150 YEARS | AUSTRALIAN ARTILLERY | 1871 2021

A Brief History of Employment of Australian Artillery

Introduction

This history provides an insight into the employment of Australian artillery on operations, in order to understand how artillery has been employed throughout its contemporary political, geostrategic and military context. The history thereby illustrates how the ever-changing character of conflict and the manner of national contribution determine the composition and extent of commitment of artillery to each conflict.

Regardless of era or tactical, operational and strategic setting, a version of the 'gunnery problem' endures throughout: that is, addressing the continual challenge to acquire adversary targets, determine the requisite effect, and engage those targets effectively, as conveyed through an effective 'Sensor-to-Shooter' linkage. Equally, effective interaction with and advice to counterpart manoeuvre arms commanders is a fundamental constant to successful artillery employment.

Beyond revealing these immutable characteristics, Australian artillery history demonstrates that Gunners need to continually train and be expert in all forms of artillery employment, as the character of future campaigns remains unpredictable.

Pre-Federation 1788-1901

Colonial forts and fortifications

Australia's first defences were based on re-purposed naval guns. Colonial artillery forts and fortifications provided a vital expression of defence of the fledgling British colonies against the threat of sea-borne raids and invasion from Russia, France, Germany and the United States (US).

Colonial-era guns were initially smooth-bore muzzle-loading, and used round-shot, as well as explosive, grape-shot, and canister shells selectively as target treatment became more and more sophisticated. As new technologies of heliography, telegraphy, searchlights, mines and torpedo boats emerged, these were often grouped with artillery as a collection of 'scientific arms'.

Field artillery

Colonial Australian field artillery operated in a Napoleonic era of manoeuvre in land warfare, where infantry, cavalry and horse-drawn artillery visibly interacted in concert. Guns were deployed in a direct fire role, firing enfilade from straight-line gun positions on the flanks of assaulting infantry. No Australian colonies fielded siege batteries, though these were commonplace elsewhere. A traditional 'gunnery problem' existed – where gun, commander and observer were co-located or communicated with direct visual signals. Speed into and out

of action was paramount. During this period, there was a steady transition from muzzle loading artillery firing round shot, towards the use of breech-loading guns using explosive and shrapnel shells, and using rifled barrels. Both developments enhanced artillery's range, accuracy, rate of fire and lethality.

Post-Federation

Garrison (coast) artillery

The largely permanent-force garrison artillery ceaselessly strove to improve resolving the 'gunnery problem'. Target acquisition benefited from advances in optics, fixation and orientation, while a growing use of meteorology (wind, temperature, density) and standardisation of munitions (storage, shell weight, charge loads) began the path towards accurate predicted fire.

First round effectiveness became theoretically achievable, though at this period remained technologically unattainable.

Boer War 1899-1902

The inception of indirect fire coincided with colonial and then Commonwealth Australian commitments to the Boer War. The range and lethality of modern small arms like the Maxim and Vickers machineguns and magazine rifles rendered exposed field artillery positions untenable.

This saw the transition to the modern 'gunnery problem': of gun positions in defilade, displaced from observers and supported manoeuvre arm commanders. Intercommunication between observer, commander and gun line thus became indispensable, though was difficult to achieve, with rider or line being the common method.

World War One 1914-1918

Prelude

The Boer War experience revealed shortcomings in early breech-loading, non-recuperating guns. Subsequently, the 18-pounder Quick-Fire guns and equivalents were introduced into service afterwards, along with heavier calibre howitzers designed for high angle, destruction and neutralisation – though the latter were in short supply and not standardised. The 18-pounder design still reflected the expected mobility to support infantry and cavalry columns of the 19th century, and made extensive use of shrapnel shells and firing in a direct fie mode.

Gallipoli 1915

The Gallipoli campaign witnessed Australia's first wholesale involvement in Industrial-era warfare and all its lethality, complexity and consumption, unmatched in its scale and national commitment to that date.

Cramped, hilly terrain and difficult logistics including lack of high explosive (HE) shells exacerbated the paucity of artillery support available to the Anzacs from both Australian and other British guns. British-Indian mountain batteries assisted, while high-velocity, low angle naval guns and the ANZAC Corps' own 18-pounder guns were frequently impeded by

intermediate crests and unable to engage targets effectively. Intercommunication between observer, manoeuvre commander and the guns was often poor. Initial use of air observation occurred, but no direct communications or imagery, resulting in a slow transfer of information.

Sinai-Palestine 1915-1918

The tenets of mobile warfare were retained in Palestine, as the theatre's terrain and scale afforded manoeuvre the advantage. Austere logistic lines of supply for both sides saw relatively low intensities of artillery expenditure predominate.

While no Australian artillery deployed, British guns supported Australian Light Horse and other Desert Mounted Corps formations in direct and indirect fire roles, in a fluid mix of rapid advances and the reduction of Ottoman defended positions. The campaign's tempo and lower strategic priority moderated adoption of contemporary artillery technological and tactical evolutions occurring on the Western Front, such as counter-battery[1] techniques, and the pursuit of predicted (i.e. calculated rather than adjusted) fire.

Western Front – the modern gunnery problem 1916-1918

On its arrival on the Western Front in 1916, the Australian Imperial Force and the Australian Field Artillery (AFA)[2] were confronted by a campaign where defence had a considerable advantage over the attack, and manoeuvre had given way to static positions and unprecedented attrition.

