



The Sir Richard Williams Foundation

Keynote Address

- Chief of Air Force: Air Marshal Geoff Brown, AO -

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Errol, thank you for the invitation to speak today.

Firstly, let me compliment the Sir Richard Williams Foundation on the excellent work that they are doing on being forward-looking and raising the debate on air power issues such as the theme that will be looked at today—Air Combat Operations: 2025 and Beyond. Air power will remain a critical enabler for our National Security Strategy and we must get it right to remain a relevant contributor to regional security.

The theme for today is timely, given the upcoming government decision on the Air Force's Next Air Combat Capability. The level of investment decided by the Government now will be a significant determinant in the platform available to us for the conduct of air combat operations in the next decade and beyond.

Air combat operations in 2025 sounds like a good title for a science fiction novel, until you realise that it is only a little over ten years into our future, which is a bit sobering. The long lead times associated with acquiring complex weapons systems—like fighter aircraft—mean that the air combat force that Australia will field in the 2025 period is already well defined by the decisions we have previously made and are about to make, as articulated in the Defence Capability Plan. In 2025, we will have fielded the F-35 as our primary combat aircraft, supplemented by the Super Hornet. They will be supported by the Wedgetail, Growler, Vigilante, JORN, Poseidon, the Triton UAS and the KC-30A, to enhance the endurance of the force.

This all sounds very cut and dried, but I would like to inject a word of caution here at the beginning of this seminar. The caution comes from the eminent RAF historian of the strategic bombing campaign against Germany in World War II, Sir Noble Franklin. In a conference at the USAF Academy in 1968, he reviewed the development of the four-engine bomber force, the standout example being the American B-17 and the British Lancaster. He noted that only the Americans and the British had persisted through the 1930s with the effort of thinking about and developing these aircraft along with their bombing doctrines over the long capability development process. He noted that the way these platforms were eventually employed bore little resemblance to the concepts created during the development process. He said 'If there is a moral in all this, it is surely that strategic thought and strategic planning in peacetime are necessary and productive processes, provided the realisation is ever present that peacetime plans especially for the employment of new weapons will not, in war, work out in accordance with expectation.'¹

We are about to hear from those most qualified to describe the new capabilities that we will gain with the acquisition of the F-35 and I look forward to learning from them. The knowledge they have obtained and will share with us is a vital first step in our own understanding and the beginning of Australian professional mastery of 5th generation air combat. But it is just the beginning; our employment of the F-35 will develop and evolve over time and change with experience.

We must not become complacent that simply having the F-35 delivers an air power advantage to us. Complacency destroys, and is the enemy of, professional mastery. We must continue to think about and analyse how we employ all of our air combat systems as a 'system of systems' in our regional security setting, and within the rapidly changing technological environment.

¹ Noble Franklin, *The Combined Bomber Offensive: Classical and Revolutionary, Combined and Divided, Planned and Fortuitous*, <http://www.au.af.mil/au/awc/awcgate/cbo-afa/cbo01.htm>, accessed 6 March 2014.

Another highlight of today's seminar for me is the important presentations on the future regional security and future technology environments. Increasing our knowledge of the region can only help us to better understand the actions of our neighbours, and how our own actions are perceived by them. It can be a key resource in our efforts to defuse any regional tension.

In the realm of future defence technology, I welcome any assistance in understanding the future technological environment that we will operate in. So much of what only 20 years ago seemed unlikely now seems possible, if not probable. Developments in unmanned systems, autonomy, stealth, directed energy, ballistic missiles, rockets, hypersonics, space and cyber warfare could significantly affect our options and capabilities both defensively and offensively. These factors will play a large part in deciding how we will upgrade, modify and enhance our air combat systems.

Air Power

Before we spend time on the future systems and their possible applications and challenges, let me take a moment to reflect on what elements of air power I expect to endure, regardless of the timeframe. When talking about air combat operations, I look mainly, but not entirely, to two of our core air power roles: control of the air and strike.

Control of the air allows operations to occur in all of the environmental domains, without the effective interference from the adversary's air power and air defence capabilities. To do this in the time frames that will be discussed today will require the maintenance of a technological edge as technologies continue to change. It also requires numbers—many will have heard my OIF example: 3 x 24/7 Combat Air patrols over Iraq took 155 fighters.

