
THE REQUIREMENT FOR AIR COMBAT MASS AND DEPTH IN THE INDO-PACIFIC

The Sir Richard Williams Fondation

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**SIR RICHARD
WILLIAMS
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Prologue

On 1 October, the Sir Richard Williams Foundation returned to the question that has quietly reshaped Australian airpower debate over the past two years: not whether the Royal Australian Air Force can support the Integrated Force, but whether it can generate the scale, endurance, and reach to fight and keep fighting in a contested Indo-Pacific. The seminar's title states the problem plainly: mass and depth. Its argument is less plain but more consequential, and it builds directly on the April 2026 session's "fight tonight" theme.

National Defence Strategy 2026 and its accompanying Integrated Investment Program described an Air Force that "provides air support for integrated operations", surveillance, air defence, strike, air transport. That formulation, framed around inputs and tasks, is precisely what this seminar sets out to move past. The organisers argue for a reset: air and space power judged by operational and strategic outcomes rather than by the list of missions it services. That is a shift from thinking of Air Force as a supporting function bolted onto a joint force built around surface combatants and land systems,

toward thinking of it as the domain that determines whether the rest of the force can operate, survive, and matter at all.

The logic is straightforward once stated. Australia is building a larger surface combatant fleet and a land force oriented on littoral operations in the northern approaches — landing craft, tactical joint fires, combined-arms systems designed for archipelagic and coastal fighting. Every one of those investments raises, rather than reduces, the demand on air combat power.

Ships and land forces operating forward need localised air superiority to survive; they need survivable strike reach to hold targets at risk without exposing the platforms doing the holding. The more capable the surface and land forces become, the more air combat mass they consume, not less. This is the seminar's central bet: capability growth elsewhere in the Integrated Force is quietly outrunning the air combat capacity meant to protect and enable it.

That produces a demand-and-supply framing that runs through the agenda.

On the demand side: control of the air, sustained continuously across vast geography, in all weather, alongside a strike capability launchable from sovereign bases with integrated targeting and enough political discretion to preserve surprise.

On the supply side: a mix of crewed and uncrewed systems sufficient to generate that control and that strike reach without exhausting a small, exquisite, and therefore fragile force structure. This is where the seminar's framing intersects with what I have elsewhere called the choice between intelligent mass and exquisite scarcity.

A force built entirely around small numbers of extremely capable, extremely expensive platforms is a force that cannot absorb attrition, cannot generate enough

combat power across a theatre the size of the Indo-Pacific, and cannot deter because an adversary can do the arithmetic and see that the force runs out quickly. Mass and depth are not a hedge against that logic. They are the answer to it.

The agenda's opening panel on Collaborative Combat Aircraft makes the point concretely. CCAs — represented on the program by Boeing's MQ-28 Ghost Bat effort alongside contributions from Lockheed Martin and Northrop Grumman — are not simply cheaper adjuncts to crewed fighters. They are the mechanism by which Australia converts a fixed, expensive crewed fleet into a scalable force: attritable mass that multiplies sorties, dilutes an adversary's targeting problem, and extends reach without extending the exquisite-platform bill. Phil Gordon's session on "multi-mission force multiplication" and Robert Denney's on "building mass with industry" both point the same direction: industry is being asked to help solve a structural problem, not just supply hardware faster.

The seminar also foregrounds a set of enabling arguments that rarely get equal billing in force-structure debates: workforce, training, and sustainment. A scalable air combat force is only as real as the people and pipelines that generate and regenerate it. Sessions on workforce management and automation, and on training-system effectiveness and mission rehearsal, are not peripheral housekeeping items. They are where "self-reliant, scalable capability" either becomes real or stays aspirational. The same is true of the closing block on preparedness, replenishment, basing, logistics and supply chains. Deterrence by denial is a sustainment problem as much as a platform problem; a force that cannot be replenished at the tempo a

high-end fight demands is not, in practice, a force that can sustain denial for long.

If the April seminar was about readiness — fight tonight — this one is about durability: can the force that fights tonight still be fighting, and generating deterrent effect, months into a high-end contingency. Mass and depth are the answer the Foundation is putting on the table.

Whether the National Defence Strategy's next iteration absorbs that answer, or continues to describe Air Force primarily as a supporting service to the rest of the Integrated Force, is the question this seminar sets up for the Government to answer next.

Introduction

I have been coming to Australia since 2014 to write the Sir Richard Williams Foundation seminars. Over a decade of seminars, in a real sense, makes me the historian of this particular record, not because I have any special claim to insight, but because I have been in the room, notebook open, for the whole arc.

And from that vantage point, the October 1, 2026 seminar at the National Gallery of Australia reads less as a single event than as the latest crest in a wave that has been building since I first started making this trip.

It is worth remembering where that wave began.

In 2014, the story was modest by design. On that first visit I toured the new KC-30A tanker fleet and the newly arrived Wedgetail airborne early warning aircraft, visited a hypersonics research effort still in its early stages, and sat in on an RAAF-sponsored conference about an F-35 that had not yet arrived. The C-17 had recently given the RAAF reach it had never had before.

The characterization that stuck with me from that trip, offered by a Canadian air force officer sitting in on the

same conference, was that Australia was building “a modest but effective 21st century Air Force”, assembling the building blocks, one platform at a time, after a long period of underinvestment, shaped by hard lessons from East Timor and Afghanistan.

It was an Air Force preparing itself, not yet an Air Force positioned against a specific, capable adversary. The F-35 was still a thing that was coming.

The 2024 seminar was where that preparatory decade cashed out. That session put the fifth-generation revolution on full display in Australia: the F-35 no longer a future acquisition but an operational reality reshaping how the RAAF thought about combat, and fifth-generation thinking beginning to pull the rest of the joint force along with it.

It was, in the terms this analysis has used elsewhere, the moment Australia stopped assembling parts and started fielding an architecture. That seminar answered the question the 2014 trip had left open: what happens once the modest, effective building blocks are joined by a genuinely transformational platform. The answer was a shift in mindset as much as in inventory — air and space power beginning to be understood as the domain that determines whether the rest of the force can operate at all, rather than a supporting function bolted onto ships and land systems.

That transformation is ongoing, and it is not yet finished.

But the center of gravity has moved.

The October 1 seminar, under the heading of mass and depth, is not introducing a new platform the way the 2024 session did. It is confronting what the fifth-generation revolution failed to solve on its own: a small, exquisite, technologically superior force is not, by itself, a sufficient answer to a Chinese air and maritime force that has gener-

ated its own precision revolution — long-range strike, dense sensor coverage, and a targeting complex that treats fixed, forward, and known bases as vulnerabilities rather than assets.

An adversary that can do the arithmetic on a fleet of extremely capable but extremely limited platforms can also calculate how quickly that fleet runs out. Mass and depth, and the basing and sustainment posture that make mass and depth sustainable rather than merely notional, are the next phase, not a departure from the fifth-generation shift but its necessary completion.

This is the throughline a decade of these seminars has made visible: 2014 built the modest, capable pieces; 2024 fused them around a fifth-generation core and a new way of thinking about airpower's role in the joint force; 2026 is asking whether that core can be made deep enough, distributed enough, and sustainable enough to survive contact with a precision-strike adversary rather than simply outmatch it in a single engagement.

Collaborative Combat Aircraft — Ghost Bat and its Lockheed Martin and Northrop Grumman counterparts — are this seminar's answer to that arithmetic problem: not cheaper substitutes for crewed fifth-generation aircraft, but the mechanism by which a fixed, expensive fleet becomes a scalable one, attritable mass that dilutes an adversary's targeting problem instead of simplifying it.

The sessions on workforce, training, and sustainment that round out the agenda are not housekeeping. They are where the difference between an aspirational force and a real one gets decided, exactly as they were in 2014, when a C-17 global sustainment program and a shared tanker fleet with Singapore were the unglamorous mechanisms that actually gave the RAAF reach.

If one lays the 2014 balance of Chinese and allied

airpower in the Pacific next to today's, the shift is unmistakable, and it runs in a direction that should concern anyone still describing Australian airpower primarily in terms of what it can add to the joint force rather than what it must independently be capable of sustaining.

In 2014, the conversation was about acquiring the pieces of a 21st century force. By 2024, the conversation had become about fusing those pieces around a genuinely transformational platform.

By 2026, the conversation is about whether that platform, however capable, can survive and keep fighting against a Chinese force that has spent the intervening decade building precisely the kind of precision-strike mass that punishes small, forward-based, exquisite formations.

Ten years in, the question this seminar puts in front of the Australian government is not whether the Air Force can support the Integrated Force.

It is whether the Integrated Force, and the basing and sustainment architecture beneath it, can support an Air Force fighting a war of depth against an adversary that no longer has to be deterred by quality alone.

Mass, Depth and Reach:
The Williams Foundation
Asks Whether Australia's
Air Force Is Built Effectively
for the Indo-Pacific Fight

The second Sir Richard Williams Foundation seminar of 2026 opened with a question its organizers said has no simple answer. What does sufficient air combat mass and depth look like for Australia, and is the country building it?

The seminar, “The Requirement for Air Combat Mass and Depth in the Indo-Pacific,” sat deliberately apart from the Foundation’s recent work. For the past eighteen months its seminars have concentrated on the Australian Defence Force’s ability to “fight tonight.” That meant the force’s readiness to compete this afternoon, fight tonight, and survive and win tomorrow, with 2027 looming as the planning milestone. This seminar stepped back to first principles: the strategic, operational and tactical requirements of a high-end fight in the Indo-Pacific specifically.

The shift matters. A force can be tuned very precisely for the next crisis and still be poorly shaped for a prolonged one. Readiness answers the question of what the force can do now. Mass and depth answer a harder question: what it

can keep doing once the fight is no longer short, and once the adversary has had a vote.

Not the Middle East, not Ukraine

Air Chief Marshal Mark Binskin (Retd), Chairman of the Foundation, opened the day with an observation about the Australian debate. In Australia, the moment air power comes up, the conversation turns to the Middle East or Ukraine. Those theaters offer important lessons, but they are not the Indo-Pacific. They do not involve the ranges across which Australian air power would have to operate in a regional high-end fight.



ACM Mark Binskin (Retd) presenting at the Sir Richard Williams Foundation, October 1, 2026.

That framing ran through the whole day. Binskin pointed attendees back to George Kenney's wartime reports, which he called a great summary of how to fight a war in the Indo-Pacific. Technology has changed since, but "the basics are still there": distance, logistics, basing and the unforgiving geography of the theater. The Foundation's concern is that these issues are not as broadly understood in Australia as they need to be.

Binskin said the seminar would examine the “realities that our people face in this complex environment” through air combat mass, depth and reach. The three words were chosen with care. Mass is what most people picture. Depth is what keeps mass useful over time. Reach is the reminder that, in this theater, none of it counts unless it can be delivered across the distances involved.

Reframing the question

Wing Commander Sally Knox, Commanding Officer of No. 6 Squadron and the day’s MC, supplied the analytical frame in her opening. She started from the strategic environment described in the 2026 National Defence Strategy and its commitment to deterrence by denial. If Australia is serious about denial, she argued, it must ask whether the force it is building has sufficient mass, depth and reach to deliver it.

She listed the Indo-Pacific realities: distance matters, access matters, and basing, survivability and sustainment all matter. Meanwhile, demand for air capability is growing along three lines:

- Protecting the integrated force and critical infrastructure;
- Gaining and maintaining control of the air; and
- Delivering sustainable strike at range.

Knox then made the point that shaped the rest of the day. This was “not simply a conversation about whether air force needs more aircraft.” Sufficient combat mass has to be assessed across the whole system, which she defined as platforms, weapons, people, training infrastructure, logis-

tics, ISR and the space capabilities that enable them. An air force can have an impressive aircraft count and still lack the weapons stocks, the maintainers, the airfields or the data links to turn that count into sustained combat power.

It is a useful corrective to the way such debates usually run. A count of aircraft is easy to publish and easy to compare. The other items on Knox's list are harder to see, harder to measure and slower to build, which is precisely why they tend to be undercounted.

The shape of the day

In her opening remarks, Knox laid out a program that moved from strategic context to the future force.

Session one began with the geostrategic environment and what it means for Australia's future air combat requirements. It then turned to collaborative combat aircraft: where CCAs fit in the broader force, what they offer in mass, survivability and operational effect, and how defense and industry can deliver them together. Industry perspectives on the supporting capabilities and systems followed.

Session two, after morning tea, addressed deterrence and national defense. It looked at contemporary air power and space lessons, and at what those lessons mean when applied to Indo-Pacific distances, threats and operational demands.

The afternoon looked further ahead. It began with the Royal Air Force's perspective on developing and delivering a sixth-generation force. It then turned to the gaps, risks and opportunities in generating air combat mass and depth, and closed by bringing the discussion back to Australia: what the national defense strategy means for the Air Force and its contribution to the integrated force.

The sequencing was itself an argument. The day began with geography and strategy, moved through the new technologies, and only then asked what a future force requires. Platforms were not the starting point. They were something to be fitted into a larger problem.

Crafting a sustainable air enterprise



Sally Knox presenting at the Sir Richard Williams Foundation Seminar October 1, 2026

Knox returned for the closing and distilled the day into a few conclusions, which function as the seminar's argument in compressed form.

First, air combat mass is “much more than numbers of aircraft.” It is the whole system that generates combat power: people, platforms, weapons, networks, training, infrastructure, logistics and industry. The decisive test is whether that system has the depth to absorb disruption, adapt and keep operating. In a high-end fight, disruption is a given. What matters is whether the force can keep operating through it.

Second, technology will change how mass is generated. Collaborative combat aircraft, autonomy and related capa-

bilities, she said, “offer enormous potential.” But technology does not dissolve the enduring demands of geography, sustainment, preparedness and workforce, and those demands bite hardest across the distances of the Indo-Pacific. An uncrewed aircraft still needs fuel, weapons, a runway or a launch point, and people to maintain and employ it. The conceptual gains of autonomy do not exempt it from logistics.

Third, and most pointedly: “technology does not equal strategy.” It is easy to confuse acquiring capabilities with having a way of using them. Knox implied that the harder question is what the force is for, how it will be sustained, and how it fits the national strategy.

What the Foundation is pushing against

Australia’s debate about air power often defaults to platform counts and, increasingly, to the promise of autonomous mass. The Foundation’s organizers pushed against both. Their view is that mass without depth is brittle, and that depth is mostly unglamorous: weapons stockpiles, trained people, logistics chains, resilient bases, space and ISR connectivity, and an industrial base able to sustain operations over time.

Neither of the two temptations is foolish. Aircraft numbers matter, and autonomy may well change the economics of generating mass. The danger lies in treating either as the answer rather than as one input. A large fleet that cannot be sustained, or a cheap uncrewed one that cannot be based, supplied and protected, offers the appearance of strength rather than the substance.

The reference to George Kenney is telling. Kenney’s air campaigns in the Southwest Pacific succeeded through

improvisation, forward basing and logistics innovation as much as aircraft numbers. The Foundation is effectively reminding its audience that the Indo-Pacific rewards those who solve the geography problem, and that today's lessons from other theaters do not carry over unchanged to this demanding theater of operation.

A takeaway: The enterprise, not the platform

My own takeaway was that the seminar offered a very different take on next-generation airpower. Rather than concentrating on a platform – a sixth-generation platform, whatever that turns out to mean – the focus was on a recrafted airpower enterprise. One might call it regenerative airpower: a force whose strength lies in its ability to absorb loss, recover, reconstitute and keep generating combat power, and not merely in what it can put in the air on the first day.

In other words, the next generation of airpower is an enterprise, not a platform. That is a harder thing to procure, to announce and to photograph. It is also the thing that determines whether a force still counts for anything in the fourth week of a conflict.

But more on that in a later chapter.

Geostrategic Perspectives:
Securing Australia in
a Fractured World

Professor Rory Medcalf opened the Sir Richard Williams Foundation's October 1 seminar on air combat mass and depth in the Indo-Pacific by declining to do what the room expected of him, which was to start with the threat. He started with the public instead, and that choice carried the argument of his whole presentation: air power, like every other instrument of defence, is only as durable as the national will behind it.

Medcalf is Head of the National Security College at the Australian National University, a post he has held since 2015. His career spans diplomacy, intelligence analysis, journalism and the think-tank world. He served as a senior strategic analyst with the Office of National Assessments, was a diplomat posted to New Delhi and seconded to Japan's foreign ministry, and was the founding director of the International Security Program at the Lowy Institute. His 2020 book *Contest for the Indo-Pacific*, published internationally as *Indo-Pacific Empire*, helped fix the Indo-Pacific as the organising concept for how Australia and its partners think about the region. The seminar's moderator

introduced him as the person best placed to set out the strategic realities that should shape assumptions about mass, depth and reach.



Professor Medcalf presenting at the Sir Richard Williams Foundation seminar October 1, 2026.

Medcalf was candid about the difficulty of the assignment. A geopolitical overview is a ritual at gatherings like this one, and most of what can be said in that vein is either obvious, already said many times, or speculative and hard to prove. In a security environment moving this fast, he observed, any description of the risk horizon is obsolete on delivery. So how does a strategic generalist add value to a room of air power specialists?

His answer was to ask not what he thinks, but what the nation thinks. Part of the reason is that Australia is a democracy and government serves the people. The harder reason is practical: no defence effort lasts without public understanding, consent and active support. He tied the point to remarks earlier this year by the Chief of Air Force on building fighting depth. A capability advantage in any domain, Medcalf argued, becomes a Maginot line if the public and political will to sustain a fight is missing.

Fighting depth, in other words, begins well outside the hangar.

An Age of Anxiety: What Australians Expect

Australians already believe they are heading into an age of polycrisis, and they are right to be worried. That was the central finding of a two-year community consultation led by the National Security College, which included representative surveys of more than 20,000 people. Respondents were shown 15 plausible security issues. For most of them, a majority judged the threat likely within five years, serious in its consequences, and the nation underprepared. Medcalf noted that almost every item on the list would qualify, in business language, as a critical risk: high probability and high impact.

The numbers were stark:

- 87 per cent considered a critical supply chain disruption at least likely within five years.
- 89 per cent expected AI-enabled attacks in that window.
- 85 per cent considered an economic crisis at least likely.
- 69 per cent thought Australian forces were likely to be involved in military conflict overseas.
- 67 per cent rated a critical infrastructure attack likely, very likely or almost certain.

Medcalf offered these figures, as he put it, without judgement about whether the public, or for that matter the intelligence community, is making the right assessments.

The point was the shape of public perception. What Australians fear is not a single threat but several arriving together and feeding each other: economic shock, AI-magnified cyber intrusion, supply chain failure, infrastructure attack, disinformation, social unrest, foreign interference, terrorism, armed conflict, and the compounding effects of climate change and natural disasters. The polling was done in mid-2025, well before this year's Iran conflict made some of these fears real.

The finding most relevant to the room concerned war. Direct military attack on Australia was the only item on the list that fewer than half of respondents considered likely within five years, yet 45 per cent still did. When asked about consequences, the ranking inverted. Fully 80 per cent judged that a foreign military attack would have major or catastrophic consequences, the highest consequence rating of any threat tested.

For air power planners, Medcalf drew a practical conclusion. The public is open to a whole-of-nation conversation about security, including what he called the total sense of mass: the enablers, the infrastructure and the political will behind defence capability. The gap between what security planners worry about and what the public suspects is not large.

That gives government licence for a more open dialogue about preparing for conflict precisely in order to discourage it. He welcomed the signals on civil preparedness and resilience in the 2026 National Defence Strategy, calling them welcome if overdue, and said he looks forward to parliamentary scrutiny of how quickly that agenda can move.

The Planning Tripod Has Fallen

Australian defence planning, Medcalf reminded the room, long rested on a tripod of comfortable judgements. Geographic distance conferred a great protective advantage. Australia retained qualitative military superiority in its region. And there would be at least a decade of warning time while a potential aggressor modernised and mobilised its forces. Major power war was considered unlikely and direct threat remote.

That world, he said, is gone. The public knows it, and government policy frameworks are coming to terms with it, even if their public-facing language remains cautiously worded. Each leg has weakened at once. Distance is eroding because cyber, quantum, AI and hypersonics erode the barrier geography once provided. The qualitative edge is under pressure because of the scale, quality and reach of Chinese military modernisation, and because of the growing difficulty of maintaining a broad-based capability advantage. Warning time, in his blunt phrase, has evaporated.

He then pointed to the language of government's own strategic documents, which now contemplate forced projection and military coercion at levels not seen since the Second World War. He recalled the warning of the then Chief of the Defence Force a year ago that the nation must countenance scenarios of combat operations from its home territory. For an air combat audience, this is the operative sentence of the presentation. A force designed for a continent protected by distance and warning time is a different force from one designed to operate, sustain and regenerate under fire from home bases.

Medcalf also made a point that is easy to miss. Even if Australia is never a frontline belligerent, its interests will be

affected immediately and radically by a major conflict in the region. Trade routes, supply chains, energy, finance and the stability of near neighbours all sit within the blast radius. Preparing for conflict therefore means preparing for consequences that arrive before, and independently of, any decision to fight.

Four Trends Reshaping the Environment

Medcalf organised the government's view of the changed environment around four interconnected trends.

