

S E C O N D L I N E O F D E -
F E N S E

Delivering Capabilities to the War Fighter

THE COMING OF THE F-35



The Services and Partners Get Ready for the Next Phase of 21st Century Air Combat Operations

The Coming of the F-35: The Services and Partners Get Ready for the Next Phase of 21st Century Air Combat Operations

The USMC and Shaping an Ongoing Innovation Process	3
Visiting MCAS Beaufort	5
Operational Testing Aboard the USS WASP	6
The USAF and Shaping a Force for 21st Century Operations	9
The Warfare Center at Nellis and the Coming of the F-35	11
The US Navy and the Coming of the F-35	18
The Allies and Rolling Out a Global Enterprise	24
Australian Force Transformation	25
The UK and Cross Cutting Transformations	30
Conclusion: Crafting 21st Century Joint and Coalition Air Operations	35

In a meeting last year in the United Kingdom with one of the RAF officers responsible for the introduction of the F-35 into the UK forces, Group Captain Paul Godfrey highlighted the behind the scenes work to roll out an F-35 fleet, an effort largely ignored by the analytical press.

“There are 115 F-35s flying now. We are focused on how we are going to use the capability, not whether it will exist. There is a huge gap between the users of the aircraft and the broader puzzlement over the future outside of the warrior community; we are just getting on with it.

We just need to encourage thinking that isn’t tied to whatever we’ve done in the past. The F-35 fleet is different and can be used for force transformation; unless you don’t.”

While more direct than most, Godfrey’s comment reflects the reality as seen by those in the U.S. services and in US allied partners involved in bringing the F-35 fleet to life. The number of airplanes flying is now 140, rather than 115 but the perceived reality among the growing F-35 community is that the future is now.

It starts this year with the USMC and will accelerate through the next three years. While the Chinese and Russians introduce their “fifth generation” aircraft, the U.S. and its allies are preparing to launch a global fleet. The Chinese and Russians have client states; the U.S. has allies and what is unique about the F-35 is it is jointly funded and jointly operated by a global coalition.

This simple fact seems to be missed by many. When 60 minutes did a program on the F-35, not once was it mentioned that this is a global aircraft, not simply an American export.

Recently, the Norwegian Defence Minister opened an F-35 partners meeting held in Norway by this comment with regard to the arrival of the F-35 for the US and the partners: “We’re turning the future into the present.”¹

This report will look at the services and the allies as they prepare to introduce the F-35 into service and look to transform their airpower capabilities appropriate to dealing with 21st century threats. The report is based on dozens of interviews with the services and partners, ranging from Italy, to the UK, to Australia and from Eglin, to Yuma, to Fallon.

21st century warfare technologies concepts of operations, technology, tactics and training are in evolution and revolution. However, there is always the reactive enemy who gets a vote in combat. Consequently the roll out of new approaches to execute a successful combat campaign being shaped by the impact of the F-35 is critical to understand.

The F-35 is at the heart of 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, has a revolutionary sensor fusion cockpit that makes it effective in AA, AG and EW. 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

¹ <http://breakingdefense.com/2015/05/fundamental-change-in-direction-for-f-35-kendall-floats-plan-to-buy-450-planes/>

impact of a fleet of integrated F-35s operating as a foundational element will make the current term “5th Gen” obsolete.

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 if what the fleet brings to the fight is learned and applied. Combat warriors, at all ranks, can leverage what they learn and then apply those lessons to reshaping the force over and over.

The F-35 is entering service at an interesting time in the evolution of digital warfare. The US and Allied fleet of F-35s will also add an “electronic” or “tron” warfare component to the fight, an “E” for electronic. It is not necessary to designate the F-35 as the F/A/E-35 but that would be more accurate.

Because of the growing role of shared situational awareness and shaping of what some are calling the “combat cloud”, tron warfare is part and parcel of the transition in air warfare. Tron warfare is about protecting your ability to operate in shared communication space and to deny your adversary the ability to do so.²

To put it another way, the F-35 fleet allows the air services to shape a new foundation for engaging in active and passive Tron Warfare, but because “no platform” fights alone can be a foundation from which other elements of the airpower and combat capabilities are woven in for 21st century operations.

In other words, the IOC of the F-35 is not simply about the introduction of a replacement aircraft but the next phase in the revolution of airpower and inextricably intertwined with doing air combat differently. In discussions with the pilots, maintainers and industrialists involved in the launch of the F-35, there is clear awareness that the F-35 is not simply about business as usual. There is a clear sense of excitement seen by the F-35 launch cadre, which is missed by those not part of the process.

And each service or partner has a particular launch point with regard to transformation, which the F-35 enables or facilitates. This is not a replacement aircraft in and of itself, but rather it is the driving technology catalyst for a transformation of combat air power in this next phase of military aviation history.

The USMC and Shaping an Ongoing Innovation Process

The USMC is the first user of the F-35, and is on track with plans to declare IOC in 2015. The Marines have been in the throes of a decade long transformation associated with the MV-22 Osprey. The standing up of the first F-35 Squadron, VMFA-121, will continue with the ‘Green Knights’ being the first of many squadrons eventually joining a Marine Air Ground Task Force or MAGTF.

Because the Marines are an integrated air-ground-sea force, their combat force preparation and initial experience with the F-35 will have significance far beyond just the USMC and is being closely tracked, watched and discussed by a number of partner nations in the F-35 program.

Precisely because the F-35 is coming at the end of an innovative decade of introducing the Osprey into operations, the F-35 is the next big step forward in the transformation of the USMC. With the Osprey, the Ground Combat Element

² <http://www.sldinfo.com/shaping-a-21st-century-approach-to-tron-warfare-2/>

(GCE) gained range and speed to operate on land or from the sea; this range and speed has led to several changes in how the Marines operate and these changes are being embodied in a new class of large deck amphibious ships, the USS America class, which has been specifically designed to operate both the Osprey and the F-35.

The Marines are the only tiltrotor enabled assault force in the world, and the impact of that on USN-USMC operations is profound. The Marines can insert force at significant distance from an objective without establishing forward operating bases ashore to do so. With the changes, the Marines are working how to do C2 and ISR support differently. The F-35 enters precisely at the point where providing C2, ISR and close air support to a tiltrotor-enabled force is required. It is the right plane at the right time for the Marines.

The Marines made the decision to neck down from three separate aircraft – the F-18, the Prowler and the Harrier – into one multi-mission aircraft. And they are doing so to enhance operational tempo, capability and sustainability.

The Marines played a key role in standing up the training effort at Eglin. Marine Corps aviator, “Turbo” Tomassetti was there from the beginning and provided significant continuity as the facilities were stood up and planes, maintainers and pilots began their training.

In an exit interview as he was preparing for retirement in the summer of 2013, Col. Tomassetti discussed the Marine Corps perspective on the F-35 and its impact.

“When we talk about what it brings to the Marine air-ground taskforce, you have to look at what does that airplane in the battle space mean to that Marine on the ground with the rifle and the radio? What does that airplane in the battle space mean to that Marine in the tank or in the armored vehicle? It means that he or she has access to information they might not otherwise have because that F-35 is there.

It means they will have visibility into target sets and spheres of influence beyond the range of what they would normally have access to before. And when we talk about the F-35B, we’re bringing that airplane up close to where the troops are because of its expeditionary nature. Because it can go from amphibious ships, it can go from expeditionary airfields, troops will have access to that airplane, they have access to what that information that airplane brings to the table.

It will open up a whole new world of possibilities in the battle space. What that brings to the Marine air-ground taskforce is a degree of insight into the battle space and ability to affect the battle space that we have not had before”³

The Deputy Commandant of Aviation, Lt. General “Dog” Davis, has provided a very clear perspective on how the Marines approach the F-35 and their further force transformation.

“The Marine Corps does not want to be denied to go anywhere we have to go on day one. So day one through three, or four as we basically create the conditions to basically project power ashore, or to shape the battlefield. We can use full fifth generation capability to knock down the defenses and enable us to provide close air support, or those ground operations we need to do from the beginning of the operation.

The beauty of the F-35 is once I’ve used the high protection, high capability, I can very quickly go to a level effort in the airplane appropriate to the mission. We can load significant external ordinance and become a bomb truck. Or we

³ <http://www.sldinfo.com/the-f-35b-coming-to-the-magtf-turbo-reflects-on-the-past-and-the-future-of-usmc-aviation/>

can function as an EW truck or whatever we need that airplane to be. And it's always going to be an information and command truck for the operation."⁴

A unique approach taken by the Marines is their crafting of a clear path to continuous experimentation by collocating their first F-35 squadron with MAWTS-1, their tactics and training squadron, and with VMX-22. The intersection of three operational entities, the F-35 squadron, MAWTS-1 and VMX-22 (Marine Operational Test & Evaluation Squadron 22), will facilitate innovations and transformation. Notably, a key focus is upon enhancing digital interoperability and evolving C2 systems in shaping the evolving insertion force.

Visiting MCAS Beaufort

Prior to going aboard the USS Wasp to watch some aspects of the sea trials of the Marines preparing for IOC of the aircraft, we were able to visit MCAS Beaufort on May 19, 2015. The visit to MCAS Beaufort highlighted the role of the F-35B training squadron, not just in flying the aircraft, but working through tactics with 4th generation aircraft as well.

As the CO of MAG-31, Col. Lieblein put it:

"We have six F-18 squadrons and one F-35 training squadron at Beaufort.

One of our major tasks is developing integration between 4th and 5th generation aircraft.

Our F-35 training squadron participates on almost a daily local basis on such efforts and works on a greater scale as well."

An example of the greater scale was Exercise Sentry Savannah 15-1 where the USMC F-35Bs participated in the Georgia Air National Guard's Air Dominance center efforts to work integration.

According to the Georgia Air National Guard:

"The Air Dominance Center is also an ideal location for large-scale Fighter Integration training because it can include participants from other aviation units stationed along the East Coast.

"Within about one hundred miles of Savannah there's about 15 other fighter squadrons that fly indigenously ... so when one fighter unit comes in here they can coordinate and do dissimilar air combat training with all of those units that fly around here on a daily basis," said Maj. Merrick Baroni, ADC director of operations.

