

The F-35 and The Transformation of the Power Projection Forces



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Fifth Generation Enabled Combat Capability

This report is based on interviews with the USMC, the US Navy, the U.S. Air Force, the Royal Navy, the Royal Air Force and the Australian Defence Force and highlights the context within which U.S. and allied forces are in the process of transformation enabled by or accelerated by the coming of fifth generation air combat capabilities.

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FIFTH GENERATION ENABLED COMBAT CAPABILITY

Introduction	3
Transforming the Power Projection Forces for the Liberal Democracies	4
Building the Honeycomb Force	5
An Update from British, Australian and American Forces	6
Building Platforms After Next	13
F-35B at Farnborough: Strategic Deterrence with Tactical Flexibility	14
Airpower in Contested Airspace: Highlights from the Trilateral Combat Exercise	18
Fighting with the Force You Have Now While Preparing for an Airpower Transition: The Perspective of General “Hawk” Carlisle, Air Combat Command	23
USAF Moves Forward with Integration of F-22 and F-35	26
How the Units/Aircraft Will Train Together	26
Becoming an F-22 Multi-tasking Combat Aviator	27
Raptor Pilot Qualities	28
Adversary Air	30
Fights On	31
The Deputy Commandant of Aviation Down Under: Plan Jericho Marine Corps Style	33
The Sea Services Prepare to Prevail in the Extended Battlespace: The Perspective of Rear Admiral Manazir	36
Rear Admiral Manazir in Australia: Allied Convergence on the Kill Web	43
The Future of Naval Aviation Aboard the USS George Washington	45
The Way Ahead in the RAAF in the Joint Forces Space and the Coming of the F-35: The Perspective of Air Commodore Kitcher	48
Shaping a Way Ahead for the F-35 in UK Defence: The Perspective of Air Commodore Harvey Smyth	53
The Synergy Built Into the Queen Elizabeth Class Carriers and the F-35B	61
Transforming the Royal Air Force’s ISTAR Force: A Discussion with Air Commodore Dean Andrew	65
The Impact of Software Upgradeable Aircraft	68

From Deployments to the Baltic Region to Empowering the Kill Web in Defense of the Homeland: UK Evolution?	72
Synergy and Building Out Extended NATO Defense	74

INTRODUCTION

The F-35 has been operational with the USMC for more than a year, and this summer with the USAF. The US Navy is getting ready for the introduction of the F-35 and already sees it as a key element of and trigger for what Navy leadership calls the kill web. This means that the F-35 is seen both as a new capability but part of a much broader transformation of the power projection force.

In this report, we look at perspectives of the US services and the allies on the impact of fifth generation enabled combat capabilities and ways to think about the patterns of transformation of the power projection forces.

Interviews have been conducted at the major bases and warfighting centers in the United States as well as interviews in the UK and Australia as well. There is a convergence of thinking about the broad strategic direction of the reshaping of power projection forces but a diversity of innovative approaches with regard to how best to achieve change.

21st century warfare concepts of operations, technology, tactics and training are in evolution and revolution. The F-35 is at the heart of this change for a very simple reason – it is a revolutionary platform, and when considered in terms of its fleet impact even more so. The F-35, Lightning II, will make combat aviation history with the first of kind sensor fusion cockpit. The F-35 is essentially an F/A/E-35 that makes it effective in AA, AG and EW combined missions. Allied and U.S. combat pilots will evolve and share new tactics and training, and over time this will drive changes that leaders must make for effective command and control to fight future battles.

An issue has been that the F-35 has been labeled a “fifth generation” aircraft, a sensible demarcation when the F-22 was being introduced. But the evolution of the combat systems on the aircraft, the role of the fusion engine, and the impact of a fleet of integrated F-35s operating as a foundational element will make the current term “5th Gen” obsolete. The F-35 is the first of a new generation of design features and airborne capabilities that will change everything. It is a first generation information and decision making superiority “flying combat system.”

The global fleet of F-35s will be the first generation for building a foundation for a fundamental change in the way air power operates in overall combat concepts of operations. It is not in and of itself a single aircraft platform; it is about what an integrated fleet of F-35s can deliver to TRANSFORM everything. The decade ahead will be very innovative. Combat warriors, at all ranks, can leverage what they learn and then apply those lessons to reshaping the force over and over.

The impact of an integrated fleet of F-35s with fused internal pilot combat data and also distributed information out, will allow the US and its allies to rethink how to do 21st century air-enabled operations. Each F-35 will be able to network and direct engagements in 360-degrees of 3-dimensional space by offloading tracks to other air/land/sea platforms including UAVs and robots.

The current head of the ACC when he was PACAF looked forward to the time when allies and the US forces had substantial numbers of F-35s flying in the Pacific area of operations and highlighted how dramatic he saw the coming changes to be.

“General Carlisle was asked what would be the impact of a fleet of F-35s (allied and US) upon a Commander of PACAF a decade out. It will be significant. Instead of thinking of an AOC, I can begin to think Second Line of Defense

of an American and allied CAOC (Combined Air Operations Center). By sharing a common operating picture, we can become more effective tactically and strategically throughout the area of operations.”

<http://www.sldinfo.com/the-pacaf-commander-and-reworking-pacific-defense-the-aor-will-become-a-caoc/>

The most neglected aspect of the roll out of the F-35 is its global nature. It is not just about the three US services, it is about partners and allies concurrently rolling out their F-35s and sorting out how their new air systems transform their forces. The F-35 is not an airplane; it is a global air combat system.

Although the F-35 is a U.S. aircraft, it has significant foreign content provided by an integrated global network of suppliers. With the introduction of F-35s globally, comes the nascent global sustainment enterprise. The forces are working out ways to leverage the commonality in the plane and the support structure to sustain those planes in combat.

It is a nascent effort, but is already laying down building blocks such as sustainment enterprise in Europe and Asia to support the partners, and the operation of U.S. forces from regional support centers, such as being built by the Italians, the Dutch or the Australians. The roll out of the aircraft is built upon a common logistics enterprise shaping a global sustainment effort similar to that of the successful the C-17 global enterprise.

Global defense industry, not just the U.S. defense industry, is significant to building AND sustaining the F-35. About 30% of the F-35 fleet will be built with foreign content, and the maintainability will rest on best practices from global suppliers. The F-35 logistics enterprise will not simply be forced to rely on sole source suppliers for any number of key parts produced globally. And with the system to identify parts, the performance of those parts will be put to the test and the better performing parts suppliers determined by performance in combat and in operations, not simply determined in a procurement bureaucracy.

Besides the US, the F-35's nine partner countries are Australia, Canada, Denmark, Italy, the Netherlands, Norway, and Turkey. And they're a number of other countries buying the aircraft via a more traditional FMS acquisition route, including; Japan, South Korea, Israel and possibly Singapore. Each of these countries is buying the F-35 as part of their overall efforts to shape 21st century defense forces.

The global nature of the fleet – is a trigger for change and key allies are looking at F-35 enabled defense transformation. The coming of the F-35 triggers key aspects of shaping 21st century concepts of operations, we will focus on an examples of how concepts of operations can be reshaped, namely the evolution of “tron warfare” under the impact of the F-35 global fleet.

Leveraging the F-35 triggered transformation, rather than pursuing a stove-piped platform modernization and upgrade strategy, will be the essential catalysis to shape new platform acquisitions. The decade ahead will be one of significant innovation which will in turn build a technology, training and tactics foundation for what new systems will be important to develop in the decade after next.

TRANSFORMING THE POWER PROJECTION FORCES FOR THE LIBERAL DEMOCRACIES

The period ahead could be a very deadly one for the liberal democracies. Ill-liberal powers whether they be states (Russia, China or Iran) or irredentist movements spouting 12th century values are clearly working to change the global order to their advantage.

Many factors of power are in play, but clearly one of them is military. And if the liberal powers can learn to not dissipate their military capabilities and investments in nation building and other diversions, the reshaping

of insertion forces able to meet threats and to meet clearly established political objectives can be strengthened.

Indeed, the decade ahead can be one of significant transformation for the military forces of the liberal democracies. Most of the platforms necessary for transformation already exist; what is needed is more investment in standing up the new force and commitment to the culture change which a transformed military can deliver.

Also, crucial is changing the culture of the “high priests of strategy” who can find many places to send the military to serve metaphysically defined rather than Realpolitik objectives. There needs to be a transformation of the strategic culture to recognize that setting clear and limited objectives and achieving clearly delineated strategic objectives is necessary prior to sending the military as errand boys for abstract and undefined objectives.

Building the Honeycomb Force

Earlier, in our book on **The Remaking of American Military Power in the Pacific: A 21st Century Strategy**, we argued that a new approach to military transformation and engagement between the U.S. and allies and partners in the Pacific was necessary to protect the interests of the liberal democracies in the Pacific.

The evolution of 21st century weapon technology is breaking down the barriers between offensive and defensive systems. Is missile defense about providing defense or is it about enabling global reach, for offense or defense? Likewise, the new 5th generation aircraft have been largely not understood because they are inherently multi-mission systems, which can be used for forward defense or forward offensive operations.

Indeed, an inherent characteristic of many new systems is that they are really about presence and putting a grid over an operational area, and therefore they can be used to support strike or defense within an integrated approach. In the 20th Century, surge was built upon the notion of signaling. One would put in a particular combat capability – a Carrier Battle Group, Amphibious Ready Group, or Air Expeditionary Wing – to put down your marker and to warn a potential adversary that you were there and ready to be taken seriously. If one needed to, additional forces would be sent in to escalate and build up force.

With the new multi-mission systems – 5th generation aircraft and Aegis for example – the key is presence and integration able to support strike or defense in a single operational presence capability. Now the adversary can not be certain that you are simply putting down a marker.

This is what former Air Force Secretary Michael Wynne calls the attack and defense enterprise.

The strategic thrust of integrating modern systems is to create an a grid 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 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.

When one can add the strike and defensive systems of other players, notably missiles and sensors aboard surface ships like Aegis, then one can create the reality of what Ed Timperlake, a former fighter pilot, has described as the F-35 being able to consider Aegis as his wingman.

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

Second Line of Defense

Inherent in such an enterprise is scalability and reach-back. By deploying the C5ISR honeycomb, the shooters in the enterprise can reach back to each other to enable the entire grid of operation, for either defense or offense.

<http://www.sldinfo.com/crafting-an-attack-and-defense-enterprise-for-the-pacific/>

U.S. forces and policies in the region provided a crucial lynchpin providing the reachback and dominance necessary to protect national and allied interests. The intersection of honeycombed force packages operating as modules and interconnected through networks will allow US and allied forces to shape a distributed force into the area of interest, and to provide strike and defense capabilities throughout a combat or spider's web of operational capabilities.

An Update from British, Australian and American Forces

Since we published that book in later 2014, we have had the chance to talk extensively with British, Australian and American military innovators who are creating the reality, which we projected in our book. And new combat systems have come into being which are providing key building blocks for the new approach such as the Wedgetail, the A330MRTT, the F-35 and the P-8/Triton combination.

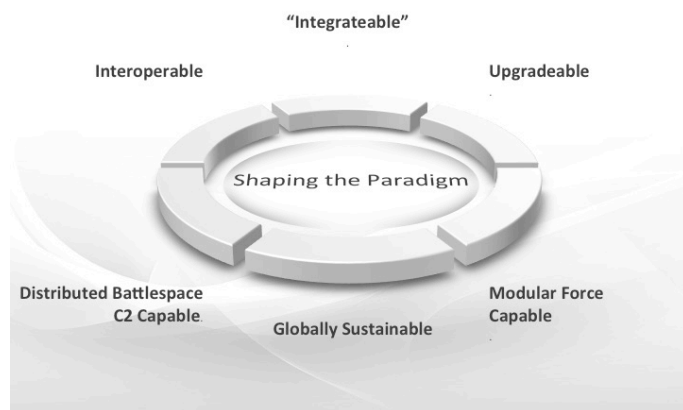
In effect, a new foundation is being laid for the decade ahead in the transformation of the power projection forces and lessons learned by the warriors in combat, exercises and training will shape the way ahead for the decade after next. Even though some technologies can be identified as important to the next decade, it will be through the shaping of a new paradigm through which new platforms will then be built and along with them incorporated or adjacent technologies.

<http://www.sldinfo.com/rear-admiral-manazir-in-australia-allied-convergence-on-the-kill-web/>

From the discussions with the US and allied warfighters, a number of key characteristics can be identified with regard to key elements of the new paradigm of the kill web, or the honeycomb operational force. The decade behind us was one where the platforms became connected and the joint and coalition force learned to leverage the benefits of such a force. Now that is expected, and the build forward is to shape an distributed but integrated force.

Platform Characteristics

Building Blocks for Kill Web or Honeycomb Modular Force



First, platforms are expected to be interoperable.

If they are not, then they need to be replaced. The Australian Plan Jericho has been exploring among other things, how to bring those platforms considered important which are not interoperable with the combined force into the picture.

For example, in a Jericho Dawn exercise held last March, the Aussies sought to find ways to take an important Army asset, the Tiger assault helicopter, and to connect it to the RAAF's air combat force.

According to an Australian Ministry of Defence press release on March 21, 2016, the exercise was described as follows:

Our Army is focussed on two key areas to ensure improved air-land integration. The first is to deliver better communication systems to ensure an agile, efficient and timely response to an intelligent, well-armed and motivated adversary," said Major General McLachlan.

"The second is to advance how we plan and conduct air-land operations to deliver the right effect, at the right place, at the right time.

"The demonstration highlights how we can better harness the strengths of our team by digitally connecting air and land platforms.....

Capabilities involved include RAAF's C-17A, AP-3C, KC-30A, E-7A Wedgetail and FA-18 Hornet aircraft, as well as the Army's air-land enablers from the 16th Air Land Regiment, Tiger armed reconnaissance helicopters from 1st Aviation Regiment, and vehicles and equipment from the Combined Arms Training Centre.

<http://www.sldinfo.com/jericho-dawn-the-aussies-shape-21st-century-ground-maneuver-forces/>

Second, platforms are expected to be integratable from the ground up.

As Air Marshal Leo Davis put it:

"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?"

Second Line of Defense

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?”

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?”

And to clarify what this means for platform acquisition, Air Marshal Davies discussed the Tiger case.

“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.”

<http://www.sldinfo.com/mastering-the-reshaping-of-the-joint-force-capability-puzzle-a-discussion-with-air-marshal-davies-of-the-royal-australian-air-force/>

Third, systems are expected to be upgradeable from the ground up. A new approach to integratability is associated with what might be called the coming of software upgradeable aircraft, such as the P-8/Triton, F-35 or Wedgetail.

Software upgradeability provides a key opportunity to evolve the capabilities of an air combat platform without having to change the hardware and correlated software configurations through a complicated upgrade process.

And the software will evolve with the evolution of the threat and the coming of additional opportunities to shape a “new” aircraft, which will look the same but not operate the same in the battlespace. That is the point about software upgradeability.

<http://www.sldinfo.com/the-software-upgradeable-combat-aircraft-the-case-of-the-p-8/>

The introduction of software upgradeable systems introduces a new dynamic as well. Clearly, the manufacturer needs tight configuration control over the core systems software. That is clear; but the shift is to shape an application layer on top of the core systems software, which can be introduced much more rapidly. The military is envisaging their own version of the Apple development, modernization and migration model.

In an interview with the RAF ISTAR force commander, the importance of integrated upgradeability was seen as crucial to shaping the evolving force.

As the core platforms are replaced by an all software upgradeable fleet, the possibility could exist to put the platforms in competition with one another for modernization upgrades.

“Which upgrade gets the priority for which platform to make the greatest contribution to the integrated ISTAR capability are the sort of decisions that should lie with the ISTAR Force in the future – it is at Force level, not within individual programmes and projects that the overall capability benefit can be seen and prioritized.”

We then discussed the notion of transformation as a process, not an outcome.

The Air Commodore was very keen to stress again the need for “cultural change, where the aperture is opened for the team and they can embrace greater integration”

“We have the iPhone 6 generation in the Force now, yesterday’s analogue approach to our business is no longer appropriate.

“With the aperture fully open, the individual platforms and capabilities become the apps that enable the integrated Force ‘iPhone’.

“Thinking of it in this way, will allow us to tap this new generation of warriors.”

<http://www.sldinfo.com/transforming-the-royal-air-forces-istar-force-a-discussion-with-air-commodore-dean-andrew/>

Fourth, the platforms function in networks but it is not about some giant global network, which can be disrupted; it is about force packages operating as modules working together to achieve objectives and their power extended as they are connected with other force packages.

In effect, the senior commander’s roles, which shift to assembling, deploying, evaluation and augmenting or withdrawing force packages as dynamic tasks, are achieved. It is not about managing the tactical details of forward deployed operations.

For example, work at 2nd Marine Expeditionary Brigade is focused on shaping such a capability.

2d MEB is clearly focused on working international naval relationships, which played a key role in Bold Alligator 2014 and Exercise African Lion 2014, the largest exercise on the African continent.

In Bold Alligator (2014), the Marines worked an interwoven C2 relationship with the Dutch, who also commanded the USS Arlington, a new US Navy LPD, and worked for and adjacent to the Navy-Marine Corps construct.

Coalition participation required installing CENTRIXS, an allied communication system, on the USS Kearsarge, which improved the forces’ readiness for future crisis and contingency operations.

Throughout the exercise, 2d MEB experimented with various configurations of MAGTF C2 support for operations by leveraging the enhanced US and allied seabase.

In order to facilitate C2 aboard limited amphibious ships, 2d MEB experimented with a robust reachback capability.

Reachback capability allowed 2d MEB to deploy a small part of the staff on ships but employ the whole staff using modern communications technology from a land-based structure given the ships’ space constraints.

2d MEB is a standing operational HQ with no forces assigned.

This provides flexibility to GCCs. Because 2d MEB was designed with its most likely mission in mind – crisis response – the unit needs to be able to deploy and provide C2 within 24 hours after heeding a GCC’s request.

The lack of force structure outside the CE allows the unit to serve as the Swiss army knife of C2 for the GCC.

2d MEB can deploy the CE and composite joint and international forces already close to the operating area.

Second Line of Defense

The flexibility of the MEB CE also allows the unit to deploy and employ scalable force packages of as little as a few thousand personnel for crisis response and up to 15,000 for its most deadly mission – small-scale conventional warfare.

This is important for warfighting and operating throughout the ROMO the MC engages in.

<http://www.sldinfo.com/2d-marine-expeditionary-brigade-shaping-the-scalable-modular-forces-for-21st-century-operations/>

The leadership of the Australian Navy has highlighted as well the importance of flexible task forces in reshaping combat power.

The foci of both Vice Admiral Barrett, Chief of Navy, and Rear Admiral Mayer, Commander Australian Fleet, at the recent Air-Sea integration conference held by the Williams Foundation is upon re-energizing the task force concept, but in terms of modular force packages which include, Army, Navy and Air Force capabilities configured to achieve the mission with appropriate tool sets.

It is a Swiss army knife concept of operations.

<http://www.sldinfo.com/vice-admiral-barrett-on-the-way-ahead-of-the-australian-navy-design-the-force-for-decisive-and-distributed-lethality/>

<http://www.sldinfo.com/the-network-as-a-weapon-system-the-perspective-of-rear-admiral-mayer-commander-australian-fleet/>

Fifth, sustainability has to be built into the force.

Military leaders are looking for the new systems to significantly more maintainable in order to provide for higher reliability and dispatch rates.

This is about designing into systems ways to ensure that the platforms are more sustainable; and because the key foundational platforms are often multi-national systems – such as F-35, P-8, Triton, A330MRTT – the expectation is that they can be globally sustainable.

And this means cross-maintainable with core allies when operating in a common area of interest.

Sixth, the force is expected to be able to contribute and to operate in a secure manner within a distributed battlespace and commanded by a distributed C2 package.

C2 is become an essential element for force structure transformation, rather than focusing excessively on the ISR, or collection of information to inform decisions.

The shift from the kinds of land wars fought in the past decade and a half to operating across the range of military operations to insert force and to prevail in a more rapid tempo conflict than that which characterized counter-insurgency operations carries with it a need to have a very different C2 structure and technologies to support those structures.

The shift to higher tempo operations is being accompanied by platforms which are capable of operating in an extended battlespace and at the edge of the battlespace where hierarchical, detailed control simply does not correlate with the realities of either combat requirements or of technology which is part of a shift to distributed operations.