Of course, Strike is the ability for us to attack with the intention of damaging, neutralising or destroying a target. Finding the right balance of multi-role platforms and sophisticated weaponry is a challenge for us all to reflect on. Not getting strike right, when it is applied, can have adverse political, diplomatic and military repercussions. Therefore, it is important to look at the future environment, such as population densities and locations, in order for us to adapt.

In both roles, just having the ability to conduct them in the 2025 context will provide an important deterrence factor. That deterrence will help us maintain one of our prime national objectives: that of regional stability.

With my remaining time, I would like to speak on why 5th generation capabilities are essential to prepare Australia for 2025 and beyond, and the associated challenges with their introduction. However, before I do that, I would like to first review the technological evolution of air combat aircraft in order to put the 5th generation fighter into perspective.

Technology Evolution

1940s/50s

Starting around the time of the Korean War, we saw 1st generation jet fighters, such as the F-86 Sabre and Mig-15, make their appearance. These aircraft had basic avionics systems with no radars or countermeasures. Armament consisted of machine guns or cannons, as well as unguided bombs and rockets. However, these pioneering designs largely ended the relevance of World War II-era propeller-driven fighters, and forever changed the character of air warfare.

1950s/60s

The 1950s and into the 60s saw the introduction of radar, infrared and semi-active guided missiles. 2nd generation jet fighters such as the F-104 and MiG-21 enjoyed advances in engine design and aerodynamics. These advances allowed this generation of fighters to be the first to sustain supersonic speeds in level flight.

Engagements were still within visual range, but the employment of radar-cued missiles started to stretch out engagement ranges. Survival in the aerial combat arena began to rely on more than the mark-one eyeball.

1960s/70s

During the 1960s/70s, improvements in manoeuvrability, combined with significant enhancements to the avionic suites, saw the emergence of the first cadre of multi-purpose 3rd generation fighters such as the MiG-23 and F-4. Developments in radar allowed a 'look down, shoot down' capability, and with off-boresight targeting and semi-active guided RF missiles like the Sparrow and Apex, engagements moved to beyond visual ranges.

Being able to visually see the target was no longer a prerequisite to killing your opponent.

1970s/80s

Through the 1970s and 80s, the trend of improvement in avionics and aerodynamic design continued with the development of fly-by-wire 4th generation fighters, such as the Su-27, F/A-18, F-15, and F-16.

For those of us from this generation of fighters, the ability to switch missions between air-to-air and air-to-ground became the norm, and the line between control of the air and strike became blurred.

Generation 4.5

The 1990s saw enhancements to 4th generation fighters through the addition of radar absorbent materials, thrust vector-controlled engines, greater weapons carriage and extended range performance.

The addition of an AESA radar was a significant enough game-changing combat capability for these redesigned fighters to be deemed a generation of their own—Gen 4.5.

So in just five decades, air combat had made multiple evolutionary leaps from the capabilities afforded by the likes of the venerable F-86 Sabre, to those delivered by mission systems like the F/A-18 Super Hornet.

I draw from this quick review is that air combat in 2025 and beyond will continue to be dominated by technological evolution. Future growth in our capabilities is essential if we are to maintain a relevant air combat capability.

Why 5th Gen?

With so much capability inherent in generation 4.5 fighters, it has been often asked why do we need 5th generation? The answer to this is simple: we need to ensure we conduct tomorrow's air combat operations with tomorrow's capabilities. Historical examples highlight loud and clear that today's technology won't be suitable in 2025, and certainly not in 2035.

So, what are the characteristics of a 5th generation fighter and what are some of the challenges that Australia faces in transitioning to this new generation of air combat capability?

Stealth

The aspect of 5th generation aircraft we tend to hear most about is Stealth technology, but this is often misunderstood as simply having a small radar cross section. True low observable technology is designed from the ground up into every signature of a 5th generation aircraft: infrared, visible and radar frequency spectrums must all be considered.