Sentry Savannah 15-1 consists of Air National Guard F-16 flying squadrons from Minnesota, South Carolina and the District of Columbia, an F-15 unit from the Florida Air National Guard, T-38 and F-22 aircraft from Tyndall Air Force Base, Florida, and Marine F/A-18 and F-35s from Marine Corps Air Station Beaufort, South Carolina."⁵

⁴ <http://www.sldinfo.com/lieutenant-general-davis-on-the-usmc-and-the-f-35-preparing-for-2015/>

⁵ <http://www.gadod.net/news/ga-dod/current-stories/217-sentry-savannah-15-georgia-guard-hosts-large-scale-fighter-jet-exercise>

The interviews with the CO of the Warlords, Lt. Col. OD Bachmann and Major Brian Bann highlighted the significant progress of the squadron and the maturing of the aircraft. When I last interviewed OD Bachmann, he had just flown the 200th sortie of the aircraft and the plane had around 800 flight hours.

Fast forward to 2015, and the F-35B has more than 11,000 flight hours and the aircraft at Beaufort are among the 140 flying today.

When asked what are the differences between our last meeting and now, the CO of the Warlords highlighted that the Marines in the past 2 and 1/2 years have gone from basic flying of the aircraft to training a “much more capable pilot.

We operate a variety of tactical missions including CAS, armed reconnaissance support, tactical intercepts and we operate multiple airplanes operating together via data links.”

Although the air trials aboard the USS WASP are clearly part of the IOC process, in reality what is converging on the WASP are multiple dynamics.

Yuma is present with all the convergent work of the MAWTS-1, VMX-22 and Marine Fighter Attack Squadron 121 upon F-35B IOC and integration with the MAGTF.

And this squadron is working the F-22 and F-35 integration with the MAGTF as well as working with the USAF and the USN.

Beaufort is clearly there in many ways, including providing a maintenance detachment for the aircraft.

And the Brits are there too as the Wasp is mission rehearsal for the HMS Queen Elizabeth and its coming F-35B squadrons.

The Italians will come to Beaufort to train as well as other F-35B partners, of which there could be several in the next few years.

Operational Testing Aboard the USS WASP

The continuous sorties of F-35Bs aboard on the USS Wasp on May 26, 2015 witnessed by visitors from the foreign and the U.S. press was almost numbing. There were six planes aboard the ship, 4 from the Green Knights squadron at Yuma and 2 from the Warlords at Beaufort. We saw several sorties of F-35Bs aboard the ship conducted by pilots from both squadrons.

Although the planes was a clear focus of attention, the role of many key organizations culminated in what we saw that day. As Lt. General Davis, Deputy Commandant of Aviation for the USMC, stated in response to a question about the date for the initial operating capability of the aircraft: “It will be this summer. We are clearly focused on July. But it is in the hands of the professionals and they are making it happen.”

The professionals he had in mind were both aboard the ship and linked to their home bases or organizations. We saw aboard the ship maintainers from three squadrons, the Green Knights (Yuma), the Warlords (Beaufort) and VMX-22 (New River), the squadron that prepared the Osprey for its IOC in 2007 and is continuing its work with F-35B integration. In addition to the USMC squadrons, the USN has worked hard on modifying the ship to operate the new USMC aviation assets.

The XO of the ship, Captain Andrew “Mongo” Smith, highlighted that the ability of a 25 year old ship to become part of “fifth generation warfare” and its ability to operate the F-35 showed the flexibility of the ship and the USN-USMC team.

And as one of the USMC pilots involved with the ship integration-testing put with regard to what the plane brought to the ship:

“No one in the world has ever sent an airplane off of an amphibious ship with this level of situational awareness and fusion between aircraft to aircraft and aircraft to ship. The fusion of the data aboard the airplanes and your ability to see what other planes are seeing a number of miles away from you as well as what the ship is seeing and then to be able to communicate with them without using the radio is a tactical and strategic advantage that can not really be over stated.”

Together, the USN-USMC team is transforming a Gator Navy, which historically has operated amphibious ships for assault by helos, amphibious vehicles, and infantry to one capable of amphibious assault at great distance. It is turning what was a Greyhound Bus role to shaping an entirely new strike capability appropriate for 21st century operations. It began with the introduction of the Osprey and is being empowered by the integration of the F-35B with the Marine Corps force.

The nature of this change has already been presaged in a Marine Corps exercise involving San Clemente Island, which was conducted in the first part of 2014. For the Marines, airpower is part of the Marine Air-Ground Task Force (MAGTF), or put in simple terms, a key force allowing force insertion – built around the ground combat element – to occur in a diversity of settings and situations. The Marines, operating from the training base in Twentynine Palms and landing on San Clemente Island off of California, approximately 100 students from the Infantry Officer Course in Quantico flew aboard Ospreys the simulated test area to eliminate cruise missile threats and take back an airfield from enemy forces.

The Infantry Officer Course at Quantico paired with VMX-22 conducted the exercise and the Ospreys were accompanied by specially configured Ospreys with an airborne communication gateway with a Wi-Fi network that linked the tables carried by the squads riding in the Ospreys. The Cat Bird, the F-35 surrogate sensor aircraft, which operated its sensor sent real time information about the objective area to the Marines in route to the objective area. The information shared was maps and images as well as text messaging among the ground force element aboard the Ospreys.

In effect, the F-35s went in and provided the capability to eliminate the ground missile threats and allowed a distributed company to be inserted to do their job. In other words, the Osprey carried the force; the F-35 surrogate providing the cover which could insert the force more effectively. This is how the Marines are looking at a key aspect of the F-35 approach to providing close air support for a 21st century ground insertion force.

Thus, it was not surprising to find VMX-22 aboard the USS Wasp for the operational tests. The CO of VMX-22, Col. “Horse” Rauenhorst highlighted that their work as a squadron was focusing on the integration of the Osprey, the F-35 and the new CH53K as key elements enabling a more lethal and survivable MAGTF. The infantry Marines will

be inserted at greater distance, with greater flexibility to enhance their effectiveness and survivability. That is the whole point of the innovation being tested aboard the USS Wasp.



A very evident aspect of the effort for ship integration of the F-35B aboard the ship was maintenance at sea for the F-35B. Maintainers from the three squadrons – the Green Knights from Yuma, the Warlords from Beaufort, and those from VMX-22 – came together for the first time to work the maintenance effort aboard the ship. And according to the maintainers their approach worked very well.

But this would not have happened if the USMC had not established what they call organic maintenance of the aircraft, meaning that the Marines did their own maintenance, and shaped their own way ahead. Often forgotten is that the new generation of maintainers is creating the policies and procedures whereby those who follow will learn how to maintain the plane. Or put simply, standing up the plane at sea is a first, and the maintainers see their role as pioneers in process of innovation for 21st century capabilities.

And the report from the team aboard the ship was straightforward: “we could maintain the plane on ship very well and saw no loss of capability compared to maintaining the plane ashore.”

The Brits were aboard the ship as well and are training with the Marines at Beaufort, South Carolina, the base where all foreign F-35B pilots will be trained and of course maintainers as well. The Italians will be coming next, and both the Italian Navy and Air Force will operate F-35Bs. In an interview with the Italian Chief of Staff of the Air Force, Lt. General Preziosa put it with regard to the B:

“We studied the issue carefully (of the decision for the IAF to buy F-35Bs) and for the kind of missions we face we needed the flexibility which the B can add to the fleet. We need to go to the mission — not the airfield. We will operate in many areas where there are only short runways; the B allows us to operate in those conditions.

I have now had a chance to visit all three new large deck ships where the F-35 will play a key role: the HMS Queen Elizabeth on March 31, 2015 in Scotland earlier aboard the USS America, and the CVN-78 (Gerald Ford). The British carrier is an F-35B enabled strike carrier and the engagement of the UK Royal Navy and Royal Air Force with the USMC and the USN is very significant, and personnel onboard clearly were looking for lessons learned aboard the ship to integrate with the standing up of the new class of the UK’s very innovative carriers which the United Kingdom is building.

During a panel discussion with team members aboard the ship with reporters, there were two members of the Royal Navy who participated. Lt. Cdr. Neil Mathieson and Lt. Cdr. Beth Kitchen, represented different roles within the process. Mathieson was visiting the ship and returning to the UK with lessons learned; Kitchen was based at Beaufort and is an integral part of the USMC team, notably with regard to rolling out the maintenance process and effort.

Lt. Cdr. Kitchen put it nicely in resonating with the theme which Lt. General Davis was later to tell reporters: “it is in the hands of the professionals.” Kitchen underscored:

“The F-35 can be surrounded by myth and legend. But it is a real testimony to the capabilities of the maintainers of the Royal Navy, the Royal Air Force and the USMC to adapt to the new technological challenges. Their knowledge of aircraft systems is now being applied to a new air system and taking steps forward into the unknown. It is a testament to the professionalism of these maintainers that they are just getting on with the job of making this aircraft work. Every single person involved in this detachment are passionate about this aircraft and not just because it is a sexy looking aircraft but want to see it working in every operational environment.”

The USAF and Shaping a Force for 21st Century Operations

The USAF is slated to be the largest buyer of the F-35 and over time, the impact of the F-35 will go up globally as critical mass is reached by the USAF and the experience of USAF working with the global fleet of F-35s becomes combat practice.

The plane comes at a critical juncture for the USAF when its last decade of supporting the ground forces moves forward into rethinking how to do air superiority against peer competitors or those with significant strike forces to affect the viability of the 4th generation fleet.

The F-22 was used initially in the counter-ISIL operations because of its force protection capability and then transitioned to ground strikes. This was not in combat with a peer competitor but in an area where significant air defense threats are present. And it must be noted that the shoot down of the Malaysian airliner over Ukraine is a clear reminder of the deadly pop up of threats to that can occur and threaten combat airpower without any strategic warning.

The USAF and the USN have done an excellent job working with the ground forces in Iraq and Afghanistan. A number of innovations have been rolled into the effort such as Rover, precision air-dropping, the wide-spread introduction of so-called unmanned air vehicles (more appropriately called remotely piloted vehicles), significant innovations in C2 and in ISR support from manned aircraft, just to name a few. Clearly, the decade ahead will not look like the decade behind. Yet the lessons learned from this decade will not simply be forgotten, rather the services will harvest the best from the past decade and leave the rest.

However, the air operations environment ahead will be one where air superiority and air support will be forged together without clear sequencing. The coming of the F-35 could not be better for the USAF in thinking through how to deal with the combined operations challenge delivered by a multi-mission aircraft. The senior USAF leaders do not want to keep an A-10 fleet in part because they believe that CAS in air threat environment is not well done by a legacy aircraft solely dedicated to one mission like the A-10. The ability to switch roles as needed is clearly crucial, a key capability of the F-35.

