

A soldier in full combat gear, including a helmet, sunglasses, and camouflage uniform, is holding a rifle. The soldier is positioned in the center of the frame, looking slightly to the right. The background is a blurred field of tall grass and some distant structures. The overall tone is serious and focused.

Sticking to our guns

A troubled past produces a superb weapon

ASPI

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Chris Masters

A black and white photograph of a soldier in full combat gear, including a helmet, goggles, and a tactical vest. The soldier is holding an assault rifle and is positioned in a field of tall grass. The image is semi-transparent, allowing the text to be overlaid.

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Cover image: A Reconstruction Task Force 4 soldier patrols the Green Zone north of Tarin Kowt, Afghanistan. Photo: Australian Department of Defence, [online](#).

Contents

Preface	1
Introduction: self-sufficiency	2
A century of hard lessons	4
The long peace	12
Back into action	25
The tempo builds	29
A customer at war	40
EF88: the development phase	58
Conclusion: the software is more important than the hardware	80
Notes	81
Acronyms and abbreviations	83
ASPI case studies	84
About the author	85
Acknowledgements	86

The ADF's conventional assault rifle, in continuous service since 1988, is in this text referred to in all its forms: Steyr AUG, F88, Austeyr, EF88 and F90. Originally imported from Austria under licence, the Steyr AUG evolved over 25 years to become a unique weapon developed and manufactured in Australia.

Preface

With *Sticking to our guns*, Chris Masters delivers a cracking read about the ‘funny plastic weapon’ that replaced the Vietnam-era L1A1 assault rifle in the 1980s, the successors to which remain the ADF’s primary personal weapon. And what a history it is. Chris skilfully weaves the political, design, industrial, economic and battlefield factors that have driven decision-making about the weapon earlier known as the Steyr AUG, F88 and Austeyr and now known as the EF88.

As anyone who has been involved in Defence and government decision-making knows, ‘captain’s calls’ and emotional reactions can play as large a role in equipment design and procurement outcomes as any amount of careful spreadsheet rationalism. Why, for example, is the current EF88 coloured black? Chris reveals all and recounts a near-run thing: an earlier version of the weapon could have been coloured pink. He’s quick to say that neither outcome was necessarily wrong—because acceptance of the weapon, and the user’s confidence in it, are a fundamental part of making the product fit for purpose.

Few items of kit are subject to tougher evaluation and more varied opinion than the soldier’s personal weapon. And Chris makes it clear that the Steyr started with some bad press: ‘It didn’t look sexy. It was green; it didn’t look like a weapon ... That can’t be a gun.’ Masters quotes a senior leader from the Capability Acquisition and Sustainment Group (CASG): ‘With a weapon, a boot, or a uniform, you open yourself up to 50,000 opinions.’ And yet, as Chris makes clear, with testing and modification and with extensive operational use, the Steyr has emerged as a high-quality general-purpose weapon—‘more reliable and more accurate at longer distances’—favoured by many users.

With research underway for the rifle’s eventual replacement, Masters’ judgement is that ‘the Austeyr story isn’t only about barrels and bolts and bullets. It’s also about mindset, expectation management, training and communication.’ That observation is surely true of every Defence acquisition, and I would argue that the Defence organisation consistently underinvests in the internal and external demands of expectation management and communication. Chris Masters’ study of the Steyr brings this and other lessons to the front of the story.

As with earlier ASPI case studies on defence projects, *Sticking to our guns* is designed to help those in Defence, industry and parliament and other interested observers to better understand the complexities of the business, all with the aim of improving how Australia equips the ADF. Chris Masters is to be congratulated for his outstanding contribution.

My thanks go to the former Deputy Secretary of CASG, Kim Gillis, for kicking off this series of case studies and to the current Deputy Secretary of CASG, Tony Fraser, for his engagement with and continuing support for the project.

Peter Jennings
Executive Director, Australian Strategic Policy Institute

Introduction: self-sufficiency

A man fires a rifle for many years, and he goes to war, and afterwards he turns his rifle in at the armory and he believes he's finished with the rifle. But no matter what else he might do with his hands—love a woman, build a house, change his son's diaper—his hands remember the rifle and the power it proffered.

—Anthony Swofford, writer and former US Marine

Gun debate can clamour like an angry mob, with noise and passion surging at the forward edge while reason and logic shrink to the rear. This may in part explain the polarity of opinion on Australia's service rifle, the Austeyr.

According to one of the engineers closely associated with its development, 'Australia should be proud of the Austeyr. It's the first time we've done a ground up design of a frontline infantry rifle that's now right up there with the world's best.'

With equal conviction, a professional instructor at the range at Townsville's Lavarack Barracks counters: 'It's an older weapons system that hasn't adapted to current needs. It's just kind of an older system that has been polished and had attachments added to try and fix those issues.'