Each of the warring forces strove to resolve this lethal manifestation of the modern 'gunnery problem' in-stride: firstly, improving fixation & orientation of guns in a growing moonscape of featureless terrain with refinements in survey instrumentation and computation; secondly, addressing calibration of guns through accounting for variance in barrel wear, projectile size and weight, and propellant composition and handling; thirdly, the inception of the novel field of enemy weapon-locating; and finally, making rapid advancements in recording and applying meteorological corrections to gunnery calculations.

The inception of *registration* missions providing 'correction of the moment' allowed the usage of accurate predicted fire, and later, were used to support surprise attacks when conducted at a distance from the assault area, or otherwise disguised. Communications developments saw wire telegraphy gradually replaced by wireless radio, permitting immediate and relatively reliable linkage between forward and aerial observers and the gun lines. Together, these advancements allowed more flexible application of artillery in support of manoeuvre arms, greater concentration of fire, and heightened responsiveness and reliability of fire.

The employment of anti-aircraft artillery spread rapidly as the war progressed. Heavy and light machineguns and field artillery were originally re-purposed, but soon replaced by purpose-built, quick-fire guns such as the 3-inch, and the 1-pounder 'pom-pom'. Immense mathematical and physics challenges in target acquisition, range finding and airburst fuse setting were rapidly confronted. Though initially not coordinated beyond local point defence, Allied and German

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[1] Counter-battery (CB) was alternately termed *counter-bombardment* during World War One.

[2] The Australian Field Artillery comprised the artillery elements of the Australian Imperial Force, and was drawn from pre-war RAA, Royal Australian Field Artillery (RAFA) and Royal Australian Garrison Artillery (RAGA) personnel, volunteer Militia artillerymen, and new recruits.

anti-aircraft artillery nevertheless accounted for many hundreds of aircraft kills, including – famously – the 'Red Baron', by a 53rd Battery, Australian Field Artillery gunner.

While aerial observation from balloons had occurred for decades, the advent of fixed wing flight and improvements in aerial photography permitted huge advances in the speed of intelligence dissemination and application, including, for artillery, predicted fire for both assault and defence. Gridded photomaps shared aloft and at the gun-line now permitted rapid target indication and engagement. Airborne wireless radio introduced in the final months of 1917 – employed notably later in mid-1918 at Le Hamel – permitted real-time artillery adjustment to barrages.

Aerial reconnaissance added significantly to the nascent function of artillery intelligence and the development of counter-battery fire techniques. In the absence of locating radar, effective sound ranging and flash-spotting techniques were developed on both sides – each striving to locate, engage and destroy the adversary's guns. Counter-battery operations became a specialisation in itself. Heavy calibre, long-range guns were increasingly dedicated to counter-battery work, while lighter calibre guns would be employed to both deceive and provoke an enemy response, at the risk of 'unmasking' gun positions in the face of a still-heavier retaliatory artillery 'ambush'.

The Western Front marked the height of complexity and scale in deliberate fireplan construction. Allied and German defences were part of concentrated fortification systems that were heavily protected, and linear as well as deep. The impregnability and lethality of such targets necessitated comprehensive and meticulous artillery support that could simultaneously blind, suppress, neutralise and destroy targets across uneven, narrow and congested frontages.

Fireplan barrages evolved from simple, fixed arrangements to *creeping* barrages that moved in front of advancing troops, *standing* barrages that neutralised whole enemy trench lines, and *lifting* barrages which were *standing* barrages that moved wholly to subsequent objectives and cut-offs. *Defensive* fireplans included predicted-fire *Support or Suppression* (*SOS)* missions that engaged likely enemy approaches, while *box* barrages were fired around advancing troops on new-won objectives to counter enemy penetration.

Other standard Australian Field Artillery fire missions included *registration* as well as '*search'* and '*sweep'* missions that were employed across areas to harass forward troops or unmask enemy guns, while heavier calibre howitzers conducted *harassment & interdiction* missions against depth targets, using predicted fire generated from aerial reconnaissance.

The increasing complexity of artillery tactics and functions led to commensurate augmentation of the staff of divisional-level General Officers Commanding Royal Artillery (GOCRA).[3] Similarly, the growing incidence of corps-level artillery fireplanning in support of corps- and higher-level deliberate operations saw the creation of corps-level artillery commanders across British and subsequently Dominion forces, with steadily increasing authority to allot, coordinate and orchestrate the fireplanning and employment of massed artillery. This included Brig.-Gen Coxen as the first Australian artillery commander of the newly formed Australian Corps from November 1917.

[3] Alternately titled *Brigadier-General Royal Artillery* from May-Dec 1916.

By the mid-1916, artillery command and control – the allocation and employment of firepower assets at all levels – had evolved to permit strong, highly centralised *command* of guns, primarily to support the destructive massed fireplans of 1916 and 1917. By the War's end, artillery command and control had further developed to allow equally, the decentralisation of artillery *control;* permitting commanders to more flexibly allot and guarantee fire support along the front. Rapid improvements in communications, fixation, orientation and ballistic correction facilitated the development of artillery support tasking, which in turn unleashed an unprecedented capacity for artillery to switch and move fires across the front, in greater concert with manoeuvre forces.

Despite the immense efforts given to perfecting artillery indirect fire, artillery in direct fire roles was still essential for the reduction and destruction of obstacles in the attack – such as by 6th Battery, Australian Field Artillery at Pozières – or later, as prototype anti-tank guns, successfully employed first by German defenders at Bullecourt, and adopted later by both sides. Both HE and shrapnel shells were employed – the latter effective in direct fire, where the fuse could be set accurately.