Distributed operations over an extended battlespace to deal with a range of military operations require distributed C2; not hierarchical detailed micro management.

In effect, the focus is upon shaping the commander's intent and allowing the combat forces to execute that intent, and to shape evolving missions in the operations, with the higher level commanders working to gain an overview on the operations, rather than micro-management of the operations.

Unfortunately, the relatively slow pace of COIN, and the use of remotes (UAVs or RPAs) in the past decade have led to a growing practice of growing the level of command in order to try to exercise more detailed control. This has led to the current situation in the air operations against ISIS where you have more members of the CAOC than you have actual air strikes!

According to one of the architects of Desert Storm, Lt. General (David) Deptula, the CAOC for Desert Storm was quite lean, and the goal was to get the taskings into the hands of the warfighters to execute, with a later battle damage assessment process then informing decisions on the follow on target list.

It was not about micro managing the combat assets.

And this was with air power multi-mission assets, which went out to execute a command directive in a particular area of the battlespace to deliver a particular type and quantity of ordinance in that area of the battlespace.

With new air technologies, multi-tasking platforms will fly to the fight and execute the initial commander's intent but will shift to the mission as needs arise during the air combat operation. Fleeting targets are a key reality, which requires an ability for the pilots to prosecute those targets in a timely manner, rather than a deliberate C2 overview manner.

Put in other terms, the command structures will need to "lean out" and to work with warfighting assets where the pilots and operational decision makers are at the point of engagement, not in a building housing a CAOC.

<http://www.sldinfo.com/c2-modernization-an-essential-element-for-21st-century-force-structure-innovation/>

This requires build in a new approach to C2 from the ground up as the new assets are introduced into the force. For example, the introduction of the F-35 should bring with it a fundamental rethink away from hub-and-spoke C2 to distributed C2 and modular force package operating forces.

C2 for fifth generation aircraft is about setting the broader combat tasks and unleashing them to the engagement area, and once there they can evaluate the evolving situation during their engagement time and decide how best to execute the shifting missions within the context of the overall commander's intent.

Hierarchical command and control of the sort being generated by today's CAOCs is asymmetrical with the trend of technology associated with fifth generation warfare.

As Robert Evans, a former USAF pilot, and most recently with Northrop Grumman put the change:

Formations of F-35s can work and share together so that they can "audible" the play. They can work together, sensing all that they can sense, fusing information, and overwhelming whatever defense is presented to them in a way that the legacy command and control simply cannot keep up with, nor should keep up with.

That's what F-35 brings.

Second Line of Defense

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.

<http://www.sldinfo.com/the-coming-of-the-f-35-and-the-dynamics-of-change-in-air-force-c2-systems/>

<http://www.sldinfo.com/reshaping-operational-and-training-approaches-airpower-led-combat-innovation/>

In fact, the former MARFORPAC, Lt. General Robling, underscored to central importance of distributed C2 for a deterrence in depth strategy in the Pacific.

The Australian military is small in comparison to the US, but it is a lethal and technologically sophisticated force.

In the face of a large-scale threat, they, like the US and others in the region, wouldn't be able to defend by themselves. They would have to be a part of a larger collective security effort and ally with the US or other likeminded nations in the region in order to get more effective and less costly defense capabilities pushed farther forward.

This is one reason why their buying the JSF and the "Wedgetail" is so important. These two platforms are amazing force multipliers that bring to the region superior Command and Control and networked strike capabilities. These capabilities will be both additive and complementary to the capabilities other nations bring to collective security in the region.

The JSF with its superior networked sensor suite can collect a lot of information from sources at significant distances, and partner with the capabilities of the "Wedgetail" to help disseminate that information to air, sea, and land forces who need the information.

These capabilities and others make perfect sense for Australia and the greater Asia Pacific's collective security requirements. In addition, other countries like Japan and Singapore can likewise contribute to this collective security because they too are buying the same types or similar military capabilities.

I like the term deterrence in depth because that's exactly what it is. It's not always about defense in depth.

It's about deterring and influencing others behavior so they can contribute to the region's stability, both economically and militarily, in an environment where everyone conforms to the rule of law and international norms.

<http://www.sldinfo.com/the-distributed-laydown-in-the-pacific-and-deterrence-in-depth-lt-general-robbling-discusses-the-evolution-of-the-usn-usmc-team-in-the-pacific/>

The emerging perspective which can be characterized as a kill web, or the “network as a weapon” or a “fifth generation enabled force” can be encapsulated in the following graphic, which reflects the convergent lines of transformation shaping a foundation for the next decade of change.

Operating and Prevailing in the Extended Battlespace

The Offensive-Defensive Enterprise Operating As a Kill Web



Building Platforms After Next

The need to operate at greater distance and to deal with a growing diversity of threats has highlighted the importance of ensuring an ongoing modernization effort to enhance that the liberal democracies have the capabilities to fight as a an integrated team in that battlespace.

This requires capable platforms, which can perform their core missions but to do so with greater effect by being more capable through the connectors or enablers for a more integrated force.

Each of the key platforms has a set of core functions, yet their impact is enhanced by inter-connectivity and determining how best to operate those platforms in ways which enhance the overall capabilities of the force.

When approaching the question of the acquisition of new platforms, a key consideration needs to be what does that platform bring to the integrated battlespace?

Posing the question in this way then drives a different way to think about those new platforms which might be added to the force.

How can its organic capabilities enhance the capability of the force to provide for an integrated effect?

How can the platform contribute to the multiplier effect of its operation within the battlespace?

How can the force best survive and prevail and how do new platforms contribute to that effort?

How upgradeable is the platform with regard to the other key capabilities operating in the battlespace?

Second Line of Defense

How can the central role of software upgradeability best be recognized and supported in building out an information secure, decision dominant force?

How to measure cost effectiveness in an integrated battlespace world?

How do new approaches to sustainability built into 21st century systems get recognized as cutting edge ways to have a more effective and sustainable force, rather than being audited to death by 20th century practices and thinking?

The most expensive acquisition could well be one that is the cheapest up front in terms of initial price tag, but is not an effective member of an integrated battlespace.

Such platforms might only contribute to a narrow function without any real capability to evolve with the forces shaping a way ahead to reshape capabilities to achieve key effects in the evolving battlespace and within that battlespace shaping an open-ended force integration process.

In short, the decade of innovation underway can lay the foundation for a new approach to platform acquisition, which can get out of the platform centric ghetto that is so often the only lane in which they are discussed, considered and bought.

F-35B AT FARNBOURGH: STRATEGIC DETERRENCE WITH TACTICAL FLEXIBILITY

The F-35B will be a staple for the USMC and the RAF and will fly with the Italian Navy as well.

There are a number of other Air Forces which are clearly interested in the aircraft as well, including Israel, Singapore, Japan, and Spain.

The plane can operate in a wide variety of locations, which gives it an operational advantage over those, which must operate, off of conventional airfields.

As Ed Timperlake put it in an article published in 2012 entitled “strategic deterrence with tactical flexibility:”

Every fighter pilot has had or will have a moment in the air when the biggest indicator in the cockpit is showing how much fuel is left: the fuel indicator immediately can dominate the pilots attention and really focus thinking on where to immediately land.

Fuel is measured in pounds usually with an engineering caveat stating a degree of uncertainty over how low the number may go before all the noise will stop. Pounds of fuel remaining eventually become everything.

It is actually a very simple and terrifying equation, no fuel means simply no noise because the jet engine has stopped working.

Contemplating this very time sensitive dilemma, when the “noise gage” goes to zero, all pilots know that their once trusted and beautiful sleek multi-million fighters that they are strapped into will rapidly take on the flying characteristic of a brick.

Running low on fuel, calling “bingo,” on the radio which is announcing min fuel left for a successful recovery and then realizing you are actually going below “bingo” could occur for a variety of reasons.

In peacetime it is mostly a delay in landing because of weather related issues.

In combat, in addition to horrific weather at times, throw in battle damage to the fuel tanks and it becomes a real life or death problem.

In peacetime you can eject, probably lose your wings and that will be that.

However, in combat, in addition to shooting at you the enemy always gets a vote on other methods to kill you and destroy your aircraft. They will use any means possible.

Consequently if aircraft in their combat strike package get lucky and a few survive to bomb “homeplate” taxiways and all divert fields it can become a significant problem.

Even more realistically in this 21st Century world, missile proliferation, both in terms of quality and quantity, is a key challenge. All nations can be peer competitors because of weapons proliferation.

An enemy may have successfully improved the quantity and quality of their missile such that an Air Battle commander’s entire airborne air force can be eliminated by the enemy destroying all runways, taxiways and divert bases.

In a war at sea, hitting the carrier’s flight deck can cripple the Carrier Battle Group (CBG) and thus get a mission kill on the both the Carrier and perhaps even the entire airborne air wing if they can not successfully divert to a land base.

With no place to land, on the sea or land and with tanker fuel running low, assuming tankers can get airborne, the practical result will be the loss of extremely valuable air assets.

In such circumstances, The TacAir aircraft mortality rate would be the same as if it was during a combat engagement with either air-to-air or a ground –to-air weapons taking out the aircraft.

The only variable left, between simply flaming out in peacetime, vice the enemy getting a kinetic hit would be potential pilot survivability to fly and fight another day.

However, with declining inventories and limited industrial base left in U.S. to surge aircraft production a runway kill could mean the loss of air superiority and thus be a battle-tipping event, on land or sea.

Now something entirely new and revolutionary can be added to an Air Force, the VSTOL F-35B.

Traditionally the VSTOL concept, as personified by the remarkable AV-8, Harrier was only for ground attack. To be fair the RAF needed to use the AV-8 in their successful Falklands campaign as an air defense fighter because it was all they had.

The Harrier is not up to a fight against any advanced 4th gen. aircraft—let alone F-22 5th Gen. Fighters that have been designed for winning the air combat maneuvering fight (ACM) with advanced radar’s and missiles.

Now though, for the first time in history the same aircraft the F-35 can be successful in a multi-role.

The F-35, A, B & C type, model, series, all have the same revolutionary cockpit-the C4ISD-D “Fusion combat system” which also includes fleet wide “tron” warfare capabilities.

There has been a lot written about the F-35B not being as capable as the other non-VSTOL versions such as the land based F-35A and the Large carrier Battle Group (CBG) F-35, the USN F-35C.

Second Line of Defense

The principle criticism is about the more limited range of the F-35B. In fact, the combat history of the VSTOL AV-8 shows that if properly deployed on land or sea the VSTOL capability is actually a significant range bonus. The Falklands war, and recent USN/USMC rescue of a Air Force pilot in the Libyan campaign proved that.

The other key point is limited payload in the vertical mode. Here again is where the F-35 T/M/S series have parity if the F-35B can make a long field take off or a rolling take off from a smaller aircraft carrier-with no traps nor cats needed it can carry it's full weapons load-out.

The Royal Navy just validated this point by reversing back to the F-35B.

Give all aircraft commanders the same set of strategic warning indicators of an attack because it would be a very weak air staff that would let their aircraft be killed on the ground or flight deck by a strategic surprise.

Consequently, the longer take off of the F-35 A, B or C with a full weapons complement makes no difference. Although history does show that tragically being surprised on the ground has happened.

Pearl Harbor being the very nasty example. Of course, USN Carrier pilots during the "miracle at Midway" caught the Japanese Naval aircraft being serviced on their flight deck and returned the favor to turn the tide of the war in the pacific.

In addition to relying intelligence, and other early warning systems to alert an air force that an attack is coming so "do not get caught on the ground!" dispersal, revetments and bunkers can be designed to mitigate against a surprise attack.

Aircraft survivability on the ground is critical and a lot of effort has also gone into rapid runway repair skills and equipment to recover a strike package. All F-35 TMS have the same advantages with these types of precautions.

The strategic deterrence, with tactical flexibility, of the F-35B is in the recovery part of an air campaign when they return from a combat mission, especially if the enemy successfully attacks airfields.



FIGURE 1 F-35B AT FARNBOURGH AND PHOTO WAS SHOT BY RAAF AND IS CREDITED TO THE AUSTRALIAN MINISTRY OF DEFENCE.

Or is successful in hitting the carrier deck-they do not have to sink the Carrier to remove it from the fight just disable the deck. War is always a confused messy action reaction cycle, but the side with more options and the ability to remain combat enabled and dynamically flexible will have a significant advantage.

With ordinance expended, or not, the F-35B does not need a long runway to recover and this makes it a much more survivable platform — especially at sea where there might be no other place to go.

A call by the air battle commander-all runways are destroyed so find a long straight road and "good luck!" is a radio call no one should ever have to make.

But something revolutionary now exists.

In landing in the vertical mode the Marine test pilot in an F-35B, coming aboard the USS Wasp during sea trials put the nose gear in a one square box. So the unique vertical landing/recovery feature of landing anywhere will save the aircraft to fight another day.

It is much easier to get a fuel truck to an F-35B than build another A or C model, or land one of the numerous "decks" on other ships, even a T-AKE ship then ditch an F-35C at sea.

This unique capability can be a war winning issue for countries like Israel, Taiwan and the U.S. Navy at sea.

<http://www.sldforum.com/2012/05/strategic-deterrence-with-tactical-flexibility-the-coming-impact-of-the-f-35b/>

<http://www.sldinfo.com/wp-content/uploads/2014/11/21st-Century-Approach-to-Tron-Warfare.pdf>

Indeed, it can be easy to overlook how revolutionary a vertical lift aircraft, which can operate at supersonic speeds actually is.

In the final interview we conducted with Col. "Turbo" Tomassetti at the time of his retirement in 2013, "Turbo" looked back at his time with the program and his 30 years in the USMC.

Col. Tomassetti underscored as well the important role which the F-3B is bringing to the USMC expeditionary approach.

"What does that airplane bring to the Marine on the ground?"

It means that the warrior has access to information that they would not normally have.

And the F-35B is about bringing that aircraft up close in the battlespace and it can operate off of a variety of platforms to allow for operational flexibility."

He contrasted his experiences with the Harrier and the F-35B and highlighted the impact of the digital capabilities and information dominance, which the F-35b will bring to the USMC.

He also emphasized that his commitment to the development of the aircraft try was founded on trying to ensure that the plane would be easy to fly, unlike the Harrier and to do so for the safety and security of the pilot.

He reflected back on the contrast between his involvement in the prototype phase of the F-35 and what is on the flight line currently.

"We really did not conceptualize the data fusion capability and its impact.

"We had some ideas in briefing slides and graphics, but now it is entering reality on the flight line."

The Osprey has had an important impact on the USMC in shaping cultural change within the USMC overall.

The F-35B and its cultural impact have been prepared for within the USMC by the Osprey experience.

But still the F-35 demands a change in pilot culture.

"The legacy pilots need to jettison some of their (experiential or legacy) baggage and open their minds to what the new aircraft brings...."

Second Line of Defense

"I am looking forward to the next phase when the new pilots join the program directly from their initial training and the F-35B will then be their first operational aircraft. That will be a very exciting development"

Finally, he discussed the impact of the f-35 as a fleet on combat operations and how different this concept of operations will be for the force.

"It is too easy to fall back to what you know when you talk about the airplane.

"With the F-35 you have to get to the next step.

"You need to understand it is not just a single airplane..."

"The common airplane can deliver shared data across the fleet of F-35s and with other assets as well.

"We need to learn to use that capability of a group of airplanes, regardless of where they took off from or what insignia is outside the aircraft."

<http://www.sldinfo.com/turbo-tomassetti-reflects-on-the-future-of-the-f-35-and-looks-back-at-the-past-thirty-years/>

And if you are in the F-35 program, and start with As can you add Bs later down the line.

The pilot training is common in many respects, and as [Col. Novotny](#), the 48th Wing Commander (at RAF Lakenheath) recently highlighted:

"So from the beginning, there is great synergy and opportunity to learn from each other.

"Obviously, they are primarily responsible for working the airspace issues, which will in turn shape how a basic element of how we will train and operate together as well.

"We're talking about exchange opportunities across the logistics enterprise, and among the pilots as well. If you can fly the A you can fly the B; and vice versa; it is an adjustment, not a whole new training process.

"We are looking to have RAF pilots flying USAF jets and vice versa."

In short, "Turbo's" forecast is coming true.

AIRPOWER IN CONTESTED AIRSPACE: HIGHLIGHTS FROM THE TRILATERAL COMBAT EXERCISE

By Robbin Laird, Ed Timperlake and Murielle Delaporte

As former Chief of Staff of the USAF "Buzz" Mosley once stated about the USAF:

"There is not a place on the face of the earth that the USAF will not fight their way into."

This core objective has been challenged by the combat learning, training and operations for nearly decade of combat with significant expenditures in counter-insurgency.

Skill sets for technology and training for U.S. Air and Naval forces for National Defense embracing offensive global power projection have atrophied. Land combat focused budgeting priorities have been prioritized for slow motion "human terrain mapping" Counter insurgency focused nation building operations.

There is an intellectual COIN cult, which has come to dominate the Department of Defense and allied Ministries of Defense based on the Iraq/Afghanistan military experience of the past decade of operations.

Publics used to hearing about large defense investments in the past decade can be excused for confusing defense expenditures for land operations with a shortfall in investments in Air/Sea power projection.

Things are changing dramatically with a resurgent Russia and an increasingly geo-politically aggressive China.

Fortunately the USAF, RAF and French Air Force have come together to develop jointly accepted air combat con-ops.

A combat exercise held at Langley Air Force Base in December 2015 with the high end air combat capabilities of the USAF, the Royal Air Force (RAF) and the French Air Force (FAF) was about recovering lost or diminishing skill sets, honing new ones, and shaping a template for the 21st century transformation of their respective nations air combat force.

The origins of the trilateral exercise came from agreements reached five years ago by the three nations and the three air forces.

The exercise at Langley was the flying confirmation of the bold commitment to reshape the capabilities of the three air forces in fighting high-end warfare.

And with the events unfolding in the Middle East, and with a peer competitor firmly entrenched at a new airbase in Syria, the challenge of contested airspace is not an abstraction, but a real world reality. And this was something which the Turkish-Russian exchange reinforced in the minds of pilots, and decision makers from the current conflict.



Figure1 From left, U.S. Air Force Gen. Hawk Carlisle, commander of Air Combat Command, French air force Deputy Chief of the Air Staff Gen. Antoine Creux, Chief of Staff of the U.S. Air Force Gen. Mark A. Welsh III, British Royal Air Force Chief of the Air Staff, Air Chief Marshall Sir Andrew Pulford, and U.S. Air Force Gen. Frank Gorenc, commander of U.S. Air Forces in Europe (USAFE), answer questions during a press conference hosted during the Trilateral Exercise at Langley Air Force Base, Va., Dec. 15, 2015. As part of the exercise, Pulford, Welsh, Creux and Gorenc hosted a press conference to discuss the importance of working together as coalition forces. (U.S. Air Force photo by Tech. Sgt. Katie Gar Ward)

Second Line of Defense

The close relationship to the real world and the exercise was highlighted in a remark made by Chief of Staff Mark Welsh at the Media Day held during on the exercise on December 15, 2015.

“Interoperability among allies, and deconfliction in the operations of air forces in close proximity is crucial. We are using the same communications processes in the exercise that we are currently using in the Middle East to provide for interoperability and deconfliction.”

But while the real world was hovering over the event, what the three air forces were working on was shaping a template for 21st century operations within which fifth generation capabilities were being blended with the rest of the air combat force to create a more lethal, survivability and effective 21st century combat force.

This was a pull exercise in which a fifth generated enabled force was being shaped, in which the core capabilities of the Typhoon and Rafale were being leveraged to shape a more capable air combat force.

The F-22 was ending publically its period of looking like an orphan; and although the F-22 has flown with Typhoon in the past, this was the first time flying with the Rafale.

As Hawk Carlisle put it: “The whole is greater than the sum of the parts and we are working in this exercise in shaping a more effective force.”

The changing threat environment was highlighted by the senior Air Force officers present at the media day event. All of the speakers — USAF Chief Mark Welsh, ACC Commander Hawk Carlisle, USAFE Chief General Frank Gorenc, RAF Chief Sir Andrew Pulford, and General Antoine Crux, Inspector General of the French Armed Forces representing the Chief of Staff of the FrAF – commented on the evolving threat environment, which was perhaps the only topic on which all five provided comments.

The threat environment was largely discussed in terms of contested air space.