This running battle about the most important piece of kit in Australia's defence inventory that has dragged on for the past 30 years isn't only about the weapon, but the industry it springs from. Central to the argument about the capability of the weapon is its sustainability.

Globalisation doesn't make the island continent less geographically remote. Nor are the seas and shores less vulnerable. Self-sufficiency in weapons production and maintenance is a goal that's sensible in peacetime and indispensable in a crisis.

Another critical goal is the alignment of the three main industry groups invested in the project: the designers, builders and users within the Australian defence estate. Producing a state-of-the-art weapon that will suit a range of uses, and for the space of a generation remain relatively futureproof, is the tallest of orders. When aspirations and objectives fall short, as will likely be the case, the key stakeholders tend to turn on one another. So, behind the battle to build a better weapon is another struggle: to harmonise team effort.

Another goal that should be unmasked at the outset is what's sometimes described as 'unobtainium'. No matter the expertise and budgetary power applied, there's no such thing as a perfect weapon. Compromises relating to national capability, general purpose, fleet management and costing will inevitably cast a shadow of disappointment.



And the frowns will be mostly found on the faces of the soldiers—the ones who count the most. With the very fabric of their life invested in the performance of their personal weapon, the soldier understandably has prime leverage.

And, while I'm coming close to choking on my own words, it has to be declared that they don't always know what they're talking about. As seen too often, inexperience, personal preference, prejudice, fashion and vanity can come into play.

Meanwhile, the project managers, design engineers and manufacturers are obliged to mediate myriad demands and complaints while maintaining a cold, hard eye on the evidence.

The Austeyr story captures all these highs and lows. While it isn't always appreciated, the people who have built it care about the product of their labour. Like the men and women in uniform, they contribute to the defence of Australia.

In subsequent chapters, I cover the way the weapon evolved and the arguments about its strengths and weaknesses—I hope without straying too far into a subsuming swamp of detail.

Criticism of the Austeyr will sometimes, I'm sure, be found to be valid and other times to be unfair. As in life, we need to sift nuggets of reality from the mullock of perception.

Like a sniper in a hide contemplating the target, we must measure our breath, advance situational awareness and focus.

An obvious outcome of all that heat generated by all that argument over an individual weapon is an issue of confidence. The Austeyr story isn't only about barrels and bolts and bullets. It's also about mindset, expectation management, training and communication.

Citizens of the future will always look back on the past as a period of lost opportunity. While little can be done to prepare for the unknown unknowns, we can be vigilant about lessons learned from modern and deeper history.

As eyes and minds and bottom lines turn to the ADF's new Small Arms Replacement Program, the story of the last major acquisition and its attendant evolution is both interesting and important, cautionary and enlightening.

A century of hard lessons

In 1907, Prime Minister Alfred Deakin wrote:

Our position at the other side of the globe, surrounded by alien races to whom we cannot look for aid and assistance in this matter, or indeed in any other, and far from any sources of supply of arms and material of war is very different [from that of other members of the empire, such as Canada], and we feel its urgency.¹

The year marked the origin of the Lithgow Small Arms Factory, which was opened five years later by Governor-General Thomas Denman, a British aristocrat and Boer War veteran.

In 1912, Denman travelled from Melbourne to Sydney before crossing the Blue Mountains to open the door of his private carriage on a bracing Lithgow winter. The location was hardly chosen for the weather, but rather for its road and rail links as well as its expansive coalfields, which could fuel a power plant and the local Hoskins Ironworks.

The principal product, a .303 calibre short magazine Lee–Enfield (SMLE, or ‘Smelly’), was to be produced at the Commonwealth Small Arms Factory to British War Office sealed pattern specifications, but, against empire loyalists’ expectations, the tender to design the factory and provide machine tools went to a US company, Pratt and Whitney.

The contract was for 15,000 rifles to be manufactured per year by a fledgling workforce of 190 employees working a 48-hour week.

The learning curve to achieve precision mass production from scratch was every bit as steep as the nearby Zig Zag railway. An immediate challenge was standardisation of measurement. Across Australia and the world, notions of what constituted an inch, or, for that matter, a foot or a yard, varied. Weapons production calls for precision measurement. It took a while for Lithgow to realise that Enfield had its own idea of what constituted an inch. The Drawing Tool Department set about evaluating variations between the ‘Enfield inch’ and the ‘Pratt and Whitney inch’. In addition, teething problems with springs and bolts and magazines dogged the first batch of weapons. It took a year before the factory began regular deliveries.

Preparing for war

The advent of the Great War just two years into the life of the Lithgow factory meant an increase in personnel and working hours, but equipment issues and industrial action strained attempts to meet the quota.

In 1915, a second shift was introduced to boost output and, in time, quality control improved to a point where the Australian-made .303 matched or surpassed the standard of its British equivalent. But that didn't stop nay-sayers nagging about the 'dangerous defectiveness' of rifles produced by American machinery.²

Beyond the taint of misinformation and teething problems, a range of experiences from the war years would resonate through the century. Tensions between the manufacturer and customer regarding quality assurance were to become routine. And serious limits to Australia's supply chain were exposed, so critical componentry such as specialist steel had to be imported.

