, both in terms of the U.S.'s standup of its own bases abroad and at home, and, notably in terms of shaping a new operational dynamic for RAF Lakenheath.

The USAF F-35s at Lakenheath can become integrated into the operational, training and support elements in the UK as well, shaping a new approach for the USAF as well.

As Wing Commander Butcher, the CO of 617 Squadron, underscored the possibilities:

"We want to take forwards everything that we've done in the pooling and implementation agreement in the United States, and try and see how we can transpose that into a UK model.

"We're looking to have jets taking off, F-35A's taking off at Lakenheath. Well, what if they have an issue and they need to land in Marham. Rather than take the time to move people, spares etc from Lakenheath up to here, what's to say that we couldn't conceptually have some maintainers from 617 Squadron repair the jet, sign off, send it flying again.

"Lakenheath is going to be busy base with the closure of Mildenhall. Increased efficiencies working with us would make sense.

"Could we potentially have F-35As operating out of Marham on a daily basis?

"How do we organize hot pit operations on each other's base?

"One can easily see how that could buy you a lot of combat flexibility, in terms of how you might do maintenance operations."

https://sldinfo.com/preparing-for-the-operation-of-the-lightning-force-infrastructure-operations-and-the-way-ahead-at-raf-marham/

And visiting RAF Lakenheath, the synergies underway are obvious as well.

According to Col. Evan Pettus, the Commander of the 48th Fighter Wing at Royal Air Force Lakenheath, England:

"We do not have a closer partner than the UK. We will both operate the F-35 from Marham and Lakenheath respectively, which are very close to one another.

"Shaping synergy between the two bases is clearly an important objective. We are working this process in a step-by-step manner, from understanding how we might operate F-35As from Marham and F-35Bs from Lakenheath, to deeper sustainment and training opportunities as well."

But the potential is even greater for synergy from the two bases working together across the region. During my visit last year I discussed the impact of the synergy of the US and the allies standing up at the same time

the new air combat force with then Col. Novotny, the 48th Fighter Wing Commander, and now General Novotny at the Air Combat Command.

"We are not flying alone; but joined at the hip. We will be flying exactly in the area of interest for which the plane was designed and can fly together, maintain together, and operate together leveraging the air and sea base for which the F-35 B will fly from as well. It is a unique and strategic opportunity for the USAF and for the nations."

https://sldinfo.com/raf-lakenheath-prepares-for-the-future-usaf-f-35as-and-f-15s-combine-with-raf-capabilities-to-provide-a-21st-century-deterrent-force/

General Novotny added that the two bases joined at the hip can provide a key strategic impact as well.

"As we get this right, we can bring in the Danes, the Norwegians and Dutch who are close in geography and the Israelis and Italians as well to shape the evolving joint operational culture and approach. Before you know it, you've got eight countries flying this airplane seamlessly integrated because of the work that Lakenheath and Marham are doing in the 20 nautical miles radius of the two bases."

The RAF, the RAAF, the USAF and the USMC are already learning how to integrate the F-35 into the air combat force at Red Flags, and recently have included the French Air Force in a Langley trilateral training exercise. But integration will be accelerated by the integration of normal operations from common bases throughout the European region as well.

As Novotny put it: "Doing Red Flags requires bring forces to Nellis and expending monies to come to the exercise, clearly an important task notably in learning to fly together in high intensity warfare exercises. But what can be shape from the RAF Marham and Lakenheath bases is frequency of operations with core allies flying the same aircraft."

"The same aircraft point can be missed because the UK did not fly F-16s, the Norwegian, the Danes and the Dutch do. And the USAF does not fly Typhoons and Tornados; the UK does. Now they will ALL fly the same aircraft."

"I did two OT assignments and we worked to get into Red Flag when we could to do joint training. Here we can do that virtually every day. We reach the Dutch training airspace, and can work with the Dutch, with the Brits, with the Germans, with Typhoons, with F3s, with the NATO AWACS. We take off and we fly 30 minutes to the east and we make it happen. It is Red Flag as regular menu; rather than scheduling a gourmet meal from time to time."

https://sldinfo.com/synergy-and-building-out-extended-nato-defense/

And it is not only European allies who can engage in the cross learning.

