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Air Power

The Air-Ground Littoral Is Not the Answer

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The proliferation of cheap, small uncrewed aerial systems (sUAS) — drones — is changing warfare. The ADF is integrating this new technology into its order of battle, but its organisational, conceptual and doctrinal adaptation remains unresolved. Ideas are emerging; however, these tend to focus on service-centric solutions that reinforce legacy approaches, exemplified by the growing interest in the "air-ground littoral". Drones are just one part of a broader shift towards heterogeneous air power that demands the ADF move beyond a service-centric approach and innovate in response to the need for an integrated force operating across five domains.

1. Introduction

Small and inexpensive uncrewed aerial systems (sUAS), often simply called drones, are changing warfare. In response, militaries and non-state actors are rapidly innovating and integrating drone and counter-drone capabilities into their force structures and operations. Most of the public and military interest in drones focuses on the technology and its tactical employment; however, the less exciting aspects of this innovation – the organisational, process, procedural and doctrinal changes – are critically important as they determine how effectively a military translates capability into effect. These areas are also more contested. Structure, process and doctrine are well-established and have significant inertia; challenging or changing them can threaten established interests and identities. But effective innovation requires a culture that encourages debate, particularly on those topics in which interests are most vested. For this reason, it is heartening to see a debate emerging around how the Australian Defence Force (ADF) should adapt organisationally and doctrinally to the challenges and opportunities of drone technology.

In his May 2026 article, Christopher Wooding advocated that the ADF adopt the air-ground littoral (AGL) as an organising concept for Australian air power development and employment in the new drone age. Coined in 2021 by a US Air Force (USAF) colonel, Maximilian Bremer, and USAF Air Command and Staff College professor, Kelly Grieco, the AGL offers a way to understand and respond conceptually to how the proliferation of cheap drones and loitering munitions operating at low altitudes was changing the conventional understanding of and approach to control of the air (Bremer & Grieco, 2021). Although the term has been widely adopted across Western militaries and by military scholars, the AGL has not been officially defined. The seminal definition is that originally offered by Bremer and Grieco as the 'area from the Coordinating Altitude [10,000 feet] to the Earth's surface, which must be controlled to support land and maritime operations and can be supported and defended from the air and/or the surface' (Bremer & Grieco, 2021, p. 68; Giffen, 2024, p. 55).

From an ADF perspective, the AGL is an attractive concept, as it offers a way to simplify the complex problem of adapting to the proliferation of cheap, massed air power. But adopting the AGL concept as the solution would reinforce service-centric thinking, which is no longer suited to how the ADF must fight. What the rapidly changing character of air power demands is that the ADF shift to the domain-centric thinking advocated in the 2023 *Defence Strategic Review* (Department of Defence, 2023, p. 54).

This paper argues against the ADF adopting the AGL as a solution to the challenges of adapting to modern air power. Its central claim is that the AGL seeks to solve a domain-integration issue by creating another organisational seam. Adapting to this new organisational seam then becomes the problem that the ADF must resolve. This, in effect, frames the solution as the problem. The problem the ADF must focus on solving is how to integrate the full spectrum of existing and emergent air power (of which drones are but one part) to maximise the tactical effectiveness of the integrated force in conflict. This paper does not aim to solve the problem; rather, it seeks to correctly frame the air power debate in which the ADF must engage.

2. Drones, air superiority and the air-ground littoral

At the heart of the drone debate lies the question of control of the air. Simply stated, control of the air is a measure of an adversary's ability to use air power to interfere with friendly force operations across all domains. It is a spectrum extending from parity where no side has advantage, through superiority where one side or the other has freedom of manoeuvre in all domains without *prohibitive* interference, to supremacy where one side or the other has freedom of manoeuvre in all domains without *effective* interference (Australian Defence Force, 2023, pp. 30–31). These definitions are important because they highlight that

it is not the amount of air power either side can generate that determines control of the air, but the level of interference that air power creates for their adversary.

This nuance is often lost in discussions on modern air power primarily because of the dominance Western air power has enjoyed since the end of World War II. Since 1945, the United States (US) and its Western allies have worked to perfect the technology and application of air power to achieve air superiority. They have done this by both investing in ever more capable, exquisite and expensive aircraft and weapons, and developing the tactics, techniques and procedures (TTPs) needed to integrate these capabilities to maximise their effectiveness. This has proven to be an effective combination. For over 70 years, from 1953[1] until 2024, no US service personnel were killed by enemy air attack. As a result, Western military professionals, across all domains, began to assume not only freedom of manoeuvre but freedom from air attack. Drone technology is disrupting this assumption.

