

Fifth-Generation Enabled Military Transformation: Australia, the UK and Shaping a Way Ahead



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Australia and the UK are located in very different parts of the world. But both face significant challenges from a regional power with global reach. And both are reshaping their militaries to face the strategic shift from the land wars to full spectrum crisis management.

Each has a different trajectory but through the common acquisition of the F-35, have cross-cutting transformation trajectories which will influence each other. And this is not due just to historical roots, but to the fact that for the first time in a significant period, both are flying the same combat aircraft.

This report will address how each nation is addressing its military transformation and the evolving strategic context within which this unfolding. And the question of collaborative opportunities which might flow from their cross-cutting transformation processes are addressed.

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Australia and the UK are located in very different parts of the world.

But both face significant challenges from a regional power with global reach. And both are reshaping their militaries to face the strategic shift from the land wars to full spectrum crisis management.

And a key platform which is a driver in the reshaping of the force and its transformation is clearly the F-35. For both, the F-35 is not an end in itself, but a facilitator for change and a foundation for the reshaping of their air combat enterprises.

Each has a different trajectory but through the common acquisition of the F-35, have cross-cutting transformation trajectories which will influence each other. And this is not due just to historical roots, but to the fact that for the first time in a significant period, both are flying the same combat aircraft.

This report will address how each nation is addressing its military transformation and the evolving strategic context within which this unfolding.

We will then address the question of collaborative opportunities which might flow from their cross-cutting transformation processes and pressures from the evolving strategic environment.

I: THE RETURN OF GEOGRAPHY: THE CENTRALITY OF AIR-SEA INTEGRATION

The British and the Australians are facing common security and defense challenges, albeit in very different geographical locations. But in both cases, there is a return of geography as a key determinant of the next phase of their defense policies.

Both have been heavily engaged in the land wars in the Middle East, which the United States has encouraged but now with the return of Russia and the rise of China, the Middle East can no longer be the core focus of attention.

The UK Case

During my most recent visit to London, a senior defense official flat out stated: “With the return of geography, the focus needs to be clearly on our Northern and Southern Flanks, and this means the emphasis needs to be placed upon air-naval integration. The Royal Navy and the Royal Air Force need to find ways to work much more effectively together. And our new carrier provides a means whereby we can do so.”

With the coming of Brexit, there is a natural withdrawal of military attention from what used to be called the Central Front during the Cold War days, and a renewed focus on the flanks. France and Germany have asserted that their defense collaboration will take care of Europe’s defense and providing the maneuver forces and space for the defense of Europe’s new front line in Poland and the Baltics, and the UK’s contribution will be reduced to reinforcing efforts, not leading them in this continental European sector.

The new carrier is a key piece of sovereign real estate around which flank defense will be generated. It is also a focal point for RAF and Royal Navy integration of the sort which a transformed force will need to deliver to the nation.

During my visit to Portsmouth, England and to RAF Marham in early May 2018, I visited senior Royal Navy and defense personnel involved in the standing up of the UK carrier strike capability.

After my morning briefings with the Royal Navy with regard to preparing the carrier for its role as the flagship of a maritime strike group, I had a chance to discuss the way ahead with the commander of the UK

Carrier Strike Group, Commodore Andrew Betton and with Colonel Phil Kelly, Royal Marines, COMUKCSG Strike Commander.

The new UK carriers are coming at a time when there is a broader UK and allied defense transformation and a strategic shift from counter-insurgency to higher end operations.

The new UK carrier provides a mobile basing capability by being a flexible sea base, which can compliment UK land-based air assets, and provide a flexible asset that can play a role in the Northern Flank or the Mediterranean on a regular deployment basis and over time be used for deployments further away from Europe as well.

Commodore Betton and Col. Kelly both underscored the flexible nature of the HMS Queen Elizabeth.

The UK is building out a 21st century version of a carrier strike group, one which can leverage the F-35 as a multi-domain combat system and to do both kinetic and non-kinetic strike based on these aircraft, as well combine them with helicopter assault assets to do an F-35 enabled assault, or if desired, shift to a more traditional heavy helicopter assault strike.

As Commodore Betton put it: "Our new carrier offers a really flexible, integrative capability.

"The carrier can play host and is intended absolutely to play host to a carrier air wing.

"At the same time, it can provide something very different in terms of littoral combat operations, primarily using helicopters."

They emphasized that the Royal Navy was building new escort ships as well as new submarines and the approach to building a maritime strike group meant that working through the operational launch of the carrier was also about its ability to integrate with and to lead a 21st century maritime strike group.

And the new maritime strike group was being built to work with allies but just as importantly to operate in the sovereign interest of the United Kingdom.

The F-35B onboard was a key enabler to the entire strike group functions.

Commodore Betton: "The airwing enables us to maneuver to deliver effects in the particular part of the battlespace which we are operating in. You can have sea control without the airwing.

"Our air wing can enable us to be able to do that and have sufficient capability to influence the battlespace.

"You clearly do not simply want to be a self-sustaining force that doesn't do anything to affect the battlespace decisively.

"The F-35 onboard will allow us to do that."

Col. Kelly noted that with the threat to land air bases, it was important to have a sea base to operate from as well, either as an alternative or complement to land bases.

"The carriers will be the most protected air base which we will have. And we can move that base globally to affect the area of interest important to us.

"For example, with regard to Northern Europe, we could range up and down the coastlines in the area and hold at risk adversary forces.

"I think we can send a powerful message to any adversary."

Commodore Betton added that the other advantage of the sea base is its ability to be effective on arrival.

“If you have to operate off of land, you have to have the local permission. You have to move assets ashore. You have to support assets ashore. And you have to protect the land base. The sea base has all of that built in.

“And there is nothing austere about our carriers in terms of operating aircraft.”

“We focused on how the carrier becomes integrated with broader strike picture, for the point is not simply that the carrier itself launches F-35s or helicopters, but how the command post can manage the aircraft they launch with the distributed strike assets in the strike group, which could include land-based air or land based forces as well.”

Col. Kelly emphasized that their position was similar to the evolution of the USMC where “every platform can be a sensor or a shooter” in the battlespace.

The C2 onboard the carrier on in the air with the Crow’s nest or the F-35Bs can be part of a distributed CS system to ensure maximum effect from the strike and sensing capability of the task force and its related partners in the battlespace.

And innovations in the missile domain up to and including directed energy weapons have been anticipated in the support structure onboard the carrier.

During my visit in 2015 to the Scottish shipyard when the initial Queen Elizabeth carrier was being built, I had a chance to look at the infrastructure onboard the ship to support weapons as well as was briefed on the significant power generation capabilities onboard the ship which clearly allow it to when appropriate technology is available to add directed energy weapons.

In addition, to the longer-range weapons already in train and the ones which will be developed in the decade ahead, the British carriers are being built to be able to handle rolling landing which allow the F-35s to come back onto the ship with weapons which have not been used during the mission.

The second carrier, HMS Prince of Wales is the first of the two carriers to be fitted with this capability which will be further tested when it comes to the United States in a couple of years for its F-35 integration trials as well.

In short, the new carrier is being built with “growthability” in mind, in terms of what it can do organically, and what it can leverage and contribute to the maritime task force, and reach out into the battlespace to work effectively with other national or allied assets operating in the area of interest.

The Australian Case

For the Aussies, the return of geography is part of the enhanced threats from China and the PLA’s push out into the Pacific. The Japanese and the Australians are both pushing out their perimeters of defense, along with the U.S. sorting through new approaches, including island hopping strategies to determine how best to shape a deterrence in depth strategy.

This means that the Northern Territories and Western Australia are becoming significant again in Australian defense, much as they did during World War II.

Australian strategists are starting to highlight the role of geography in Australian's strategic shift in the region. For example, Dr. Andrew Carr of the Australian National University is such an analyst. During my visit to Australia in August 2018, we discussed his perspective on this strategic change.

Question: You have worked what you see as key elements of the past Australian approach, which are part of the fabric of Australian defense going forward as the focus on the defense of continental Australia proceeds in the new strategic situation.

What are these basic key elements, which you have identified?

Dr. Carr: The first is that the threat emerges from the North; but our population lives in the East and South. This leads to a key challenge of geography, namely how to work the Australian geography to deal with a threat from the North?

"We are a country that doesn't quite understand its geography in part because of where the people are clustered, and yet, Northern and Western Australia provide some of the most important geography in a defense sense.

"The second is that Australia is both a continent and an island. This reality goes to the fundamental division between the Army and Navy. A lot of Australian defense thinking actually came from the British, not just because of the kind of the cultural history, but as an island that is offshore from a heavily populated continent.

"The Australian Army thinks of itself in expeditionary terms and by that not operating on Australian soil but in expeditionary operations with allies. How might this change with a return to considerations of leveraging Australian geography to defend the continent from threats to the North?

"The third is that the defense of Australia cannot begin with a narrow continental or fortress Australia focus. It doesn't make sense to simply line up people and give them a rifle and tell them to stand on the beach and protect the continent at that point.

"Geography matters, but you have to have at least some understanding of what's going on beyond your borders. The great fear has always been a hostile major power having control of an island base, or some significant piece of territory just off the Australian continent that can directly threaten the continent.

"The fourth is that Australia's greatest security threat depends on how valuable it is to its allies. In WWII, the Japanese weren't concerned by the Australian behavior. They saw us as too small, too irrelevant, not a significant security threat.

"But, because our continent was very valuable to the Americans, in trying to respond to their sphere of influence efforts, it then became attractive to the Japanese.

"I think this is something the Australians don't always understand, when they think about alliance relationships.

"It's not just about Australia and America as separate countries with distinct capabilities, but it's also about the nature of the Australian continent and its significance within the region.

"I think this will probably play out again in the future.

"The Chinese won't see Australians as a substantial direct threat, but they will see the Australian continent as substantial base for projecting power by Australia in an allied context."

In other words, for both the UK and Australia, the return of geography requires much more dedicated focus on air-sea integration as a core means to project power into the proximate geographical regions most central to the defense of their territories and their interest. The ground forces become a support element to this effort, but unlike the engagement in the Middle East land wars, not the leading element.

This also requires a very different type of air-sea integration which can maximize the impact and influence of an integrated force, and this is where the transformation piece comes in as the core overlay on the strategic shift to extended geographical defense.

II. DIRECT DEFENSE AND THE CHANGING ROLE OF ALLIANCES FOR THE UK AND AUSTRALIA

The return of geography is about the priority being upon direct defense of the nation and the role of allies in the evolving approach as well.

Both the UK and Australia face significant change in their alliance relationships as the rise of the 21st century authoritarian powers is combined with crises in the liberal democracies as well.

On the one hand, the two island nations need to enhance their ability to provide for direct defense but on the other hand, their alliance relationships are in flux.

The question then is how to combine the ability to enhance direct defense and to reinforce working relationship with allies who will actually show up in a direct defense effort in the region?

The UK Case

For the UK, Brexit is at the heart of the change in the alliance structure as well as the question of US global defense policy in flux.

With the projected withdrawal from the European Union, not only are the political-economic relationships with Europe in flux but key security working relationships as well.

Brexit is a process which have a major impact on the UK and Europe for sure.

And no matter what the Brexit negotiated outcome that will be sorted out between the EU and the UK, both continental Europe and the UK will have to find a way to work together going forward.

The UK has a long history of dealing with continental Europe as does continental Europe with the United Kingdom, and certainly not all such experiences have been peaceful.

Brexit is an episode of history which will be ingested as the UK and Europe go forward in the next phase of their interactions.

Clearly, the UK and as well as major continental powers will sort out a way ahead, but as they do so several trajectories of developments will be set in motion.

Brexit has a number of key impacts on the future of European defense and certainly NATO as well.

First, the UK is a major defense power within Europe.

What is its relationship to the continent after Brexit?

What does a post-Brexit defense policy look like for Britain?

Second, what impact will Brexit have on the internal cohesion of UK defense policy?

What role for Scotland and England?

And how will the Irish question intrude into the defense equation?

Third, will continental Europe meet the demands of enhanced defense responsibility for its own defense?

How will France and Britain work together?

Where will German defense policy focus its attention and its resources?

What impact will the UK have within European defense organizations or not?

Fourth, what impact will Brexit have upon the relationships between UK and continental defense and aerospace companies?

Airbus, Thales, MBDA, and Leonardo all have major working relationships and facilities in the UK.

What is their fate and how will these relationships work in practical terms as movement of personnel, taxes and import and export issues get sorted?

Will joint investments continue between Britain and the continent within these companies?

What is the future of Eurofighter if the UK and continental European relationship is disrupted?

Will France and UK co-investments in missiles via MBDA continue uninterrupted?

In other words, there are a number of key questions to consider determining the fate of European and UK defense in dealing with the looming Brexit impacts.

The defense industrial side of Brexit is clearly tied up with the general dynamics of whatever trade and circulation of skills and labor generally agreed to between the UK and the European Union.

But defense is an area where exceptions in regulations are often the rule; but they clearly are affected by the general state of trade, notably the commercial aerospace trade arrangements.

Brexit is occurring at a time of profound change in Europe, triggered perhaps in part by Brexit, but due to a wide range of dynamics which are clearly leading to the politics within nations focused on their future and the kind of European working relationships those nations wish to see.

It is very clear that Brexit provides a major challenge to UK defense and aerospace industry given that the major focus and major capabilities in those sectors rests on their role in global supply chains and programs, many of which are European.

Airbus is a central player in the UK aerospace industry, and in defense as well. Leonardo is many ways a UK-Italian company. MBDA is a Franco-UK company with German and Italian aspects. Thales has a very large UK component which both complements and challenges its French dominant part of the company.

With the very significant uncertainties facing Europe and the UK with regard to Brexit, NATO is in flux as well with the return of direct defense to Europe. With the seizure of Crimea by the Russians in 2014, NATO recognized a new historical challenge: how to deal with the return of Russia as a direct threat to Europe?

But this is not the return of the Cold War, as the Warsaw Pact has dissolved and both the European Union and NATO have extended themselves to the Russian border. They have done so without adding new defense forces or capabilities, and indeed Europe has experienced a significant decline in defense expenditures.

At the same time new challenges have been added.

The Russians have used a new form of warfare, hybrid warfare, to achieve their objectives in Ukraine and have launched major cyber threats as well. NATO Europe has dismantled much of its direct defense infrastructure and now with the rise of the cyber challenge has a more comprehensive threat system to deal with.

The challenge of building a 21st century defense infrastructure and rebuilding NATO forces is significant and at the same time, Europe is now confronting the impact not only of the Russians but other authoritarian states and movements.

The Nordics are clearly reworking their defense capabilities and approaches and the UK is finding a natural ally with regard to a rethink as well with how best to rework both national and allied defense policies for direct defense. This process is facilitated in part by the acquisition of some new systems in common, notably the F-35 and the P-8 as well as other collaborative efforts.

But as of 2019, it is difficult with certainty to know what the relationship among UK defense modernization, its relationship with the European Union and the dynamics of change within the NATO alliance will shape the ultimate direct defense capability's and approach for the United Kingdom.

The Australian Case

Although the Australian's do not have something as dramatic as Brexit on offer, their path to change within the evolving alliances in the Pacific are clearly in flux. In part this is because of the rise of China, and the nuclear threat posed by North Korea, but also by the growing defense effort by Japan to push its perimeter defense further out, and the continuing uncertainties over the focus, priorities and thrust of American defense policies.

Clearly, Australia is working its defense modernization in close harmony with the United States and Japan but how best to provide for its direct defense and the exact nature of the working relationships among the core allies going forward is a work in progress.

A rather remarkable set of statements about the rethinking going on in Australia was provided in the recent Williams Foundation seminar which highlighted perspectives on ways to enhance the sustainability of the Australian forces and to operate more effectively within alliance relationships in flux.

The latest Williams Seminar held in Canberra on April 11, 2019 focused on the strategic shift for Australia within the context of the evolving global situation. Facing the rising challenges posed by the 21st century authoritarian states, and by the changing nature of alliances in the Pacific and in Europe, Australia needs to enhance its sovereign capabilities to operate within a regional or global crisis. And this requires, Australia to have more capability to sustain its evolving integrated force and to do so in the service of the direct defense of Australia.

The Williams seminars over the past five years have focused in detail on the reshaping of the Australian Defence Force (ADF) as a more integrated force, one which can operate as discrete Australian force packages able to operate with allies or on their own.

The acquisition of the F-35 is seen as a trigger for accelerating the kind of force integration which Australia is seeking, namely a very capable force package within which fifth generation enablement enhances the lethality and survivability of modular force packages.

But the goal is to have such capability both for the direct defense of Australia and to work with allies during sustained periods of crisis.

It was clear from the latest Williams Seminar that this is not just a technical force packaging effort. It is part of a broader reset within Australian thinking about how to move ahead as the global competition changes.

As Williams Research Fellow, Dr. Alan Stephens put it, Australia needs to focus on Plan B:

“A military posture based on the premise that Australians will assume the burden of combat of defending their own country.”

“For most of our history, Australia has been unwilling to confront the imperatives of a defence posture which would require us to assume the burden of responsibility. Consequently, when faced with our only existential threat, in World War II, we were left dangerously exposed; while on other occasions, the apparent need to pay regular premiums on Plan A has drawn us into morally dubious wars of choice.

“In short, Plan A has distorted our strategic thinking and compromised our independence.

“If Australian defence is to be credibly self-reliant – if we are to have a Plan B – we can start by looking to the examples of those individuals and local industries that have challenged traditionalists and science-deniers, and have instead embraced innovation and transformation.”

Dr. Andrew Carr then followed highlighting what this means in terms of the strategic reset for Australia in dealing with the direct challenges from China and the changing dynamics of the American Alliance. Carr argued that Australia needed to focus on its regional interests rather than following American proclivities over the past three Administrations to pursue conflicts significantly removed from direct defense challenges to Australia itself.

“This is not to suggest an isolationist or inward-looking turn. Far from it. Nor is it about returning to the 1980s Defence of Australia concepts.

“Rather, it is a position which takes seriously the idea that we may be early into a half-century or more of strategic competition. This means knowing what we will fight to protect and how we can do so. And then being able to go forward from a secure continent. That is what a return to fundamentals means.

“To do otherwise, to keep focusing on what we can do at the furthest limits from our core interests, attempting merely to hold firm to the status quo is to risk our own version of a grey zone style crisis.

“A world where we are making commitments to our allies abroad that we can’t be sure future government’s and the Australian public will want to keep.

“Nor does this extended approach make sense in the face of our specific adversary on the field today. A strategy of simply trying to give ‘110%’, year in and year out, by tired and debt-ridden Western nations, finding ourselves always on the defence against a better resourced and fresher People’s Republic of China is not a winning approach.”

He posed a key question: What are the fundamentals of continental security for Australia?

Carr underscored that Australia needed to deal with the new strategic challenge and to do so by rethinking its defense and security strategies.

“Unfortunately, this is a question we will need to think through afresh, rather than hoping that past generations have done the work for us. The Defence of Australia policy, which was in place from roughly 1972 to 1997 took shape in a very different world, politically and technologically. This was an era where our continent was secure – something that is not obviously true today.”

The well-known Australian strategist Brendan Sargeant then contributed his thoughts on the way ahead in this new historical era. Sargeant has had many policy positions in the Australian government and spoke from that experience to discuss the challenges facing Australia in this new period of history.

His focus was upon how best to take the capabilities Australia has built and is building and how to leverage them effectively in Australian interests

“The development of capability is important, perhaps the most important element of defence policy, but also important is understanding how these capabilities might need to be used in the future.

“How should we shape the force to respond to future crises?

“How we think about that question will in part determine how we want to evolve capabilities, and how powerful and sustainable we will want the force to be.

“Have we thought sufficiently about how we might need to use defence capability in the future, and are we building for that day or days?”

The new Aussie approach will have significant implications for Australia’s allies and industrial partners as well. A focus on sustainable direct defense will clearly mean a shift in focus and reorientation of how Australia will work with global partners and industry.

And this has direct consequences for programs such as the British frigate, the French submarine and US produced 21st century air combat assets, such as P-8, Triton, Growler and F-35.

Dr. Carr highlighted how different the way ahead is from the recent past.

“We should find a new language instead of the term self-reliance.

“This term has always been used by Australians to mean an exception to usual practice. Self-Reliance was we did in the worst-case scenario, or did on the margins while normal allied cooperation was the mainstay.

“Instead we should think of this issue as most other countries do. Defending ourselves is our task and our primary responsibility. We will build alliance cooperation on top of this, we will seek to use our geography to support and sustain a regional order that has been very valuable to us. But what we do alone is not the exception, but a fundamental part of a re-invigorated, and resilient approach.

“So let us take this moment to rethink and regroup. The siren calling us back onto the pitch is sure to blast very soon, and the next half is going to be even tougher. But with a better plan, based on the fundamentals, I am confident the game’s momentum will soon run our way.”

In short, both the UK and Australia are reworking alliance relationships as part of a broader effort to rethink direct defense and the defense of national interests. In the process, the two countries are finding areas to collaborate as well which we will discuss later in this report.

III. THE AUSTRALIAN AND UK TRANSFORMATION APPROACHES

The UK and Australia are both in the throes of significant force transformation. But unlike earlier periods of history, the Australians are not simply the students of UK military development. They are crafting their own path, one which has a significant impact on the UK as well.

The two differ in key ways, as the UK relies more on a legacy air force and the role of its national defense industry is much more significant in shaping the options open to the RAF and to the Royal Navy.

The Australian Approach

The Australians have taken a much more comprehensive approach to transformation, one built around what they refer to as building a fifth-generation force, than the Brits who are relying more significantly on a modernized legacy force, the Typhoon.

But both the Australians and the UK have identified significantly enhanced integration of their air forces with their navies as a key way ahead, and the role of the F-35 is a key part of shaping such integration.

At the most recent Fighter Conference held in Berlin in November 2018, Air Marshal (Retired) Brown laid out the path of airpower transformation which has been the keystone of the process of change for the Australian Defence Force.

In the case of the Royal Australian Air Force (RAAF) and the Australian Defence Force (ADF), the acquisition of the F-35 has been seen as not providing a replacement aircraft but providing a trigger to broader force transformation, with a future is now mentality.

Brown provided an overview of how the ADF is looking at the crafting of a fifth gen force or a fifth generation enabled force and some of the highlights from his presentation underscore how the Aussies are looking at this dynamic of change.

For the last 5 – 10 years in Australia we have been determining the characteristics of combat operations in the post 2025 era.

The RAAF we have been very fortunate to have been well supported and funded by government.

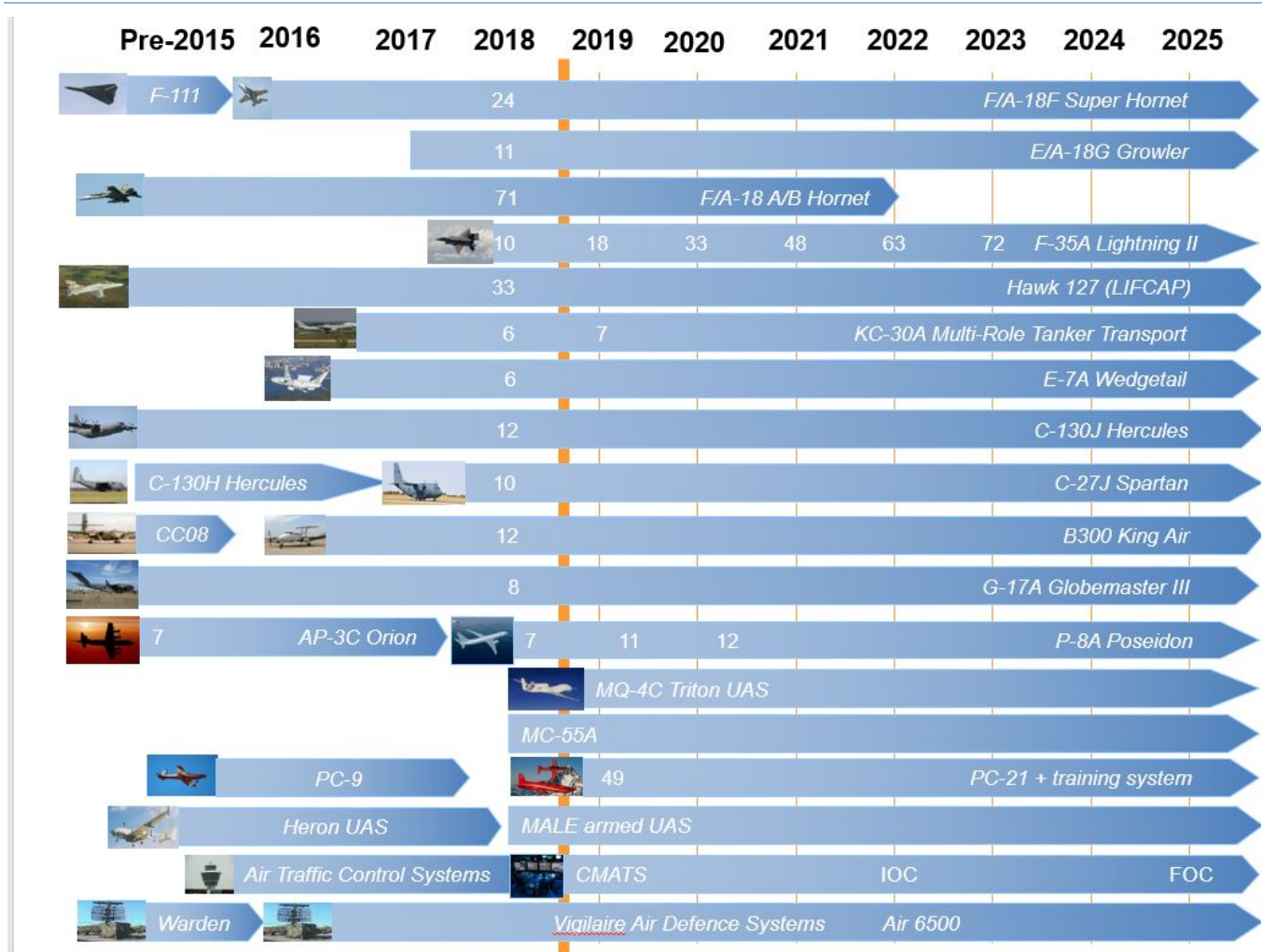


FIGURE 1 THE RAAF MODERNIZATION PATH

In the RAAF it's been nice to say that most pieces of the future combat fleet are in place or that the funding has been secured. It will be a F-35's supplemented by Super Hornets and they will well be supported by systems like Wedgetail, Growler, KC-30s, and air defence systems like Vigilaire and over-the-horizon radar, and I even think the Maritime Patrol Fleets, P-8s and Tritons, will all contribute to the air combat system.....