The new geopolitics. Powerful states are acting with blatant self-interest. China remains Australia's chief source of great power risk, and whatever the talk of stabilisation, there is no trust in the relationship with Beijing. Australia and China are in permanent contest for influence, especially in the Pacific. He added the dangerous reality of a Russia-China axis, which links the Eurasian and Indo-Pacific theatres of contest, underscored by China's material support for Russia's war against Ukraine.

The United States is part of this picture too. Faced with the blatant assertiveness of the Trump White House, Australia has stopped describing its alliance in terms of shared values and the upholding of a rules-based order. Yet the alliance is still needed. Medcalf observed that the Australian public, like the government, seems to be coping with the cognitive dissonance of depending on an ally it understandably has trouble fully trusting. He found a silver lining here: it lays foundations for a more mature conversation about national self-reliance.

The erosion of rules that protect smaller powers. Sovereignty, territorial integrity and the constraints on the use of force have favoured small and medium powers like

Australia, and they are now under extreme threat. Canberra's most frequent protests concern Russia's invasion of Ukraine and China's disregard for maritime law, including the UN Convention on the Law of the Sea and the codes that govern unsafe military encounters. Medcalf praised the professionalism with which Australian forces have handled repeated incidents involving PLA aircraft and ships. The fracturing of the order, he argued, both reflects and emboldens the use of force as an instrument of coercion, up to large-scale war. It is already a reality in Europe and the Middle East, and last year's sharp, sudden air war between India and Pakistan showed it can erupt in Asia. The demonstration effect matters: war, from full invasion to undeclared hybrid operations, is becoming normalised. And such conflicts, once begun, tend to become protracted, placing immense pressure on munition stocks, economic resilience and political will.

The retreat of free trade. Medcalf mentioned this one only in passing, but the message was clear. Economic interdependence is being weaponised as a tool of statecraft, government is beginning to understand that national and economic security are deeply intertwined, and a world of fully free trade and investment is now no more desirable than it is attainable.

Disruptive technology. Here his concern was the shifting military balance in the Indo-Pacific. China's capabilities are growing in scale, quality and reach, and Australia finds it increasingly hard to keep a broad capability edge. Cyber, quantum, AI and hypersonics threaten to neutralise the geographic barrier. The rapid weaponisation of drones and AI may lower the thresholds for conflict and escalation even as it offers asymmetric advantage to powers willing to seize it. Critical technologies are also an avenue of oppor-

tunity for Australia, whether in its own capabilities or as part of regional and allied supply chains.

In aggregate, Medcalf concluded, these trends mean the potential for major conflict is rising, including in Australia's own region.

Compromised Sovereignty in China's Coercive Shadow

China, Medcalf said, remains the paramount strategic concern: Chinese power, the way it is being used, and its growing presence in Australia's immediate geography. It is no longer controversial to argue that Beijing seeks hegemony in East Asia and perhaps the wider Indo-Pacific. For a decade, the driving concern of Australian grand strategy, whatever its public utterances, has been to prevent Chinese dominance of the Indo-Pacific, preferably without war.

The vital questions follow.

- To what extent might Beijing risk escalation to armed conflict to achieve its objectives, from seizing Taiwan to broader hegemony?
- Are the risks of miscalculation and escalation manageable? What can Australia feasibly do?

Medcalf stressed that these are not abstract questions. They go to whether Australia's trade and investment are conducted on terms negotiated rather than dictated, to the maximum preservation of sovereignty and diplomatic freedom of action, and to Australia's identity as a liberal democracy free from coercion and interference.

He corrected a common misreading. Australian concern about China is sometimes caricatured as a paranoid fear of invasion. The more accurate picture is a fear

of permanently compromised sovereignty in China's coercive shadow.

There are many ways short of invasion to subjugate a country: maritime blockade, economic coercion, political interference, disinformation, subversion and critical infrastructure sabotage, used in combination. That is why Australia studies Europe's experience of Russian hybrid warfare so closely. The interest is not only solidarity among democracies; Europe is, in his word, a laboratory for what could be waged in the Indo-Pacific.

It also explains where Australia has put its diplomacy, development assistance and infrastructure financing: countering Chinese influence in the South Pacific and obstructing a permanent Chinese security footprint there. A Chinese military presence east of Australia, such as a base in one of several island nations, could block sea lines of communication to the United States, tie up Australian forces and hold targets at risk along a largely undefended east coast.

The military reach to match is arriving. Even open-source analysis indicates that China's missiles, navy and air force, including systems based on militarised artificial islands in the South China Sea, can increasingly target Australian territory. Last year's far-from-friendly circumnavigation of the continent by a PLA naval task group was a reminder, Medcalf said, that Australia cannot afford to look only northward.

Deterrence, Mass and Reach for a Lonely Middle Power

Medcalf was careful to say that a strategic snapshot cannot itself define the optimum capabilities for the Australian Defence Force. What it does is reinforce the case that cred-

ible deterrence is fundamental to the statecraft of conflict prevention, that risks may rise sooner than planners assume, and that Australia cannot afford to hold defence investment at the recent levels of cautious ambition.

He placed that argument inside a distinctive Australian predicament. Australia is a democratic middle power in a vast region with no natural bloc of partners: no NATO and no European Union. Japan, another capable but lonely power, is now Australia's most valued regional partner of any real strategic weight.

At the same time, like other American allies, Australia faces new uncertainty about the character, motivations and reliability of the superpower. The diplomatic web of partners and alliances is deepening and diversifying, and that is welcome. But diplomacy alone does not carry weight in a crisis.

This is where he linked the geopolitical picture to the seminar's subject. Australia's own military weight, he argued, must be treated as a critical element of an all-arms approach to statecraft. Close-in friends, from Japan to Indonesia, along with a growing arc of Pacific partners, will see Australia as a more credible partner if it does not deny itself the ability to project power in a crisis, power that would serve their interests as well as its own. That is a notable framing for air power. Reach is not only an operational attribute; it is part of what makes Australia a security partner worth having.

There is also a question of time. Medcalf acknowledged the logic of acquiring strategic weight over the long term, and not only through AUKUS.

But the confronting reality is that an Australian government will need options to deal with a breakdown of the regional order in the short run. Such a conflict could be protracted, and Australia's geography would be a critical

factor in how events unfold. The old comfort that distance would buy time has become a planning condition to be managed, with geography now cutting both ways: it is a barrier no longer, yet it remains the stage on which any sustained campaign would be fought and sustained.

The seminar's agenda was capability and deterrence, high-end conflict, and the need to prevent it by being prepared to fight. Medcalf's contribution was to set the conditions under which those technical debates must be conducted.

The public already expects trouble and wants to hear more from government about what defence capabilities are for. The planning assumptions that once justified modest ambition have collapsed. China's coercive shadow is a more subtle and more probable danger than invasion, and the force that deters it must be able to act in the short run as well as the long one.

Mass, depth and reach, on this reading, are national propositions as much as air force ones. They depend on aircraft and munitions, and equally on infrastructure, industry, civil resilience and a public that understands why it is being asked to invest.

Deterring Whom?
Michael Pezzullo and
Australia's Missing
National Defence Strategy

Rory Medcalf's presentation to the Williams Foundation seminar on air combat mass and depth described a population that senses danger but cannot say what it is afraid of. The National Security College survey he drew on found widespread unease about Australia's strategic circumstances. That unease is, in Medcalf's phrasing, ungrounded and imprecise.



Mike Pezzulo presenting to the Sir Richard Williams Foundation October 1, 2026.

Michael Pezzullo, the former Secretary of the Department of Home Affairs, took up that gap in his address to the seminar audience.. He spoke for under twenty minutes and set out a harder argument than most of the day's more technical contributions.

His starting point was that Australia has made deterrence a staple of its official vocabulary while declining to say what it is trying to deter, who it is trying to deter, or what it would take to succeed. His answer to the question was uncomfortable. What we can deter alone is not what we most need to deter. The gap between the two is closed by national preparedness, which the country has barely begun to address.

A Title Change and a Provocation

Pezzullo told the audience that the organisers had first proposed an "arid and dry" topic on the role of deterrence in Australia's national defence strategy. He asked for a change, and the organisers agreed. The session was retitled "Deterring Whom?", a title he hoped the audience would appreciate for its grammar as well as its provocation.

The audience, ranging from serving officers to industry executives, had spent the morning on capability. The session before it had worked through what the evolving Indo-Pacific means for Australia's future combat requirements, and the potential of collaborative combat aircraft to deliver mass, survivability and operational effect.

Pezzullo's contribution was to ask what all that capability is for.

He began with a blunt proposition: "deterrence, absent a grounding in actuality," is dangerous. It earns its place in Australian strategic documents because it is agreeable. It is non-threatening and carries a defensive connotation. It implies that someone else might do something to us while we get on with our lives in relative prosperity and ease. Used that way, he argued, the concept goes soft. The official documents that invoke it become passive and abstract, written at a level that most citizens in a democracy lack the time, patience or interest to unpack. Without a defined adversary and a defined set of risks, deterrence becomes a word that signals seriousness without requiring any.

Deterrence Was Born Grounded

To make the point that deterrence has never been an abstraction in the places where it works, Pezzullo offered a

compressed history, which he conceded could only be a sketch.

Modern deterrence thinking, he suggested, begins in the late nineteenth century. After Bismarck's departure from the scene, a newly unified Germany grew colonial ambitions and naval power, and British and European strategists had a concrete problem to grapple with. The Bolshevik Revolution posed a second, as Western governments, in some cases to the point of military intervention, tried to work out what a Soviet form of Russian power would mean for their security. Hitler, initially puzzling and treated by many as an aberration after 1933, quickly became a practical question of whether to appease, prepare for war, or do some combination of both. He noted that the audience had heard John Curtin's remarks of 1937 earlier in the day.

The Pacific offered a fourth case. Imperial Japan's naval build-up prompted serious thought, with regrettably little coordination between Washington and Canberra, about how to deter Japanese aggression and, if that failed, how to defeat it. Pezzullo observed that the war plan the United States executed after Pearl Harbor looked much like the Rainbow and Orange series of plans developed through the 1930s. Deterrence did not work, but the plans did, once America harnessed its national will and its industrial power.

For Pezzullo the lesson is that deterrence thinking was always tied to an identifiable threat, and that when deterrence failed the plan still carried weight because it had been worked up in advance. The question that preceded the doctrine was always who, and how.

The classical age arrived after 1945. Stalin's acquisition of nuclear weapons meant that deterrence, whether by denial, punishment or retaliation, had to be worked

through down to force design and operational concepts, with nuclear forces placed on a hair trigger. Practitioners approached the problem through mathematics, game theory and statistical analysis, with Herman Kahn and Thomas Schelling the exemplars, or through the historical and philosophical lens of Henry Kissinger. Either way, deterrence became a recognised discipline within strategic studies.

Pezzullo then moved to the present. Deterrence thinking now shapes doctrine, force design and operational concepts in NATO, which is dealing with Russia. The United States, which maintains a bilateral relationship with China, also places China at the centre of its deterrence strategy. Japan is increasingly thinking in deterrence terms, and Israel has had to do so out of necessity since its founding. Then he asked where Australian deterrence thinking sits, and answered with deliberate charity: it is "implied, inferred, and abstract".

A Strategic Culture That Looks Outward

Pezzullo offered a possible explanation in national strategic culture. Australia has absorbed the idea that distance protects it, and its military culture is largely expeditionary. The country sends forces elsewhere, typically in the service of some larger global objective. The exception was a brief period between 1942 and 1944, when Darwin was bombed and midget submarines entered Sydney Harbour. In 1945 the threat largely passed. Beyond a diffuse fear in the 1950s of annihilation in a Soviet nuclear strike, Australians have never really felt threatened by something they could see.

He illustrated the point with a personal story. As a twelve-year-old in 1976, the son of an Italian migrant

family in a Sydney street full of First and Second World War diggers, he pestered his neighbours about the Western Front and the Kokoda Track. His neighbours, who could be reluctant, remembered events of thirty years earlier with great clarity. Pezzullo noted that the audience now stands fifty years from 1976, which puts us further from that boyhood conversation than the conversation was from the war itself. The living memory that once gave Australians a tangible sense of threat has largely gone.

That sets up a puzzle. Public awareness and unease are growing. The Deputy Prime Minister says often, and almost alone among his colleagues, that we are living through the most dangerous strategic circumstances since the 1940s.

So what, specifically, is the population uneasy about? Pezzullo acknowledged the many non-military worries, from terrorism and artificial intelligence to the broader polycrisis. He also set aside the homeland risks below the threshold of military conflict, such as cyber sabotage and state terrorism, which he said demand vigilance and are the main reason Home Affairs was created, as a civil defence and homeland security department before anything else. His focus was on the military threshold and on what, at that level, Australia is actually trying to deter.

Three Candidates, Ranked by Probability

Pezzullo approached the question by elimination. He could work through the United Nations roster from A to Z, but briefly confirmed that Australia is not seeking to deter Chile, South Africa or Brunei. Instead he set a forty-year horizon, matching the timescale of the Treasury's recently released Intergenerational Report, and excluded invasion.

Even at the peak of its reach, he noted, Imperial Japan judged an invasion of Australia unviable and unnecessary.

What he included was everything short of that: limited lodgements on Australian territory, air and missile strikes, raiding and sabotage by special and other forces, and naval operations. Those operations might fall short of a full blockade of the sea lanes but could include interdiction, the mining of ports, and the cutting of internet cables. He added attacks on offshore oil and gas, and parallel operations in cyberspace and the cognitive realm. The purpose of such a campaign would be to compel Australia to do an adversary's will, either by subordinating it to that adversary's interests in the Indo-Pacific and beyond, or by splitting it from its American ally.

He offered three candidates for deterrence, in ascending order of probability to 2066.

The first is a military dictatorship in Jakarta.

Pezzullo was careful to call this the least likely scenario, at well under one per cent. It would involve an Indonesia under a very different political regime, perhaps one that had to accommodate Islamist tendencies, and that had the military power generated by decades of growth. Australia would have warning time, perhaps ten or fifteen years, and Pezzullo had pointed words for those who say warning time has expired. He called that a comfortable way to draw a blind over things the country is not doing, and a distraction from the multi-generational work of building a force.

Many of the exquisite capabilities discussed earlier in the day are multi-decade undertakings. Deterring such an Indonesia would probably rely, he said, on Australia's own combat power and a highly offensive military strategy designed to deny that regime the capacity to do harm through strike and other operations. The one assumption is that the principal ally is not "turned off", as the United

Kingdom was able to rely on in its war with Argentina. This is a file Defence should keep open and do some work on, he argued, but no more than that.

The second is a hegemonic China in a world where the United States, through military defeat or its own choice, no longer extends security guarantees to any Western Pacific nation. In this world America has retreated behind a defensive line at the third island chain, something Washington think tanks speculate about from time to time, most recently in the past week. There are no U.S. installations or forces in Australia.

Pezzullo called this the hardest deterrence problem of all, but one with a potential solution, because it would be decades in the making. If humanity gets through to 2066 without being undone by AI agents or some other planetary catastrophe, Australia would have around 40 million people. A regular, part-time and militia force of about a million, combined with nuclear weapons, would leave it relatively secure. That is a very different world from the one under discussion, but again worth enough planning to keep a warm fire.

The third is the one that matters now. It is a disruptive China, willing to use growing military power to change the territorial or other status quo in the Western Pacific and the wider Indo-Pacific.

Here, Pezzullo said, there is no warning time left. He pointed out that Scott Morrison, launching the 2020 Defence Strategic Update not far from the seminar venue, declared that warning time had expired. That was six and a half years ago. If the country still had a decade up its sleeve then, it is now six and a half years into that decade, which is cold comfort.

Deterring by Annoying

Pezzullo was clear that Australia cannot meet the third problem alone. His formula was that Australia cannot deter by denial in that fight. At most, "we deter by annoying". The war he has in mind, in which China uses force to change the order in the Western Pacific, would be in no one's interest, China's included, because it could escalate vertically into the unthinkable.

The realistic contribution is as part of a U.S.-led collective defence system. That system is still largely built on the bilateral treaties Washington created in 1951, but it is increasingly working through trilateral and quadrilateral constructs at sub-ministerial levels, such as Australia, Japan and the United States.

In that fight, Pezzullo said, Australia would "regrettably" bring too little weight and too little national preparedness to make much of a difference. Its likely role, notwithstanding all the good work by people in the room and elsewhere, would be to secure a bastion at the southern end of the third island chain from which counteroffensives could be launched.

He did not dismiss what is under way. He was careful to say that excellent work is going on inside Defence with limited resources, though not enough to achieve the strategic effects required. He was particularly pleased by the Air Force's publication on the National Defence Strategy, *More Options, More Places, More Often*, and by its cover. As he described it, the image shows Royal Australian Air Force and US Air Force aircraft flying in formation, including B-2 bombers, what looked to him (he is not a plane spotter) like an F-22 Raptor, Super Hornets or Growlers, and a Wedgetail. "That, ladies and gentlemen,"

he said, "is our deterrent solution to the actual deterrence problem that we are currently facing."

The remark was delivered lightly, but its content was the argument of the whole address. The credible Australian contribution to deterring China is a combined force, integrated with American airpower and other allied capability, that makes more options available in more places more often. For a seminar organised around air combat mass and depth, it was a pointed reminder that the Australian contribution is judged as part of a coalition's weight and persistence.

We Have a Defence Strategy, Not a National One

Pezzullo's most pointed criticism was reserved for the whole-of-government picture. He praised the quality of the discussion within Defence, which he sees from time to time through contact with former colleagues. But almost nothing is being done materially and effectively at the whole-of-government level, which "puts a lie to the idea that we have a national defence strategy".

What exists, he said, through no fault of anyone in the room, is a defence strategy. A national defence strategy would show things like a partnership between Defence and Home Affairs on a civil defence mobilisation model. "Civil defence and mobilisation," he observed, are "two terms that dare not speak their names."

He welcomed the decision of a joint parliamentary committee to undertake an inquiry into national preparedness and civil defence, and hoped it would expose the issue. But he made clear that the country is a long way from a whole-of-nation conversation about mobilising all the

elements of power that the near-term deterrence challenge would require.

His closing argument was that an abstract discourse on deterrence "serves no purpose at all", and that it fails three audiences at once. It leaves the public uninformed. It denies practitioners within Defence the cover and legitimacy they need to reach across the rest of the Commonwealth government, the states and territories, municipal governments and critical infrastructure providers.

And it does not bother the adversary, which he named without hedging as the planners of the People's Liberation Army. Because of the lack of weight Australia puts behind the Australian Defence Force, those planners would at most treat it as an annoyance. Pezzullo hoped they are wrong, and that Australia could hit back harder than they anticipate. For now, he said, "I dare say they're not exactly quaking in their boots."

What the Argument Asks of Air Power

Pezzullo's address sits well alongside the rest of the seminar, and it sharpens some of its themes.

First, it reframes the mass-and-depth question. A seminar on air combat mass and depth tends to treat the problem as one of platforms, sensors and munitions, and of how many of each the Air Force can field. Pezzullo's argument is that mass and depth are national attributes before they are service attributes.

A force can only sustain combat power in a contested environment if the surrounding nation can generate, protect and regenerate it. That depends on industrial capacity, critical infrastructure resilience, fuel and logistics, a civil defence posture, and a population that understands

why any of it matters. His call for a Defence and Home Affairs partnership on civil defence mobilisation is a call to build the enterprise around the force.

Second, his reading of the third scenario fits an emerging view of how Australia contributes to coalition deterrence. If the country's realistic role is to secure the southern end of the third island chain as a bastion from which counteroffensives are launched, then the requirement is for a resilient, dispersed and regenerative base, rather than a standalone war-fighting force. The bastion's value depends on how quickly it can absorb strikes, recover and keep sortieing. That requirement is as much about hardened infrastructure, repair capacity, stockpiles and an integrated civil-military effort as it is about aircraft.

Third, his candour about warning time is a corrective to a familiar and comfortable debate. Some argue that Australia has time to build capability gradually. Others argue that the window has already closed. Pezzullo's approach was more discriminating. For the Indonesian and hegemonic-China problems, warning time is real, and use of the term "expired" can be an excuse for neglecting the long-term work of building a multi-generational force. For the disruptive-China problem, warning time has gone, and the response must be built from what exists now, along with whatever national mobilisation can be generated at speed.

Fourth, there is a point about democratic consent that is easy to overlook in a room of practitioners. Medcalf's survey data describes a public that feels unease without direction. Pezzullo's remedy is more specific than telling the public to be more worried. It is to tell them who, what and how: which adversary, which kinds of coercion, and what Australia would be asked to contribute and to endure. Without that, practitioners lack the mandate to ask other parts of government for what the defence effort needs, and

the public has no way to judge whether the effort is proportionate.

Pezzullo's wording was dry, but his conclusion should not be missed. Australia has an excellent discussion happening in Defence, a fine Air Force document and an alliance of real value. What it does not yet have is a national defence strategy, and without one the aircraft on the Air Force's cover will be asked to carry a weight that no air force can carry alone.