By enabling adversaries, both state and non-state, to access and exploit lower altitudes at low cost and in mass, drones have created ways to interfere with land and maritime manoeuvre that Western air power is currently not structured to address. Military planners and operators can no longer assume that capabilities and TTPs that enabled Western militaries to achieve and maintain air superiority at higher altitudes, what Bremer and Grieco (2021, p. 68) refer to as 'blue skies', will enable freedom from attack for ground forces in, through or from the air at lower altitudes, the so-called AGL, where drones have proliferated. This disruption demands 'a paradigm change in American military thinking about verticality' (Bremer & Grieco, 2021, p. 67).

The creators of the AGL concept have provided an important insight that highlights a blind spot in the modern Western approach to air power, which both state and non-state adversaries have exploited. They have drawn attention to how the proliferation of drones has invalidated key air power assumptions and overturned the mindset they fostered. However, this insight of the creators of the AGL concept has metastasised from a new way of thinking about control of the air into calls for a new military 'subdomain' or 'trans-domain' (Kavanagh, 2024, p. 25; Wooding, 2026). In the process, the framing of the problem has shifted from how air power professionals re-examine the understanding and pursuit of control of the air in light of drone proliferation, to how we coordinate Army and Air Force air power in the lower levels of the air domain. In effect, commentators have problematised a solution for the modern air power integration challenge.

Wooding's article is an example of this as he concludes by highlighting that it is not the challenge of the drones that the ADF must focus on, rather the military 'must seriously discuss and resolve the challenges of the AGL, from theory and doctrine through coordination to counter threat, to improve their battlefield effectiveness'. The problem with this approach is that by making the AGL the problem to be solved, Wooding and other AGL advocates shift the focus from reimagining Australian air power to re-establishing service equities in the drone age.

3. The AGL perpetuates service centricity, not domain integration

The genesis and evolution of the AGL concept lie in the assignment of roles-and-missions within the US military and the interservice rivalry and tension it generates. Grieco & Bremer (2024, p. 10) made an explicitly parochial service-centric argument that '[a]bsent a significant revision in US Air Force thinking and operations, the service risks ceding control of the air littoral to the adversary *as well as other services*' (emphasis added). Key to the AGL debate is how services stake and hold their claims to portions of the air domain. Importing the AGL into Australian air power discussions brings US service parochialism and associated interservice rivalries into the ADF context, as it struggles to transition into an integrated force.

Wooding's (2026) framing of his argument that both the Air Force and the Army must approach the AGL challenge together implies a belief that the AGL offers a path towards improved air-land integration. However, by viewing the problem through a service-centric lens, Wooding reinforces the seams that exist between the services. In his characterisation of how the two services approach operations within the AGL, he implies that the Army and the Air Force operate in pursuit of their own aims rather than in support of broader joint or integrated operational objectives. Wooding is not alone in this view. He echoes an argument made by RUSI researcher Jack Watling (2023, as cited in Wooding, 2026) that, given the threat posed by modern integrated air defence systems, air forces would be unlikely to prioritise the employment of scarce and exquisite assets to support land-force manoeuvre. A service-centric perspective is also evident, subtly but significantly, in Wooding's assertion that 'air forces must still be prepared to project power through the AGL, *even if they choose* only to do this sparingly' (emphasis added) (Wooding, 2026). Whether intentionally or not, these statements reflect the view that services operate primarily for their own benefit. This not only misrepresents air power theory but is in direct contradiction to the goal, outlined in both the 2024 and 2026 *National Defence Strategy*, of creating a force structure 'integrated across five domains' (Department of Defence, 2024, p. 27, 2026, p. 33)

Air forces do not pursue control of the air to enable their own freedom of manoeuvre. As the definition above implies, air superiority is pursued to enable the freedom of manoeuvre of friendly air, land and maritime forces by degrading or complicating an enemy's ability to use the air domain. More importantly, control of the air is not solely

1 Prior to the January 2024 drone attack on Tower 22 in Jordan, which killed three US Army reservists, the last successful air attack on US service personnel occurred on 15 April 1953 (Grier, 2011).

a function of the air force. Surface-based (land and maritime) air defence is critical to a military's ability to gain and maintain the required level of control of the air. Air forces also do not choose to project power at lower altitudes. Within the Australian context, Air Force, Army and Navy assets are employed at the direction of the Commander Joint Operations, not by the services. Modern ADF operations are increasingly planned and executed as integrated multi-domain force packages designed to meet tactical and operational requirements of the entire force, not any one service.