Low observable technology, combined with minimising electronic emissions, is what delivers Stealth and this mix of features allow the pilot to break the adversary's kill chain in ways never before considered feasible. While Stealth will be important in future air combat operations, networking and superior situational aware-

ness are equally important for they give the pilot all-important decision superiority, the ability to make better decisions faster than the adversary.

Decision Superiority

To achieve decision superiority in 2025 and beyond, air combat operators will need to be able to see who and what is in the area of operations, with very few limits to arcs of coverage. The fusing of multi-spectral sensors and electronic support must enable targets to be detected without the knowledge they are being tracked.

The cueing of capabilities must not be limited to on-board sensors, they must be available from multiple off-platform sources. The networking capabilities of these future air combat assets must be a force multiplier. They must be able to feed, and be fed from, multiple sources.

The end result is that the pilot must be able to focus solely on the fight, not allocating time and effort to managing data that supports the fight.

Weapon Systems

However, we should never assume perfection in any system.

In the event that a 5th generation aircraft is detected, or an adversary gets close enough to bring weapons to bear, an advanced countermeasures suite must provide a degree of multi-spectral protection appropriate to future threats. The 5th generation aircraft must bring a new dimension of survivability.

Yet survival on combat Operations in 2025 will not be enough. In the air combat domain, the ability to defeat your adversary in most cases requires lethal force. Survivability is pointless without lethality.

The 5th generation capability must allow the adversary to be engaged and neutralised, ideally without ever being aware they were under threat. If detected, the engagement time must be so short to not let the adversary take defensive actions.

It is this lethality, combined with a high degree of survivability delivered through 5th generation capability that will breed success in future air combat operations.

Challenges

However, new capabilities breed new methods, and how a 5th generation fighter undertakes these missions in 2025 and beyond are unlikely to resemble yesterday's air combat operations. In future, as it is now, the ability to integrate all the fundamental inputs to capability will still be what determines relative combat effectiveness.

The ability to fly an aircraft does not mean you have the ability to fight the aircraft. This is never more so than in 5th generation fighters. This is where training will be so important to our success in future air combat operations.

We have always been proud of the air combat training system within the Royal Australian Air Force. I believe the effectiveness of a training system has always been a key determinate to combat success and 5th generation training will take a more systems-centric approach rather than a platform-centric one. Training will still be the key.

As with the current trend of training, heavy emphasis will need to be placed on simulation. However, the training must not focus solely on the pilot. Intelligence, maintenance, weapon-loading and some logistics and support elements will need to be trained in the virtual environment.

Combat simulator training must not be limited to the single fighter. Collective training through real-time links to other dissimilar-type fighters and other combat elements, such as the AEW&C, Growler and Vigilante will also be essential. We need to be able to train with our friends and partners in the virtual and constructive domain, just as we do in the live domain.

Generational Transition Issues

The greatest challenges we face are the transitional issues that arise in moving a force from one generation to another. In Australia, we have had to face and learn from the inter-generational issues that have arisen in our transition from the F-111 and classic F/A-18 to the Super Hornet. We will continue to face these challenges with the introduction into service of the Joint Strike Fighter.

5th generation capabilities represent a generational shift for everybody involved in the air combat system, not just the operators and maintainers. For example, we will need to complete a generational change in the ISR, network and communications systems and other capabilities that will support the F-35 if we are to get the most out of aircraft's capabilities.

Conclusion

In closing, history tells us some things with relative certainty about air combat operations in 2025 and beyond. Importantly, it tells us that technologies will have evolved markedly by 2025, making it essential to acquire capabilities with future growth. 5th generation capabilities, such as the F-35 Joint Strike Fighter, offer a quantum leap in air power capabilities over their compatriots. The missions they will undertake may not be new, but the capabilities 5th generations fighters bring will vastly change the character and effectiveness of how the missions are undertaken.

To be successful in air combat operations in 2025 and beyond, we must overcome the great challenges of transitioning to these new capabilities. Our training, intelligence, logistics, and even our service culture may need to adapt. We cannot simply adopt old methods to new capabilities.

As we look beyond 2025, I can only but wonder how long do we have until a 5th generation fighter is insufficient for successful air combat operations? When do we start asking the question - What will a 6th generation fighter need to bring to the fight?

Thank you.