Mass Without Depth Is Temporary

On 1 October, at the National Gallery of Australia in Canberra, the Sir Richard Williams Foundation held its second seminar of 2026, *The Requirement for Air Combat Mass and Depth in the Indo-Pacific*. One session carried the question that sits under most air force planning at the moment. As air forces rebuild combat power and add collaborative combat aircraft (CCAs) and other autonomous systems, where are the gaps, the risks and the opportunities?

Air Marshal Geoff Brown AO (Retd), Deputy Chair of the Foundation, explored that question with Lt Gen David Deptula, USAF (Ret.), Dean of the Mitchell Institute for Aerospace Studies. Deptula's central message was that air forces must be designed to win, with enough capability and capacity to achieve national objectives and keep fighting.



Air Marshal Geoff Brown AO (Retd), Deputy Chair of the Foundation, and Lt Gen David Deptula, USAF (Ret.), Dean of the Mitchell Institute for Aerospace Studies discuss the question of combat mass.

Brown was more than a moderator. As a former Chief of Air Force who served as the operational commander of Australian air assets in Operation Iraqi Freedom, he pressed Deptula from the operator's seat, testing the American case against the Australian experience. Several of his interventions sharpened the argument, and they appear in the sections that follow.

Mass is an effect, not a count

Deptula starts by refusing to equate mass with numbers. "Tail count is not combat power," he said. Land power creates mass by physically massing forces. Airpower creates its equivalent by concentrating effects in time and space, through speed, reach, precision, coordination and sequencing.

On this logic, a small force of highly capable aircraft can produce enormous operational effects if it can penetrate, find the right targets, communicate, employ weapons and return to do it all again. A much larger force that cannot reach the battlespace, or cannot survive in it, produces very little. His Forbes article puts it starkly: a

thousand aircraft orbiting outside an adversary's engagement envelope do not provide the combat power of a hundred able to penetrate it, execute their missions and fight again.

This leads to his working definition. He would measure combat mass by asking how many relevant effects a force can generate, at what distance, against what level of opposition, and for how long. The final clause matters most, because it introduces the second half of the seminar's title.

Depth is what makes mass last

"Mass without depth is temporary," Deptula wrote. Depth means enough aircraft, weapons, crews, maintenance capacity, fuel, basing, command and control, and logistics to sustain effects over time. A force that generates enormous effects for two days and then runs out of weapons or serviceable aircraft lacks depth, however impressive its opening performance.

This is the half of the equation that procurement announcements tend to underplay. Aircraft are visible and countable, and they photograph well on a ramp. Weapons stockpiles, spare engines, trained maintainers, hardened shelters and fuel infrastructure do not. Yet they determine whether a force is a campaign instrument or a one-week demonstration.

For Australia, with its long distances and thin infrastructure, the point is acute. Depth is the quiet determinant of whether a capability can be sustained at the tempo and duration a crisis demands.

The problem with "affordable failure"

The phrase in Deptula's title is deliberately sharp. His target is the habit of treating low unit price as a virtue in itself, and his objection is that cheap is not the same as cost-effective.

Brown returned to the phrase in the discussion: there is no virtue, he said, in affordable failure. He reached for a Second World War parallel in the air commander George Kenney's comparison of air forces to a poker hand, in which the second-best hand costs a great deal of money and gets you nothing in the end. The analogy cuts against the budgeting instinct. A force that is cheap but not good enough does not save money. It spends it on a result that does not count.

Deptula offered an illustration. A \$10 million aircraft that must be sent in groups of twenty to achieve what one \$100 million aircraft can achieve, and loses half the formation doing so, is not cheaper. Nor is an aircraft at one-third the price more useful if inadequate range, payload, survivability or weapons capacity forces repeated sorties at greater cost and risk.

His preferred metric is cost per desired effect, and the historical case he reaches for is stealth. In Desert Storm, F-117s flew less than 2 per cent of combat sorties yet struck more than 40 per cent of the fixed targets. The first non-stealth attack package of the campaign comprised 41 aircraft, only eight of which dropped bombs, striking three aimpoints on a single target. At the same time, twenty F-117s struck 38 aimpoints on 28 targets without additional force-protection aircraft. By that comparison, one F-117 was the equivalent of 26 non-stealth aircraft. The F-117 cost more per airframe and far less per effect.

Brown asked whether the airframe is even the right thing to cost, and Deptula's answer was that the public and most legislators, in Washington as in Canberra, think about defence the way they think about shopping. They compare unit prices and overlook that the cheaper option may need twenty or thirty units to do what the dearer one does. Warfighting, he said, is not buying two cans of beans. He conceded that a rigorous cost-per-effect analysis is much harder than comparing sticker prices, but argued that this is where the discussion has to go.

The denominator is the crux. Compare the price of a penetrating aircraft with the price of a conventional one and stealth looks extravagant. Count the whole package required to produce the effect and the conclusion reverses. That package includes the aircraft, weapons, people, fuel, bases, maintenance, supporting assets and expected losses. Deptula applies the same test to autonomous aircraft. He has no objection to a \$20 million aircraft doing the job of a \$100 million one, provided it actually does the same job under realistic combat conditions.

His practical test is a question for anyone quoting a flyaway price: what else has to be operating for that aircraft to be effective? An inexpensive system may depend on tankers, airborne ISR, satellite communications, electronic warfare, command nodes and suppression of enemy air defences. "Those dependencies don't appear in the flyaway cost," he said, "but they absolutely appear in the war plan."

Attritable is not the same as affordable

The distinction was Brown's opening. Attritable aircraft, he suggested, are about operational risk, and he doubted that

a force should be designed to lose large numbers of platforms. Deptula's reply was that he was spot on.

Deptula went further, insisting on separating two ideas that the contemporary debate often fuses. In his words, attritability is about risk and affordability is about resources.

Willingness to risk an aircraft is an operational choice. Commanders have always decided where and when to accept losses, and uncrewed aircraft are especially valuable when a mission warrants risking the platform but not an aircrew. He pointed to MQ-9 Reapers in Operation Epic Fury, which provided persistent overflight and combat power despite significant losses. He added that at \$30 million to \$40 million each, they are hardly "attritable" in any meaningful sense.

Designing a force around the expectation of loss is a different matter. That, he said, is a force-development decision, and a potentially very bad one. Every loss reduces combat capacity, and replacement depends on factories, engines, sensors, munitions, transport and theatre logistics. "An aircraft destroyed on day three," his Forbes article observes, "cannot be replaced on day four merely because it was inexpensive."

His line on the matter is clear: attritability can be a useful characteristic, but it should not become a strategy. It is worth noting what he is *not* saying. He explicitly rejects the opposite error, an aircraft made so survivable that commanders are afraid to employ it. The aim is a force prepared to absorb attrition without making attrition its theory of victory. Brown distilled the exchange neatly: whether to put an aircraft at risk is a decision for the commander at the time, not a premise to build into force development.

Why attrition is the wrong contest with China

Here his argument takes on a strategic edge. Attrition, he said, is a condition of warfare, not an attractive strategy. Every serious force must be able to endure losses and keep operating, which requires reserves, industrial depth, weapons stocks and replacement capacity. But there is a major difference between preparing for attrition and planning to win through it.

Against China, he argued, the difference is decisive. He cited the Defense Department's description of China as the world's leading commercial shipbuilding nation, with the industrial capacity to produce large numbers of military vessels while also sustaining extensive missile and armaments production. He was careful to note that shipbuilding is not aircraft production and that the comparison should not be pushed too far. The strategic lesson holds regardless: why would the United States voluntarily choose a method of warfare that plays to one of China's greatest structural advantages, scale and industrial output?

"I don't want our theory of victory to become: we can replace inexpensive airplanes faster than China can," he said. Against a production powerhouse, that may be precisely the contest Beijing would prefer.

His Forbes article applies the same caution to Ukraine. Small, attritable drones have been central to Ukraine's defence, and Operation Spider Web showed what small weapons can do against high-value aircraft. But Deptula reads Ukraine's approach as a product of constraint: a grinding war of attrition shaped in part by Ukraine's lack of a modern air force with sufficient capability and capacity, and by Russia's suboptimal use of airpower. American strategy, he argues, should aim to avoid that model of

warfare rather than emulate it. The aim is to achieve air superiority rapidly, impose effects across far greater distances and at far greater scale, and prevent a peer conflict from devolving into a prolonged contest of attrition. Spider Web, he wrote, was ingenious and strategically valuable, much like the Doolittle Raid, but like that first raid on Tokyo it was not decisive.

Brown opened the session by asking Deptula to unpack the recent air campaigns, beginning with Ukraine, and his answer went further than the Forbes article. Ukraine lacks air superiority, he said, because it lacked capacity and the right equipment, and the war has settled into a stalemate reminiscent of the First World War. Necessity then drove invention. A quadcopter carrying a grenade is better understood, in his view, as a personally controlled precision-guided munition than as a drone, and the long-range systems striking Russian oil and electricity infrastructure are cruise missiles that happen to be propeller-driven. What they demonstrate is the value of strategic attack, done on the cheap. It is the damage to Russia's economy, he argued, rather than the losses at the front, that is getting Moscow's attention. The wrong lesson would be to emulate a form of warfare that suits a state fighting for survival and not one preparing to deter China.

Air superiority is what makes the alternative possible. It lets a joint force operate freely while denying the enemy the same freedom, and it opens the way to attack the systems that make an adversary effective: command and control, sensors, logistics, air defences and missile forces. The purpose is to impose disproportionate costs rather than trade platforms one for one. As he put it, use brains as well as mass.

CCAs: enablement, not substitution

None of this makes Deptula an opponent of autonomy. He called it potentially one of the most consequential developments in military aviation since the jet engine, and he said he wants the United States to lead the world in autonomous combat aviation.

His view of where CCAs fit is precise. He sees them principally as combat-air *enablement*, not combat-air *substitution*. A CCA might extend sensing hundreds of miles ahead of a crewed aircraft, carry additional air-to-air weapons, perform electronic warfare, act as a communications node, conduct reconnaissance, create false targets, or accept risk in environments where commanders would hesitate to expose a crew. Those are potentially revolutionary contributions.

The question that matters, in his framing, is not whether an F-47 can be replaced by three or five inexpensive aircraft. It is what an F-47 commanding or collaborating with several autonomous aircraft can accomplish that neither could achieve alone. That is the real opportunity, and it is a statement about formations rather than airframes.

Brown supplied the Australian example. The Ghost Bat, he said, grew out of operational analysis, and one of its motivating roles was to protect the E-7A Wedgetail. Deptula, who said the Australian programme with Boeing is heading down the correct trail, called that a great concept of operations: the CCA does not replace the E-7, it is melded with it to make the surveillance and control aircraft more survivable. That is the kind of prototype-driven concept development that shows how best to employ these systems, after which capacity decisions can

follow. Brown then pressed the contrast with the United States. Deptula's view was that the operational analysis there has so far been done largely on computers, and that the Increment 1 aircraft now flying have yet to take part in many large-scale exercises. Asked whether the danger was that the concept would be treated as a replacement for crewed aircraft, he agreed, naming the F-47 as the aircraft some would like CCAs to stand in for.

Deptula noted that the Air Force's own description is consistent with this. CCAs are intended to extend reach, awareness and survivability while operating in tandem with the rest of the combat air force, and the Air Force describes them as "optionally attritable", not disposable. He also drew attention to a tension in the programme. The service is moving towards roughly 1,000 CCAs, with an intention to field 500 by 2032, while simultaneously confronting the need to modernise its crewed fighters, bombers, tankers, command-and-control systems, munitions and base defences. As CCAs gain the capability and survivability to fight through contested airspace, their cost rises and the affordability-and-mass premise narrows.

Prove it, then buy it in numbers

His prescription is "experiment aggressively, test ruthlessly, prove the operational effects, and then buy them in substantial numbers." What he objects to is the move from promise to force-structure assumption before the operational proof exists.

He welcomed what the Air Force is doing: flying CCAs, conducting weapons-integration testing, experimenting in operational exercises, developing tactics and testing portable command-and-control systems. But he set out the hard questions that still need answers:

- How well do CCAs function when communications are degraded, and how autonomous are they in practice?
- What happens when GPS is denied?
- Can they identify targets reliably?
- How do they perform against advanced electronic attack?
- What is their real range with a useful payload?
- What support footprint do they require, and how many operators are actually needed?
- How quickly can sorties be regenerated?

These, he stressed, are not arguments against the technology. They are the questions professionals should answer before betting force structure on it. His related point on design sequence is the one he returns to most. Systems should be designed from the mission backward, not from the price forward. Begin with the operational effects needed to defeat the adversary, determine the range, payload, survivability, sensing, autonomy and weapons required to produce them, then challenge industry to deliver them as cheaply as possible. Reverse the sequence, setting a price and asking what capability fits inside it, and the result may be a wonderfully affordable aircraft that cannot perform the mission the force exists for. In his words, the ambition is not an aircraft whose principal virtue is that it is cheap enough to lose.

He applies the same standard to the Air Force's massed modular aircraft concept, whose business case, he argues, closes only if it produces the desired effects without requiring so many aircraft that total programme cost exceeds that of fewer, more capable ones.

Brown offered the strongest case for modularity. On a CCA, he noted, payloads can be changed rapidly, whereas

altering anything on a complex crewed platform such as the F-35 or F-47 is slow. Deptula accepted that modularity is a good concept and went straight back to cost per effect. If the mission needs three payloads at once, it takes three aircraft, and the total can approach the price of one more capable platform that already carries all three. If it takes three to do what one can do, he said, it is a toss-up. Modularity has to be more than a slide in a PowerPoint deck. The devil, he said, is in the details.

Connected when possible, operational when disconnected

A further risk sits in the networks that tie a modern force together. Deptula's standard is simple to state: assume from the outset that a sophisticated adversary will attack communications, satellites, GPS, data links, cyber infrastructure and the electromagnetic spectrum. The requirement is therefore to be connected when possible and operational when disconnected.

Brown brought personal experience to the point. In Operation Iraqi Freedom, he said, he would have a dollar for every time a communications or network failure disrupted collection from an uncrewed surveillance aircraft. In a high-end fight every network will be under pressure, so how much confidence can anyone place in a highly networked autonomous system? Deptula's answer was to ask how much external input a system needs in order to succeed, which is the question of organic capability against offboard capability. There is a balance to strike, he said, and the issue reaches beyond autonomous aircraft to mission command: a system cut off from its network must act and think independently. Many operations run on accurate information arriving within seconds

or minutes, generally from space. If that link goes away, there has to be an alternative.

For autonomous systems, this means sufficient onboard sensing, processing, decision-making and mission understanding to keep contributing when communications are degraded or intermittent. Otherwise, as he put it, the enemy does not need to shoot the aircraft down. He only needs to sever the connection that makes it useful. His Forbes article notes that China is developing the ability to disrupt and disconnect US weapon systems through electromagnetic-spectrum warfare, and that inexpensive aircraft dependent on continuous communications may become ineffective when data links are cut.

The point also feeds back into cost. A system that looks inexpensive but needs satellite links, relay nodes and escorts to function carries those costs and vulnerabilities whether or not they appear in the price.

Geography is unforgiving

"Distance is not a detail," Deptula said of the Indo-Pacific. "Distance is one of the defining characteristics of the problem." A low acquisition price does not solve a shortfall in range, payload or survivability.

Brown put the same issue to him directly. If range, payload and survivability command a premium, is unit cost a simplistic measure for the Pacific? Deptula agreed emphatically and offered a comparison for his Australian audience: the distance from Canberra to Beijing is greater than the distance from Beijing to Honolulu, a fact most Americans do not appreciate. What matters is not only range but how fast a force can get there, what it can do on arrival and whether it relies on offboard systems or organic capability. Those factors shape investment, he said, and

explain why the Air Force is at last expanding its production objective for the B-21, a step he called long overdue.

The consequences run through the whole force. Short-range aircraft require more tanking. More tanking requires more tankers, bases and protection. Forward bases require air and missile defence, fuel, logistics and repair capacity, and communications must function across enormous distances. All of those supporting elements become targets in their own right. Against an adversary that has spent decades building a military architecture to keep US forces at a distance, with long-range missiles, integrated air defences, contesting fighters and attacks on the networks that connect the force, range, payload, survivability, autonomy, sensing and resilient communications are, in his phrase, "not luxuries—they are requirements."

For Australia, the implications are direct. Deptula said Australia does not need to replicate the United States Air Force, but it does need sovereign combat power sufficient to generate meaningful effects at the distances its geography imposes, without assuming that every operation begins from a sanctuary close to the target. That means range, survivability and weapons depth. It means resilient command and control, hardened and dispersed basing, fuel, maintenance, and air and missile defence. And it means numbers, correctly understood.

He sees real promise for autonomy in this setting. Autonomous systems may let a relatively modest force extend its sensing, weapons capacity and geographic coverage. But their value depends on integration with the rest of the enterprise. The right question for Australian force design, he argued, is not how many inexpensive aircraft the country can afford. It is what combination of capabilities gives Australia the sovereign ability to generate and sustain the combat effects its strategy requires.

Too few, and so too expensive

One of the most useful parts of Deptula's case concerns why advanced aircraft look so expensive in the first place. His answer is that we often make them so by buying too few.

Brown teed up the point. The B-2 was built in small numbers and the F-22 production run was cut short, he observed, and both carried heavy development costs that fed into high unit cost and into difficulties with maintainability.

The B-2 was conceived around a fleet of more than 100 aircraft, and only 21 were delivered. The Air Force itself has identified that tiny fleet as creating unique sustainment challenges, and the active inventory today is 20. The F-22 requirement was 381 aircraft and production ended at 187. When production is truncated, fixed costs do not disappear. Development, tooling, software, test infrastructure, training and sustainment systems must be spread across far fewer aircraft. The supplier base is disrupted, economies of scale are lost, and the owner eventually pays heavily to sustain small fleets of unique systems. In the seminar Deptula added that the F-22's original planned inventory was 750 before it fell to 381, and that the programme was terminated by Secretary Gates when it was well down the production learning curve and building aircraft at the lowest unit cost it had reached. That, he argued, is precisely when production should be increased.

"Then we point to the high unit cost," Deptula said, "and say, 'See, advanced aircraft are unaffordable.' That's backwards." Sometimes, he observed, the most expensive way to buy an aircraft is to buy too few of them. His Forbes article draws the practical conclusion: maximise production of the F-35, F-15EX, B-21, F-47, KC-46, E-7

and CCA to bring down unit costs and build realistic attrition reserves.

Strategy, resources and the honest conversation

Underneath the force-design questions lies a harder one about money. Deptula acknowledged that a force combining advanced crewed aircraft and autonomous systems makes the resource problem harder, and that pretending technology will make the problem disappear does not help. His diagnosis is that the underlying difficulty is a mismatch between national strategy and the resources allocated to execute it.

Brown put the funding question bluntly. If the US Air Force has been underfunded for years, and the plan is to field both crewed aircraft and a large number of CCAs, where does the money come from? Deptula's answer was that the case has to be made to Congress and the public that the strategy needs funding at that level, or else the strategy must be throttled back. The Air Force is already stretched by operations against Iran, he said, before any contest with China is considered.

He pointed to the breadth of what the US FY27 proposal must fund at once: F-35s, F-15EXs, CCAs, tankers, munitions, readiness, sustainment, infrastructure and next-generation capabilities. There are efficiencies to pursue: reduced overhead, acquisition reform, more competition, open architectures and higher production rates. But eventually there is a strategic choice. Either resource the force the strategy requires, or change the strategy and accept the risk. "Cutting the force while leaving the strategy unchanged is not a solution."

His proper sequence is worth stating in full. First iden-

tify national security objectives. Second, determine the military strategy needed to achieve them. Third, determine the force structure and capabilities required to execute that strategy at acceptable risk. Only then work out what it costs. If political leaders judge the price unacceptable, that is their prerogative, but it should prompt an honest discussion about adjusting the strategy or accepting more risk. Reversing the sequence, starting with the budget and then constructing concepts suggesting that the resulting force is sufficient, is what he called "rationalisation", not strategy.

Brown tested the point by asking what single design assumption Western air forces should change. Deptula's answer was to stop letting arbitrary budgets drive defence strategy and to fund the national defence strategy according to the demands it places on the force. That requires leaders willing to make the case. They work within the budget they are given, he said, but they can still say what the strategy asks for, and the gap between the two is risk: how much are they willing to accept?

His closing message on autonomy follows from this. A force multiplier multiplies something. If decades of under-investment keep shrinking the number of penetrating fighters, bombers, tankers, electronic warfare aircraft, weapons, bases and crews, eventually there is not enough underlying force left for autonomy to multiply. His bottom line: embrace autonomy, accelerate it, test it under the most demanding conditions, then field it at scale, but use it to build a larger and more capable combat air force, not to explain why a shrinking one will somehow be enough.

Gaps, risks and opportunities

The session was framed around gaps, risks and opportunities, and Deptula's material maps onto that triad cleanly.

The gaps are capacity and proof. Capacity has been eroded by decades of retiring aircraft faster than they were replaced and truncating production. Proof is missing because the operational evidence for CCAs under electronic attack, degraded communications and denied GPS is still being gathered. Brown added a third, which is advocacy: air forces are not yet good enough at explaining what airpower takes to the people who fund it.