What the ADF requires to respond to shifts in the character of modern air power is an approach that maximises the ADF's ability to exploit the air domain irrespective of the service operating the system. It should not do this by reinforcing legacy, service-centric thinking.

4. Change mindsets not airspace

Wooding's (2026) framing of low-level operations as a choice for air forces implies that creating a subdomain within the air domain, primarily for Army use, is an effective way to integrate the full array of increasingly diverse air systems operating in the battlespace. This idea is not new. Wooding acknowledges this as 'old wine in new wineskins'. The coordinating altitude and coordination level are doctrinal airspace coordinating measures to procedurally deconflict aircraft based on who controls the airspace. The AGL concept risks turning these 20th-century battlefield coordination procedures into a 21st-century force design principle.

There are, however, more variables at play than just drones. Air power strategist Peter Layton has coined the term 'heterogeneous air power' to describe the reality of modern air power (Layton, 2025a). According to Layton's definition, 'heterogeneous airpower includes cruise missiles, SAMs, ballistic missiles and drones built using technologies able to be rapidly updated and upset long-standing power balances' (Layton, 2025b, p. 17). When the definition is expanded to include other emergent capabilities operating in or exploiting the air domain, such as ground-based long-range rockets and directed-energy weapons, the complexity of the airspace over the modern battlefield becomes even clearer. There are no 'blurry vertical boundaries of air domain, where the AGL ends and the air domain's higher altitudes begin' (Wooding, 2026).

Land-based fires and directed-energy weapons will operate across all altitudes; as will aircraft, crewed, uncrewed and autonomous. Land strike weapons, from air-, land- or maritime-based launchers, will have increasing ranges and operate at various altitudes along their trajectories. The emergence of heterogeneous air power means that land, maritime and air planners and commanders will both have access to and will be threatened by a wider range and greater number of air capabilities. Bifurcating the air domain between the AGL and blue skies, as AGL advocates propose, will not solve this problem. Adapting ADF capability, organisation and doctrine, based primarily on the army or navy commander's ability to use organic systems to contest or control the air domain, will limit a truly integrated force's ability to use heterogeneous air power to achieve tactical and operational effects across all domains.

The problem the ADF needs to solve is how to integrate the full spectrum of existing and emergent air power to maximise the tactical effectiveness of the force in conflict. This is a wicked problem with no current answer. But that does not mean the ADF should try to make some progress by solving the wrong problem. The starting point must be an understanding of how air operations are changing technologically, tactically and operationally. This understanding cannot be gained by dividing the air domain into subregions based on perceived service equities.

As the ADF seeks to adapt to the challenges and exploit the opportunities of modern warfare, it cannot afford to reinforce a legacy, service-centric mindset. The ADF must shift its paradigm from a joint force that identifies and solves problems from the perspective of the three services to an integrated force that views the battlespace as the intersection of five domains. The first step in this process is to be clear and precise about the difference between the domain and the service that is exploiting it. This is not an easy mental shift to make. Army UAS may be clearly air-domain assets, but where do land-based anti-ship cruise missiles fit? This leads to the second point: unlike the services, domains can only be understood through their intersection. Whereas a service-centric definition of problems enables them to be compartmentalised and solved as simple equations, domain-centric problems demand higher-level maths.

5. Conclusion

The ADF must take up the invitation to debate the organisational and doctrinal implications of the changing character of modern air power. As it does, such debate must first ensure that it has correctly defined the problem. The Air Force bears significant responsibility for defining this problem, since Air Force aviators are the ADF's air warfare experts. Aviators must not only seek to provide technical and organisational solutions to this problem but also fill the gap in understanding of air power. '[I]f airmen do not understand and cannot explain airpower, no one else can be trusted to step into the intellectual void' (Gray, 2012, p. 309). Only with that understanding will the ADF's domain experts be able to come together to reframe the drone problem and begin to solve it, along with the myriad other technologically generated challenges the modern battlespace presents.

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