We have concluded in Australia, that air operations will be characterized by the capability to connect air, ground and maritime forces.

In the ADF we have actually called that 5th Generation enabled CONOPs. The ultimate goal is that the combat and strike power of a single aircraft is not defined by what it carries itself but by its ability to direct and rely upon its network partners. Even to the point of using other platforms weapons. We have been in the process of developing 5th Gen CONOPS across the ADF informed by the forcing function of 5thGen aircraft and the associated air, maritime and land systems.

In a 5thGen force, C2 systems will be enabled by flying ISR and C2 system, the combination of sensors and Stealth will enable aircraft like the JSF to operate in an Adversaries airspace and allow aircraft to serve as nodes in a dispersed and distributed air battle management system....

One of the things that the critics of the F-35 don't get is, in all the studies of air combat, the amazing statistic is that 5% of the pilots have taken 95% of the kills. Now, when you do the analysis of those 95% of the kills and what makes the difference with those 5% of pilots, it was their superior situational awareness in all the situations that they faced that made the difference. And the F-35 gives you a massive leap in situational awareness, and that's the key factor in 5th generation capability. It's the integrated fused picture.

It's worth briefly working through the value chain of the F-35. I'll start in operations and I'll work my way towards fundamental inputs to capability, and we'll just have a bit of a look at some areas that we have been working on.

Over the last 10 years I almost get a hoarse voice trying to explain to people why 5th generation capabilities are important in the F-35 and why speed and maneuverability don't necessarily have the same impact that they previously had.

What is 5th generation?

It's low observability, it's a low infrared signature, it's low electronic emissions, it's an AESA radar, it's the data links associated with that, but the most important thing in my mind that the JSF brings is the fused picture – that situational awareness that it actually brings to the operator.

And your level of situational awareness is a combination of all those things. If you look at the difference between an F-35 and a legacy platform, you don't have to manipulate the sensors. You've got a fused picture on the display, you don't have to have as much communications between the flights; the pilots fundamentally got a lot more brain space to actually look at the tactical situation and go forward.

Now what are the implications for Air Battle Management?

We're already implemented some of this with the rest of the ADF.

We're successfully fusing the picture between Wedgetail and the Navy Destroyers and Frigates. One of the great decisions we made with Wedgetail was that on each one of the crews there's a Navy Air Intercept Controller. We've had Mission Commander who's are Navy Lieutenant Commanders – and our recent experience on exercises and in Iraq and Syria with the Super Hornet and Wedgetail have really shown the power of that integration.

When you look at the F-35 be able to find, fix, track, target, engage and assess. That's the cycle. The JSF can do that all by itself, but it is far more powerful if you look at the find and fix and you use a lot of the systems we've got from Vigilare to JORN to Space Based Systems, to maybe even the Triton and P-8.

They're all part of that find and fix. And if I was to look at track – Wedgetail, AWD, Growler are all parts of that. The engage – well, that's the job of Super Hornet, JSF and Growler, and what we aspire to is to have, some integrated fire control with the Royal Australian Navy. That's all well within the realms of possibilities.

The more nodes you've got, the better off it is for the entire system. And what we see is the advantage of the F-35, it does increase the capability of the entire system....

After his presentation, I had a chance to sit down and discuss his presentation and the way ahead for the ADF leveraging the F-35 as a trigger point for change.

In the discussion after his presentation, Air Marshal (Retired) Brown highlighted a number of key points which he believes are central to thinking about the future of airpower.

First, he argued that buying an advanced plane and getting on with it was crucial

“70% of your cost is about maintaining, supporting and modernizing your airplane. Why would you want to do that with a legacy jet when you can buy a fifth gen jet?”

Second, by getting the F-35 into service, the ADF could then look to add what is missing to that jet or to the air system and then look to shed legacy assets.

A case in point is support to the Australian Navy.

“When we have an effective maritime strike weapon onboard the F-35, we will look to retire our Super Hornets, with the exception of the Growler. Flying the Super Hornet has prepared us for F-35 in some key ways, notably in terms of the security requirements necessary to manage data generated by the aircraft.”

Third, the 5th gen approach as characterized by Brown is a shift to working the interconnected force in a different way.

He provided an example with regard to CEC and the Air Warfare destroyer.

“Our Navy has just started deploying our air warfare destroyers but we have already demonstrated CEC interoperability with the US Navy.

“We will put CEC on our Wedgetails to be able to provide weapons quality tracks to our ships, hence enhancing significantly the range for the strike capability of our fleet.

“And as we go forward we will find ways to directly link our F-35s with the fleet as well.

“Our Navy and Army are now focused on fifth generation communications with their platforms as well, which is why having the F-35 in the force can drive change in the strategic direction in which you want to go.

“You fly a legacy asset you cannot drive the kind of change the ADF needs in the near to mid-term.

“It is not an abstract, long-range aspiration or goal.

“As the head of the RAF Lightning force, noted, the future is now.”

Fourth, the change in the overall structure of the ADF and the architecture to guide its development is being driven by a fifth-generation mentality and approach as well.

“Our architecture is not up to speed with what the F-35 can provide.

“We have a great airplane with enormous capability which will continue to evolve but a lot of the supporting infrastructure we’ve got is not designed to get the best out of that airplane.

“And I think that our focus needs to be on getting the rest of the system up to speed.”

Finally, fifth generation warfare training requires a paradigm shift.

“If you want an integrated system, you’ve got to train with an integrated system.

“You can exploit a lot of the capabilities that the F-35 brings to the fight in the live environment but the only place you can do it as a force is in the simulated environment.

“We need to develop fifth gen warfare networked simulation capabilities.

“And you just can’t afford for the simulated environment to be behind the airplane.

“It’s got to be updated at the same rate that the aero plane is being updated.

RAAF – The 5th Generation Air Force

The Royal Australian Air Force will become the world’s first 5th Generation Air Force driven by our need to fully exploit the potential of 5th generation technology in increasingly volatile, complex and uncertain environments.

The attributes below describe a 5th Generation Air Force. To become a 5th Generation Air Force, RAAF must develop these attributes across all areas of our organisation including, but not limited to workforce, infrastructure, training and education, logistics, capability management / development, engagement and operations.

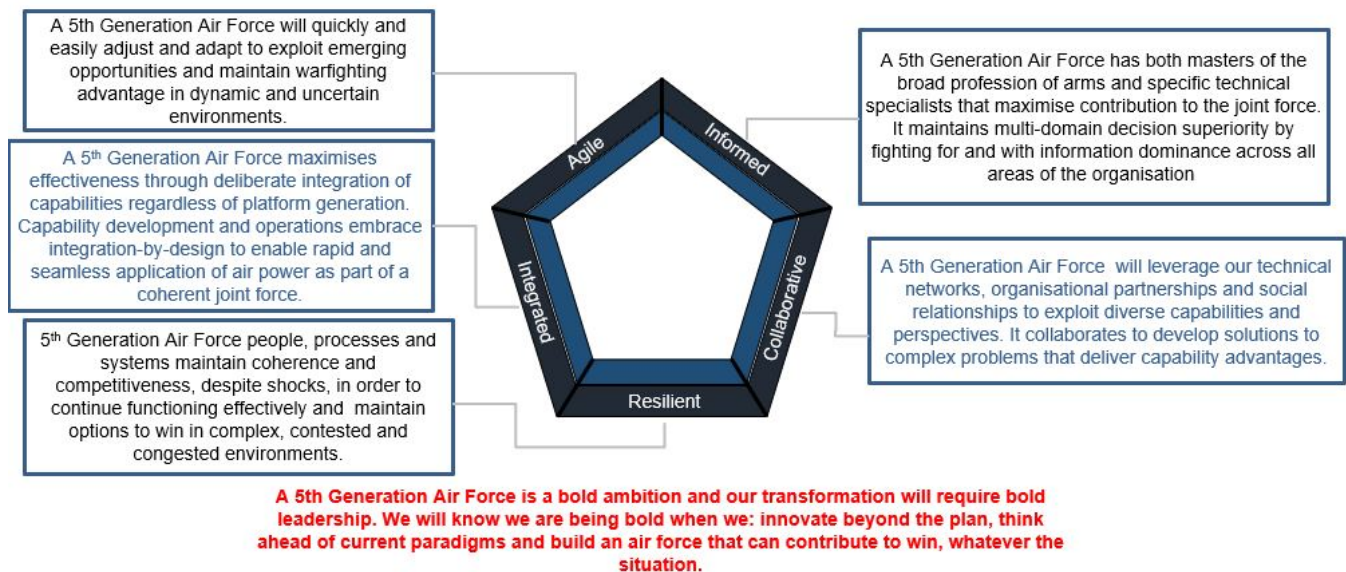


FIGURE 2 THE RAAF'S APPROACH TO SHAPING A FIFTH GENERATION FORCE

A key part of how the RAAF has generated a broader perspective on transformation has been supporting the reshaping of defense perspectives, and that has been done in part through what they have named Plan Jericho.

In my 2015 report for the Williams Foundation, the Plan Jericho approach was highlighted. This report looked at the RAAF approach to the transformation of jointness as they prepare to introduce the F-35 into the force.

The Aussies have a modern air fleet, with Super Hornets, KC-30A tankers, the Wedgetail E-7 battle management system Heron UAVs, and C-17s, recently in service and are seeing Growlers, the Triton UAV, the P-8 and the F-35 coming into the fleet shortly.

But no platform fights alone, and the Aussies are looking at how to rework their forces to shape a more interactive and enabled force. The F-35 is seen as not a replacement aircraft, but one which takes the integrated enablement of the force to the next level, but that will not happen without the transformation of the RAAF and with it of the ADF.

The Williams Foundation of Canberra, Australia held a one-day seminar/workshop on Plan Jericho on 6 August 2015, which featured presentations from the RAAF and industry as well as from the USAF looking at the way ahead.

Former Air Vice Marshal John Blackburn, one of the key stalwarts of the Plan Jericho effort, introduced the session. Blackburn hammered home really the most significant and challenging point – it is about design driven innovation, not simply R and D, technology or mini-experiments driven.

Rather than piece-meal, bits and pieces of applications of technologies to platform modernization or patchwork modernization, Plan Jericho aimed at a different goal – design driven innovation.

Blackburn contrasted the network-centric efforts of the 1990s with what Plan Jericho had in mind. In the network centric effort, stove pipes were linked; it was about filling gaps, linking disparate systems, and getting as much connectivity as possible – with the basic operational mantra of the diverse platform drivers largely unchanged, namely to drive ahead with the diverse cultures, but better connected.

In contrast, Plan Jericho looked to design innovation and a way ahead, where connectivity could be built-in from the design to the delivery of capability, and whereby the operators would look at the effect which the force could deliver, not just their own platform set.

<https://sldinfo.com/wp-content/uploads/2015/10/Plan-Jericho-Report-October-2015-1.pdf>

The UK Approach

The RAF does not yet have a Plan Jericho but with the coming IOC of the carrier, perhaps that is in the works as a way to look more comprehensively at the transformation path facing the UK forces.

But the RAF is undergoing a fundamental change, one which might be characterized as a triple transition.

The first transition is from the Tornado to Typhoon.

The second is the transition is to a fifth generation enabled air combat force.

The third transition is the deployment of F-35s aboard the new Queen Elizabeth class carriers and shaping their operational integration with land-based Typhoons into an air-sea-land combat package.

For the Brits, their weapons complex strategy which highlights a central role for the weapons company MBDA, as a means of ensuring weapons sovereignty is a key part of the triple transition.

The weapons revolution is being set into play enabling the capability to shape an integrated offensive-defensive strike force. And at the heart of this transition are MBDA weapons being acquired through the UK's Team Complex Weapons approach.

This is an approach which expands the partnership between industry and government whereby the customer can work more closely with industry to shape and drive the needs customized to its force development.

In this case, the customer needs to enable its high-end legacy aircraft with an integrated approach to fifth generation enablement.

The first transition is about the Tornado going out of service with the Typhoon subsuming many of its core missions. And this is being done by modifications to the Typhoon in its cockpit and software and the incorporation of key Tornado weapons, such as Storm Shadow and Brimstone.

This overall transition is referred to by the UK as the Centurion program which is designed to transition Tornado capabilities to the Typhoon which have been recently completed.

The incorporation of Tornado weapons is part of the Phases 2 and 3 Enhancement packages for Typhoon and also includes the introduction of a new missile the Meteor that can be considered to be a new capability being added to the force.

The Meteor adds range and lethality to the Typhoon in terms of its ability to carry out its air superiority missions.

While the incorporation of the Tornado weapons provides for an expanded Typhoon role, the addition of Meteor represents the next step in the weapons revolution enabled by fifth generation aircraft.

The Meteor's longer range means that forward targeting by F-35s with data sent to Typhoons enables the air combat force to significantly enhance its overall capability to deliver longer range strikes against adversary air forces.

It shifts the consideration from the role Meteor can play on Eurofighter organically, to one whereby Eurofighter is providing strike for the penetrating air combat force enabled by the F-35.

This has already been seen at Red Flags.

Discussions with the Aussies, Brits and Americans involved in this year's high-end exercises emphasized that Typhoon's strike weapons were enabled by targeting data from F-35s operating deeper in the battlespace.

When Meteor is added to Typhoon this means that Typhoons can fire its weapons load against targets identified by the F-35 force at a greater distance because of Meteor with network enabled kill capabilities.

This is the template for weapons to come.

It is about weapons in the force being empowered by forward targeting and decision making by the F-35 which in turn then highlights the importance of high weapons load outs which the Typhoon is designed for.

The Meteor then provides a strike means of much greater range than current US shorter range strike weapons.

In other words, the RAF is preparing itself with its longer-range strike weapons, Storm Shadow and Meteor, to be a core weapons carrier for an F-35 enabled combat force.

And the force is being designed along these lines.

There are other key advantages of the approach as well.

With various European legacy air forces buying Meteor and Storm Shadow, stockpiling of weapons can be enabled to reduce costs and to enhance capabilities at the same time.

With Meteor to fly on multiple European air frames, development costs can be reduced, modernization enhanced and logistical reach enhanced.

This also is a template upon which forces can build.

Both templates – off-boarding of strike and weapons stockpiling across air frames – are key to the next phase of the weapons revolution.

The first will be about building out capabilities from a force which no longer is focused on what the single combat aircraft or its close proximity wing men can deliver but upon what the combat force can deliver enabled by F-35 forward based decision making and target identification.

A glimpse of this future was seen in Red Flag 17-1 one where one RAF pilot asked “Where are our SEAD weapons for Typhoon?”

The F-35 identified clearly the targets; but why is it dropping weapons in the SEAD mission?

Why not pass that on to us and we can then fire the long range SEAD weapons against targets identified, selected and ordered up by the F-35s?”

Good question and will be answered by the next phase of the weapons revolution.

Another part of this evolving template was seen in tests earlier this year whereby MADL data (the video data stream which the F-35s use to transfer machine to machine data) was passed to Typhoons.

This development opens up the possibilities of transferring selective targeting video packages to other elements of the combat force.

And this could well see the transfer of another of the Tornado experiences, namely, the role of the weapons officer.

The Tornado has continued to fly for so long with effectiveness largely because of the combination of a weapons officer on board and the arrival of dual seeker Brimstone.

This strike package is a bus containing weapons which are independently directed to their target and managed by the weapons officer onboard Tornado.

Spear 3, a new MBDA weapon, will allow the single cockpit aircraft to use automation to replicate some of this capability.

But the role of the weapons officer could well be transitioned from a platform like Tornado to the combat force itself.

There is no reason that the weapons officer could not be flying on the Wedgetail, or A400M or another aircraft whereby the distributed strike force has embedded in it lower cost weapons which are guided to their targets by a weapons manager supporting the fifth generation enabled strike force.

And this will clearly be the case as the capabilities of the naval surface fleet flow into the air combat force as well.

Clearly, there is no reason weapons from a surface ship could not become part of the strike arsenal of an F-35 enabled air combat force. The UK is in a good position to do this as their F-35 force will be flown by an integrated team of Air Force and Navy pilots and enabling a carrier strike force.

In other words, the way the RAF is approaching Typhoon-F-35 integration prioritizes the weapons revolution and network enablement.

But it is really the introduction of the new carrier flying F-35Bs which really opens the transformation aperture for RAF and Royal Navy integration.

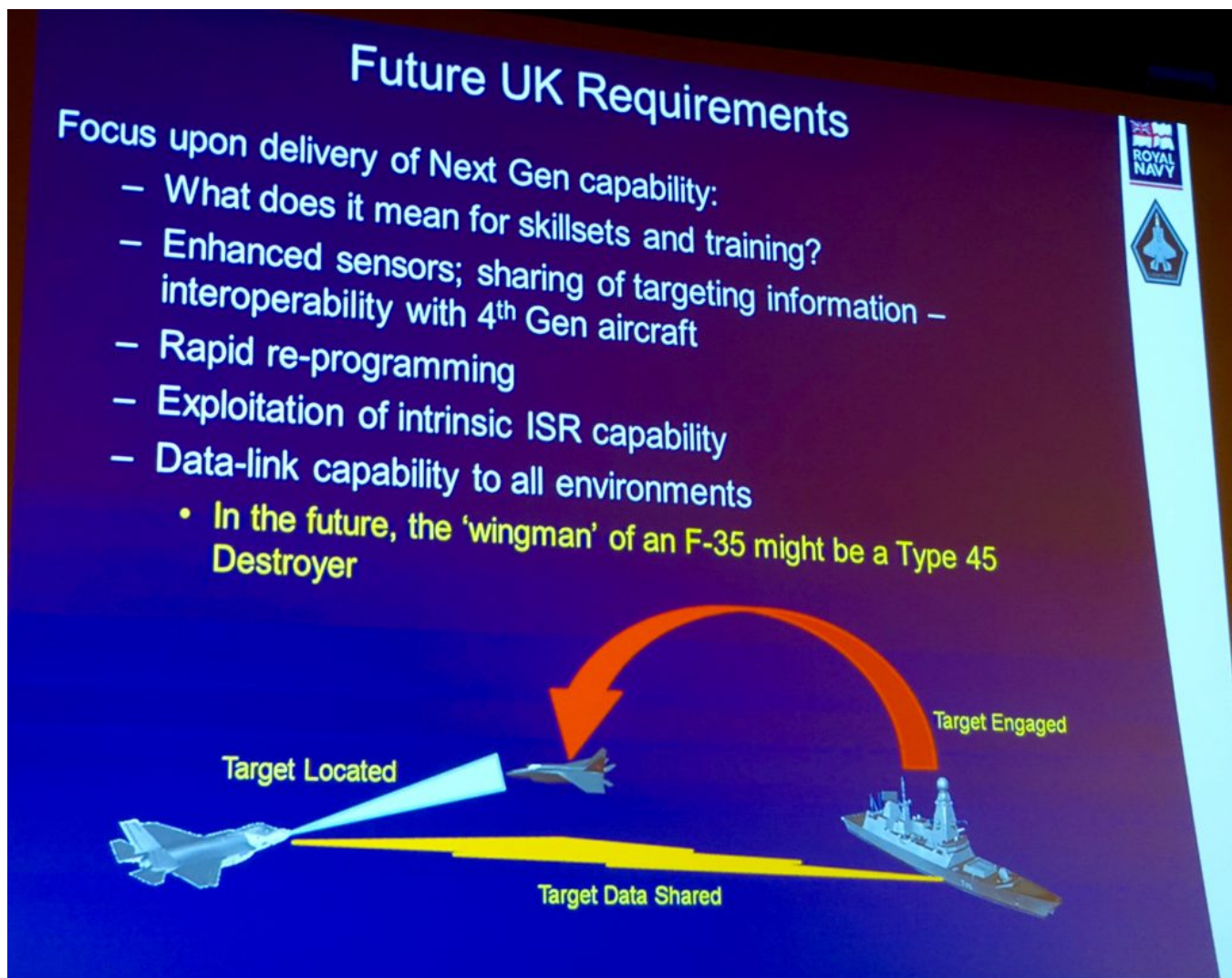


FIGURE 3 GRAPHIC FROM PRESENTATION BY ROYAL NAVY CAPTAIN NICK WALKER AT THE WILLIAMS FOUNDATION SEMINAR IN CANBERRA, AUSTRALIA, ON AIR-SEA INTEGRATION, AUGUST 2016

As Group Captain [Ian Townsend](#), a key officer involved in working the F-35 introduction into service for the RAF and now the RAF Marham Base Commander and currently the F-35 force commander, put it with regard to the Queen Elizabeth and F-35 transition:

As an airman, I like anything that enhances my ability to deliver air power, and the ship certainly does that.

The ship has been tailor-made from first principles to deliver F-35 operational output.

The ship is part of the F35 air system.

I think this is the key change to where we were in Joint Force Harrier where the ship was really just a delivery vehicle.

The ship was just a runway.

The Queen Elizabeth class aircraft carriers are much more than that.

They are right at the heart of the air system's capability fundamentally enabling and supporting what the air vehicle is doing three, or four, or five hundred miles away from the ship.

And that wasn't quite the same in Joint Force Harrier with the Invincible Class CVS carriers.

So it's very different for us.

Everyone involved in embarked F-35 operations needs to understand what the air vehicle is going off to do because everybody on the ship is much closer to that end delivery of effect.

This is a very different concept of operations from 15 years ago.

The new Queen Elizabeth class carrier is the largest warship ever built in the United Kingdom. While most of the focus of the press coverage has been on the process of building the carrier and now its sea trials, the carrier is coming at a very interesting point in British history.

There is a clear need to shape a post-Brexit defense policy, and having a significant epicenter of national sovereignty able to operate throughout the region and beyond

But it is also at the heart of integrating UK forces to deliver UK capabilities within the integrated battlespace, both in terms of an integrated carrier strike force as well as in terms of shaping the various war fighting systems which will come together onboard the ship.

It is however at the heart of shaping 21st century interoperability.

There is the interoperability being worked with the US Navy, as evidenced in the Saxon Warrior exercise off of Scotland.

There is the interoperability being worked as the USMC will operate its F-35Bs off of the ship. This will require an ability for the ship to operate US weapons onboard as well as to accommodate USMC maintainers as well with their specific national maintenance approaches.

The ship is an F-35 carrier and will work its interoperability with other F-35s as well in the region, notably with the Dutch, the Norwegians, the Danes, the Italians, the Israelis, the US and perhaps others Europeans as well.

In other words, the carrier is at the vortex of a turn in British history, and a key element of shaping 21st century force integration and interoperability.

This triple transition requires significant RAF and Royal Navy collaboration to ensure effective use of the integrated force in full spectrum crisis management.

And this is clearly a work in progress, which I will discuss in a later section of the report.

The basic approaches to modernization and transformation are in place for both the RAAF and the RAF, but major challenges face each as changing the overall defense systems are required to deal with the full spectrum crisis management challenges facing their respective nations.

In the next two sections, I will deal with the challenges facing each, and then return to the question of cross-cutting and collaborative opportunities for the two forces.

IV. SHAPING A WAY AHEAD: THE AUSTRALIAN DYNAMIC

The Australians have acquired a modern Air Force spearheaded by the F-35. They are working to shape an integrated Air Force that can work effectively with the naval force being modernized as well as with the

Australian Army, whose mission is being reshaped with the shift from the Middle Eastern land wars to regional defense.

And underlying all of this is a return to direct defense which requires re-consideration of how to sustain the force effectively through a regional crisis and to build out industrial capacity for greater reliance and sustainability.

They are clearly working force integration with a clear focus on working with key allies, notably the United States and Japan and are looking for ways to re-work their position in the region to enhance greater deterrence in depth capabilities.

And as they look forward to the next phases of airpower modernization, they are looking to leverage the fifth-generation enabled force they are crafting to provide for new capabilities, notably in terms of new weapons , unmanned and information technologies.

The F-35 is a foundational element, but not the end of history for the RAAF in transition.

Shaping an Australian Way Ahead on Defense Transformation

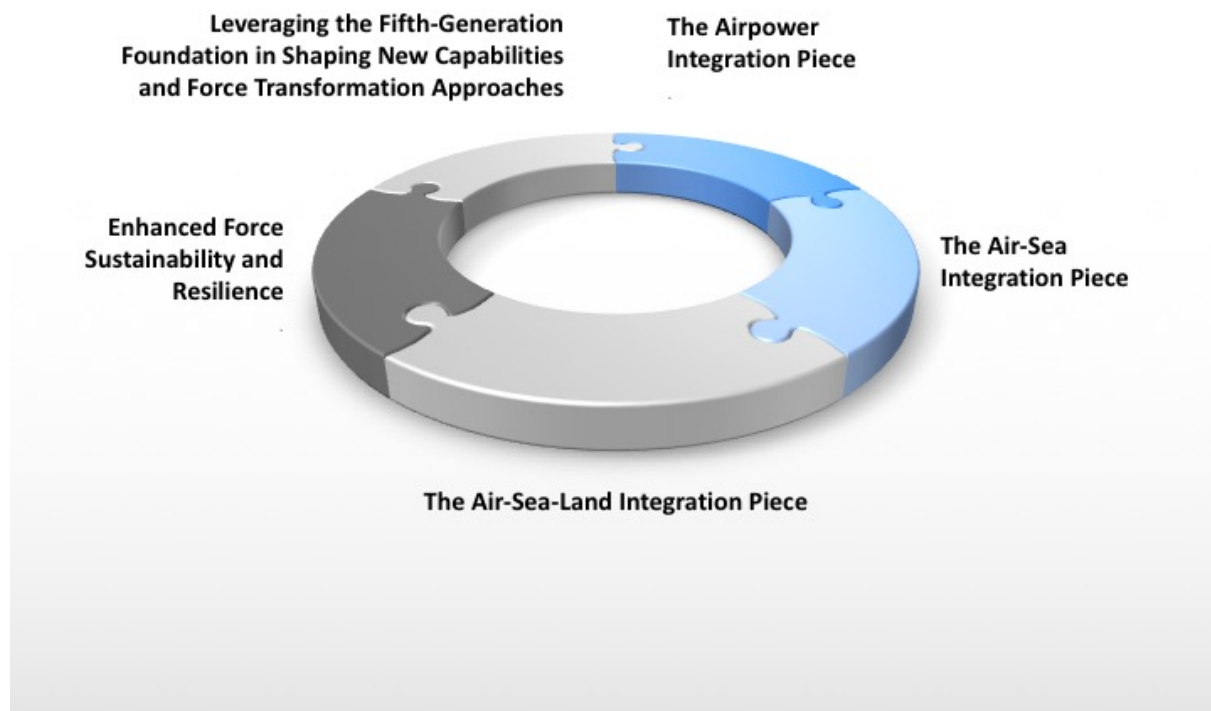


FIGURE 4 SHAPING AN AUSTRALIAN WAY AHEAD FOR DEFENSE TRANSFORMATION

The Air Integration Piece

As the RAAF brings its F-35s on line, there is a threefold dynamic underway.