Artillery technology and materiel development finally matched the rate of evolution of artillery tactics in the final months of the War, although communication difficulties were never fully resolved. The Australian Corps' advance during the Amiens Offensive witnessed a transition from static back to mobile warfare, with artillery units stepping up behind advancing infantry, and the precursor to modern-day quick fireplans, formulated to respond to rapidly unfolding battles.

The growth of artillery formations and units on the Western Front was relentless. By 1918, the strength of deployable Australian artillery had swelled from a pre-war permanent strength of three field batteries in 1913, to the Australian Corps employing a total of up to 1,200 guns, including 13 field artillery brigades,[4] two heavy siege batteries, five divisional ammunition columns and numerous medium and heavy trench mortar companies.

Between the Wars

The 1930s saw widespread downsizing across the Australian Military Forces, including the demise of corps-level artillery commanders, and the diminishing of divisional-level Commander Royal Artillery functions. Confronting the task of defending a continent with a depleted force based on the rhetoric of the *Singapore Strategy*, the Chief of the General Staff John Lavarack convinced the Government to invest in motorisation and re-equipping of its modest land forces, including artillery.

Meanwhile, huge advances in aircraft technology were occurring in Britain and elsewhere, as the European powers prepared for conflict. These heralded commensurate gains in capability to provide effective intimate close air support. Global investment in anti-aircraft artillery grew accordingly, although Australia remained seriously underprepared and underequipped in both arenas.

As war neared and the threat of German and possibly Japanese raiders and bombardment grew, Australian coast artillery expanded, re-equipping as well as recalling obsolescent guns into

[4] Today's equivalent of gun regiments

service. The outbreak of war saw Australia increasingly engaged, ultimately on a massive scale in multiple theatres, in highly lethal conflict, demanding Australia move to a war economy to re-equip and re-arm with artillery, munitions and all enablers for firepower.

World War Two 1939-45

Tobruk, Greece and Crete 1941

The Australian defence of Tobruk saw artillery used defensively in both indirect and direct roles, and the first Australian employment of dedicated anti-tank artillery, working closely with defending infantry – including the use of a large collection of captured Italian guns.[5] Anti-aircraft artillery was critical to the besieged defenders, with the Axis forces exploiting their persistent air superiority.

The abortive subsequent Allied campaigns in Greece and Crete saw Australian artillery often under-employed and misemployed. British, New Zealand and Australian forces quickly lost the initiative against the coordinated all-arms[6] German advance through Attica, and the Allies fell back, with the withdrawals frequently covered by Australian guns, including notably at Thermopylae and Brallos Pass by the 2/2nd Field Regiment. In Greece, and during the subsequent air assault on Crete, the overall paucity of anti-aircraft and field artillery in both campaigns directly contributed to heavy Allied losses prior to evacuations.

Syria-Lebanon 1941

This Australian-led campaign to clear dogged Vichy French resistance witnessed the extensive, innovative employment of Australian and British Dominion field artillery in the advance and attack, fixing Vichy defenders while Allied infantry and light armour manoeuvred to outflank or bypass. As well as standard missions, single guns and artillery sections were continually used forward in anti-tank and direct-fire tasks. Though only two Australian field artillery regiments were in action during the Syrian campaign, Australian artillery fired almost 15,000 rounds.

Australian Continental Defence 1939-45

Prior to the War, coast defence artillery units were situated sparsely at strategic locations around the Australian coastline. By the War's end, in excess of 200 anti-aircraft and coast artillery batteries, along with searchlight, anti-aircraft group, fire control and command headquarters existed in fixed defences. The expansion of artillery in general and coast defence, survey batteries and anti-aircraft units in particular, meant that by mid-1942 some 80,000 of the Australian Army's strength of 406,000 were Gunners.

Malaya 1941-42

The short-lived Malayan campaign saw haphazard artillery employment as the mixed British, Indian and Australian forces conducted rolling withdrawals after losing the initiative early on. Dispersed 8th Australian Division field artillery batteries conducted disaggregated but effective

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[5] Australian artillery Gunners operated fully functional captured Italian and recaptured British air defence, anti-tank and field artillery pieces, alongside Australian infantry using partly functional captured Italian guns known as the 'Bush Artillery'.

[6] More latterly referred to as *combined arms*.

close support for the Commonwealth forces retreating southwards. Despite stubborn resistance by the 2/10th and 2/15th Field Regiments and others against the ensuing Japanese amphibious assault on Singapore, the island abruptly capitulated, and its defenders were massacred or captured.

North Africa (after Tobruk) 1942

The 9th Australian Division's artillery assets were an integral part of the British 8th Army during the later North African campaign, which was characterised by employment of many artillery tactics and techniques from World War One: regular use of counter-battery fires, detailed and concentrated fireplans in support of mass attacks, and heavy use of dedicated aerial observation. Australian Army Air Liaison Officers [7] were also heavily employed in coordinating the air-ground battle.

Artillery was used at El Alamein on a massive scale, supporting the infantry in the assault, and protecting troops when they were counterattacked. Anti-tank artillery and anti-aircraft artillery were relied upon heavily firstly in the defence, then in the subsequent breakout and pursuit westwards. Airspace coordination with Desert Air Force elements was crucial, and integrated in the overall coordination with Allied infantry and armoured commanders.

Papua New Guinea and Pacific Islands 1942-45

Exceptionally rugged terrain and tropical conditions in the South West Pacific severely hampered the conduct of manoeuvre and firepower early in the campaign. The under-strength 13th and lightly equipped 14th Field Regiments (Militia) were only able to deploy close to Moresby, the latter firing at maximum range in support of the Australian troops withdrawing from Kokoda.