An F-35 pilot from the USMC, Lt. Col. Summa, highlighted how the F-35 deals with the combining of close air support with air superiority challenge, based on his experience to prepare the first operational squadron of F-35s.

“The plane and its combat systems and the way the cockpit is designed allows the pilot to handle the (air superiority and close air support) missions in a very effective an integrated manner. In the F-18, when we were going to air-to-ground mode specifically on the strike, and we are using the radar, and if we want to the targeting pod, we would get to a certain point in time in the mission, where we have to use some sort of a planning tool. The pilot would have to

sort out when he would be able to go all heads down to try to find the target and employ on the target....It was up to me as an aviator knowing the capabilities and limitations in my system to decipher and draw the line between the mission sets.

In the F-35, the fusion engine does a lot of that in the background, while simultaneously, I can be executing an air-to-air mission or an air-to-ground mission, and have an air-to-air track file up, or multiple air-to-air track files, and determine how to flip missions. Because the fidelity of the data is there right now, which allows me to determine if I need to go back into an air-to-air mindset because I have to deal with this right now as opposed to continuing the CAS mission. And I have a much broader set of integrated tool sets to draw upon.”⁶

The ability to handle both CAS and Air Superiority missions in a fused manner provides a whole new way as well to think about 21st century operations. For the USAF, there have been several changes already identified by senior commanders, which the F-35 facilitates or forces opportunities for change in operations.

The first is an ability to work towards fusion of air defense and air strike missions. Already PACAF is now in charge of Pacific air defense systems and is looking to find ways to fuse the ability to defend and to strike which the F-35 fleet will empower. Integration of THAAD with Aegis with Patriot and then with a deployed F-35 fleet will provide for a significant enhancement of the kind of kill chain necessary to deal with adversaries like North Korea. The interlocking mutual supporting combat capability of US Army ADA and USAF airpower is crucial for effective US and Allied Pacific deterrence in the second nuclear age.



The second key component is to re-shape C2 so that USAF can embrace distributed air operations which will enable it effectively to disrupt and defeat any enemy which will continue to operate in a C2 hub and spoke battle management doctrine. Peer adversaries are building new air systems, which are designed to be ultimately commanded from the hub; the F-35 is not. The Lightning II is designed to deploy, decide and act within a distributed framework. And to do so will require evolution of C2 systems.

The third is to find new ways to connect the attack and defense forces overall and some in the USAF are referring to this as shaping a sensor shooter concept of operations that harnesses cloud computing technological trends toward building a viable “Combat Cloud.” In a successful “combat cloud,” systems can be linked, and organized to provide ready information for various vectors of attack and defense. This is about connecting various elements of the air fleet and with other combat assets as well.

The fourth is to think through what an integrated F-35 can deliver all by itself. What can a service and allied integrated fleet deliver to the commanders in the battlespace? The ability of the fleet to share data, and to shape decision-making options across a deployed fleet will be unprecedented. How best to use this capability? The USAF will have a key role in shaping ways ahead for the joint and coalition forces on this key dynamic.

⁶ <http://www.sldinfo.com/visiting-the-f-35-squadron-at-yuma-air-station-the-executive-officer-of-vmf121-provides-an-update/>

The fifth is to think through how F-22s and F-35s will work together to provide maximum effect in the battlespace. The two aircraft are now training together but the opportunity will be to shape an ability to do interactively what they can do more effectively than as separate platforms. The way to think about evolving 21st century combat operations and acquisition approaches is to focus on ways to leverage multi-mission platforms, rather than to pursue stove piped upgrade or acquisition processes. No platform fights alone is the key mantra.

It is ultimately the impact of an integrated fleet of F-35s with fused data and distributed decision-making which will allow the USAF to rethink how to do 21st century air operations. The US Air Force can build a seamless capacity to move among the various missions, which the fleet will need to perform.

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 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.”

And in the same interview, General Carlisle highlighted the central role he saw the USAF would play in the reworking of 21st century air operations:

“The USAF is the only service in the US with decades of experience with stealth aircraft, with regard to how they work, how they change the operational reality for pilots and how they are sustained. Within the region, we can help allies to avoid paths which will not be optimal for their emerging fifth generation fleet of aircraft.”⁷

The Warfare Center at Nellis and the Coming of the F-35

And the first general officer to become an F-35 pilot, Major General Silveria, head of the Warfare Center at Nellis has highlighted how he sees the coming of the F-35.

The coming of the F-35A to Nellis means that the F-35 is now part of the re-shaping approach crafted by the USAF Warfare Center.

The USAF Warfare Center is under the Air Combat Command, and the previous ACC Commander underscored how important it was for him to experience the F-22, and the impact of NOT fully understanding the aircraft in his earlier assignments.

Question: The last time we met, we learned that you had become the first ACC Commander to actually fly the F-22. We were impressed. From your perspective, how will the challenge of working the F-22s and the F-35s be worked with the legacy fleet?

General Hostage: You mean the Re-norming air operations if I were to steal a term?

⁷ <http://www.sldinfo.com/the-pacaf-commander-and-reworking-pacific-defense-the-aor-will-become-a-caoc/>

Well, I was fortunate to fly the airplane, I learned what I didn't know.

I was writing war plans in my previous job as a three star using the F-22s in a manner that was not going to get the most out of them that I could've because I didn't truly understand the radical difference that the fifth gen could bring.

People focus on stealth as the determining factor or delineator of the fifth generation, it isn't, it's fusion. Fusion is what makes that platform so fundamentally different than anything else. And that's why if anybody tries to tell you hey, I got a 4.5 airplane, a 4.8 airplane, don't believe them. All that they're talking about is RCS (Radar Cross Section).

Fusion is the fundamental delineator.

And you're not going to put fusion into a fourth gen airplane because their avionic suites are not set up to be a fused platform. And fusion changes how you use the platform.

What I figured out is I would tell my Raptors, I don't want a single airplane firing a single piece of ordinance until every other fourth gen airplane is Winchester. Because the SA right now that the fifth gen has is such a leveraging capability that I want my tactics set up to where my fourth gen expend their ordinance using the SA that the fifth gen provides, the fifth gen could then mop up, and then protect everybody coming in the next wave.

It's radically changing how we fight on the battlefield."⁸

Those radical changes are being worked out at the Air Warfare Center. It is important to note that it is NOT called the Air Warfare Center but is called the USAF Warfare Center, which is a recognition of the changing nature of warfare and the flexible multi-mission role of airpower in the 21st century battlespace.

Major General Jay Silveria is Commander, United States Air Force Warfare Center, Nellis Air Force Base, Nevada.

General Silveria grew up in an Air Force family and is a 1985 graduate of the U.S. Air Force Academy. He completed undergraduate pilot training in 1986, and his subsequent flying assignments include positions as flight commander, chief of wing standardization and evaluation, and operations officer. During his most recent assignment, General Silveria served as Vice Commander, 14 Air Force, Air Forces Strategic, at Vandenberg Air Force Base, California.

He has previously served as the Director, Security Assistance in the Office of Security Cooperation-Iraq. The general has also served as aide-de-camp to the Supreme Allied Commander Europe and Commander, U.S. European Command. He has commanded a fighter squadron and served as a deputy mission support group commander. Additionally, he commanded the 32nd Air and Space Operations Center at Ramstein Air Base, Germany, and 48th Fighter Wing, Royal Air Force Lakenheath, England.

General Silveria has flown combat sorties over the Balkans and Iraq and served as Vice Commander at Bagram Air Base in Afghanistan. He is a command pilot with more than 3,800 hours in the T-37, T-38, F-15C/E, HH-60 and F-35A aircraft.

⁸ <http://www.sldinfo.com/training-for-air-combat-general-hostage-focuses-on-the-challenge-of-training-for-the-21st-century-fight/>

The discussion with Major General Silveria focused on the role of the Warfare Center, the coming of the F-35 and the key role, which the center plays in shaping airpower integration, which is more correctly understood as “calibrated combat choreography.”

Question: What is the basic role of the Warfare Center?

Major General Silveria: At the Warfare Center, we do the three Ts: Testing, training, and tactics. The Warfare Center owns the three Ts for the USAF. The testing T is operational testing, not developmental testing. AFMC does the accession of weapons system. Technological development goes through Edwards developmental testing. Then it arrives to us.

We're going to test it in operational conditions, which lead to the integration piece. How will the new aircraft or system work with the overall combat air force?

We test it in operational conditions, on the Nellis range, with experienced pilots in the most realistic conditions. Developmental testers worry about things like:

Is the software safe and does it do what the requirement side says and when the bomb comes off does it come off and separate properly from the airplane?

Does the weapon hit the airplane?

Does the weapon do damage to the airplane?

What we're interested in is how quickly can I get through the operational mechanics of the airplane to drop the bomb?

Can I respond to a threat the way that it operates to release it and respond to a threat?

How does the play affect mission planning and impact on the other elements of the combat air force?

That is the testing part that we're responsible for, namely operational testing.

Then the training is advanced training. It's Red Flag. We do advanced training for operationally qualified squadrons when they show up at red flag and they go on the range against various threats, against aggressors, and at Green Flag operationally qualified crews work on evolving tactics for air-to-ground integration.

Weapons school is the gold standard for doing the advanced tactics for the combat air force. You are going to visit the leadership of each of these elements, and they will deepen your understanding of each key element of

The operational testing and the training lead to the tactics development that the warfare center is responsible for the combat air force.

Question: We learned at Fallon that the warfare center there worked on a regular basis with the deployed fleet and provided a kind of “consulting service” to the fleet to deliver updated tactics for problems in current areas of operations.

Does something similar happen here?

Major General Silveria: We work regularly with the air component commanders and help them with integration challenges or operational challenges they are facing in their area of operations.

And we feed back that work into the evolving tactics and training done here at the Warfare Center.

Question: Do you have a process as well to feedback squadron pilot lessons learned to shape innovation going forward?



Major General Silveria: We do. Indeed, on another part of the Warfare Center right now you have a good example of the process. We are hosting a weapons and tactics conference where we assemble in core areas, such as precision attack, ISR, or personnel recovery. We assemble working groups from across the various platform groups across the USAF: We have an F-35 working group, and F-15E working group, and F-22 working group and so on.