The risks are three. One is the substitution trap, in which the promise of autonomy becomes the justification for cutting proven capacity before it has been demonstrated. Another is the attrition trap, in which a force built to absorb losses ends up competing on the industrial ground where an adversary is strongest. The third is the dependency trap, in which an apparently inexpensive system relies on a web of tankers, nodes and links that an adversary can attack.

The opportunities are real and substantial. CCAs can extend sensing, add weapons capacity and accept risks that commanders would not impose on crews. For a middle power such as Australia, they may expand the reach and weapons depth of a modest force. The condition is that they are designed from the mission backward and integrated into an enterprise with the depth to sustain them.

One reading of the argument is worth pressing, and it is my own rather than Deptula's. His framework treats cost per effect as the decisive test, and it is a good one. But the test is only as sound as the assumptions fed into it, and those assumptions are exactly where the debate between affordable mass advocates and their critics now lies. How survivable are crewed penetrating aircraft and their bases against a missile-heavy adversary? How quickly can a force regenerate sorties rather than merely count aircraft? How

much of a package's cost is truly fixed and how much is scalable?

His emphasis on regeneration, on factories, engines, crews and logistics, points towards a broader proposition: that airpower is an enterprise rather than a platform. Seen that way, the real contest is between competing enterprises, and the one better able to regenerate effects under pressure holds the advantage. That is a harder metric to apply than unit price, and a more honest one.

The measure that matters

Deptula's Forbes article closes on a line that his seminar remarks reinforced. The measure of a combat aircraft is not how cheaply a nation can afford to lose it. It is whether it can accomplish the mission, survive where possible and return to fight again, so that the war can be won as rapidly and decisively as possible. What costs more than a first-rate, full-capacity air force, he concluded, is a second-rate one without the capability or capacity to win.

For air forces in the Indo-Pacific weighing how to build mass and depth with autonomy in the mix, the lesson is not to choose between crewed and uncrewed, or between high-end and low-cost. It is to start with the effects required to win, test what the new systems can truly deliver, and resource the force the strategy demands, or be candid about the risk of not doing so.

See the following for the Forbes article:

<https://www.forbes.com/sites/davedeptula/2026/09/27/there-is-no-virtue-in-affordable-failure-design-the-air-force-to-win/>

Combat Depth, Not
Just Mass: Collaborative
Combat Aircraft and the
Australian Industrial Base

The most useful argument at the Sir Richard Williams Foundation's seminar on air combat mass and depth in Canberra on 1 October was not about aircraft. It was about what kind of enterprise Australia needs behind its aircraft if collaborative combat platforms are to matter at all.

The panel, "Collaborative Combat Aircraft in Context: CCAs and Defence Industry," brought together practitioners from the air force's ideas community, from industry, and from the Foundation itself. John Conway, Sir Richard Williams Foundation Research Fellow, served as moderator. The two participants were WGCdr Chris McInnes, PhD, Air and Space Centre and Jeremy Feldhahn, CCA Strategy Leader, MQ-28 Boeing Defence Australia.



John Conway, WGCdr Chris McInnes, and Jeremy Feldhahn discussing CCA's at the Sir Richard Williams Seminar, October 1, 2026.

The moderator set three guardrails: keep the discussion relevant to Australia's theatre, avoid being captivated by tactical detail from other wars, and think about mass and depth in terms of national strategy and the choices open to government. The conversation honoured them. It never settled into a platform comparison.

What emerged was a coherent position, reached from several directions. Collaborative combat aircraft, or autonomous collaborative platforms (ACPs), the broader term many panelists preferred, are valuable to Australia less as expendable mass than as a way to build combat depth, persistence and options for commanders. They add to the force rather than replace anything in it. Their value depends on institutions that can integrate them and on an industrial base that can design, build and adapt them at speed. And the economics should be argued in terms of value and effect, not unit price.

The panel did not agree on everything. Questions from the floor on price expectations and vendor lock-in produced the sharpest exchange of the session, and the closing minutes opened a topic, command and control,

that the format had no time to explore. This chapter follows the panel's reasoning, themes first, then the points left contested.

The problem has not changed since 1937

Australia's defence problem is a persistent mismatch between its responsibilities and its resources, and the panel began there rather than with technology. In early 1937, at the end of the Depression, the then opposition leader John Curtin argued that the strength of Australia's defence must lie in aviation. The air force had roughly 96 aircraft in eight squadrons, and he called for more than three times that number. His reasoning was geographic and demographic: a small population, a vast territory, and isolation. Nearly ninety years later, one panelist observed, the country is having the same conversation with different technology.

The figures cited reinforce the point. Australia holds more than 8,000 islands across some 10 million square kilometres of sovereign territory, before the wider Indo-Pacific, an area of roughly 260 million square kilometres, is considered at all. Airmen add height to that, up to perhaps 50,000 feet, so the real quantity to be defended is a volume of airspace rather than a map.

One framing deserves to travel beyond the seminar: Australia functions as an archipelago, not as a continent or an island. Its cities are separated by what one speaker called oceans of dirt and sea, and they connect to each other by air. The Sydney-Melbourne route, cited as the sixth busiest in the world in 2025, was described as the most aviation-intensive on the planet when measured by scheduled seats against the population served, at nearly 90

seats per 100 people, against under 70 for the next highest, Riyadh to Jeddah. The sea lines of communication that Australia depends on, in turn, depend on aviation for surveillance and security.

The discipline this imposes was stated plainly. There are no "defence needs" separate from national needs; there are national needs, and defence is one of the ways to meet them. Autonomous platforms were therefore introduced as another evolution in using technology to close a mismatch that geography will not close. The question for the rest of the session was which technology, applied how, and built by whom.

From range to reach to coverage

The panel argued that range is the wrong metric for air power, and that much of the recent planning vocabulary has been built around it. Range is a fair description of a land- or sea-launched weapon, measured from the launcher. It misleads for air-launched weapons, because the launching platform does roughly two thirds of the engagement and is reusable. Charts that plot weapon range from the launch point therefore understate what air power contributes.

In its place the panel proposed two terms. **Reach** combines range, the speed at which a force arrives, and what it delivers on arrival. The last element matters more than it is given credit for: some of the warheads now being acquired, one speaker suggested, would have no meaningful effect on the targets they are meant to engage. **Coverage** is reach sustained over time, or reach combined with tempo.

The distinction has operational consequences. A long-range strike off the east coast on Monday is something

several parts of the Australian Defence Force could manage. Repeating it in the Indian Ocean on Tuesday or Wednesday is something only air power can do. Air power is the closest the force comes to being in two places at once, which is exactly the attribute a country with Australia's resource-to-responsibility mismatch needs.

This reframing is what makes the later discussion of CCAs coherent. If the goal is coverage, then what matters is the capacity a system adds: how many places, how often, for how long. Whether it is a fighter, an uncrewed wingman or a communications node is secondary. Several later arguments, on persistence, on leverage and on value for money, follow from this starting point.

What has changed, and what has not

Four drivers of change were identified, and each bears on how quickly uncrewed systems can move from concept to fielded capability.

- **Autonomy and AI.** Autonomy is advancing quickly and is now ready to field and experiment with, with humans on the loop rather than in the cockpit.
- **Design speed.** Model-based systems engineering and digital pipelines allow a design to move from concept to build far faster, and to be matched with a supply chain earlier.
- **Government reference architectures (GRAs).** Industry initially resisted them. Their purpose is to break vendor lock, so that a mission autonomy package, a payload, an autonomy skill or a weapon built to open

missile standards can be swapped in without rebuilding the platform. The approach has been driven by the United States and accepted by several other countries.

- **The character of conflict.** Over the past four years the proliferation of autonomous systems has accelerated change. The panel was careful to separate these platforms from what the press calls drones, which are often munitions or low-cost cruise missiles.

A historical precedent kept the discussion honest. Between 1964 and 1973 the United States Air Force flew some 3,500 combat sorties with the Lightning Bug uncrewed aircraft, adapted into about 27 variants. It began with bomb damage assessment, moved to chaff laying and leaflet dropping, and then made a consequential contribution to signals collection against the SA-2 surface-to-air missile, whose data was used to reprogram payloads and improve the survivability of the crewed B-52s and Phantoms. But it was launched from a C-130, controlled from the back of one, and recovered by a helicopter with a grapple hook. When combat ended, the business case collapsed.

The lesson drawn was that the earlier problem was the lifecycle: logistics, maintenance and operational support. Modern jet-powered systems, down to something as basic as landing gear, have addressed much of that, which makes them useful beyond high-end combat.

One panelist offered a second reason for optimism. Reference architectures and design tools are bringing in different kinds of people, software engineers, supply chain specialists and production designers, who were not historically part of air power. The concept moved from hypoth-

esis to practice in about five years, and fielding is planned for 2028.

What CCA's are for: Depth, not disposable mass

The panel rejected the picture that dominates the popular debate, in which a force buys large numbers of platforms because it expects to lose many of them. That is not the movie Australia is in. Australia's strategy is denial, which calls for combat depth, and for a force that looks somewhat more formidable than it is. The point is to outsize the force that exists, not to plan for attrition.

The case was built on three pillars.

- **Risk management.** A commander at the strategic, operational or tactical level gains the option to use an asset with no human aboard, or one employed in a different way. That adds a layer of risk management to the whole force.
- **Capacity optimisation.** This was described as the most important potential. It offers capacity where there was none, within both the services and industry, from the low end to the high end of the force.
- **Persistence.** Persistence supports coverage. The panel suggested that with the right capacity ratio, strikes that now have to be sequenced across the continent could be done at the same time.

A companion idea was leverage. The ADF has a small number of high-value assets that cannot be replaced quickly: crews above all, but also aircraft such as the E-7

and KC-30, which cannot be built overnight any more than a battleship could be. CCA's do not exist to give crewed aircraft something to do, and the issue is not jobs. The aim is to maximise the force already in hand. This moves the conversation away from crewed against uncrewed and toward how existing capability can be extended.

Two further points shaped the panel's view.

First, "collaborative combat aircraft" is too narrow. The term covers a family of platforms that can act as communications nodes, weapons carriers or distributed sensors, not just wingmen. They are becoming part of the fabric of the force, not an adjunct to it. Second, they are additive.

Normally a new platform replaces an old one and inherits its people and infrastructure. CCA's replace nothing, and when international partners ask what is being replaced, the answer is that nothing is. This is the source of the real difficulty. The constraint is the capacity of the organisation to absorb something new, not whether the technology works.

The operational record offered some support. The panel pointed to recent operations over Iran, where the United States Air Force's chief of staff reportedly named an uncrewed Reaper as the most valuable platform.

Two explanations were offered. One was the extreme cost of the rescue of a downed crew member, in resources diverted, aircraft at risk and tasking disrupted. An uncrewed loss would not trigger that cascade, though nobody argued that crews should not be rescued. The other was the same value uncrewed aircraft showed in Afghanistan: they soak an area, endure, and close the kill chain organically once airspace is no longer lethal on entry.

Learn from the people and ideas, not the things

Asked what to take from Ukraine, the Middle East and elsewhere, one panelist borrowed Boyd's trinity of people, ideas and things and argued for learning from the first two. The hardware matters less, because the geography is different, and Ukraine is a continental land war. How systems are designed, produced and organised is directly relevant. How they are used around a land front is of limited relevance.

The contrast offered was between two uses of air power. In Ukraine, Russian aerospace forces held numerical and technical superiority but failed to turn it into air superiority. Their air arm is subordinate to the land forces, and an early campaign against enemy air defences was switched off when ground commanders demanded close air support. The comparison was with Israel's dismantling of Iran's air defence system. It was described as an overnight success thirty years in the making, built by an air-minded force that combined airborne ballistic missiles, drones and cyber effects under air-minded leadership. That did not resolve the conflict, but it set conditions on land and at sea.

Air-mindedness is a way of thinking

The discussion kept returning to air-mindedness, and the panel treated it as a mindset, not a licence held by pilots. It was characterised as a higher, faster, further perspective that values expertise and looks for other ways to achieve an effect. Flying informs it, but it is not about hands on a throttle and stick. This matters because of a worry raised

at the seminar: how will air-minded leaders be developed when aircrew numbers fall? The panel's answer was that air-mindedness can be taught and held by people who do not fly.

Institutions can absorb this, if they let themselves

Western air forces separate force generation from force application, and organise by time and task using whatever resources are available. That is exactly the model that can absorb CCAs.. The panel pointed to the Pitch Black exercise, where roughly 100 aircraft from 21 nations are formed into packages and flown every day, as evidence that the institutional capacity exists. One speaker said the obstacle may simply be getting out of our own way.

The underlying principle was the right tool for the job. Autonomous systems do not need to be fitted into the way the force already does business. They need to be embedded in it, so that persistence and risk management are designed in from the start.

Sovereign industry as a kernel, not a standing army

The industrial argument was the most developed of the session, and it rested on a distinction between what Australia must build in peacetime and what it must be able to build when it counts. Nobody argued that taxpayers should fund a large aerospace industry for defence alone. The argument was that the country needs the kernel: the skills, competencies and people who know how to design, build, adapt and manage these systems at scale and at speed.

The precedent was the Second World War. Australia had no machine-tool industry before the war and no ships to import one, yet it went on to build about 2,500 combat aircraft and 2,000 high-performance aero engines, producing the great majority of its own machine tools with a workforce that was largely untrained. Britain's shadow factories were commercial car-engine makers repurposed for aircraft, not idle plants waiting for war. The speaker's conclusion was that claims the country cannot do such things should be resisted.

Adjacent industry and dual use

If the kernel is the goal, adjacent industry is the route. Panelists asked what the nuclear enterprise being built for the submarines could be repurposed to produce, and what other Australian industrial activity could pivot. Ukraine was the modern example. Its accelerating development cycle, reported to have fallen from seven months to weeks, drew on a strong domestic base in car manufacturing and wiring looms. Dual-use development was described as largely unexplored for aviation: logistics, surveying, even mail delivery to the outback could add to industrial depth without being combat aircraft.

What the MQ-28 programme shows

The MQ-28 programme has run since roughly 2017 to 2018, has at least 125 active suppliers, and has had as many as 200. Around 70 per cent of the investment goes back into Australian industry. Several suppliers had never worked in aerospace, and some have since moved on to other things. It is described as the first military aircraft built

in Australia in some fifty years. The point was not that this one aircraft is the answer but that the intellectual depth now exists to pivot if a different system is needed.

Choose your dependencies

On sovereignty the panel was realistic. Doing everything at home is not feasible, and the more useful aim is to choose your dependencies rather than have them chosen for you, keeping control over the elements that matter most. A related distinction was drawn with the Heron remotely piloted aircraft, which Australia could effectively rent and operate using existing fast-jet, intelligence and engineering people. CCAs do not work that way, because the challenge is having sovereign industry able to build them together.

The funding mismatch

A structural problem was raised without being fully resolved. Australian practice funds acquisition and sustainment, but has no equivalent research and development line, so much development is carried inside sustainment through spiral upgrades. The result is a habit of buying and sustaining, and little interaction with industry on long-term goals. Without that line, the depth the panel wants is hard to build or to renew.

Value for money, not cheap mass

The panel's most pointed argument was that cost is the wrong place to start. The moderator framed the issue as a question of what Australia values, then of what it costs to protect it. Australia values its people and does not accept

the casualty rates that some adversaries will. That ordering changes what counts as affordable.

Several speakers disliked "cheap" and "affordable" for the same reason. A cheap car is not what you buy your children, and the cheapest aircraft is not necessarily the most cost-effective one. The better question is cost per effect, a line of analysis the panel credited to the Mitchell Institute. Nothing is ever unaffordable, one speaker remarked, it is only not prioritised.

Two concepts supported this view:

- **Operational opportunity cost.** A cheap launcher for a weapon may cost little to buy but impose heavy burdens on the rest of the force to deploy and use, making it expensive in practice.
- **Massive effect, not massive equipment.** The question is what effect has been created, not how many platforms exist.

The illustration was drawn from Ukraine. A one-way attack drone costing tens of thousands of dollars and carrying a warhead of tens of kilograms is, by the figures cited from CSIS, shot down in a large majority of cases, and those that arrive achieve little. Their real effect is to impose defensive costs on the target. Under a strategy of denial, the panel observed, an adversary will not be deterred by annoyance, and sinking ships requires heavier weapons. By contrast, a reusable platform carrying a 2,000-pound warhead may achieve far more. A multi-million-dollar ACP that protects a crewed aircraft worth a hundred million and achieves the required effect beats a drone costing a few thousand dollars that achieves nothing.

Systems that fight into dense defences and fight out

again, with large warheads, cannot be built on the cheap, and some uncrewed systems will cost more than was once expected. As supply, demand and industry investment mature, cheaper systems will arrive for particular missions and threats.

What ties them together is architecture: a reference architecture so that systems costing ten thousand dollars or twenty million can all work together.

Building Mass with Industry: Industrial Capacity Is Combat Power

The session on building mass with industry opened with a disclaimer. Air Vice Marshal Robert Denney, Northrop Grumman's Country Executive for Australia, told the audience he had built his own slides and that they were "for oral learners," not visual ones. A non-compete arrangement with a colleague meant he would not be competing with the earlier speaker's material. The joke set the tone for a short, unadorned argument that cut against how most air forces spend their money.

Denney brought 33 years in the Royal Australian Air Force to the podium. He commanded No 6 Squadron and No 82 Wing, served as Head of Air Force Capability, and finished as Head of Force Integration. In that last post he was responsible for designing and assuring delivery of interoperable capabilities across the joint force. He joined Northrop Grumman in January 2025 and now spends his time building Australian industry partnerships and connecting them to U.S. capability and technology. That career gave him standing to say what he said next: the

tacticians, himself included in his day, have been optimizing the wrong part of the problem.



Air Vice Marshal (Retd.) Robert Denney, Northrop Grumman's Country Executive for Australia speaking at the Sir Richard Williams Foundation Seminar October 1, 2026.

The change Clausewitz missed

Denney began with a historical claim. Something changed in warfare in the 1800s, visible in the American Civil War, confirmed in the First World War, and decisive in the Second. Industrialization turned war from a contest decided by tactical brilliance into an economic contest decided by the nation with the greatest industrial output. The mobilization of national economies for mass production of war materiel determines what reaches the front line, how much exists at the start, and how much arrives as reinforcement.

Clausewitz's work appeared in 1832, just as this shift was beginning. Denney's point was that industrialization was not part of the strategic thinking of the time, so the generations of staff college tutorials that have since

analyzed On War have not dwelt on it either. The discipline of strategy inherited a blind spot.

The air domain depends on industry more than any other

Denney argued that the dependency is sharpest in the air. On land, he said, Russia has shown that a soldier can be given a rifle and two weeks of training, and mass can be generated that way. That is a crude and costly form of mass, but it is mass.

The air domain does not allow it. Even to occupy the air, a nation needs complex machinery built with advanced manufacturing techniques, specialized materials, and skilled workforces. Air power depends on industry merely to exist and far more to create mass. Land and maritime forces can improvise to some degree. An air force cannot improvise an airframe.

Nations know the cost of the alternative, which is why they have always sought quick victories to avoid endurance contests. Denney offered two examples. Blitzkrieg succeeded in Western Europe, then Russia turned the Eastern Front into a grind, which let the Allies' industrial capacity become the determining factor. More recently, he said, Iran turned an American expectation of rapid decapitation into a contest of endurance. It did this partly by absorbing weapons, and partly by exploiting the reality that the United States will not fully mobilize.

That last point matters for every Western democracy. Full mobilization takes substantial political capital, which democracies rarely hold outside a threat to national survival. Ukraine is facing that kind of threat now. Denney said the case more relevant to Australia is Poland, which is elevating industrial capacity in specific areas.

The shape of a war

At the center of the talk was a diagram Denney drew himself, which he said looked a lot like an ECG trace. He asked whether anyone recognized ectopic trigeminy, then described it as a plot of combat effect over time, “not to scale nor to be used for navigational purposes.”

The curve starts on the left with a level of peacetime readiness. Then comes a surge into the initial phase of combat, where combatants commit their pristine equipment, their war stocks, and their most highly skilled people. Intensity falls from that peak and settles into a sustained tempo. Denney called it the grind. The timeframes and magnitudes vary from war to war, but the general progression holds.

“Combat effect” is a dimensionless quantity in his construction. He joked that it might be called “capabilitrans,” though the term was already taken. It combines industrial capacity, readiness, tactical efficiency, stockpiles, communications, and more. Most of those components degrade as war goes on. Readiness falls because troops enter the fight with less training than in peacetime. Stockpiles, weapons reserves, and communications networks are targeted and destroyed. Tactics do improve, but they improve on both sides, so the improvement does not give either side a lasting edge.

What remains in the grind is set mainly by industrial capacity. Denney put it directly: that is what makes your mass. The height of the line in the grind is the rate at which a nation can replace combat effect against the rate at which an enemy can destroy it. A nation that produces more than it loses can rebuild. More often, he noted, a nation commits any surplus to a push for victory that

would end the grind. This is especially so in a limited war, where political will to stay engaged decays quickly.

What industry makes in the grind

Denney split industry's contribution into two categories.