Conditions and Japanese local air superiority throughout New Guinea drove reorganisation of Australian forces from a Mediterranean theatre order of battle into light, jungle forces with increased reliance on organic, small calibre mortars and machine guns, though artillery remained in high demand throughout as the only guaranteed, all-weather fire units. After Milne Bay and the counteroffensive northwards towards Kokoda, gun detachments of the 2/4th Field Regiment equipped with the innovative Short 25-pounder accompanied the US Army's 503rd Parachute Infantry Regiment, to conduct the first Australian airborne assault onto Nadzab airfield.

As the campaign progressed, naval gunfire and Close Air Support became increasingly available – the latter founded upon the advent and growth of the pivotal Army Air Liaison Officers' function. The clearances of the last Japanese forces from the northern New Guinea coast and subsequent landings in Borneo witnessed the Australian Army's emergence as a dedicated jungle fighting force, developing a far closer integration of artillery and fire support coordination with manoeuvre units at brigade level. This was a departure from the level of command and scale of employment seen in Europe, Middle East and Africa – and, indeed, on the Eastern Front. Nevertheless, by the end of the War, the Royal Australian Artillery had raised in excess of 70 regiments of field, medium, anti-tank, anti-aircraft and survey artillery.

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[7] The precursor to modern-day *Ground Liaison Officers* (GLOs).

Post-War to Cold War

Korea 1950-53

The War's aftermath saw a rapid demobilisation of units across the entire Army, and the emergence of a fully volunteer force centred on the nascent Royal Australian Regiment, conducting peacekeeping in the former Dutch East Indies and with the British Commonwealth Occupation Force (BCOF). Nonetheless, Australia maintained a significant force of militia-based artillery in Australia, retaining its wartime experience.

Despite the resurgence of full-scale warfare on the Korean Peninsula, Australia elected not to contribute artillery units. Selected Royal Australian Artillery officers were seconded to British and New Zealand artillery units and headquarters, and Australian Air Observation officers served with the Royal Air Force, gaining valuable insight into post-War joint fires coordination and airspace control concepts.

Meanwhile, the onset of the jet and rocket age was heralding the demise of anti-aircraft artillery in favour of surface-to-air-missiles,[8] and the introduction of anti-tank missiles into infantry unit inventories, supplanting anti-tank artillery. Coast artillery units were also progressively disbanded.

Pentropic reorganisation 1960-65

Australia nonetheless remained focussed on regional specialisation, and soon after, adopted the *Pentropic* organisation, wherein Australia's reorganised two divisions were intended to be air-portable, capable of fighting in a limited war and of conducting dispersed anti-guerrilla operations. For the Royal Australian Artillery, this meant the introduction of 105mm L5 Pack Howitzers and rugged, air-portable M2A2 guns, and development of weapon locating and surface-to-air missile capabilities. At divisional level, heavier calibre 5.5in guns were introduced, though the guided missiles also proposed never eventuated.

Whereas once divisional-level, then brigade-level was the principal echelon of tactical action, now it had devolved to the *Pentropic* 'battle group' level. Despite a strengthened divisional artillery group, the *Pentropic* concept's organisational decentralisation accelerated a trend away from proficiency in formation-level joint fires coordination and concentration that had been practiced in the previous world wars.

South East Asian conflicts

Despite discontinuing the abortive *Pentropic* experiment, Australia's foreign and defence policy of *Forward Defence* prompted expeditionary intervention operations across South-East Asia. Counter-insurgency operations in tropical terrain prevailed, with an emphasis on dominating ground through aggressive patrolling, based out of and supported from defensible firebases.

[8] This development led to change in nomenclature to Air Defence (AD), then progressively Ground-Based Air Defence (GBAD), to distinguish from the corresponding air power role.

Malaya 1950-63 and Malaysian-Indonesian Confrontation 1963-66

The Commonwealth operations in Malaya and the subsequent Confrontation in Malaysia saw the deployment of Australian field artillery batteries in Malaya during the Emergency, then in Malaysia and Borneo, and light anti-aircraft artillery batteries to Butterworth, embodying Australia's extant *Forward Defence* posture. Tactical engagements were largely fleeting in both campaigns, and responsiveness, dispersion and persistence became key characteristics of field artillery employment, at the relative expense of concentration of force, and flexibility of allocation of support. Commonwealth operations in Borneo saw the establishment of 'company bases' from which artillery and mortar elements located with infantry outposts to provide a secure location from which manoeuvre operations could be supported.

South Vietnam 1962-72

With the commitment to Vietnam came a change in threat to a mix of irregular and regular force adversaries. Interoperability with US forces became vital, and scale and intensity of combat increased markedly, though changes in Australian artillery employment occurred more slowly. Vietnam saw the evolution of company bases into battalion group size Fire Support Patrol Bases, adding armoured elements to the infantry forces.[9] This concept would develop further through the employment of Forward Operating Bases during subsequent coalition operations in Iraq and Afghanistan.

The advent of reliable utility helicopters saw greater fulfilment of the air mobility concept, and restoration of a dedicated organic attack aviation capability, alongside increasingly responsive and powerful close air support and battlespace air interdiction[10] capabilities. This abundance of joint fire assets allocated at brigade (1st Australian Task Force) and battalion levels drove demand for additional forward observers with greater access to joint fires. It also saw the augmentation of the Artillery Tactical Headquarters at the 1st Australian Task Force Headquarters Fire Support Coordination Centre with US Air Force liaison, naval gunfire support liaison, and artillery warning elements. The effectiveness of Fire Support Coordination Centres at battalion level was clearly demonstrated at the Battle of Coral Balmoral where the organisation controlled up to nine Allied batteries, helicopter gunships and offensive air support for the three weeks of fighting.