The meetings allows the weapons officers and ops group commanders and squadron commander to gather in one place, to discuss the core tactical problems going forward and can then prioritize the tasks for the period ahead. Then those Captains and Majors brief the 4-star generals to provide their recommendations.

The persons who are actually executing with the weapon system every day, who see the exact tactical problems, as always generate the real value for

shaping a way ahead.

This provides a avenue for them to present that to the four-star General. Then the four-star General whose responsibility is now resourcing and manning and staff energy can decide what to do in terms of resourcing or focusing training.

Question: Yesterday we talked with you briefly as the fifth F-35A landed at Nellis. The first four are developmental test aircraft; the one that arrived yesterday is an operational test aircraft. It is the plane which will go into the IOC inventory. In effect, this plane is the entry card into the process of integrating the F-35 into the combat air force?

Major General Silveria: It is. It is not a test airplane. This is an airplane that is in the configuration that we'll go to IOC with next year.

You met the pilot who flew into Nellis yesterday, Capt. Brent Golden. He is an F-15E weapon school graduate who is now working on writing the first syllabus for the F-35 weapons school to be stood up in 2018. There is another pilot currently down at Eglin who will come here and work with Brent to build that syllabus. By 2017, we will have an initial class of instructors who will then validate the syllabus, and then it will be the foundation for training for the new F-35 weapons school.

Question: You are a certified F-35 pilot and fly the plane regularly.

What has been your experience with the plane and how to you explain the nature of the aircraft as a weapons system to those who have not?

Major General Silveria: Let me deal first of all with some of the fundamental differences which this aircraft poses and how those differences affect the way ahead.

A key aspect is the impact of numbers of aircraft. The USAF will be the largest user of F-35s but we have many partners worldwide who are investing significantly in the aircraft. Our ability to work together is going to be a fundamental aspect of shaping our working relationships going forward and helping one another to deal with difficult combat situations ahead.

The aircraft will demand a culture change, and understanding the adaptability of the aircraft is at the center of the culture change. The aircraft is adaptable in many ways. One way is simply the cockpit – you have very few switches and you have a blank screen that you can configure to the mission, which you are engaged in. You will configure differently for air-to-air mission than close air support missions, for example, in terms of what you want to see on the glass in the cockpit.

When you first start to fly it you have a 20 by 8 touch screen. You don't have an air-to-air display, a radar, a targeting FLIR display, an instrument reading, an engine instruments, a radio frequency, an ILS display. You don't have any of that unless you want to see it.

And so you start with a blank page.

One of the things that's interesting in training and it still goes on, is that the instructor who you first fly with will say, okay, here's what you do. You get four displays, I want you to take the right side make this one all one big display and then I want you to take this one and I want you to put the air-to-ground radar here and I want you to put the targeting flier here and I want you to put the air-to-air radar over here. And down on the bottom of this one put the weapon one and the other, you know, the air-to-service weapon and then I want you to put the air-to-air weapon here. And okay, go.

So there are you are flying because that's what your instructor told you to do. And then you start to realize that you can configure to your preferences.

I'll do a full screen here and then when I'm in a air-to-ground role I'm going to expand my air-to-ground and it's going to take up this whole side because I want it bigger and I want to be able to pick out the little part of the radar that I'm trying to target.

The air-to-air display will have this element, this element, and the another element. It will show me the electronic emissions that are in the air, but when I go to air-to-surface mode I don't want to see all that so I'll change what appears on the screen.

What's interesting is when you get in to the debrief, you can see people's how they do a displays tape and they're all different.

Question: So one aspect of adaptability is clearly the pilot able to configure the screens to support the missions. In what other ways should one think about adaptability?

Major General Silveria: Clearly, a key aspect of the F-35 is software upgradability. This provides both for growth potential but a significantly different way to operate. And this is difficult for people to grasp who do not fly the aircraft.

One aspect associated with both fusion and software upgradeability is that the F-35 is an integrated weapons system. Many articles are written criticizing this or that particular system on the aircraft; but this aircraft is not really about this or that system; it is about the capability of a diversity of system to work together to deliver an effect and overall capabilities.

Another aspect is what software eliminates from the aircraft and allows for enhanced combat effectiveness. A key example is the CNI system. The plane has NONE of the items that traditionally on airplanes to transmit and receive. It does not have any of those.

What it has is a rack two CNI (Combat, Navigation and Identification), combat navigation racks. It has two racks and you tell the airplane: I would like to transmit in the UHF wave form and it generates that wave form and transmits in the UHF wave form; which is a difficult concept to think about. There is no UHF radio on the airplane.

There is no ILS on the airplane. If I want an ILS I have to go in, tap on my glass, and say, hey, good morning jet, I'm going to need an ILS today so I need you to generate the ILS waveform when I need it.

What does this mean in terms of performance and maintainability? I do not have to maintain what is not there; I do not need to be affected by failure rates of systems that are no longer there.

Let me use the example of the IFF transponder, which I do not have on the plane as a separate system. On an F-15 E, you can walk to the ramp and open up a panel and you can find a little box that has all sorts of cannon plugs on it and it would say IFF transponder.

And if it fails during the operation, when you come back you tell maintenance, it does not work. They'd undoe the cannon plugs, they'd pull out this IFF, they'd send it to the back shop, they'd go through all the testing, they'd figure out, they'd fix it, and it would come back. They would put another one in. Well, this airplane doesn't have that to either fail or to fix.

Question: What is the role of the initial service to deploy the aircraft, the USMC and your dealings as well with the F-35 partners as the Warfare Center shapes a way ahead for the combat air force?

Major General Silveria: A key aspect of the F-35 notably as a fleet is its ability not only to fuse data but to communicate that data to other F-35s and via link 16 provide greater situational awareness and targeting information for legacy aircraft.

But less known is the key role of correlating the sensors with the mission data files correlated with the F-35 fleet. The mission file is built around the operational intelligence mission data. The mission file includes all of the data about every threat, aircraft, surface-to-air missile, blue aircraft, airliner, whatever that airplane may see during its flights.

That intel mission data will fill the mission data file that will build is what the airplane then goes in and looks to see when it fuses that target.

The mission data file that we're building right now in the 513th at the 53rd wing which are part of the Warfare Center were initially building are for the Marines. Our guys are building that mission data file.

The real value here is that we're all going to be working off that same mission data library.

This means that the Marines will go first and as they operate their aircraft their operational intelligence data will flow into "our" mission data file. That is a whole different meaning to joint.

And then there is the coalition piece. When I trained to fly the F-35 at Eglin, there were Dutch, Navy, Marine Corps, British and Air Force pilots in the group. We were all co-mingled. When I go to Edwards and fly with my test squadron, there are Aussies, Brits and Marines there as well.

This is unprecedented. This is just the beginning of the operational use of the aircraft and we are sharing operational experience from the ground up on the joint and coalition level. We are stirring the pot from the very beginning of the program.

Question: How does the Warfare Center approach integration of a new aircraft such as the F-35 into the combat air force?

Major General Silveria: Integration is what we do here at the Warfare Center. We are the only place you will find F-16s, F-15Es, B-1s, B-2s, RPAs, AWACS, and F-22s working together in common tactics and training being tested in real world Red Flag or Green Flag exercises.

But the term integration can be confusing because it really is about the evolving capabilities of the combat air force going forward and to shape the combat choreography of many moving parts to shape the effects you want to achieve with airpower.



And with the F-22 to date and with the F-35 entering the combat air force, it is about how legacy aircraft can adjust to the new capabilities and the combat team learn how to use both the legacy and the new aircraft more effectively together.

For example, with regard to the F-22, which is by now an aircraft well integrated into our combat choreography, we have learned that the situational awareness and information dominance, which it brings to combat, has made the legacy aircraft more lethal and survivable.

And we have seen with the F-22, that with its information dominance capabilities, there is a clear advantage of these aircraft providing information to enable legacy aircraft to fire their weapons much more effectively at core targets.

For example, the F15Cs now have learned what they get from the F22s. And so now they are certain things they won't try to do because they know they're going to get that in from the F22. We have to teach the fourth gen at the same time we're learning about the capabilities from the fifth generation aircraft.

The F-35 will enter directly into that world; we will learn what the F-35 provides and how legacy aircraft can become more lethal and survivable.

And we will learn whole new ways to operate as the F-22s and F-35s operate together, indeed we have already started that operational testing at Eglin.

There is an interesting aspect of the F-35 coming to the force which should not be ignored – we have pilots from a diversity of backgrounds, and these pilots are bringing those different cultures to the aircraft.

I fly with the 422nd and when I go into the F35 division of the squadron there's an A10 pilot, an F16 pilot, and F15E pilot; there are a broad mix of different platforms in that F35 division.

This can bring the F-15E interdiction mindset, along with the A10 attack mindset, the F-16SEAD mindset. With those cultures blending and with our ability to tap into our F-22 squadrons to bring the LO and information dominance mindset in as well, we are well positioned to shape an F-35 transition.

The process is complex; but at the Warfare Center we are working on helping shape the evolving combat air force, and to ensure that the combat choreography leverages what we can deploy now but anticipates where we can go next.⁹

The US Navy and the Coming of the F-35

The last of the U.S. airpower services to put their F-35 into operation will be the US Navy. The USN benefits significantly from earlier service investments in the common combat systems across the three variants the USN will fly the F-35C.

As Rear Admiral Manazir, the head of Naval Warfare put it in an interview:

“A key element is the capability to evolve our systems over time. It needs to be recognized that the USN shares its investment in F-35 combat systems with the USMC, the USAF and coalition partners – we are all using the same combat systems in our aircraft. That is an investment multiplier.”¹⁰

It must be realized that the USN, unlike the USAF, has not yet operated a stealth aircraft. The USAF has decades of stealth experience, consequently, there will clearly be a learning curve for the carrier air wings, in operating and leveraging what a stealth enabled flying combat system can provide the fleet.

For the carrier Navy, the F-35C comes at a very crucial time. On the one hand, the threat envelope is going up as competitors like China are looking to enhance their long range strike capabilities against the Carrier, although striking a well defended carrier maneuvering in the open sea at 30 plus knots is much harder than critics seem to realize. On the other hand, a new Carrier class is coming on line, one which is designed with the F-35C in mind.

With regard to the threat envelope, the Navy is working to expand its capability to operate in an expanded battlespace, with organic, joint and coalition forces. It is about the reach of the carrier within a maritime, joint or coalition context, not simply the Carrier against the world. This point is clearly missed by many analysts.