The environment is seen as one in which U.S. and allied forces would have an increasingly difficult time to operate to support broader military operations.

The threat was characterized variously as anti-access, area denial, or multi-spectrum threats, or simply adversaries enhancing their capabilities. General Hawk Carlisle put it in terms of a multi-spectrum environment shaping a new threat envelope.

“In this exercise in particular we are focused on enemy aircraft and their missiles, surface to air missiles, and electronic warfare as evolving adversarial threats.”

Carlisle then went on to note that during the exercise “we are focusing on link architecture and communications to pass information, the contributions the different avionics and sensor suites on the three aircraft can contribute to the fight, the ability to switch among missions, notably air-to-air and air-to-ground and how best to support the fight, for it is important to support the planes at the point of attack, not just show up.”

In other words, the dynamic change in how high end aircraft were working together was the crucial point of the exercise.

One key difference from the past is the role of the AWACs.

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.

It is an ongoing challenge, which required the air forces to shape relevant skill sets.

The skill set theme was especially highlighted by the head of the RAF. Sir Andrew Pulford noted that as the RAF added two additional Typhoon squadrons and an additional F-35 squadron, he was concerned to shape the right skill sets going forward into a world in which a benign environment for air operations would not be the norm.

The Typhoon is a very lethal combat asset, which is leading the RAF attacks against ISIS in the Middle East with the Typhoon-Tornado tandem as a key part of the force package.

Typhoon modernization is adding to the lethality and survivability of Typhoon and will make it even a more valuable member of any air combat coalition.

According to Group Captain Paul Godfrey, the air boss of RAF Lossiemouth:

“The modernization of Typhoon is underway and we have seen real progress in terms of electronic warfare, sensors and integration, and improvements in the human machine interface which is going to make the cockpit more effective to operate the aircraft in the expanded battlespace with 5th gen assets.”

<http://www.sldinfo.com/royal-air-force-operations-and-evolving-concepts-of-operations-shaping-a-triple-transition/>

The Rafale is the oldest of the three fighters in the core air combat air force in the exercise.

The plane has seen significant combat experience in Africa and the Middle East and Afghanistan.

It is the key enabler of the French force approach to joint and expeditionary operations, and over time the combat systems on the aircraft have seen significant modernization.

Fifteen years have passed since the first Rafale entered in service in the French Navy.

“We started very small with a fleet of only ten aircraft up until 2004”, recalls Marie-Astrid Vernier,, who at the time of the June 2014 interview was head of military support at Dassault Aviation and who has worked on the Rafale since 1994.

Second Line of Defense

The current French Rafale fleet has been built with the delivery of four different “tranches” of aircraft which have been upgraded over the years into various standards, the latest one being the Standard F3R to be delivered in 2018.

Today’s Rafale F3 has little to do with the very first F1: “Retrofitting the very first planes from a F1 standard to a F3 standard takes far more time than upgrading later-built planes”, explains Capitaine de Vaisseau Sébastien Fabre, formerly in charge of the support of the Rafale fleet within the French MoD.

As the thousandth modification was achieved in 2014, the latter stressed in an interview that “60% of these changes relate to standard and technical tracking, while the rest has to do with improving equipment and support tools”.

Today’s 2015 Rafale is a rather different bird from the 2000’s Rafale, as new technologies allowed for new operational missions, which in turn drove new technical requirements.

The convergence of the RAF and the FAF onto Langley to work with the USAF bringing their top tip of the spear forces – Typhoons and Rafales – to fly with the F-22 was itself a work in progress on expeditionary airpower.

But the tip of the spear is only that without the expeditionary support provided by the entire combat force.

The mere ability to cross the Atlantic and train together is already an achievement on its own.

Preparing the support of such a large-scale exercise is also something both the RAF and the French Air Force are accustomed to thanks to exercises regularly hosted by the USAF, such as Red Flag.

What was different however was the way it was done in a joint manner between the two European Air Forces and was considered as such by many participants as an “expeditionary opportunity” on its own.

All French personnel (about 110) -- besides the fighters and KC-135s pilots -- were flown first from France to the UK with French transport means, but then were taken onboard British C17 and KC-30A Voyager (British A330 MRTT).

In short, the exercise is a beginning effort during which the air chiefs emphasized they would continue and perhaps accelerate the efforts in air force combat transition.

“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.”

<http://www.raf.mod.uk/news/archive/trilateral-agreement-gets-airborne-17122015>

Perhaps the best capstone comment on the exercise was provided by the head of the RAF, Sir Andrew Pulford:

“The important thing is our three air forces can operate together as one.

The three air forces are demonstrating that we can and always have worked well together, that we still can and still do, and it doesn’t matter whether we are operating over Iraq or Syria, or exercising here on the east coast of the U.S., these are three air forces operating as one team and for the common good.”

FIGHTING WITH THE FORCE YOU HAVE NOW WHILE PREPARING FOR AN AIRPOWER TRANSITION: THE PERSPECTIVE OF GENERAL “HAWK” CARLISLE, AIR COMBAT COMMAND

By Robbin Laird and Ed Timperlake

General “Hawk” Carlisle has been at the center of operations as well as the airpower transition for some time. As the PACAF commander, he helped shaped the evolution of what is becoming an offensive-defensive enterprise in which combat air and missile defense systems will become more tightly integrated.

As the ACC Commander, he has overseen global combat operations for the US Air Force, and has seen the acceleration of an airpower transition. During his watch, several new combat assets have come to play in Middle East operations, namely the more visible and central role of the F-22, the new variant of the Typhoon (which the RAF calls, the Operation Shader variant of the aircraft and is being optimized for the delivery of ground support weapons) and the Aussies have brought their Wedgetail and KC-30A tanker as well.

At the RIAT airshow, Carlisle discussed the coming of the F-35 to the force as the aircraft was omnipresent at RIAT and Farnborough.

He told reporters that F-35A IOC was on track for this year and he anticipated that the F-35 would see combat within the next 24 months.

Indeed, operational F-35Bs are now participating in Red Flag 16-3.

This is a US-only Red Flag and is testing the kind of multi-domain operational capabilities being deployed now and augmented with the airpower transition.

For the ACC Commander, the future is now but at the same time, he needs to weave new assets into an ongoing transformation process.

Question: A number of new aircraft have entered the fight in the Middle East and the F-22 has taken a prominent multi-tasking role, how would you assess the performance and change?

General Carlisle: Each of the new assets – the F-22, the Typhoon, the Wedgetail and the KC-30A – have performed well. They have proven once again that if you get new assets into the hands of the young men and women in the force that amazing things can happen.

The platforms have been pushed to a level that we could not guess at prior to real world operations.

Their performance and that of the entire force is highlighting the need for more effective combat multi-domain integration.

That is a key work in progress and these new platforms are driving us further down the road to achieve it.

We’ll make even more progress when we get to the link architecture and the translators that allow us to truly achieve fifth to fourth and fourth to fifth integration and to take national technical means and bring that into the fight as well.

What we’re not doing is bringing these disparate parts up together in a collaborative, honeycombed environment at the level that we really can. We’re not off-boarding everything from the F-22 and F-35 that we should. There’s a wealth of information on those platforms that never gets taken advantage of. However, we are working to ensure that we position ourselves to do so.

Second Line of Defense

Question: You have Nellis in your command; how is Nellis working with the Marines and the Navy to shape innovation?

General Carlisle: The F-35 as a common platform among the air services is a key element in our transformation. Nellis and MAWTS have taken Air Force and Marine Corps integration to a whole new level of collaboration, integration and understanding as we work together on the F-35.

We're doing the same thing with the Navy and Admiral Manazir and I have had discussions about greater collaboration and integration many times.

When you consider that in the international context, flying the same aircraft is taking us to a new level of collaborative engagement.

And assuming the Canadians buy F-35, we will see even closer integration among the five eye nations. We will shape a level of synergy among those air forces that exceeds anything we have done before.

Question: The airpower transition we are talking about really is about multi-domain evolution. Could you talk to that opportunity and challenge?

General Carlisle: At the Weapons School at Nellis we are now completely focused on multi-domain integration as a warfighting skill. The weapons school is a crucial incubator for practical changes and feedback about ways we can enhance greater collaboration and integration across the warfighting domains.

We are clearly working hard on integration of missile defense with our strike assets as well.



FIGURE 2 F-35 FLYING WITH F-22. CREDIT: USAF

For example, we have made significant steps in the Pacific where we can better integrate area defense for the carrier strike groups and defend our airbases as well.

At the same time, we are still at a negative price point in terms of our ability to launch interceptors against incoming missiles. But of course, we are not just going to sit there and take incoming missiles.

In that sense, we are combining offense with defense to protect our forces and our interests.

We are clearly working on getting low-cost, high-magazine, high-accuracy defensive systems such as those associated with the rail gun or lasers.

Directed energy weapons are clearly part of the transition.

We will be putting one on an F-15 for test purposes before long. The first thing we are going to do with it is defensive, in particular against a SAM.

We know how to do hit-to-kill and our sensor and C2 packages are getting better.

We just need to enhance the technology, which provides us with the low-cost, high-magazine and high-accuracy systems to go along with the sensor grid.

Question: You are describing the kill web.

And as the air combat assets get better at off-boarding information and cross-supporting the strike and defense functions, the air combat force will get better.

We asked you about the F-22 as an air battle manager at the Trilateral Exercise. Could we revisit that dynamic?

General Carlisle: With regard to the F-22, the first strikes were in September 2014. We have done upgrades as well which allows us to fire SDBs at a greater level of accuracy. We are also using the sensor fusion on board the aircraft to pass information to the rest of the force, which is bringing their game up as well.

The F-22 functions in this sense as a battle manager because the pilot has the SA inside his cockpit to direct other aircraft on what they do and how they can do it more effectively.

We are better at this now than we were even a year ago.

You create a problem for an adversary when you have multiple places from which you can strike.

You have the SA and the information shared among all three platforms in the case of the trilateral exercise.

You couldn't defend against all of them.

Question: It is clear that we need a weapons revolution to catch up with the new air platforms and the reconfiguration of the legacy platforms. What is your sense of this challenge?

General Carlisle: There is a clear need for new weapons. We need range; we need magazine depth; we need broad spectrum capabilities.

We need to be able to do a central sweep that can cover the spectrum that's not defined by medium range, or medium wave IR, or X Band, but rather can cover the IR spectrum potentially in the EOIR, and potentially the RF spectrum as well.

Besides the networking and the architecture that we haven't shaped to the level that we want to, the next thing is we have great fifth generation capability with fourth gen weapons, and that doesn't make sense.

I don't need a new point-and-shoot weapon.

I just want a look and shoot, and I want unlimited magazine depth.

I want scalable effects so that based on what the environment is I can change the weapon's effect to protect friendlies.

Second Line of Defense

Obviously, in the air-to-air mode, I need broad spectrum weapons.

I need range; I need numbers.

USAF MOVES FORWARD WITH INTEGRATION OF F-22 AND F-35

By Todd Miller

Even before the USAF declared the F-35As initial operational capability (IOC) on August 2, they were well ahead of the curve planning the next phase of the F-35A program.

This next phase is focused on the priority of F-35A integration within the USAF fighter fleet, and in particular with the F-22 Raptor.

To that end a 5th Generation Integration Conference was hosted on July 20 & 21 by the 1st FW at Joint Base Langley-Eustis, VA. Col. Pete Fesler, 1st FW Commander [F-22], and Col. David Lyons, 388th FW Commander [F-35A] discussed the conference, and the integration of the USAF 5th Generation fleet of F-22 Raptor and F-35A Lightning II.

Lyons and Fesler both noted that significant integration of 5th Gen fighters with the 4th Gen fighters has been underway and effective. The F-22As have been very active over past years integrating through exercises such as Red Flag, Checkered Flag and more while the F-35As at Hill AFB have been working extensively with the local F-16s.

However, F-22 integration with the 4th Gen fleet has been more of a stop gap effort while looking forward to the introduction of the F-35A.

As Fesler says, "The F-35 is here.

"We need to start determining the path to integrate the F-22 and F-35A as part of the joint team right now."

Lyons noted that from the outset, the F-22 and F-35A were part of the USAFs resourcing strategy, envisioned to work together as a team. F-35As joining the fleet represent the realization of that vision.

These two aircraft are the leading edge of the Air Force fighter fleet, and their integration on tactical, operational and support levels is a priority.

It is well known that each aircraft bring unrivaled 21st Century situational awareness to the battlespace, and yet each has a distinct strength.

Fesler paraphrased comments made by Gen. H. "Hawk" Carlisle, "the F-35 is the best A2A platform in the world, except for the F-22. The F-22 is the best A2G platform in the world, except for the F-35."

Fesler continued, "So we have two aircraft, one designed primarily for A2G, one primarily for A2A, both with complimentary capabilities to assist each other in either role.

Together they create a team that is optimized to simultaneously go after air and surface threats."

The 5th Gen Integration Conference assembled the Commanders of the Fighter Wings that operate the F-22 and F-35 to discuss all aspects of operational activity underway.

How the Units/Aircraft Will Train Together

The units/aircraft will operate in combat together to maximize effectiveness in the battlespace.

How the units/aircraft will be best manned and systems maintained for maximum efficiencies is a work in progress.

The Raptors have a decade of 5th Generation “real world” experience to share with the F-35A.

Lessons learned from airframe and systems maintenance, low observability maintenance and more may be adopted by the F-35A community to make their experience more efficient.

At the same time, information will flow back from the F-35 global fleet to the F-22 and generate opportunities for specific retrofits to the F-22 fleet, as well as integration lessons.

Fesler explained that greater gains will be realized for both aircraft as all associated personnel “cross-flow” between platforms.

Fesler acknowledged that the while the interchange of information between 5th and 4th Gen platforms was challenging, the sharing between 5th and 5th Gen platforms was relatively seamless.

Legacy systems of the 4th Gen aircraft require substantial upgrades to effectively communicate the high volume of battlespace information (e.g. Talon Hate pods).

Even though the F-22 has been in service over 10 years, its systems have maintained adequate pace with the F-35As systems, ensuring seamless data communication and a shared picture of the battlespace.

Fesler notes that while the F-22 is optimized for A2A and can work through the SAM problems as well as hit high value targets, the F-35 is designed “100% to find any ground threat and make it go away” even while providing a very solid A2A capability.

Lyons indicated that the F-22/F-35 tandem is the team required in peer or near peer environments with advanced A2A and A2G threats.

The F-35 will provide the team leadership with SEAD, DEAD, Dynamic targeting, EW as well as passing tremendous amounts of information to the entire Blue team, all while the F-22 provides the primary A2A protection.

I am left with the distinct feeling that the team driven Fesler and Lyons are more than confident in their aircraft to take on any challenge with either aircraft, and yet gratified to go to the fight delivering an unrivaled 21st century team to deliver a one-two punch

Special Thanks to the USAF ACC 633 ABW Public Affairs Team, Col. Pete Fesler, Commander 1st Fighter Wing, and Col. David Lyons, Commander 388th Fighter Wing,

BECOMING AN F-22 MULTI-TASKING COMBAT AVIATOR

The key to understanding fifth generation combat aviation is sensor fusion and the man-machine working relationship built into the cockpit. The F-22 started the process; the F-35 continues it.

At the heart of the new capability is moving from being a sequential multi-mission pilot directing the combat capabilities of the aircraft, to becoming a multi-tasking decision maker where the machines are processing data and providing information as the task changes.

In the following piece by Todd Miller, he addresses the question of the making of a 21st century pilot.
Second Line of Defense

The Making of the 21st Century Fighter Pilot

By Todd Miller

With the F-35A program generating an abundance of positive news, it is easy to overlook that the F-22A Raptor remains the USAF platform of choice for the Air Superiority role.

In a recent interview 1st Fighter Wing Commander, Colonel Pete Fesler paraphrased comments made by the Commander of Air Combat Command, General Herbert “Hawk” Carlisle; “The F-35 is the best air to air (A2A) platform in the world, except for the F-22. The F-22 is the best air to ground (A2G) platform in the world, except for the F-35.” Fesler continued,

“So we have two aircraft, one designed primarily for A2G, one primarily for A2A, both with complimentary capabilities to assist each other in either role.

Together they create a team that is optimized to simultaneously go after air and surface threats.”

The F-22 Raptor has a unique combination of stealth, speed, maneuverability, operational altitude and weapons load that make it the “bar” by which A2A fighters are measured. Seen in the context of the current and emerging threat environment, the capabilities the Raptor brings to the fight drive a paradigm shift in the role of the fighter pilot.

Operating the stealthy F-22 in highly contested space with anti access/area denial (A2/AD) systems AND adversaries with their own advanced stealthy aircraft provides extraordinary challenges.

These current and anticipated air and surface threats drive an aggressive training regime for Raptor pilots.

On a recent visit to Joint Base Langley-Eustis (JBLE) Lt. Colonel Charles “Stab” Hebert, Commander of the 71st FTS (Fighter Training Squadron) and first assignment Adversary Air (ADAIR) pilot call sign “Leeroy” provided insights into the selection and training of Raptor pilots.

The 71st FTS flies the Northrop T-38 Talon as ADAIR support for all F-22 Raptors based at JBLE (27th FS, 94th FS & the 192nd FW).

Raptor Pilot Qualities

During college Leeroy entered the Air Force through the Reserve Officers’ Training Corps (ROTC), and subsequently took his Undergraduate Pilot Training (UPT) at Sheppard AFB. As a student graduating from the UPT, Leeroy was assigned to the 71st FTS “Ironmen” where he has honed his piloting skills flying against the Raptor.

After what will be two years of flying as a Raptor adversary (with at least 1 Raptor Kill – more on that later), Leeroy is now uniquely qualified to achieve his goal and become a Raptor pilot. In the short time since graduation Leeroy has become qualified as an instructor in the T-38 ADAIR program.

As Hebert explained, Leeroy is making a little history – being the first, first assignment pilot to become an ADAIR instructor. Leeroy applied himself and broke barriers by achieving something extraordinary in just over 18 months at his first assignment. This is precisely the type of high achievement individuals with excellent flying skills that the Air Force looks to fill Raptor seats.

Hebert speaks insightfully, he was one of those originally tasked to transition the T-38s from training support for the F-117 to the F-22.

Hebert is qualified in the T-38, F-15C, and F-22 – so he knows what’s involved in excelling as an air combat, adversary and F-22 pilot. With that wealth of experience Hebert notes that not every pilot has the aptitude or the skills to fly the F-22 Raptor.

As Hebert says, pilots are graded on many aspects throughout their undergraduate pilot training (UPT) including; instrument, formation, low level, aerobatics, pattern work, academics, physical condition, and professional conduct. By the end of training, it is clear which students are qualified for the F-22.

And as Hebert states emphatically, “it matters, because you have a very expensive single seat platform and one hour of training in the Raptor may involve multiple Raptors, a Tanker, AWACS, and multiple adversaries.

Leadership needs to ensure the student has the right aptitude, the ability to learn from the sortie without multiple do overs, and progress to the next step.”

Existing Air Force pilots that transfer into the Raptor program from another fighter platform must have also demonstrated exceptional piloting skills and aptitude.

Raptor capabilities include sensor fusion that provides the pilot with superior situational awareness vs. Gen 4 fighters.

Coming from the F-15C Eagle, Hebert says, “I used to look at Raptor pilots and think, those guys are so lucky, the jet does everything for you.

Then I flew the Raptor for myself, and yes the jet does a lot for you, but much more is expected of you!

There are fewer aircraft and the Raptor pilot is addressing a larger mission set.

The aircraft has the speed and sensor suite, it can do anything you need a fighter to do and more, however you have to manage your fuel and your weapons.

The role of a Raptor pilot is more like a mission commander (even as a wingman) as opposed to the Eagle.

One Raptor is expected to do the work of multiple Eagles.

It’s not easy to employ the Raptor well, because you have a lot to manage.”

Each step forward in technology drives increased platform capability.

The era of platforms dedicated to a specific role are winding down.

Platforms like the Raptor now include capabilities that may all be utilized on the same mission; A2A, A2G, electronic warfare/electronic attack (EW/EA), and Intelligence, Surveillance, Reconnaissance (ISR).

A familiar way to understand this is to consider the mobile phone from its inception to what we use today.

When first introduced it was “just” a mobile phone, then became a phone with added calculator, notepad, email, and now the mobile phone is a “smart phone” that includes cameras, office assistants and so much more.