The Aussies and the Dutch are standing up their F-35s at about the same time, and cross learning between the Aussies and the F-35 European enterprise is clearly already underway based on my interviews in Australia as well.

In short, the UK is leading the way in shaping a new infrastructure for a 21st century air combat force and with its operational footprint at RAF Lakenheath, the USAF is well positioned to interact with this dynamic of change.

With the RAF and the USAF setting up four squadrons of F-35s between them at two nearby RAF bases, there is a clear opportunity to shape a common sustainment solution.
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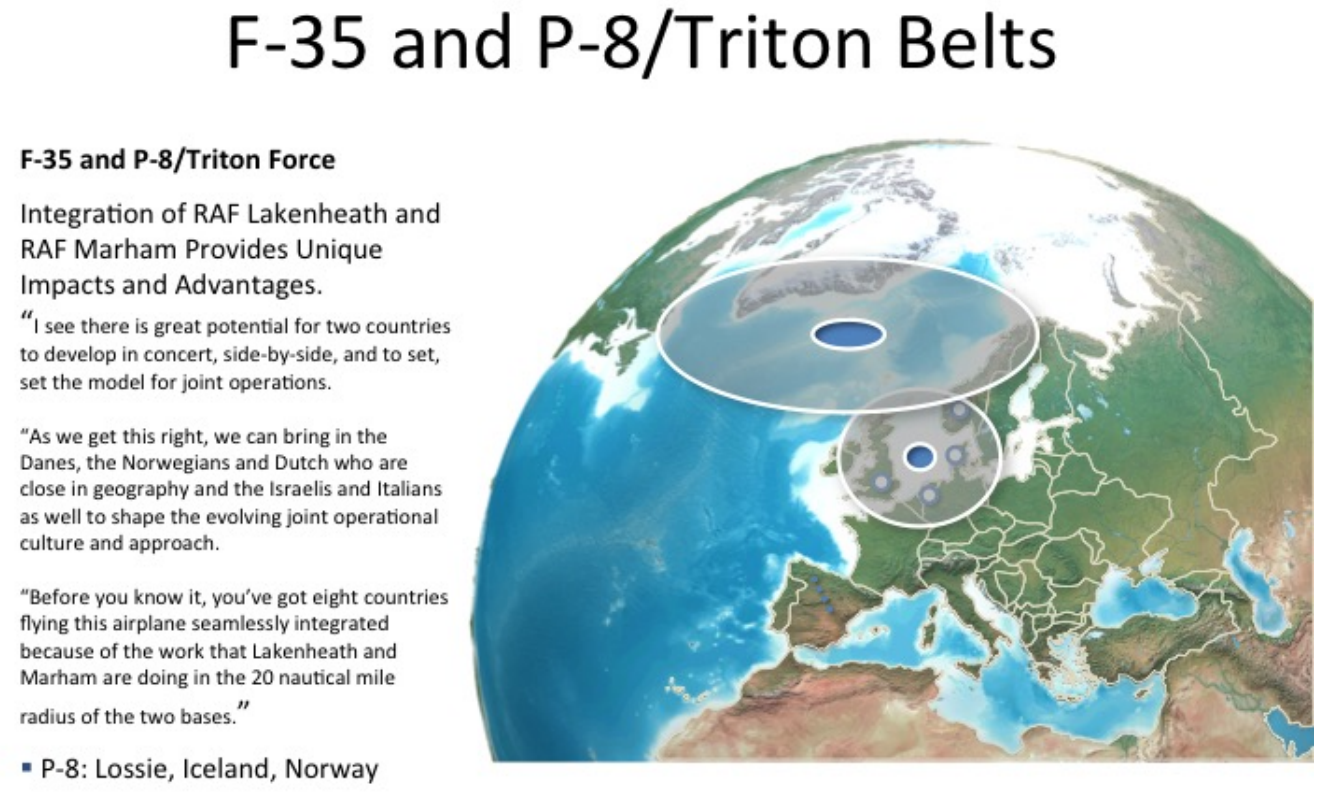
And the impact of so doing could be significant on the North Sea neighbors, namely, the Danes the Norwegians and the Dutch. This is clearly a key way ahead in building out NATO capabilities going forward, which provides a 21st century example of burden sharing which delivers relevant capabilities.