A visit to Fallon Air Station highlighted how the USN is preparing to expand their capabilities to operate in an expanded battlespace. At Fallon, the Navy trains to provide an integrated air wing to deploy aboard the Carrier. Because of the need to prepare for an expanded battlespace, at Fallon they are laying down the foundation for virtual live constructive training to reach beyond what can be trained to in a physical range. This means training pilots and commanders to deal with expanded reach of red forces as well as an ability to reach more effectively into maritime and joint forces as well.

⁹ <http://www.sldinfo.com/the-usaf-warfare-center-and-shaping-the-future-of-the-combat-air-force-a-discussion-with-major-general-silveria/>

¹⁰ <http://www.sldinfo.com/expanding-the-reach-of-the-integrated-strike-group-leveraging-fifth-generation-capabilities/>

It is this shift to preparing to fight in the expanded battlespace when the F-35 C will enter the carrier air wing. It is about expanding the reach of the carrier, not simply relying on the organic range of any particular organic asset.

According to Rear Admiral Scott Conn, Commander of the the Naval Strike and Air Warfare Center:

“I think of anti-access and area denial (A2AD) as the proliferation of precision for potential adversaries and how this proliferation of precision effects joint forces ability to maneuver where we need to be and when we need to be there.

For me, it is about expanding the battlespace and training with regard to how to do this. We are developing the means to push out the battle space and our ability to find, fix, track, target and engage the threat. The F-35 will bring enormous capability in this area. At the same time we are developing means to deny, degrade or delay a potential adversary’s ability to do the same to us.”¹¹

And the USS Ford is entering into the fleet concurrent with the F-35C as well as the reworking of Navy concepts of operations to operate as a total fleet fighting force. A fleet approach from satellites, to Aegis ships, to ASW ships and subs can evolve together into a more effective integrated fires support approach. Effective information and combat capability of Naval/Marine “Sea Service” assets to USAF, Army ADA and Allies will be driven by the F-35C IOC

The USS Ford is not a Nimitz-class Carrier; and there is much debate about the new class and its role. The USN can make a clear case that the Ford is a very different type of carrier, which provides a significant capability to command a strike force over significant distance by tapping into USN, joint and coalition assets. And to really do so is linked with the ability of the F-35C flying off of the carrier to tap into the global fleet of F-35s with which it can share data, and decision-making capabilities at great distance.

The USS Ford is to come on line in 2016 and join the fleet in 2019 with the F-35C on board the Ford at that time. Vice Admiral Moran when he was head of Naval Warfare provided a way to think about the Ford and the F-35-C:

“We see the coming of the FORD and the coming of the F-35 as highly synergistic for the fleet and its operation as a sea base. And with the F-35C must come Block 3F capability, which has a fully enabled set to operate the weapons we use at sea, multi-ship integration and a host of other very important capabilities important to how we expect to operate in the future. We are not going to accelerate the number of production airplanes until we get to Block 3F which will give us the capability that we need to operate off the carrier. Once we marry up F35C with key capability investments in the Super Hornet, E2D, Growlers and a mix of unmanned capabilities, we will continue to have an airwing that can dominate in any environment.”

In effect, the USN is looking to the overlap among their ability to fight in an expanded battlespace, adding the USS Ford and its capabilities to the fleet with the coming of the F-35C. It is not just about the IOC of the F-35C as a Super Hornet replacement. It is about enabling of USN transformation.

As Rear Admiral Manazir has summarized the interactivity of the transformation effort in the mid-term:

“Reach not range is a key aspect of looking at the carrier airwing and its ability to work with joint and coalition forces. This is clearly enhanced with the F-35. What you can do with a Carrier, given joint and coalition perspectives is the Carrier automatically extends your reach because you can put it anywhere you want. The mobility of the carrier

¹¹ <http://www.sldinfo.com/training-for-the-extended-battlespace-an-interview-with-rear-admiral-scott-conn-commander-naval-strike-and-air-warfare-center/>

is a key point. You can put it up against the problem set the national command authority or the joint force commander wishes to address; and then you can move it to deal with an evolving target or operational set of challenges, again aligned with the commander's intent."¹²

And an interview with the head of the F-35C program at Lockheed Martin and a former carrier commander provided a further look at the impact of the F-35C on the air wing and the way ahead for the carrier navy.¹³

Jim Gigliotti is Director, F-35C and Navy Program Manager. Gigliotti is an experienced retired Naval Officer who started by flying A-6s in the 1980s, and finished his Navy career as the Executive Assistant to the Commander, US Joint Forces Command. He previously served in several sea-going command positions including command of the Aircraft Carrier USS Harry S. Truman.

For the Navy, the F-35C is part of the overall evolution of the fleet in reshaping distributed operational capabilities or in the words of senior Navy Admiral's "distributed lethality."

As Vice Admiral Tom Rowden, Commander of the US Naval Surface Forces put it earlier this year:

I want to follow up on my remarks about the future of our Surface Force using the concept of distributed lethality. Distributed lethality is the Surface Force's contribution to the CNO's first tenet—Warfighting First—by taking a long-hard look at our Force's strengths and weaknesses, and thinking through how best to maximize the former and mitigate the latter.

This is a relatively simple yet powerful idea. By applying the principles of distributed lethality, the Surface Force can help sustain and extend America's competitive advantage in power projection against a growing set of sea-denial capabilities. Distributed lethality is the most effective and efficient method of capitalizing on the Fleet we have today, and the one planned for the immediate future. We simply need to make better use of the ships we have today, and think differently about how we equip and employ them.

The F-35 is a facilitator and enabler of a crucial evolution of the naval fleet, namely, enhancing, facilitating, and shaping 21st century distributed operations, and shaping a 21st century version of what the US Navy did earlier to deal with long range threats to the carrier battle group, perhaps even re-vitalizing what the Navy used to refer to as the "chain saw" approach in dealing with emerging long-rang threat capabilities.

A layer of defenses facilitated the operation of the carrier with combat aircraft at the outer edge, which provided several opportunities to defeat air-breathing threats to the carrier or to deal with subsurface threats as well.

The discussion with Gigliotti highlighted the cross-cutting processes of US Navy fleet innovations with the coming of the F-35C.

Question: What is the impact of the F-35C on distributed operations?

¹² <http://www.sldinfo.com/the-uss-ford-in-the-u-s-navys-future-enabling-the-distributed-force/>

¹³ <http://www.sldinfo.com/the-coming-of-the-f-35c-and-the-evolution-of-carrier-strike-power-an-interview-with-jim-gigliotti-lockheed-martin-navy-program-manager/>

Gigliotti: One has to understand that distributed operations have always been crucial to carrier operations. In what we used to call “chain saw”, F-14s would operate at the outer edge of the Carrier Battle Group (now Carrier Strike Groups or CSGs) and provide initial carrier defense capabilities for the battle group.

When Aegis ships and newer, better surface-to-air missiles came to the fleet we began to morph how we conducted such operations, but it was distributed operations none the less.

For strike operations against land-based targets, there was dedicated level of coordination that took place in the 90s in which Tomahawk missiles and Carrier-based aircraft were folded into complex, integrated operations.

Witness what happened during and after Desert Storm. The strike group was widely separated in order to best place ships and aircraft for most effective employment. The only time the various ships in the carrier battle group were together in one place was for the photo op.

Clearly, with emergence of new threats and build-up of state actors in specific regions, the carrier battle group may need to re-shape some variant of a 21st century “chain saw” approach.

The E2D and the F-35, working closely with the F-18E/F and enhanced Aegis capabilities are central pieces to shaping such an approach.

The idea is to move rapidly information and assets around the battle-space in order to efficiently and decisively assign the right platform with the right capability or weapon to neutralize the threat.

What we’ve always needed in the fleet is the ability to securely move a lot of decision-quality data around the battle group so we could make quicker, faster, decisions to negate enemy reaction or employment time. That’s what it is all about.

It’s about controlling time domains.

How do I control time domains? I either have to go real fast, or I have got to be delay detection or interpretation of intentions i.e be stealthy, or I have got to control information flow. In reality we need to do all three.

But what we’re trying to eventually do is to control the time domain to our advantage.

We want to be able to determine when we could employ weapons and actually expand our own force engagement envelopes both in terms of time and distance while decreasing an adversary’s ability or opportunity to engage.

The more time I have to react, the less time he has to react, the advantage accrues to me. I do that with again, speed, stealth, and data movement.

The more I can distribute the faster I can move that data the more I can build the situational awareness (SA) the more advantage I have to employ my weapons.

It chains like that, that’s how I view it.

We’ve conducted distributed ops for a long time, but with airplanes like E2D coming online the F35 moving that data we will be able to operate at a different level of capability.

Question: The F-35C and the E2D will help the Navy to extend the reach of the carrier from a defensive point of view, but it unlocks enhanced strike capabilities as well.

How do you view this process?

Gigliotti: In Desert Storm, the USAF leadership rightly complained that USN strike aircraft spent an inordinate amount of time defending the carrier as opposed to providing ramped up sortie generation rates against Iraqi targets.

Of course, that is why the Army puts Patriots around U.S. bases and the USAF dedicates airplanes in a CAP role as well.

What the E2D and the F-35C, working alongside F/A-18s and EA-18Gs, do is to unlock more offensive capabilities from the strike force.



The F-35 was developed to operate unsupported in high-threat environments and is therefore designed with the inherent capability to gather, process and disseminate a significant amount of data by itself or by working in conjunction with other F-35s.

It can also work closely with other air wing and joint assets, and this is where the true value of the aircraft comes in.

It is an information sump.

The F-35 collects a lot of information across multiple spectrums in order to provide the pilot a fused picture of the battlespace.

While the intended use is for the aircraft itself, certain pieces of information can be shared with and amongst other F-35s and even the amongst the strike group.

If that information can be properly shared among the rest of the strike group and air wing, the F-35 helps make the entire strike group more effective and, in turn, does the same for the F-35.

By expanding the SA available for fleet defense, the numbers of assets which can be devoted to strike operations can be enhanced. Of course, it is scenario dependent, but you're going to have more flexibility to be able to proportion forces for offensive operations in the future.

The F35 is unequivocally going to make the carrier strike group as a whole, not just the aviation side, better.