The F-22 does more, and that “more” translates into a significant increase in the scope of the mission set.

The F-22 and F-35s advanced sensors ensure both play a critical part in driving the emerging C5ISR (Command, Control, Communications, Computers, Combat Systems, Intelligence, Surveillance, and Reconnaissance) structure. The aircraft form critical nodes in the associated kill web of information driven assets.

Second Line of Defense

They are not replacements for existing Gen 4 aircraft, but provide an entirely new capability, and as such new Tactics, Techniques and Procedures (TPPs) must become second nature for the pilot.

While new mission sets are seldom discussed (due to the classified nature of the capabilities), even traditional mission sets have many variables.

The Raptor may be flown in a blended environment with both Gen 4 and coalition (international) jets, or fighting on its own.

In a blended group the Raptor often functions as a battlespace manager for the group providing a “god’s eye view” to all participants – even as it keeps the airspace clear of adversaries, and sends volumes of ISR data back to other platforms.

In some cases, the mission commander will utilize Raptor driven information and designate the missiles of other aircraft to down adversaries, ensuring the Raptor keeps maximum weapons load for use as a last resort (as we have seen in Red Flag exercises).

In another scenario the Raptor may be driven by a time sensitive window to get a bomber on target and aggressively strike deep into contested space with scores of hostile air and ground threats to evade or neutralize.

As Hebert summarized, “the Raptor pilot is called upon to manage each unique environment, and that challenges how you manage your weapons. Do you sling one missile or are you slinging two, ensuring the threat is killed?”

“That affects what weapons you have available on board to support the mission on egress. So there is a lot to think about.”

It goes beyond multi-tasking, to multi-tasking in a fluid, dynamic environment with an un-compromised commitment to survival and achievement of mission objectives.

Each circumstance brings a new set of challenges to utilize the available sensor information and deploy the aircraft effectively. Hebert says “the pilot is constantly evaluating out how one change affects everything else and what decision has to be made now.”

Adversary Air

While of 1960s vintage, the sleek, black T-38s are effective adversaries for the Raptors, and train against them daily.

Not to be confused with dogfighting within visual range (WVR) (generally suicidal for a T-38 vs an F-22), the primary training involves taking on multiple bogeys beyond visual range (BVR) that attack in a wide variety of formations.

In the past F-22 pilots used to slip in and out of the T-38s to try their hand against their own aircraft, but that is generally not the case today. Each pilot is focused on their specific craft. Leeroy brings a fresh but disciplined approach to flying as an F-22 adversary.

As he explained, he flies the mission while maintaining a series of priorities revolving around the mission and safety; maintaining fuel; staying within the designated airspace; keeping a safe distance from other participants.

“The formation (to include my wingman and myself) must be executed correctly, the tactic we have been tasked to reflect must be executed correctly. Not merely flying a profile, ADAIR must replicate a tactic and in some cases an aircraft type. It is the responsibility of ADAIR to drive specific learning objectives for the Raptors.”

For the T-38 pilot, communication is typically verbal (from an AWACS or Ground Controller), and situational awareness is the 3D picture the pilot paints in their own mind. In this respect, there is no help from the aircraft! With aircraft often converging at well over 1000 mph – things are happening fast, leaving lots to think about and little time for decisions and actions.

Hebert comments, “I like Leeroy’s response because it illustrates the difference between what’s happening with the Raptor versus Leeroy. Leeroy is flying in a fast jet, he’s really got a lot of variables; he’s thinking about communication; he is literally building a picture in his mind so that he knows what he’s doing next, where his threats are or how he can affect a mission. That is hard. But his effectiveness is small compared to the Raptor.



FIGURE 3 AN F-22 BEING REFUELED. CREDIT PHOTO: TODD MILLER

“A Raptor pilot benefits from tremendous systems that give him a lot of situational awareness, they’re not having to do as much mentally, however they’re wildly outnumbered.

“There’s a lot more aircraft out there trying to kill those two or four jets and so they have to figure out how they’re going to complete their mission, preserve their fuel, preserve their weapons and realize it’s not just an air to air threat, they are also dealing with air to ground threats. The Raptor pilot must stay true to their own limitations associated with that mission set. Our training is very challenging on both sides.”

It is clear – Raptor pilots are pressed through a crucible.

As has been noted in the USAF Red Flag exercises and USAF Weapons School at Nellis AFB – the objective is to train pilots in environments designed to be equal too, or more difficult than what is expected in combat.

While virtual training is utilized, Hebert notes that there is nothing that can train like being in the air. The physical exertion, the actual reality of managing fuel, weapons, the mission set – all escalate dramatically in the air.

Fights On

The typical training sortie takes one of three forms, involving 2 – 6 or more T-38s vs 2 – 4 F-22s;

Short Range, Low Awareness: This scenario typically involves two to four T-38s vs two F-22s with the focus on ACM (air combat maneuvering). The Talons approach the Raptors quickly from behind. The Raptors turn
Second Line of Defense

around with low awareness and attempt to quickly kill all threats. Just like an old western shootout, except the Raptor pilot has to contend with three or four gunslingers at once!

Offensive Counter Air (OCA) and Defensive Counter Air (DCA): In these sorties ADAIR flies as a hostile nation in a scenario that is drawn up by mission planners. ADAIR represents a specific type of aircraft and a particular threat country. A designated “territory” is defended, or attacked. Engagements that end in kills to ADAIR send the T-38s back to a specific location to regenerate and reenter the battle. Given the regeneration those 6 – 8 T-38s might represent a total of 20 – 30 bandits for the F-22s to address during the sortie.

Both OCA and DCA are “missionized scenarios” so the regeneration threat airfields are identified and coordinated with intelligence. The Raptors must typically honor a surface to air threat and they will be penalized if they violate. The surface threats are critical to reflect the A2/AD environment that the Raptor will be expected to fight and prevail in.

The problem sets created for Raptor pilots are difficult, and represent a significant step up in sophistication and difficulty from Gen 4 air to air training exercises (that have primarily focused on ACM or specific mission set served by a given platform).

Hebert addresses the question many are asking, “How is that that a 1960s aircraft challenges a Raptor? By volume, size, and speed. It’s the fact that Leeroy is well versed in Raptor tactics. We know how to work the Raptor to the best of our ability, add intelligence and the difficulties associated with their mission sets (such as their escorting someone you know they have to protect at all costs) -and it gets hard, quick.”

Pride must be taken in the execution of the mission, because it must get old always getting killed! Has Leeroy ever “killed a Raptor?”

A brief moment of hesitation indicates a reluctance to share, “Yes, I have – it happens from time to time.”

Now before readers and armchair fighter pilots lose their minds, there are a number of reasons why a 1960s T-38 may get a Raptor kill, and none of them include the Raptor being out flown by a T-38 in a WVR engagement.

As Hebert explains, it was likely a very hard kill.

While it could have been a mistake (an overlook) by a Raptor pilot, more likely the Raptor was being tasked to do something very aggressive. We may ask them to achieve the impossible.

We have to push them beyond their limits to effect valid training, to hammer home hard lessons. It is a natural, if not critical part of the training.

With Leeroy soon to be flying Raptors he reflects on the most impressive things he’s seen from both the perspective of the F-22 and the T-38.

“With the Raptor – you constantly die without ever seeing it – that’s very impressive” he both smiles and frowns. “On the other hand, if you do get close, right on the Raptors six and you think you are going to get a kill, you quickly learn that the maneuverability of the F-22 is incredible.”

The F-22 turns on a dime, and you are another F-22 statistic. And the most impressive thing about the T-38 Talon? Sounding much like I might expect a B-52 pilot would, Leeroy answers, “to fly a 1960s jet in 2016!”

The situation is ripe with paradox.

A 1960s jet flown by a young, very capable pilot is making an invaluable contribution to the creation of pilots for the most lethal air superiority platform of today and tomorrow.

What could be more exciting? I looked at Leeroy and he could not wipe the smile off his face, he's enrolled in the Raptor-B-course this coming January.

Now that is exciting!

The Second Line of Defense would like to thank Lt. Col Charles "Stab" Hebert, Commander of the 71st FTS "Ironmen"; "Leeroy," T-38 Instructor and soon to be F-22 Raptor pilot; Jeffrey Hood, Media Operations Section Chief, JBLE; and TSgt Katie Ward of the 633 ABW PAO.

Editor's Note: One impact of the F-35 is a dramatic increase in fifth generation pilots; there are few F-22 pilots and few F-22s; in fact, already Lockheed has or will soon have produced more F-35s than F-22s!

THE DEPUTY COMMANDANT OF AVIATION DOWN UNDER: PLAN JERICHO MARINE CORPS STYLE

The Williams Foundation hosted a seminar earlier this year on new approaches to air-land integration.

The terms of reference for the conference were as follows:

Air forces need to be capable of delivering air and space power effects to support conventional and special operations in the land domain.

Air-Land integration is one of the most important capabilities for successful joint operations.

The last decade has seen a significant shift in how airpower has supported ground operations.

With the introduction of systems like Rover, the ability of airpower to provide precision strike to the ground forces saw a significant change in fire support from a wide variety of air platforms.

Precision air dropping in support of outposts or moving forces introduced new capabilities of support.

Yet this template of air ground is really focused on air support to the ground whereas with the shift in the global situation, a much wider set of situations are emerging whereby the air-ground integration approach will become much wider in character, and the ability to insert force rapidly, as a precision strike capability, and to be withdrawn will be a key tool in the toolbox for decision makers.

Fifth generation enabled operations will see a shift to a distributed C2 approach which will clearly change the nature of the ground-to air command system, and the with the ability of fifth generation systems to generate horizontal communications among air assets outside the boundaries of a classic AWACs directed system, the change in C2 will be very wide ranging.

The seminar will explore how the ADF can take advantage of Army's Plan Beersheba and Air Force's Plan Jericho to enhance Air-Land integration.

Quite obviously, the evolving capabilities of the USMC are clearly convergent with the approach, which Williams wished to foster for the future of the ADF.

Second Line of Defense

Lt. General Davis highlighted at the beginning of his presentation that when he attended the Avalon Air Show and then head of the Royal Australian Air Force (RAAF) introduced Plan Jericho, it was clear that the Marines and the RAAF were on the same page.

"I went back to the Commandant and said that we need to work more closely with the RAAF because with Plan Jericho they are onto something big with regard to innovation."

The presentation was hard hitting, comprehensive and clearly on target for the Australian audience.

As Air Commodore Steve Robertson, Commander Air Combat Group and a former exchange officer with the USMC, commented, "If you think this was hard hitting, it was mild compared to some Marines.

The Marines are gung ho about the future and shaping new combat capabilities.

They do not like to lose."

This theme was central to Davis's presentation – the entire point about combat innovation was to be the best force, which America could deliver to any global crises at any time.

"We want to be the best partner to our friends; and the most feared enemy of our foes."

Technology is important to this effort, and he highlighted that the Osprey being brought into the force was a generator of "disruptive change," but the kind crucial to real combat innovation.

"But change is difficult; and the critics prevalent."

He noted that if we held this conference 12 years ago, and the room was filled with Marines we would hear about all the things the Osprey could not do and why we should not go ahead. "If we brought those same Marines into the conference room now, they would have amnesia about what they thought then and press me to get more Ospreys and leverage it even more."

But it is not just about technology – it is about "equipping Marines, not manning the equipment."

His point was that you needed to get the new equipment into the hands of the Marines at the earliest possible moment, because the young Marines innovate in ways not anticipated when the senior leadership gets that equipment to them.

The Marines like at risk differently from the cubical commandos.

I recall a conversation I had with a well-known and oft quoted aviation analyst who told me that the Marines should have waited few years before using the F-35B because doing so now was "risky."

I pointed out that it was inherently risky flying legacy aircraft into ever more challenging conditions than getting new equipment into the hands of Marines who would innovate rapidly in ways that could not be imagined in the chat corridors inside the Beltway.

Davis provided several examples of innovation, but one was about the F-35.

He argued that there was no doubt that the F-35 is the right plane for the USMC.

Now that it is in the hands of Marines, they are innovating in ways which the leadership really did not anticipate and much more rapidly than might be imagined.

He described an event where the Commandant was going witness a Yuma to Nellis scenario in which F-35s would be used to support Marines in the maneuver space.

He went to the Marines working the exercise and asked: "Was everything ready for the Commandant?"

The answer was: "Sir we are not going to do exactly what you asked for and are not ready to do it that way?"

Davis commented: "The Commandant is just about here, what are you talking about?"

The Marine answered: "Frankly, the scenario you suggested was not tough enough for we wanted to take our F-35s into a more advanced SAM belt to get through and then support the Marines on the ground."

Davis was a bit taken aback, but the innovation already evident by the squadron pilots was rewarded with a demonstrated success on the Nellis ranges.

The Commandant was impressed, and although a ground combat Marine, he argued "we need to get that plane into the hands of Marines as fast as we can."

The DCA noted throughout his presentation that the RAAF focus on bottom up innovation with the Plan Jericho processes was what the Marines felt was central to real combat innovation.

And shaping the way ahead was really about leveraging the new platforms, shaping key enablers and then ensures that whatever follow-on platforms are bought that they build upon but push the innovation envelope.

He saw the tiltrotar experience as a crucial baseline and saw the future of Marine Corps rotor wing as tiltrotar.

He saw the Cobras, Hueys, and Yankees replaced over time by a new generation tiltrotar aircraft.

He favored developing one, which would be two seaters, and able to be either manned or unmanned to provide for the kind of flexibility which the Marines would want to reshape the capabilities and approach of the assault force.

His version of the Plan Jericho approach to building a more integrated assault force was as follows:

Every platform a SENSOR, every platform a SHOOTER, every platform a SHARE/CONNECTOR, and every platform an EW NODE.

And throughout he highlighted that the Marines were preparing for the high end fight and enhanced capabilities to operate throughout an expanded maneuver space, and able to operate from land, and sea sequentially, concurrently or jointly as the mission demanded.

With regard to equipping that force, he saw the need to build on fifth generation capabilities, multi-mission everything, spiral develop everything and leverage bottom up combat innovation.

He concluded that he saw a great opportunity to work with an ADF in transformation as the Marines went down a similar path.

THE SEA SERVICES PREPARE TO PREVAIL IN THE EXTENDED BATTLESPACE: THE PERSPECTIVE OF REAR ADMIRAL MANAZIR

By Robbin Laird and Ed Timperlake

The decade ahead is not a repeat of the past 15 years; it is not about a continuation of the land-centric and counter-insurgency slow motion war.

It is about global agility, the ability to insert force to achieve discrete and defined objectives, and to maneuver in the extended battlespace to work with allies and joint forces to credibly prevail in the range of military conflict across the range of military operational situations.

For the power projection forces –USN/ USMC, USAF with appropriate elements of the US Army, especially Air Defense Artillery – it is about the capability to work across an extended battlespace with flexible means which can be linked together as necessary to prevail in the military and strategic conditions facing the US and its allies in the period ahead.

It is about building capabilities at the high end, which have the flexibility to operate through the range of military operations or ROMO.

It is about powerful and flexible force packages which can operate and dominate in specific military situations but be linked to other capabilities to provide the kind of reachback and dominance which effective deterrence requires.

In our book on the **Rebuilding American Military Power in the Pacific: A 21st Century Strategy**, we highlighted several key elements required to shape 21st century war winning deterrent forces.

By leveraging some of the new platforms coming online and replacing older, costly, and stove-piped platforms and systems, a new scalable force structure can be built. And at the heart of doing so will be the inclusion of allies and U.S. forces within a modular scalable structure.

The strategy is founded on having platform presence. By deploying assets such as USCG assets— for example, the national Security Cutter, USN surface platforms, Aegis, or other surface assets— by deploying subsurface assets, and by having bases forward deployed, the United States has core assets that if networked together can end a stovepiped acquisition strategy of platforms bought separately from one another and make significant gains in capability possible. Scalability is the crucial glue to make a honeycomb force possible...

Two other key elements are basing and weaponization. Basing becomes transformed as allied and U.S. capabilities become blended into a scalable presence and engagement capability. Presence is rooted in basing; scalability is inherently doable because of C5ISR enablement, deployed decision-making, and honeycomb robustness.

The reach from Japan to South Korea to Singapore to Australia is about how allies are reshaping their forces and working toward greater reach and capabilities. For example, by shaping a defense strategy that is not simply a modern variant of Sitzkreis in South Korea and Japan, more mobile assets allow states in the region to reach out, back, and up to craft coalition capabilities.

The approach we have suggested is built around “no platform fights alone,” whereby we look at key platforms as nodes in a honeycomb force, which can act with effective lethality throughout an extended battlespace.

Those platforms which can operate in an interconnected manner are the crucial ones to build, deploy and sustain in the period ahead, versus those which are very limited in their capability to provide synergy to joint or coalition forces in the battlespace.

This means as well that force packages need to be examined, less in terms of themselves individually, but rather in terms of their synergy and capabilities to shape dominant combat power in the interconnected battlespace.

To discuss the way ahead for the sea services from the standpoint of the head of Naval Warfare, we had a chance to discuss key elements of innovation being put in place.

Rear Admiral Manazir, then Director of Air Warfare on the Staff of the Chief of Naval Operations and now Deputy Chief of Naval Operations for Warfare Systems, sat down with us in November 2015, to discuss the way ahead.

Question: As global events unfold, most dramatically the reach from the Middle East to Paris and back again, how do the sea services contribute to the fight?

Rear Admiral Manazir: The Navy/Marine team has always been expeditionary; it was at its inception 240 years ago for both services.

We have always been expeditionary.

We design the Navy / Marine Corps expeditionary force to be able to engage against a nation state when necessary.

That could be all the way from what people technically refer to as the high-end anti-access area denial fight all the way to putting power ashore to engage in counterterrorism fights.

The Marine Corps has grown in capability from being naval infantry to now having the capability to come from the sea with high-end meshed, networked, honeycombed, resilient capability, with an array of options depending on how you integrate the force.

The sea base itself has a powerful ability strategically to wage war because you don't need a permission slip from a foreign power to use their bases.

The United States Navy and the United States Marine Corps singly in the world have retained and modernized the sized capability that allows one to fight a nation with our force rather than just fight another naval force.

Question: Put in other terms, a force capable of being sized to the mission?

Rear Admiral Manazir: That is right. Our modernization strategy will make us even more effective to deal with the future mission set.

What the higher-end capabilities that are delivered with F-35B and C and then the future air wing that includes unmanned give us is the capability to really own that battle space, and all domains of it. It can be flexed from the higher-end war fight down to delivering combat power ashore from the sea base.

Going into a high-end battle space with F-35Bs and Cs will allow us to identify more of the players in that battle space than we did before. With the information gathering and data fusion capability resident in the F-35, you can empower the rest of the air wing.

Second Line of Defense

The F-35 is truly revolutionary technology.

The ability to bring in that much information into a single platform, share it together via machine language and put that picture together is game changing. The ability to then coalesce that much data into knowledge is unprecedented.

If you are operating over the battle space, like a counterterrorism situation, where you have a lower-end air-to-air threat, you can operate, and persist over a ground battle space as you collect information and shape a much more rapid strike capability as well. The decision cycle can accelerate in either the higher end or lower end fights.

The point can be put simply: we are expanding our capability to shape an agile force to operate throughout the battlespace and to deal with the spectrum of threats which a sea base would be tasked to operate against.

The F-35 will be a contributor to shaping the overall modernization strategy.

The F-35 has a powerful ability to share information, the ability to sense the battlespace, whether it's signals from a surface naval vessel, signals from an air contact, ID-ing the air contact at long-range, or processing and identifying targets on the ground, all tasks that we're going to have to do going forward to win.

Question: When we were at Fallon, the air wing training to go out on deployment was in real time communications with the Bush on deployment in the Middle East.

And the Fallon team is working hard to evolve the approach to Live Virtual Constructive Training in order to be able to fight effectively in the expanded battlespace with higher speed warfare and operational dynamics.

How do you view the impact of these new capabilities on shaping the sea base going forward?

Rear Admiral Manazir: The ability to share information between decision-makers and staffs that are not all geographically located, is getting better and better. This allows not only dynamic combat learning but provides greater fidelity to the training process as air wings prepare to deploy.

In the past, we only sent text reports. Now we are sending full motion video. The EA-18G Growler can send actual data back to the warfighting center and say: "We have not seen this signal before, what is it?"