GRAPHIC REPRESENTATION OF SHAPING THE ISR AND C2 STRIKE ENTERPRISE ACROSS THE NORTH ATLANTIC WITH US AND ALLIED F-35S AND P-8S. CREDIT: SECOND LINE OF DEFENSE

AIRPOWER IN THE NEXT TWO DECADES OF THE 21ST CENTURY: SECRETARY WYNNE LOOKS AHEAD

11/16/2014

By Michael W. Wynne

In the development of airpower, one has to look ahead and not backward and figure out what is going to happen, not too much what has happened.

— *Brigadier General William 'Billy' Mitchell, USAS 1926.*

Although we are only fourteen percent of the way through the 21st century, it is not too early to begin asking ourselves what constitutes airpower in 2014.

Already, we have enjoyed over one hundred years of maturation that has been complemented by a diverse array of scientific advancement serving to augment our notion of flight.

To wit: we have gone very slowly with vertical take-off and landing, very fast with the breaking of the sound barrier, and we've achieved commercial and military supersonic transport capability.

Most experimentation, however, was conducted during the first half-century of flight, and this advancement culminated with manned space exploration and a future frontier that has been left to a new generation of explorers.

The airpower domain in its present construct lies in a controlled state where actions can be planned, modeled, and forecast with routine predictability.

This configuration, while a familiar and reliable process, has unfortunately led to atrophy in our quest to inject modern and innovative means into this domain.

In contrast, what we are witnessing in China is great enthusiasm for their space program as well as a drive to shape new and modern aerospace strategies.

The biggest challenge we may well face from China is our own lack of enthusiasm and a complacent assumption of superiority that was born from past achievement but not paid for in the achievements of the future.

From our perspective, cost has become a driving factor that puts the air domain well beyond the scientific realm and into the context of engineering.

Unfortunately, financial constraints have hampered the competitive spirit that brought us so much success in the past, and it has opened the door for competitive nation-states to overtake our capability and it positions them to best us in both domestic and global respects.

What does seem clear is that modern breakthroughs of the late 20th century featured fast transmission of information.

This led to concepts such as information as an asset and displays allowing great portability of decision making processes.

In military terms, this translates into situation awareness, and command and control.

This flattens hierarchies; and puts decision control closer to the point of application of weapons.

As this was largely an inspiration of American Ingenuity, it seems easy to forecast this infusion into Airpower in the coming decades.

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This allows for connectivity much talked of, and seen between the ground, maritime, and air domains, throughout the beginning stages of this century.

Conceptualizing the Way Ahead for Airpower: Rethinking the OODA Loop

We have reached a point where we must assess the airpower domain, and this should be accomplished using an appropriate contextual approach.

One approach that bears examination includes the underpinning of our armed forces' *raison d'être* as cited in our constitutional preamble: "To Provide for the common defense" of the nation.

Utilizing this founding premise as a fundamental benchmark, we will assess whether we continue to appropriately fulfill this critical mission.

Globalization may have brought the world closer together in terms of collaboration, but the United States remains a singular continent that can now be reached by the forces of military globalization, missiles and nuclear weapons.

Without air superiority, we can neither defend our land nor project power abroad.

If we rest our assumptions of superiority on an aging stock of proud yet outdated airplanes, we can never hope to prevail in the face of rising and adventurist powers like China and other modern adversaries.

In this piece, I would like to examine a way forward in understanding how we can recapture air superiority and the enthusiasm necessary to build and sustain it.

I am going to champion the ideas of John Boyd that, while initially targeted towards individual pilot, can also serve as a tool to building overall force capability in the next twenty years.

Leveraging the OODA Loop

A significant component of our mission is to preserve America's ability to act in its best interests and preserve national security.