I think the E2D has already gone in that path working with Aegis ships and the Super Hornet. I think the F-35 will help take it to the next level.

Question: The F-35 is entering the Navy at a time when the Navy is shaping a more synergistic force, and the operational concept of Naval Integrated Fire Control-Counter Air (NIFCA) is clearly designed to do this.

What is your view of the contribution of the F-35C to NIFCA?

Gigliotti: For me, I prefer to speak of NIFC or Navy Integrated Fire Control.

It does not have to be anti-air.

It can be anti-surface as well.

What you are focused upon is a more effective ability to pair the right weapon from the right platform with the right targets in a timely fashion.

Clearly, an airplane like the F-35 will be a key part of that process.

An airplane like the F35 specifically because of the ability to get in and do things, not necessarily completely undetected, nothing is invulnerable, is going to provide more options for how we can build an integrated fire control network.

Again, the task is optimally to pair weapons against targets and engage those targets faster.

Question: When we spoke to Admiral Manazir about the extended reach with the F-35 brought to the fleet, a key consideration is the global fleet of F-35s.

With MADL able to connect the F-35 and create the possibility of an integrated air fleet, the ability of the carrier to tap into that fleet expands carrier capabilities and enhances the carrier's contribution to the joint or coalition force.

How do you look at this process?

Gigliotti: There are a couple of ways to look at it.

If we look at the Marine Corps-Navy team, its integration and lethality will go up with the introduction of the F-35.

The Marines will fly F-35Bs from amphibians and F-35Cs off of carriers.

They will integrate both planes. And the operation of the F-35Bs off of the amphibians will send data to the carrier-based F-35Cs, Navy or Marine, thereby expanding the mission flexibility and lethality of both types of ships and strike groups.

In fact, Vice Admiral Tom Rowden, Commander of the US Naval Surface Forces, clearly is looking at the USMC F-35Bs as a key asset for the overall contribution to what he refers to as distributed lethality.

There is a real partnership emerging there that will affect the Navy's future.

Imagine a pair of F-35s flying off the North Coast of Australia and operating with the RAAF whose F-35s are then part of an integrated air operation, which can be in support of an Australian operation, or a jointly declared common objective in the region.

Question: The next decade of airpower innovation will be quite interesting.

The first appearance of the F-35s will undoubtedly do what one Typhoon pilot referred to as the F-22 contribution to the Typhoon – make it more lethal and survivable.

But it will take time to unlock all of the advantages which an F-35 fleet can provide.

What is your perspective on the process?

Gigliotti: I think that is a good way to look at it.

The plane will have an immediate impact when it enters service but until the war fighters get their hands on it and wring it out, we will not know what the jet's full impact is going to be.

The captains and the lieutenants who are flying this airplane are uncovering things that we didn't think about in design.

And they're going to discover all kinds of new ways to do distributed ops missions or to employ the aircraft in more lethal ways that weren't even envisioned when this aircraft was designed.

Just like with any new airplane, the discovery curve will be steep with regard what we can do with the aircraft once we get to the fleet.

And as security limitations are sorted out, the cross-learning among the various international partners working with the US services will unlock even greater operational capabilities.

But in general this program will not realize its full capability from a military employment standpoint until we find a way to get the pilots in the room, regardless of Service or what flag they're wearing on their left shoulder and say, "Okay... how did you do this? What did we learn? How do we do it better?" Just like any fighter mission, training or real-world operation, the debrief may be the most important part of the flight.

We need to be able to pull the right and best ideas out of the cockpit, or out of the Combat Information Centers on our Carriers and Aegis ships for that matter, in order to rapidly realize and expand what the aircraft will bring to the fleet as whole.

The Allies and Rolling Out a Global Enterprise

The most neglected aspect of the IOC 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 IOC, 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 as such the IOC rollout is laying down building blocks of the future, such as a sustainment enterprise in Europe and Asia to support the partners, and the operation of US forces from regional support centers. Without an IOC built upon a common logistics enterprise, the possibilities of shaping a global sustainment effort would not be feasible.

The partners are major buyers as evidenced by the most recent buy of F-35s, LRIP 8 (To be delivered in Spring 2016). The US is buying 27 aircraft (19 F35As for USAF, 6 F-35B for the USMC, 2 F-35Cs for the USN) but the partners are buying 14 aircraft (4 F-35B for the UK 2 A's for Norway 2 A's for Italy 4 A's for Japan (Balance to be built in their FACO), 2 A's for Israel). In a time of fiscal pressure on the US and its allies, this buying structure is a significant step forward in force transformation based on shared cost.

It is also the case that 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 sup-

pliers 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 acquisition route, namely Japan, South Korea, Israel and almost certainly Singapore.

And each of these countries is buying the F-35 as part of their overall efforts to shape 21st century defense forces. Here, I will focus on only two of the partners, briefly with regard to Australia and then in more detailed manner, the UK.

Australian Force Transformation

For Australia, the F-35 is coming in the midst of an overall transformation of the Royal Australian Air Force (RAAF), whereby it can self-deploy globally and to employ a significant combat capability. The new C-17s and Airbus allowed the RAAF to self-deploy from Australia to Iraq.

The F-35 is viewed as providing a multi-mission lethal enhancement of a globally deployable force, and one, which can provide for regional leadership as well. And if the fleet is kept common, the Aussie F-35s could come to Europe and be supported there by European based maintainers, and not require bringing the entire maintenance support structure with them.

When United Airlines flies to Australia from Washington it does not bring its maintainers with them; but the military still does; this change would be revolutionary for coalition military operations. It could enable the operation of a rainbow coalition, where maintenance is provided regionally or nationally added by another nation's maintainers but supplied regionally rather than airlifted from home.

The F-35 is coming to Australia within a transformation context and as viewed as an accelerator of the effort. It is not just about technology, but cultural change as well. As the Chief of Staff of the RAAF has put it in announcing the effort, which is termed Plan Jericho, May 29, 2014 (and obviously the term speaks for itself with regard to what impact he anticipates with regard to the F-35 on the forces):

"I intend to release Plan Jericho, the RAAF transformation plan, in early 2015. It will guide our force transformation, enabled by our new 5th Gen capabilities, over the next decade. I will also be engaging closely with industry in the development of the plan.

It is the technology that is being developed by industry that affords us the opportunity to transform our force. It is essential that we partner with industry to explore how we can maximize the opportunity offered by 5th Gen systems. I ask you to consider how you can work with us, not just at the platform level ... but in helping us think through and design our overall future force using the 5th Gen capabilities you develop and will help us sustain in the future."

Rather than just waiting for the coming of a fifth generation aircraft, the Aussies are looking to reshape the force to become more integrated and lethal, enabled by vastly improved and shared situational awareness, as well as targeted decision making able to operate effectively in challenging environments. It is about a step change in the ability to operate as an integrated team across the Australian Defence Force and in Coalition operations.

The RAAF considers the F-35 as an entirely new type of aircraft, along the lines, whose impact comes not simply from being a new type of aircraft but from providing enhanced situational awareness, decision-making, and spectrum dominance.

And the full value of the plane simply will not come by operating by itself as some sort of silver bullet, but operating in an effective manner with other new platforms as well as with legacy systems that are themselves becoming shaped for 21st century operations.

In part, the challenge is to get past the replacement platform mentality.



The core air platforms have been or are being replaced, but the task is not simply to learn the new platform and prepare for the next one in a narrowly defined functional area where a fighter is a fighter, a tanker is a tanker, a lifter is a lifter, an air battle manager is an air battle manager, and so on down the 20th century species list. The challenge is to shape cross-platform capabilities and to reshape how battle management, operations, and warfare are conducted.

This is challenging for a small air force, which is already taxed learning how to operate new platforms and getting them into operations.

The notion of preparing for the introduction of the F-35 and cross-platform innovation will be evolved by testing new approaches to using other new platforms and leveraging them as well in new ways PRIOR to the F-35 becoming the dominant fighter in the RAAF.

For example, the RAAF Super Hornets operating in the Middle East have changed aspects of how they operate as they worked with F-22s in operations.

To take another example, the Wedgetail is an innovated battle management platform, but it is not simply providing a 21st century upgrade to the tasks performed by AWACS. It's operations are about managing the battlespace differently with various domains and testing ways to do battle management differently with the KC-30A tanker and the Hornets and Super Hornets.

The Australians are aiming to find ways to shape distributed operational capabilities before the F-35 is introduced.

It is not about waiting for change to occur; it is about transforming with the coming of the trigger force, the F-35, and other key elements—such as the Triton.

John Blackburn, former Air Vice-Marshal inof the RAAF, recently argued in a presentation to the Copenhagen Airpower symposium, that the heart of the challenge is to shape a narrative for this force transformation that gains wide acceptance in the Australian Defence Force and resonates with the public.¹⁴

It is not about adding silver bullet capability for future fights.

Shaping a fifth generation warfare narrative and driving transformation are closely connected.

The narrative is not just an abstraction but describes a universe of innovation populated by cross-platform transformation.

The Chief of the RAAF starts with underscoring how the F-35 impacts on the pilots.

He has identified the following 5th Gen Implications for the pilot:

- Sensors require little if any manual manipulation;
- Fused picture is presented to the pilot on a single display;
- Inter-flight comm is significantly reduced;
- Pilot has more brain-space to be a tactician rather than a sensor operator and data fuser;
- Faster and more accurate decisions;
- Massive generational leap in Situational Awareness;
- Ability to forward plan and allocate resources pre-emptively.

He then moves from this and asks about its implications then for the force:

In particular, “the Chief has focused on the 5th Gen Implications for Air Battle Management and has concluded:

We need a generational change in the ISR, network, and Comms systems and other capabilities that will support the F-35 as we are to get the most out of the aircraft’s capabilities ...

We must continue to think about and analyze how we employ all of our air combat systems as a system of systems in our regional security setting and within the rapidly changing technological environment.”

For Air Marshal Brown, the task for Plan Jericho is about combat innovation and not just about a new airplane, but what that plane and the innovation in the RAAF associated with the plane might mean for the Australian Navy and Army as well.

The question he posed to launch Plan Jericho is simply: What is a 5th Gen / 5th Gen enabled Force?

¹⁴ <http://www.sldinfo.com/plan-jericho-john-blackburn-explains-the-raaf-approach-at-the-copenhagen-airpower-symposium/>

For the Chief this is clearly a Force with vastly improved shared situational awareness, the ability to operate as an integrated team, and the term is a lever for joint integration in 21st century combat conditions and adapted to a 21st century strategic environment.”