First, there is the opportunity to work with the various players in the F-35 global enterprise.

As one senior RAAAF officer put it to me recently: “This is a global plane with several key partner; and we have a chance to work with those partners to shape cross-cutting innovation and working relationships. It is not just about working with the United States.”

Second, there is the Plan Jericho initiative which is find ways to enhance the ability of the various air platforms to work with one another in an integrated manner, to provide for opportunities for expanding the reach, survivable and lethality of the overall force.

This includes reworking how air lifters, tankers, EW aircraft, the E-7, Triton and P-8 can work together in innovative ways to deliver a kill web con-ops approach.

This means shaping ways for the sensor-shooter relationships to be distributed throughout the force with the F-35 seen as a key C2 asset for enabling air power to exercise combat flexibility across the spectrum of warfare.

Third, to work a kill web approach, training needs to be reshaped and reworked.

This means that the opportunity to use Australia’s geography to provide for Australian and allied training for a distributed combat approach will become of increasing significance over time.

The RAAF has established a new Air Warfare Centre focused on both developing and training for a more effective integrated air force, but also in such a way that the aperture is being opened to engaging with the other services to ensure that a kill web multi-domain force is shaped going forward.

During a visit to Australia in March 2018 I had a chance to discuss the way ahead for the newly established Air Warfare Centre with its dynamic director, Air Commodore Joe “Vinny” Iervasi.

The Air Warfare Centre was launched as part of the Plan Jericho initiative at the time when Air Marshal Geoff Brown was the air chief, and was forged, designed and shape to work 21st century force integration, not simply to train air warriors to fight in a legacy manner.

In part this was done in recognition that the F-35 is not a legacy fighter, but a “flying combat system” which can form the foundation for a kill web approach to warfare, in which the relationship among sensors and shooters changes and with that the need for a new C2 approach and learning new ways of doing things.

As Air Commodore Iervasi put the challenge: “How do we learn what we have not done before?”

“We can train and get better at legacy approaches, but how do we learn what we have not experienced before and how do we leverage our new platforms to transform and create an integrated force?”

His focus is upon a 2-6-year period ahead and how to prepare the force to execute new concepts of operations leveraging ongoing integration capabilities.

He even projected the notion that the best outcome for the Air Warfare Centre would be to be transformed in a decade into a Joint Warfare Centre.

He sees the RAAF with their new platforms, new thinking and evolving approaches as being in a good position to lead a transition, but one which is about forging a very different force from the legacy force.

One aspect of the difference is that the separate force elements train and prepare for joint exercises, but how do they know what is an evolving joint capability and how do you train for what you don’t know”

He advocated moving more training time into joint exercises and training rather than the relative high proportion of time spent on service or platform specific training.

The overall challenge facing the Air Warfare Centre is to shape a fifth-generation force and how that force might come together in combat situations to prevail.

“The Air Warfare Centre is focused on the blending between bottom up initiative, top down direction, and to foment and facilitate the ideas, the concepts, the wherewithal, the tactics of actually knowing and shaping what an integrated force needs to do in the evolving combat environment we are facing.”

“Because we’re trying to integrate a force the way a force has never been integrated before, we’re going to have to do so in innovative ways. Innovation is going to be a byproduct of integration.

“It is going to be a byproduct of immersing ourselves in current and emergent technologies and sort out what they actually might mean operationally.

“In other words, it’s our drive to integration that’s actually going to necessitate an innovative approach.”

Throughout the interview, he was very clear on the importance of breaking out of legacy patterns and thinking and finding ways to train for the future fight with the force you are crafting.

“Our senior leadership, including myself, has never grown up in the combat environment which is now evolving rapidly. We need to unlearn as well as learn to shape an effective way ahead.”

How do you shape a future force structure based on where you need to go, rather than what you have inherited?

From this point of view, how do you leverage the simultaneous acquisition of the F-35 by Australia and its core allies to drive change in new ways rather than simply treating it as nice new toy?

“Each of our warfare centers (US-UK-Australian) inherently has a particular strength.

“How do we leverage those strengths and come up with an approach where we can generate collectively initiatives to test and experiment and drive operational changes in the joint force?”

“How do we actually create an expanded multi-disciplined team and collaboration environment in Australia such that we are open to the opportunities that present themselves?

“Doing things better is the bottom line.

“When I talk about multi-disciplined teams, I am speaking broadly. I am not just focusing on the operators of our air fleets.

“It’s the engineers, scientists, industry, and academia coming together with operators to develop new concepts for emergent domains, specifically cyber and space.

“What we’re attempting to do in our air warfare center is create multi-disciplined teams physically co-located at our major bases Amberley, Williamstown, and Edinburgh, with each service’s main warfighting elements.”

“For example, Williamstown is close to Sydney where we’ve got Forces Command HQ for Army and Fleet Command HQ for Navy. Up in Brisbane, we have HQ 1 Division and HQ of the Amphibious Task Group in proximity to Growler, Super Hornet, Combat Support Group and a large portion of our air mobility fleet.”

“Our core integrators are our air warfare instructors and we see them in the role of driving operational integration initiatives within a 2-6-year time line of implementation.”

In effect, the Air Warfare Centre is generating various vignettes of the evolving operational environment and then testing capabilities, and new ways of using those capabilities, against that projected operational environment.

And by working within a 2-6-year time frame, they can be realistic, drive change and not get excessively metaphysical.

It is not about the world in 2030; it is about driving change for a fifth generation enabled force able to shape a more effective and integrated force in the near to mid-term.

And doing so, with close collaboration with the other services and the allies who are themselves rethinking their approach to combat operations.

The Air-Sea Integration Piece

The Australians are recapitalizing their Navy and are doing so across the fleet. But at the heart of the approach is shaping integrated combat systems, with the focus on force integration, and doing so with a close eye on the ability then for those combat systems to not just operate with but to integrate with the air systems.

This approach was highlighted in a recent interview which I had with the recently retired Chief of Navy, Vice Admiral (Retired) Tim Barrett. The Navy was being recapitalized in terms of hulls, but the larger picture was how those hulls would work together with the larger ADF and beyond that with core allies and partners.

Here the former Chief of the Navy provided further details on the core point he made at a Williams Seminar in 2016:

“We are not building an interoperable navy; we are building an integrated force for the Australian Defence Force.”

The kill web approach was clearly what he is working from when he discusses force modernization for the Navy.

Barrett provided a particularly compelling example of the approach and what it means in terms of acquisition. He described a recent visit to Spain where his wife was privileged to launch a new tanker to support the maritime force.

That tanker has on it a combat system which allows it to operate in a joint manner with the wider maritime force and to be integrated into the wider ADF.

This was a good illustration of what we have argued for, namely “no platform fights alone” if linked with platforms and assets in a broader kill web.

Barrett argued that a key consideration for naval procurement was the nature of the combat systems being placed on the hulls as well as their potential for continuous modernization which is part of what he meant when he argued for a continuous shipbuilding strategy.

The operational advantage that can go to a 21st century combat force can come as much for the clean room where software is developed as from the armaments onboard any particular vessel.

And in part this is because if one can shape a kill web force one can get this sort of outcome:

“An Air Warfare Destroyer is as important to the RAAF as is an F-35 to the RAN.”

He underscored that: “We have deliberately separated the procurement strategy for the hull from that of the combat management system.

“For example, with regard to Aegis, the hull is there to take Aegis to sea.

“The hull configuration will change only gradually over its lifetime.

“The Aegis combat system however will evolve and adapt constantly, informed by operational experiences and from the broader Aegis community as well.

“And Aegis is what provides the combat advantage, not just for the Navy but for the wider ADF.”

This applies even in the case of the offshore patrol vessel where the focus is upon having a combat system onboard that allows for integration with the rest of the ADF, something crucial for its role in maritime border security and gray zone operations.

At the heart of the OPV program is its common combat systems and C2 systems which will allow the ship to be part of an integrated “kill web force” which will allow it to become a scalable presence asset by reaching back to Australian or allied connected combat assets.

As one analyst put it: “To compare the ACPBs (the current offshore patrol vessels) to the OPVs is somewhat like comparing a Cessna to an F-35 in regards technology and system performance. In a nutshell, each OPVs will act as a coherent ‘Node’ within a wider shared picture compilation and information dissemination environment.

“Not only will the OPV offer greatly improved sea-keeping and endurance over the ACPBs, but it will also be able to actively contribute with other ADF and Allied force elements within a Joint Force combat environment.

“In addition to nominal Border Protection Patrol functions (Patrol/Deterrence/VBSS etc.), the increased Electromagnetic environmental awareness and data connectivity intrinsic to the OPV will enable it to either act as a forward deployed sensor (with wider Common Data Link connectivity to both Tactical and Strategic assets), or as a mothership for its own ‘Constellation’ of Unmanned Systems (UAVs/UUVs/USVs), or as an interactive communications relay node in Denied, Degraded, Intermittent, Low-bandwidth (DDIL) SATCOM environments.

“Succinctly, the new OPVs will be better able to actively contribute to and assure a wider Battle Group information environment that do the present tranche of Australian Navy Frigates and Destroyers.”

When at the last Williams Foundation Seminar held on April 11, 2019, I had a chance to discuss the OPV approach with the recently retired head of the Australian Navy, Vice Admiral (Retired) Tim Barrett.

Barrett highlighted how the OPV fitted into the larger shipbuilding picture and evolution of the integrated air-maritime force.

“It is clearly not just about the platform, or buying a replacement platform. With the contract, we are kick starting an entire industry in Australia. We will be training those who will build the launch platforms, but those individuals will be part of a continuous build process and will be part of the design, modernization and sustainment process. It is part of establishing a sovereign industrial capability.”

But it is not just that.

It is about putting in place a key approach to ensure commonality across the fleet with regard combat and C2 systems, and a commonality that reaches deep into allied fleets as well.

“We are building the ship around a mothership concept, which means that its ability to link and work with not just systems operating from the OPV but within the ADF more broadly is a critical one. With this platform as with our other new ships, we have separated the decisions on making the hulls from the decisions about the onboard systems. The latter is really the key part of ensuring we have an integrated not interoperable force.”

He drove home the point about viewing these assets as nodes within the kill web.

“We have to start treating these platforms as nodes, which can both leverage other ADF or allied capabilities, and contribute as well to the capabilities of a seamlessly stood up task force.”

The mother ship concept is at the heart of what a kill web OPV can do. It is anticipated that both UAVs and UUVs could be operated from the ship. That data will go to the ship but can be distributed into the operational space. And given that it is data, how that is managed, handled and distributed will be determined not just by technological capabilities, but also with regard to the evolution of processing technologies and decision-making algorithms.

Put in other terms, the OPV can host capabilities, which are reaching deep into the future, but capability of delivering capabilities for today's operating force.

The Air-Sea-Land Integration Piece

Clearly, there is an enhanced role for the Australian Army within Australia itself notably with regard to missile defense and perhaps operation of longer range ground based strike systems, but also in terms of operations of the new amphibious ships and within the region as well.

Close integration with air and sea power are crucial to the viability and effectiveness of an insertion force, but at the same time, the impact of the ADF in the region requires the right kind of air and sea power integration as well.

The current head of the ADF, is the former Chief of Army, General Angus Campbell. Campbell has clearly focused on the overall evolution of the ADF and the place of the Australian Army for some time, and at the heart of that change is shaping its role within the defense of Australian territory and interests in the region.

In two significant public presentations in 2016, Campbell, then head of the Army, made his position clear with regard to Army evolution within a joint context.

The first was during the RAAF's 2016 Air Power Conference and the second was during the Williams Foundation seminar on new approaches to air-ground integration.

For General Campbell it was about having the “right effect, at the right place and the right time” for the joint ground force, whereby he clearly meant the joint maneuver force.

He underscored that the core challenge was the co-evolution of the ground, air and naval forces to deliver a timely capability against the tasks or missions in the area of interest.

He argued that the technology was outpacing our concepts of operations and argued that if Wellington came back to see operations in World War II, he would see a decisive difference in how the ground forces operated in the combined arms context.

But that if one would look from World II to now, although the technology had changed dramatically, the differences in concepts of operations are not as significant as the changes in technology would allow.

He argued that we needed to become significantly more innovative in our conceptual thinking to find ways to better leverage technology and to prepare to better use advancing technologies and capabilities.

Here he saw two great opportunities.

The first is to break the hold of incrementalism and imagine significant disruption driven by dynamics of change being introduced in the man-machine relationship. He argued, in effect, that we need to think from the future back into our current thinking to shape a better way ahead in the joint arena.

The second is to move from the very divergent data, communications and related systems to shape more convergent efforts, in effect, to shape more effective co-evolution of the key elements of combat power.

And to shape a more effective joint land force it is crucial to determine where the key capabilities might most effectively be placed, throughout the multi-dimensional combat force.

“In some cases, we are looking for the touch points where best to evolve a capability,” by which he meant that rather than looking for organic upgrades to each platform, the challenge was to look at the joint force and determine which elements of the evolving capability can perform optimal tasks within the overall force capability.

He argued for the increasingly important role of the small, mobile unit within the ground forces, which can leverage the joint assets and, in turn, can contribute to the other joint forces in shaping more effective fire or situational awareness solutions.

He underscored that the evolution of software was a key element in the joint space, and that new approaches needed to be found to more rapidly evolve software in the joint space to provide for the joint effect.

And the “T” or transformation factor was crucial. Rapidity of operations was a key element of the way ahead, and it was important for the joint land force to be able to function more rapidly, with greater effect and in a variety of situations in which connectivity would be degraded.

“The small group needs to train to operate in degraded situations and to operate with as great a capability to not be detected as possible.”

The integration of air, naval and ground power was crucial to the way ahead, and the Australian Army’s battle management lab had RAAF officers involved on the ground floor shaping the way ahead.

Clearly, for General Campbell, the Army is an embedded joint force, and with the new RAAF and Royal Australian Navy capabilities coming on line, would become more so.

Enhanced Force Sustainability and Resilience

As Australia thinks through its options for enhanced capabilities to defend the nation in the changing strategic context of the Indo-Pacific region, Australian geography may well be returning in a way not seen since the days of World War II.

During World War II, Japan directly attacked Australia in order to try to ensure that it would not function as a launch point against Japanese extended territorial defense. Japan had significantly expanded its territory and control over the Pacific and its islands; it was threatened by the United States and its ability to operate in the Pacific from various island bases and certainly the notion that Australia could become the unsinkable aircraft carrier for the allies was a key concern for Japan.

Although dramatically attacking Darwin with the same naval task force which had earlier attacked Pearl Harbor, the Japanese ultimately failed in its efforts to negate Australia and its role as the key ally of the United States in defeating the Empire of Japan.

The Battle of the Coral Sea was clearly a key turning point in this phase of the War.

With the Chinese pushing out from the mainland and shaping a phased island strategy, their ability to project power out into the Pacific raises again the question of the role of Australian territory, notably Western Australia and the Northern territories in the defense of Australia.

An enhanced role for these territories in extended deterrence is a distinct possibility for the Australian Defence going forward.

Some in Australia would see this as a Fortress Australia policy, but it really something quite different.

It about the ADF can operate from Western Australia and the Northern Territories much more flexibly and do so as if the territory operated a chessboard across which forces could be moved in a crisis.

There first of all is the question of Australian forces and the ability to do so.

The RAAF will certainly look at agile basing and enhanced capabilities to operate from a variety of airstrips and mobile bases.

The Navy already operates their submarine force from Western Australia and as the new build submarines are added to the force, might next flexibility be considered in how to operate the force, somewhat similar to how Australia operated in World War II.

This leaves the key question of the role of the Army.

There is a beginning of change within the Australian Army as new strike capabilities in support of the maritime force and new active defense capabilities are being built.

But might not the Army have an even more significant role as the Aussies look to leverage F-35 2.0 and provide longer range strike and active defense capabilities for a power projection force designed to go much deeper into the Indo-Pacific region to defend Australian interests?

In addition, there is the consideration of key allies, notably Japan and the United States.

For the United States, a major challenge is to generate a much more mobile and flexible force able to operate with an alternative to large fixed bases.

Cooperation with Australia could provide flexible basing in a crisis but only if the United States can really learn how to show up for relatively short periods of time but operated a sustainable force.

And to do this without permanent basing of a sort not relevant to the 21st century and the crisis management challenges on the horizon.

For the Japanese, as they add new military capabilities, such as new ships, new submarines, new aircraft and new strike systems, they clearly will be looking to move capabilities on a short-term basis outside of the limited perimeter of their island chain.

A good starting point for change could well be for Japan and the United States to learn how to operate their F-35s from the sustainment facilities the Aussies are building for their own F-35s.

This would mean that if desired by the Australians in a crisis, the United States, Japanese or other F-35 partners could fly to bases in Australia, bases with significant active defenses or ability to operate from mobile bases, and be maintained by Australian sovereign capability.

The F-35 inherently can do this; but it would require a revolution in sustainment thinking on the US and allied side to achieve what is inherent in the aircraft itself as a combat system.

It is a case study of a broader set of changes which could interweave with the changing role which territory will play in 21st century extended deterrence in the Indo-Pacific region.

And such a return of geography, raises some fundamental questions as well for the ADF, notably for the Army which has thought of itself largely in out of Australia expeditionary terms. Now it might play a much more significant role in terms of the defense of Australia in terms of its national territory, notably in Western Australia and the Northern Territories.

For the United States to be an effective partner in such a change would require significant alterations in how the US power projection forces operate as well. It would require building on those areas where common platforms are yielding potential for common sustainment and weaponization solutions, but generated from the Aussie side.

It is not about turning Australia into a Fed Ex set of terminals for the American forces; it is about an agile, flexible engagement force which could show up for 90 days in a crisis and support common policies and interests.

And the weaving in of the Japanese will be a challenge as well both on the Australian and Japanese as well for the Americans who have to shed their superpower mindset and think in terms of regional crisis management and their contributions and role in a tailored set of crisis solutions.

To reset how to think about geography in relationship to the new platforms and technologies is a major challenge not only in a rethink of Australian defense but for Australia's closest allies as well.

This means as well that infrastructure and its defense become core strategic challenges for both Australia and its closest allies.

And in this process, the Australians are clearly looking at ways to reshape the role of industry to support a more sustainable force. The last Williams Foundation Seminar held in April 11, 2019 clearly focused on this question.

And within the broader question of how Australia might pursue what Alan Stephens referred to as Plan B (cited in the first section of the report), the seminar focused on what one might call the eco system for a more sustainable ADF.

A key element of shaping a way ahead clearly is to shape a more sustainable force which can endure through a crisis. This meant taking off the table the capability of the Chinese to disrupt the supply chains into Australia and choking off the sustainability of the ADF. This clearly needs to be dealt with by crafting “buffer” capabilities to sustain the force.

Another key aspect being worked is enhanced local industrial support to ADF forces, as well as new approach to stockpiling parts and skill sets to sustain the force.

There are clear security issues as well. There needs to be enhanced security of Australian civil as well as military infrastructure, in terms of IT, C2 and energy security.

Put in blunt terms, with a focus on direct defense of Australia comes a broader social recognition of the long-term challenges posed by its powerful neighbor in the region as well as finding ways to rethink crisis management tools. An integrated ADF which able to operate in flexible force packages as a key enabler for sovereign options in a crisis is a different trajectory than envisaged in the last White Paper.

But to enable, you need to survive and be sustained. This is why active defense measures are being stood up and rethinking about logistics and industrial support under way.

It is clearly a work in progress.

But the new Aussie approach will have significant implications for Australia’s allies and industrial partners as well. A focus on sustainable direct defense will clearly mean a shift in focus and reorientation of how Australia will work with global partners and industry. And this has direct consequences for programs such as the British frigate, the French submarine and US produced 21st century air combat assets, such as P-8, Triton, Growler and F-35.

An RAAF Perspective on Force Sustainability Going Forward

Illustrative of the rethink was a discussion I had with senior RAAF officers during my April 2019 visit with regard to force sustainability. The roundtable discussion involved the head of the JSF Division, Air Vice Marshal Leigh Gordon, DGSP-AF Air Commodore Stephen Edgeley and DGLOG-AF Air Commodore Martin Smith.

The RAAF has spearheaded significant modernization of its force and has provided a significant input into overall ADF force transformation. The result of this effort is clearly a more integrated force and one able to provide for integrated force packages which can be tailored to a particular mission.

But without proper sustainability the effects which can be achieved by this force will be significantly attenuated in a crisis.

This means that Australia needs a focus on how to sustain the force through a crisis period, but with an approach which is realistic in terms both of resource commitments and the infrastructure in Australia.

The concern was defined by one participant as follows:

“You don’t want people to be able to easily coerce you by strangling obvious methods of resupply.

“You don’t want to hand an easy win to anybody by providing them the opportunity to coerce you simply by cutting off resupply.

“A review of resilience inside the ADF is not about sustained high end war fighting,

“It is simpler than that.

“In a competitive environment, an adversary is going to look for ways to coerce you, and the most obvious way to coerce you is to affect those things that limit your ability to be resilient.

“This means that we need to look carefully at those elements of our sustainment pipelines that can be most easily coerced and correct those shortfalls.”

Building from this approach, Australia needs to build buffer resupply capabilities in-country to sustain the force in a crisis.

The buffer concept is a focus on critical supplies necessary to sustain the force through a crisis period.

And is designed to take off the table coercion options associated with supply chain inputs to sustainability from outside the continent.

This is clearly not about building fortress Australia but about strengthening Australia’s role in the region and to meet its roles within the context of its changing alliances.

For Australia, its role is expanding within the region and within the alliance; and the reset of the relationship with the United States is best understood within that context.

To do so will require increased investments in capabilities for enhanced Australian self-reliance.

The Shift from the Middle Eastern Mindset

Another participant highlighted the strategic shift from the experience of the Middle Eastern mindset to a regional one.

“We have been focused on efficiency more than effectiveness.

“Many of the aspects of our logistics enterprise have been efficiency driven, drawing on allies and global supply chains, to operate efficiently in the Middle East.

“Now the focus needs to be more on effectiveness in a regional contingency and the durability of operation.”

“We are turning a corner.

“We are focused on logistics and its role in survivability and durability of the force.”

The Plan Jericho initiative was cited as providing a focal point on the re-shaping of logistics and finding ways for effectiveness to leverage efficiency, but to enhance force survivability overall.

“The focus of Plan Jericho in this regard to integrating logistics into the battlespace.

“We cannot do this by ourselves but we see this as part of our alliance anchoring role within the Alliance.”

Put in other terms, as the Aussies have generated significant allied interest in force integration through their example, perhaps they can do so as they reform the sustainability part of force integration, one designed to operate through a crisis.

Energy security is clearly a key element of the effort.

“If you’re going from fuel holdings, good enough for a raise, train and sustain force to having fuel holdings that will survive a crisis and provide a buffer, that clearly is turning the page and creating a new approach to sustainable logistics.”

And this will mean as well when one comes to IT and C2 systems, that working with commercial providers is fine, as long as the military works with those focusing on enhanced security considerations.

As one participant put it: “I’m fine with the idea of a commercial service provider, but let us work with the right one from a security point of view.”

The Case of the F-35

We then discussed the F-35 in this broader sustainability context.

One participant proffered his assessment of how Australia is addressing the F-35 and sustainability issues in the regional context.

“The global support system for the F-35 is a work in progress and much of the evolution is positive.

“We look to our role in the region and the participation of our firms in the program as a key part of working the sustainability piece.

“For example, we have established an engine repair facility in Australia and the first engine going through the facility is not Australian it is one from a regional partner.

“This means we do not have to go back to the U.S. for this type of repair.

“We have developed common maintenance standards throughout the program which can allow for repairs to be done globally.

“I expect we will get to a point where we can do cross-aircraft maintenance across the partners.

“We’re certainly having to challenge some sacred cows to do that but I think it is important and can be done.

“We could not afford an F-35 without a partnership.

“I don’t think any of the partners and operators could afford the platform in isolation.

“We have to be part of an efficient and effective network that allows us to make the best decisions based on fleet wide performance data.

“The maintenance approach is evolving and will be a function of what partners and the US services negotiate and implement.

“This will require compromise by the US as well as the partners, but our goal is very clear – we need to maintain and sustain the air system through a crisis.”

In this area as in the maritime area, where a UK-Australian-Canadian partnership at play.

A software reprogramming laboratory to support F-35 aircraft from Australia, Canada (should Canada eventually purchase the F-35) and the UK is being stood up.

Known as the ACURL (Australia, Canada, UK Reprogramming Laboratory), the facility is adjacent to a similar USRL (for the US Air Force, Navy and Marine Corps) and NIRL (for Norway and Italy).

A further reprogramming laboratory will support the remaining partner nations and FMS customers.

More broadly, the RAAF is looking at regional partners, including the U.S. services, to ensure capabilities to plus up parts in a crisis as well, with common aircraft like the C-17 operating in the region.

Reworking the Relationship with Industry

The sustainability focus is seeing as well significant change in the working relationship between industry and the Air Force with regard to maintenance.

There is an evolving blended workforce approach designed to enhance availability of aircraft and to provide for a more effective and efficient process of maintaining aircraft as well.

The Aussies have clearly moved beyond a classic depot system to shape a more agile approach to providing for available aircraft.

According to one participant: “The focus is upon an enterprise approach and determining where the choke points are to delivering more aircraft for operations.

“This means that industry is a key part of the solution rather than just a supplier to the resolution.”

In short, Australia can build a counter-pressure strategy where sustainability is a weapon system.

The operations of the past decade where the RAAF could operate globally with an integrated air combat package required global logistical support, Such support has been clearly understood as a key enabler.

But in a regional crisis it is much more than that.