The first is what he called the things you consume whatever the combat outcome: munitions, fuel, and spare parts. These are consumed and resupplied as a matter of course, even when everything goes to plan. Logistics systems must be accelerated and “turbocharged” for the increased tempo, and they will be targeted by an enemy who goes after production and distribution as well as the front line.

The second is reinforcement of losses: workforce, aircraft, ground support, command and control nodes. These are items a force does not plan to consume but must replace because of the destructive nature of combat.

On reinforcement, Denney was blunt about Australia's position. Replacing a modern, high-technology aircraft in a reasonable time frame is unlikely. He suggested Australia does not have that ability today. He also argued Australia should not plan on allies having the capacity, the willingness to forgo their own needs, and the means to transport such things to Australia, on the scale needed to sustain the level of combat effect Australian planners expect in protracted operations.

For Australia, then, sustained combat effect requires sufficient domestic industrial capacity. That capacity must come from somewhere, and the timing creates the difficulty. Industrial capacity before a war determines the level of the grind, and only a finite amount can be added once a war begins. Denney said the real challenge may be raising it at all, given the other national distractions and drains on

resources. History shows that it takes years if you wait for the shooting to start.

A force design problem

His conclusion was that capacity must be built up front, before an adversary starts destroying the equipment a nation already has. What Australia builds now will be the base from which its industry grows when a war starts.

He then reframed the issue. “It’s not an industry problem; it’s a combat power problem.” Industrial readiness and capacity must become a force design consideration. The size and areas of investment needed to establish the industrial base should be part of the design process, alongside platforms, sensors, and networks, and not treated as a procurement afterthought.

For where to start in what he called the pre-war period, and which he said is now, Denney pointed to consumables: munitions, fuel, and spare parts. He was careful about the business case. The production should not be sized to the current demand of the Australian Defence Force. Exporting any surplus would be welcome but should not be a prerequisite. The purpose is twofold. One is to build stockpiles and war stocks that will be there if war comes. The more important one is to develop the industrial capacity for the grind.

The paradox of deterrence spending

Denney acknowledged an awkward feature of this argument. The true value of the investment is something everyone hopes never to see realized. In the best case it would look like the worst value-for-money decision in

history, an inefficient waste of production. The justification is deterrence, the same logic applied to military hardware. A submarine that is never fired in anger is not a wasted submarine. Industrial capacity that is never called on to fight a protracted war is not wasted capacity either, if it helped prevent that war.

He added that history treats industrial capacity once the shooting starts as the war winner, and that is why it needs to be treated as a requirement now.

Where the resources come from

“What's the offset?” Denney asked, noting that this might get some people excited.

Australia is currently consuming a great many resources to be ready to fight tonight. The tacticians, as he was in his day, are working to make the point of the spear as sharp as possible: maximizing tactical readiness and aircraft serviceability, running the highest-fidelity exercises, and tightening interoperability. He said he did exactly this when he held those jobs.

His challenge was about what that effort does to the overall shape of the curve. In a resource-constrained environment, investment in the peak is investment taken from the grind. A force that maximizes the height of the red line at the front is driving down capacity later in the war because it is not investing in it. It is not maximizing the area under the curve, which is the total combat effect the nation can bring to a sustained war of endurance.

That image carries his argument. The usual measure of readiness looks at the height of the peak. His measure looks at the integral. The two lead to different budgets.

The closing question

Denney tied this to the present. Unless a force achieves a decisive result in the initial phase, war is determined by industrial capacity in the grind. Forces enter a phase limited by that capacity, and he pointed to the Middle East today, where precision strike and integrated air and missile defense interceptors are the constraint.

His parting question to the audience was whether a quick win is a realistic expectation against the most likely adversary Australia is preparing for. Or is the more likely scenario an industrial arm wrestle of attrition, which is also the most dangerous one for Australia? He believes it is the latter. The war Australia should prepare for is one that will be determined over the long run by industrial capacity.

That capacity is what gives the ADF combat mass to sustain operations “not tonight, but night after night, week after week, month after month.” The sooner and the more Australia builds it, the greater it will be at the pivotal moment, even if that means not sharpening the spear quite so much. Denney's last claim was about deterrence itself. Preparing for the deterministic part of the war Australia will most likely face is what will deter an adversary, and deterring an adversary is the ultimate goal for Australian security.

What the argument adds to the seminar

Denney's talk sits comfortably beside the day's larger theme. If the seminar's emerging answer to air combat mass is that the next generation of airpower is an enterprise and not a platform, then Denney supplied the enterprise's foundation. A fleet is a snapshot. A regenerative

enterprise is a rate: how quickly a nation can turn factories, workforce, logistics, and stocks into combat effect while someone is trying to destroy them.

His argument also complicates the “exquisite versus intelligent mass” debate. If reinforcing exquisite platforms is unrealistic for Australia, then the case for lower-cost, more producible systems is not simply about cost per aircraft. It is about what a national industrial base can actually regenerate under fire. The same applies to the kill web: a network that depends on a few irreplaceable nodes inherits their fragility.

The hardest part of his message is political and budgetary, not technical. Building industrial capacity as a force design input means accepting a less sharp spear today, in exchange for a deeper force later. That is a difficult trade in any defence budget, and harder when the threat is described in terms of readiness tonight. Denney offered no formula for the trade, and said as much by joking that he had spared the audience a colleague's formula. What he offered was a way to see it: measure the area under the curve, not only the height of the peak.

Multi-Mission Force
Multiplication: Phil Gordon
on Generating Combat
Mass by Doing More
with What You Have

When a Lockheed Martin executive takes the stage at an air power seminar, the room expects a pitch for more F-35s, or at least for a new variant of something. Air Commodore (Retd) Phil Gordon AM opened by acknowledging that expectation and then setting it aside. He told the audience he could talk about those platforms afterwards. His subject at the Williams Foundation was a different route to combat mass, depth and resilience, which he called multi-mission force multiplication.

Gordon is well placed to take that route. He spent 36 years in the Royal Australian Air Force. He commanded No. 2 Operational Conversion Unit and 81 Wing and led Air Force planning for the introduction of the F-35. He commanded Air Task Group 630 on operations in the Middle East and served as Australia's Joint Force Air Component Commander. He later commanded the Air Warfare Centre and then served as Director General Air Defence and Space, where he led capability development across integrated air and missile defence, air battle

management and command and control. He also helped establish Defence Space Command. He joined Lockheed Martin Australia in July 2025 as International Strategy and Business Development Director for Rotary and Mission Systems, a role that covers command and control, integrated air and missile defence, radars, sensors, cyber, electronic warfare and sustainment.



Air Commodore (Retd.). Phil Gordon AM
speaking at the Sir Richard Williams
Foundation seminar October 1, 2026

His argument concerns how a defence force thinks about what it already owns, and it is aimed squarely at the way Australia buys and structures capability. In his view the problem is organizational at least as much as it is technological.

Mass as a Matter of Concentration

Gordon began from a simple proposition. Combat mass at a particular point in time and space can be generated in

two ways: by having more things to call on, or by doing more with the things you have. He spent his fifteen minutes on the second.

He offered what he called, with a nod to the Guinness Book of Records, a new air power formula. Mass is concentration of force, and air power generates it through its characteristic attributes. To generate mass, he argued, you maximize speed, reach and flexibility while minimizing dependency and fragility.

His treatment of speed was the interesting part. Air power people usually think of speed in knots. Gordon wanted to focus on speed as a unit of time: how quickly a force can detect, make sense of what it has detected, decide, and then communicate decisions, directives and coordinates to the force at both the operational and tactical levels. Concentration of force depends on how fast the decision cycle turns, as well as on how fast the aircraft fly.

Time Measured in Seconds

To anchor the point, Gordon drew on a recent presentation by Admiral Brad Cooper, the commander of U.S. Central Command, who had been discussing Operation Epic Fury. As Gordon relayed it, Cooper's observation was that time in that operation is measured in seconds, sometimes minutes and rarely hours. Gordon said plainly that this is the movie the force is now in. Command and control can no longer mean assembling slide decks so that a commander can approve an action 72 hours ahead. Everything is happening in real time and machine to machine.

He tied this to Boyd. The OODA loop has never been more relevant, he said, but technology and integration have opened new opportunities to improve performance at every stage of it. His case was not that the loop is new. He

argued that the tools for compressing it are now available, and that the way capability is acquired and organized has to change to take advantage of them.

For readers who follow the kill web versus kill chain debate, this will sound familiar. A kill chain is a linear sequence in which each link is a single point of failure. A kill web gives the force multiple paths through the same decision cycle. Gordon argued that the paths multiply when the force's battle management nodes can do many things, rather than being built to do one.

Air Battle Management as the Core

Gordon was candid that, being from Lockheed, he would talk about a program that is close to his heart: the joint air battle management network the company is delivering under AIR 6500. He described it as a scalable, survivable, cyber-hardened, next-generation joint air battle management system that will be the core of Australia's integrated air and missile defence.

The nodes come in many form factors. He described everything from hard cases and pelican cases that can be set up in tents, through vehicle-mounted and cabin-integrated configurations, to fixed facilities. They operate as a multi-nodal network, and each node can continue to operate independently and resiliently if it is cut off, which is the condition a contested battlespace will impose.

On artificial intelligence he was measured. The program aims to incorporate machine-assisted human decision making. Gordon said the force is not ready to hand over the keys to superintelligence and does not want to unleash the killer robots just yet. But he saw great potential in smart machine learning and algorithms running in

the background, paired with the right human-machine interface.

He made a point of stressing the architecture's openness. The system is built on a modular ecosystem approach and delivered through agile software development. For the many industry partners in the room, he said, Lockheed's role as strategic partner is to integrate best-of-breed solutions. In his words, it is not about selling more Lockheed Martin products. If the system is genuinely open, the question of whose effector or sensor plugs in becomes secondary to what the network can do with it.

The Mission App Model

The center of Gordon's argument was what he called mission apps. Air battle management and integrated air and missile defence are the first mission app on the system. He then walked through the other missions the ADF faces and asked why each is treated as a separate problem.

Electromagnetic battle management was originally in scope for the program. It has since been pulled out, but Gordon noted that considerable work with industry partners had already been done to prepare a solution, and that the team is ready to move quickly if it returns.

On counter-UAS he was emphatic. He expects most of the room would agree that counter-UAS cannot be treated as something separate from integrated air and missile defence. If a hostile track is closing on a defended asset, nobody wants to hear that it is a Group 2 UAS and out of scope. The problem runs from counter-hypersonic to counter-UAS, and it is all battle management that has to be done in an integrated way.

Lockheed had spent money and time developing a homegrown counter-UAS battle management app, and it

has since become the company's global counter-UAS app, scaled and uplifted in the United States.

He stressed that this is not in competition with LAND 156. The land-based project is still needed, and not every counter-UAS node needs full joint battle management functionality. But every battle management node, he argued, needs a counter-UAS capability, and the sensors and effectors industry is developing for the ADF's counter-UAS solution could all be integrated with an open system fairly quickly.

Space followed the same logic. If a hostile track transits 100 kilometres in altitude, it is still a hostile track. Nobody should hand it to another team in another building running another system, least of all on a contested battlefield where reliable communications with that other unit cannot be assumed. Everything above the surface of the Earth, including above 100 kilometres, belongs to integrated air and missile defence.

He extended the pattern further. Offensive fires coordination is a large airspace and battle management problem. Fire support applications are mission apps that could sit on the same battle management systems. ISR processing, exploitation and dissemination, joint targeting and theatre command and control are different versions of the same underlying challenge.

The Fragmentation Problem

Here Gordon turned from capability to institutions. Each of those circles on the chart, he observed, is a separate project with a separate funding source and a separate team running the competition and the acquisition. Each produces its own individually fragile and bespoke solution, rolled out to the ADF in ones and twos. The result is

dependency and fragility, the two variables his formula says must be minimized, and it undermines the depth and resilience the force needs.

This is the sharpest part of his argument, and it will resonate well beyond Australia. Acquisition systems are organized around discrete requirements, and each one is scoped, competed and delivered on its own. The battle-space has stopped respecting those boundaries. Gordon's contention was that the missions are merging in the current technology environment. They are all essentially versions of the OODA loop, and the force is still buying them as if they were different things.

From Common Operating Picture to Common Operating Data

His proposed remedy has a vocabulary shift at its core. He asked the audience to move past the twentieth-century fixation on the common operating picture and embrace a twenty-first-century view of common operating data within a common OODA loop. That data is then presented through what he called a mission context interface.

The practical reasoning is easy to follow. An operator fighting the counter-hypersonic fight and an operator fighting the counter-UAS fight should not be looking at the same screen at the same range scale. Each needs an interface tailored to the mission, including its own machine-assisted decision support. Gordon joked that if people dislike changing the acronym, they can call it a contextualized operating picture and keep saying COP. The underlying data is shared, while the presentation is tuned to the task.

The other half of the concept is external connectivity.

Common operating data flows through the mission context interface and through a series of external system interfaces that pass secure, cyber-resilient, actionable information machine to machine in both directions. That, he said, is the dream behind the lightning bolts on every integration chart, and it is achievable if the force changes the way it thinks about the problem.

PACE Applied to Roles, Not Just Radios

The idea that generated the most interest was Gordon's application of PACE. Military communicators already use primary, alternate, contingency and emergency as a planning construct for communications paths. Gordon proposed applying the same logic to battle management, and indeed to everything the ADF does.

If every system and every unit has a primary, alternate, contingency and emergency role, then people can rise to the occasion. Gordon was confident that ADF personnel are exceptional and that, given the tools, they will handle complex multi-mission battle management challenges. His model does not require everyone to be highly proficient at everything all the time. People need the tools and a base level of training, and in a contingency they can be trained quickly to do more. What the force gains is options.

That is where depth comes from. If every battle management node is a potential strike cell, a potential counter-air cell and a potential contributor to space battle management, the force no longer depends on a single strike cell. And when those nodes are fighting in a contested, disconnected environment, they retain the tools to keep fighting. Gordon said this gives real meaning to mission command: tell your teams the objective and trust

them, now equipped with the means, to take it while cut off from higher headquarters.

This should reassure anyone worried about overloading operators. The model he describes is not about asking every airman to master every mission on day one. It is about designing systems and training pipelines so that a secondary or contingency role can be activated rapidly, rather than being a separate capability that has to be built from scratch.

Effectors: Doing More with Platforms Already Bought

The obvious objection, which Gordon raised himself, is that battle management is all very well but the force does not have enough effectors. He argued that the same mindset applies there, and offered several examples.

The first was a reusable high-power microwave system, which he said has been proven against Shahed-sized drones and can manage more than twenty engagements before the battery pack needs changing. He argued that every battle management node could be equipped with high-power microwave kill capability and the supporting battle management solution for less than it would cost to stand up a project, run a competition and staff the team.

The second was the lead-in fighter. What if the new aircraft were also a capable second-tier fighter? Its primary mission would be training and its ultimate mission ADF support. Its contingency mission could be to carry APKWS rockets with a targeting pod and Link 16 and take down large drones and cruise missiles. This, Gordon said, is a way to buy something the force was going to buy anyway but give it more utility by embracing the PACE mindset.

The third was the Apache. He hoped someone, some-

where, was writing the tactics, techniques and procedures for Apaches to join the inner layer of air defence as part of counter-UAS and integrated air and missile defence. It is a highly capable platform with a favorable cost per kill against some of these targets. He went a step further: strap weapons on the Black Hawks and make them loyal wingmen to the Apaches. Black Hawk crews would not need to be proficient in targeting. They would carry munitions to the fight and the Apache would do the targeting for them.

Assessment: Intelligent Mass Without New Platforms

Gordon's presentation sits comfortably alongside the wider conversation at the seminar about mass and depth. Much of the debate about mass turns on how many aircraft, how many munitions and how many uncrewed systems the force can field, which are really questions about scale and affordability. Gordon's contribution was to ask how much latent mass the force already holds and why it is not being used.

His answer implies a particular view of air power as an enterprise, in which the integration layer matters as much as any airframe. It also reflects an argument familiar from the kill web debate. A force built from single-purpose nodes is brittle, while one built from nodes that can each take on several roles can lose pieces and keep fighting. Intelligent mass depends on this kind of flexibility as much as it depends on numbers.

Several questions remain for the force and for industry. Multi-mission nodes require a training and certification regime that supports rapid role changes, and the ADF has to decide how much proficiency in secondary roles is

enough. A more concentrated architecture raises the stakes on cyber hardening, which Gordon identified as a design priority but which will need continuous testing. And an open ecosystem depends on government being willing to hold the integration standards, and on prime contractors, including Lockheed, being willing to let competitors' products into the system. Gordon's statement of intent was clear, but the proof will come in contract structures and interfaces.

The deeper obstacle is the one Gordon named at the start of his critique, the way projects are scoped and funded. A multi-mission mindset cannot be delivered by a contractor alone. It requires the customer to rethink how requirements are written, so that a counter-UAS capability is specified as part of battle management rather than competed separately, and a fighter's contingency role is considered at the point of purchase rather than after delivery.

More Options, More Places, More Often

Gordon closed with an observation about language. When he joined the Air Force, multi-role was the goal. He suggested the force now needs to expand that to multi-mission and to embrace the PACE mentality.

He added that, by pure coincidence, he had come across a document the previous night, and read more of it that day, whose theme was more options, more places, more often. That, he said, is what he had just spent fifteen minutes describing. There are ways to generate more options with the things the force already has, which makes those assets capable of acting in more places and doing so more often.

For a seminar devoted to mass and depth, it was a fitting summary. The most accessible source of combat mass may be the capacity already sitting in the force, waiting for a mindset, an architecture and an acquisition system that allow it to be used.

Five Airmen on the Way Ahead for Airpower

The Sir Richard Williams Foundation's seminar on The Requirement for Air Combat Mass and Depth in the Indo-Pacific, held in Canberra on October 1, 2026, drew many speakers. Three of the practitioner sessions, taken together, say more than any one of them says alone. Each speaker stood somewhere different, and each described a different layer of the same problem.

Air Marshal Paul Lloyd, the Royal Air Force's Deputy Chief of the Air Staff, spoke from the European theatre, where the air force of a major NATO power is resetting its combat air strategy around a war on its own continent. Air Commodore Jarrod Pendlebury, Director of Strategy and Planning for the Royal Australian Air Force, spoke with Wing Commander Chris McInnes. He argued for the nation-level purpose of airpower and for the institutional qualities that turn aircraft into strategic effect. Air Vice-Marshal (Ret'd) Steve "Zed" Robertson and General Mark "Mike" Kelly, a former RAAF fighter pilot and the former commander of US Air Combat Command, offered a candid reading of what recent conflicts actually teach.



Air Marshal Sir Paul Lloyd, Deputy Chief of the Air Staff Royal Air Force, presenting at the Sir Richard Williams Foundation Seminar October 1, 2026.

Read in sequence, the three sessions give a coherent account of where airpower is going. In the first, control of the air returns as the non-negotiable foundation of everything else. In the second, control is shown to be a broader strategic effect than winning the air battle. In the third, delivering either one depends on an enterprise of sustainment, production, training and connectivity that no one buys with a platform. The way ahead that emerges is less about the next aircraft than about building an air force that can absorb loss, sustain tempo, and regenerate combat power over a long fight across very long distances.

The first requirement returns

Lloyd opened with the Battle of Britain, which the RAF was marking that month, 86 years on. He used it as a corrective as much as a commemoration. Because of the way Britain remembers 1940, he said, many people think of control of the air as a purely defensive mission: protecting the homeland. That is only part of it. Even in 1940, Air Chief Marshal Wilfrid Freeman understood that the battle had to be won in a way that allowed the offensive

to follow. A wholly defensive posture could avoid losing but could never win.

The offensive half of the idea found its great exponent in the Australian-born commander Sir Arthur “Mary” Coningham. Across the North African and European campaigns, Lloyd said, Coningham’s first lesson was that air superiority is the first requirement for any major land operation. Lloyd called the pairing “shield and punch”: defend against air attack, and strike the enemy’s air power at its source. Once control of the air was achieved and held, air power could be released to support the joint campaign. Lloyd summarised what control provides to a coalition commander as three freedoms: to operate, to manoeuvre, and to take the initiative. He reinforced the point with Montgomery’s line that whoever controls the air generally controls the surface, and with David Petraeus’s modern echo that with air superiority anything is possible and without it everything is dangerous.

His diagnosis of how the West forgot this was blunt. For three decades, the peace dividend produced forces optimised for wars of choice fought far from home against adversaries who could not contest the sky. Close air support, reconnaissance and air mobility dominated the contribution of air forces. Control of the air was a given, a free benefit, rarely needed by the service or its partners, and as its relevance faded, so did its funding. Few people in uniform today remember an era of no-notice exercises, fighting from the home base, and routine operations at scale with allies.

Then Ukraine arrived. Lloyd called the war, now past four and a half years, a case study in mutual air denial. Neither side has achieved enduring control of the air. The result is a grinding attritional conflict he compared with the First World War: armour destroyed by low-cost drones,

people moving underground, progress measured in metres. From an air force perspective, he said, the deduction is stark. If you cannot achieve air superiority, you will be forced into the meat grinder.