And then the labs can run it through their data libraries and work the problem to ID the signal and send their findings back to the deployed fleet.

The F-35s coming to the fleet will add significantly to this process. It is about rapid combat learning in a dynamic warfighting environment.

We are shaping the foundation for "learning airplanes" to engage the enemy.

LVC will enable us to train in a more robust environment than we are on our current ranges that are geographically constrained, and currently do not have the full high end threat replicated. LVC will allow us to train to the full capabilities of our platforms across a variety of security environments and do so without exposing our training process to an interested adversary.

Question: What you are talking about is shaping real time combat forensics against an active and dynamic threat?

Rear Admiral Manazir: That is a great way to put it. And this capability is crucial going forward.

We're back into a scenario where lots of threats around the world require us to react to enemy learning. Then, when they act in accordance to our reaction, we react again and so on. The enemy morphs to do X. We have to react and we now do Y.

What is not widely realized is that the evolving air wing on the carrier and on the large deck amphibious ships, is being shaped for a dynamic learning process. The F-35s will play a key role in this evolving process, but we are already underway with this process as you mentioned with regard to Fallon.

With regard to the air war, where it's either air-to-ground missions or air-to-air missions, we can share that information and bring in more people into the discussion with our long-range information and communication systems.

That kind of capability is foundational to the evolving air wing.

We're also working on the capability to bring in national technical means into a cockpit where the synapses that are required to do that are significant to be able to have something with a relatively low latency.

Imagine an off-board sensor that gives you a piece of information in the battle space that you can get into the cockpit and adds to the information you already have. It's about closing down the information deltas that we have traditionally considered as a strategic national asset with a tactical naval asset.

And we're closing down the connection lines between where we get that information and conveying to the warfighter.

There is a constant effort to enhance the ability to get intel to the warfighter so he can act on it.

Question: What you are describing is the fighter wing as sortieing of information, and not only weapons?

Rear Admiral Manazir: That is a good way to put it.

We are doing what Bayesian theory talks about, namely we are providing more and more information to get closer to the truth in targeting or combat situation. One can reduce that fog of war by increased understanding of what actual truth is, you're going to have better effects.

This is why the technology that the F-35 brings to the fight is so crucial.

You have decision-makers in the cockpit managing all of this information.

With Block 3F software in the airplane, we will have data fusion where you transform data information to knowledge enabling greater wisdom about the combat situation.

The processing machines in the F-35 provide enough of the fusion so that the pilot can now add his piece to the effort.

This enables the ships to enhance their ability to operate in the networks and to engage with the air fleet in dynamic targeting at much greater distance.

It is about reach not range for the honeycomb enabled expeditionary strike group. The F-35 is a key enabler of this shift, but it is part of an overall effort to operate in the expanded battlespace.

Second Line of Defense

Question: Visits to the USS America, to CVN-78 and to the Queen Elizabeth, all highlighted the importance of building ships which can provide what one might call 21st century infrastructure of combat air.

How do you look at the Ford, for example, through this lens?

Rear Admiral Manazir: It is a 21st century naval infrastructure asset, which lives off and further enables the transformation of the air wing.

It's a facilitator for all the things you're going to do off the flight deck.

The electrical generation capacity on the Ford is three times what the Nimitz's is.

It gives you the ability to put greater electronic systems on to the ship.

The ability to have high power requirements with high cooling requirements for your data servers is enabled by the ship.

It has the capacity to be able to support those things and in conjunction with the high-end air wing we're building, you're going to be able to do the missions we discussed earlier more effectively in the expanded battlespace.

The Ford's infrastructure will be partnered with the airplanes that come on and off the flight deck.

Question: What you are describing is a shift from thinking about the carrier as the deck which can fly X number of aircraft to thinking of the carrier as a moving epicenter of an extended strike enterprise, that can work with the USAF and coalition partners and live off of their combat capabilities in the expanded battlespace.

Is that what you are arguing?

Rear Admiral Manazir: Absolutely.

The focus is upon the carrier as a moving epicenter for a netted capability with the joint and coalition force.

It is not about counting the number of airplanes on the deck or projecting the future existence of paper airplanes.

It is about the air wing we are building and how it will operate with the transformed joint and coalition forces we are collectively modernizing.

The approach is to have force structure flexibility with an interconnected extended battlespace.

You can operate as a separate force package; or as a federated force when you are connected but can plug and unplug; you can be interoperable, integrated or interdependent; depending on time, circumstances and mission.

What the Ford class, the Joint Strike Fighter and future unmanned platforms bring is the ability to pull the information in and be an epicenter of an enlarged and extended reach for the joint and coalition force.

Question: The expeditionary strike group as a sea base is seeing significant increase in its flexibility with the changes in the amphibious as well as carrier fleet. It really is an engagement force, which can allow for significant operational flexibility.

How would you describe the evolution of the sea services with regard to the way ahead?

Rear Admiral Manazir: You can describe it in terms of continuity of change and transformation.

They are engagement forces; they are presence forces; they are deterrent forces. They are extensions of the National Command Authority.

In the old days, way back when Perry opened up Japan, he was an independent Captain given mission orders and off he went.

In World War II, they were given mission orders and off they went.

Through the 60s, naval forces operated to deter. The Strike Group commander had communications back to the National Command Authority. The links were limited and text based.

Now, you have the real ability to actually have a fundamentally robust connection with the engagement forces forward at sea and one can pursue Bayesian logic, getting down towards more truth in the picture. You start to reduce the fog of war that comes from misinformation, or a different understanding of the battle space.

And as you reduce the fog of war by increased understanding of what actual truth is, you're going to create better effects from the use of force.

The great thing about naval forces is that we can move in and out of operational sanctuaries, and the Navy Marine Corps team can move to the area of interest and the point of attack. You can take that capability, whether it's in the Eastern Med or in the Western Pacific, with the reach of this network-enabled combat force, and especially when you start to link it together with coalition partners, you start to grow a honeycomb mesh of integrated networks that are all sharing information.

And the reach of this combat capability is greater than what flies or is launched off of any particular combat ship.

Question: They are some critics who focus on the Navy building too complex of platforms for new sailors to operate. Our observations are somewhat different from either operating on or visiting Naval platforms – complexity is there but the focus is upon the ability of sailors to operate more automated systems as well.

How do view this challenge?

Rear Admiral Manazir: I'd push back against anybody that says we make our systems overly technical for our sailors to operate. Our most important war-fighting asset is the United States Navy sailor.

The sailors that are on Ford, we're training them at the level that the technology is advancing. Our air crews that are in our F-35s are trained to operate that weapon system. They are expert at that higher technology weapon system. We train them to be part of that weapon system.

We put a program together that doesn't just give them a piece of equipment and say here, go figure this out. We are the best in the world at building training systems that optimizes our technology.

What we really get, though, through the inventiveness and the ingenuity of our sailors and junior officers is that they take their weapon system, which is now more software-driven than it is hardware, and drive it's capabilities forward, enhancing the warfighting impact of the new technology.

Second Line of Defense

And based on growing up in a data-rich world and growing up in a machine-rich world, they know how to take this weapons system to a higher level than we even designed it for.

For example, the recommendations we got coming back from the first deployment of the Growler, was that they're developing tactics for us that we did not envision when we first sent it out on the ship.

The new systems rely on significant machine to machine and man to machine interfaces. We are finding that the best way to enhance the machine-to-machine learning is to make it a man-machine interface to enhance the dynamics of change in the machines and the quality of combat innovation.

For example, when I think of the future of remotely piloted systems operating from or with a carrier, I envision a future that has a Joint Strike Fighter pilot with three unmanned wingmen.

Question: One capability which fifth generation systems have brought to the fight is the capability of the aircraft to operate at great distances from one another.

This is a key enabler of better combat capabilities in the extended battlespace.

How do you view this synergy?

Rear Admiral Manazir: With the fifth generation aircraft and their sensors and fused data you can cover a much greater swath of combat space than with legacy aircraft.

And as we sort through how to integrate unmanned systems with F-35s we will be able in a single operational unit cover significant combat space.

You are looking at exponential growth in coverage capabilities to inform the process of generating the combat effects, which you want in that extended battlespace.

And the growth in the ability to generate better target information will allow us to execute strikes within our rules of engagement.

The coming of the F-35 will help in this process.

We train our aviators in the Navy and the Marine Corps to be decision-makers, given the constraints.

A lot of times, we can't apply the rules of engagement we've been given because we can't identify that's a bad guy, whether he's on the ground or in the air.

With better fidelity of information at the forward edge of the battle, I can execute more rapidly as well.

Question: We are discussing the evolution of the sea base and its operational capabilities in the extended battlespace.

But what can be missed is the innovation already underway by the Marine Corps-Navy team with the Osprey reaching 10 years of operational life, the IOC of the F-35B into Naval Aviation and several other innovations already in place and underway.

We noted that when the Truman strike group went to sea recently, that the team put the strike group to sea in a much quicker turn around than planned.

Rear Admiral Manazir: The Truman did go to sea based on a planned surge cycle, deploying to deal with emerging combat needs and requirements.

The carrier presence number is a vetted, risk-based, posture and presence discussion, with the Navy, the Joint Staff and the Secretary of Defense.

We choose where and when to put our forces out there.

But when they go, they're ready for any mission.

In short, while some are considering the anti-access, area denial challenge as the end of history for the sea services, the professionals are treating the challenge as the opening of new round of innovation for the operation of the sea services in the 21st century battlespace.

REAR ADMIRAL MANAZIR IN AUSTRALIA: ALLIED CONVERGENCE ON THE KILL WEB

The lead off speaker at the Williams Foundation seminar on air-land integration held in Canberra, Australia on August 10, 2016 was Rear Admiral Manazir.

Rear Admiral Manazir currently serves as the deputy chief of naval operations for warfare systems (OPNAV N9) on the staff of the chief of naval operations. In this capacity, he is responsible for the integration of manpower, training, sustainment, modernization and procurement of the Navy's warfare systems.

His presentation focused on the strategic context for the U.S. and allied maritime forces and shaping a convergent way ahead.

His presentation highlighted both the significance of the maritime domain for commercial operations and the emergence of peer competitors within that domain.

The U.S. and its allies are clearly concerned that the freedom of the seas, and rule of law be exercised by the global maritime nations.

Equally obvious is the concern that rival maritime powers are committed to their own interpretation of the rules of the road and are building capabilities to seek to implement their will in the maritime domain.

The question is how can the allies shape convergent capabilities to ensure that the global commons remain open, and not controlled by powers seeking to enforce their will against the allied powers?

Rear Admiral Manazir highlighted the kill web approach as a way to shape more effective integration of force and convergence of efforts.

The kill chain is a linear concept which is about connecting assets to deliver fire power; the kill web is about distributed operations and the ability of force packages or task forces to deliver force dominance in an area of interest with the F-35 as a key capability in empowering the kill web.

It is about building in integration from the ground up so that forces can work seamlessly together through multiple networks, rather than relying on a single point of failure large network.

Later in the seminar, both the Chief of Navy, Vice Admiral Barrett, and Rear Admiral Mayer, Commander Australian Fleet, underscored similar approaches to the one introduced by Rear Admiral Manazir.

In his presentation at the conference, Vice Admiral Barrett underscored that "we are not building an interoperable navy; we are building an integrated force for the Australian Defence Force."

Second Line of Defense

He drove home the point that ADF integration was crucial in order for the ADF to support government objectives in the region and beyond and to provide for a force capable of decisive lethality.

By so doing, Australia would have a force equally useful in coalition operations in which distributed lethality was the operational objective.

Vice Admiral Barrett noted that it is not about massing force in a classic sense; it is about shaping a force, which can maximize the adversary's vulnerabilities while reducing our own.

Rear Admiral Mayer focused specifically on the networking aspect of the kill web and how to make it work.

He highlighted that the Navy was returning to a task force concept but one which was 21st century in character, whereby Navy was tapping into ground and air assets as "part" of the task force, rather than simply focusing on Navy operated assets.

This evolution of the task force, clearly in the mode of what the US Navy is referring to as the "kill web," will require the evolution of capabilities, both in terms of connectivity, and training. During the seminar he characterized as the network as a weapon system with "no single master."

It was important to shape a way ahead for the joint force to work within the evolving networks in order to effectively operate in a distributed task force sense.

"Each service is underpinning its platforms with elements of a common network.

"There is increased overlap thereby for the air and sea forces. How should we best develop our joint concepts of operations and joint capability?"

And later in the seminar the perspective of the Royal Navy was provided by Captain Nick Walker, Royal Navy, with regard to the coming impact of the Queen Elizabeth Class carriers.

His presentation highlighted that the impact of the new carriers was joint through and through and was about empowering the British defense force to operate throughout the spectrum of conflict.

It was about not simply adding a new ship, but shaping a networked enabled capability able to operate to serve national interests or to support coalition operations.

Captain Walker quoted the most recent Strategic Defence Review with regard to the Queen Elizabeth Class carriers as follows:

In short, Rear Admiral Manazir was part of an Australian and Allied re-think about the way ahead.

When asked after the seminar about his reactions to the seminar and his meetings in Australia, he underscored that he found a significant amount of innovative thinking going on generated by the Williams seminar.

"The Williams Foundation is coalescing around a lot of the issues that we're trying to solve.

Most often the public discussions are mostly about resources.

That conversation is important but the discussion, which Williams set in motion, is about how to develop a different kind of navy.

The conversation has got to be along the lines of what we had today if we are going to get it right. For this, I thank the Williams Foundation."

When asked what he thought about the presentations of his Australian peers, Rear Admiral Manazir had this to say:

“I thought the Fleet Commander was very, very good. He understands his trade and he speaks comfortably about his trade. And he understands where the Navy needs to go. What I took from Vice Admiral Barrett was his vision and his passion about that vision. He’s obviously a bold leader.

I see great examples in the Australian Navy of the kind of bold and competent leadership necessary for us collectively succeed.”

When asked about the UK presentation and perspective, Rear Admiral Manazir underscored that what impressed him most was the emphasis on the strategic role which Air and Naval modernization was being accorded by the UK government.

“The new carrier is being viewed as a government strategic asset, not simply a new platform, in and of itself. The British government is clearly investing in the Queen Elizabeth class of aircraft carriers.

And I’m so very happy that we still are committed to an aircraft carrier force; that we don’t have to go back and reaffirm our commitment to that force but can move ahead with re-shaping its role and capabilities in the period ahead, in the period of building the kill web.”

Finally, he highlighted what he sees as a key leadership role exercised by the Royal Australian Air Force and its Plan Jericho approach and mentality.

“Let me add my admiration of the approach that the RAAF has taken over the last 7-10 years.

“They have bought their platforms with an eye to interoperability inside the ADF, and with coalition partners, with key regard to the United States as well.

“RAAF leaders, energized by Geoff Brown’s forward-thinking approach, have already moved past the platform replacement approach and are focusing on capabilities delivered by networked combat power.”

THE FUTURE OF NAVAL AVIATION ABOARD THE USS GEORGE WASHINGTON

By Todd Miller

The USS George Washington (CVN-73) hosted the F-35C in its final Developmental Testing cycle (DT-III) Aug. 14-23, 2016.

However, for a few of those days the two VX-23 “Salty Dogs” F-35Cs from NAS Patuxent River were joined by 5 F-35Cs from VFA-101 “Grim Reapers” out of Eglin AFB.

The 7 F-35Cs gathered on the deck of the USS George Washington represented the largest carrier contingent of F-35Cs onboard a large deck aircraft carrier to date.

Media were hosted on the USS George Washington August 15 to observe the carrier qualifications at the onset of DT-III. All pilots embarking must perform a number of “cats” and “traps” prior to executing the specific tests involved with DT-III.

DT-III is focused on a number of issues:

Second Line of Defense

Validation of the aircraft's flying capabilities with full inert internal and external stores (up to 4 GBU-12s and two AIM-9X on external hardpoints);

Handling tests with asymmetrical loads;

Testing for maximum weight launches at minimum power; evaluating all of these in a variety of wind and sea conditions.

As explained by Tom “Briggo” Briggs ITF (Integrated Test Force) Chief Test Engineer, there were additional minor tests to run through, such as ship borne evaluation of minor adjustments made to control laws (based on previous DT testing), and night launches to verify the Gen 3 helmet performed as desired.

Briggs made clear that the testing is to prepare the aircraft launch and recovery bulletins (ALB/ARB). These are the operating guides the Navy will utilize to determine the appropriate launch and recovery parameters for the aircraft given weights and conditions. These bulletins will ensure the aircraft can safely launch with the desired loads to complete assigned missions.

Complete ALB/ARBs will enable the F-35Cs to be very combat capable as they reach IOC utilizing the Block 3F software.

DT-III is a significant milestone for the F-35C program and represents the progression towards US Navy IOC somewhere between August 2018 and Feb 2019.



FIGURE 4 F-35CS ABOARD THE USS GEORGE WASHINGTON

It was all business as planned. Media probed for human-interest stories from the cadre of pilots on board: “What was it like, after all the simulator hours and practice landings at the airfield to actually land on the ship?”

From pilots who had 50 traps with the F-35C to those who had just realized their first – they struggled to provide any other answer; “no drama, no surprise, performed as expected, very vanilla, pretty straightforward.”

No news.

“Any issues moving 7 F-35Cs around the deck at once, or reliability issues?”

No news.

Though not officially part of DT-III, the Grim Reapers of VFA-101 put the state of the F-35C program in context – and made news of their own. VFA-101 represents a cadre of instructors and strike fighter tactics specialists who took this opportunity to carrier qualify so they can prepare the instructor syllabus for the F-35C.

12 VFA-101 pilots with 5 F-35Cs completed their carrier qualifications (CQs) in just over 1.5 days. That is, as Capt. James Christie of VFA-101 described, 10 landings and 2 touch and goes each – 120 cats, 120 traps and 24 touch and goes.

As U.S. Navy Commander Ryan “Flopper” Murphy, F-35 ITF Lead said: “the greatest satisfaction was to watch the fleet (VFA-101) start to utilize the aircraft.

After all, that is the point of everything we are doing, all the years of work; to equip and empower the Fleet with the F-35C.”

After observing VFA-101 for a few hours, it is clear the equipping and empowering are well underway.

Simultaneously the 5 VX-23 pilots performed their CQs.

Suffice it to say, the F-35Cs on board were very busy, and from an observer’s perspective, landing and launches were very frequent. There were instances of hot refueling, with pilot changes during refuel and the aircraft cycling back for more CQs.

As VX-23 F-35C pilot Ted “Dutch” Dyckman explained, everybody completed their CQs faster than with the Hornet. The additional fuel on the F-35C, the ease of landing due to Delta Flight Path mode, along with the aircrafts reliability all played a part in the accelerated CQs.

The innovative “Delta Flight Path” mode that is engaged on approach alters the control laws, setting auto throttles and maintaining the optimal 3-degree glide slope to landing. This approach makes the pilots job landing on the carrier much easier, and they were hitting the desired 3 wire almost 100% of the time.

Any wave-offs were driven by deck activities – not derived from within the aircraft. Delta Flight Path utilizes the flaps to add or decrease lift during approach so as to maintain the glide slope. Observers can see tremendous amounts of flap adjustments on aircraft approach to the deck – these are all controlled by the computer to provide the pilot what they want – glideslope to the deck.

The Super Hornet and Growler control laws are being modified to feature the same Delta Flight Path in an initiative called “Magic Carpet.” Once Delta Flight Path is fully integrated on the F-35C, F/A-18E/F & EA-18G the efficiencies created will make a profound, operational impact on naval aviation. Numerous pilots identified the benefits provided by Delta Flight Path; safer, less stressful landings on board; pre-embark training cut by as high as 50%; more time available to focus on tactics and missions; reduced wear and tear on aircraft; fuel savings; fewer “tankers” required in the air during recoveries and more.

USMC Major Elroy Northam, a pilot with VX-23 extolled the value of the F-35 in the battlespace as a stealth platform with an advanced sensor suite that will push its way to the forefront of the battlespace, gather all kinds of information as to what is out there, quickly identify “red or blue,” and push it out throughout the force including to legacy aircraft.

The information will provide an unparalleled situational awareness (SA), and the guy with the best SA usually wins.

Second Line of Defense

Recently appointed to the new position, Director of Joint Strike Fighter Fleet Integration, Rear Admiral Roy “Trigger” Kelley was on the USS George Washington for DT-III. Kelley will direct the F-35C program towards IOC.