In this context, let us look at the contribution of the airpower domain as a part of the larger Observe, Orient, Decide, Act (OODA) Loop- a concept first brought to our attention by military strategist Colonel John Boyd ("The Essence of Winning and Losing,"1996) when dissecting air combat. Boyd breaks this cycle into four interrelated and overlapping processes through which one cycles continuously:

- Observation: the collection of data by means of the senses
- Orientation: the analysis and synthesis of data to form one's current mental perspective
- Decision: the determination of a course of action based on one's current mental perspective
- Action: the physical playing out of decisions

In later years, Boyd expanded the OODA Loop concept and applied it to other forms of competition in society.

This included multiple sensor functions that deliver data or convert it into amplifying information.

Further, the Loop was applied in academic circles as it examined mental processes and allowed for a different approach to cultural, genetic and other inputs that arrive in later stages of the orientation period.

According to Boyd, decision points and sound courses of action are achieved by converting a wealth of information into useful, actionable data.

This provides a person with sufficient command and control relative to a situation, and ultimately this guidance allows for the successful carrying out of one's objective within the OODA Loop construct.

This procedural overview provides some intellectual backdrop as we take a good look at airpower in the 21st century, and as this discussion has already argued, shaping a force that leverages the OODA Loop is a key strategy in the way ahead.

Strategic Dominance

Another element that bears examination is determining whether the Air Force has remained on the strategic path fostered by the Mighty 8th in the Second World War, and also espoused by General Curtis Lemay.

Are we committed to strategic dominance in airpower, or are we just willing to have a checkmate with our adversaries and potential adversaries?

With the end of the air battle in Europe, the Army Air Corps and the services certainly understood that without air superiority and dominance, the Nazis would have been difficult to dislodge- let alone to defeat.

But what about today's Air Force?

Does it adopt a "just enough" approach in supporting the coalition of the willing-but-unable, or does it continue to serve as the strategic backbone for deterrence and global warfighting?

Combining this optic of strategic dominance with a macro look at the OODA Loop, how does our current approach stack up?

The Air Force Vision for 2013 was released just as the new Chief of Staff was feeling the harsh realities of a constrained fiscal environment.

With such restrictions in mind, his vision would ultimately be considered an aspirational perspective, in spite of the ideas communicated by the Commander.

Still, his guidance could not be wholly disregarded, as it remained instructive in measuring his strategic ideas against the intellectual foundation of the OODA Loop.

A look at excepts of the Vision Statement will provide a better understanding:

"The world's greatest Air Force – powered by Airmen, fueled by innovation

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The Air Force's enduring contributions are rooted in our original roles and responsibilities that were assigned in 1947.

Today we call them:

(1) air and space superiority;

(2) intelligence, surveillance, and reconnaissance;

(3) rapid global mobility;

(4) global strike; and

(5) command and control.

We already combine our air, space, and cyber forces to maximize these enduring contributions, but the way we execute these five calling cards must continually evolve as we strive to increase our asymmetric advantage.

"To strengthen our enduring contributions, the Air Force will:

• Deter and defeat adversaries with a credible first look, first shot, and first kill capability;

• Hold our adversaries and what they value at risk while operating on a global scale with unmatched joint integration;

• Exploit and defend air, space, and cyberspace, especially in contested environments, while denying our adversaries unrestricted use of the same;

• Integrate and organize our Active, Reserve, and Guard forces to leverage the unique strengths and perspectives of each to seamlessly execute Air Force missions;

• Enhance relationships and interoperability with our sister Services, other government agencies, allies, and partners;

• Better train Airmen to bring their unique specialties together in more realistic, intense, and diverse environments to advance integrated airpower operations;

• Emphasize readiness to ensure the highest quality force, regardless of size;

• Modernize our capabilities to reduce operating costs while attaining desired effects with greater persistence, survivability, longer range, and more versatile payloads."

While this language provides more of a forward looking and futuristic perspective, it is also important to consider the past if we are to gain some grounding in moving forward.

An example of this involves the modern day dilemma of **incorporating the cyber mission** into The Mission of the Air Force.

At present neither the Air Force nor the nation possess superior capability within this discipline, however it should be remembered that Air and Space missions once undergone similar struggles while in their formative years.

In this regard, it is important to not only look forward, but also rely on lessons learned of past initiatives.