That is the strategic logic behind the RAF's present reorientation. The 2025 Strategic Defence Review pushed the service toward warfighting readiness, a NATO-first focus, and lessons drawn from Ukraine. The Chief of the Air Staff's "four by four" approach holds that the RAF must optimise its current forces for the fight tonight while modernising for the fight tomorrow. Its four pillars are people, delivery of the Review, a NATO-first orientation, and modernised capability programmes aimed at gaining and keeping control of the air.

What matters for the rest of this article is how Lloyd described the force that results. It is not a single-platform story. He described a bridge built from several layers:

- **Typhoon as the mass.** The fleet is being upgraded with an advanced radar and enhanced weapons integration, becoming what he called a beyond-fourth-generation workhorse.

- **F-35 as the penetrator.** The RAF is buying more of them, including the F-35A with its nuclear dual-capable aircraft role and increased deep precision strike. Stealth and Typhoon's mass together provide, in his words, an immediately lethal entry into contested environments.

- **Collaborative combat aircraft as affordable mass.** Crewed platforms alone, he said, cannot handle a complex and saturated battle space. The refreshed strategy accelerates the introduction of uncrewed combat aircraft, flying with AI "brains" as an integrated package with crewed jets. They are meant to provide affordable mass, sensors, dispersion and weapons carriage, with greater range and similar stealth properties. The aim

is a concept demonstrator flying alongside Typhoon next year and an operational capability by 2030, with the deliberate purpose of absorbing risk and, as he put it, shifting the economic calculus back in favour of the defender.

- **Lower-end autonomous systems.** Electronic warfare capability and a new one-way attack drone of 1,000 nautical miles' range, to be operated by the RAF Regiment, sit beneath the CCAs, all tied to a UK digital targeting web.

- **GCAP as the destination.** The Global Combat Air Programme, with Japan and Italy and now with Canada's involvement, is the sixth-generation fighter, still more than a decade from the front line. Today's mix, Lloyd said, is a deliberate stepping stone that matures the digital engineering, human-machine teaming and software-driven approach the future system will need.

He added that control of the air is no longer just a fighter and sensor story. It is multi-domain and multinational, and now has to reach into space and cyber, just as the Dowding system integrated land, sea and air in 1940. The RAF, he noted, worked with 45 nations in the last 12 months. In his words, allies are the superpower that adversaries both want and fear.

What control is for

The Australian session began by deliberately stepping back from the question Lloyd had answered. McInnes opened with a joke at the expense of the way air power appears in official investment documents: the air force is going to be helpful by doing stuff. The two airmen were there to argue that the real answer is much bigger, and they framed it around two documents. One is the "More Options, More Places, More Often" paper, which sets out why airpower matters to the country as a whole, not only to the Defence Force. The other is Pendlebury's paper on

what a Tier One air force is, due to appear in the relaunched Australian Journal of Defence and Strategic Studies.



AIRCDRE Jarrod Pendlebury, Director-General, Strategy and Planning, RAAF and WGCDR Chris McInnes presenting at the Sir Richard Williams Foundation Seminar October 1, 2026.

The central proposition they asked the room to test was that the distinctive strategic contribution of airpower is neither air domain capability nor warfighting in the air. It is creating connection and control across vast distances in hours rather than days, over and over again, shaping who and what can move where, when, and on what terms.

Pendlebury unpacked control in three directions. There is control in the air: the AWACS and ISR that control information, data and situational awareness. There is control from the air: strike and close air support exercising control over surface and subsurface domains. And there is control through the air: air mobility moving people and cargo once access is secured. The framing, he suggested, has a further virtue. It pulls conversations out of the rut of platforms and toward the strategic effect that a platform exists to serve.

Both men were careful about what they were not saying. Airpower is not decisive on its own, and it does not

replace domain forces, which remain necessary for direct control of land and sea. The claim is that airpower shapes access to those domains and what is possible within them. The Second World War is the model: Allied dominance of the air allowed armies and navies to move freely, and it shaped the Atlantic and Pacific shipping wars. The point, McInnes stressed, is integrated force advantage and not a ranking of services. If Australia controls the air and the approaches, then land forces can do more things and naval forces can do more things.

Pendlebury added a corollary that deserves more attention than it gets. Control also limits the choices of an adversary. The same set of capabilities that expands the options for Australia constricts those of a potential opponent, which is why control, in this reading, is a strategic and not merely operational idea.

The payoff has a name, “more options, more places, more often”, and three sources: flexibility, reach and tempo.

Flexibility is the ability to re-task multi-role assets, giving the government of the day choice and discretion. McInnes gave a deliberately wide range of examples: air mobility missions to Antarctica to maintain sovereign presence, reach throughout the South West Pacific, a 2,000-pound bomb on a target at the bottom of an ocean. The same assets doing different jobs in different places, again and again, is what makes airpower cost-effective even though it is not cheap. It also explains how a workforce of a little under 25,000 people, which McInnes compared to the population of a mid-sized regional town, can generate effects across millions of square kilometres.

Reach is more than range. It is how fast you get there, what you deliver, and what you can penetrate to do it. McInnes insisted that penetration is not just a matter of

defences. It includes getting through bushfire smoke and heavy weather to land on Norfolk Island in a storm. It is the closest a force can come to being in two places at once, and it lets the whole force mass in one place from across the continent, as exercises such as Pitch Black and Talisman Sabre demonstrate.

Tempo is the combination of speed and the amount of sustained operation. It creates presence and pressure and generates options more often.

Pendlebury connected these to a concept the Chief of Air Force calls “building fighting depth,” which he described in terms of posture, space and time. Depth through posture means agile operational capabilities that can move quickly. Depth through space means being able to be in more than one place, and he pointed to a striking chart in the Integrated Investment Program that makes the Air Force look as though it has the shortest reach of any service. That chart measures the range of the missile, not the thousands of miles the aircraft carries it before launch. Depth through time means doing things more often: quick turns, reprogrammable, fungible assets that can be used for many tasks. Fighting depth, McInnes added, is not an end in itself. It exists to preserve the ability to create control, choice and connection over vast distances under pressure.

The pressure, he noted, is new. The last air raid on Australia was in September 1943. The last Australian soldier killed by an air attack died the following month, and the last attack from the air on an Australian warship was in January 1945. More than 80 years of serene skies have made the country comfortable. McInnes borrowed a line attributed to the UK Chief of the Defence Staff that people who have enjoyed air security tend to remember its lessons less vividly than those who have been denied it. His

own gloss was that the Air Force had been in the bath too long.

What the recent wars teach

Robertson and Kelly's fireside conversation supplied the bridge from concept to hard operational reality. Kelly started with a caution: lessons from the Middle East cannot be pasted into the Pacific, because geography, politics and threats differ. But it would be foolish to ignore the glaring ones. He offered five.



AVM Steve Robertson and General Mark Kelly, former commander of Air Combat Command presenting at the Sir Richard Williams Foundation Seminar October 1, 2026.

Sustainment is the quiet constraint. Press coverage fixates on munitions expenditure because it makes a readable story. Less visible is the strain on the supply, maintenance and sustainment enterprise behind the aircraft. Air forces build a day-to-day flying hour programme and then fund it below the requirement, in some years in the mid-80s per cent. That is manageable in a sprint. It is a different matter when crisis becomes combat and combat runs for months. "Our supply chain is not prepared for a tenfold increase," Kelly said, and the pain falls on allies drawing on the same parts. Funding

sustainment is a harder case to make to a legislature than buying more weapons, which is exactly why the problem persists.

Exquisite and affordable mass are converging.

Western forces have long used exquisite platforms and sensors to kick in the door and suppress air defences, then followed with affordable mass such as JDAMs. Adversaries have their own version, with ballistic and hypersonic missiles at one end and Shahed-type drones at the other. The important trend is that each side keeps making its cheap mass a little more exquisite. JDAM and Hellfire have become far more capable, and so have the drones, with quieter engines, anti-jam navigation and basic autonomy.

Nobody has enough air and base defence. The cost-exchange problem is brutal. A defender without an affordable interceptor fires a \$3 million or \$6 million missile at an \$80,000 threat, because the threat is still pointed at someone's sons and daughters. Kelly expects lasers and high-powered microwaves to fill part of the gap, citing Israel's Iron Beam as an early example.

Range is a hard test of any design. Tankers help, but eventually the aircraft has to unhook and do the job. Kelly said he is relaxed about whether a design is called fourth, fifth or sixth generation. "If it's a 500 nautical mile tool for my 1,000-mile problem, I don't need it." The Pacific demands solutions sized for problems of 1,000 to 1,500 miles.

Long-range kill chains decide who sees first.

Kelly described the brief India-Pakistan clash of May 2025 as a canary in the coal mine. Both sides flew capable fourth-plus generation aircraft with good weapons and well-trained crews. The difference was that one side brought a more advanced communications, sensor and

command-and-control architecture, and the information advantage tipped the balance.

When asked what should keep the region awake, Kelly moved to the strategic. His first concern was production capacity. The alliance won the Second World War in large part because nobody could out-produce it, and he cited the Willow Run plant rolling out a bomber every 63 minutes. Today the region faces an adversary with serious industrial capacity, and the open question is whether it can match the West in quality as well as quantity. He noted that his own airmen are still firing the AIM-120 family he first fired as a young captain in F-15s, which shows how long designs persist when the industrial base is not renewed. His second concern was technology development and insertion. Governments drove nuclear physics and space, but today much of the advance in space is led by industry, and in artificial intelligence, he said, government “is barely in the passenger seat.” His third was resources: a force that has run at high operating tempo for years cannot be restored to peer-fight readiness by a few budget cycles alone.

Where the three accounts converge

On their face, the three sessions answer different questions. Lloyd talks about air superiority and the kit to win it. Pendlebury talks about national purpose and institutional character. Kelly talks about the enterprise behind the aircraft. But they interlock at several points, and these points are the way ahead.

Control is the foundation, but it is a means

Lloyd’s case that control of the air is the first duty and the vital ground, and Pendlebury’s insistence that control is the strategic effect that shapes what other forces can do, are not competing claims. They are two ends of the same chain. Lloyd tells us why airpower cannot be dispensed with: without control of the air, the joint and coalition

campaign becomes problematic, and the alternative is the attritional stalemate of Ukraine. Pendlebury tells us what to do with control once it exists, and why its value to the nation exceeds the air battle itself. Together, they say that the air force must be able to win the contest for the air, and also must understand that winning is the beginning of its contribution and not the end of it.

One implication is worth drawing out. Lloyd's emphasis on the offensive half of control, the "punch" that strikes the enemy's air power at its source, sits uneasily alongside the geography Kelly describes, where the problem is 1,000 to 1,500 miles in size and the forward bases from which you would punch are themselves under threat. Control of the air in the Indo-Pacific cannot be assumed to begin with an uncontested home base. This is where Pendlebury's fighting depth earns its place: depth in posture, space and time is what makes it possible to contest the air from a base structure that is itself being contested.

Mass has to be affordable, and the economics are the strategy

All three speakers circled the same economic problem. Lloyd framed the RAF's CCA programme explicitly as a way to shift the cost calculus back in favour of the defender by absorbing risk and letting crewed platforms survive. Kelly framed the same problem from the defensive side, with the \$6 million interceptor and the \$80,000 drone. Pendlebury arrived at it from the other direction, warning of the corner of irrelevance that comes from maximising ever more expensive capabilities. He invoked Augustine's Law: if the cost of military capability keeps climbing, a future air force might afford only one remarkable multi-role aircraft, and its loss would be the loss of the entire air capability.

The three positions form a single argument. The

costs of exquisite capability push toward fewer and fewer platforms, which makes the force brittle. The cost-exchange arithmetic of the modern battlespace punishes anyone who responds to cheap threats with expensive defences. Affordable mass, whether in the form of a CCA, a lower-end autonomous system or a directed-energy interceptor, is the only way out. But Kelly's observation about convergence is the necessary warning. Cheap mass is getting better on both sides, so affordable does not mean disposable and unsophisticated. The design discipline is to keep making mass cheap while making it good enough, and to keep the exquisite layer that opens doors for it.

Pendlebury's final point on this theme deserves emphasis because it is so easily overlooked: air-minded people must understand the totality of the air domain, including small, cheap airborne assets that can affect the operation of an airbase. An air force that cares only about what flies high, fast and far will miss the threat that arrives low, slow and cheap, and will have no answer to it at the one place it cannot be spared: the airfield.

Range and depth are the same problem seen from two sides

Kelly's 500-mile tool for a 1,000-mile problem and Pendlebury's fighting depth through space are two statements of one requirement. The Indo-Pacific is large, and its geography imposes a tyranny of distance on every design choice. Lloyd's CCAs with "increased combat range," his 1,000-nautical-mile one-way attack drone, and the Typhoon and F-35 mix all address the same constraint from a European angle. Pendlebury's observation about the Integrated Investment Program chart makes the Australian version vivid: the weapon's range understates the reach of the force, but only if the force can actually

carry the weapon that far and recover, regenerate and do it again.

That last clause is the link to depth through time. Reach that can be used once is a raid. Reach that can be repeated is a campaign. And repeating it is a question of sustainment, which brings us back to Kelly's flying-hour programme funded in the mid-80s.

Connection decides who sees first

When Pendlebury says the distinctive strategic contribution of airpower is "connection and control," and when Kelly points to the India-Pakistan clash as a demonstration that architecture beats airframes, they are describing the same thing from different ends. Lloyd's reference to the UK's new digital targeting web, and his insistence that control of the air is as much about sensors and command and control as fighters, completes the triangle.

The common thread is that the platform is a node. It matters because of what it connects to, what it can see, and how quickly the information turns into a decision. That is why the most useful single question to ask of any air combat investment is not how capable the platform is on its own, but how it improves the force's ability to see first, decide first and act first across the whole system, including when the system is being jammed. Kelly's description of AI-enabled drones in Ukraine illustrates the stakes: an adversary jams the control link, then navigation, then sensors, and by that stage the algorithm on board has enough capability to continue alone, identify the target, and send a brief, low-probability-of-intercept report to the fires unit. In a contested spectrum, autonomy is how a kill chain survives its own severing.

Kelly's remarks on space add a point of particular relevance to a middle power. A nation does not need to own every layer. Commercial connectivity has shown in

Ukraine how much a short-range kill chain gains from assured links, and how much the other side loses when denied them. Access to capability can be rented, in his analogy, like a signal to watch a championship match in the outback. The question for a middle power is which layers it must own, which it can buy, and which it must secure with partners.

People, ideas, things

Both the Australian and American speakers brought the discussion back to the human side, and the emphasis is telling. Pendlebury's definition of a Tier One air force rejects the way the term is usually used. In his observation, "Tier One" tends to be invoked to justify particular capabilities, almost always exquisite ones. He prefers John Boyd's order of priorities: people, ideas, things, and in that order. A Tier One force develops people capable of conceiving novel ways to use capabilities in the air domain and of introducing innovation quickly. It earns the label only if tactical successes aggregate into national strategic effect. McInnes added the cultural dimension: air-mindedness, the instinct for higher, faster, further, the respect for technical expertise, and the habit of finding ways over a problem and not through it. Technology, in his summary, creates the possibilities, but people turn it into power.

Kelly's account of training put flesh on the argument. Before he left uniform, the high-end range airspace north of Nellis had become a national treasure but was too small and confined. As commander, he could not jam a coalition aircraft's communications, data links or GPS in a way that matched the threat, so crews met such conditions first in a simulator. His view was that it falls on commanders if crews are declared combat ready without ever having experienced them. His answer was Bamboo Eagle, which

launches aircraft over long distances, some from Hawaii, with realistic jamming, while young aviators join a tanker without knowing which base they will recover to, and are told only when they are hooked up. “We owe them that fog and friction and confusion for their first few missions,” he said, and the practice had lapsed mainly because of legal limits and real estate.

This is where the three speakers’ ideas become practical. If control of the air will be contested, and if the kill chain will be jammed, and if the adversary will target the airbase with cheap drones, then the force that wins is the one whose people have already lived in those conditions. A Tier One air force in Pendlebury’s sense is one that trains for friction before the first real mission. Lloyd’s first pillar, people, belongs in the same sentence.

The unresolved tensions

An honest reading of the three sessions has to acknowledge what they leave open, because the open questions are as instructive as the answers.

The interim problem. Lloyd was frank that the next major RAF platform, GCAP, is more than a decade from the front line, and that the force must fight with what it has in the meantime. The bridge he described, upgraded Typhoons, more F-35s, CCAs by 2030 and lower-end autonomous systems, is a plausible one, but it is a bridge built under time pressure. The same applies to Australia. Which capabilities must be in place in the next five years, not the next fifteen, is the question that the long-term platform debate tends to crowd out.

The economics of sustainment. Kelly’s observation that sustainment is a harder case to make to a legislature than munitions is a political fact with a strategic consequence. Funding a force to the mid-80s per cent of its

flying-hour requirement saves money in peacetime and costs capability in war. The tenfold surge that Kelly says the supply chain cannot meet is not a technical problem. It is a decision about what to fund. And Lloyd's observation that control of the air lost funding when it lost relevance applies equally here: the unglamorous enterprise is the first thing to be cut when the threat seems distant.

Industrial capacity and the business case. Kelly's concern about production, and about the long life of designs such as the AIM-120 when industrial lines are not renewed, points to a problem that no air force can solve on its own. Production lines survive on business cases that extend well beyond the defence budget. For a middle power, this raises the question of what it can make, what it can co-produce with allies, and what it must buy.

Whether the Australian narrative can carry weight. Pendlebury and McInnes were admirably open that their proposition was a draft to be tested, and they asked the audience to push back. There is a real risk to the "more options, more places, more often" framing, which is that a strategic effect so general can describe any force. The test of the idea will be whether it changes decisions: whether it lets the Air Force argue that a fungible, repeatable, sustained capability is worth more than a single, spectacular one, and win that argument in budget terms. The framing is strongest when it is tied to numbers, such as turn rates, sortie generation, and the flying hours behind each effect.

The dependence on allies. Lloyd's claim that allies are a superpower and Kelly's reminder that a surge in US demand falls on allies drawing on the same spares are two sides of one fact. Alliances multiply capability, and they also share its bottlenecks. A coalition that cannot surge its

supply chain cannot surge its operations, however many nations take part.

The way ahead

Put together, the three sessions describe an air force that differs from the platform-centred model in five ways.

First, it begins from the proposition that control of the air is contested and must be won, which is Lloyd's Battle of Britain lesson restated for the age of drones and long-range missiles. It cannot be assumed to be a free benefit. The Ukrainian stalemate shows what happens to the force that cannot achieve it.

Second, it treats control as a means to national effect, which is Pendlebury's argument. The force is judged by what it makes possible for the joint force and the country: options, places, frequency. That argument is an invitation to think about airpower in terms of the effects it creates on other domains and not in terms of its own tonnage.

Third, it builds mass that is affordable and depth that is real. That means CCAs and lower-end autonomous systems that absorb risk, interceptors that change the cost exchange, fighting depth through posture, space and time, and weapons and aircraft sized to a 1,000-to-1,500-mile problem and not a 500-mile one.

Fourth, it competes on connection. The side with the better architecture sees first, as India and Pakistan demonstrated, and autonomy that keeps a kill chain alive under jamming is part of that architecture. Where a middle power cannot own every layer, it secures access through partnership and commercial arrangements.

Fifth, and most important, it treats the enterprise as the weapon. The aircraft, the interceptor and the CCA are the visible part. Beneath them are the flying-hour programme funded to the requirement, the supply chain that can surge,

the production line with a business case that keeps it alive, the training area large enough to rehearse the real threat, and the people who have learned to think in terms of ideas and not just things. A force that has these can absorb a long fight, lose assets, and regenerate. One that lacks them has a short fight, whatever its aircraft are called.

That last point is the unifying insight of the day. Airpower's next generation will be defined less by a generation number than by whether it is an enterprise that can regenerate. Platforms will be lost, which is why Pendlebury's warning about Augustine's Law matters, and why Lloyd's CCAs are meant to absorb risk. Links will be jammed, which is why Kelly's autonomous drones continue the mission on their own. Bases will be attacked, which is why Pendlebury wants air-minded people to attend to small, cheap airborne threats. In every case, the force survives if it can replace, reconstitute and keep operating. The air force that can do this faster than the adversary is the one that holds control of the air, and with it the freedom to operate, manoeuvre and take the initiative that Lloyd described.

For Australia, the questions that follow are specific. Can its sustainment arrangements, and those of its partners, surge by an order of magnitude? Does it have affordable answers to cheap and improving threats, in the air and at the airbase? Are its crews trained for jamming, distance and uncertainty before the first real mission, with the fog and friction that Kelly argues they are owed? Can its weapons and production plans close a business case that extends beyond the defence budget? And can the Air Force's own narrative, more options, more places, more often, be turned into measurable requirements that win the argument for depth and endurance against the pull of the exquisite?

None of the three sessions claimed to answer them. Together, they made clear why they must be asked, and in what order. People first, then ideas, then things, as Boyd would have it, and behind all three, the enterprise that keeps the force in the fight.

Regenerative Airpower: The Next Generation Is an Enterprise, Not a Platform

The word “generation” has been doing a lot of quiet work in airpower for three decades. We speak of fourth-generation and fifth-generation aircraft, and now of sixth-generation fighters, as if the word described a property of the machine. A generation is a step change in a platform's stealth, sensors, networking, and computing, and the next step is whatever the next platform does better.