Now going forward that enabler needs to be transformed into a pillar of operational sovereignty.

Such a capability underwrites durable operations in a crisis.

Approaching New Capabilities

As the Aussies build from the foundation they have laid in the past decade in terms of force modernization, there are a number of key dimensions of shaping a way ahead in terms of new capabilities to be added to the force understood in the broader sense of the role of the ADF within the nation.

In this section, I will focus on four key elements for such an approach.

The first is the question of gaining strategic control and direction over the development of the force in terms of information capabilities.

The second is to build out Australian defense industrial structures and capabilities to provide for enhanced sustainability.

The third is to do so with regard to broadening alliance working relationships and diversifying sources of supply and platform developments.

And the fourth is the case study of the loyal wingman which provides a core focus for realizing all of the above key elements, and becomes a driver for change which builds from the fifth-generation enabled force.

The Case of Software and IT Development and Security

A number of the new platforms being acquired are software upgradeable.

It is desirable to be able to be able to manage tradeoffs among these platforms in terms of investments to get the best impact on the joint force.

It is also the case that getting the kind of transient advantage one wants from the software enabling the combat force requires agility of the sort that will come with applications on top of middleware on top of an open architecture system.

One key priority for the ADF is to be able to leverage an Australian software development base which can support their capability to generate transient software advantage from their joint force as they confront a peer competitor.

A core platform with which the RAAF has had significant experience with both the advantages and challenges of software upgradeability has clearly been the E-7 or the Wedgetail C2/EW aircraft.

From my various visits to Williamstown Air Base to visit the Wedgetail squadron I have had a chance to discuss this core aspect of the E-7 and its modernization process. For example, during a 2017 visit to Australia, my discussion with the then head of the Wedgetail squadron, No. 42 Wing, Group Captain Stuart Bellingham, highlighted the RAAF's approach.

"As we have discussed before, we have a software upgradable jet.

"This is brilliant and gives us a lot of agility.

"And leveraging the software has meant that we come from being a program of concern back in 2009 to becoming a cutting-edge airborne command and control capability.

"We are not just focused on ourselves, but how we can evolve our jet to be a greater contributor in the joint and coalition space.

"In order to write software that supports us being able to share ones and zeros effectively is dependent on an agreed understanding on tactics techniques procedures and standards that support how we are incorporate software and how we build it to make sure we're actually all aligned so that when we go out and work together we're on the same wavelength, so to speak.

"That is a significant challenge.

"To do so, we are focused on engagement and education, trying to get people to understand the capability that we bring to the fight.

"With E7, everyone straight away just thinks traditional AWACS vice what we've got, which is a dynamic software upgradable aircraft with a very different system and approach than the legacy AWACS."

The working of the E-7 with the F-35 is a good example of how the Aussies are going about the next phase of their force transformation. They currently are working the relationship between the two aircraft both in terms of the evolution of integrated airpower as well as the contribution of the working relationship between the two aircraft and what they can deliver to the force.

The Wedgetail clearly provides for air battle management, and will change as the F-35 is added to the fleet, and air dominance is the core mission, but how best to provide for the decision making superiority through other parts of the force structure, and to ensure the kind of combat effects the integrate force could deliver?

This requires shaping information sharing approaches that make sense in the contested and permissive battlespace, and shape information parsimony to deliver information to the decision maker at the point of attack or defense in the air, on the sea or on the ground.

Associated with this is the challenge of working relevant and secure information for the ADF and within Australian society are underscored both the nature of the 21st century authoritarian powers directly challenging Australia as well as with the complexity of the challenge of working information across the force to ensure effective crisis management operations.

Information security is not just an ADF issue but a whole of government, indeed a societal issue facing Australia and the other liberal democracies. Facing the rising challenge posed by the 21st century authoritarian states, and by the changing nature of alliances in the Pacific and in Europe, Australia needs to enhance its capabilities to operate within a regional or global crisis.

And this requires, Australia to have more capability to sustain its evolving integrated force and to do so in the service of the direct defense of Australia.

The Williams seminars over the past five years have focused in detail on the reshaping of the Australian Defence Force as a more integrated force, one which can operate as integrated Australian force packages to work with allies or on their own.

The acquisition of the F-35 is seen as a trigger for accelerating the kind of force integration which Australia is seeking, namely a very capable force package within which fifth generation enablement enhances the lethality and survivability of modular force packages.

But to have such capability both for the direct defense of Australia and to work with allies.

It was clear from the latest Williams Seminar that this is not just a technical force packaging effort. It is part of a broader reset within Australian thinking about how to move ahead as the global competition changes.

A key aspect of the change is working to ensure a more secure Australia, notably in terms of energy, information technology and communications.

It is clear that a national security strategy is important as well to shape a more secure Australian communications and IT networks.

Because Australia is part of the global system and certainly not expecting or looking to dominate the global IT or Communications systems, the question is how to shape enough sovereignty to support the force and the nation in times of crisis?

How to build a more robust and secure Australia from the standpoint of IT and communications?

From this perspective, crafting, shaping and ensuring such a capability is a foundational element for 21st century defense and security and should be part of any 21st century Australian national security strategy.

But it won't be if it is not addressed as such. For example, from Air Vice Marshal (Retired) Blackburn's perspective: "Sovereign capabilities in IT and communications are not a nice to have capability, but an essential part of shaping a 21st century national security capability."

As Blackburn put it during our discussion in Canberra this past April:

"In the Australian Defense Magazine newsletter of the 4th of April, they addressed the new budget which is reasonably favorable for defense. But they also noted the question of where Information and Communications Technology (ICT) programs fit into the way ahead.

"The newsletter asked "Well, why aren't the ICT programs listed on the top 30 list? Defense finance officials commented that ICT programs are usually short in nature, not material related, unlike other defense programs, and it's not core business."

The not a core business piece is really an amazing statement but also revealing.

Such programs tend to be funded in stove pipes and are not worked in a comprehensive manner which is crucial in Blackburn's view both for force integration and national security.

Earlier, [Blackburn and Ian McDonald](#) wrote a piece which focused on the fifth generation information management environment. In that piece, they argued for the need for a clean sheet approach to shape the kind of integrated system through secure information could flow to the distributed force.

"The real problem we face today is existing communications and information networks.

"We're not designed as a system, an integrated system, and they're not a good foundation on which to build this fifth-generation integrated force that we talk about.

"There is no proper integrated communications and network architecture; it's all just pieces.

"So how then will be able to deliver on the promise of a fifth generation ADF?"

For this challenge to be addressed, the shaping of such a system needs to be built around a sovereign approach.

Given the nature of global comms and IT, clearly a sovereign approach is about building a national capability through which an Australian team shapes capability which provide for what the ADF wants and needs as well as clearly focusing on robust and secure systems.

What this does not mean is Australia going it alone which would make no sense given the size, skill sets, and capabilities resident in Australia as well as the need to understand adversaries and work closely with allies.

"We have Australian owned, sovereign capabilities in pieces."

"But if you brought our SMEs and an integrator together as a team, you could have an Australian, sovereign, prime system integrated team of these small players.

"Why do we have to go to the US or Europe to get the prime system integrator to come and do the job?

"The key pieces have to be Australian owned. They have to manage the data in Australia. We need to have Australian companies that can build the expertise and maintain it through the capability life cycle.

"It's time for us to mature. And it's time for us to have confidence in our capabilities.

"We need to focus on our IT and Comms systems not just as a core business but as a weapon system and not just for the ADF but for the nation as a whole.

"We'll subcontract and support and overseas help where you need it. No doubt. This is not something we can do by ourselves. But the integrator team has to be led by Australian players with Australians at the lead of it, and not just functioning as subcontractors."

In a later meeting, Blackburn and I talked with a leading information leader in Australia and we discussed the need for a coordinated Australian effort in IT and communications.

This Aussie information leader argued that the broader challenge for industry was to generate secure bandwidth for Australian society, industry and the population.

The military were consumers of the broader effort but within that overall effort, “we need to work with the ADF to shape more innovative ways to ensure secure of data in motion and for data at rest. It is about changing work methods, technologies, and work styles to get away from the hierarchical stove pipes to operating flexible IT capable of empowering a mobile force which needs to connect modular pieces on the fly to execute integrated missions.”

We then discussed a case of what was seen in Trident Juncture 2018 where the Norwegian citizens as part of the Total Defense Concept provided information through civilian networks to the allied and Norwegian military operating against the “red” forces.

What this experience highlights is that without a doubt during a crisis period, the authoritarian states will reach into Australian networks to try to influence Australian public opinion and to undercut the ability of the government even if functioning as a whole of government effort to work effectively with the public in working through a crisis.

In other words, sovereign capabilities in IT and comms are not a nice to have capability, but an essential part of shaping a 21st century national security capability.

Enhancing Australian Defense Industrial Capabilities for a More Sustainable ADF

The strategic shift away from the Middle Eastern land wars towards the return to direct defense against the authoritarian powers carries with it another strategic shift — namely, the shift in focus from sustaining expeditionary operations with a fed-ex type logistics approach to one where support in depth is required.

What is required a shift from the heavy reliance on commercial logistics solutions to more robust mobilization ones.

Obviously, at the center of such a shift is an enhanced role for domestic industry to support a nation’s military as well as ensuring that global systems being used by a nation’s military have well thought out and well-stocked support solutions as well.

At the recent Williams Foundation seminar, the focus was upon the Australian approach to dealing with this challenge.

It is clear that a more sustainable ADF requires enhanced focus of attention on the logistics base and with how Australian defense industry can provide more robust national support in a crisis. As Lt. Col. David Beaumont of the Australian Army put recently at the Williams Foundation Conference which focused on this subject:

“The ADF’s engagement with industry must reflect the needs of higher states of readiness and surety of support. It is incredibly difficult to determine how self-reliant the ADF might be when the present practice of global production and supply masks supply chain risks, and while Australia lacks the levers or market power to directly intervene in global production. Reliability is in question; this is not a fault of industry, but a consequence of the complex, decentralized, industry environment that works well in peacetime.

“The ADF must emphasis reliability in its logistics – to deliver ‘assured logistics’ – for wont of a better term. It must also encourage industry to be ready to match short-notice, strategic, responses. It may be that in a time of crisis traditional boundaries such as intellectual property rights will need to be challenged, industry capacity seconded to defense interests, and projects redirected in new directions at very short notice.

“At the very least ADF and industry should discuss how industry ‘scales’ in parallel with any expansion of the fielded force.”

In Australian terms, given the size of the population, the workforce and the economy, no one is seeking what a country like the U.S. would consider self-sufficiency.

It is about building in greater self-sufficiency, supportability and local support as a core strategic goal.

Without doing this, not only would the ADF and the nation be at risk in a regional crisis, but the Australian effort hope to trigger rethinking across their alliance structures.

Much as the ADF has driven interest from allies with regard to thinking through building a fifth-generation force, the ADF rethink could have similar impacts on its allies with regards to supportability.

For example, in the area of F-35 support, the Aussies will be key drivers in working to ensure that the U.S. actually delivers on a global support structure for the F-35, rather than simply seeking to preserve the US depot support structure.

There is a broad rethink going on in Australia with regard to how to move forward with industry and its relationship with the ADF.

A key line of effort would clearly be to standup industry which could provide capabilities directly to the ADF and be part of a global export strategy.

THE WEAPONS OPPORTUNITY

There is probably no area potentially riper for doing this than with regard to the development and production of weapons.

At the seminar, a UK speaker, Chris Stevens, Head of Air Domain, for MBDA, provided a look at how the UK shaped a sovereign approach to weapons development.

A key focus of MBDA is to build modular weapons and such an approach certainly bears serious examination by Australia in conditions whereby stockpiling weapons cost effectively is clearly required for a crisis management force which need to operate for a significant period of time through a crisis.

MBDA’s approach has been to build its latest weapons to be useable by a variety of air platforms, including fifth generation ones, so that the flexibility of the kill web being shaped can be enhanced.

For example, with regard to SPEAR this means that it can be carried by an F-35 which allows it to engage significantly more targets than if it used a legacy glide weapon or that Typhoon which will also most likely carry SPEAR 3 can contribute significant load out capability of this weapon for the platforms operating in the extended battlespace.

It is also about what the weapon can do as an interactive data linked strike asset ON a platform; and yet be able to operate by OTHER platforms identified by the C2 authority to take over those strike assets and direct them to their final product.

This is about interactive capabilities; and a new approach to weaponization, which will transform how forces operate in the extended battlespace.

Spear 3 is a key example of how the UK is focusing upon the enhanced capabilities of the F-35 and Typhoon as strike platforms, but also shaping a way ahead for the kill web approach to weaponization.

If Australia is to take sustained operations seriously, weapons stockpiles need to be increased, and having modular missiles would be clearly the most efficient way to go about it.

With its significant test ranges, and clear interest in regional allies and others in using these test ranges, there is clear opportunity to expand its work in the weapons domain.

THE SHIPBUILDING OPPORTUNITY

Another key line of effort is underway with regard to shipbuilding.

The new “continuous shipbuilding” approach is designed to expand the industrial players working with the Commonwealth at the same time as they stand up more capability within country.

The new frigates to be built with the UK and Canada, or the new submarine to be co-developed with France are two key examples.

The Department of Defence and the Royal Australian Navy have put in place an approach which allows for both greater domestic sustainability and enhanced integration not only within their own force but for allies as well.

As Vice Admiral (Retired) Barrett has put it in various past interviews, the approach is to separate the hull builds from the combat systems build.

The combat systems build designed to take any new platforms and integrate them throughout a scalable force.

And the combat systems decisions are also shaped to enhance interoperability with core allied navies as well.

The ability to build software in common with core allies is a key part of how to ensure that the force is sustainability, modernizable, and scalable.

THE UAV OPPORTUNITY

A third key line of effort can be seen with regard to how the Australian Army is working with local industry in Australia to shape a way forward with regard to remotes or UAVs.

It is clear if you spend time in Australia, there are a number of innovative smaller firms, providing very significant innovations in the software, IT and communications areas.

In effect, what the Australian Army is doing is positioning itself to take advantage of this indigenous capability in building out its future in the remotes or UAV areas.

A presentation by Lt. Col. Keirin Joyce, UAS Army HQ, at the Williams Foundation Seminar in April 2019, highlighted a way ahead for the ADF in the UAS area.

He noted that over the past 10 years, the Australian Army have made increasing use of UAVs.

He added that they had more than 900 systems in inventory and more than 1,000 operators within the Army.

The shift as he described it was from buying off the shelf overseas; to the development of indigenous systems.

“This means that we are shifting from considering acquisition and sustainment as separate activities; to looking at them as an integrated activity.”

The past decade pattern has been to acquire abroad; and then to set up the sustainment system in country.

The new approach is to shape an indigenous approach whereby sustainment is part of the ongoing acquisition cycle.

He argued it is not just the sovereign capability in play; but also export possibilities as well.

I would add that one could argue that this was especially important in a software driven platform, where one would ideally like to drive the software in ways that support one's specific concepts of operations, and in which gaining software transient advantage against an adversary was crucial and in which dealing with the cyber threat is often best dealt with in terms of a code rewrite.

This means in turn that logistics support for a UAV is not simply about replacing parts but about code writing.

In short, the Aussies are looking for an enhanced contribution from industry, foreign and domestic with regard to building an integrated fifth generation sustainable force.

This is not a fortress Australia policy; it is about enhancing the capability of the force to operate from Australia outward in the region during times of crisis and to be effective and durable throughout an operational effort in an area of interest.

This is an approach different from the past decade or what was done during the "Middle Eastern" mindset.

But it is a core strategic shift which the allies of Australia need to take seriously going forward.

The Central Significance of the Loyal Wingman Program

Part of the defense rethinking going on in Australia involves finding ways to enhance a sustainable fifth generation force. Building out a lethal and effective offensive-defensive force, which can expand the perimeter for the defense of Australia and provide for allied extended deterrence, is a core focus of ADF modernization.

To do so in a crisis management situation needs a serious look at how long Australian operations could be sustained if a determined adversary sought to disrupt imports into Australia to support a modern society and a modern combat force.

The sustainment issue could be solved in part by enhanced domestic manufacturing capabilities and sustainment approaches, such as the projected shipbuilding effort or the F-35 regional support hub.

But clearly, there is an opportunity as well to build out manufacturing in Australia and with the ranges and potential workforce augmentations, missiles and unmanned air vehicles would be a clear area of interest, not just for Australia but for its partners as well.

As a member of the F-35 global enterprise, there is a clear global partnering opportunity whereby the Australians could do "a Konigsberg" and build missiles or related capabilities for themselves but in a way that makes them a natural partner with other key F-35 partners.

The recently announced "loyal wingman" program could be a case in point.

To be clear, the amount of money being discussed at the program launch at Avalon makes it, in the words, of a senior Australian strategist "a PR stunt."

What he was focusing on was a key reality – the money being proposed could hardly achieve a program of record.

But one way to look at it might be to see an Australian effort to leverage their position geographically and in terms of training ranges to provide a foundation for several partners to come and to build out an Australian-based test, development and manufacturing capability.

It is clear that already fifth generation led training in the United States is extending the range of training – quite literally – and it will be virtually impossible for European and Asian F-35 partners to do such training without the geographical scope that Australia provides.

If we take a look at the proposed loyal wingman program, a key element is affordability and the expectation that these are assets which can be consumed in a combat scenario, more like weapons than airplanes.

And to get a low cost, it is clear that the wingman will not be an organic festival of advanced sensors, C2 or other features.

It will be a plus up in mass for what Secretary Wynne has called for in terms of ‘the wolfpack.’”

But some of the analyses surrounding the proposed program suggests that this will be an asset which can provide the tip of the spear into contested airspace or fly with legacy aircraft in a way whereby the legacy combat asset somehow has thinking capabilities which they simply do not have.

Clearly, as a low-cost wingman is developed modifications to systems like Wedgetail or to tanker could occur to make them adjuncts to an operation, and as one considers the range of combat scenarios they could complement.

But the management capability onboard the mother ship so to speak is a key consideration of what will fly with it to make for an effective combat team.

One Australian enthusiast for the program highlighted what he sees as the contribution of this program to Australian sovereignty.

“We should now concentrate our efforts on breaking down barriers between further technological and industrial co-operation so we can build a sustainable sovereign defense industrial capability.”

Makes sense, if you are willing to invest significantly greater money in the program; but if it is a leveraging effort, then it is certainly conceivable that American, Japanese, and European F-35 partners would invest.

But it is also crucial to keep in mind the program’s limitations if it is to be a disposable lower cost asset.

The Australian analyst made a core point which he then seems to forget later in his analysis.

“The idea is that F-35s will be tasked with entering dangerous environments, relying on stealth and electronic warfare capabilities to survive, while spotting targets for lower-tech unmanned systems, like the new RAAF-Boeing drone, and non-stealthy fighters that remain outside the range of adversary defences.”

This statement is good up to a point; but the F-35 is a multi-domain air combat system with a brain big enough to work combat teaming with “slaves” in the wolfpack.

This is not true of 4th generation aircraft.

“This “loyal wingman” will be paired with fourth-generation manned aircraft such as F-18s and will likely act as decoys, scouts and communication relays. Eventually they may play a “bomb truck” role, carrying additional missiles and ordnance for both air-to-air combat and other strike missions.

“The largest benefit of these systems will be to beef-up its mass, or the amount of presence and firepower it will be able to project across the region against large numbers of adversary aircraft.

“A single F-18 with four to six autonomous wingmen in tow would be better able to survive, while being more lethal and numerous, multiplying its impact.”

The problem with this is that a legacy aircraft like the F-18 will have a difficult enough time to survive without trying to manage “slaves” in tow.

If we return to the sovereignty bit, it is clear that if the loyal wingman program is a trigger to investment and engagement by the USAF and the RAF and others in leveraging the test ranges and future training facilities in Australia, this could well be a viable program.

But certainly not one for the amount of money being put on the table currently.

The demonstrator is being developed under the Loyal Wingman Advanced Development Program, which is being supported by A\$40 million (\$28.5 million) over four years in Australian government funding and by Boeing as part of its A\$62 million investment in research and development in Australia in 2018.

The other limitation is clearly the current industrial capacity in Australia.

Boeing Australia has a modest industrial footprint in Australia, which might be considered seed corn but clearly not the kind of workforce and industrial facilities which will require a significant investment and build out.

Put in blunt terms: the loyal wingman could be part of enhanced Australian sovereignty and a trigger for global industrial partnering with Australia as a launch point rather than an importer.

As one senior Australian analyst highlighted:

“The price quoted is only for the development of the first three prototypes.

“Boeing has what was left of the Commonwealth Aircraft Corporation (CAC) and the Government Aircraft Factories (GAF) which produced their own designs in the 80s and early 90s.

“It’s now Boeing Aerostructures.

“BAE have the autonomous brains to the system, which they produced for Tarinis, and there are no hydraulics in the system only electrics.

“And they are designing it to a price point.”

Dr. Alan Stephens, the noted Australian military historian and a research Fellow at the Williams Foundation, in his discussion of a Plan B approach to Australian defense policy going forward, underscored the importance of the Australian loyal wingman program for shaping a way ahead for the next round of airpower modernization, leveraging the foundation which is being currently put in place.

“Channeling their inner Sir Richard Williams, the Air Force’s senior leadership appears to have redefined Australian air power through the agency of Project Jericho. Described as a “marriage of minds and machines”, Jericho implies a transformed organization based on artificial intelligence, robotics, machine learning, manned-unmanned teaming, networks, and innate intellectual flexibility.

“Concurrently, and channeling their inner L.J. Wackett, the Air Force, the Defence Science and Technology Group and the Boeing Company have announced the cooperative development of a stealthy unmanned combat air vehicle under the rubric of “Loyal Wingman”. This is the most exciting initiative undertaken by the Australian aerospace community since World War II. If the project succeeds, the implications are profound.”

V. SHAPING A WAY AHEAD: THE UK DYNAMIC

Even though there are significant cross-cutting opportunities for Australia and the UK to work together with regard to defense transformation and global alliance politics, the UK approach is grounded in some significant differences which will affect how the UK will work with Australia and other allies as well as the scope for room for maneuver the UK will have in political and financial terms.

In this section, I will deal with five key aspects of the dynamics of change affecting UK defense transformation and its role within broader UK defense relationships and alliances.

Those five aspects are highlighted in the graphic below:

Evolution of UK Defense and Force Transformation



The Context and Capabilities are Both Changing



FIGURE 5 EVOLUTION OF UK DEFENSE AND FORCE TRANSFORMATION

Return of Direct Defense: In the Brexit Context

The Russian takeover of Crimea signaled an end to the optimistic post-Cold War era.

As Putin continued to ramp up challenges, the West gradually began to focus on the return of direct defense. Protecting critical infrastructure from cyber-attack is, in many ways, surpassing other forms of military protection mandates.

Although counter-insurgency remains a key skill set, once again Western militaries face the threat of force-on-force confrontations and the challenge of returning to core tasks, such as anti-submarine warfare and air superiority, which had atrophied.

The Cold War has returned – in a new form.

Certainly, it has Cold War elements, but in a very changed strategic situation.

This is becoming increasingly clear in Northern Europe where I have conducted several visits over the past few years interviewing political, strategic and military leaders about how to shape a way ahead to deal with the new Russia and the evolving Western policies, leaders and threats.

It is clearly not your daddy's Cold War but, for the younger generation, not having lived through it, it can be a bit of a shock facing a nuclear power that has threatened Northern Europe (several times) with destruction if they don't comply with how the Russians want to see security and defense develop in Europe.

But there is no Warsaw Pact.

The Russians cannot lead an envelopment campaign in the event of war against Northern Europe.

In the Kola Peninsula, Russia maintains the greatest concentration of military power on earth, and this makes Northern Europe a key flashpoint as Russia pushes its military power to areas of interest, including the Middle East.

The opening of the Arctic is clearly changing the strategic geography as Putin stands up new military bases, including air bases, to provide greater reach and range and affecting his ability to project force out into the North Atlantic.

A very clear statement of the strategic shift was provided during my visit last year to Denmark. Admiral Nils Wang, former head of the Danish Navy and then head of the Royal Danish Military Academy, clearly differentiates between the Cold War threat of the Soviet Union and the Russian threat facing the Northern Flank.

Wang argues the Russian challenge has little to do with the old Soviet-Warsaw Pact threat, which had been one of invasion and occupation and using Nordic territory to fight American and allied forces in the North Atlantic. The Danes and their allies were focused on sea denial through the use of mines, with fast patrol boats providing protection for the minelayers. Aircraft and submarines were part of a defence strategy to deny the ability of the Soviets to occupy the region in time of a general war.

Admiral Wang contrasts this with the current situation, in which Russia is less focused on a general war, and more on building capabilities for a more limited objective – controlling the Baltic States.

He points to Russia's arms modernization (focused on land- and sea-based attack missiles, missile defense, and airpower) as the means to shape a defense-in-depth strategy that creates significant freedom of maneuver to achieve their objectives.

A core Russian asset is the Kalibr cruise missile, which can operate off of a variety of platforms and provide a cover for their maneuver forces. Land-based mobile missiles are being used as their key strike and defense

asset. “[It] is all about telling NATO, ‘we can go into the Baltic countries if we decided to do so. And you will not be able to get in and get us out.’ That is basically the whole idea,” says Wang.

Wang suggests a reverse engineering approach to the Russian threat, combining several key capabilities: anti-submarine (ASW), F-35, frigate- and land-based strike. This position is based in part on the arrival of the F-35 as a core coalition aircraft designed to work closely with either land-based or sea-based strike capabilities.

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

I have quoted Admiral Wang with regard to the UK situation for a very simple reason: with Brexit, the Northern Flank not the Central Region of NATO becomes the UK’s priority.

And in this regard, the core allies for both the direct defense of the UK from a geographically point of view as well as in terms of real warfighting alliance contributions will be found evident in the UK’s role and contribution to Northern Flank defense.

I am writing this as Europe has just held its European Parliamentary elections and with the initial results in and in the wake of Prime Minister May’s resignation, the Brexit crises as deepened in the UK. There may be no alternative to a hard exit which will be good for lawyers but not for most others.

But what Brexit does is directly challenge the notion of the nation whose interests are to be defended against the resurgent Russian challenge. Not only does Brexit challenge established alliance working relationships, but the financial cost of dealing with the diverse and varied consequences of Brexit could severely impact on defense investments and modernization.