The formal definition of Plan Jericho was laid out in an official publication earlier this year and the way to understand it is as follows:

Plan Jericho is the Air Force’s plan to transform into a fully integrated force that is capable of fighting and winning in the information age.

Jericho’s Vision: To develop a future force that is agile and adaptive, fully immersed in the information age, and truly joint.

This is not the final plan, but rather the first step to meet our challenge of transformation for the future.”

In many ways, the ecosystem which synergistically interacts with the coming and evolution of the F-35 global fleet (as Lt. Col. Berke put it) is what Plan Jericho is all about: how do we create an effective 21st century combat ecosystem leveraging the F-35 but within which the other platforms find their proper place in a reset or transformed combat force?

The Dutch Air Force focuses on Air Force 3.0, the Marines on the F-35 reshaping the MAGTF, and the Aussies have launched Plan Jericho.

It is not simply about buying a replacement aircraft.

It is about changing the mental furniture and reshaping the way the force operates.

This is easier said than done, something Blackburn is acutely aware of having been part of earlier RAAF processes of change.

The focus cannot be simply on top down directives or change, or simply having a transformation office handing out mandates for change.

It has to come from the O6 and O5 leaders, and it needs to come from the operators—not just the self-styled strategic thinkers.

It is about unblocking opportunities, which can be found throughout the force; it can come only from the rising generation committing themselves to change and shepherding change throughout the RAAF. It is about defining a vector rather than a detailed plan.

To do so, the Jericho team has been established with two O-6s or Colonels who are working the relationships within the RAAF and across the Australian Defence Force to support the Chief’s approach.

They have been pulled from operational responsibilities for a period as co-chairs of the effort, and given time to talk to others in the RAAF as well as to think.

And to assist in the effort, a new Air Warfare Centre is being established to facilitate dialogue on practical opportunities for innovation and change, in part along the lines of the RAF Air Warfare Centre, which means its is about combat operations as much as it is about pure airpower innovation.

Not surprisingly, when the RAAF searched for innovative thinking from allies and industry, not a lot has been easily found.

So the effort itself will need to trigger that kind of change.

In part, that is why Blackburn and the Williams Foundation were in Copenhagen to drive the debate about the future of airpower, and to be able to present with the core partner whom they recognize as going through a very similar thought process, namely the USMC.

To shape a way ahead, Blackburn discussed a four-part process that is highly overlapping and highly interactive.

The first step is to develop a fifth generation "narrative" to explain the opportunity that the JSF provides as a basis for a 5th generation-enabled force concept.

The second step is develop a high-level 5th generation-enabled air operations architecture with concrete examples for fifth generation concepts of operations, for example a new approach to air battle management.

The third step is to develop individual capability roadmaps based on existing plans that will identify gaps and disconnects with a 5th generation concept of operations.

The fourth step is to identify critical joint integrators and enablers, to identify impacts from delays to integrators and enablers on fifth generational capability, and to prioritize integrators and enablers based on capability impacts.

And clearly political leadership in Australia is listening.

Hence, the Australian Defence Minister is the first senior Minister among the industrial democracies to clearly state the coming of fifth generation warfare is what transformation is all about for the Australian Defence Forces.

In a speech delivered at the end of March 2015, he argued that with regard to the development of the Australian future surface fleet:

The 2015 Defence White Paper, to be released later this year, will provide a costed, affordable and enduring plan to achieve Australia's defence and national security objectives.

The White Paper is being developed in a considered and methodical manner and will reflect the Government's strategic, national security, fiscal and broader policy priorities.

It will outline a strategy for securing Australia's strategic interests in the period to 2035 and beyond.

The White Paper will align defence policy with a clear military strategy and a credible, affordable and properly funded ADF structure designed to achieve that policy:

- *it will set out the strategic objectives that the Government expects Defence to be able to carry out*
- *which will be underpinned by a fully-costed Force Structure Review*
- *and the Government will ensure Defence is properly funded to meet these objectives.*

Most importantly, it will propose options for the force structure that ensure the capabilities that enable modern joint operations, such as surveillance, communications and logistics infrastructure, are robust and resilient.

Succeeding in the future operating environment will depend on more than just high-end capabilities.

It's the ability to integrate and share information between platforms and systems in a timely manner that will make the ADF a truly fifth generation force and one will give us a distinct edge over many other countries.¹⁵

It is clear that the RAAF is providing an innovative challenge to allied air forces, and clearly will be a lever for change across the Pacific, in the United States, Europe, and the Middle East.

And certainly the standing up of the global F-35 fleet will provide an important opportunity for proliferating the RAAF innovation effort.

The UK and Cross Cutting Transformations

The Royal Air Force does not have a Plan Jericho but they do have a recognized strategic opportunity offered by the twin introductions of the F-35 with the new large deck carrier class, the USS Queen Elizabeth. And with the necking down of the RAF to the Typhoon and the F-35 look to gain synergies from integration of the two aircraft into a 21st century fleet,

The Royal Navy (RN) is returning the large deck carrier business after many years absence. This means that the RN while shaping the concepts of operations for its new carrier and the RAF for the new carrier air wing, the two services are not constrained by the immediate past. They are reinventing their approach to carrier airpower; not reshaping its carriers to deal simply with the addition of new aircraft to the carrier air deck, as is the US Navy.



Secretary Wynne once noted that a good way to rethink the role of the large deck carrier would be to clear the deck of its legacy airwing and imagine what a fifth generation enabled carrier might look like. The RN and the RAF as the closest proximity of any country going to do that.

But this will not be easy, for the RN and the RAF will have to rethink their legacy approaches, and shape ways to work more effectively together as an embarked force.

This will involve significant cultural change as well, with the RN having operated largely as a “frigate navy for the past few years,” according to a senior RN official. And for the RAF moving from a land-based mentality and the use of legacy aircraft will require a leap into operating a “fifth

generation enabled carrier” and finding ways to integrate that capability within the overall air combat profile of the RAF.

In other words, it is not just about adding a ship or adding an aircraft. It is about significant cultural change and the overall transformation of UK forces to a 21st Century paradigm of operations.

¹⁵ <http://www.sldinfo.com/australian-minister-of-defence-embraces-fifth-generation-warfare-concept/>

Much of this was evident from a visit to the ship and discussions aboard the ship. But in an interview conducted at the Ministry of Defence Main Building in Whitehall the day after the visit, a discussion with the RN and RAF provided significant detail and perspectives on the paradigm shift.

The discussion at MoD was with two Royal Navy personnel and one RAF officer. Chris Alcock Programme Manager Queen Elizabeth Carriers at Royal Navy was joined by Commander Nick Walker and RAF Group Captain Paul Godfrey in the interview.

Captain Chris Alcock is Head of the Carrier Strike Division in Navy Command Headquarters. He is Programme Manager for the QEC Carriers and also responsible for capability Integration of the Carrier Air Wing into the platform, specifically LII F35B, Merlin Mk2 and Crows nest.

Commander Nick Walker is currently serving as the Chief of Staff Carrier Strike in the Carrier Strike and Aviation Division within Navy Command Headquarters in Portsmouth. The role involves coordinating and brigading the activities of the Carrier Strike Team as they interact with a plethora of organizations in Defence and industry to manage the Queen Elizabeth Class project and bring the aircraft carriers into service.

Group Captain Paul Godfrey is a key RAF officer involved with F 35 Lightning II Entry into Service. He has extensive flight experience with Harrier, Typhoon and F-16. After his current assignment, he will be given command of a Typhoon Main Operating Base which position him well to support the land and sea based air integration efforts of the RAF.

Question: How demanding a shift in RN thinking is the introduction of this ship?

Alcock: It is an important shift. There are a lot of people that have never been on a carrier before, and the Royal Navy has been very much, since the demise of the carriers, has been a very much a frigate Navy. We are generating a new Maritime Task Force concept (MTF) to shape the concept of operations going forward. This clearly draws on elements of the past, but requires a fresh think as well.

People say it's not all about the carrier, but it is all about the carrier, because that will be the center of gravity around which we will provide all the other enablers for the other elements of the task group. The constitution of the task group is critical to depending on what we do with the carrier but the carrier and its air wing are the centerpiece enabling the entire task force.

We have worked closely with the USN and the USMC in the regeneration of Carrier Strike and the close working relationship has been hugely appreciated and also the work they have done for us and with us in support of this aim.



Question: The RN and the RAF have been visiting places like Nellis, Fallon and Yuma and I would assume that you are looking at cross learning and cross transformation processes?

Godfrey: Very much so. And we are training with the Marines and the other air services as we prepare to embark our F-35s aboard the carrier in three years time. And we are very much using this time to think through the marriage between the carrier and the airwing and are looking closely at what the Marines and the US Navy are doing as well.

In this three year period that we've got before we're bringing our F-35B's back to the U.K, in the four year period we've got before we declare a carrier strike capability on the 31st of December, 2020, we can have a really good look at how do we want to do this? And we are looking at a revolutionary way of doing it, rather than an evolutionary way of doing it.

Alcock: And we are looking at significant innovations different from the US as well. We will not generate the sortie rate of as many aircraft as a large deck USN carrier, but we will generate significant combat effects. Our carrier is designed to operate 24/7 and will not operate with catapults and traps. We are looking to use the F-35B and its unique operational capabilities to give us a significant combat effect.

I think we will just do things differently and we have been studying the USN model as to how they operate their CVN from Japan. Also maintenance is key and this will be an important factor for the platforms - serviceability and availability gives the UK greater flexibility. In addition we have been working closely with USMC and gaining insight into SGR's and deck cycles.

Question: We argue that no platform fights alone; this is obviously true in terms of the carrier, which is both an 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?

Alcock: As I said earlier, we have not been defined by the carrier in our Navy and some of the newer assets will be rethought with the introduction of the carrier. 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.

The good thing is that a lot of people involved in the process have open minds about thinking through the process of change.

Question: And presumably the new destroyer program designed to replace Type 45 can be defined in such a way as to leverage the carrier and to be built into the carrier enabling capabilities as well?

Alcock: That is a good point, new platforms will need to embrace the new warfare disciplines associated with the Carrier and the lessons learnt will need to be embedded in the design and operability of any replacement Platforms.

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.

Question: A key aspect to thinking about the flexibility engendered by the carrier led Maritime Task Force can come from shaping effective C2 for an intervention force.