Given 70% of the world is covered by water, the US Navy-Marine Corps team can expect to be on the frontlines of any potential battle.

Kelley is excited about the capability the F-35C will bring to the Fleet; first day access into contested areas that host sophisticated air defense systems; the ability to utilize stealth and sensors to define the battlespace combined with advanced command and control capabilities that will empower the entire fleet.

The F-35C and associated technologies (Delta Flight Path) will revolutionize Fleet capabilities, particularly when seen in context of the evolving US Navy “kill web” approach. The information gathering and sharing network consisting of the F-35C, P-8A, MQ-4C, Aegis and others will be a foundation for the maritime services operating in the extended battlespace.

Once DT-III is finished the ITF will look forward to DT-III with the F-35B in October, and then close the loop on additional verification of structural load testing on the aircraft. It is expected that their work in this capacity will wrap up the summer of 2017.

For Briggs, (recognized as the 2015 Test and Evaluation Lead Tester) it is hard to put into perspective an effort that has spanned over a decade and a half. One can feel the professional sense of pride he takes in what is being accomplished by the team including the ITF, Lockheed Martin, the USS George Washington, USMC, US Navy and others.

170 personnel from Pax were on the carrier to support the testing, and many more back on land that have been working tirelessly for many years to make it all happen.

DT-III is a significant milestone, and it is clear the US Navy is now tracking very quickly and methodically to a very capable IOC.

Second Line of Defense would like to thank the following for their support: Sylvia Pierson, F-35 ITF/JPO PA; CDR Dave Hecht, Naval Air Force Atlantic PAO; Capt. Timothy Kuehhas, CO USS George Washington; and the many supporting PAOs on and off shore, pilots, engineers, and C-2 Greyhound crews. The entire US Navy team performed as professional, gracious hosts.

THE WAY AHEAD IN THE RAAF IN THE JOINT FORCES SPACE AND THE COMING OF THE F-35: THE PERSPECTIVE OF AIR COMMODORE KITCHER

By Robbin Laird

Prior to the Williams Foundation seminar on air-sea integration held on August 10, 2016 in Canberra, Australia, I had a chance to sit down with Air Commodore Kitcher and to discuss the way ahead for the RAAF in the joint combat space.

He is the Director General of Capability Planning in the RAAF.

Air Commodore Kitcher provided an understanding of how the RAAF was integrating its new platforms into the force, and how opening the aperture from the outset on joint capability was affecting that roll out as well.

Question: It is often noted in the USAF that 80% of the platforms which will make up the 2025 force are already here.

What is the RAAF's perspective?

Air Commodore Kitcher: "It is somewhat different from the USAF. And our challenge is also somewhat different. By 2025 our oldest platform will be a C130J, which remains the most modern C130 available.

"In 2025, we're not going to be operating a platform in the air combat space that's 20 years old. In Australia, we don't have to integrate an F35 with an F16, or an F35 with the classic Hornet.

"We will be operating some of the latest and most capable platforms across the air lift, control of the air, strike and ISR roles and our challenge is to get best combat value out of an integrated Australian and coalition force using these cutting edge capabilities.

We'll retire classic Hornet, and introduce the F35-A, which is much more than a replacement for the Classic. Our other air combat asset are our Super Hornets, which are only 5 years old, and both will be supported (amongst many other things) by Growlers, which will arrive in Australia next year.

"If we look at the maritime space, P3s are retiring, P8s and Triton are being introduced. Our first P8 turns up in November this year. If we look in the airlift space, C130Js will be our oldest platform, but they remain contemporary.

"The KC-30 Multi Role Tanker Transport is 4 or 5 years old with both the hose and drogue and boom air to air refueling capabilities being fully realised and another 2 effectively new KC-30 aircraft will arrive before the end of 2019. We also picked up C-17 aircraft #7 and 8 last year. C-27J is being introduced right now and we expect it to reach IOC before the end of this year.

"In the surveillance and control area, the E-7 Wedgetail AEWAC airframe might be 10 or 15 years old. However, the Wedgetail capability is equal to or better than any similar capability in the world.

"You'd have to say Wedgetail is a cutting edge AEWAC capability. There would be some capabilities that Wedgetail has that the new USAF Block 40/45 E-3G AWACS doesn't have, and vice versa, of course."

Question: So your challenge is ensuring that your force, which is a young force in terms of new capabilities, can work effectively together; and for this, you are also working with core allies such as the US, but need to shape a core Australian way ahead.

How would you describe the challenge?

Air Commodore Kitcher: "How do I make my US Air Force 'like' F35A work closely with my US Navy 'like' Growler and Super Hornet to achieve a mission?

"Similarly, how do I ensure that these aircraft, plus the Australian bespoke Wedgetail can work effectively with the RAN LHD and Air Warfare Destroyer to achieve a Maritime support or strike mission?

"It's a good problem to have to ensure that we get the maximum collective capability out of our individual platforms in the Australian context, which means we've got to make them work with each other.

"Larger forces, like the US, may not have that same requirement, because they've got other assets that can do various specialized missions.

Second Line of Defense

“And we face a major challenge to ensure that our new air platforms work in an integrated manner with evolving Navy and Army capabilities.

“We must shape solutions which support our Australian Concept of Operations.

“Our force also obviously needs to be “integratable” and/or interoperable with the US and other allies, but we won’t get there fully by simply buying US C2 and ISR systems.

“Not only do we need to make a particular platform or system work for Australia within our ADF capability context, but we need to ensure that it’s truly interoperable in a coalition as well.

“This is a real challenge, because there are security issues, restrictions and requirements that exist that must be overcome to realize true high-level interoperability.

“However, solving these problems is far better than trying to keep something that’s 30-year-old flying and make it work with the new equipment coming on line.

“To solve these challenges, we are focused on prioritising and integrating only the things that you ‘should’ to make a more lethal and effective force.

“There is no need for all our capabilities to be fully connected to each other, there are levels of connectivity that will suffice, especially initially. We must prioritise and identify what we ‘should’ do, and to what level, then embark on a program of doing what we ‘can’ do.

“A component of the RAAF Project Jericho involves this kind of thinking and is looking at our Air, Maritime and land capabilities, determining the art of the possible with respect to connectivity, and then suggesting levels and priorities that should be pursued.

“This also includes components in the virtual and constructive areas such that we can also train more effectively in the joint arena.

“Improving our training capacity by complementing live training with virtual and constructive is vital, especially where availability of the scarce live resources necessary to generate a complex training scenario are limited, and security restrictions could inhibit operating live at appropriate levels.”

Question: You have done a lot of work to shape a fifth-generation enabled force, prior to the F-35 showing up.

How will the F-35 fit into that evolving effort?

Air Commodore Kitcher: “The F35 introduction is a catalyst for significant change.

“Although the jets don’t arrive in Australia until the end of 2018, and IOC is not until the end of 2020, believe me, we are right in the middle of introducing the F-35A into service.

“In addition to personnel we have embedded in the overall F-35 program in the US, we have two RAAF aircraft and four instructors at Luke AFB. Our first cadre of dedicated F-35 maintainers and engineers departs for the US in Jan 17, and will be gaining the necessary experience so we can operate the F-35 in Australia from the end of 2018.

“Operating the F-35 will be one thing, but we also need to be able to sustain it, and the methods of sustaining the F-35 are also different to older platforms.

“We have been planning for a while now, and these plans will continue to evolve, but I’m not sure our system fully understands that this significant transition is well and truly underway.

“You can keep flying legacy aircraft forever if you want to spend enough money on them, but they all reach a point where they will become capability irrelevant.

“Our Classic Hornets are doing a great job in the Middle East right now, and due to the raft of Hornet upgrades we have completed, remain amongst the most capable Classic Hornets anywhere.

“However, they will reach a point in the near future, especially in the higher end fight, where their utility will be significantly diminished.



FIGURE 5 THE AUSSIE TANKER REFUELS AN F-35. CREDIT: RAAF

“The F-35 brings 5th generation qualities which will allow for a significant expansion across a raft of ADF capabilities. Air Maritime, Land and most importantly joint.

“We’ve chosen, and we have structured it such that the Classic Hornet will run out of effective hours and fatigue life at the point not too far after when the F35 is being introduced. There is contingency of course but not a lot. We don’t have the luxury simply to reflect abstractly on this problem anymore, we’re in the middle of solving it.

“That gives us a very aggressive F35 introduction schedule.

“For example, we’re planning to change out a classic Hornet to F35 squadron over 12 months. A squadron will stop flying the classic Hornet at the end of December one year, and by the end of December next year they are fully up and running and operational on the F-35. That is a very tight schedule. We’ve got a plan to execute but as you would expect, it’s not without risk.

“However, being a little bit smaller than what other forces might be, we tend to also be more agile.

“And that agility will see us deal with any risks that might materialize, or the other inevitable pop up issues.

Second Line of Defense

“Due to this aggressive schedule, our ability right now to deal with many other things triggered by the F-35 is somewhat limited, we are rightly focused on introduction.

“Fortunately, most of these associated issues, such as the Mission Data Environment, have already been the subject of extensive work. We have been positioning our joint force to both provide the necessary level and type of data to maximize new capabilities such as Growler, Triton and F-35A, and process the vast amounts of data these capabilities will collect.

“There are definitely remaining challenges in this space, we’ve observed them here in Australia and also with our key coalition partners, but there is good work underway in parallel with the platform introductions.

“I’m sure after we introduce the F-35 aircraft we’ll still have a lot of work to do to get us to the point where we maximize the F35 capability across the Australian defense force, and interoperability with the other F-35 forces, but this is natural and will be dealt with in due course.

“There is certainly a lot happening at once.”

Question: But clearly, you are bringing in the F-35 with the mindset that it is not simply replacing the Hornet?

Air Commodore Kitcher: “I absolutely agree we are not just replacing the classic Hornet with another fighter.

“And we are looking from the ground up at complementary F-35 capabilities to maximize the F-35 effect across the joint space, such as the missiles we wish to see onboard our F-35.

“For example, we are looking at the Kongsberg JSM, we think that presents a logical option to consider far more seriously for our JSF maritime strike capability, and we’re looking at that right now, as was announced at the 2015 Avalon Air Show.

“Our requirement for a quality maritime strike missile internally carried on the F35 might also be ahead timewise of what the US and other coalition partners might have. It might also be ahead of what the US has programmed. We’re certainly working on the F-35 MARSTK capability and are also developing options, with Australian Industry, that might lead to a dual mode seeker in the JSM.

“But it is clear that just like in the case of Wedgetail and KC-30A, we want to put the F-35 into the hands of the warfighters as rapidly as possible.

“They will make it work.

“I know that despite all our best efforts and intent, we won’t be able to plan the F-35 introduction perfectly from Canberra. We are doing our best job to make sure we deliver the capability to the men and women in the field, as efficiently and positively as possible.

“When we throw the F-35 at them, they’re going to do all sorts of stuff with it that we will not have even thought of.

“I look forward to letting our smart young man and women, who have grown up in a different environment to those of us here in Canberra, get their hands on the F-35 and do some amazing things with it. I’m also quite looking forward to getting back out there myself, and see this first hand.

“Our job is to set up the program and set in motion the framework for that kind of tactical innovation to happen, to position them for success.

“We should not get in their way with excessive top down guidance and legacy thinking.”

SHAPING A WAY AHEAD FOR THE F-35 IN UK DEFENCE: THE PERSPECTIVE OF AIR COMMODORE HARVEY SMYTH

By Robbin Laird

During my visit to the United Kingdom in May 2016, I had a chance to meet with Air Commodore Harvey Smyth and members of the RAF Lightning Force team.

Air Commodore Smyth was the Tornado Force commander and has been involved with the F-35 program throughout its evolution from briefing charts to operational aircraft.

In his role as the Lightning Force Commander, Air Commodore Smyth is leading a team leveraging the force being trained and prepared in the United States and standing up the initial infrastructure at RAF Marham, a base which has been the key Tornado base for more than 30 years.

The British are on the ground floor of the standup, development and evolution of the F-35 as an air combat system, and visits to Pax River, Edwards, Eglin, Beaufort and Yuma have clearly demonstrated their key presence in the program and its long-term evolution.

Illustrative of the UK role was seen during an interview at Pax River, where a UK MoD engineer discussed the team Integrated Test Force at Pax River.

“Question: How does the ITF work from a UK point of view?”

Gordon Stewart: “Let me speak to my case.

I am employed by QinetiQ, but I am working here on behalf of the UK Ministry of Defence.

At the ITF, there around 900 people working here with the vast majority being U.S. Around 2/3s of the work force are contractors, and a third is government, and within that mix there are a number of UK nationals.

The UK is the only level one partner in the F-35 program, which means that we are more closely involved in the test phase of the program than other partners.

And, in my case, I work as a Flying Qualities (FQ) engineer on the 30-40 person FQ team as an integrated member.

As FQ engineers, we look at things like flight control laws and how the pilot interacts with those controls and what the aircraft feels like to fly in a wide range of conditions.

Where we do identify issues as we expand into new areas of the flight envelope, we work closely with the control law designers in Fort Worth to have those issues resolved.

We deal with the software that relates to flight controls, and those systems feeding data into the flight controls from the mission systems. Things like how the aircraft is going to get information from the ship as to where it is, what direction it is going, or how fast it is going.

As Stewart added:

This is the most integrated test team I have ever worked on.

Second Line of Defense

As we work the way ahead, it might be a UK person, a Lockheed person, or a US government person who provides the best solution. It is a very well integrated team at the working level.

It is a very different test process than in the past, although what is happening in the F-35 program is the way we are approaching the future as well. In the past, there was much more serial testing.

Twenty years ago when I first started, the contractor would do something and then throw it over the fence to the government, which would look at it, approve it and then pass it on to the operator.

Now with the pace of technology, and the role of software, we have a much more integrated process. We are shaping the evolution of the aircraft as it goes out the door as well.

At Pax, we are testing a software version ahead or a couple ahead of what the fleet is getting at the moment. In effect, we are testing the next iteration of the aircraft.

And the Edwards and Beaufort efforts provide important pieces to the evolution as well. We have an integrated RAF and Royal Navy team at Edwards. 17 (R) squadron at Edwards is a mix of RAF and RN.

At Beaufort, we have a UK team and one of our aircraft, and we are working closely with the USMC. That is another key element of the joint integrated effort, from our point of view.”

<http://www.sldinfo.com/the-uk-at-pax-river-integrated-innovative-and-creating-21st-century-airpower/>

It can be easily forgotten that the USAF and the RAF have not flown the same aircraft for a very long time indeed.

The RAF and the Marines have flown Harriers and along with the Spanish and Italians formed a three-decade Harrier community.

And Smyth as a Harrier pilot underscored the importance of this shared legacy moving forward.

“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 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.”

When I was at Williamtown Air Base, the RAAF showed me the makeover of the base with the coming of the F-35, but made the point that the government was remaking the base for the next 50 years of the evolution of airpower, not just preparing for the F-35.

With the RAF it is different.

“The UK Government is investing heavily in an infrastructure redevelopment programme at RAF Marham for the 2018 arrival of our Lightning Force.

Specifically, this is centred purely on the F-35 Lightning, and doesn’t necessarily focus on other domestic infrastructure on the base, such as new accommodation. In the future, no doubt, the domestic site will also need an uplift – effectively, bringing Lightning to Marham secures the base for at least another 40-50 years.

In the near term, we are focussed on shaping the F-35 infrastructure with the long-term perspective in mind, with regard to security and support of the aircraft.

Much of the infrastructure redevelopment involves building from scratch, as opposed to redeveloping existing architecture.”

Smyth added: “There’s a cost benefit to starting from scratch, specifically because of the need to security accredit the buildings for Lightning.

If you take an old building and try to accredit it, you must basically strip it back to nothing and then rebuild it again anyway so that you know intimately what is in the make-up of that building. Building from new is a much easier, and more cost-effective, approach.

Alongside the Lightning specific buildings, we are also updating the operating surfaces – this work was needed to be done anyway, regardless of the fact that Lightning was coming to Marham.

The main runway is getting redone.

The secondary runway, which is currently disused due to disrepair, is being rebuilt completely, and will include a short strip specifically for F-35B STOL operations.

The current taxiways are being redone and we are building 3 new purpose-built vertical landing pads, and an adjoining taxiway structure.”

Air Commodore Smyth emphasized that the RAF was standing up a base where the goal was to have clear operational sovereignty over their aircraft.

“We are building what we call our Freedom of Action facilities that allow us to maintain operational sovereignty of the airplane, which give us an ability to use the aircraft, and maintain the aircraft, through life, at a time and place of our choosing.

That was always the absolute foundational bedrock of UK being a tier one partner in the F35 programme – it is extremely important for UK Defence that we achieve an ability to maintain operational sovereignty over our jets.

With this in mind, we’re building our own maintenance and final finish facility so that we can do our own upgrades to the airplane, including stealth repair.”

The UK is also building a number of the facilities which have been stood up in the United States, such as a version of the Eglin Academic Training Center.

And one key expectation of the RAF and UK government’s part is that the sustainment approach for the F-35 will build upon their successful Performance Based Logistics model used for both the Tornado and Typhoon.

One evidence of that expectation is that the UK is building a facility for the services and industry to work together, hand in hand, in maintaining and modernizing the aircraft.

Air Commodore Smyth spoke at some length and passion about his experience as the Tornado Force Commander, where a 40+-year-old aircraft was able to be maintained throughout the very high tempo ops facing an aging force.

He argued that simply put: “We could not have had the operational performance of the aircraft without our exceptional contractual and joined-up working relationships with BAE Systems and Rolls Royce.”

Second Line of Defense

The contracts deliver a product – an aircraft able to go to combat, and he would like to see the focus shift from payments to industry based on simple aircraft availability, to ones based on dispatch rate and mission achievement for combat aircraft.

Air Commodore Smyth also discussed the ROCET contract with Rolls Royce as an example of how to do sustainment leveraging using the right kind of industrial-service partnership.

“In the ROCET contract, a few years ago we contracted Rolls Royce to do our FOD management for us.

We were probably trashing upwards of 2 or 3 engines a year through a FOD.

We were doing everything we could from an air force point of view to be good managers of foreign object damage.

We incentivized Rolls Royce to take that on, and as the subject matter experts, they were, and are, fantastic at it.

In fact last year, we had zero engines rejected due to FOD, and that’s down to them applying proper analysis and procedures and recommendations with regards to how to drive down a FOD-engine repair rate.

All of a sudden it’s a win-win for everybody.

As a Force Commander, I get better operational capability out of my airplanes.

I also have engineers that aren’t changing engines, and are able to concentrate on other work.

Rolls Royce makes more money due to the contract incentivization, and I get much better operational performance. Why wouldn’t this be a good thing?

More importantly, we do this effort together, as a Whole Force, so regardless of being Industry or Serviceman, we are all pulling together to deliver operational excellence.”

He clearly wishes to see the F-35 program build on this historical experience and not follow the USAF historic approach to sustainment with their F-15s at Lakenheath.

“With that approach. they are well over 10 years behind us with regard to our sustainment approach and experience.

I would hope that we could leverage this experience, and apply it to the sustainment of our inbound Lightning Force.”

He discussed the shift from a global solution to one, which could be shaped around regional hubs, and thought that the emergence of a viable regional hub support approach would make the most sense.

There are clear barriers to getting there, but for Air Commodore Smyth and others in the RAF, a forward leaning PBL was a necessary ingredient to ensuring the sortie generation rates which the aircraft is capable of doing.

How did he see the strategic opportunity of working with the USAF, as the USAF brings its two squadrons of F-35As to the UK?

“It is early days, but we are discussing ways to shape synergy.

We already have an excellent working relationship with our USAFE colleagues, and both sides are being very open to exploring ideas.

But the real opportunity will lie in joint training and some semblance of joint sustainment.

How do we do training in a more joined up way, both synthetically which is of immediate interest to me, and live with our F-35s because there's got to be synergy in our approaches in British and European air space.

This could then no doubt grow beyond a UK-USAFE relationship, as our close European neighbors establish their F-35s in their countries.



FIGURE 6 CREDIT: UK MOD

The next question then is sustainment.

What is the appetite from the USAF to want to leverage off what will already be found at RAF Marham as we shape our infrastructure?

We fully understand that the JPO is still working hard to bottom out what the eventual Global Sustainment Solution will look like.