And there is the broader challenge to the “United” Kingdom. Scotland could vote for independence and join Ireland as members of the European Union, which would leave a rather big challenge in terms of reworking the defense structure then of England and Scotland. Presumably, some sort of working relationship would be worked out, but again this puts money and time into an internal dynamic that makes no contribution to the direct defense of the realm or to core British allies in shaping an effective defense going forward.

This entire Brexit cloud or sledgehammer hovers over any UK defense transformation effort and is not be ignored as a core driver for change.

Reworking Alliances

The impact of Brexit is significant in many ways from a negative perspective, but provides significant openings as well if military and political leaders in Europe focus on a realistic way ahead, and do not use Brexit as a whipping post by European leaders.

A very good overview on how Brexit, defense and UK alliances might intersect in a post-Brexit period was provided by the then Minister of Defence Gavin Williamson. In a speech given at RUSI on February 11, 2019, he provided a clear overview on perhaps the most positive perspective of what could happen.

But it should also be noted that Defence Secretary Williamson was subsequently fired by the Prime Minister who has now resigned herself. But his speech does provide a perspective on how Brexit could be managed in a way to shape a more positive set of outcomes, than would happen if let to run on its own downward course.

The speech is as clear a statement as any British policy maker has provided to date, and I am quoting at length here as it raises the fundamental alliance issues.

“Today, we see a world of spheres of influence and competing great powers. Not only are we confronting a state like Russia. An ideological enemy without a state like Al Qaeda and Daesh.

“But the very character of warfare itself is changing. The boundaries between peace and war are becoming blurred....

“It is my belief that Britain has its greatest opportunity in 50 years to redefine our role.

“As we leave the European Union.

“And, the world changing so rapidly it is up to us to seize the opportunities that Brexit brings.

“We will build new alliances, rekindle old ones and most importantly make it clear that we are the country that will act when required.

“70 years on from its founding, NATO remains the bedrock of our nation’s Defence.

“In the past five years, the Alliance has come a long way. It is far more focused and readier to deter and defend against Russian hostile acts. But, more European nations need to be ready and capable of responding too....

“In an era of ‘Great Power’ competition we cannot be satisfied simply protecting our own backyard. The UK is a global power with truly global interests. A nation with the fifth biggest economy on the planet. A nation with the world’s fifth biggest Defence budget and the second largest Defence exporter.

“And since the new Global Great Game will be played on a global playing field, we must be prepared to compete for our interests and our values far, far from home.

“That is why Global Britain needs to be much more than a pithy phrase. It has to be about action....

“As well as our relationships with Europe, we need to build on our established relationship with the United States, Australia, New Zealand and Canada as part of the Five Eyes. With Singapore and Malaysia in the Five Powers Defence Arrangement. With other ASEAN nations, with Japan, the Republic of Korea and India. With our partners in the Middle East, and with our many friends in Africa – from Nigeria in the West to Kenya in the East.

“And we are seeking to use our global capabilities to strengthen our global presence.

“From this spring, HMS Montrose, along with five other naval vessels, will be permanently based in the Gulf using innovative crewing and support methods to keep the ship available for more of the time.

“Today, we also go further. And I can announce the first operational mission of the HMS Queen Elizabeth will include the Mediterranean, the Middle East and the Pacific region.

“Significantly, British and American F35s will be embedded in the carrier’s air wing.

“Enhancing the reach and lethality of our forces and reinforcing the fact that the United States remains our very closest of partners.

“We have the unique ability to integrate with US forces across a broad spectrum of areas. And, we are more determined than ever to keep working together.

“We will also be using our string of global support facilities and military bases more strategically...to consistently project power both hard and soft. The Duqm port facilities in Oman are large enough to be able to support our aircraft carriers. The Al Minhad and Al Udeid Air Bases, in the Emirates and Qatar respectively, provide strategically important capabilities.

“In Bahrain, our Naval Base and our long-standing Maritime Command make a major contribution to our activities in the region but also beyond.

“Further afield we already benefit from facilities in Belize, in Brunei, in Singapore as well as our bases in Cyprus, Gibraltar and Ascension Island.....

“Turning to our Royal Air Force, fresh from celebrating its centenary last year, it is now firmly focused on the next 100 years. They already have 17 new RAF and Royal Navy F35 Lightning jets, capable of land-based operations anywhere on the globe and due to embark on our aircraft carrier for the first time later this year.

“We’ll soon have nine new Poseidon P-8 Maritime Patrol Aircraft enabling us to patrol thousands of miles of ocean and greatly enhancing our anti-submarine and maritime capability.

“We’re upgrading our AWACS aircraft with modern and better capability that will improve our battle winning airborne command and control.

“We are growing our operational Typhoon squadrons from five to seven – equipping them with world leading radar and now carrying deep strike Storm Shadow cruise missiles.

“And, to complement leading edge technology from F35, I have decided to use the Transformation Fund to develop swarm squadrons of network enabled drones capable of confusing and overwhelming enemy air defences.

“We expect to see these ready to be deployed by the end of this year.....

“If we are to live up to our global role then our armed forces must continue to be a lethal fighting force fully adapted to the demands of 21st century warfare.

“I want to see our armed forces embracing transformation at an ever-faster rate, keeping pace with technological change, enhancing our mass and increasing our lethality. We shouldn’t be shy about the ambition that we have for our forces....”

This is an ambitious and optimistic statement of the way ahead.

Yet the dynamics of change within Britain itself could undermine it, both politically and financially.

The cold civil war going on in the United States could limit the kind of leadership which the US could provide in Europe, as well as the lingering dominance of the US Army over US defense policy in Europe could well reduce the investments which the US would make into the air and sea systems which are central to work with the transformation of the UK forces, notably in the Northern and Southern flanks.

Neither the UK nor the US Army should be leading a process of shaping an appropriate defense response to Russia today. In other words, it will be a question not just of working with allies but what are the opportunities to work with allies each working their own set of dynamics.

The 2014 seizure of Crimea started a significant process of change in how key European states looked at the willingness of Russia to reverse the post-Cold War order. Even though there are constitutional crises in Britain and in the European Union, the reach of modern European institutions remains significant and impacts on Russian thinking.

Putin certainly has played his nuclear card to ramp up from time to time diplomatic pressure on key European states as well.

And the Russian nuclear modernization process has put in play an expanded threat of the potential use of low yield nuclear weapons early in any significant conflict on the continent as well.

But rather than being on the inner-German border, the Russians face Poland and an independent Eastern Europe as challenges as well.

Here Putin is working relationships among some East European states to work to undermine the EU and NATO as these institutions remain bulwarks to Russian intervention.

The Russian Army is not a new version of the very large Soviet Army organized along lines postured for invasion of a more traditional European sort.

This poses the question for the United States with regard to what kind of force posture makes the most sense to support Europe in its direct defense role?

With Germany without a strong defense force, and with the questionable defense infrastructure situation facing the Germany of today, the role of the US Army played in the time of the Cold War in Germany makes little sense.

It would make more sense to strengthen the air-maritime forces which the US provides for European defense, and significantly alter the role envisaged for any US Army role.

Clearly, a primary mission for the US Army is to enhance significantly its ADA or missile defense roles, as well as providing Special Forces and infantry support to these missions.

Nuclear modernization coupled with UK and French efforts as well are key elements to manage the Russian challenge in terms of direct defense as well.

Although there is little appetite to think about nuclear weapons, this would be a significant strategic mistake for the United States and the UK. In fact, the question of how the three Western nuclear powers will work together going forward is one key alliance relationship which has been largely neglected in recent strategic thinking.

In other words, Brexit Britain is facing significant challenges with its allies but, at the same time, Britain needs to play a key role in the further evolution of the European alliance role.

But my assessment of the UK and Australia suggests that the Australian role within British thinking and the UK role within the overall process of change facing Australia is growing and will become more significant.

This is a function as well of the global nature of the challenge posed by 21st century authoritarian powers.

The Queen Elizabeth Carriers: More than Just a New Platform

The Brits invented carrier warfare; and in many ways with their new 65,000-ton carrier they are reinventing the large deck carrier and providing something of a hybrid between the USS America and CVN-78. The flight deck is impressive and is about 90 per cent of the size of the Nimitz class and has a very wide deck.

When I stood at the end of the ski jump and looked down at the flight deck, its width was significant. And I learned that the flight deck was built by Laird Shipbuilding (unfortunately no relation!).

This ship is designed to operate F-35Bs, which means that the RAF (Royal Air Force) and RN (Royal Navy) will drive every bit of innovation out of the aircraft to provide C2, ISR and strike capabilities. There will be natural interoperability between the US and British forces, right from training to operations.

Walking the ship takes time, but several innovations one sees aboard the Ford can be found aboard the HMS Queen Elizabeth: significant energy generation, significant C2 capabilities, very large rooms for reconfigurable C2 suites for operations across the ROMO, as well as well-designed work areas for the F-35B crews which will handle the operations and data generated by the F-35 to the fleet.

It is a ship designed to transform both the RAF and the RN for it will integrate significantly with the surface and subsurface fleet and the land-based air for the RAF. To take an example, with RAF jets operating from Cyprus or in the Middle East, the HMS Queen Elizabeth can mesh its air assets with the land-based assets and the command center directing the air operations could be on the ship, on land at an operating base, or in the air, even in the new tankers.

The new class of carriers for the UK is much more than a new platform added to the force. The coming of the HMS Queen Elizabeth to the UK combat force is a trigger for significant defense transformation.

Most of the analysis of the new carrier really focuses on the platform and what is necessary to get that platform operational but that is far too narrow an approach.

The carrier is a centerpiece, trigger or magnet for broader UK defense transformation within a unique historical context, namely, the broader strategic shift to dealing with higher end operations and the coming of Brexit.

First, the ship was built with a new shipbuilding strategy which basically mobilized national industry to build "largest warship ever built in the United Kingdom." And I must say, having seen the Queen Elizabeth being built in Scotland, it is an impressive engineering feat, one which combined significant innovations in building a carrier itself as well as generating an industrial base which was able to achieve it.

The build of the new carrier in the UK shaped a very innovative approach to building a new large ship which mobilized UK industry and built the ship from sections shipped from various parts of the country to the Scottish shipyard.

This is how HMS Queen Elizabeth Delivery Director, Jon Pearson, described the process:

As Warship Support Director at BAE Systems Maritime Services, part of what I do involves overseeing the work done here at Portsmouth Naval Base to support HMS Queen Elizabeth on behalf of the Royal Navy.

You could say I know a little bit about the Royal Navy's new flagship aircraft carrier.

My involvement in the carrier programme spans from 2003 during the completion phase, all the way through to last year when, as the Aircraft Carrier Alliance's Queen Elizabeth Delivery Director, it was my responsibility to get her ready for her delivery to Portsmouth and hand over to the Royal Navy.

Since the beginning of the carrier programme the vessels really captured the British public's imagination. They seem to have an affinity with the Royal Navy, the military in general, and anything connected to it.

This is the biggest ship we've built for the Royal Navy, and it fills a gap in capability that's been there since the 1970s when we lost the ability to fly fixed wing aircraft from carriers, plus it's a symbol of British military might and the role we play in the world.

Because of that, the programme has really been delivered from the outset squarely in the public eye, with scrutiny from senior politicians, senior Royal Navy officers, and senior members of all three organisations involved in the build – BAE Systems, Thales and Babcock.

That's certainly added an extra dimension to building the largest warships the Royal Navy has ever had.

Building any first in class ship is difficult, especially the latter stages when you're incorporating all the systems and getting it ready for trials, but building something the size of HMS Queen Elizabeth, the volumes we were dealing with on a day to day basis, was something else entirely.

We had to install over 3 million meters of cable, test 80,000 pipes, commission nearly 300 systems and handover 3,000 compartments.

But throughout the programme there has been a real sense of pride in what we have delivered, not just from the ACA but also the Royal Navy and the ship's company in particular – they were excited about being the first ship's company even before they had a ship they were able to sail!

The interest around Exit Rosyth, and then the international coverage of First Entry Portsmouth, plus the thousands of people who came to Portsmouth very early that August morning to welcome her in, really showed us that our pride is shared across the nation and beyond.

During my visit to Portsmouth last year, I had a chance to meet again with Captain (retired) Chris Alcock. The last time we met was during a meeting to discuss the carrier and the way ahead for the RAF and Royal Navy with the carrier at the Ministry of Defence in 2015.

Captain Chris Alcock was then Head of the Carrier Strike Division in Navy Command Headquarters. He was Programme Manager for the QEC Carriers and also responsible for capability Integration of the Carrier Air Wing into the platform, specifically L11 F35B, Merlin Mk2 and Crows nest.

Chris Alcock now works for Pearson and discussed the building of the carrier and shaping the way ahead.

"The ship was designed and built in sections. There were 26 key sections of the ship, which were built around the country at 7 locations and taken to the shipyard in Scotland.

"Even though the tolerances were tight, when the ship was put together it created the largest warship Britain has ever built.

"It is an expression of the brilliant industrial brains of the nation and of the nation in general; and from this point of view, it is no small engineering achievement on the part of British industry and Navy leadership."

Second, the ship is built around RAF and Royal Navy integration. Such integration is not an easy process and it is evident from my visits to the UK, that it is a work in progress.

But as one senior Royal Navy officer put it to me recently: "We need to pursue deeper integration because our joint capability is what is critical for the defense of Britain with the return of the Russian challenge and the return of geography as a key determinant of our defense interests and policies."

This integration is evident on board the ship and at RAF Marham where the two services work closely together with preparing for future carrier operations.

The F-35B is at the heart of these integration efforts. The UK is standing up a Lightning Force, not a RAF or Royal Navy force. The first two squadrons are being established on a 58/42 basis between RAF and RN pilots.

Third, as MoD focuses on future airpower developments, a key opportunity rests with regard to how the carrier could work with their version of loyal wingman. With the capabilities built in to the F-35 to manage the battlespace, a loyal wingman with significant range could add the strategic bomber function to the fifth generation enabled carrier. The reach of the carrier is significantly enhanced as data flows into the carrier-based F-35s to provide targeting solutions at longer range which can then be passed onto a loyal wingman as a targeting solution.

All three points have been discussed at some length during my visits to the United Kingdom over the past five years. And it is very clear to me, that the coming of the carrier is also a key enabler of the shift away from the land wars in the Middle East or a focus on yesterday's Central Front. If Germany and France want to work together to defend the Central Front, so be it.

That is no longer a core UK mission.

At the heart of the focus of getting the HMS Carrier Strike Group to sea is its projected maiden operational deployment in 2021. This is a significant challenge and the focus of attention of the Royal Navy and its industrial partners and a major element of my discussions while at Portsmouth.

During my visit to Portsmouth last year, I had the opportunity to talk with two key Royal Naval officers working hard to prepare the carrier for its first operational deployment. Captain Allan Wilson and Captain Mark Blackmore in Navy Command provided an overview on the way ahead with the carrier task force as well as a very insightful look at the challenge of working several intersecting programs coming together in the future maritime task force.

Captain Blackmore influences the Senior Responsible Officer for the Queen Elizabeth carrier and functions as Admiral Blount's right hand man in delivering the carrier program. They are not responsible for UK F-35 LTNG, which is the function of Air Command.

But with three new aircraft coming onboard the Queen Elizabeth, they are working with the integration of the other aircraft as well and closely with Joint Helicopter Command.

For example, the integration of the aircraft to fly on the carrier is part of the challenge as well, and includes three new aircraft, the F-35, Commando Merlin, and the Crowsnest.

And the carrier is shaping a shift from the current concepts of operations for the Royal Navy to a new one as well.

Currently, the key focus is upon targeted deployment built around a single ship to an area of interest.

With the carrier, a maritime task force is being built which will go together to an area of interest.

This change alone requires significant change as the shipyards will now have to manage the return of the task force and the maintenance cycle task-force driven as opposed to a cycle of dealing with single ships coming back from a targeted deployment.

The current goal is to have the HMS Queen Elizabeth deployed on its maiden operational deployment in 2021.

As Captain Blackmore highlighted the way ahead: “We accepted the ship last December (2017) and she will go off for the next two years to do fixed wing trials.

“We will do Developmental Test (DT) one and two this Autumn, DT three next Autumn, then Operational Test with the goal of achieving an initial operational capability (IOC) for carrier strike in December 2020 and then about four months later, we plan to deploy CSG-21.

“My focus is clearly on this end point, namely the first deployment wherever it is finally decided to do the initial deployment.

“Prince of Wales comes on about two years astern to Queen Elizabeth and she will be seen off the US Eastern Seaboard early next decade to do the rolling landing trials.

“We have a new landing aide called a Bedford array which is fitted to Prince of Wales which allows us to exploit the full enveloped of rolling landing and gives the pilot visual cues which enhance his capability to come back to the ship with more fuel and weapons as needed, The Queen Elizabeth will then be fitted with the new system.”

A key element for the carrier is clearly its integration with the F-35 for which the developmental test will expound this Fall off of the Virginia coast.

The declaration of full operational capability for the carrier is correlated with the operation of the first 24 F-35Bs, which will occur by 2023.

The new carrier embraces both the carrier strike and amphibious assault roles.

As Captain Blackmore put it: “Carrier Enabled Power Projection (CEPP) is both an organization and a capability and it captures both the literal maneuver amphibious element and also the carrier strike element.”

The US is playing a key role in the UK working towards CSG21.

One aspect is clearly working with the USMC on F-35B and jointly training at MCAS Beaufort.

The Marines will be evident on the ship as well with their operating from the ship during DT trials as well.

Another aspect is working with the US Navy on various aspects of preparation and training for carrier operations.

In 2012, a statement of intent was signed between the US and the UK providing a broad consensus on collaboration and joint training which has been evident throughout the workup of the Queen Elizabeth.

As Captain Blackmore put it: “We have been involved with the US Navy with regard to the training of personnel and the concepts, the processes and the organizations that need to come together to make a carrier a carrier. As a US Admiral noted, “This is not a pickup game. This is not something you just step onboard and just do.”

Working with the US has been a central piece of the activity to bring on line the Queen Elizabeth.

The new carrier is designed differently from a US large deck carrier and will operate differently from the US carriers, and part of the transition is sorting out a way ahead for the UK concept of carrier operations.

And that is clearly a work in progress.

But it is rooted in the design of the ship to operate F-35Bs and helicopter assault forces in varying combinations dependent on the mission.

It is also rooted in building out new ships and missiles to operate with the ship, and to be able to operate in the distributed operational battlespace being shaped by the US and other allied forces as well.

The new carrier both supports and interacts with all of these trends.

How will the carrier both contribute to and learn from these broader macro allied military transformation dynamics?

A core commitment of the UK government is to have a 100% available carrier strike capability.

This means that the maintenance and workup cycles for the two carriers need to be synchronized to ensure that this can be the case.

It is a significant challenge in that workforce, training, airpowers systems and maintenance of the carrier need to be synchronized and not just with the carrier but with the other elements of the maritime task force.

Given that the focus of the Royal Navy in the past few years has been very different, namely focused on deployment of single ships or maritime combinations built around a single non-carrier ship, shifting to the concepts of operations for a carrier strike group is very different.

Much of Captain Allan Wilson's presentation and focus during the discussion was precisely on how to meet the challenge of the coming of a maritime task force.

The Royal Navy, the Royal Air Force and MoD more generally have been adapting their organizational structure to ensure that the kind of integration, which a maritime task force enabled, by an F-35B will be successfully developed and delivered.

This is no easy task.

And Captain Wilson also noted that building out such a capability was a significant challenge but it must be met with a proper training regime to ensure a high level of readiness of the carrier maritime task force.

Captain Wilson noted: "We are redesigning force generation.

"In the past, and currently as we do with our amphibious task force, we deploy ships perhaps in a task force configuration and then they reach full operational readiness during the operation.

"When we come back to the UK, we do not maintain the task force at a high level of readiness.

"With the carrier task force approach, we are shifting our training focus to ensure that the task force is at a high state of readiness when it first deploys."

"We bring the individual elements of the task force together to work together after they have done their initial training.

"We then integrate the jets with the task force in both synthetic and live training and get them up to certification before they go anywhere.

"We will certify the task force to high level of readiness prior to deployment and will deploy within that cycle.

“And we plan to keep that task force together for a defined period of time, which will require synchronization across the key elements of the task force in terms of maintenance, training and manning.

“That is not how we have done it in the past.

“The deployment has always been the headmark. We have surged units in and out of the task force.

“And we have worked the pieces individually.”

Captain Wilson underscored the challenge of aligning the work up of the carrier and its evolving task force approaches with the aircraft coming onboard the aircraft for its maiden deployment.

In this context, we discussed the Crimson Flag exercise to be held at RAF Marham in 2020.

Captain Wilson posed a key question: “How do you bring the other combat elements into a blended synthetic-live combat training environment to work with F-35?”

He provided an answer: “We have an exercise at RAF Marham scheduled for the Autumn of 2020, within which we anticipate USMC F-35s will participate.

“We are looking at what rotary wing assets will be available as well for this exercise.

“We bring ship’s crew into the exercise to work the exercise and to focus on combat capability generated from the deck of HMS Queen Elizabeth.”

In short, the new carrier is a key part of the overall dynamics of change within UK defense.

And the senior Royal Navy team is clearly approaching this from an integrated approach looking at the cross cutting changes throughout the navy and air force as well the ground assault forces as well.

It is clearly a very dynamic and innovative process, one which will see significant challenges along the way as a core new capability is crafted for the United Kingdom.

There are several aspects of the new UK carrier of interest to broader considerations of the evolution of the airbase, including manpower requirements, weapons handling,

C2 capabilities and flexible command posts, electric power generation, building the infrastructure to handle the requirements of a data rich aircraft which is the F-35B, and building unique F-35 specific capabilities, such as the ski jump and the unique rolling landing capabilities.

In short, as a senior Australian policy maker once told me that the foundation of good defense strategy is knowing your limits and your priorities and working to meet your objectives on a priority basis.

Clearly, the UK facing significant political and alliance change and financial challenges needs to follow the advice of that Australian policy maker.

The new carrier and approaches to shaping carrier task forces of a 21st century type are both clearly a key part of the defense reset going on in the United Kingdom.

Despite the critics, new carriers are being designed and built to work more effectively in an integrated operational space to provide key elements of the distributed force, one which is forging a 21st century approach to offense-defense enterprise across the spectrum of military operations.

Defense Industrial Dynamics

The UK unlike Australia has a significant defense industrial base. This means that the UK approach to defense transformation will be tempered by protecting its defense industrial interests in a way which has not constrained Australia as it has put together its new Air Force and rethought how to capitalize a new Navy.

The Australians have focused on shaping an integrated force and working back to the industrial base; for the UK the industrial base shapes the options being offered to the Royal Navy and Royal Air Force.

This is why the impact of Brexit is so profound on the force options for the UK forces; the UK industrial base is built into a broader European industrial base and how that gets reworked in the decade ahead will have significant impacts not just on the industrial base but the options being offered to the UK forces.

The UK defense industrial base has been a key part of the evolution of a global defense industrial base in the West. This means that the priority has been less upon complete control of platform development, sourcing and production than being part of collaborative programs, and to building out its aerospace businesses as part of a much broader global sourcing effort.

This why the impact of Brexit can potentially be very disruptive. For Britain, supply chains into Britain and the export of production from Britain into European supply chains is a foundational element for the defense industrial base. Key companies like Airbus, BAE Systems, Thales and MBDA will be clearly affected and to mitigate those effects will be a key challenge going forward.

The case of the F-35 is particularly interesting for UK industry. The UK is by far the second largest player in the global F-35 program, with 15% of the content of every F-35 produced. This compares to Lockheed Martin's 30%.

Because the focus of policy makers and industry is more often on platforms than on the capabilities which make platforms innovative and even contribute to transformation, the UK contribution to the F-35 has been devalued to some extent compared to the Typhoon where BAE has had much more control over the overall platform.

But the Eurofighter case is interesting as well.

The evolved Typhoon which the RAF flies is not a common aircraft with other Eurofighters. The IP which has made the Typhoon an advanced Typhoon has been developed by the UK outside of the broader Eurofighter framework. This is why Typhoon could provide a way to work with Germany even outside of the Brexit events as Germany wishes to upgrade its Typhoons. I will return to this point in the next section.

In the shipbuilding sector, the UK is clearly shaping a new approach to try to ensure global partnerships which can deliver new platforms to the Royal Navy as well as work global sourcing and exports as well.

But the industry will face a major challenge as adding partners, notably partners which will actually dominate programs in terms of volume of production, will require adaptations on the UK industrial side to accept a different kind of prime contractor role, one in which partners technologies become part not just of the global product but be found on the UK platform as well.

A key example of this is the new ASW frigate, the Type 26 frigate. The Canadians and the Australians will each buy more ships than the Royal Navy. With the defense industrial concerns in both Canada and Australia, it is hard to imagine that part of the deal will clearly be significant content from industry in those two countries on the entire build of the frigate fleet.

An example of how the UK Ministry of Defence looks at the projected role of its defense industrial base in shaping the way ahead for defense modernization and transformation has been provided by comments made in last year's "Combat Air Strategy: An Ambitious Vision for the Future."

This is how the MoD described the UK industrial landscape and its role in shaping its evolving air combat capabilities:

The UK industrial sector has successfully underpinned our operational advantage and freedom of action in the Combat Air sector for the last 100 years. It is also key to enabling UK capability assurance. This has been achieved through the indigenous ability to design, develop, upgrade, certify and support our Combat Air systems.

A capable industrial base allows us to develop solutions to meet our requirements, be they military, political, or financial. It also enables greater national control over the cost and risk of delivering capability.

Successive Combat Air systems have cost more and taken longer to develop than their predecessors. This is not the case in other technologically-driven sectors, such as automotive, and this trend needs to be addressed urgently in Combat Air.

Technological and process developments from wider industry offer the opportunity to change this paradigm. Some of these approaches have already been implemented successfully to drive down the significant support costs for our Combat Air systems

To deliver affordable next generation capability, the UK's Combat Air industry will need to deliver ever increasing levels of productivity, efficiency and sustainability throughout the supply chain.

This will require greater innovation and diversification, particularly at the prime contractor level to reduce reliance on platform-driven acquisitions, as capability becomes more dependent on a system of systems approach.

The Combat Air sector requires a particularly wide range of core skills. Some are specific to the sector and require bespoke investment by national champions, including in systems integration, propulsion, sensors and weapons. However, others are common to a range of wider industry, high technology, manufacturing and aerospace sectors.