The OODA Loop As A Measuring Stick

Casting the new Air Force Vision against the underpinnings of the OODA Loop is a revealing and worthwhile effort.

In this section, each step in the Loop cycle will be applied to our modern concerns with reinforcing airpower.

Observe

Strategically, intelligence, surveillance, and reconnaissance (ISR) activities fits nicely into the Observe element, as does the emphasis on Space operations.

This is all about gaining access to information that might otherwise be denied, but there is also an emphasis on enhancing relationships and interoperability with our 'go to war' partners.

In this modern era of social media, this reach must now extend to areas undergoing current analysis- to include the Observable Data that is captured by all of the flying or orbiting sensors that the 'go to war' partners currently provide.

This is element is one that our intelligence services currently grapple with, and it goes hand in hand with managing the impressive flow of observable data that is shared all around the globe each day.

With the acceleration of modern technology and the capability to collect increased amount of data, it is incumbent upon the Air Force to recognize that significance of this influx of data.

An increased awareness across the service will facilitate the possibility that information sharing will be achieved between its forces and allied or sister service sensors.

For the moment, let us presume that the groundwork exists to increase the flow of data and apply advanced analytics to enable awareness of all available observable facts.

Let us also presume that these data points can be converted into actionable information that is readily available to commanders and planners.

In achieving this, we can fulfill the requirements of step one of the OODA Loop by fully addressing the Observe function.

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For the purposes of the Air Force, this must mean that an investment stream is effected that can extract maximum knowledge from all information culled 'see deep' radars- whether they are on airborne, maritime, or space platforms.

With such an abundance of tactical data, the critical question becomes, "Where do all of the captured observations go, and how will they contribute to the next step in the OODA Loop with respect to achieving airpower?"

Orient

Looking at the Orient part of the OODA Loop, the Air Force Vision emphasizes readiness and training in two major areas: training for airpower exercises (which points to the exploration of capabilities), and limits or surprise elements that may be available to the engaged forces.

Such readiness and training in the form of joint and partner exercises will add to the critical leverage and agility in this step of the planning cycle.

Admittedly, training the decision makers in force capability can be a tricky element.

Most have grown up inculcated by only their service orientation, and any shared knowledge for sister service capabilities is only superficial because it is brought to the table from outside of a particular service's native environment.

It takes engagement in joint exercises before one can truly begin to understand how unfamiliar systems can boost operations during an engagement.

It is this element of synchronizing our resources that is explored in the concept of operations, and it underscores the importance of recognizing alternatives that can fill a gap in capability.

This concept must be resident in the mind of a commander if he or she wishes to seek and successfully solicit methods capability of achieving his objective.

Concepts for joint effect such as *The Long Reach of AEGIS* (published in the U.S. Navy publication Proceedings) aptly demonstrate this compounding effect of application of our modern systems.

It is this synthesis of data that serves as the benchmark of the Orient portion of the OODA Loop.

Situation awareness can now be shared among combatant units from ground and maritime units with their air elements and with strategic air elements to both deter or destroy aggressors, and so in real time Command Authority intent can be rapidly translated to action and effect.

At its most basic essence, orientation really drives at the nature of readiness.

In the modern warfare environment, warfighters cannot be effective if they only possess an understanding of the capabilities of their own platforms.

In order to fully understand the synergy and extension available through the interaction of the various offered platforms, they must be smart on assets available from the 'Go To War' partners.

Further, data flow in the modern day has become far more automated as transmissions occur from machine to machine and no longer requires a question and response trigger in order to facilitate communication exchange.

This automation impacts the Orient step at an individual level as the lone Battle Manager must ensure a "human" and therefore logically sound synthesis of information is achieved.

This step away from automation at the ground level is critical as assessments and judgments are often fed directly to strategic decision makers and perhaps even the National Command Authority.

The discussion on Orientation could extend, as it does during wargames, from the diplomatic level to the time-sensitive and wartime scenarios of competitor reactions and tactics.

It is important, therefore, that we not limit ourselves to only the decisions executed by higher-level strategists and decision makers.