That usage is worth questioning, because “generation” has a second meaning that matters more than the first. To generate is to produce, and in air operations that means generating sorties, combat power, and trained crews, and then doing it again after the adversary has tried to stop you.

The question for the next phase of airpower is whether a force can keep generating and regenerating combat effects under attack, at distance, and over time. I am increasingly convinced that the answer depends far less on the airframe than on the enterprise around it.

The Sir Richard Williams Foundation seminar in Canberra on October 1, *The Requirement for Air Combat Mass*

and Depth in the Indo-Pacific, is a good place to test this argument. The program does not read like a sixth-generation platform conference. It reads like a description of an enterprise.

The platform habit

The platform habit is understandable. Aircraft are visible, and they carry national prestige. They can be photographed, flown at airshows, and counted in a force structure table. Acquisition systems, budgets, political narratives, and industrial strategies are all organized around them. When a defense ministry wants to signal seriousness, it announces a platform.

The habit also has real intellectual roots. Over the last forty years, platform generations did transform air combat. Stealth changed who could survive in contested airspace. Sensor fusion changed what a pilot could know. Networking changed how individual aircraft contributed to a larger picture. The fifth-generation revolution was real, and I have spent much of the last decade documenting how it reshaped Australian, American, and allied thinking, including the way the F-35 pulled the rest of the joint force toward a different concept of operations.

But notice what the fifth-generation revolution actually demonstrated. The most important thing about the F-35 was never the aircraft considered alone. It was the way the aircraft forced change in the surrounding system: in data handling, in maintenance, in training, in how commanders thought about information, in how allies operated together. The platform was the catalyst, and the transformation happened in the enterprise. We gave the credit to the airframe because the airframe was what we could see.

The sixth-generation conversation risks repeating that misattribution at higher stakes. If we believe the next leap

is a better aircraft, we will spend the next decade optimizing the wrong variable.

What the seminar's own framing reveals

The background paper for the October 1 seminar is revealing because of what it asks for. It does not ask for a better aircraft. It asks for “increasingly self-reliant, scalable capability” that can provide deterrence by denial. It calls for “increased availability of both crewed and uncrewed systems” to maintain control of the air “over vast geographic distances, 24/7/365, and in all weather.” It asks for strike launched from sovereign bases with operationally relevant payloads and integrated targeting systems. And it notes that recent operations in the Middle East have shown counter-air operations to be “resource intensive, technically challenging, and highly dependent on persistent air and space-enabled ISR and targeting systems.”

Every one of those phrases describes a system property, not a platform property. Scalability is a property of production lines, training pipelines, and logistics. Availability is a property of maintenance and supply. Persistence depends on basing, tankers, sensors, and space. Sovereign launch depends on infrastructure. Self-reliance is about the industrial base. The paper also explicitly says the requirement “steps substantially beyond” the provision of air support for integrated operations and demands a “fundamental re-set” in how air and space power is articulated, in terms of operational and strategic outcomes rather than inputs and tactical application.

Inputs and tactical application are precisely the language of platforms. Outcomes are the language of enterprises. The seminar's organizers have, perhaps without intending to, written a definition of the problem that no single aircraft can solve.

The agenda items reinforce the point: natural strategic

advantages such as airspace and geography, operational risk management, workforce management and automation, training system effectiveness and mission rehearsal, collaborative combat systems, accelerating capability development, and preparedness, replenishment, basing, logistics, and supply chains. Only one of the seven is about a category of aircraft, and even that one is titled “Collaborative Combat Systems,” which shifts the emphasis from platform to system.

Even the program's speaker slots tell the story. Among the titles is Air Marshal Sir Paul Lloyd's “Preparing for the Storm: Developing and Delivering a Sixth-Generation Royal Air Force.” Take the grammar seriously: the thing being developed and delivered is a *Royal Air Force*, not an aircraft. The sixth generation is attached to the force. I do not know how Air Marshal Lloyd will develop that theme, and I will be listening for it, but the framing is already a signal that the British are thinking about generation as an institutional attribute.

Why regeneration is the test

Why regeneration rather than simply capability, or mass, or resilience? Because regeneration is what a precision-strike competitor is designed to defeat.

Consider the problem from the adversary's perspective. The People's Liberation Army has spent a decade building a targeting complex of long-range strike, dense sensor coverage, and intelligence fusion that treats fixed, forward, and known bases as vulnerabilities. A planner in that system does not need to shoot down a fifth-generation fighter in the air. It is enough to hold at risk the runways, fuel, munitions stocks, maintenance facilities, and command nodes that put that fighter in the air. A small fleet of exquisite aircraft is an arithmetic problem, and arithmetic problems can be solved. If you know how many

aircraft can be generated per day, and you can disrupt the infrastructure that generates them, you can calculate how quickly the force is exhausted.

This is why the platform-centric view of airpower is dangerous against a peer competitor. It measures the force at the moment of its best day: aircraft ready, bases intact, weapons stocked, crews rested, networks up. But a war is not a best day. A war is the fifth day, the fifteenth day, and the fortieth day, after the first strikes have landed on the infrastructure and the first losses have hit the inventory. The force that wins is the one that can still produce combat effects then.

The Middle East experience the seminar paper cites points the same way. Sustained offensive and defensive counter-air operations consume interceptors, tankers, sensor coverage, crew hours, and maintenance capacity at a rate that surprises even experienced planners. Ukraine has shown, from a different direction, that the side able to replace losses, adapt production, and reconstitute capability under fire holds an advantage that no single weapon system confers. In both cases, the decisive variable has been the ability to keep going.

That is what I mean by regenerative airpower: the capacity of an air combat enterprise to absorb attack, replace losses, reconstitute degraded nodes, and continue to generate combat effects across a campaign rather than a single engagement. It borrows from the engineer's sense of regeneration, in which a system restores function after damage, and from the biologist's, in which an organism replaces what it loses. Neither meaning depends on any one part.

The anatomy of a regenerative enterprise

If regeneration is the test, what does a regenerative air combat enterprise consist of? I see four interlocking

elements, each of which appears on the Williams Foundation agenda.

Mass that is built to be spent. The most visible element is the collaborative combat aircraft. Australia's MQ-28 Ghost Bat, and the American CCA programs that run in parallel, are frequently described as cheaper wingmen for crewed aircraft. That description is accurate but incomplete. The deeper significance of the CCA is economic and industrial. A crewed fifth-generation fighter is a scarce asset that takes years to produce and cannot be risked lightly. An attritable uncrewed aircraft changes the cost-exchange calculation, and it changes the production logic. If a platform can be built in numbers, on a line that can be scaled, and accepted as a consumable in a way a crewed fighter never could be, then the force gains the ability to absorb loss.

But the aircraft is only the visible part. Attritable mass is meaningless without the enterprise to produce it at rate, to supply it with munitions and spares, to maintain software across a fleet, to integrate it into targeting and command systems, and to keep it flying. A squadron of uncrewed aircraft with no replenishment pipeline is a one-time demonstration. This is why the seminar's CCA discussion is framed around "CCAs and Defence Industry," and why the sessions on "Building Mass with Industry" matter as much as the discussions of the aircraft. The CCA is not a cheaper platform. It is a forcing function for building an enterprise that can make and sustain mass.

Depth that is geographic, logistical, and political. The second element is depth. The seminar's background paper emphasizes "access, basing, and overflight considerations" that are "becoming more consequential and complex," and it lists Australia's natural strategic

advantages of airspace and continental geography as an agenda item.

Geography is a real asset. A continent with large distances, dispersed airfields, and strategic depth complicates an adversary's targeting problem. But geography only becomes depth when it is developed: when runways, fuel storage, munitions handling, maintenance capacity, and protective infrastructure are distributed so that losing any one node does not collapse the system. Depth also has a political dimension. The background paper speaks of strike "at the lowest political risk" and from "sovereign bases," meaning that Australia wants to retain the ability to act without depending on the permission of others. Self-reliance in this sense is a component of regeneration, because a force whose basing depends on another nation's consent has an enterprise whose continuity depends on someone else's decisions.

This connects to a theme I have pursued in other work on the Indo-Pacific: the evolution from hosting to co-design. If Australia's northern bases are to serve the combined force rather than merely host visiting aircraft, then the infrastructure, sustainment, and logistics must be designed for distributed, resilient operations from the start. That is an enterprise design problem, and no aircraft solves it.

People as the regenerating element. The third element is the workforce, and here the platform view is at its weakest. Aircraft can be produced in factories, but aircrew, maintainers, intelligence analysts, air battle managers, and logisticians are produced by training systems, and those systems are slow. You cannot surge experience. A force that loses trained personnel faster than it can replace them cannot regenerate, however many aircraft sit on the ramp.

The agenda addresses this directly, with sessions on workforce management, automation, and development, and on training system effectiveness and mission rehearsal. I take those items seriously as indicators of where the thinking is going. Automation can reduce the human burden of some tasks, and synthetic environments can compress the time it takes to build proficiency and rehearse missions before they are flown. But the underlying point is that the human element of airpower is itself a production system, with its own throughput limits, its own vulnerabilities, and its own requirements for investment. An enterprise perspective treats that system as a core element of combat power and not as an overhead line.

Industry and supply chains as the combat reserve. The fourth element is the industrial base and supply chain behind the force. The National Defence Strategy 2026 themes cited in the seminar paper include the resilience of the sovereign defence industrial base and more diverse international industrial partnerships. The Foundation's agenda lists "Preparedness, Replenishment, Basing, Logistics & Supply Chains" and "Accelerating Capability Development."

Replenishment is the word that best captures the regenerative idea. A modern air campaign consumes munitions, spares, fuel, and airframes at a rate that peacetime stockpiles rarely anticipate. The ability to replace what is consumed, and to adapt quickly when requirements change, is a form of combat power. A nation with a responsive, resilient industrial enterprise possesses a reserve that does not appear on any order of battle. A nation without one has a force that can fight only as long as its initial inventory lasts.

The kill web and the enterprise

Readers who follow my work will recognize a connec-

tion to the kill web, the concept that Ed Timperlake and I have developed over many years to describe how modern forces fight through distributed, reconfigurable networks of sensors, shooters, and decision-makers rather than through linear kill chains tied to specific platforms.

The kill web describes how the force fights. Regenerative airpower describes how the force stays in the fight. The two are complementary, and each is incomplete without the other. A kill web that cannot be replenished will thin out. A regenerative enterprise without a flexible kill web will produce forces that are hard to destroy but poorly employed.

There is also a structural parallel. The logic of the kill web is that any node can connect to any other, so that the loss of a node degrades the system gracefully rather than catastrophically. The logic of regeneration applies the same principle to the supply side: no single base, factory, training school, or supplier should be a point of failure, and the system should be able to reconstitute around losses. In both cases, resilience comes from architecture, not from the excellence of any single element.

This is why I think of the enterprise, not the platform, as the relevant unit of analysis. A platform is a node. An enterprise is the web.

Implications for Australia and its allies

If the argument is right, several implications follow.

First, acquisition logic has to change. Decisions about what to buy should be judged by their contribution to the regenerative capacity of the whole, not by the performance of the item alone. A platform with slightly better specifications but a fragile supply chain, a scarce maintenance workforce, or a dependence on vulnerable fixed infrastructure may add less combat power than a less exquisite platform embedded in a robust enterprise.

Second, sustainment moves from the back of the conversation to the front. The glamorous questions in airpower are about range, speed, stealth, and weapons. The decisive questions are increasingly about turnaround time, spares availability, software update cycles, fuel resilience, and the throughput of training pipelines. These are enterprise metrics, and they need the same attention, and the same senior champions, that platforms receive.

Third, industry becomes part of the force in a more direct sense than before. The Australian government's emphasis on a sovereign defence industrial base is not merely an economic policy. In a regenerative framework, it is a component of deterrence by denial, because an adversary must reckon not only with the force in being but with the capacity to rebuild it. That has implications for how Australia structures its partnerships with American, British, and other allied industries. The aim should be mutual reinforcement, in which each partner's enterprise can regenerate the others' combat power, rather than simple dependence.

Fourth, allied interoperability takes on a deeper meaning. We have spent decades pursuing interoperability in communications and data. Regenerative airpower suggests interoperability in sustainment and production: shared spares pools, common munitions and software baselines, interchangeable maintenance capacity, and distributed basing arrangements that allow a coalition to function as a single enterprise. The 2014 observation that shared tanker and global sustainment arrangements gave the RAAF real reach is a modest precursor of this idea. The next step is to extend that logic across the whole air combat system.

Fifth, the conversation must include the homeland. The seminar paper notes that protection of Critical National Infrastructure will compete for scarce air combat

resources. A regenerative enterprise depends on civil infrastructure, power, transport, communications, and fuel, and an adversary will target them. National resilience, which the NDS elevates as part of national defence, is therefore not a separate topic from airpower. It is the foundation on which the air combat enterprise stands.

Conclusion

The sixth-generation platform will arrive, in one form or another, and it will matter. Better sensors, better stealth, better propulsion, and better integration with uncrewed teammates will all add combat value. I am not arguing that platforms are unimportant.

I am arguing that they are no longer the decisive variable. Against a competitor that has built its strategy around holding fixed infrastructure at risk and exhausting a small, exquisite force, the decisive variable is whether the air combat enterprise can absorb the first blow and keep generating combat power. The winning advantage will belong to the side that can regenerate.

That is a different idea of what the next generation means. It is not a number attached to an airframe. It is a property of an entire system: its mass, its depth, its people, its industry, its bases, its allies, and its resilience. In that sense the next generation is already under construction in every area the Williams Foundation's agenda has identified, whether or not anyone has yet given it a name.

I would offer one. Call it regenerative airpower, and recognize that the thing being regenerated is not an aircraft. It is the capacity to fight.

What the Williams Foundation Seminar Told Us About the Next Generation

The Sir Richard Williams Foundation seminar in Canberra on 1 October, *The Requirement for Air Combat Mass and Depth in the Indo-Pacific*, was framed around a question that sounds like a platform question: does Australia have enough air combat mass? By the end of the day, almost nobody in the room was answering it that way. Operators, industry executives and visiting commanders kept reaching for the same set of ideas: sustainment, industrial capacity, people, architecture, and the willingness of a society to carry a long fight.

The closing synthesis put it plainly. Mass is about much more than numbers of aircraft. It is a property of a whole system, and the test is whether that system has the depth to absorb disruption, adapt and keep operating. Technology, it added, does not equal a strategy.

That is the argument of my concluding essay: the next generation of airpower is an enterprise rather than a platform, and the quality that matters most is regeneration. By that I mean the capacity to absorb attack, replace losses and keep generating combat effects across a campaign

rather than a single engagement. What follows tests that argument against what was said in the room. The seminar ran under Chatham House rules, so I have not attributed remarks to individuals.

The generation label loses its grip

The pointed comment on generations came from a former combat commander, who said he found the fourth-, fifth- and sixth-generation labels unhelpful. His example was a fourth-generation airframe fitted with fifth-generation avionics, sensors and weapons, which he said is no longer a fourth-generation aircraft in any useful sense. What he cared about was range and payload. A 500-nautical-mile tool is no use against a 1,000-mile problem. The label describes the airframe, but the problem lives in the system around it.

A veteran airpower planner made a related point. The F-35 and F-22, he said, are better understood as flying sensor-shooters, valued as much for collecting and sharing information with the integrated force as for what they carry. He was also exasperated that his government had just announced a new combatant command built around autonomous weapons. You build commands around missions, he said, not weapons. It is the platform habit in miniature, because even autonomy gets organised as a thing rather than as a contribution to an effect.

The clearest evidence that architecture outranks airframe was the India–Pakistan air clash of May 2025. Both sides flew capable fourth-plus-generation aircraft with good weapons and well-trained crews. One side arrived with a far more advanced communications, sensor and command-and-control architecture, and the information advantage tipped the exchange. The platforms were comparable and the enterprises were not.

Even the road to a sixth-generation force looked like an

enterprise story. A visiting senior officer noted that the next major crewed platform is more than a decade from the front line, so the force must fight with what it has. In the meantime, uncrewed combat aircraft, digital engineering frameworks and human-machine teaming are maturing as what he called a deliberate stepping stone. The enterprise is built first and the aircraft arrives at the end of it.

The grind is the test

The most direct support for regeneration came from an industry presenter who drew a simple graph of combat effect over time. It starts with a level of readiness, then a surge into high-intensity combat in which pristine equipment, war stocks and skilled people are committed. After that comes a decline into what he called the grind.

Almost everything that makes up combat effect degrades. Readiness falls as people go forward with less training, stockpiles are consumed, and networks and nodes are targeted. The height of the line in the grind is set by industrial capacity, meaning the rate at which a nation can replace combat effect as fast as the enemy destroys it.

His conclusion was that it is not an industry problem but a combat power problem, and that industrial readiness must become a force design consideration. A force optimised for the sharpest possible tip on its best day, in a resource-constrained environment, is trading away the area under the curve. That area is the total combat effect a nation can bring to a sustained war.

He doubted Australia could count on replacing exquisite platforms in any reasonable time, or on allies having the capacity, willingness and means to deliver them. So he argued for starting with munitions, fuel and spares, produced to build the capacity for the grind rather than to meet today's demand. He joked that it might be judged the worst value-for-money decision in the department's history,

and hoped it would be, because its value is deterrence. That is regeneration expressed as a business case.

Others brought evidence from current operations. A former combat commander described the widening gap between the demands of enduring combat and the sustainment enterprise behind it. A fleet funded around 16 flying hours a month per jet can find itself flown ten times that over Pacific distances. The supply chain, he said, is not prepared for a tenfold increase sustained over months rather than weeks, and the shortfall cascades to allies chasing the same parts. Weapons expenditure makes the headlines, but sustainment is what quietly runs out.

The airpower veteran gave the sharpest illustration. Operation Midnight Hammer was celebrated, but it consumed the entire B-2 force to assemble one package, and most of the ageing tanker fleet needed serious maintenance on landing. Repeating it the following week, or perhaps the following month, would have been a stretch. Here the enterprise was failing to regenerate in the middle of a success.

Depth is a design choice

Regeneration concerns architecture as well as supply. An industry presenter on battle management argued that Australia buys its command and control as a series of separate projects, each with its own funding line, competition and bespoke solution, rolled out in ones and twos. That, he said, creates dependency and fragility. His alternative was a multi-nodal network in which every node can operate independently if cut off. Each node would carry a primary, alternate, contingency and emergency role, borrowing the communicator's PACE concept. Every node then becomes a potential strike cell, counter-drone cell and contributor to space battle management. That, in his words, is depth and resilience.

Readers of this site will recognise the kill web logic. Any node can connect to any other, and the loss of one degrades the system gracefully. His point is the supply-side twin of that logic: do not build single points of failure into the architecture, or into the way the project portfolio is structured.

A former combat commander offered the physical version. An air force that wakes up under ten to twelve layers of air defence, behind hardened shelters, has decided in advance what it will be able to absorb. He had yet to meet anyone, he said, who thinks they have enough air base defence. Depth is something you design and pay for before the war.

Mass, reconsidered

Here the seminar complicated my essay usefully. I described attritable collaborative combat aircraft as mass built to be spent. Several speakers cautioned against that framing, and they were right to.

A CCA industry strategist said the picture of needing lots of aircraft because you plan to lose lots of them is not the movie Australia is in. For a strategy of denial he offered three pillars: risk management, capacity optimisation and persistence. Another speaker called it leverage. The high-value assets that cannot be replaced quickly, above all the people, are the fulcrum, and uncrewed systems are the lever. You cannot build an E-7 or a tanker overnight, so the question is how new technology multiplies what the existing fleet generates. Both stressed that these systems are additive rather than a replacement, which is an awkward fit for an acquisition system built around replacing one platform with the next.

The airpower veteran went further. Attritability is about risk, he said, and affordability is about resources. Losing an aircraft is an operational decision made on the

day, but a force whose principal virtue is that it can afford to lose large numbers is a force development decision, and a bad one. He preferred "sufficient capacity" to "mass", since mass is not the number of tails. In the first 24 hours of Desert Storm the air campaign struck more targets than the combined bomber offensive did across 1942 and 1943, with far fewer aircraft. Stealth, precision and effects-based targeting made the difference.

He also asked for proof. Increment one CCAs are flying, but the operational analysis so far has been done on computers, and the right metric is cost per effect rather than unit cost. A questioner from the floor made the same point from the other direction, noting that published price points sit well above the figures people like to quote for affordable mass.

I read this as a refinement that strengthens the regenerative argument. The value of attritable mass is not that you can afford to waste it. It is that you can replace it, and that is true only if an enterprise exists to build, supply, maintain and integrate it. The aircraft is the visible part of a claim whose substance is the production line, the software baseline and the sustainment pipeline. In effect, the sceptics were asking for proof that the enterprise exists.

People are the part you cannot surge

My essay argued that the human element is itself a production system, with its own throughput limits. The seminar supplied three supporting observations.

The first came from a visiting senior officer responsible for people in his service. He said people will remain the greatest challenge in building a sixth-generation force. He asked what a sixth-generation workforce looks like, which skills and attributes it needs, and admitted nobody has thought it through given AI-driven, networked technology. Without the people, he said, the kit does not do anything.