To remain affordable and sustainable the Combat Air sector needs to evolve fast to engage with and leverage the best of wider industry. The Department for Business, Energy and Industrial Strategy and the Ministry of Defence will work together to develop the means to incentivise greater involvement of the wider UK skills base.

Combat Air will be increasingly defined by winning the information battle: collecting, processing, sharing, exploiting and protecting data. The wider UK industrial base has world-class expertise in this area, and access to wider global innovation.

This must be fully integrated into industrial solutions and the Combat Air industry needs to respond imaginatively and inclusively to this opportunity.

The UK has a long history of success in international partnering and exporting defence capabilities. Key to the health of the Combat Air related industrial base is continued success in the international market. To achieve this, future systems must be designed with international partners and the global market at the forefront. Taking an open system architecture approach will allow partners' needs to be met by rapidly and cost-effectively integrating a range of capabilities on a common framework.

UK-generated Intellectual Property, people, skills and facilities are critical to sustaining operational advantage and freedom of action, securing our national prosperity and the UK's position as a defence exporter. They are also key to enabling choice in future acquisition and international partnering. Industry investment in UK Intellectual Property should be aligned to those technologies that can be exploited to secure operational advantage and freedom of action or export opportunities.

To enable this, the UK Government will provide greater clarity on future national Combat Air capability requirements.

The Ministry of Defence will work with industry, including small and medium-sized enterprises and industry bodies, to define and prioritise investment in the technologies that are critical to sustain our operational advantage and freedom of action requirements. This Strategy confirms our long-term national intent, enabling industry to respond and invest accordingly.

Transformation, New Platforms and Shaping A Way Ahead

The UK along with all liberal democratic nations with significant indigenous industrial capabilities face a constant challenge of simply producing legacy products for industrial purposes and to support ongoing operations defined in part by the con-ops which those legacy products allow and the need for force transformation.

The challenge is to get to a point where the industrial-defense relationship can actually cross-fertilizer for transformation rather than industry or defense simply blocking the process based on legacy industrial needs and requirements.

There are several examples of this tension certainly in the United States as well as in the UK and France, to cite three major examples.

The strategic shift from the Middle East land wars requires the transformation of the forces of the liberal democracies to more effectively engage in higher tempo and higher intensity operations.

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

The Strategic Shift: The New Operational Environment

It is neither the return to the Cold War no the continuation of the concepts of operations of the Land Wars

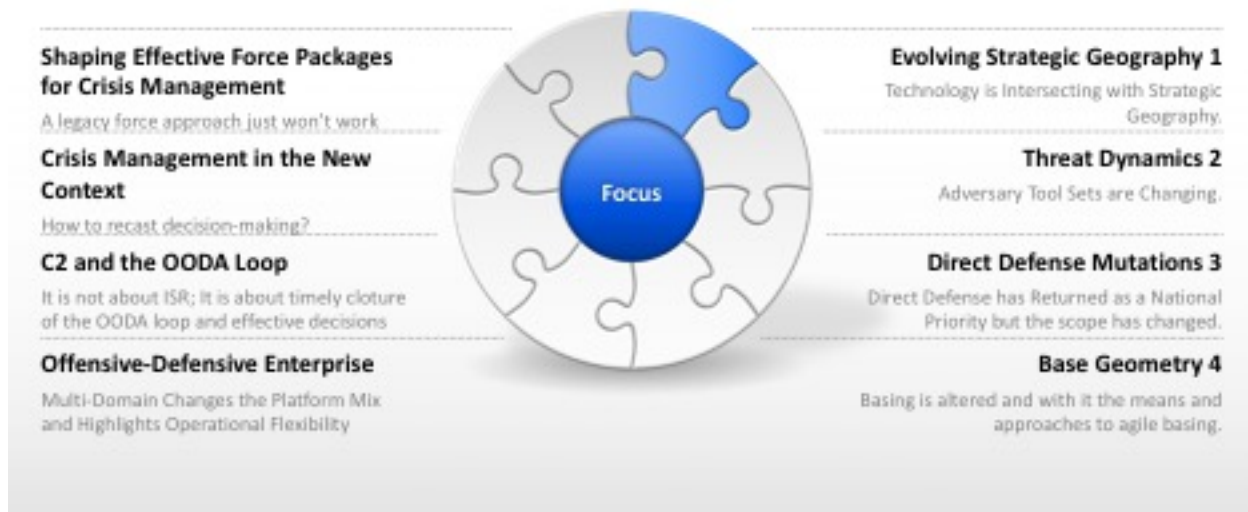


FIGURE 6 THE NEW OPERATIONAL ENVIRONMENT

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

To get to where a transformed force wishes to go with regard with an integrated force, key decision-making superiority is a crucial capability delivered throughout the integrated battlespace.

In other words, all attributes are not equal.

To do so means appropriate information needs to be generated and delivered to the appropriate decision maker at the point of need.

It is about effective C2 in the battlespace operating at the various points of attack or defense;

It is about generating and distributing information appropriate to those decisions;

It is about information parsimony not simply doing an NSA approach to collecting as much as one can;

It is about focusing on where the decision makers are in the battlespace, allowing them to make decisions at key points of attack or defense and to shape a realistic and effective secure information approach within that battlespace.

Clearly, cyber needs to be built in as well as learning how to fight cyber war within the integrated battlespace.

It is not that platforms are not important; they are; but they now must be placed in the context of their contribution to the effects desired by the integrated force.

In making future platform selections, a key decision point is how they contribute to the ultimate desired effect, and how they contribute to decision making superiority and enhanced information security and dominance.

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

There will be more emphasis placed on the joint force – bringing together different land, air, sea, intelligence, electronic warfare, cyber and space capabilities so the ADF can apply more force more rapidly and more effectively when called on to do so.

For this to work, the purchase of platforms requires a new working relationship between industry and government as well as the services working more effectively to shape how their particular new platform contributes to both the service's core missions as well as the effects desired for the extended battlespace.

This requires shaping information sharing approaches that make sense in the contested and permissive battlespace, and shape information parsimony to deliver information to the decision maker at the point of attack or defense in the air, on the sea or on the ground.

Platform Characteristics

Building Blocks for Kill Web Modular Force

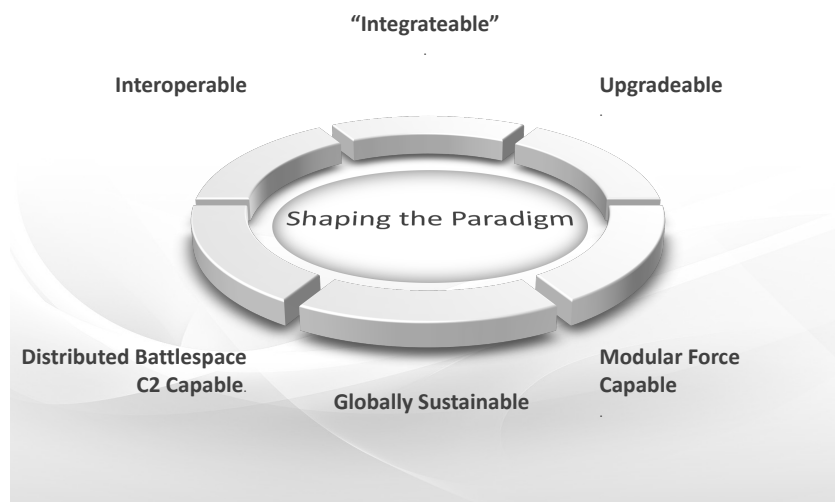


FIGURE 7 EVOLVING, DEVELOPING AND CRAFTING NEW PLATFORMS FOR FORCE TRANSFORMATION

Thus, when one approaches the acquisition of new platforms, a key consideration needs to be what does a new platform bring to the battlespace?

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

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

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

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

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

How to measure cost effectiveness in an integrated battlespace world?

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

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

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

The Next Phase of Airpower Transformation

At the Farnborough Air Show last year, then Defence Secretary Gavin Williamson, highlighted the new UK Combat Air Strategy and with it the launching of Team Tempest. The focal point of his presentation on July 16, 2018 was the goal of developing a next generation fighter.

The UK MoD story published that day explained the initiative.

The concept aircraft has been put together by British firms including BAE Systems, Leonardo, MBDA and Rolls-Royce, which have joined together with the RAF Rapid Capabilities Office to form 'Team Tempest' to pursue the opportunity.

Team Tempest brings together the UK's world leading industry and sovereign capabilities across future combat air's four key technology areas: advanced combat air systems and integration (BAE Systems); advanced power and propulsion systems (Rolls-Royce); advanced sensors, electronics and avionics (Leonardo) and advanced weapon systems (MBDA).

The MOD will now set up a dedicated team to deliver the combat air acquisition programme.

They will deliver a business case by the end of the year, and have initial conclusions on international partners by next summer – with engagement with potential partners beginning immediately.

Early decisions around how to acquire the capability will be confirmed by the end of 2020, before final investment decisions are made by 2025. The aim is then for a next generation platform to have operational capability by 2035.

The UK is already a world-leader in the combat air sector, with a mix of skills and technologies unique in Europe, supporting over 18,000 highly skilled jobs. The sector delivers a turnover in excess of £6bn a year and has made up over 80% of defence exports from the UK over the last ten years.

Investment in combat air technology, combined with the strengths of UK industry, has resulted in the UK being the only Tier 1 partner with the US on the F-35 Lightning II programme, with British industry delivering 15% by value of every F-35 built. The UK has been able to help define the operational capabilities of the aircraft, while reinforcing UK industrial capability, critical skills and supporting wider economic prosperity.

The UK also continues to lead the way in combat air power as one of the four partner nations in the Eurofighter Typhoon programme. With more than 20,000 flying hours on deployed operations to date, the Typhoon delivers world leading capability, unparalleled reliability and proven interoperability with our allies. The MOD will continue to invest in the Typhoon for decades to come, with the best technologies being carried forward on to next-generation systems.

The F-35 Lightning II and the Typhoon are two complementary multi-role combat aircraft that will make up the RAF's combat air fleet, placing the UK at the forefront of combat air technology - with the Typhoon expected to remain in UK service until at least 2040.

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

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

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

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

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

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

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

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

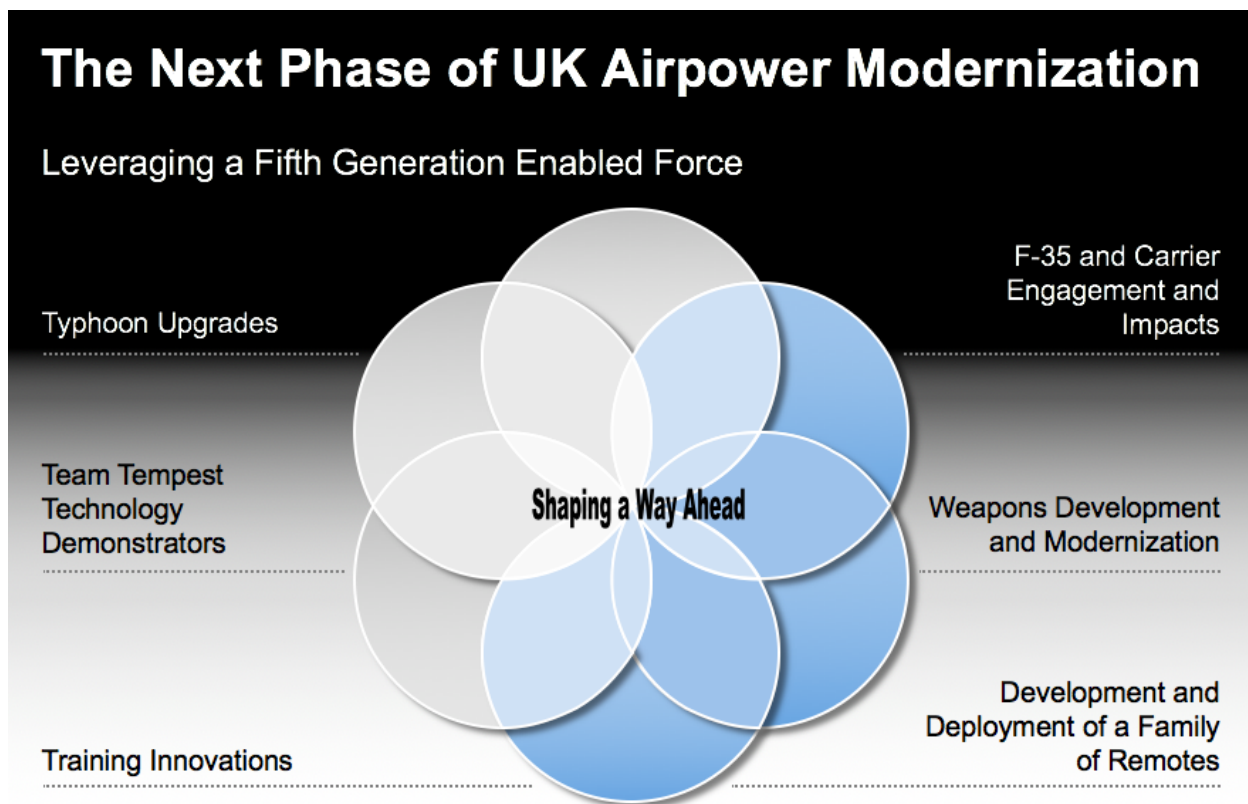


FIGURE 8 THE NEXT PHASE OF UK AIRPOWER MODERNIZATION

TYPHOON MODERNIZATION

The UK version of the Eurofighter, the Typhoon, has several aspects of UK developed intellectual property which have been part of the upgrade process. As the UK is part of the Eurofighter consortium, there clearly is the possibility of leveraging the Typhoon modernization process to provide a significant working relationship with the Italians, the Spanish and the Germans in the decade ahead.

This consortium can be a force for mitigating the Brexit impacts as work arounds get sorted out in post-Brexit period. It is also an opportunity to work Eurofighter integration, which has been a core challenge facing the Eurofighter partners. For example, the last chief of the Luftwaffe reached to the RAF chief to find ways so that each countries Eurofighters could be sustained in operations in the Baltics.

The Typhoon integration challenge is a significant one, which the European Air Group, based at High Wycombe in the UK, has focused upon as a challenge to be dealt with. During a 2016 visit to the EAG, I discussed this challenge with Brigadier General de Ponti, then Deputy Director, of the European Air Group and joined by the “drivers” of the ETIP (Euro Typhoon Interoperability Project) as well as organizers of exercise efforts to shape a new approach, namely Lt. Col. Jacobo Lecube of the Spanish Air Force and Lt Col. Marco Schiattioni from the Italian Air Force and Chief of Staff Col. Stephane Pierre, of the Belgian Air Force.

The overall focus of the effort is upon shaping a more common fleet approach among Eurofighter nations. Although four nations came together to build a common airplane, the planes have been used by four different air forces with limited overlap in standards and operating practices.

As the Euro-Typhoon is clearly a key element for the future of European airpower and with the coming of the F-35 to Europe, this makes little sense. And what the European Air Group is focused upon are practical ways to shape more common fleet approaches among the air forces, which fly Euro-Typhoon.

Also, shaping a common template in doing Baltic air policing in which Eurofighter/Typhoons are becoming a frequent asset in executing the mission provides an obvious opportunity to find ways to shape common procedures and support approaches as well.

The problem was simply put by one of the participants: "When an Italian Eurofighter lands on a German base, it cannot use the ground support equipment or change a tire, because the standards are different. These are procedural issues, which may make sense in terms of national norms but not in terms of common fleet operations. Through this project we seek to end differences which get in the way of common operational support."

According to BG de Ponti: "The Eurofighter-Typhoon project is an important effort for our air forces. It is about the co-evolution of Typhoon with the shaping of a 4th-5th generation integrated force. It is two prongs of shaping more effective European airpower. It is a building blocks approach to shaping evolving capabilities."

The focus is upon achieving practical steps towards greater integration of the Eurofighter-Typhoon based on the working together of the crews to shape common approaches and capabilities. The EAG is leveraging an exercise approach to shape a way ahead.

According to Lt Col. Schiattioni: "We started as a normal forum, but quickly realized that we needed to shape an exercise approach. From the beginning, the Tornado had a much more common operational approach than with Typhoons. Although the jet was built together, each nation did its own training and TTPs. Each nation operated the jet differently. But now that we operate more together, we need clear common operating procedures, notably with regard to maintenance of the aircraft. In turn, this drives a wedge in common modernization which needs to be done with the broader fleet."

The approach is based on sharing information and to get the pilots and maintainers to together to share experiences and to shape common standards. Lt Col. Schiattioni underscored that "We managed to get the key people for each air force responsible for the standards for their national aircraft to shape a more global approach to standards.

And also important was bringing the maintainers together to share lessons learned and to shape more common maintenance procedures." Lt. Col. Lecube emphasized that the program has been very industry driven which meant that the operational commonality was not the center of attention.

"But at the squadron level there has been a growing interest in ways to shape more operational commonality. The Baltic patrolling was a key driver for this approach as well. With the Spanish and the British e.g. operating together in the Baltic Air Patrol, it is crucial to operate a common SOP in such operations."

A key achievement clearly is to shape a more common SOP for operations and maintenance which, of course, will become even more important as the Tranche 3 standard comes into play for the Eurofighter nations.

Underlying the new approach is a broad agreement reached many years ago where the seven Eurofighter nations agreed to broad ways to work together but the EAG as in other areas is focused on driving practical solutions.

Lt Col. Schiattioni added: "The sharing of information can provide a better way to underscore how each nation can pursue modernization but sort out which among the Eurofighter nations is interested in a solution

generated by a particular nation. This will allow national, bi-national approaches which can drive innovation for the larger Eurofighter enterprise.”

As I mentioned earlier, the transition from Tornado to Typhoon encompassed a transfer of some core weapons which had been carried by Tornado onto Typhoon, and this UK project is clearly of interest to the other Eurofighter partners. Project Centurion, has been done in three phases.

Phase One Enhancement (P1E) of the Typhoon has included the integration of Raytheon Paveway IV laser/GPS-guided bombs. P1E entered service in 2015.

Phase Two Enhancements (P2E) include “initial integration” of MBDA’s Meteor BVRAAM and Storm Shadow air-to-surface cruise missile. P2E also includes additional human-machine interface (HMI) and availability improvements to operate the weapons as well.

“Final integration” of both weapons is part of P3E, which also includes the MBDA Brimstone 2 close air support weapon.

Finally, a key element of the Eurofighter modernization effort, one which will shape lessons to be learned for the sustainment of F-35 as well as the overall air combat force, is the new approach to Eurofighter sustainment. This new approach is based on a 2016 sustainment contract called TyTan.

The contract is the product of the evolution over more than a decade of working on support arrangements associated with various modalities of performance-based logistics to a fleet availability approach. The effort is grounded on the experience gained with the Tornado ATTAC contract and the initial support contracts with Typhoon. The Typhoon has been in service for more than a decade but is still in the process of evolution.

It was designed initially as an air defense aircraft, which was spearheaded in many ways by the requirements of the Central Front and the role of Germany and with the post-Cold era, a migration was started to make it a more flexible aircraft. Project Centurion is part of that migration.

And as the Typhoon fleet was stood up and operational experience accumulated with various deployments by the RAF, the opportunity to shape a new sustainment approach, one, which would embrace the Typhoon as a fleet, was possible.

Obviously, the impact of Project Centurion on the fleet is to diversify the fleet at the outset and to require any sustainment strategy to work around and to support modernization of the aircraft.

Another challenge associated with diversified modernization is to manage the different variants of Typhoon.

The TyTan contract is one which leverages two decades of sustainment experience and working an enterprise approach with the MoD and the RAF and shaping new working relationships to achieve the core goal: to provide the right number and types of aircraft at the right time and at the right place.

The TyTAN contract is focused on availability of aircraft for the Typhoon fleet taken as a whole. It is clearly a challenge to position oneself to be able to get a bird’s eye objective with regard to an entire fleet and the effort is a work in progress.

What is at stake is being able to take a longer view with regard to the year ahead of the state of the fleet and the projected availability demands and to make daily decisions informed by the strategic direction of fleet use. And given the mix of Typhoons, it is also about understanding what kinds of sorties are demanded within the framework of the joint fleet plan, and to work the broader approach in terms of being able to provide the right aircraft, to the right place at the right time.

To get to the TyTAN opportunity, the UK MoD, RAF and industry have worked together for a number of years on performance based contracts. The evolution of those contracts started with managing elements of the supply system to provide for parts and to provide technical query management.

But it became clear in working that contract, that for a leap forward in sustainment, namely to get the point where joint fleet management was possible would require more than a PBL approach. It was beyond the kin of industry alone to find ways to better support the RAF.

What was required was nothing less than a fundamental change in the regulations, laws and practices that governed how industry and the government could work together. And by changing the context, an enterprise approach could be empowered. What happened was nothing less than revolutionary.

The rules were changed so that savings generated by sustainment efforts could be recycled back into the increasing the capability of the aircraft.

According to one senior sustainment official “this meant that “industry was not being paid to replace things or benefitting from the need to repair, alternatively we had buy-in from the RAF, MoD and industry to enhance performance, generate costs savings and to provide for new monies for modernization of the aircraft.”



FIGURE 9 EMERGENCE OF THE TYTAN SUPPORT APPROACH

In other words, the TyTan approach is incentivizing support for fleet enhancement, rather than simply sustaining aircraft. It means as well that savings can be provided to support the Centurion Program and other modernization efforts for Typhoon.

This is especially important as I believe the other partners of Eurofighter have not been exactly pushing the envelope on aircraft modernization which has increased the burden for modernization on the RAF.

But organizational change is not an end state; it is an ongoing process which means that as the approach is implemented and evolves new plateaus will be reached and it is hoped that the enterprise rules can then be modified to enable whatever the next phase might be.

In short, the TyTAN approach is a key effort in support of the RAF as they move forward with Typhoon deployments. And as these deployments change in the post counter-insurgency phase, new demands will be placed on the fleet, and the enterprise will adjust to try to provide optimal fleet support.

This UK experience is very different from that of the Australians. The Australians are sunsetting their classic Hornets and have sold some of these to the Canadians. They will keep some of their Super Hornets until they have stood up their complete F-35 force and have a key naval support weapon operational on the aircraft. They will then become an F-35 fighter force.

But for the UK having both the Eurofighter and F-35 does provide a way to work with the Eurofighter and F-35 Air Forces on the continent; and this is something which will provide an expanded set of partnering options for the RAF as well as UK industry going forward into the uncharted waters of a post-Brexit Britain.

F-35 ENGAGEMENT AND IMPACT

The UK has built the carrier as part of a national shipbuilding effort, enabled by the coming of the F-35. The F-35, of course, is coming not only to the RAF and Royal Navy but to partner nations in Europe and worldwide creating new opportunities for collaboration.

It's particularly important that the UK will be flying the same aircraft as the Northern Europeans, including the Dutch. And the close working relationship with the US Navy and Marine Corps which is evident in the working relationships with new Queen Elizabeth carriers. What's more, the US Marines will operate off of the ship, including next year during further ship trials off of the British coast.

The Dambuster squadron arrived at RAF Marham last summer and it is clear that the RAF and Royal Navy leadership are focusing not just on standing up the jets but shaping a longer range view as well. Their focus is for the longer term, on how to support the new air system, how to leverage the air system as part of a multi-domain transformation of the UK forces and how to work with allies to get the best combat coalition advantage out of the aircraft as a coalition asset as well.

This is clearly a work in progress but one, which will shape the future of combat airpower in the UK for sure. Because the F-35 is first to operate from the Queen Elizabeth carriers, the joint experience of operating an RAF and Royal Navy asset off of a ship will be part of the transformation as well.

How will that joint experience and operating from a mobile airbase affect the thinking about the new air combat strategy?

How will it affect the way ahead for the UK forces more generally?

During a 2018 visit to RAF Marham, I had a chance to talk with Group Captain Townsend most recently was the Deputy Lighting Force Commander and has come from that position to be the Station Commander at RAF Marham.

The base at RAF Marham is being rebuilt to operate the F-35 and to shape the transition from Tornado to F-35 as well. But the challenge is not simply to put in place a 21st century infrastructure and to introduce a new aircraft, it is about shaping an integrated base operational system which enables the F-35 to become a multi-domain combat system driving innovation throughout the force.

Group Captain Townsend noted that he was travelling to France shortly and to view the Maginot Line alongside a group of RAF senior leaders. The point of this was to focus on getting the right warfighting strategy to go with the right technology to deal with 21st century adversaries.

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

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

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

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

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

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

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

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

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

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

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

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

“That is too focused on airplanes.

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

During my most recent visit to the UK in May 2019, I had a chance to continue my conversations with regard to the next phase of the F-35 in the UK force. The RAF is preparing for the deployment of F-35 as an expeditionary force. They are focused on the coming deployment to Cyprus and for operating onboard the Queen Elizabeth carrier as part of the preparation for its 2021 initial operating tests.

Chief of the Air Staff Air Chief Marshal Sir Stephen Hillier highlighted the coming deployment to Cyprus as follows:

“It is great to see 617 Squadron, the modern day Dambusters, flying the most advanced and dynamic fighter jet in the UK’s history and about to start their first overseas deployment.

“I have no doubt that this short deployment will offer many tests, but likewise I am confident that our highly trained and skilled personnel will rise to the challenge and confirm our ability to deliver truly formidable capability.”

Admiral Sir Philip Jones KCB ADC DL Royal Navy, First Sea Lord and Chief of Naval Staff said:

“This first overseas deployment of these world-beating British F-35B aircraft to RAF Akrotiri, together with their embarkation in HMS Queen Elizabeth for the first time in the Autumn of this year, are important milestones to prove their readiness for deployed operations anywhere in the world in defence of our national interests.”

Clearly, the deployment on Cyprus was not just about getting the air system ready for deployment, but in place an expeditionary eco system capable of supporting the operations of the aircraft.

During this effort, two areas are particularly significant.

The first is the expanded role of the cyber support squadron within the F-35 force. Here the focus is upon the cyber security required to support the data systems integrated into the F-35.

The second is the sustainment approach which is built around the ALIS (Autonomic Logistics Information System) or the IT system which supports F-35 sustainment.

The squadron has been focused on integrating ALIS within the UK's sovereign operational systems as well as working on ways to ensure that it can operate effectively in supporting sustainment. And the cyber support squadron has been a key part of this effort as well.

The RAF will be taking their deployable tactical trailers to Cyprus to provide for the IT support for the ALIS system.