As previously mentioned, Colonel Boyd developed his theories by examining 'dogfights' between two competent fighter pilots.

In the modern day, it is a rarity to witness this 'mano a mano' conflict, and for the focus has shifted to training towards a 'many on many' premise, ideally with leverage from numerous available systems and support platforms.

It is a far more difficult and complex problem to match our force against the evolving combat environment, and the capability to conduct dogfights has been replaced by the need to influence events in a 360 degree operational space.

Today there are far more systems working to deny us the capability to maintain airpower superiority.

Interestingly; our army and naval commanders are already familiar with the depth and breadth of synthesized planning as they participate in fleet and theater operations in a joint environment.

In the past many of these same strategies have been applied as air armada operations reprising World War II tactics have been utilized.

These pre-strike sorties have enable understanding of enemy strengths and weaknesses, in addition to accurate targeting data and localization of anti-access systems.

Dynamically, the use of fifth generation aircraft as target location systems may not be seen as satisfying to the traditionally trained pilots, but it can serve a vital role for forward observers in concealed locations.

If executed fluidly, the flow of information on targets can be near real time so that the data is oriented and proved useful to commanders in pressing a plan.

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In sum, the 360-degree revolution and the ground-to air revolution that is already witnessed with the remotely operated visual enhanced receiver (more commonly known as ROVER) provide a key perspective to shaping the future of airpower, as well as a view of airpower beyond what the USAF traditionally considers its operating domain.

Decision

We now arrive at the decision point and its associated methodology.

The Vision statement describes command and control systems as a paramount operating commitment to the Air Force.

The operation of this resilient system could very likely be under assault during the run up to an engagement, as the world saw during the run up to the invasion of Georgia by the Russian forces and the run up to diplomatic negotiations with Estonia.

Our peer competitors got to practice with real time integration of cyber and physical forces, and this has been accomplished in joint exercises ever since.

Whether it is a day without space, or communication under duress, it is all a part of the Decide point in the OODA Loop.

To put it in more concrete terms, when one sends two B-2s or two F-22s to the North Korean deterrent fight, what options does the national command authority really have if their bluff is called?

As the Air Force considers itself to be a part of the run up and flow down Decision points, it is incumbent on the Air Force to ensure the integrity of the data flow in both directions.

By extension, there then exists a sharing of this integrity amongst the various agencies that serve as information providers and decision executors.

The Air Force mission to be in Cyber is all about an awareness of this responsibility and the impact of trusted data to its forces, and this will only grow in importance over time.

Action

The final element in the OODA Loop is Action.

We have seen the Air Force's role in the Observe, Orient, and Decide elements, but it is in the Action portion that the essence of military force resides.

Sir Winston Churchill has best described our state of affairs as, "The power of an air force is terrific when there is nothing to oppose it."

This has been the state of play in the engagements for the past quarter century, and this has misled key decision makers to consider investment in the air domain as a waste.

Decision makers failed to look to forward and anticipate a future with peer competitors, and instead they decided that sitting on their lead was sufficient in the name of saving resources.

Secretary Robert Gates once said in a speech to the Economic Club in Chicago:

Consider that by 2020, the United States is projected to have nearly 2,500 manned combat aircraft of all kinds.

Of those, nearly 1,100 will be the most advanced fifth generation F-35s and F-22s. China, by contrast, is projected to have no fifth generation aircraft by 2020.

And by 2025, the gap only widens.

The U.S. will have approximately 1,700 of the most advanced fifth generation fighters versus a handful of comparable aircraft for the Chinese.

Nonetheless, some portray this scenario as a dire threat to America's national security.

This projection, although seemingly ominous, turned out to be false in two respects.

First, Chinese and Russian fifth generation fighters were indeed manufactured, and domestic cutbacks started almost immediately prior to the F-35 program.

The potential of a threat to America's security was certainly not yet dire; but one cannot help but wonder if these developments have signaled a drift in priorities.

As General George Kenney was said, "Airpower is like poker. A second-best hand is like none at all — it will cost you dough and win you nothing."

Even Secretary Donley, who while Secretary Gates was in the position wrote a letter supporting Gates' decision to stop producing F-22's has now testified that " The Air Force has stretched the risk we can prudently take and must push now to get the most combat power possible from our forces."