But at Marham we have left an ability to do modular builds and to grow it bigger if there is an appetite from USAF, or from someone in Europe, to want to bring their airplanes in as well.

This applies to training as well as sustainment.

The USAF has operated F-15s at RAF Lakenheath and have used a classic USAF model of flying in parts to sustain their F-15s with C-5s, C-17s and tankers.

It would make sense to shift to a new model whereby our F-35s shared sustainment and parts, transparently between our two bases, which after all are not very far apart."

Second Line of Defense

Preparing for Synergy: The Coming of the F-35 to RAF Lakenheath

By Robbin Laird

Last April, I had the chance to talk with Air Commodore Smyth about the coming of the F-35 to RAF Marham.

And just down the road from Marham is RAF Lakenheath where the USAF will operate its UK-based F-35s.

Flying the same aircraft in the same airspace and with the colocation of maintenance facilities provides an overall opportunity to shape a common approach, a common culture, and extensive synergies between two operating forces.

And the two forces can provide an interactive base to work with the close proximity neighbors, the Dutch, the Danes and the Norwegians who will also fly the same aircraft.

In other words, there is a unique opportunity to share training, maintenance, parts, and operational experience for the two forces on bases within close proximity.

To get a sense of how the USAF is looking at the challenge and the opportunity, I visited RAF Lakenheath in June and discussed the evolving approach with the Wing Commander and the staff standing up the F-35 at Lakenheath.

In this piece, the discussion with the Wing Commander is the focus of attention; in the next the discussion with the staff will be highlighted.

Colonel Robert G. Novotny commands the 48th Fighter Wing at Royal Air Force Lakenheath, England, the only wing in the Air Force with an official name, the "Statue of Liberty Wing."

The Liberty Wing consists of nearly 5,000 active duty personnel, 2,000 British and U.S. civilians, and includes a geographically-separated unit at nearby RAF Feltwell.

The wing employs three combat-ready squadrons of F-15E Strike Eagle and F-15C Eagle fighter aircraft, as well as a squadron of HH-60G Pave Hawk Combat Search and Rescue helicopters and a squadron of Guardian Angel para rescuemen.

Question: You are an experienced F-15 pilot as well as having worked the F-35?

Col. Novotny: "I am and I have.

"This is my sixth F-15 assignment and worked the F-35 as the Commander of the 53rd Test & Evaluation Group, Nellis AFB,. So I was the Commander of the OT squadron for F-35."

Question: Could you describe the process of the F-35 stand up at Lakenheath?

Col. Novotny: "The F-35 bed down decision was a secret NOFORN initially as the base selection was being made. Now with Lakenheath having been identified as the long-term base for F-35s in Europe, we can put the correct pieces in place.

"All the area planners are Brits who work at Lakenheath.

"They are Ministry of Defence employees who are working with the whole plan to standup the wing.

“And after the announcement, we have been working directly with RAF Marham and Air Commodore Smyth in shaping our approach. We deal frequently with the RAF F-35 program integration office and RAF Marham personnel have been here frequently to engage with our own Site Activation Task Force.

“So from the beginning, there is great synergy and opportunity to learn from each other.

“Obviously, they are primarily responsible for working the airspace issues, which will in turn shape how a basic element of how we will train and operate together as well.

“We’re talking about exchange opportunities across the logistics enterprise, and among the pilots as well. If you can fly the A you can fly the B; and vice versa; it is an adjustment, not a whole new training process.

“We are looking to have RAF pilots flying USAF jets and vice versa”



FIGURE 7 COMPUTER GENERATED IMAGE OF THE MAINTENANCE AND FINISH FACILITY WHICH IS BEING BUILT AT RAF MARHAM, NORFOLK, AS PART OF THE PROGRAM OF WORK TO PREPARE THE STATION FOR THE ARRIVAL OF THE F-35 FLEET IN 2018. CREDIT: MOD

Question: When we were at Edwards, the USAF was maintaining a C and the young mechanic said that it was no big deal for it was just an F-35.

Col. Novotny: “That is where we want to get to here as well. A model pilots could fly B model airplanes with very little training and just be dual qualified”

Question: The synergy between Marham and Lakenheath can provide a strategic opportunity for the USAF.

What is your sense of this opportunity?

Col. Novotny: “That is really the bulls eye point.

We are bedding down a number of facilities in the United States, but what we are doing is different: it is standing up a common capability between two core allies at a critical point in the defense of US and allied interests.

“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.

Second Line of Defense

"It is a unique and strategic opportunity for the USAF and for the nations.

"I'm glad that we are the first base overseas, but 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."

Question: As an F-15 pilot, you saw the challenge of breaking down the cultural barriers for the F-22 community to learn not to fly the F-22 like an F-15. I am sure you are seeing the same with the F-35?

Col. Novotny: "That is a good point.

"I remember when we first flew the F-22, we pilots were thinking, if all we're going to do is fly like an F-15, that's a gigantic waste of money. But over time, the F-22 community evolved to leveraging its unique capabilities.

"We have the same thing with the F-35. We'll have to break down some cultural barriers. We'll have to take the yoke off the intellectual capacity of the squadron. We'll have to integrate them into Red Flag exercises and Iron Hand exercises in the group.

"And we'll have to pay attention to what other countries are doing, and learn from mistakes, and adopt best practices.

"I think we can do all that right here at Lakenheath/Marham.

"That is why it is a strategic opportunity.

"To shape the day-to-day operational perspective, to shape the combat learning, which squadron pilots bring to the fight, we can do that here at Lakenheath.

"Two countries are working side-by-side to figure this plane out.

"And unlike the F-22, the F-35 is not being stood up as a small fleet. It is a global fleet, and by working the synergy here you can accelerate the learning curve.

"And it is inherently a coalition aircraft. Because everybody's going to benefit, we're all going to work together.

"And the ability to fly together means that the squadron pilots as well as the maintainers share their experiences.

"If you want to do a Red Flag, you send the force across the pond, prepare and it costs a dedicated amount of money to do that.

"Here we just fly and we can have our regular Red Flags over the North Sea.

"And it doesn't have to be three weeks out of every fiscal year, or three weeks out of every two fiscal years.

"We've seen the Typhoons do QRAs since I've been in command, When you do that with F-35s, the US and coalition F-35s will now know exactly what's going on at the same time.

“That’s happening here almost right now by shared awareness.

“With the F-35 will just take it up to, you know, two or three levels higher than that.

“I think this is going to be one of the test beds for integration, which will evolve, based on operational practice.

“Compare this with standing the F-35s up in the United States.

“For example, Hill AFB is doing great work in standing up the F-35 but they are only going to integrate with other US fighters or operate in the less frequent Red Flag.

“There are almost no other fighter units near them that are not already fully engaged in real world operations.

“We are standing up a coalition integrability force from the outset.

“Take my example at the OT squadron.

“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.

“Most of that learning is done after the sortie. Face-to-face interaction, the conversations that are happening in the squadron vaults that happens at Red Flag three weeks out of every two years.

“We will have the opportunity to do that regularly here.

“There is such a unique opportunity here compared to any other place.

“Because every other place which is s going to get into the F-35 program in whatever capacity is going to eventually attempt to develop a little bit of a stovepipe. It happens.

“This is the only place where it’s not the case.

“There’s no other place where we have a maintenance officer who’s run into an issue on Monday at Lakenheath and decides to get in the car and drive 35 minutes to Marham and talk to them and see what they’ve figured out face-to-face.

“Learn to listen.

“Have a bite to eat.

“Be back here by 2:00 in the afternoon with the solution that came from another country.”

THE SYNERGY BUILT INTO THE QUEEN ELIZABETH CLASS CARRIERS AND THE F-35B

Recently, the Williams Foundation held their latest seminar on 5th generation enabled combat. This one focused on new approaches to air-sea integration, and featured two key foreign military perspectives.

Second Line of Defense

The first was provided by Rear Admiral Manazir, who currently serves as the deputy chief of naval operations for warfare systems (OPNAV N9) on the staff of the chief of naval operations. In this capacity, he is responsible for the integration of manpower, training, sustainment, modernization and procurement of the Navy's warfare systems.

His presentation focused on the strategic context for the U.S. and allied maritime forces and shaping a convergent way ahead. How can the allies shape convergent capabilities to ensure that the global commons remain open, and not controlled by powers seeking to enforce their will against the allied powers?

Rear Admiral Manazir highlighted the kill web approach as a way to shape more effective integration of force and convergence of efforts.

The kill chain is a linear concept, which is about connecting assets to deliver fire power; the kill web is about distributed operations and the ability of force packages or task forces to deliver force dominance in an area of interest.

It is about building in integration from the ground up so that forces can work seamlessly together through multiple networks, rather than relying on a single point of failure large network.

The second major presentation by a foreign military leader was by Captain Nick Walker of the Royal Navy, who is on the Naval Staff. Earlier, we interviewed Captain Walker as part of a RN and RAF team discussing the carrier and strike aviation during an interview conducted at Whitehall in the first quarter of 2014.

He was then Commander Nick Walker and serving as the Chief of Staff Carrier Strike in the Carrier Strike and Aviation Division within Navy Command Headquarters in Portsmouth.

During that interview, Captain Walker underscored a key point about the new capability for the national decision makers:

Question: How does this evolving capability affect a possible rethink about the way ahead for the forces?

“Walker: This evolving capability will give the decision maker a lot of flexible tools to respond or prepare for crises.

The Maritime Task Force can be well integrated with land based air but does not need a lot of forward ground presence to generate combat effects.

This can give decision makers significant flexibility with regard to a crisis or to have the ability to move to crises rather than having to generate force build up in a particular place in order to intervene.”

Captain Walker certainly picked up on that theme and wove the carrier discussion within a broader emphasis on how it both triggered and reflected the transformation process for the UK power projection forces.

He underscored that both the F-35 and the carrier are being brought into service together, and together they are key definers of the new power projection approach for an information age.

The carrier is being introduced from the ground up as a joint asset; not simply a maritime asset.

“The carrier strike journey is driving significant cultural change in the forces as well.”

He started by focusing on the core point that the carrier is coming into service as part of the overall transformation of UK power projection capabilities. Indeed, the CEPP or Carrier Enabled Power Projection statement of intent highlights the way ahead:

“An integrated and sustainable joint capability, interoperable with NATO, that enables the projection of UK Carrier Strike and Littoral Manoeuvre power as well as delivering humanitarian assistance and defence diplomacy, enabling joint effect across the maritime, land and air environments at a time and place of political choosing.”

He noted that the role of Special Forces has been highlighted since this original statement and will be folded into the revised statement of intent with regard to the role of the carrier within the UK forces.

CEPP has been maintained within the Ministry of Defence. This is in distinction to most other capabilities, which have been given to the front line commands. This allows joint forces command and the services to focus on CEPP as a joint capability.

The deck of the Queen Elizabeth carrier is 85% of the size (i.e. area) of a Nimitz class carrier; which can carry up to 36 F-35Bs along with a Merlin Crowsnests and a Merlin Mk2 ASW helo. Alternatively, the ship can be used in the projection of land forces from the sea in terms of Marines and helo insertion capabilities as well.

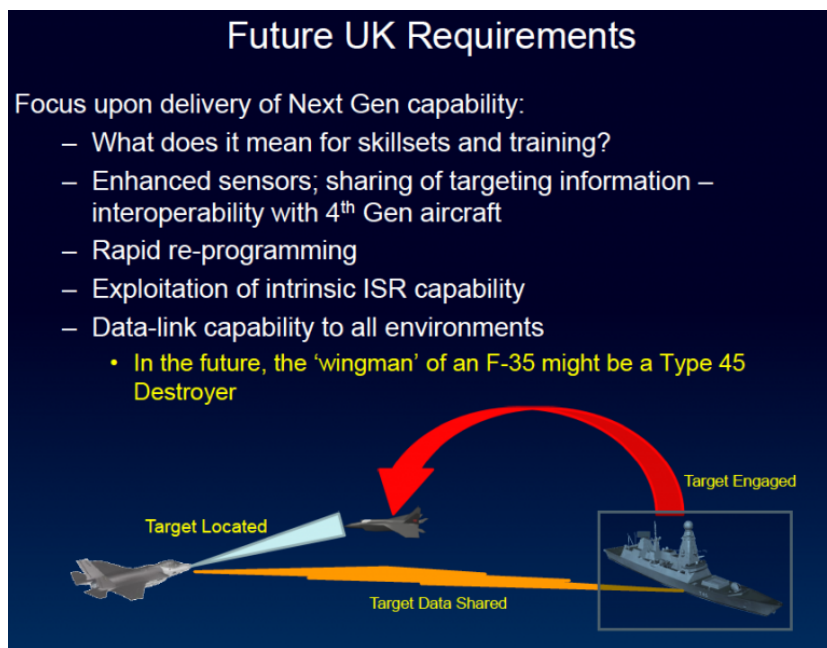


FIGURE 8 SLIDE FROM PRESENTATION BY CAPTAIN WALKER, ROYAL NAVY, AT WILLIAMS FOUNDATION AIR-SEA INTEGRATION CONFERENCE, AUGUST 10, 2016

But it is the carrier strike focus which is definitional for the new carrier.

The ship has been designed from the ground up to support F-35B, in terms of weapons, C2, and ISR integration.

“We have also built from the ground up interoperability, and have worked closely with the USN and USMC with regard to this capability. And we are working on a broader approach to NATO interoperability as well.”

Second Line of Defense

He provided an overview of the timing of the build out of the ship and the process of marrying it with the movement of the UK F-35Bs being prepared and trained in the United States to its permanent location in the UK at RAF Marham.

The initial carrier IOC is projected to be December 2020 with the fully integrated F-35 and carrier having full operational capability by 2025.

Much like the leadership of the Royal Australian Navy focused on in their presentations at the seminar, Walker emphasized new approaches to task forces as key part of their transformation approach.

Clearly, the UK is looking at the evolving impact of introducing carrier strike upon the overall change in the RAF and Royal Navy as well. And a key aspect of this transformation is working the evolving integration of fifth gen upon legacy capabilities.

Captain Walker highlighted the shift from a legacy mindset, which focused on thinking of maritime versus air environments to an integrated information dominance environment.

“A key cultural change is that we are looking at air and maritime as an integrated domain; and we are looking at the interaction among the environmental seams of our forces driven by a kill web approach and capability.”

A clear challenge is reworking C2.

“We need to shape a more mission order vice a directive Air Tasking Order approach to the use of an integrated air-maritime force.”

Putting the new carriers in play completely integrated with the F-35 will provide the foundation for shaping the way ahead for the UK power projection forces.

Put bluntly, shaping the way ahead will be defined by the operational experiences entailed in operating and deploying the new carrier strike force and leveraging that capability will be crucial in thinking through future procurement decisions as well.

“We are focused on being more platform agnostic; and ironically, the F-35 can be looked at as a new platform and keep in the old platform-centric approach but we are looking at it as lever of change for next generation thinking and capabilities.

“We are taking the kill web concept very seriously, and examining how best to shape the desired outcome from nodes in the operational force, rather than focusing on specialized platforms.

“How do we generate operational tasks to be delivered from the integrated force?”

“How do we bring the Typhoon which is a key air asset into the kill web?”

“Rapid reprogramming of platforms is a crucial way ahead for sure.

“The ability to exploit the intrinsic ISR capability of the force, rather than simply relying on specialized ISR platforms is a key way ahead as well.

“The ability to deliver effect throughout the force with data-link capabilities such as in the future the wingman of an F-35 could well be the Type 45 destroyer”

In short, Captain Walker saw significant commonality in terms of the Australian rethink about the way ahead for their navy and how the UK was thinking about the transformation of its power projection capabilities.

TRANSFORMING THE ROYAL AIR FORCE'S ISTAR FORCE: A DISCUSSION WITH AIR COMMODORE DEAN ANDREW

By Robbin Laird

During my visit to the United Kingdom in June 2016, I had a chance to talk with Air Commodore Dean Andrew, the ISTAR Force Commander based at RAF Waddington.

We spoke about the challenges of transforming the current platform focused Air ISTAR community to an integrated Force capability in the future – while continuing to meet today's warfighting demands.

The challenge is one of balancing current operational commitments, with the introduction of new platforms and capabilities and developing a more integrated enterprise model for 2025.

According to Air Commodore Andrew:

"I have been given a clear mandate for transformation by the RAF senior leadership.

"I need to create the conditions for the integrated Force to emerge and grow to where the Strategic Defence and Security Review tells us to be in 2025."

The project of transformation is called Programme Athena.

The name is taken from the Greek goddess of reason, intelligent activity, and military victory.

Fierce and brave in battle; she defended the state and home from outside enemies using wisdom, initiative and resources to hand. 1

According to a baseline brief given by the Air Commodore (one of the slides from which is included later in the article), "the key to sustained improvement is working together as a Whole Force, which includes all personnel from serving military personnel and reservists to civil servants, industry partners, and contractors."

The goal is to shape an "integrated team that can deliver every aspect of operations, support services, facilities and amenities for the UK's Air ISTAR capability."

With its hub at RAF Waddington, the Air ISTAR Force comprises five small fleets: E-3D Sentry, Sentinel R1 ASTOR (airborne standoff radar), RC-135 Rivet Joint/Airseeker, MQ-9 Reaper and Shadow R1.

All are supported by the intelligence processing and exploitation expertise of No 1 ISR Wing.

The current force has developed through the serial acquisition of separate platforms.

Personnel and contractor support have been built around these individual platforms and squadrons and there has been a lack of coherent investment in the technical and domestic infrastructure needed to support modern information based warfare or provide sufficient headroom for growth.

There is also the major challenge of manpower and training.

According to Air Commodore Andrew:

Second Line of Defense

“There will need to be an overall uplift of personnel, but if we consider training, career stream manning and common transferrable skills as Force-level opportunities – we can be much more efficient with our collected growth across individual squadrons, units and branches and trades.

“We need to do something radical and innovative to deliver the enhanced capability, but with fewer people than we might have required 10 or 20 years ago when many of our ISTAR capabilities were conceived.

“This is not about doing more with less, but being smarter with our assumptions over how we can operate as an integrated Force and where technology and creative Whole Force concepts can be applied.

All of this has to be in addition to the military manpower levers of recruitment, retention and talent management to better manage the people we have.”

The Air Commodore recognizes that a fundamental look at how the ISTAR Force does its business is required to deliver the change.

His view of the transformation challenge focuses on the vision and adaptability of his people and the ability to lead, manage and organize at the capability level, not the platform level.

Most important are the qualities those people have.

“I need to have people coming into the force who already have their aperture open and can drive change” stresses the Air Commodore. .

“I need the human equivalent to the 360 degree sensing F-35 airplane as the foundation for the future force.”

He mentions the F35 as an example of the paradigm shift in capability that the RAF will experience as the aircraft comes into service — particularly in terms of its ISR role, which complements its strike capabilities and can be leveraged for the ISTAR Force.

He adds that “the F35 will not be our platform, but it will have core ISTAR contributing capabilities that stretch the boundaries of integration even further for the transformed Force.

The overlapping Venn diagrams that we start to see across the RAF and Defence if we use an ISTAR ‘contributing capability’ lens get bigger and more complex as new and legacy platforms and services become integrated”

The Air Commodore emphasized that the move of ISTAR assets from No. 2 Group to No. 1 Group was a key part of positioning the transformation process. 2

“We now are directly connected to the users who are demanding our capability.

“This puts us in the position of demand driven change as well.”

Similarly, the introduction into service over the next few years of the Poseidon P-8A offers opportunity to bring the previously stove-piped maritime patrol force into the ISTAR fold.

Air Commodore Andrew sees this as a real test of his transformation leadership – cautioning that “if we don’t view the P8-A as a maritime domain awareness strike asset, rather than a replacement MPA, the UK will never realize the full benefit of their investment and generate the enhanced operational effectiveness that is required for the future Joint Force.

“Making the financial and conceptual space for that enhancement requires a common approach to training, manpower, support and sustainability, information and operating concepts that is at the heart of the transformation.

“Treating each of the platform types as interconnected segments of an ISTAR capability Venn diagram will allow us to create the breadth of intelligence and understanding in the common operating picture that the Joint Force needs.

“Getting out of the platform stovepipe mentality will not be easy; it will be necessary to shape an overall operational approach to where the key operators of the platforms become plug and play elements in the overall ISTAR Force.

“This means changes for civilian and industry partners as well.”