As one officer commented: “I think ALIS is an incredibly malleable system if you understand the system. That's again the work we've been doing over the last 12 months. We've got some deployable infrastructure that we're going to take with us and use for the first time.”

The Brits are treating RAF Marham as the supply hub to resupply F-35s during the Cyprus operation, but in future they could tap into other F-35 supply hubs in the region as well.

The deployment to Cyprus puts them into an environment where the F-35 global collaboration comes into play with USAF, and USMC or USN, Italian or Israeli F-35s operating in the region as well.

And this expeditionary deployment precedes the 2021 deployment onto the Queen Elizabeth. In fact, the flow from the Cyprus deployment to that of Queen Elizabeth as parts of the same learning process. The working relationship with the Marines will continue to be central as the Marines fly onboard the Queen Elizabeth in 2021.

The Aussie approach is somewhat different in that they are operating the F-35As and they are not carrier focused. They also are anticipating an all F-35 force which creates a different approach to the standup of the force as well as was noted by Air Commodore Bradshaw when we talked at RAF Marham last year.

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

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

“You can see going around the base the buildup of our new F-35 infrastructure but see the Tornados flying overhead.

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

Bradshaw also added a perspective on the UK sovereignty perspective with regard to the F-35s at RAF Marham. They are also building what they call “Freedom of Action” facilities to ensure UK sovereignty over their operational aircraft. Such a facility is the stealth finishing facility to ensure maximum stealth performance of the aircraft in operational conditions.

But the UK is building out from outset an approach to leverage the F-35 as a driver of combat innovation, something I like to call F-35 2.0. This is how Air Commodore Bradshaw put it. “The F-35 Integrated Training Center is the jewel in the crown of the F-35 effort at RAF Marham.

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

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

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

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

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

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

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

This is how Air Commodore Bradshaw put it:

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

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

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

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

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

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

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

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

In short, shaping a new operating base at RAF Marham and working with the two Queen Elizabeth carriers provides a significant opportunity for shaping air combat innovation and laying down a foundation which can be leveraged moving forward.

WEAPONS DEVELOPMENT AND MODERNIZATION

Four key dynamics shape the UK approach to weaponization.

The first is the priority placed on the UK weapons complex to develop and deliver the core weapons for the naval and air sectors. In the UK, MBDA and the three UK Armed Services have worked closely over the years, and most notably with the establishment of the Team Complex Weapons approach that has deepened their ability to work closely together.

This approach was described by MBDA as follows:

Team Complex Weapons (Team CW) defines an approach to delivering the UK's Complex Weapons (CW) requirements in an affordable manner. This value for money proposition also ensures a viable industrial capacity.

The implementation of the Team Complex Weapon's approach between Ministry of Defence (MoD) and MBDA is through the Portfolio Management Agreement (PMA), which has been independently evaluated as offering greater than £1Bn of benefit to MoD over their 10-year planning period.

The PMA aims to transform the way in which CW business is conducted by MoD with its main supplier. At the heart of this is a joint approach to the delivery of the required capability based on an open exchange of information and flexibility in the means of delivery.

<http://www.mbda-systems.com/about-us/mission-strategy/team-complex-weapons/>

This agreement has allowed the UK MoD to work with MBDA and other weapons suppliers to shape the evolution of capabilities in close cooperation with the operators to shape ongoing capabilities. And such an approach is absolutely central to the emergence of the next wave of weapons, namely software upgradeable ones. The developer, manufacturer and the operator have to be in a close symbiotic relationship to craft the kind of software transient advantage necessary to deal with peer competitors.

The second is the changing nature of weapons whereby the sensor-shooter relationship is becoming distributed, a trend clearly facilitated by the F-35 and its interactive allied capabilities to identify targets and to provide for C2 at the tactical edge.

The working relationships established under Team CW have facilitated the transition to the next phase of weapons development, namely software upgradeable weapons. It has also allowed for the significant evolution of capabilities to support the land wars, notably with the transition from Brimstone to Dual Mode Seeker Brimstone.

One example is clearly the Meteor missile. It is an active radar guided beyond visual range air to air missile which offers a multi-shot capability against long range maneuvering targets. It can do so in a heavy electronic countermeasures environment at extended ranges owing to its air-breathing propulsion system

Longer range is crucial for a combat aircraft that has enhanced situational awareness with a significantly greater radar reach than the current AMRAAM, and the Meteor certainly is considerably more appropriate than the traditional AMRAAM for the F-35.

The new Meteor missile developed by MBDA is a representative of a new generation of air combat missiles for a wide gamut of new air systems. It can be fitted on the F-35, the Eurofighter Typhoon, Rafale, Gripen and other 21st century aircraft.

It is a software upgradeable missile which pairs nicely with the arrival of a software upgradeable aircraft like the F-35.

Software upgradeability is a game changer for 21st century systems not well understood or highlighted by analysts. In the past, new products would be developed to replace older ones in a progressive but linear dynamic.

But now, one builds a core product with software upgradeability built in, and as operational experience is gained, the code is rewritten to shape new capabilities over time. Eventually, one runs out of processor power and BUS performance and needs to consider a new product, but with software upgradeability, the time when one needs to do this is moved significantly forward in time.

It also allows more rapid response to evolving threats. As threats evolve, re-programming the missiles can shape new capabilities, in this case the Meteor missile. The current production missile is believed to be using well below the maximum processing power and bus capacity of the missile. Significant upgradeability is built in from the beginning.

Although software upgradeability is not new with regard to weapon systems, the F-35 as software upgradeability is. Combining the launch of a software upgradeable aircraft with a missile designed from the ground up with upgradeability built in will allow the aircraft and the weapon to evolve together over time to deal with evolving threats and challenges.

And underlying the model and the code is a multinational team. And this team is the core capability, which can drive weapons development over time. MBDA has functioned as the prime and has worked with three aircraft manufacturers and radar manufacturers already and is working with additional players as the missile prepares to go onto the F-35.

What has been a challenge – working with six air forces – is an opportunity as well. Each of the partners had different takes on the target set they wished the missile to serve. This has meant that the range of targets and engagement envelopes were very wide ranging, from low-level cruise missiles and high flyers, to UAVs, to helos, etc. The end result is a software upgradeable missile with a very wide-ranging initial capability to deal with a diversity of targets.

Another key aspect of the missile is it is designed from the beginning to be employed on and off-board. It can be fired by one aircraft against a target initially cued by another aircraft or system and then handed over for delivery to target by the original aircraft or the inflight data link can be used via another asset – air or ground based – to guide it to target.

It is understood the missile will be integrated into the Block 4 of F-35. When so done, the missile can provide a sweet spot of 4th and 5th generation weapons integration with its core networking capability. Because of the nature of software integration on the F-35, the Meteor missile, which will be integrated onto the F-35 due to European requirements, means that it is available to all the other global partners of the F-35 as well.

The RAF Typhoon Force is leveraging Meteor as a key asset to work integration with the F-35.

The Typhoon is being modified to enhance its capability to receive targeting data from F-35s and with the longer range of the Meteor can operate as a weapons caddy for the F-35 in firing many types of weapons, and certainly provide a significant barrage of air to air strike missiles to support the forward operations of the F-35.

The third is the clear focus on leveraging the F-35 global enterprise to widen the market for UK or MBDA generated weapons.

The coming of the F-35 provides a significant opportunity for the UK to enhance their global reach with 5th Gen weapons such as Meteor and SPEAR 3:

- F-35 as a global enterprise – the 9-Nation MOU encourages US allies in the program to invest in core capabilities for the benefit of the JSF partnership – Meteor and SPEAR 3 are examples of this;
- F-35 is the bedrock for high end warfare and 5th generation weapons such as Meteor/SPEAR 3 will help maximize coalition capabilities with direct benefit to the US services in the joint fight;
- The integration of 5th Gen weapons such as Meteor onto 4th Gen platforms also enables the allies to better utilize their whole combat air force, not just their 5th Gen platforms.

Allied weapons integration on the F-35 provides a range of off the shelf solution sets for those interested in buying weapons developed by key members such as has happened with Konigsberg or MBDA.

The fourth is the growing overlap between UAVs or remotes and weapons.

Because MBDA is a key Franco-British collaborative effort with the Germans as well, the efforts which have been identified by Team Tempest in the UK or FCAS in France and Germany can be facilitated by MBDA.

MBDA has the potential to become a key player in shaping a post-Brexit weapons and remotes development effort which can tie together efforts on the continent with Britain as well.

Australia could become player in how this could play out, which I will discuss in the collaborative opportunities section to follow.

And with the growing interest of Japan in defense industrial development and diversification, Australia could provide a focal point for a reshaping of the weapons complex for the allies as well.

DEVELOPMENT AND DEPLOYMENT OF A FAMILY OF REMOTES

With the Typhoon-F-35 dyad underlying the decade ahead for UK airpower development, the focus is upon making the Typhoon a capable weapons carrier for the F-35 enabled air combat force.

And as the F-35 is leveraged to play this role, the question of how to add mass to the air combat force will be answered in part by the overlap between weapons and unmanned air vehicle or remotes developments.

It is clear that prior to any serious focus on the next manned fighter, there are two decades of work to be done with regard to how to leverage the brains and data links from the F-35 as a C-2 at the tactical edge flying combat system capability.

How best to leverage the multi-domain capabilities of the F-35 to shape a wider range of effectors having an impact in an area of interest?

These effectors could fly autonomously or be engaged by a variety of platforms from Typhoons to rotorcraft to airlifters.

This is an area of clear strategic interest to the UK.

And what the UK as it faces its next two decades of airpower modernization could well be focused on becoming a key player in delivering what Secretary Wynne envisaged a decade ago when he highlighted the coming of the wolfpack concept to 21st century airpower.

As Wynne envisaged it:

The fifth-generation platforms; as scouts would be admonished to not shoot lest they give away their position; but rather to expend all the weaponry from the fourth-generation platforms; or from any available shooter that could reasonably engage the designated target. If they are required to engage owing to the fact they have been detected; then shoot and scoot is the motto. This concept would seek to preserve the quantity of fifth generation assets well into the second and third day of warfare.

Realizing that you go to war with the weaponry you have, not the weaponry you want, our Air Forces, whether Naval Aviators or Marine Aviators or Air Force Aviators need to think about force multiplication and affordability.

Apparently, our leaders are relating in as loudly as they can that our Nation will no longer 'darken the skies' with the quantity of Air Assets made available to our forces.

As a nation we are reaching out to coalition partners and other friendly nations to adapt our capabilities so there is a symbolic and real reserve force worldwide to thwart any determined competitor. The United States capability must be interoperable with these forces and within our own forces to leverage what we can using situation awareness, the ability to share this situation awareness; and overwhelm competitors needs training and early employment.

Concepts for exploiting the best of fourth generation assets and available fifth generation assets; in combination with what we have learned in the first decade of Remotely Piloted Vehicles will be crucial to deterrence in the face of increasing attention to economics.

The 'Wolfpack' can be more than casual thought; properly employed by well-trained pilots, it can change the outcome in surprising ways.

Crafting the 'Wolfpack' can provide a strategic advantage and a best value-leveraging proposition.

<https://sldinfo.com/2012/09/shaping-the-wolfpack-leveraging-the-5th-generation-revolution/>

With the coming of the new UK carrier and with F-35s flying off of the carrier being able to generate C2 at the tactical edge, an ability to work with longer-range remotes can bring significantly flexibility to the combat force.

The UK's F-35 enabled carrier can operate flexibility over a wider area than just where it happens to be operating, for the reach of the aircraft onboard through the data network open to the low observable F-35 the ability to work a wolfpack concept with members of the wolfpack able to operate at greater forward distance, can change the impact of what an F-35 enabled carrier is all about.

The following graphic which we developed to explain how the F-35Bs on the Cavour could have significant reach in the Mediterranean provides a snapshot of the potentiality.

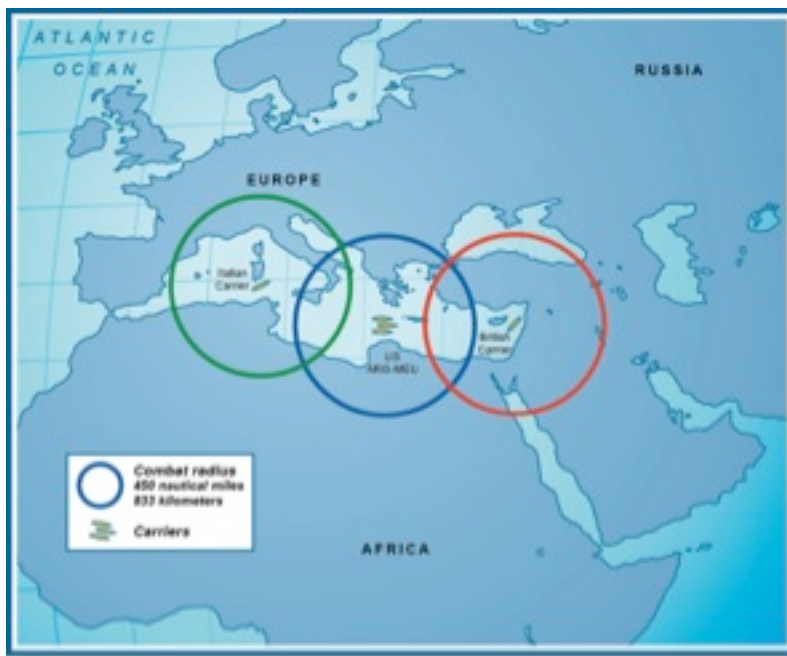


FIGURE 10 F-35 ALLIED REACH IN THE MEDITERRANEAN

Recently, I discussed with a well-placed UK defense analyst, the potential UK approach with regard to remotes going forward.

In this discussion, he argued that at the heart of an effective remote development and deployment strategy was leveraging the F-35. The F-35s fusion engine and ability to do C2 at the tactical edge provided significant opportunities to expand the effectors.

And with a loyal wingman approach one could build a relatively simple and relatively cheap wingman for the F-35 led force.

But the concept of a wingman was greatly expanded and different with a fifth-generation fighter.

One saw this as the F-22s started to sort out the distances and which they flew to support one another and with the F-35 and its fusion engine and low observable data transfer system, the notion of the wingman is migrating to other platforms, other assets and a much broader diversity of ways to provide a targeting solution.

With a longer-range loyal wingman – a modular remote with a data link and an ability to be directed by the F-35 and its interactive networks – can operate from a variety of air launch points which provides for the kind of airbase mobility and flexibility necessary to deal with an adversary which is prioritizing strike on fixed bases and targets.

The UK analyst argued this was a way to give the RAF back a capability for de facto strategic bombing as well as providing for much more flexible employment of the existing force. And with modularity, one could envisage a wide range of potential payloads, which could evolve with technology and with the evolving weapons mix required for diverse missions in a crisis environment.

Such an approach could open the window significantly for partnering for the UK forces and industry, which this analyst felt was crucial to a post-Brexit environment. This could tap into a much broader F-35 enabled market place, much like the weapons manufacturers are doing as well as provide entry points as well into

working with initiatives like FCAS. And obviously, there is a natural point here for collaboration with the Australians.

TRAINING INNOVATIONS

The UK has limited airspace in which to do fifth-generation training, either in terms of the F-35 itself and even more significantly working the broader kill web training piece. This is an area where UK airpower leaders see themselves as providing some leading-edge solutions because of their absolute need to utilize effectively the synthetic environment and by so doing look to provide significant capabilities as well with regard to the kind of live virtual constructive training with regard to kill web C2 and execution as well.

A 2015 article published by *Military Simulation and Training Magazine* provided an early sense of how the UK was approaching its engagement in the F-35 global enterprise and how the training piece was being worked.

From the perspective of one nation, the UK, the F-35 program is estimated to be worth over £1bn (about \$(US) 1.55bn) per year to British industry, and is expected to support 25,000 jobs over 25 years. Alongside the major contribution of BAE Systems and Rolls Royce, over 130 British companies are in the F-35 supply chain. The contribution of most of these companies is not confined to the F-35B or tied to the UK purchase; they have been involved with the F-35A from the start of the program.

One example is Manchester-based EDM, a manufacturer of training systems for both military and civil applications. EDM has developed a Weapon Load Trainer and Cockpit and Ejection Seat Training Systems which are applicable to CTOL, STOVL and CV (US Navy's carrier-based model) variants of the F-35.

The UK F-35B government-industry team is inserting a healthy dose of modeling and simulation elsewhere in the lifecycle of the aircraft and the operational interface with the QEC carriers.

In one instance, the UK identified that the QEC designers needed information on the aircraft to be operated from it, and vice versa. Additionally, the unique concept of carrier operations from the QEC required some development modelling work to be done on the management of the flight deck as well as flying techniques.

In addition to the carrier's ski-jump, allowing semi-conventional take-off at greater weights, recovery to the deck can also be achieved by either vertical landing or the Short Rolling Vertical Landing (SRVL), which again allows recovery at greater landing weight, such as with unexpended ordnance. In the former case, the aircraft is recovered to a position alongside the desired landing spot at 100ft, and then maneuvered sideways until over the deck and descended vertically.

For the SRVL, the aircraft is recovered to the ship centerline at 200ft, and closes until a 7-degree glideslope is achieved, then descended on the 7-degree slope, guided by indicator lights until contact with the deck at a predesignated spot. BAE Systems has built a flight simulator at its Warton site which has been used in the development of these techniques, using data supplied by the QEC Carrier Alliance.

The UK MoD and its industry supplier is using a blend of virtual and live training on their roadmap to achieve the nation's F-35B initial operational capability for carrier operations.

While industry team member BAE has a cutting-edge flight simulator for F-35B development, the week of this February 23, the Lightning II variant started its live "ski-jump testing." In this early live training phase, two UK pilots are initially testing the ability of the new warplane to take off from upward-sloping ski-jump ramps used on aircraft carriers like those operated by Britain and Italy. The ramps launch the jets forward and upward, reducing the thrust needed.

<https://militarysimulation.training/air/international-expansion-f-35-lightning-ii/>

The virtual environment is crucial in order to use a number of the fifth gen capabilities, associated with tron warfare and other cross leveraging means which one would not like the adversary to be able to see in the operational space.

This means then that the preparation for kill web ops requires combining live and virtual training either in the same physical training space or through visual engagement across training spaces.

What a kill web allows you to do is to operate a force appropriate to the full spectrum crisis management environment which the liberal democracies face.

Because the adversaries are building to mass and are emphasizing expansion of strike capabilities controlled by a very hierarchical command structure, the kind of force which will best fit Western interests and capabilities is clearly a. distributed one.

Fortunately, the technology is already here to build effectively down this path, a path which allows engagement at the low end and provides building blocks to higher end capabilities.

Recently, the UK MoD announced a new training effort which clearly provides a building block for shaping the way ahead along the lines described above.

According to a recent story published [May 16, 2019](#) on the UK MoD website, the Gladiator program was announced and described.

Speaking on a visit to RAF Waddington today, the Minister announced a £36m contract for simulation technology which can replicate up to three real-life scenarios simultaneously and independently of each other, allowing US and UK aircrew to experience the same battle environment and threats.

The capability, known as ‘Gladiator’, will give the RAF unprecedented training flexibility, enabling pilots to exercise capabilities, tactics and procedures that would be impossible in the live environment due to airspace, aircraft availability, or security constraints.

Defence Minister Stuart Andrew said:

“This synthetic training technology offers the RAF a cost-effective, powerful and safe way to prepare our aircrew for the complex threats they will face on the battlefield.

“The UK-US defence partnership is already the deepest and most advanced of any two countries and now our pilots will be able to train for the frontline more closely than ever.”

The manufacture and design of the capability is expected to be completed within two years, with aircrew to start training on the equipment in autumn 2021.

Initially, Typhoon pilots will be able to fly virtual missions alongside their counterpart aircrews in America and interact with UK and US Joint Terminal Attack Controllers who direct combat aircraft from an advanced ground-based position. F-35 Lightning jets are expected to be added to the package by September 2021.

The RAF will also look to include Wedgetail early warning radar aircraft in the future, as well as upgrading the capability to enable the Royal Navy and the Army air assets to undertake collective training exercises.

The contract, signed with Boeing Defence UK, includes the design and manufacture of the simulation systems and software, and the first five years of support, sustaining up to 40 highly skilled UK jobs. The design and

manufacture of the software will take place in Fleet in Hampshire and Bristol, and the equipment will be installed at RAF Waddington.

Flight Simulator and Synthetic Training Portfolio Team Leader, Russ Cole, said:

"The award of this contract heralds a 21st century capability that will transform the ability of the RAF to undertake collective operations, tactics and procedures training in the synthetic environment that cannot be performed in the live environment.

"We are looking forward to working with Boeing over the next few years to design, build, deliver and operate a state-of-the-art training hub at the centre of a collective training web capability."

Air Commodore David Bradshaw, Senior Responsible Owner for the programme said:

"This contract award signals the go-ahead for the core element of the Royal Air Force's future synthetic training capability. This new capability, known as Gladiator, will provide a step-change in the ability of our front-line Forces to train together in operationally realistic situations to meet an ever-increasing adversary threat."

"Combined with other Programmes that are delivering new aircraft simulators to front-line Squadrons, Gladiator will allow aircrew to hone their skills, training with colleagues and allies. Our crews will be better prepared for a range of current and potential scenarios they may face. Gladiator is the pathfinder programme for similar synthetic training solutions planned across UK Defence."

<https://www.gov.uk/government/news/uk-and-us-pilots-to-prepare-for-frontline-on-state-of-the-art-simulators>

TEMPEST PROGRAM SPONSORED TECHNOLOGY DEMONSTRATORS: THE NEED FOR A UK PLAN JERICHO

In effect, Team Tempest is focused on generating effective technology demonstrators from UK defense industry working closely with the government. Although identified as focused upon replacing Typhoon at some point, the reality is that leveraging the Typhoon-F-35 dyad is really the point.

And the evolution of the effectors flowing from this dyad in my view will define what comes next in terms of a fighter aircraft. The potential advantage which the UK has comes through its two, coalition developed and operated aircraft.

On the one hand, Typhoon allows for reachback into the continent and working relationships with Italian, German and Spanish industry. And provides ways to work with the Franco-German FCAS initiative.

On the other hand, the F-35 global enterprise fits much better the "Global Britain" thematic which comes out from the Brexit dynamic.

As sense of what Team Tempest is about was provided by an announcement of a Team Tempest Industry Day in Farnborough.

Companies from across the UK defence industry came together in the first opportunity for suppliers to engage with the Government and Team Tempest partners over the future of Combat Air System development in the UK.

The event in Farnborough was launched by Minister for Defence Procurement, Stuart Andrew, and saw 300 delegates including SMEs and technology-led organisations attending to build connections and take part in a series of briefings outlining the capabilities and skills needed to shape the future of Combat Air System delivery in the UK.

The Tempest programme aims to harness and develop UK capabilities that are critical for Next Generation (NextGen) Combat Air capability and to retain the UK's position as a globally competitive leader through understanding of future concepts, technologies and capabilities.

Hosted by Team Tempest (a co-funded technology initiative bringing together the Royal Air Force Rapid Capabilities Office, Dstl, DE&S, BAE Systems, Rolls Royce, Leonardo and MBDA) and facilitated by ADS, the event offered a briefing for UK industry to better understand the Tempest programme and its role in supporting the UK MoD's Combat Air Strategy and was followed by a separate, classified briefing.

The Tempest programme will directly inform the UK's acquisition programme to succeed Typhoon. Representatives of the acquisition team were on hand at the event to explain their programme and how it interacts with the Tempest programme.

ADS Chief Executive, Paul Everitt, said: "The UK's future Combat Air capability is essential for our national security and the long-term health of the UK defence industry.

"It is great to see Team Tempest reaching out to the wider UK industry and ensuring this important project is a genuine national endeavour. The UK has world leading capability and a diverse range of businesses with the experience and expertise to support this important work."

<https://www.contracts.mod.uk/do-features-and-articles/government-holds-team-tempest-industry-day-in-farnborough/>

Obviously for a post-Brexit Britain, the financial and working relationships necessary to achieve a broader global success will be challenging.

And the launch of Team Tempest around a next gen fighter model was nice, but I would argue also perhaps a bit ahead of itself.

I would argue that the Typhoon-F-35 dyad and leveraging that dyad through innovations in weapons, remotes and training will be the key definer of the way ahead.

This would suggest that perhaps complementing or supplanting Team Tempest might be a UK focused Plan Jericho.

The brilliance of the Aussie Plan Jericho launch was precisely because it was NOT technology centered. It has been focused on how to build a fifth-generation force; how to build an integrated, fifth generation enabled force. It is con-ops oriented interactive with considerations of technology and organizational innovation.

The danger is that the defense industrial base will drive the options, rather than the UK force transformation necessary for the force driving what one would want from a defense industrial base undergoing significant change with the twin impacts of Brexit and the F-35 global enterprise underway.

Precisely because the carrier is a disruptive technology and seriously challenges the UK's ability to integrate air-sea and insertion forces, and certainly raises fundamental questions with regard to how the civilian leadership will use such a capability in a crisis, the focus needs to be on how to manage a way ahead with the O-5 military or rolling FYDP as the military builds near term capabilities which prepare it fight more effectively rather than more graphics or mock ups on what the next generation fighter might look like.

The blunt fact is that the next two decades of leveraging the F-35 global enterprise will be a key driver in whatever comes next.

And frankly, neither I nor anyone else really knows where the successes and failures will be and the openings which will have to be filled in real world combat.

VI. SHAPING A WAY AHEAD: COLLABORATIVE OPPORTUNITIES

Obviously, there is a long history between Australia and the United Kingdom. But the defeat of the British and Australian forces in the Fall of Singapore led to Australia working much more closely with the United States during World War II and after.

And the entrance of the United Kingdom into the European Union led the British to change significantly their relationship with the Commonwealth.

This means that at least thirty years of history has seen the UK-Australian relationship as hardly the central one in their respective histories, but this could well be changing as the strategic threats change as well as the alliance relationships for each in the context of a very dynamically changing world of global liberal democracies.

For the British, the change is very clear.

Brexit will pose the challenge of fundamentally reworking the UK's relationship with Europe as well as the broader world. And it almost certainly will challenge how "United" the Kingdom will actually become.

For the Australians, the change is less dramatic but significant as well. At the heart of the change is the rise of China, and the need to have a more significant role in their own defense rather than being an input to a global American strategic policy.