Sound ranging and early-technology weapon-locating radars became instrumental in rapidly and effectively fixing enemy mortars and rockets, cueing CB fires responses, and vectoring patrol missions. The technique of coordinating offensive patrols using combined artillery and signals intelligence was most famously demonstrated in 1966, leading up to the Battle of Long Tan. The success of Delta Company 6th Battalion's ensuing desperate firefight was guaranteed by the lethal and accurate fire from the supporting Australian, New Zealander and American gun batteries.

Deployment from air-portable and static fire support or patrol bases continued, with increasing artillery assets and an ongoing employment of organic, small calibre mortars. Combined-arms operations from the fire support patrol bases at Coral and Balmoral in 1968 exemplified both

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[9] Also known as *Fire Support Bases* or *Firebases.*

[10] More recently termed simply *Air Interdiction*. Close air support refers to support to fighting elements in combat, while air interdiction refers to engagement of target deeper in enemy territory.

the tactical effectiveness, as well as the potential for risks, intrinsic in planning and conduct of such actions.

Post-Vietnam

Post-Vietnam 1973-1999

Withdrawal from Vietnam saw force reductions and further batteries disbanded, and an Army reorganisation re-focussed towards a Cold War conventional threat. The re-focus witnessed a short-lived recognisance of the importance of coordination of artillery at the divisional level that was reflected at least in Australian artillery doctrine and training, if not in its organisation.

As the spectre of war with Warsaw Pact forces evaporated, the 1990s saw the onset of the Defence of Australia doctrine, anticipating widespread low-incidence, though lethal, threats. The Army in the 21st Century (A21) Trials proposed highly decentralised command of fire support, and artillery integrated as organic assets into motorised infantry. In response to the prevailing Defence of Australia doctrine, a concept of 'continental' force projection similar to that exhorted between the Wars was attempted, as a desperate recourse to maintain a nucleus of modern levels of firepower and manoeuvre, in the face of dwindling defence expenditure.

Improvements in fire control computerisation allowed the ability to disperse firing locations, yet accurately concentrate fire, and supported the introduction of artillery precision-guided munitions. Advent of precision-guided munitions indisputably re-introduced destruction as a primary artillery mission.

The A21's 6th Motorised Battalion Group construct trialled an organic armoured cavalry reconnaissance troop; guns of both light and medium calibre distributed in section-level positions; forward observer parties; organic weapon-locating, meteorological and survey assets; and the inception of a battalion-level All-Sources Cell. Importantly, the latter fused organic artillery and cavalry intelligence collection, but also imagery from the battalion's primitive unmanned aerial vehicles, thermal imagery and ground surveillance radars in Reconnaissance/ Surveillance Company. While locally potent and well supplied in intelligence, the A21 concept's command structure lacked the flexibility to aggregate forces, and to coordinate its artillery firepower in support of higher-level, high intensity operations.

Meanwhile in the late 1990s, Headquarters 1st Task Force was experimenting with Joint Offensive Support Coordination Centre structures, building on the functions and capability of the predecessor Fire Support Coordination Centre organisation. Timely fusion of intelligence, surveillance and reconnaissance (ISR), and coordination of lethal and non-lethal effects entered Australian Army developing doctrine, and with it the re-defining of the employment of artillery at formation level.

During this period, as part of the ADF contribution to the US-led Gulf War of 1991, 16th Air Defence Regiment deployed multiple air defence missile launchers and command elements aboard RAN replenishment vessels HMAS Success and Westralia to protect them from close air and small surface threats from September 1990 to June 1991. These deployments marked the only conventional Army unit deployments to this operation, albeit in a slightly non-traditional fashion.

Contribution to Peace Operations and United Nations commitments

Operational employment of conventional artillery firepower waned as Australian foreign policy trended from post-Cold War towards overt support to United Nations (UN) commitments. Earlier Australian peacekeeping with the British Occupation Commonwealth Force in Japan had seen deployment of a gun battery for precautionary purpose. Now, as deployment under United Nations Chapter Six conditions became standard in theatres such as Lebanon, Namibia, Cambodia, and Western Sahara, the low threat conditions limited employment of artillery in such operations to liaison, communications and non-lethal targeting roles only.

Despite heightening ground threat situations in Rwanda, Somalia and Former Yugoslavia, Australian peacekeeping missions sought to maintain a low profile and overt neutrality to offset any potential 'threat to force'. Subsequent regional peacekeeping deployments including artillery elements into Bougainville and later into the Solomon Islands continued this approach.

Consequently, Australian land force doctrine developed the option of employing artillery elements in civil-military cooperation roles, particularly in evacuation scenarios, exploiting the Gunners' intrinsic characteristics as well-equipped combat soldiers, organised for command, liaison & observation tasks in all threat settings.

Recent intervention operations: 1999-now

All recent Royal Australian Artillery employment reflects an ongoing prominence of artillery command, liaison, observation, communications and targeting functions. Royal Australian Artillery staff and commanders have provided individual or staff cell contributions to all Australian deployed headquarters, and individual third-country embedded staff into larger coalition headquarters in all active theatres – Timor-Leste, Iraq, Afghanistan and the wider Middle East. The application of artillery principles learned in lethal fires engagements were redeveloped to provide clear and effective appreciations of employment of non-lethal effects such as Information Operations and public information, and even the calculated apportionment of development assistance.