What is your thinking and approach with regard to the C2- enabled carrier maritime task force?

Alcock: We have spent a great deal of time thinking through C2 over the past few months, and C2 in terms of operating from benign to high combat environments. The inbuilt working relationship between the RN and the RAF engendered by the carrier is an important forge point to get the two services to think through 21st century technologies and approaches to C2.

And given the carrier and the MTG will be used not just as national assets but as coalition ones, then working the coalition piece of this is crucial as well.

Question: Could we return to the challenge of adaptation posed by the carrier to the RN. How do you view this challenge?

Alcock: In part it is about the carrier; and in part is about the F-35. A core challenge is to get the RN understand what fifth generation is all about.

Do we understand what 5th gen means?

Do we understand what the carrier can do? Do we understand how type 45 or new type 26 will integrate into the MTG and what we can then bring to other coalition partners?

That is where the hard work is going to come and actually getting that out to people to incorporate in their operations and train and exercise the capability.

We clearly face a challenge in bringing the various strands of innovation and transformation together into the operational crescendo necessary to make the MTF fully effective.

Question: A number of British allies are in throes of change as well, ranging from the Aussies to Italians. Clearly, you are bringing a powerful evolving template to the process of shaping 21st century combat approaches. You're part of the club trying to figure out how to do combat differently moving forward in the 21st century.

Walker: That is one of the strengths which comes from the various working groups we have within MoD and with core allies. We can both learn and contribute to the overall learning process for coalition partners.

When designing the carrier, clearly the designers were looking at core elements which the carrier would be built around which provide a base line infrastructure for 21st century operations. A large carrier is first of all to be understood to be a floating infrastructure for operations, and dependent upon what comes from the flight deck of the carrier, it is an infrastructure for variable operations. The integrity of the logistics of a carrier and its task force is a key advantage of carrier operations, namely that it, in the words of the CG of 2nd Marine Expeditionary Brigade, Major General Simcock, "it commutes to work."

Recent events in Iraq whereby the ISIS seized US and allied equipment left behind in Iraq reminds one of the problem of leave behind stores and supplies as opposed to carrying the supplies with you.

A key advantage of a carrier is that it carries its logistics with it and when it leaves those supplies go with it.

The other advantage of a sea-based task force is that the force does not have to have significant supplies ashore to operate, or the creation of significant numbers of forward operating bases or FOBs which in turn must be protected. The ability to project power ashore is simply limited by the ground forces on board and the nature of the aircraft used to project those forces ashore.

Obviously, if the goal is a large invasion force for occupation or stability operations, this would simply be a forced entry force. But, in a number of cases, this might be all the force one would want, especially when linked with a variety of coalition partners.

The UK carrier will come to its initial operational life as a new phase of building scalable modular insertion forces is unfolding. The confluence of evolving ISR, C2, and fifth generation capabilities are shaping a new approach to scalable modular force. Rather than building sequential build to mass air operations, forces which operate in an area of interest will increasingly be linked to other forces to allow for scalability, reachback and mission success by focused lethality rather than overwhelming with mass.

The carrier will operate as this phase of the evolution of airpower is unfolding and accelerating with the emergence of a global fleet of F-35s. The RAF will focus on ways to link sea-based and land-based airpower into a seamless whole; the carrier will be capable of providing a C2 lead to the air insertion forces or to support to an air or land based C2 lead element.

Because it is a moving strike or defense force, the carrier can either lead or support a variety of national or coalition operations. The carrier will not depend upon forces deployed ashore to lead and operation; but can carry out autonomous operations, or be part of pushing force ashore and then supporting it as a mobile support, strike or defensive system.

And the carrier will be operating in a period where missile modernization will accelerate.

The UK by laying down its complex weapons enterprise will have the advantage of leveraging weapons commonality across the weapons enterprise. The same weapons can be fired by air or surface platforms, e.g. SPEAR 3 can be fired from surface assets by simple modifications. This would mean that the air and surface fleet could be armed with basically the same missile, and provide for economies of scale and significant stockpiling advantages for the force.

The scalability of the aircraft aboard the new carrier is an essential part of shaping how the carrier can engage in a wide variety of operations. The reach of F-35Bs coming off the carrier is significant when integrated with other F-35s either launched from sea platforms or land bases. The integration of the fusion engines aboard each F-35 provides a wide-ranging honeycomb of ISR, C2 and strike integration.

And the capability, which the F-35 will have to work with other strike assets to identify targets and offboard the strike function, will mean that F-35s launched by the carrier can enable a significant strike capability across the air, surface, and subsurface fleet as well.

And the carrier can provide for a mix and match of missions dependent upon the situation. It can be optimized for strike, for insertion of ground forces and their support, for sea control functions or defensive functions. As Secretary Wynne commented with regard to the new UK carrier:

The ship could be used for offensive operations or configured as primarily a defensive asset, for example, optimizing its role as a sub hunters. In other words, employing a defensive suite, much smaller than the planned offensive suite yields really interesting constructs. Then as it achieves a position of importance and then the offensive unit could arrive supported by tankers to provide transit fuel to the offensive unit and swap out the primarily defensive assets which have been prioritized in its sub hunting role."

In other words, by thinking through how to CONFIGURE the flight deck, they are a wide variety of missions which the carrier can do, particularly as the combat aircraft can move from and to the deck enabled by the new 330 tankers which the RAF is operating.

In short, the flexibility of a 21st century carrier is based in part by its ability to integrate with the other force assets rather than simply compliment them. And the F-35 is a lynchpin to this as well as the complex weapons enterprise and the ability of the weapons loading system to manage a variety of configurable weapons loads to the missions, offensive, or defensive.

And the capability of the F-35 to be integrated into the subsurface and surface strike roles will bring significant synergy to UK forces and their contribution to coalition forces or the ability to either lead or support those forces.

Conclusion: Crafting 21st Century Joint and Coalition Air Operations

The roll out of the F-35 global fleet through the iterative IOC process lays a foundation for crafting 21st century joint and coalition approaches to air and combat power. Built into the IOC of the F-35 roll out is a nascent global fleet. Again it is not about the IOCs of a single platform for a single service, it's the concurrent roll out of U.S. and allied F-35s.

And this roll out is supported and facilitated by a collaborative cadre of pilots, maintainers, and industrialists worldwide. For the US services, this means being joined at the hip about the way ahead for the F-35 community. For the allies, this means engagement with the U.S. service's "F-35 cadre" as they roll out their capability as well.

Indeed, there are two key lines of collaboration shaping the roll out.

The first is the training cadre based at Eglin, Luke and Beaufort where pilots are trained to fly either the F-35A, or B or C. Luke will become the center for excellence for the roll out of US and allied F-35As; with Beaufort becoming the initial training base for the roll out of US and allied F-35Bs. The Navy is currently training at Eglin, with its first squadron of F-35Cs, the Grim Reapers.

The second key collaborative effort is shaped by the warfighting centers of excellence at Marine Corps Air Station, Yuma, Nellis AFB, and Fallon Naval Air Station. The F-35 community at all three warfighting centers is working together to think through how to use the F-35 as it comes into the fleet. F-35 partners are visiting the centers as well, such as a recent visit of the Royal Navy and Royal Air Force officers to Fallon.

It is this community of warriors, which is shaping the roll out of the F-35 global fleet. The commander designate of VMFAT-501 at Beaufort, Lt. Col. Summa, described the process, which as Executive Officer of Marine Corps Squadron VMF-121, he was experiencing:

"We are working with the USAF at the 422 Test and Evaluation squadron at Nellis. We tend to busy here, so we send operators from the training department or former patch wearers (MAWTS-1 and TOPGUN) to work with SMEs from the Navy and USAF at conferences or simulator events.

The young senior company grade who are coming off of a tour with a Hornet or a Harrier and now wearing a Green Knights patch go into the room with the aviators at Nellis with F-16 and F-15 pilots and work through the process.

In effect, an F-35 enterprise is emerging built around a group of individuals in the profession of arms who want to make this airplane as lethal as possible.

People come in from different backgrounds – Raptor, Eagle, Viper, Hornet or Harrier – and are focusing on the common airplane and ways to make it work more effectively in a tactical setting. And talking to the experience of a common plane is a crucial piece of the effort.

When an F-35 pilot sits down regardless of what service he is in, he's talking with an individual from another service on the same data point....If we differ in training, it doesn't have to do with hardware, it doesn't have to do with software; it has to do with service approaches or carry-over from previous doctrinal employment.

When an F-35A pilot talks with an F-35B pilot and they discuss what they would see with the evolution of the aircraft they are discussing essentially the same airplane and its evolution.

It is two operators of the same airplane focused on what they want to see evolve even though they are in different services. And the commonality point is really lost in the broader discussion of the F-35. And when it comes to strategic impact it is the commonality associated with logistics, which will have a really significant operational impact.

The interoperability at the supply level, the logistics level, the procurement level or the maintenance or training level is a key foundation for joint and coalition airpower going forward leveraging the F-35"

It is inevitable that the joint services and the coalition partners are clearly going to find significant commonalities and ways to work together going forward from the process of figuring out how collectively to use their F-35s within their service or partner operational cultures.

And this is facilitated by the common cockpit information systems within the fleet. One little noted commonality is the common symbiology in the cockpit. All pilots will have uniformly understandable symbols and cockpit display icons that are not language specific.

The common icons and graphics can be understood correlated with evolving combat experience, in the fighter, attack and electronic warfare mode. This represents a dramatic shift from the past. For the first time in history, individual F-35 pilots –A, B or C – will have the best database of real time knowledge in the history of combat aviation. And all of this is internal to their cockpit and enabled by advances in computer processing and sensor information fusing.

The USMC and the smaller partner air forces due to their size will find very innovative ways to leverage their F-35s within their operational situations. The USAF as the largest user of the F-35 will find unique ways to combine F-35s with their other assets in shaping a more effective air dominance enterprise. And the USN will focus on how the F-35C enables a more effective integrated fire controls integration effort and to empower the evolving integrated air wing and Navy surface warfare ships and their submarines.

Each service and partner will provide ways to think about how the F-35 transforms their approaches; and the sharing of these ways to think will empower the overall joint and coalition combat capabilities for US and allied joint and coalition forces as well.

In other words, rather than thinking of an IOC it is better to focus on rolling out of a global fleet which will help reshape collaboration and innovation in 21st century air operations.