Messaging is important also.

“When you drive onto the base you see as many signs for individual companies as you do welcoming you to ‘The Home of the ISTAR Force.’

“This reflects a reality which needs to change.”

He pointed out that a number individual contracts are coming up for renewal, and there will be an opportunity to reshape the working relationship with industry partners in order to come up with more integrated solutions.

The infrastructure on the base is quite old, and one focus for shaping an integrated force could be built around combined requirements and multi-purposing of new infrastructure around new ways of working.

Training offers a good example.

“We need to shape a common training capability, and perhaps in a common building where synthetics will play a key role in shaping the way ahead, in which the key platform operators work together in establishing the joint ISTAR picture.

“By sharing ideas and facilities and technology we can then build in a more integrated cognitive and operational process.”

He sees synthetics and mixed live, virtual and constructive training as the key to the way ahead.

“Both the F35 and P8-A are hugely software driven, which offers tremendous opportunity for connected computer generated training in federated systems – perhaps linked together as spokes to an overall ISTAR synthetic training hub which includes all of the other capabilities in the ISTAR Force.”

We discussed the idea that as the core platforms are replaced by an all software upgradeable fleet, the possibility could exist to put the platforms in competition with one another for modernization upgrades.

“Which upgrade gets the priority for which platform to make the greatest contribution to the integrated ISTAR capability are the sort of decisions that should lie with the ISTAR Force in the future – it is at Force level, not within individual programmes and projects that the overall capability benefit can be seen and prioritized.”

We then discussed the notion of transformation as a process, not an outcome.

Second Line of Defense

The Air Commodore was very keen to stress again the need for “cultural change, where the aperture is opened for the team and they can embrace greater integration”

“We have the iPhone 6 generation in the Force now, yesterday’s analogue approach to our business is no longer appropriate.

“With the aperture fully open, the individual platforms and capabilities become the apps that enable the integrated Force ‘iPhone’.

“Thinking of it in this way, will allow us to tap this new generation of warriors.”

He also seeks to build a sense of strategic purpose and community from bottom to top.

He cited the example of when President Johnson met a janitor at the NASA space center in Houston and when asked what he was doing, the janitor replied: “I am helping put a man on the moon, Mr. President.”

“We are driving to a similar mindset in the ISTAR Force – everyone contributing regardless of where they work.”

He argued that this perspective was essential to mission success.

“The paradigm shift needs to be cultural and organizational if the ISTAR force with a large F to become a reality.

“We are going from a tradition where we have operated isolated force elements to one where an integrated force can deliver 24/7 support and we need to shape a Whole Force solution approach.”

Getting it right for ISTAR is critical to the success of the RAF’s contributions to operations and to the UK’s intelligence and understanding of the world.

The Air Commodore concluded:

“One cannot simply pause, and recapitalize the force in a vacuous power point exercise.

“It is about transformation ‘in contact’ and ensuring that we leverage maximum integrated capability from the new platforms coming to the RAF, while re-brigading the legacy systems as best we can and putting in place the foundations required for an adaptable, upgradeable and technology driven capital F force in the 2025 time frame and beyond.”

THE IMPACT OF SOFTWARE UPGRADEABLE AIRCRAFT

By Robbin Laird

A new aspect of building, modernizing and evolving the combat capabilities of the new generation of combat aircraft is software upgradeability. Software upgradeability provides a key opportunity to evolve the capabilities of an air combat platform without having to change the hardware and correlated software configurations through a complicated upgrade process.

One such aircraft is the F-35. Many of the critics of the F-35 have simply missed the point about the F-35, namely that the evolving blocks of software make it an evolving capability aircraft throughout its lifetime. As Dan Osburn, Deputy Director, 461st Flight Test Squadron (FTS), Integrated Test Force / Director of Projects, put it during a visit earlier this year to Edwards AFB:

“Software blocks are about combat capabilities, or mission sets. They are additive.

It is not about whether we have an effective combat product. For example, Block 2B, the USMC aircraft, is an F-35 with clean wing and delivering three types of weapons.

Over time, and rapidly, now the envelope will be expanded, but this does not mean the Marines do not have the most lethal combat aircraft they have ever had.

Perhaps it would be better to describe our software approach as one of agile development, of taking a stable foundational software system and evolving its capabilities over time as the plane operates, and inputs come back with regard to what are the most desirable next steps.”

As then Deputy Commandant of Aviation who then became MARFORPAC, Lt. General Robling put it in an interview at the Paris Air Show in 2011:

“Question: What is the next great airplane after the F-35 and the Osprey?

Robling’s answer was something like this: “Every few years the F-35B will be more capable and a different aircraft. The F-35B flying in 2030 will be significantly more capable than the initial F-35Bs. The problem is that will look the same at the airshows; but will be completely different inside. So you guys are going to have a tough time to describe the differences. It is no longer about adding new core platforms; it is about enabling our core multi-mission platforms. It is a very different approach.”

To put it mildly, the critics simply do not get this; but although the F-35 is unique, the approach is not. The first large combat aircraft to be software upgradeable is the Wedgetail air battlespace management aircraft built around a 737 airframe. The Wedgetail version flown by the Australian Air Force has been battle tested in the Middle East and has proven itself to be the most advanced air battlespace management system operating today.

But to get there, required the Aussies to change their procurement mindset. Instead of setting a hierarchy of requirements, which the aircraft had to meet, they froze the software baseline and put it in the hand of the warfighters and then let them evolve the aircraft in dialogue with the software engineers.

When I interviewed 2nd Squadron at Williamtown Airbase, the squadron operating Wedgetail, the Squadron Commander underscored the challenge of understanding software upgradeability:

“This is a software upgradeable aircraft with a defined launch point (IOC) but no fixed end point (FOC). The system will always be evolving and growing as the software code gets rewritten to reflect events and demands from the squadron.

The squadron works through its experience and shapes change orders, which get sent to the procurement authorities to sort out priorities for the next round of upgrading the aircraft.”

The difference between older and such a new system was outlined by one participant during the visit as follows:

“We have in the same time frame bought a CRC system full up which will look pretty much like it is in 20 years; with Wedgetail it will look nothing like it does now in 20 years.”

This process of upgrading means that the software engineers work closely with the operators in shaping the evolution of the aircraft. This is a very different approach from legacy systems.

Second Line of Defense

As Paul Kalafos, Vice President of Surveillance Systems at Northrop Grumman has put it:

“We are getting significant feedback from the RAAF on deployment and requests to automate tasks where possible to enhanced the capability of the machine part of the man-machine relationship to shape a way ahead. A lot of the input is through the ARCS working group, which is a collaborative study environment involving Boeing, Northrop Grumman, MIT/Lincoln Labs, Air Force Life Cycle Management Center (AFLCMC), CEA Technologies, Defence Science and Technology Organisation (DSTO), Royal Australian Air Force (RAAF), and the Commonwealth of Australia (CoA). Operational requirements come out of that process and shape the next increment of software development.

The ARCS is focused on problems and their resolutions. These are software updates. We get a software refresh out about once a year. Six months are spent doing the study to shape the plausible change; and the next six months are spent doing the integration and then getting it out the door. We shed the specs in favor of resolving problems, which the operational community identified. They can even write recommended change requests as well which provides part of the demand side process.”

The P-8/Triton replacement for the P-3 is following a similar process of change. During a visit to Jacksonville Naval Air Station in late May 2016 with my colleague Ed Timperlake, we had a chance to talk with the P-8/Triton team shaping the new maritime domain awareness strike capability replacing the P-3.

In our discussion with Captain Corapi, the Wing Commander of Patrol and Reconnaissance Wing 11, we focused on how the evolution of the P-8/Triton dyad was subsuming within it several of the earlier capabilities flown by the US Navy to do ASW but was doing so from the standpoint of creating a whole new digital capability, one which could be seamlessly integrated with the air and maritime forces.

It is not just a Navy asset; it is a joint and combined warfighting capability, both informed by and informing the entire force operating in the extended battlespace.

“This airplane is completely different from the P-3. It is much more automated, so much more. Everything is just set up so much different in the cockpit, just in particular. We’re finding that the aircrews are making that leap with really no issue.

Because there’s so many young aviators now that have never seen a P3 and they’re innovating from the ground up, they’re learning how to fight the airplane in a completely different way.”

The combat learning cycle undergone by the P-8 Wing and by the coming Triton squadrons is convergent with the software upgradeable nature of the new air systems.

“All of the squadrons in the Wing are the baseline P-8. Soon these baseline aircraft will be upgraded to Increment 3. Increment 3 will enhance the networking and communications capability of the aircraft. But the core point is that even the baseline aircraft is better than and different from the P-3 from the ground up and the crews are learning the skill sets for a P-8, rather than staying within the boundaries of what a P-3 can do and how it operates.”

The acquisition strategy was similar to the Wedgetail in terms of freezing a baseline.

“In 2005 we snapped a chalk line and we said, ‘Technology, as it exists today, is what goes in this airplane.’ We’ll do the spiral upgrades later. It was a brilliant move.”

And in a follow-up interview with Commander Miguel Martinez, CO of Patrol Squadron 16 and Commander Amanda Hawkins, the Executive Officer of the Squadron, the importance of software upgradeability was highlighted as well.

The evolution of software aboard the software upgradeable aircraft was part of the ongoing transition which might be characterized as a “permanent revolution,” if what is being experienced to date is continued into the future.

“We have just completed our second deployment. A lot of the capability on that deployment did not exist during the first. And the main difference was because of software upgrades.”

And as they prepare for their next deployment, more software upgrades are under way. And the CO commented that the “operators are telling me that we will have capabilities through the software upgrades that would have been extremely useful during the last two deployments.”

And software applies as well to the weaponization of the aircraft. For now, the P-8 is flying traditional P-3 weapons; but with its software upgradeable weapons system there is no reason to continue such an approach.

In an interview during the Jax Navy visit with the Deputy Commander, Patrol and Reconnaissance Wing ELEVEN, Captain James Robinson, the point was driven home about the weaponization opportunity for the P-8.

“Because the P-8 operates with the common 1760 Bus which is a common weapons standard for smart weapons, the only limit is your imagination with regard to what weapons might be put on the P-8 in the future.

It is forward compatible with future smart weapons.”

At some point in the future, the P-8 could be in the battlespace armed with hypersonic cruise missiles to go with its capability to see deep into the battlespace. By building key capabilities for prevailing in the extended battlespace, the USN is building towards the future as it deploys in the present.

During a visit to RAF Lossiemouth earlier this year, there was chance to discuss the coming of the P-8 to the RAF. The key RAF officer had met with a Navy Captain who had deployed with the P-8 to the Joint Warrior exercise. During that meeting, the RAF officer highlighted that he was very impressed with the aircraft and very interested in the weapons hard points on the aircraft and their potential for operating in the North Atlantic.

It turns out that the USN Captain involved was none other than Captain Robinson who remembered the exchange well and in his train and equip role was talking with the Brits about future infrastructure for support to the P-8. RAF Lossiemouth is one of the candidate bases for operating UK P-8s as well.

Captain Robinson had worked earlier for Admiral Gortney who in our interview with him had highlighted the threats at the 10 and 2 O’Clock to North America, and when at Joint Warrior, Captain Robinson was operating in the 2’Oclock.

Norway is interested as well in the P-8 which then create a significant interlocking force. For Norway, because the P-8 is not a P-3, they would benefit from seeing much deeper into the maritime space to protect their interests. It is not just about flying to an area of interest and patrolling it. When you take off with the P-8 you link into the data network and are on station when you take off.

As Captain Robinson put it:

Second Line of Defense

“With the P-3 we flew together and shaped a common operating picture largely by voice communication or the archaic link 11.

It was always a challenge.

With the P-8 we can share data electronically over hundreds of miles being able to link with other line of site contributors.

We will be able to have maritime domain awareness over huge square miles of ocean that can be covered by a single P8, even before we discuss what Triton brings to the effort.

You have a single sensor that from the time aircraft depart is operating miles and miles away, having domain awareness and feeding a common operational picture to the commander or a set of commanders.

That’s incredible.”

And the software will evolve with the evolution of the threat and the coming of additional opportunities to shape a “new” aircraft, which will look the same but not operate the same in the battlespace.

That is the point about software upgradeability.

FROM DEPLOYMENTS TO THE BALTIC REGION TO EMPOWERING THE KILL WEB IN DEFENSE OF THE HOMELAND: UK EVOLUTION?

In an April 2016 UK MoD announcement concerning the UK role in Baltic defense, it was announced that RAF Typhoons will be deployed along with the HMS Iron Duke.

This is clearly designed to operate forward and to provide for NATO defense in the Baltic region.

As the F-35 comes to the force aboard the new HMS Queen Elizabeth, a future deployment to the Baltic region will actually provide for an integrated force which could form a key element for both homeland defense for the United Kingdom as well as providing core combat capabilities within an overall kill web.

Such a kill web would be empowered by a force at sea which can reach back and forward to air assets deployed throughout the region.

With the Russians deploying tactical weapons – notably cruise missiles – with reach deep into what the UK would consider strategic space, the need to deter, and defeat such threats will be increasingly important.

With the Eurofighters flying both from the UK over the North Sea, and forward deployed, and with the F-35Bs deployed off of the Queen Elizabeth, such an integrated force can be built as part of both homeland defense and an extended kill web extending into Northern Europe.

And such integration can lay the foundation for the further modernization of the UK surface fleet, as the new destroyers can deploy combat systems, which can co-evolve with those of the F-35.

Rather than thinking of the kill chain, the kill web is about engagement forces in an area of interest which can operate throughout the distributed battlespace and defeat an adversary throughout the kill area.

The sensor-shooter relationship is within the distributed battlespace and not attributed to the strike platform itself.

The idea of shift from a linear kill chain and hub-and-spoke operations to one of an distributed force contributing to capabilities across the integrated battlespace was highlighted by a key Australian RAAF leader:

According to Air Commodore Robertson, the CO of the Air Combat Group, the RAAF is going through a three-phase process and “we are only at the first step.

“We need to be in the position where our maritime surface combatants are able to receive the information that we’ve got airborne in the RAAF assets. Once they’ve got that, they’re going to actually be trying to be able to do something with it.

That is the second level, namely where they can integrate with the C2 and ISR flowing from our air fleet.

But we need to get to the third level, where they too can provide information and weapons for us in the air domain.

That is how you will turn a kill chain into a kill web. That’s something that we want in our fifth generation integrated force.

And in a fifth generation world, it’s less about who is the trigger shooter but actually making sure that everybody’s contributing effectively to the right decisions made as soon as possible at the lowest possible level.

And that is why I see the F-35 as an information age aircraft.

I’m less concerned about the load outs on the F-35. You can give it another ten weapon stations and you would miss the core point.

What’s actually important is how the F-35 makes other weapon providers or effect providers out there far better and shape faster reaction times.

A lot of people seem stuck in the old mindset of how many weapons we are going to stack on each aircraft.

That’s almost two generations ago.”

And in an interview last year with the Royal Navy officer leading the Queen Elizabeth effort, the potential for re-shaping the approach to building out the new destroyers from the evolution of a more integrated force was highlighted.

“Question: We argue that no platform fights alone; this is obviously true in terms of the carrier, which is both and enabled and enabling platform, notably with regard to its carrier air wing.

What is some of the thinking in the RN about the potential evolutions?

With the advent of the carrier we will need to re think doctrine, tactics and training.

There will be much work between elements of the CAG specifically interaction with Merlin Crows Nest and F35B but also our T45 destroyers will work extremely closely with F35B and be a great enabler in tactical development.

We need to explore the boundaries of what we can do as we leverage the carrier with regard to our other force assets, Navy, Army and Air Force.

Second Line of Defense

The good thing is that a lot of people involved in the process have open minds about thinking through the process of change.”

Weaponizing the kill web in which fifth generation leverages of weapons on surface and subsurface ships as well as managing hand-offs to fourth generation platforms is a key element of the way ahead.

MBDA the key weapons designer for the RAF is already developing and in the process of completing the first weapons with the kind of two way data links enabling such a handover, namely the Meteor and Spear 3 weapons.

Put in clear terms, although the UK carriers can be used for expeditionary purposes, they will provide key centerpieces for any extended defense of the homeland via modular integration with other allied forces.

These forces would be deployed as scalable kill web, where the sensor-shooter relationship among missile defense, and strike assets can operate in a distributed defense structure.

SYNERGY AND BUILDING OUT EXTENDED NATO DEFENSE

USMC and RAF F-35Bs flew from USMC Beaufort Air Station to participate in the RIAT and Farnborough air shows.

USAF sent F-35As across the Atlantic to participate as well in RIAT. These flights are the latest trans-Atlantic crossings with the Italians coming first on February 5th with a landing at Pax River and then with later flights as well to Luke AFB bringing Italian build F-35s across the Atlantic.

The Dutch were next flying from Edwards AFB to the Netherlands.

These flights are simply part of the process of standing up the F-35 enterprise in the extended defense of Europe and the North Atlantic.

Put simply, the simultaneous standup of F-35s in the UK by the RAF and the USAF, the coming of the F-35Bs to the new British carriers, the F-35Cs to US aircraft carriers, of F-35As to Norway, Denmark and the Netherlands provides a key opportunity for synergy in shaping the extended defense of NATO.

With the same combat systems operating across the force, and the sharing of data across that force, a significant capability is being stood up from the beginning to provide for the common defense.

This is a work in progress and will take significant effort and innovation. It will be about opening the aperture on thinking about common infrastructure, shared logistics, and cross-cutting combat learning and innovation.

But it is inherent in flying a common airplane, that the pilots, maintainers and airpower leaders associated with the F-35 can figure it out.

We hear often about the need for NATO to enhance its defense capabilities; yet one key means for doing so is simply staring NATO in the face, namely leveraging a common fifth generation aircraft and reshaping the capabilities of the entire combat force.

This has been recognized by key organizations such as the European Air Group or the NATO Joint Air Competence Center (JAPCC). The European Air Group, based at High Wycombe in the UK, is an advisory group to the 7 key European Air Forces, and they are working on ways to shape 4th-5th generation integration.

The JAPCC is based in Germany and is working on how airpower was changing with the operations of fifth generation aircraft and the co-evolution of legacy systems with the augmentation of the role of fifth generation aircraft with the F-35 operating with the Marines and shortly by the USAF.

The con-ops rethink is driven by the practical experiences rooted in the common effort to standup US and allied F-35s.

In fact, when we interviewed Squadron Leader Hugh Nichols, the RAF pilot who flew the UK F-35 recently to the UK, at USMC Beaufort Air Station last year, he underscored what the joint standup with the USMC meant.

“The Marines have done a fantastic job working through previous program difficulties and have blazed a trail towards bringing this next generation capability into service. They are Marines, and if anything gets in the way, they deal with it.

“Working with them will clearly ensure that we are ready for the Queen Elizabeth.

“And the pooling agreement is important in terms of cross learning. Our young maintainers are working with Marine Corps maintainers and they are learning to work through different procedures and protocols to learn how to maintain a common airplane....

“The Marines could fly jets off of the Queen Elizabeth and we off the Wasp or other ships the USMC enable for F-35B use in the future.”

The F-35s flying in the skies above the UK are simply a step in what could well be a significant launch point towards enhanced NATO synergy and capability.

The two UK airbases where F-35s will be based, RAF F-35s at RAF Marham and USAF F-35s at RAF Lakenheath, are in very close proximity and the joint training, joint logistics, joint maintenance and joint operational experience will be significant.

And the UK is building facilities at Marham that the USAF will not do but which sharing arrangements can be shaped and worked.

And it is not just about the F-35, but it is about fifth generation enabled combat, and here the ability to fly every day with RAF Typhoons and USAF F-15s along with the new P-8s coming to the RAF along with the

Last December, USAFE and the RAF set up a joint working group to work the synergy issue.

This group has met three times to date and will brief initial findings to senior RAF and USAFE leadership later this summer.

A wide gamut of issues are being concerned from training, to ops, to warehousing of parts, and to sharing across a wide spectrum.

The challenge will be to do what one USAF officer noted in discussing the potential for synergy:

“Let’s not talk about what we can or we can’t do.

“What’s right to do?

“Everything can be changed.

Second Line of Defense

“And if it makes sense for us to operate in a different manner, we change the written guidance to support that as long as the leadership is in full agreement.

“We will have to break glass.

Applying yesterday’s procedures and policies to this joint effort makes little sense.”