Timor 1999-2012

In support to United Nations peacekeeping operations in Timor, the scale of the mission, prevailing low threat and low lethality induced the re-role of artillery sub-units into infantry and other non-artillery roles, reprising similar Royal Australian Artillery employment in earlier conflicts. Initially however, while the threat was uncertain, options were retained for the deployment of field artillery to provide close support from firebases in familiar counter-insurgency roles, operating in austere, disaggregated and tropical settings. Meanwhile, Royal Australian Artillery command, liaison and observation groups performed important civil-military roles, coordinating with humanitarian and development assistance.

Iraq 2003-2011

Royal Australian Artillery elements were not involved in the initial ground invasion and occupation of Iraq in 2003, although elements of 16th Air Defence Regiment again provided a point air defence role aboard HMAS *Kanimbla* from May 2003. Royal Australian Artillery

Ground Liaison Officers also deployed with Royal Australian Air Force assets conducting air operations as part of *Operation Falconer*, the initial Australian contribution to the United States-led military coalition to remove the threat of Iraqi weapons of mass destruction.

Royal Australian Artillery elements were deployed later as part of the Al Muthanna Task Group, by which time security threats from insurgent direct fire, improvised explosive devices and indirect fire were low in incidence, although potentially highly lethal. From 2005, successive rotations of the Australian task group provided security initially to their partner Japanese reconstruction units, and later to co-located Australian Army Training Team-Iraq units also.

Subsequently, the Australian commitment transitioned to a more wide-ranging security employment, as the mission expanded in 2006 to an operational overwatch role, in support of fledgling Iraqi security control of the provinces of Al Muthanna and, eventually, Dhi Qar. In addition to integral Joint Offensive Support Team[11] and Joint Offensive Support Coordination Centre targeting, liaison and observation functions furnished throughout the deployment, Royal Australian Artillery personnel operated unmanned aerial vehicles to provide organic intelligence, surveillance & reconnaissance ('ISR') to the restructured, retitled Overwatch Battle Group (West).

In 2006, Royal Australian Artillery locating assets were rapidly introduced to provide a counter-rocket, artillery & mortar (C-RAM) capability. The composite counter-rocket, artillery & mortar system incorporated locating radars, and cued base force protection measures as well as intelligence, surveillance & reconnaissance responses. Later, a British self-propelled howitzer was incorporated to provide a counter-battery response capability, which was demonstrated on several locations. These operations exemplified the increasing norm of deploying multi-disciplinary artillery batteries, capable of coordinating coalition fires and effects in support of Australian forces.

Afghanistan 2005-2014

After the initial Special Operations-led commitments in 2001-2, Australian military intervention into Afghanistan in the Regional Command-South area of operations increased and diversified from 2005, deploying into a moderate threat setting of sporadic indirect fire, but escalating ground threat in terms of direct fire and improvised explosive devices. Although Australia did not deploy organic artillery fire assets with successive reconstruction and mentoring units, the provision of supporting Joint Offensive Support Teams and a Joint Fires & Effects Coordination Cell[12] was imperative to Australian targeting and access to reinforcing coalition fires and effects. Interoperability with North Atlantic Treaty Organisation (NATO), International Stabilisation Assistance Force (ISAF) and US forces became essential; and Australian Special Operations and manoeuvre elements in both Uruzgan province and beyond relied on US and NATO artillery, mortar, attack aviation and close air support throughout the campaign.

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[11] JOST replaced the more generic and historic term of *Forward Observer* party, reflecting a regularly wider role of application of and access to non-artillery fire support. The term JOST was itself later replaced to the simpler *Joint Fires Team* (JFT).

[12] The *Joint Fires & Effects Coordination Cell* term superseded the *Joint Offensive Support Coordination Centre*.

Royal Australian Artillery-operated tactical Unmanned Aerial Vehicles combined with Royal Australian Air Force and coalition counterpart assets to provide multi-layered aerial intelligence, surveillance & reconnaissance. Fusion of this intelligence, surveillance & reconnaissance product from manned and unmanned platforms through the Joint Fires and Effects Coordination Centre to lead and inform tactical manoeuvre became standard practice, while Joint Fires Observers[13] and Royal Australian Artillery, Special Operations and Royal Australian Air Force Joint Terminal Attack Controllers[14] coordinated joint fires and effects for both defensive and patrol operations.

The indirect fire threat heightened as Australia's commitment into Regional Command-South continued. This precipitated the deployment of a counter-rocket, artillery & mortar system manned by re-trained Gunners from 16th Air Defence Regiment, and later, weapon locating assets to protect the Coalition base at Tarin Kot. These systems were integrated through the Joint Fires and Effects Coordination Centre, cueing force protection and intelligence, surveillance & reconnaissance response assets.

Separately, a troop of Royal Australian Artillery field artillery was also embedded with British Royal Artillery/Royal Horse Artillery field batteries in support of British operations in neighbouring Helmand province, where the ground and indirect threat was markedly higher. The tempo and intensity of artillery fire – both indirectly supporting Coalition manoeuvre forces, and directly in local defence of the troop's own firebases – were considerable, regularly requiring significant augmentation by joint fires from helicopter attack aviation and close air support.