Strategically, "action" is where most armed forces dwell and operate most effectively.

This is also the beauty of the OODA Loop, as it transcends levels of scope and allows each stage to explore uses of the components of its forces.

At the same time, this devolvement may result in independent behavior and what has become 'islands of excellence' or 'stovepipes'.

One of the best examples of this involves the use of geography to establish operational division between ground units.

In Iraq 2003 for example, the Euphrates River was used by commanders to separate successful campaigns by the Coalition Army and Marine forces.

Each supported one other by protecting the common flank, which was the river itself.

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This effort became muddled as progress reports became discordant, and command authorities began to order slowdowns and halts- a move that was strikingly similar to Eisenhower's commands of British and American forces in the Second World War.

For these reasons and more yet; it is heartening to see the Air Force Vision statement utilizing terms like integrate, and interoperability, and building relationships.

Actions taken in the rapid-fire future engagement will need nearly machine to machine coordination as the weaponry flies farther; and with more devastating effect, and mastering these concepts of integration, interoperability and relationship building will become crucial stepping stones.

Additionally, with our forces diminished by obsolescence and budgetary drawdowns; we must believe our 'first look, first shot, first kill' slogan so as not to waste precious commodities of the future fight that include projectiles, missiles, bullets and cruise missiles.

Credible feedback as the battle progresses may be a difficult commodity, but it is incumbent on the Observe element to continue to provide situation awareness to every level of command.

We must fully integrate the force so that every shooter is a sensor, and some sensors as shooters can provide facts about targets and anti-access platforms that will minimize our own casualties.

The Need for an Attack and Defense Enterprise

In this element of the OODA loop is where the offensive enterprise resides.

This enterprise is composed of all the elements for expeditionary warfare, to include resupply.

The Air Force, in designing its force structure, also serves as the supply element for other services in rapid mobility exercises.

As an example, the tanker force does not only function as a self-servicing agent, but also as an asset for joint and coalition forces.

In the same vein, in this time of reduced resources, the Air Force must look to coalition partners as it has in the past to provide needed firepower and support elements that go beyond airfield support.

When Admiral Mike Mullen was alluded to building a "thousand ship Navy," he envisioned that our coalition partners would be included in our own force element.

Similarly, the Air Force must also count the tankers, C-17s, as well as the complementary fighter elements that may be made available to counter competitor actions. It has become increasingly clear that our governing body will not be able to provide a complete complement of ready forces as we formerly were accustomed.

How this risk is characterized should be left to the word of the active military commanders, but it has been clear that in future operations, a reliance on coalition equipment is paramount.

By 2025, the Air Force should size its offensive capability around the fifth-generation force construct. The fourth-generation aircraft should be dominantly assigned to the defensive enterprise, chiefly protecting the Homeland and some expeditionary locations.

The vulnerability of large command and control aircraft is well known, but America continues to believe that we will own the skies in the future fight.

This is an unsustainable prediction.

Our aircraft may retain utility as requirements develop and evolve, but one wonders about the allocation of resources between assured victory and the aftermath.

This is the decision that must underscore the future of airpower.

As one fighter pilot put it when asked about the results of 'Cope India' in early 2007, "Thank goodness we competed with degraded capability, because when the competitor discovers they can kick your ass;, they won't stop at their border or yours." Should this occur, thing will be sure to get ugly.

In the case of Space, Cyber and Transportation, funding should not be spared with respect to training and support of the offensive enterprise with respect to national objective support.

Unfortunately, when funding constraints start to where they are trained and support the offensive enterprise or can be shown to become a reality, objectives can become obscured.

Our dominance in Space currently rests in quantity, and this should not be confused with military dominance other than when it is used in support of military operations.

We have not had a conflict involving space assets, but we have seen other nations training to conduct such conflict. The rules for such a conflict are not yet clear, and thus research into resiliency such as fractionated satellites or other survivable mechanics have not been invested.

During this interwar period, such an invention might well turn future tides in battle.

With our forces growing more and more reliant on space capabilities, a ten-year target for truly resilient space should be developed.