The second came from the CCA strategist, who noted that autonomy is already changing who works in air power. The new workforce includes software engineers, design specialists, supply chain and production people, not just pilots and mechanics. The workforce of the enterprise is much wider than the workforce of the squadron.

The third was training as capability. A former combat commander explained that the main training ranges had become too small to rehearse jamming and electronic attack at realistic distances. The service moved to larger exercises that launch aircraft over combat-relevant distances, where young aircrew learn where they will recover only when the tanker tells them. They are owed that fog and friction, he said, before the real thing. The airpower veteran added that many units outside the forward-deployed forces are not flying enough hours to maintain basic mission qualification.

The Air Force strategists tied this together with a hierarchy borrowed from Boyd: people, ideas and things, in that order. A Tier One air force, one said, develops people who can conceive novel ways of using capability and introduce innovation quickly. He warned of Augustine's law, in which rising cost leads to a single magnificent aircraft whose destruction removes the capability altogether. The last word of the day agreed. A Tier One air force is not just the capability you have, but how you use it and how you support it.

Industry as the combat reserve

The industrial theme ran through every session, and the most useful contributions were practical.

On the MQ-28 program, the strategist said roughly 125 suppliers are active, about 70 per cent of the investment flows back into Australian industry, and several suppliers had never worked in aerospace before. The value

he stressed was intellectual depth. If the specific system turns out not to be the answer, there is something to pivot from. He pointed to Ukraine compressing its development cycle from months to weeks by drawing on a car-making and wiring-loom industry.

Another speaker recalled that Australia built thousands of combat aircraft and high-performance engines in the Second World War, and made most of its own machine tools, having had no such capacity beforehand. He did not expect taxpayers to fund a large defence-only aerospace industry in peacetime. But the country needs the kernel, meaning the people and competencies who know how to design, build and adapt. The strategist added a sovereignty test worth keeping: it is unrealistic to do everything yourself, but you should choose your dependencies rather than have them chosen for you.

A visiting leader, asked how to scale output more than tenfold, said defence cannot solve that alone. His ideas included dual-use arrangements, contractual mechanisms that do not rely on goodwill, and conversations with airlines about what they could contribute in a conflict when their passengers stop flying. He also observed that large defence budgets elsewhere are soaking up capacity globally. That is a caution for the allied dimension of my argument. Shared spares pools and production lines regenerate combat power only if they are deep, and in a long conflict every partner draws on them at once.

Three further points stood out. First, a commander urged closing the business case with someone other than your own government, as Israel does by exporting what it builds, because peacetime demand alone will never sustain surge capacity. Second, a presenter noted that Australia's investment program funds acquisition and sustainment but has no research and development line, so the capacity to

pivot is thin. Third, the airpower veteran recalled that the F-22 line was terminated just as it was producing at its lowest cost and best quality. Production lines are regenerative capacity, and once they close they are very hard to reopen.

The enterprise extends to the nation

The last theme is the one my essay placed last and the seminar treated with growing urgency: the homeland and the public.

The opening speaker, drawing on large-scale national polling, reported that Australians already regard supply chain disruption, AI-enabled attack and critical infrastructure attack as likely within five years. Eighty per cent believe a foreign military attack would have major or catastrophic consequences. His message was that no defence effort lasts without public understanding, consent and active support, and that capability without will becomes a Maginot line.

A later speaker pressed the point from the policy side. Australia has a defence strategy, he argued, rather than a national defence strategy, because the civil defence and mobilisation partnership with Home Affairs is largely absent. Abstract deterrence talk leaves the public uninformed and gives practitioners no cover to reach across government and industry. A visiting officer contrasted the leaflet that arrived in every Swedish letterbox explaining what to do in an attack, and doubted anything similar would be tolerated at home.

The Air Force strategists framed the payoff in a way I found helpful. Air power's value is to the nation as well as the defence force: more options, more places, more often. A workforce of roughly 25,000, about the size of a regional town, generates effects across millions of square kilometres by using the same assets for different jobs, again

and again. They described building depth through posture, through space and through time, meaning quick turns and rapid reprogramming. That is a regenerative enterprise in practice, where assets, people and nodes can be turned, re-tasked and reconstituted quickly.

What the day left open

Two caveats. The closing remarks acknowledged that access, basing and overflight were not covered and that the limits of air power would come in a later seminar. My own depth argument rests on distributed, hardened and co-designed basing, so the gap matters. Bases are the part of the enterprise an adversary will target first.

Second, one speaker argued that in the most demanding contingency Australia would deter only by annoying, and that its realistic role would be securing a bastion at the southern end of the island chains. I would put it differently. Regeneration is how a middle power turns a modest force into a credible contribution to a coalition's staying power. A bastion that can keep generating effects is far more than an annoyance, but only if it can regenerate.

Conclusion

The seminar's closing synthesis said the decisions made now will determine the combat power available to Australia in 2035 and beyond. The best answer I heard to what "sufficient" means was the industry presenter's graph. Sufficiency is measured across the whole curve of a campaign, rather than at its best moment, and the height of that curve is set by what was built before the shooting started.

Platforms will keep arriving, and they will matter. But on the evidence of this seminar, the speakers were describing a different idea of the next generation. It is a system with sustainment that scales, an industrial base that

can replace losses, people who can be trained faster than they are lost, architecture with no single point of failure, allies who reinforce one another, and a public that understands what it is being asked to carry. I called it regenerative airpower, and nothing said in Canberra argued against the name. The thing being regenerated is not an aircraft. It is the capacity to fight, as one speaker put it, night after night, week after week, month after month.

Reflections on Fifth
Generation and the
Challenge of Understudying
Airpower Transformation

Lt. Col. Chip Berke, one of the first Marine pilots to fly the F-22, used to make a point about the iPhone. When Steve Jobs introduced it, he described it as three devices in one: a computer, a music player and a phone. Nobody describes it that way now. What proved revolutionary was the ecosystem that grew up around the phone, not the phone itself.

I have thought about that analogy more or less continuously since I first heard it, because it explains most of what went wrong, and some of what went right, in how the West came to understand fifth-generation airpower. For two decades the argument was about the airplane: its cost, its schedule, its software, its place in a procurement ledger. The airplane was never the point. It was a forcing function, and the real subject was how a force fights, how it is trained, supported and networked, and how its allies fit together. That subject was much harder to see, so it was much harder to study.

I spent the period from 2004 to 2018 trying to study it. In retrospect I was an understudy in the theatrical sense,

learning a part by watching the principals perform it, in the hope of being ready when the stage manager called. The word also carries a second meaning, which is that the subject was understudied. The distance between the two is the story I want to tell.

It Began With a Word

The term “fifth generation” came from Michael Wynne, the Secretary of the Air Force whom I worked with as a consultant from 2004 to 2008. It is easy to treat the phrase as marketing, a way to distinguish the F-22 and F-35 from the legacy fighter fleet. Wynne meant something sharper. He was using language to force a break in thinking. Air Vice-Marshal John Blackburn of the Royal Australian Air Force later put it to me plainly: Wynne’s aim was to change how the Air Force talked about these aircraft, because you cannot operate an F-22 or an F-35 the way you operate an F-15 or an F-16.

Wynne’s own thinking was never confined to the platform. An op-ed he drafted in 2007, “The Interdependent Fight,” argued that fifth-generation fighters were not only breakthrough kinetic platforms but battlespace sensors that could collect and disseminate information on the way to and from a target. He was describing what he called “spherical situation awareness,” an idea that sits comfortably inside today’s multi-domain and kill web vocabulary. Each aircraft, in his telling, was a direct arm of the battlespace manager. He was also pushing the department on cyber, on remotely piloted vehicles, and on buying capabilities rather than products. Fifth-generation aircraft were one element of a wider concept of operations, and the concept was the thing he cared about.

One small episode from those years stays with me. Before a trip to Norway, I was asked to bring back the competing fighter presentations for the Norwegian compe-

tion. One competitor argued that Norway should buy its aircraft because it was European and the best available today. Another gave fifth generation a single slide. A third gave a genuinely excellent briefing on how its aircraft could enable a networked force. Wynne looked at them and called Lockheed's chief executive to ask for a slide showing how F-35s working with Aegis would provide battlespace awareness and coverage for Norway. Lockheed produced it, but it plainly was not part of the company's mental furniture. The vendor was selling an airplane, while the customer's most senior acquisition leader was already thinking about a system of systems. That gap in assumptions would define the next fifteen years.

The Custodians Leave

Wynne's departure, along with that of the Air Force Chief of Staff, removed what I came to think of as the custodians of the message. Whatever one thinks of the policy disputes behind it, the practical effect on the fifth-generation conversation was large. The F-22 buy was truncated. The land wars in Iraq and Afghanistan dominated the department's attention and budget. And the F-35 entered what became a long "time of troubles," during which the program's acquisition difficulties came to define public perception of what the airplane was.

When I interviewed Billie Flynn, the veteran test pilot, in 2023, he gave the cleanest explanation I have heard of why it took so long for the point to land. People, he said, find it hard to believe what they have never seen. The F-22 had been kept inside what he called a USAF bubble, and it was only gradually understood not as a replacement for the F-15 but as a different kind of aircraft. Wynne and the Chief of Staff, General Moseley, understood this problem. That is why they pushed to put allied pilots and pilots from other services into the F-22 community. Berke was the

most notable example. I sought him out at Nellis, and we later interviewed him at Eglin. We set up a Wynne-Berke meeting and got him invited to Australia and Denmark to share what he had learned.

Flynn's deeper argument was that if you view the F-35 through a legacy, replacement-aircraft mentality, you cannot possibly understand how it transforms warfare. That is a problem of perception that no amount of data can fix. With the custodians gone and a decade of difficulty on the airplane's record, the replacement frame hardened. "Trillion-dollar aircraft" became the shorthand, based on projections of acquisition and life-cycle cost running half a century forward. Ed Timperlake and I spent years arguing that the headline number was misleading, since the same projections put the legacy fleet's support costs far higher. We also argued that the F-35 was a fleet and not a single plane, with commonality, upgradability and allied participation as part of its value. I stand by that argument, but I have also come to see that it was fought on the wrong ground. A cost debate is a debate about a procurement item. The transformation argument is about something else entirely.

The land wars reinforced the same habits of mind. Ben Lambeth, whom I interviewed about the air campaign against ISIS, made the point that a generation of civilian and military leaders had no experience of dealing with peer nuclear powers that also possess significant conventional capability. Airpower had been reduced to a support element for ground maneuver, operating in permissive airspace, and the habits of that environment shaped what people expected a combat aircraft to be for. As General Mike Hostage, then Air Combat Command's commander, noted in one of our interviews, the fleet of remotely piloted aircraft that was so effective over Afghanistan

might simply not transfer to the vast distances of the Pacific or to contested airspace. In his view, the air combat cloud had to define the role of those systems, not the other way around.

Why This Subject Is Hard to Study

It is worth being honest about why airpower transformation resists analysis, because the failure was not only a failure of political will. There are structural reasons.

The first is that the thing being studied is relational. A platform can be described by its specifications, but an ecosystem has to be described by how its parts behave together, and most of those interactions do not exist until the force is built and exercised. In the early years, the F-35's most important capabilities were things like data fusion, fleet-wide software updates, and the ability to share a common picture across services and allies. All of these were hard to demonstrate in a press briefing and easy to dismiss as promises. General Hostage's observation that the aircraft "is not a boutique aircraft" captures this: the full impact comes only with the fleet, and the fleet takes years to exist.

The second is that the evidence appears at the edges, away from where observers are looking. I learned this on the USS Wasp. I was fortunate to be aboard for two of the three F-35B sea trials in 2011, and the trials were the obvious story: a supersonic, short-takeoff, vertical-landing fighter operating from an amphibious ship. But what mattered was happening elsewhere. The ship was serving as a test bed for an entirely new at-sea capability, one that would later become evident when the USS America and HMS Queen Elizabeth operated in the same way. The same had been true a year earlier with the Osprey in the Bold Alligator exercises, where journalists waited on the beach for an amphibious assault that was in fact being

conducted by Ospreys deep inland. The observers who stayed with the visible event missed the actual one.

An Osprey operator I interviewed after *Bold Alligator* 2012 put the underlying logic in a chess analogy. A traditional amphibious group, he said, moves a pawn one space at a time toward the enemy. With the Osprey's speed and range you can move a knight, a bishop or a rook and come at the opponent from behind. The point generalizes. Transformation shows up first in changed geometry, in operating radii that expand from 100 miles to hundreds, and in the relationship between ships, aircraft and ground forces. A reporter or analyst focused on a single platform's performance statistics will not see that.

The third reason is that the debate was never really about the plane. Flynn argued that a program like this has to operate inside a triangle of politicians, the media and the public, and that marketing an aircraft as a platform was never going to be enough. The program was a proxy for a larger argument about what kind of military the West needed after the land wars, and for much of the period the answer from the political level was not to need one at all. In the foreword to my book, Lt. Gen. George Trautman, the former Marine deputy commandant for aviation, makes a related point. He notes that the aircraft was often treated as the residue of worn-out Cold War thinking. If the strategic premise is that the future looks like the last decade, an expensive, high-end combat system looks like an anachronism, and no analysis of its technical merits will persuade anyone otherwise.

The Method: Go Where the Operators Are

If the subject is relational, appears at the edges, and is entangled in politics, how do you study it? My answer, developed more by trial and error than by design, was to go to the operators and stay there.

That meant Eglin, where the F-35 training enterprise was being built from nothing and where my first interview in January 2010 introduced me to what a joint, multi-service, eventually multinational training system looks like when it is assembled from scratch. It meant the Marine Aviation Weapons and Tactics Squadron One, where tactics for a new generation of aircraft were being invented and tested. It meant Beaufort, Yuma, Nellis and the ships. And it meant repeated conversations with the pilots, maintainers and commanders who were actually discovering what the aircraft could do.

What those conversations taught me, over and over, is that the real innovation was happening at the tactical level, and that it was being generated by people who were willing to unlearn. Berke's line that fifth-generation pilots have to unlearn several of their instincts and build new ones is the single most useful sentence I collected in fifteen years. A fourth-generation pilot is trained to manage an aircraft's sensors, weapons and communications, and a fifth-generation pilot has to learn to trust fused data and to think about the aircraft as a node in a network. That is a cognitive shift, not a technical upgrade, and it is why pilots who had flown the F-22 and returned to their home air forces became such effective ambassadors. They had seen it, and they could say so to their peers.

It is also why the cross-service dimension mattered. When Air Force and Marine pilots log hours on the same aircraft and share lessons across three ready rooms, you get what I called a combat learning revolution: a pool of knowledge that is larger than any one service's. Studying that process from outside is difficult, since it lives in squadrons, warfighting centers and debriefs. You can only understudy it by being there, asking questions repeatedly, and publishing what you learn so that the learning travels.

This is also where I would say something about the limits of my own method. A reporter or analyst embedded this closely risks absorbing the community's assumptions. I was aware of that risk throughout, and I do not claim to have fully escaped it. The corrective I tried to apply was to keep asking the question that Flynn and Blackburn kept returning to: what are the barriers to changing the rest of the force? An observer who only celebrates the capability has not done the work. The harder analysis concerns what stops it from being used.

The Partners Who Saw It First

One of the more surprising findings of those years was that some of the allies grasped the point before the United States did. Flynn called Australia the exception that proved his rule. For the Australian Defence Force, the F-35 was understood from the beginning as the spearhead of fifth-generation warfare, and not simply as a replacement for the Super Hornet.

My first Sir Richard Williams Foundation seminar, held in Canberra in March 2014, made this vivid. The title was "Air Combat Operations, 2025 and Beyond," and it happened in the same month MH370 disappeared over the Indian Ocean, which I did not know at the time was a marker of how quickly the strategic environment was about to change. The Chief of the Air Force, Air Marshal Geoff Brown, addressed directly the question people kept asking: with so much capability in 4.5-generation fighters, why do you need fifth generation? His answer was that you must conduct tomorrow's air combat with tomorrow's capabilities, and that off-board cueing and networking had to be baseline requirements. He then launched what became Plan Jericho, named, as he made clear, because the walls were going to come tumbling down.

Coming from the American debate, where the aircraft

was under daily attack, to a room of senior professionals discussing how to build a fifth-generation force was a breath of fresh air. It showed me what a serious institution looks like when it decides to treat an acquisition as a transformation. Blackburn, who became one of my closest interlocutors on this subject, would later say that the Australian effort was to use language the way Wynne had, to change how the force talked about itself.

Other partners had other experiences. In Italy and the United Kingdom, industrial interests tied to legacy aircraft were ambivalent or opposed, and where they could not stop the airplane they worked against the force transformation that should have come with it. Britain bought the aircraft for its carriers but, in my judgment, did not build the force around it as far as it might have. In the Nordic countries, the arrival of the F-35 coincided with Russia's seizure of Crimea in 2014 and then the invasion of 2022, and the demand for regional integration may drive greater fleet integration there than anywhere else. And Canada's repeated delays are, to my mind, a textbook case of the replacement mentality at work: Flynn's warning that Canadian officials would discover they had a monster on their hands, a transformation of infrastructure, personnel and mindset rather than an Air Force acquisition, is a fair summary of the problem.

The lesson I draw is that the partners who succeeded were those who treated the aircraft as an occasion for institutional change. Those who treated it as a purchase got a purchase.

F-35 2.0 and the Roadblocks

By 2018, I had begun to describe the next phase as "F-35 2.0": the aircraft was operational, the global fleet was being stood up, but the real work of leveraging it to enable a broader kill web and distributed concepts of operations

had barely started. The question was no longer whether the platform worked but how to change everything else around it.

The most useful treatment of that question came from Blackburn in a 2018 interview that I chose to end my book with. He identified several roadblocks, and rereading them now they look less like a 2018 snapshot and more like an agenda for the 2020s.

The first is the business model. Defense establishments have spent decades buying standalone platforms and working out afterward how they would fit together. A fifth-generation aircraft that delivers weapons, non-lethal effects, ISR and command-and-control, and that can either strike organically or hand off to a partner, breaks that model. If you pursue integration it drives change; if you do not, you reduce the aircraft to one of its functions. Blackburn's formulation was that the warfighters get what the F-35 drives in terms of change, but the same integrative approach is not replicated at the level of acquisition, which remains stovepiped. His blunt summary was that we were preparing to fly fifth-generation aircraft in a legacy ecosystem. He also drew a distinction I find clarifying, between innovation by addition, in which every platform is modernized in parallel, and targeting innovation on a lead platform, designing the force around the effect you want to create.

The second is energy. Blackburn observed that there were no future energy concepts or designs in place, and that planners had assumed the market would supply the fuel and power a future force needs, which would be close to impossible in a regional crisis. The third is networks: a multiplicity of them, and a legacy security regime that cauterizes information in ways that make no sense for a force operating at fifth-generation speed. The fourth is

industrial and weapons policy. Australia, he noted, built conventional ammunition but not missiles, and as he put it, without weapons the aircraft is not much use.

None of these roadblocks is about the airplane. All of them are about the ecosystem that determines whether the airplane matters. That is the central lesson I would offer anyone trying to understand airpower transformation: the binding constraints are rarely in the thing you are buying.

What Understudying Teaches

What would I tell someone approaching the next transformation, whether it is autonomous systems, distributed maritime forces, or the new generation of collaborative combat aircraft?

First, watch the language. Wynne understood that a new term, if it carries a new concept, can do institutional work that a budget line cannot. The reverse is also true. When a transformative capability is described in the vocabulary of the old force, as a replacement, a multi-mission upgrade or a better version of what already exists, it will be absorbed by the old force. Blackburn's distinction between a multi-mission aircraft and a multi-domain one is exactly of this kind.

Second, find the custodians and ask what happens when they are gone. Transformations need people who can explain why the change matters in terms that survive a change in leadership. The F-35 was fortunate that the Marines, with their commitment to the Osprey and the F-35B, carried the program through a period when its strongest backers had been removed. That was not a robust way to run a national program, and it should not be repeated by design.

Third, study at the edge. The decisive evidence will usually appear in an exercise, a sea trial, a squadron's tactics development, or a partner's force design process, not

in a program review. Go there, and stay long enough to see the same thing happen twice.

Fourth, take the fleet view and the alliance view seriously. A capability that is valuable because it is shared, whether through common software, common training, common sustainment or a common picture, cannot be evaluated one aircraft at a time. And allies are not an afterthought. In this case, several of them were thinking more strategically than the country that built the airplane.

Fifth, expect the roadblocks to be institutional. The questions about energy, networks, weapons and acquisition are less glamorous than the questions about stealth and sensors, and they are where programs actually succeed or fail.

I wrote the book as a record of a journey, and I said in its introduction that I wanted to be a recorder of history for the operators of many nations who made this capability real despite the media and many government officials who wanted to see them fail. That remains the right way to describe what I was doing. An understudy does not write the play, but an understudy who has watched closely enough can sometimes see, before the principals do, which scenes are going to matter.

What I saw, again and again, was that the airplane was the least interesting part of the story, and the part that is hardest to see is the force that forms around it.