The rise of China piece is as much about the role of the Chinese reach into the Australian polity and economy as it is about any direct military threat.

And the challenge of reworking the relationship with the United States is really three Administration's in the making.

George W. Bush led an invasion of Iraq and changed the face of Middle Eastern policies.

The Obama Administration pursued a globalization policy without teeth, and the experience of watching wavering Red Lines during that Administration left the Aussies puzzled over what exactly the Administration would really do.

Now with the Trump Presidency, I am not using the term Administration, because it is precisely because it is not an Administration in any classic sense which creates significant challenges for America's allies. The President is the center of his own initiatives; and the relationship between those initiatives and anyone employed by the US government let alone at a senior level is never quite clear.

I am making this broader point about the evolution of American simply because the shift I think is significant and something way beyond the question of the Trump Presidency. This means that the Australians need to rethink how to rework their own defense in a broader alliance context, where the United States is the central ally but not the only one that matters in terms of shaping their defense and security policy going forward.

The well-known and experienced Australian strategist, Brendan Sargeant, put the challenge this way with regard to Australian and the reworking of alliances.

"Great powers like the United States are more interested in totalizing alliance arrangements than their alliance partners are likely to accept. Australians like other regional allies of the United States will seek

working arrangements with a variety of regional partners to provide for our interests and work through different sorts of working arrangements to deal with our strategic challenges.”

“The shift is clearly from followership to engagement in working relationships where leadership is shouldered or shared differently from the great power followership role which Australia has followed first with Britain and then with the United States.

“Working relationships with regional or global partners around specific issues and challenges are becoming “the real alliances. They are being built in response to specific crisis or specific problems.”

For Australia, the challenge will be how to deal with global and regional crisis management. For defense, this means shaping capability which can be leveraged in a crisis and effectively used by political leadership effectively to meet the national interest.

This means taking a hard look at the kind of defense force which Australia has and is developing and determining which tools are available to decision makers.

It also means building a more durable and sustainable force through a crisis period.

“The ability to deploy force creates more decision space in a crisis. But you need to do that over time. That requires a robust logistical and industrial base that can give you more confidence that you can scale up during a crisis.”

“From a policy perspective, you want to give yourself more strategic options by giving yourself more time. Which means that you will need to have a more sustainable force during a crisis.”

And the crisis management challenge requires thinking through partnerships and working relationships with allies.

“When do you exercise leadership? When do you exercise followership?”

Comparing the Paths of the RAAF and the RAF

A presentation at the Williams Foundation seminar in August 2018 by Air Marshal S D Atha, Deputy Commander of Operations for the RAF provides a good baseline from which to understand overlaps and differences between the RAAF and the RAF.

What he focused on was the strategic shift from the land wars to engaging with peer competitors. He underscored how the flexibility demonstrated by Western airpower over the past decade and a half in the counter-terrorism operations in the Middle East actually has led to a de-emphasis on the core function from a national point of view, which is deterrence of a peer competitor, and in the British case this was clearly Russia.

He noted that with the celebration of the 100th anniversary of the RAF, the refocus on the deterrence mission was central to British thinking. The RAF is engaged in a number of Article V activities such as air policing in the Baltics and most recently in Romania. He underscored that the ability to forward deploy and support allies provided for a key deterrent function, mainly, to deflect adversary actions.

He argued that deterrence obviously required have a punishment capability associated with it, and although he did not use the term crisis management, he clearly had in mind the key role of an ability to deny adversary objectives. Airpower played a crucial role in this function because of its ability to operate rapidly and over distance.

He argued that the RAF and the RAAF now flying common platforms, notably the F-35 and the P-8, could enhance their interoperability. The two Air Forces had much in common, including historically. But moving forward they shared some common approaches to deterrence as well.

He did distinguish between the two air forces with regard to the question of building a fifth-generation force. The Aussies are clearly moving from 4th to 5th generation and rebuilding their force around the new F-35 capabilities; according to the Air Marshal, they thought this put too much emphasis on a single platform and they will be flying Typhoons for several years as well as working on building a new air platform as well.

The Air Marshal emphasized a number of key capabilities which needed to be enhanced in the period ahead to have a more effective deterrent structure.

First was an ability to have much more effective mobile basing. With the coming of the F-35B as well as the Queen Elizabeth carriers, a new approach to mobility was being injected into the RAF.

Second, how best to interconnect 5th generation aircraft with 4th generation aircraft?

The RAF clearly has an approach evolving between Typhoon and F-35 but the overall challenge will be to shape ways for overall force capabilities to be enhanced as the new air system is introduced.

Third, from a deterrent perspective, how best to ensure that coalition forces can work together in a networked environment?

He did not put it quite this way but the question on the table certainly with regard to crisis management is how does C2 work with a coalition force of variant possibilities?

Personally, I think this question is a key one, but I also think that the fifth-generation forces will do operations separate from those allies which simply do not have those capabilities, not the least of which such a force can deliver much more lethal impact with significantly less deployed force than can a legacy one.

Despite the similarities between the RAF and the RAAF, there is a clear difference with regard to their approach to fifth generation aircraft, at least in terms of how policy is stated.

For the RAAF, the F-35 is being leveraged to configure a very different force and they are not looking to the next generation tactical aircraft. They may well consider ways to deploy longer range strike on a new platform, whether it be a bomber or something like an A400M. Their focus is clearly on fifth-generation enablement of an offensive-defensive strike enterprise.

For the RAF, the government is already shaping a new air combat strategy built around another tactical fighter. This will be challenging on several dimensions, but the Aussies prefer to invest in ADF force integration and development rather than a next generation fighter.

The newly announced air combat strategy raises a number of questions for Britain, for the RAF and for working relationships with the RAAF as well.

With Brexit and the current European dynamics, how will the UK air combat strategy interact with European initiatives?

How will the UK leverage Typhoon and shape a post-Typhoon strategy?

How will the UK leverage the launch of its new carrier and the coming of the F-35 to shape a way ahead for a 21st century air combat strategy?

Will the new Air Combat Strategy live up to the legacy of Air Marshal Dowding and his focus on the right concepts of operations for the RAF to deal with evolving threats and challenges?

Which global partners might join this project and what manner?

In short, given the strategic context, how realistic is the project as announced?

Put in stark terms, the Aussies are retiring their fourth-generation aircraft; the RAF is modernizing them.

The RAF and RAAF are on complimentary path in some dimensions but a divergent one on others.

Britain is a nuclear power; Australia is not and this has an impact as well on approaches to deterrence of an authoritarian adversary.

Nonetheless, there are several areas where collaboration is already occurring and could be deepened to ensure that the UK and Australia could help each other more effectively in the reshaping of their defense forces in era of change both in terms of the alliance dynamics for the liberal democracies as well as the nature of the threats being posed by the 21st century authoritarian powers.

A Plan Jericho Initiative

The Aussies have been very open to working with a variety of nations and to buying platforms to reshape their combat force. They are clearly now reworking their defense industrial policy but they have not been forced by powerful prime contractors as in the UK to buy a particular capability.

This means that the Aussies have been able to have a broader reexamination and process of change to reshape the integrated force not on legacy defense industrial lines but with a much more open aperture on the way ahead with regard to how to build out a defense industrial structure which can better support transformation and self-reliance.

The five-year process of working Plan Jericho type of thinking in Australia would be a good place for the UK MoD to start in coming up with a more integrated approach to their defense transformation and guide Team Tempest rather than being driven by the industrial interests underlying Team Tempest.

The F-35 Global Enterprise

The F-35 global enterprise is clearly a very significant domain within which both the UK and Australia can generate common initiatives as well as to help organize nations within the global user groups to drive the kind of changes in the air system which can benefit both countries.

Clearly, both have a key stake in making regional support structures work with the UK being able to leverage European support structures to plus up a regional support approach which clearly the Aussies are on track to replicate in their region as well.

Significant cross-learning as well as common lobbying of the USAF and DoD can facilitate change favorable to a regional support structure approach.

Another example is collaboration on the mission data system underlying the aircraft its threat identification capabilities.

In article published by Australian Defence and Business Review on their January-February 2019 issue, Andrew McLaughlin provided a look at how the Aussies, the Canadians and the UK are working common solutions.

But an EW system is only as good as the data library from which it draws its information. While the ASQ-239 may be able to provide information on threats to the pilot faster than previous systems, the old adage of ‘rubbish in – rubbish out’ remains as pertinent today as it was with older analogue systems.

To this end, dedicated data reprogramming laboratories have been established by the US, partner nations, and FMS customers to generate mission data files that will ensure the F-35 EW system’s data library is not only of sufficient fidelity for its advanced systems, but that it remains tactically relevant for the F-35’s life of type.

There are several reprogramming labs (RL) for the F-35 for which the various partner nations and FMS operators are patrons, and these are generally aligned with levels of capability or access. The US maintains its own RL at Eglin AFB in Florida, and an FMS customer lab has been established at Naval Air Warfare Center (NAWC) Pt Mugu, Ventura County north of Los Angeles.

Australia has teamed with two other non-US ‘five-eyes’ JSF program partners to establish the Australia Canada UK Reprogramming Lab (ACURL). The three nations share common geo-political and strategic interests, and are generally subject to similar US export and security requirements. And while Canada has paused its F-35 acquisition pending a competitive evaluation of other air combat capabilities, it remains an ACURL partner for the time being.

“There’s a number of different laboratories being established,” Australia’s JSF Program Manager, AVM Leigh Gordon told ADBR. “There’s one for the Norwegians and the Italians (the NIRL), there’s the US complex (USRL), and there’s the ACURL. There’s also a lab at Point Mugu that looks after FMS customers and other partners who haven’t built or contributed to their own sovereign reprogramming laboratories.”

The ACURL hardware was initially established at Lockheed Martin’s Fort Worth factory in Texas, but is in the final stages of being moved to a purpose-designed 2,300 sqm facility adjacent to the USRL at Eglin AFB in Florida and which comes under the USAF’s 53rd Electronic Warfare Group (EWG).

“The ACURL has two meanings – one is the building and the name on the building. But it’s also the capability,” JSF Division Project Director Support Systems, GPCAPT Guy Adams told us.

“The reprogramming capability consists of hardware and software tools to build the MDFs, and additional hardware and software to test the performance of the MDFs once they’re produced,” GPCAPT Adams said. “It also includes the people – that capability will consist of up to about 115 people by the time we get to IOC (initial operational capability) which includes Australian plus Royal Air Force and Royal Navy personnel as well. It also includes US partner support complex personnel and a number of US contractor personnel.”

The hardware component of the ACURL consists of radio frequency stimulators and simulators, as well as actual aircraft hardware that can inject threats to test how mission data files will respond using hardware-in-the-loop testing procedures. While no date has publicly been set for IOC, it is planned to be later this year.

“The ACURL is an absolute joint arrangement between us and the UK – we are tied at the hip to the UK,” explained GPCAPT Adams. “The ACURL is jointly managed and operated by Australia and the UK, with operators of both nations joined in dedicated reprogramming teams,” he added. “We really appreciate the experience the UK brings to the table from their reprogramming background.”

The mission data files generated by ACURL will be far more sophisticated than those used by 3rd and 4th generation combat aircraft.

“I won’t go too far into that, but with respect to the complexity associated with reprogramming this aircraft, compared to the EW library you would see in a classic Hornet or even a Super Hornet there are substantially more components to the JSF,” GPCAPT Adams explained.

"For the 5th generation, data is the king and shared awareness is the force multiplier," he added. "In the mission data file space, it's all about recognising that the real capability in the F-35 is the complex sensors and the way in which that information is integrated and passed not only to the pilot, but to other platforms as required."

Much like the myriad of ingredients a chef needs to source to be prepared, cooked and presented for a menu in a Michelin star restaurant, the raw data for ACURL comes from a wide variety of sources. "They come from multiple sources, given the multiple parts of data that we need to program this aircraft," said AVM Gordon.

"They come out of a number of intel shops, depending on whether it's EW-related data or any of the other boxes that needed to be filled. But they generally come out of the intel shops both here in Australia, and from the five-eyes community."

Fortunately for all F-35 operators, it hasn't been necessary to start with an empty pantry for the Michelin star ACURL. Data that has been gleaned over decades for previous generations of air combat capabilities such as the classic and Super Hornet, can also be integrated with the F-35's EW library. "The legacy data can be used and what we're finding is it's effective, it works," AVM Gordon said. "But the F-35 would like more detail, so to speak."

And it is the ACURL that provides that higher level of detail. In the past the ADF's Joint Electronic Warfare Operational Support Unit (JEWOSU) – which is now part of the Edinburgh-based Air Warfare Centre – has been tasked with developing EW data files for the ADF, and this will continue.

"From an organisational perspective, the Australian people that work at ACURL will also belong to the Air Warfare Centre," explained GPCAPT Adams. "So, ACURL does for F-35 what JEWOSU does for the remainder of the ADF platforms, but they work for the same organisation."

"Whilst outside of the JSF Program of Record, one of the other aspects of the mission data capability that we've been working on is the Ghosthawk tool set," said AVM Gordon.

"Ghosthawk is a tool to allow us to better manage intelligence data, and helps us get it into the right format in a way that it can feed into things like ACURL. However, Ghosthawk is intended to be entirely platform agnostic with an ability to support a wide range of ADF platforms as well as the JSF.

"It's not just having the data, it's got to be in the right spot in the data base in the right order to be able to be sucked up by the next step in the system," he added. "JEWOSU already has a database, and Ghosthawk will replace that with a far more '5th gen' paradigm. The current database is very 'mandraulic', and limited in the data types it supports.

"Ghosthawk will provide the ability to store digital models of various threats and responses. The level of specificity that this whole system allows us to bring to the game, makes that data absolutely critical when it comes to joint warfighting with coalition partners."

The installation of the ACURL hardware in the loop test facility at Eglin AFB is due to be completed at time of writing, after which the lab will be integrated and tested, and the ACURL staff will commence their training on the new systems. Following that, a verification and validation program will be conducted to ensure the ACURL can meet the operational rate of effort requirement of the UK and Australia. IOC is scheduled for the second half of 2019.

The five-eyes arrangement and Australia and the UK's agility provides an opportunity for the ACURL to contribute better ways of managing and presenting mission data files to the wider JSF enterprise.

<http://adbr.com.au/building-data-inside-the-raafs-f-35-mission-data-programming-capability/>

Flying Common Platforms

The RAF and RAAF are flying other common platforms than the F-35 as well.

Notably, they are both operating P-8s and working with the US Navy on reworking their ASW approaches with the systems onboard. And the performance of the Australian E-7 significantly influenced an MoD decision to replace their AWACS with the E-7 as well.

These are both American air systems, but it is clearly the UK and Australia have common requirements for operating the two aircraft, both as smaller air forces and in terms of the geography which they are prioritizing regionally.

They will want software modifications for sure to support capabilities which they will prioritize. It will benefit both to work together to enhance the ability of both to ensure that the US will be receptive to prioritizing their upgrades, which of course, the two countries could both financially contribute to.

With the arrival of software upgradeable aircraft as the new norm for 21st century air combat systems, the question of an ability to cross learn and to prioritize specific platforms for upgrades for specific missions for particular platforms is clearly something that would make a great deal of sense, notably for smaller Air Forces.

I had a chance to discuss this during a visit to RAF Waddington in 2016 with the Commander of the ISTAR force. And it is clear that if the RAF and the RAAF could get on the same page with software upgrades they both felt were priorities their ability to both afford and get then would be significantly enhanced.

“Both the F35 and P8-A are hugely software driven, which offers tremendous opportunity for connected computer generated training in federated systems – perhaps linked together as spokes to an overall ISTAR synthetic training hub which includes all of the other capabilities in the ISTAR Force.”

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

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

<https://sldinfo.com/2016/08/transforming-the-royal-air-forces-istar-force-a-discussion-with-air-commodore-dean-andrew/>

Kill Web Training

An ability to actually have a kill web force requires the training to actually do it.

Training will need to occur on two levels.

First, in the live environment, working the physical pieces of operating ADA with Naval Systems with Air Systems and working the C2 architecture to put the pieces in place to cross-leverage and to work distributed C2, on the one hand, and strategic level command of a distributed force on the other.

And such training will require significant ops space, of the sort the US, Canada and Australia have available.

Second, the virtual environment is crucial in order to use a number of the fifth gen capabilities, associated with tron warfare and other cross leveraging means which one would not like the adversary to be able to see in the operational space.

This means then that the preparation for kill web ops requires combining live and virtual training either at the same tie or separately.

What a kill web allows you to do is to operate a force appropriate to the full spectrum crisis management environment which the liberal democracies face.

Obviously, the RAAF and the RAF are already undergoing fifth generation training in the United States, at various locations, including Red Flag. But the Aussies face a significant opportunity to turn their test and training areas into real allied friendly capabilities.

This requires investment by the Commonwealth, but it is clear that the very air and sea spaces in which to practice and develop kill web combat capabilities are in short supply among the liberal democracies. Australia has a real opportunity to build out capabilities in this area.

This is an area where the desire to shape 21st century defense industrial capabilities could be clearly be built and prioritized. And given the UK investments in simulated training, it would be very probable that UK companies could be part of this effort in Australia as well.

It is not just a question of the wide area needed to do training, it is also the question of the security of training as well. Operating from Guam is not exactly a hard challenge for the Russians and Chinese to observe closely.

And US training ranges clearly need to be complemented by Canadian and Australian ranges which European allies need to become regular contributors to.

Here operating common platforms provides an opportunity for not having to fly your own physical asset across the long distance from Europe to an Australian test range.

It is also a question of how to train for the various air and sea platforms can cross leverage one another and to train to do so.

In an interview I did with former head of the RAAF, Air Marshal (Retired) Geoff Brown, we discussed the strategic shift necessary to do kill web training. Notably, we had this discussion shortly after he presented at a training conference held in the UK.

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

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

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

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

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

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

The three key questions for Brown are as follows:

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

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

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

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

He underscored the challenge this way:

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

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

Clearly, this is an area where the UK and Australia are going to invest in – why not emphasize collaborative technologies and approaches and open up the ability to use Australian training ranges?

Weapons and Remotes

There is no area where the UK working Australia makes more sense than in the weapons and unmanned systems or remotes area. Australia has test ranges and very innovative small companies already supporting an indigenous UAV business area, and the UK has a clear to diversity where its UK weapons complex can work.

The last Williams Foundation Seminar held on April 11, 2019, discussed these issues at some length and I followed these up with a number of interviews and the report for that seminar, including the appendices can be read as a complement to this one.

<https://sldinfo.com/wp-content/uploads/2019/04/Sustaining-Self-Reliance-Full-Report.pdf>

The collaborative opportunity with regard to weapons was underscored by Air Marshal (Retired) Brown in an interview held shortly after the seminar.

“Clearly, we need to hold bigger stocks of expendables and weapons, to take one key example.

“I think that operational support and repair capabilities need to be clearly done in Australia and we are on the way to achieve that goal.

“It may cost us a little more because the scale will be smaller, but we probably just should do it for self-reliance.

“There was a good presentation by MBDA in terms of how the British have developed modular weapons which has allowed them to reduce their logistics footprint and kept their developmental and manufacturing capability as well.

“Looking back at the seminar, I believe it was just the start of the conversation and it’s one that we need to continue.

“But I think we are raising the right questions.”

And if Australia were to become a key development, testing and manufacturing hub for weapons, there is a clear opportunity for the Japanese who are seeking new collaborative defense technology opportunities to become a key player in such an inter-allied effort. And all of this is clearly facilitated by flying the same combat aircraft which can provide for common software solutions for a weapon which could fly on the air systems of the three air forces as well.

And given that MBDA is clearly focused on working a legacy-fifth gen enterprise, this would expand the global exportability for Australia as well.

With regard to remotes, the Brits are using test ranges already for the development of the remotes business area.

One example is the Airbus Defence and Space high altitude UAV called the Zephyr.

According to Airbus, the Zephyr S can provide a number of potential applications for users.

The Zephyr S is a solar-powered aircraft, providing a wide scope of applications, ranging for example from maritime surveillance and services, border patrol missions, communications, forest fire detection and monitoring, or navigation.

Operating in the stratosphere at an average altitude of 70,000 feet / 21 kilometers, the ultra-lightweight Zephyr has a wingspan of 25 meters and a weigh of less than 75kg, and flies above weather (clouds, jet streams) and above regular air traffic, covering local or regional footprints. Ideally suited for “local persistence” (ISR/Intelligence, Surveillance & Reconnaissance), the Zephyr has the ability to stay focused on a specific area of interest (which can be hundreds of miles wide) while providing it with satellite-like communications and Earth observation services (with greater imagery granularity) over long periods of time without interruption.

Not quite an aircraft and not quite a satellite, but incorporating aspects of both, the Zephyr has the persistence of a satellite with the flexibility of a UAV.

The only civil aircraft that used to fly at this altitude was Concorde and only the famous military U2 and SR-71 Blackbird could operate at similar levels.

The Zephyr successfully achieved several world records, including the longest flight duration without refueling.

<https://www.airbus.com/newsroom/press-releases/en/2018/07/Zephyr-S-set-to-break-aircraft-world-endurance-record.html>

Unfortunately, this aircraft crashed earlier this year in Western Australia.

<https://www.telegraph.co.uk/news/2019/04/12/uks-ministry-defence-linked-airbus-drone-crash-australian-outback/>

Another was the BAE Systems Taranis. The test flights of the Taranis were held at the Woomera test range. The Taranis program provided inputs into an Anglo-French Future Combat Air system (AFFCAS) which is no on

hold. But it does show that a UK-generated project with Australian could feed into FCAS or Tempest or other global efforts.

<https://www.abc.net.au/news/2014-02-06/taranis-drone-uk-mod-bae-systems-woomera-south-australia/5242636>

And a clear focus of common interest would be variants of the loyal wingman.

The British can bring relevant industrial capacity to the challenge along with Boeing Australia capabilities which can then leverage Australian test and development areas to shape a range of loyal wingman, some designed to fly with the F-35 and its fusion sensor enabled C2 capability and some designed to work with differently configured manned systems.

The Frigate Case

As the Chinese challenge grows, Australia is clearly concerned about expanded Chinese influence within Australia and with regard to Chinese efforts to reshape the external environment to expand the influence and power of the Chinese authoritarian state.

Clearly the United States remains Australia's core ally in dealing with the Chinese challenge, but as Australia modernizes its forces, it is broadening as well its working relationships with other key allies

The case of dealing with the region's growing submarine threat provides a good case study of how the Aussies are working their alliance relationships. With the P-8 and F-35, the Aussies are working closely with the US to add new multi-domain warfighting capabilities to the force. The Aussies just stood up their own training facilities for the P-8, have eight P-8s already at RAAF Edinburgh and are moving ahead with this new capability. They are concurrently working to stand up their F-35 squadrons in rapid succession as well.

The Royal Australian Navy has worked hard to rebuild their once-flawed Collins class submarines and to generate higher availability rates as part of their response to the growing submarine threat in the Pacific. With the P-8 working with Collins, and with the F-35s working with P-8s as well, the RAAF and RAN will shape a new template with the United States to work anti-submarine warfare over the next few years, one in which their reach and capabilities are extended.

The next round of naval capability is being worked with the Brits and the French in terms of platforms, though the US is slated to play a continuing role in terms of force integration.

As Britain faces a post-Brexit world, working with the Aussies is seen as a key political objective, in addition to any technological relationship.

Australia decided to buy the new UK Global Combat Ship frigate at the end of June 2018, a key touchstone of how London sees its new role. It also is a good indicator of the Aussie point of view on what it needs for a new approach to shipbuilding.

On 29 June 2018, BAE Systems Australia were announced as the successful bid to design the Global Combat Ship – Australia Hunter Class frigates, to be built by ASC Shipbuilding at the Osborne Naval Shipyard in Adelaide, South Australia. SEA 5000 Phase 1 Future Frigate Program will deliver anti-submarine warfare frigates, the Hunter class.

The Hunter class enters service in the late 2020s replacing the eight Anzac frigates, which have been in service since 1996.

The Hunter class will have the capability to conduct a variety of missions independently, or as part of a task group, with sufficient range and endurance to operate effectively throughout the region.

The frigates will also have the flexibility to support non-warfare roles such as humanitarian assistance and disaster relief.

Incorporating the leading-edge Australian-developed CEA Phased-Array Radar and the US Navy's Aegis combat management system, with an Australian interface developed by Saab Australia Australian interface, the Hunter class will be one of the most capable warships in the world.

The Australian anti-submarine frigates will be known as the Hunter Class and will be built by ASC Shipbuilding at the Osborne Naval Shipyard in Adelaide, South Australia. The Hunter class should enter service in the late 2020s. They replace eight Anzac frigates, which have been in service since 1996.

The ships will carry the Australian-developed CEA Phased-Array Radar and the US Navy's Aegis combat management system.

<https://www.baesystems.com/en-aus/feature/hunter>

The UK and Australia are shaping a wide-ranging set of agreements on working together as well as determining what Aussie assets might go onto the UK version as well.

There is a clear design and build strategy already agreed to and a key focus is upon the manufacturing process and facility to be set up at the Osborne shipyards.

The priority is upon creating a digital build process.

According to a top BAE Systems official involved in the process, the benefits will be significant.

"Having a single point of truth in the design phase will mean that each of the nine ships will be replicated, which hasn't been done in Australia previously, and which will benefit every stage of the program, including the upgrading and maintenance of the ships during service,"

Glynn Phillips, CEO of BAE Systems Australia, said. "It will also be the first time in Australia where a ship's systems will have the intelligence to report on its own performance and maintenance needs and have the ability to order both the maintenance and parts required prior to docking."

With the coming of the Queen Elizabeth class aircraft carriers and the new UK frigates, and with extensive collaboration to build the Aussie frigates, a key foundation is being laid for working the UK-Australian strategic relationship in the years ahead.

But the frigate program comes with a significant challenge to the UK and its approach to program leadership. The Canadians have also selected the frigate which means that Australia and Canada will buy the large majority of the frigates in the program, while the Royal Navy only a segment of the total buy.

This will certainly mean that the Australians and Canadians will expect their own national content on the overall frigate build as well.

In short, UK and Australian collaborative opportunities can clearly go up in the period ahead, but there will remain significant differences in approaches as well as in their respective strategic situations. But both will be sorting out new relationships with allies, including the United States.

And that process will clearly be one where UK and Australian approaches will clearly be cross cutting.