Within the International Stabilisation Assistance Force mentoring mission, the Royal Australian Artillery deployed several joint fires & effects training teams, including personnel within the Army's combat support Observation, Mentoring and Liaison Teams, training individual Afghan National Army field artillery batteries to combat readiness. Additionally, the Artillery Training Team – Kabul was responsible for wider artillery training within the Afghan National Army's Training Command, while other Royal Australian Artillery training elements were embedded within the Afghan National Army Officer Academy and elsewhere.

Contemporary artillery and the coalition joint fires battlespace

The contemporary joint fires battlespace continues to evolve, presenting new considerations for modern artillery employment. Developments in long range precision surface fires and multi-domain fires exploiting the electro-magnetic spectrum continue, matched by a revitalisation of ground-based air and missile defence, and the enduring importance of joint fires and effects planning, coordination and advice.

Iraq 2016-18

Recent Coalition operations in Iraq from 2016 have faced considerably increased threat in terms of scale, intensity and lethality from Islamic State militants. In providing modern coalition joint fires and enablers to the beleaguered Iraqi Security Forces, *Operation Inherent*

[13] The term *Forward Observer* was altered to *Joint Fires Observer* to reflect the growth in accessing joint fires.
[14] The term *Forward Air Controller* was altered to *Joint Terminal Attack Controller* to reflect the ability to terminally control all forms of joint fires.

Resolve forces have provided highly effective intelligence, surveillance & reconnaissance and targeting through coalition Joint Terminal Attack Controllers and artillery observer mentors. These elements coordinated overwhelming quantities of lethal and pervasive joint fires – both precision-guided munitions as well as conventional munitions – delivered from US and NATO field artillery guns, rockets and mortars, in the form of long-range precision fires and artillery raids from prepared firebases.

Meanwhile, coalition joint fires and effects mentors aided Iraqi Army artillery in providing close support to Iraqi manoeuvre forces in the advance and attack against Islamic State forces. Coalition Strike Cells coordinated all coalition joint fires on behalf of Iraqi forces, as the Iraqis prepared to develop their own fledgling theatre-level joint fires coordination. Within Coalition headquarters at component and combined joint task force levels, Royal Australian Artillery personnel were embedded as part of targeting and joint fires and effects coordination.

Today's joint fires battlespace

Contemporary artillery employment characteristics include: full coalition integration; inherent expeditionary capability; high-technology, high-lethality adversaries; global political interest in tactical outcomes; and full spectrum conflict short of nuclear exchange. Modern joint fires now comprise surface-surface missiles and rockets, 'tube' artillery, mortars, naval gunfire, attack aviation, and airborne strike (close air support and air interdiction) from manned aircraft and unmanned aerial vehicles. Coalition interoperability in coordination offers unprecedented joint fires access.

Artillery command, liaison & observation groups[15] still provide the joint fires 'brokerage' to manoeuvre arm commanders. Provision of Joint Terminal Attack Controllers and Joint Fires Observers remain integral conduits for vital reach-back & coordination for joint fires and effects – including non-lethal effects such as information operations, electronic warfare and even cyber – at increasingly lower tactical levels.

Dramatic improvements in intelligence fusion in theatres with unchallenged airspace have permitted uncontested, high quality targeting of irregular adversaries for neutralisation or destruction. However, detection is often possible when discrimination is not, and lethal engagement remains constrained under rules of engagement. Contemporary conflict between other belligerents – such as in Ukraine – demonstrate that target development is less simple against peer adversaries in hotly contested domains, especially air and the electro-magnetic spectrum.

Surface artillery's capacity to provide intimate fire support is enhanced through precision-guided munitions. Such precision-guided shells and rockets offer an increasing repertoire of reliable precision joint fires, when platforms for air-delivered munitions are unable to fly, or acquire targets effectively. However, parallel ongoing advances in artillery technology, and the persistent application of survey, meteorological, calibration & ordnance corrections, continue to improve conventional artillery's predicted fire accuracy and precision. All standard mission types – blinding, obscuration, illumination, suppression, destruction, neutralisation and even

[15] Also known as *Tactical* or *Tac Groups*.

direct fire – are still employed consistently. Deliberate and quick fireplanning remain essential parts of the artillery skillset.

Theatre-level precision for location and orientation via satellite geo-location is now prevalent, but the growing threat of electro-magnetic signal interference is creating a fast-growing need for autonomous geo-location & orientation systems. Accurate meteorological data remains essential, and though increasingly provided automatically, is still difficult to disseminate time-sensitively.

While some Royal Australian Artillery surveillance & target acquisition systems including ground sensors, surveillance radars and acoustic sensing have not recently deployed, these systems have all been employed by coalition partners and other belligerents in recent conflicts. Further systemic refinements to counter-rocket, artillery & mortar systems will fully integrate the initiation of multiple responses – force protection measures and launch of intelligence, surveillance & reconnaissance assets, as well as lethal counter-bombardment. This tactical approach reflects irregular adversary use of indiscriminate, disparate indirect fire from highly mobile, low-detectability platforms in several recent conflicts.

The Air Observation Post is now embodied in the Royal Australian Artillery's own, and other airborne intelligence, surveillance & reconnaissance capability. Unmanned aerial vehicles feed product directly to coalition fires strike cells. Ubiquitous, high trust communications networks permit commensurate levels of centralised fusion and allocation of scarce joint fires assets, across vast areas of operation.