Cyber has already seen application in war as demonstrated during the campaign in Georgia.

In this case the national ability to connect was denied in parallel with aggressor action that crossed the border.

Such denial resulted in a successful invasion that persists to this day with hostile troops occupying a part of that nation.

The current cyber war is more economic than military, but it is also so clandestine that attacks and aggressive defense have been masked in the related activity.

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There will need to be research on how to ultimately defend or cover our intended activities.

The current concept of mutual assured destruction as adapted to each domain is currently in vogue, but the extension into cyber belies the low barrier to entry, and makes it mandatory to put in place true barriers. That said, tailoring for each service application will continue to dominate current investment.

Nothing has happened to detract from making Cyber more and more intrinsic into operations and administration, and war logistic and humanitarian activities- especially as commercial applications- become increasingly adaptable.

Adaptability and agility will dominate this domain, thus impacting command and control activities. Investment in training and integration with other force elements will therefore become critical.

Re-Shaping the Technological Advantage

One of the first uses for the OODA Loop was to foster energy maneuverability in fighter design.

This application of physics was at first left to the winners of engagements during World War I and World War II; but Colonel Boyd used it to advocate for the design of the lightweight fighter that became the F-16.

In a famous photo comparison; his theory was played out illustrating the turning radius of the F-4 and the F-16, where it was clear that the F-16 could start out as the hunted and end up quickly as the hunter.

From this illustration, well over 7,000 aircraft have been produced for use by air forces all over the world, and many more for configurations of missiles.

This use of the OODA Loop has clearly resulted in fewer one on one fights, and a greater concentration on force to force operational concepts. 'First look, first shot' is the war cry today and not 'Give them the gun'.

During this same period, concepts for anti-access; and counter anti-access became design elements, and conceptions for 5th Generation Fighters came about via the F-117, B-2, F-22, and F-35.

It is safe to say that the ferocity of the anti-access forces appearing in a less than peer competitor during the Vietnam War was a strategic surprise, and it was countered by technological advance and investment.

It is clear that the "Action" part of the OODA loop is highly dependent on whether this technological advance is followed through to a real force advantage.

All of the elements of our current Air Force- whether Space, Cyber, Transport, and our magnificent Airmen who provide at a moment's notice- work at a deliberate pace in responding to the national command authority decision to act.

My own doctrine: " If you are ever involved in a fair fight; it is the result of poor planning." emphasizes proper action throughout the OODA loop; and entails actions by resource decision makers and department leadership to maintain our strength and resilience in periods of high activity and periods of pause.

Even with the chastisement of Secretary Gates for his prognostication, the words of a former Russian diplomat ring in my mind:

"The future is not understandable, and we do not entertain predictions."

There must be planning that reasonably reflects the desires for maintaining our national sovereignty, and the opportunity to contribute to lasting peace through strength can be achieved by implementing the OODA Loop.

Conclusion

Airpower in the 21st Century will be all about maintaining a sufficient deterrent capability to preserve the always-fragile peace.

Airpower provides leverage to our diplomats and it provides credibility to our joint operations.

We spent the better part of the 20th Century identifying and developing the lead technology of stealth and we embedded it into our fifth generation of fighters and bombers.

This progress must be maintained.

The fusion of information transmission between the land, maritime, and air combat components must be a near term goal to leverage every aspect of our forces engaged.

This accelerates the OODA loop by insisting that every shooter be a sensor; and some sensors as shooters as well.

Transmission of information will strain our capabilities, and stress the security element; but with the pace that all discuss in future war; keeping the command authorities abreast of the action will serve all well.

There will be fewer resources available for our military as our assets dwindle and the capability to leverage forces from engaged partners emerge as the key to victory in the future fight.

The recognition by our international partners is clear evidence that this investment was in the right direction, and this investment must continue.

To close; let it be said by our past leaders:

If our air forces are never used, they have achieved their finest goal.

— *General Nathan F. Twining*

If we maintain our faith in God, love of freedom, and superior global airpower, the future [of the US] looks good.

— *General Curtis Lemay*

This is the mission and goal of airpower in the 21st Century.
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