Anti-Aircraft Artillery Defence has evolved into Ground-based Air & Missile Defence, capable of being fully synchronised into integrated air defence systems at multiple levels of command and control. The projected re-introduction of standoff ground-based air & missile defence in the Australian Defence Force will complement the Royal Australian Artillery's legacy low-level air defence capability. Recent operations with no or minimal air threat has lowered wider military perceptions of the requirement for such a capability. However, the intensifying threat from potential enemy unmanned aerial vehicles, and maturing technological solutions to provide effective counter-rocket, artillery & mortar systems is correcting this misperception.

The value of artillery to coastal defence is again being recognised. The proposed acquisition of long-range surface-to-surface rocket systems primarily for land-based deep fires also has utility in anti-access anti-denial in the maritime environment. When linked with other advances in the Royal Australian Artillery's acquisition, lethality, range and operational and tactical mobility, these systems will provide highly effective standoff artillery in the maritime environment.

The Royal Australian Artillery today

Currently, the Royal Australian Artillery comprises seven units and a number of smaller, enabling force elements. There are three gun regiments equipped with 155mm towed howitzers, each regiment supporting a combat brigade; one regiment responsible to provide surveillance and target acquisition primarily through Unmanned Aerial Systems;[16] and one

[16] *Unmanned Aerial System* (UAS) describes the entire capability system (airframes, ground control station, Command & Control nodes, observation and advice elements), whereas the term UAV describes the airframes specifically.

regiment equipped with missile systems and extended-range radars responsible to provide Army's air defence capability. The latter two regiments are force-level assets, grouped as part of 6th Combat Support Brigade. Within the 2nd Division, the Royal Australian Artillery's Reserve regiment equipped with 81mm mortars and smaller unmanned aerial vehicles provides joint fires and effects command & control, joint fires observers, and close fire support to the various 2nd Division battlegroups. The School of Artillery continues to conduct artillery and joint fires and effects training for all Royal Australian Artillery trades, as well as individual training for infantry mortars.

The Royal Australian Artillery also provides standing Joint Fires and Effects staff functions and advice to the wider Army and the Australian Defence Force. This advice is provided to several joint operational commands through: the Joint Fires and Effects Coordination Centre within Headquarters 1st Division / Deployable Joint Force Headquarters; the Supported Arms Coordination Centre within Headquarters Amphibious Task Group; and the Directorate of Army Air Support within the Royal Australian Air Force Air Command. These staffs are supported by various embedded Royal Australian Artillery force elements such as Joint Terminal Attack Control Troop and Ground Liaison Troop, as well as Joint Fires Teams in the Army's amphibious battalion. Additionally, the Regiment contributes staff into higher joint headquarters, such as the Effects Cell within Headquarters Joint Operations Command.

Along with a number of smaller individual elements embedded across the Australian Defence Force, the Royal Australian Artillery collectively provides the land domain element of the Australian Defence Force's joint fires and effects capability system. Several key changes in progress, or due to commence in the near future, will further enhance and evolve these capabilities. The Royal Australian Artillery is currently well placed to incorporate these changes, and adapt effectively to the future battlespace and warfighting environment.

Conclusion

Tenets of artillery employment

The history of Australian artillery employment reveals a highly varied application of offensive support and coordination. Moreover, it demonstrates that all branches of artillery – surface-surface field artillery, surveillance & target acquisition, ground-based air & missile defence, airspace coordination, targeting and strike coordination – and accompanying artillery advice to manoeuvre commanders are all still relevant contributors to joint battlespace functions. Conventional artillery remains integral to contemporary conflict in all its forms, while the unique character of each conflict and national strategic commitment drives artillery's varied manifestation, employment and prominence in each battlespace.

The 'gunnery problem' dilemmas arising from technological deficiencies during World War One are now able to be resolved, founded on ongoing application of underlying principles of ballistics, kinetics and chemistry. Nonetheless, several aspects of artillery employment remain consistent.

- The principle of standoff and out-ranging opponents has not changed – distances are simply greater, and now encompasses standoff in virtual (cyber and electro-magnetic) as well as physical domains.

- Effective target engagement is fundamental, and a function of both discrimination and detection.
- Logistic supply considerations remain vital to artillery employment, across extended lines of operation, scale, dispersal, duration, and rates of fire.
- Airspace coordination is more important than ever, with unmanned aerial vehicles and attack, aero-medical and utility aviation congesting airspace. The land manoeuvre commander still unequivocally owns the airspace directly above the close fight, and requires a dedicated manager.

Other aspects of joint fires coordination have merely evolved in their sophistication of employment.

- Conduct of tactical intelligence, surveillance & reconnaissance now clearly divides into support to intelligence preparation of the battlespace; targeting development; current operations; and after-action assessment.
- Regardless of changing nomenclature and growth in complexity, joint fires coordination remains the domain of artillery, with its inherent joint fires pedigree, expertise, integral communications & organisation. This domain must be shared in concert with Air and Aviation as fellow contributors.

The employment of artillery remains a fundamental component in the application of land forces, and in the combining of firepower with manoeuvre. Artillery commanders at all levels must be highly flexible and readily adaptable in its employment, and anticipate artillery's latent potential for widespread application in all operational theatres, with commensurate rates of expenditure.

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Editor's Note: This history was originally written by Lieutenant Colonel NH Floyd in conjunction with the RAA's Regimental History Committee, for Combined Arms Training Centre, as an Annex to the forthcoming edition of LWD 3-4-1 *Employment of Artillery*, and designed to provide an informative historical context for artillery employment throughout Australian military history. It was originally published in *Cannonball* No. 97 Winter 2020. The content here has been revised and updated in 2021.

The text will form the basis for a larger, more detailed work currently under development, on the *'Essential History of Australian Artillery 1871-2021'.*