A century on, the fundamentals are largely unchanged. As Assistant Secretary Land Engineering, Shane Aitken, observed in 2018: 'Thinking through sovereign capability, there is a balance. We certainly couldn't make everything.'

Back in 1918, by war's end the Lithgow factory, with five times its original workforce, had produced close to 100,000 rifles. Given the challenges, it was an estimable tally, but, even so, went nowhere near supplying Australia's deployed forces, the great majority of whom used British-made .303s.

Another confronting lesson for the century emerged once the crisis had passed and there was time to count the costs. To some consternation, it was found that importing the .303s would have been far cheaper.

But the bottom line isn't the whole story. The beginnings of an industry had formed, and that, after all, was the point.

Surviving peace

As it turns out, lessons learned when rising to challenges of capability, development and sustainment are drawn as readily from peacetime as from wartime.

As Shane Aitken explained, 'A lot of the improvements have come through that need to service a customer who is actually at war. If you get too close, you can design the perfect weapon that's five years late.'

A fine balance needed to be struck in retaining a skilled workforce capable of responding to an emergency, without leaning too hard on subsidies and falling prey to indolence. This was true at Lithgow and other government-owned facilities, such as the ordnance factory at Maribyrnong and the ammunition plant at Footscray.

Even in wartime, Australia's small population wouldn't demand the volume required to sustain major industrial facilities such as those that crowded the skylines of Birmingham and Detroit.

When the need for mass production of weapons passed at Lithgow, a workforce that in time was reduced to prewar dimensions set about finding something else to occupy its skill sets and machinery. In other words, turning swords into ploughshares.

That can be easier said than done. Commercial manufacturers, particularly at a time of economic recession, resent unfair competition. With so many weapons left over from the war, there was little demand for commercial firearms.

Some useful products, such as artificial limbs, then in sore demand, were turned out. Perhaps in keeping with the rising requirement for entertainment as the Depression years began to bite, the Lithgow factory found a market for sound and film gear. Best of all was the shearing equipment, which called for precision manufacture and served a ready market.

As to weapons, machinery was purchased and retooled to begin manufacture of the Vickers heavy machine-gun. Then, in 1936, work began on a lighter version designed by a Czech engineer, Vaclav Holec: the Bren gun.

As is often observed, World War II started with more menace than fanfare, creeping inexorably towards a new era of mass violence, 20 years after what was thought to have been the war to end all wars.

Desperate times

In the interwar years, such was the proliferation of the .303 service rifle that scant research and development had been applied to a successor. And now suddenly it was in extreme demand, not only in Australia, but all across the allied frontier.

Following the fall of Dunkirk to the Germans in 1940, Australia was called on to send ammunition and 30,000 rifles to Britain to replace losses.

In the following year, after Japan attacked Malaya and Pearl Harbor, anti-aircraft weapons were mounted around the Lithgow factory and on its roof, and a volunteer defence corps was placed on full alert.

For anyone contemplating prospective threats and the future defence of Australia, December 1941 and the subsequent 12 months should come to mind. Australia was in a fight for national survival. In May 1942, Sydney was attacked by Japanese submarines, causing some citizens to abandon their homes and head west across the Blue Mountains. In August, Australian soldiers using weapons made in Lithgow were desperately resisting Japanese forces advancing on Port Moresby.

In that year alone, the factory, with the help of satellite facilities established at nearby Orange and Bathurst, produced more than 140,000 rifles and machine-guns.

The broader munitions industry was also expanding and dispersing. A high explosives and propellant plant was established on the New South Wales side of the Murray River at Mulwala. Such was the urgency that it was constructed to existing plans imported from the US, retaining snow grates and street names such as Chickasaw Drive.

The crisis of global conflict helped deliver an important first for Australia: a national standards organisation, which would at last reconcile a baffling range of interpretations of what constituted a unit of measurement.

At Lithgow, staff numbers had swelled to almost 6,000, 1,100 of them women. Shift managers came to recognise something that would be noticed again and again in generations to come: that in some areas the women outperformed the men. Bruce Hutton, Operations Manager in 2018, told me while we watched a female worker piecing together components of the latest assault rifle, 'Women are better at following process.' Manufacturing Manager Wayne Gurney, whose grandad worked the same floor, told me, 'A lot of World War II carried over; now 40% of the staff is female. Women pay greater attention to detail. All the assembly is done by the girls.'

By 1943, the might of American ground, air and naval forces had turned the Japanese back, easing threats of air attack and invasion. Australian soldiers, fighting on in New Guinea, had reported their World War I vintage .303s to be unwieldy in the dense jungle. Shortened versions were called for and delivered in 1944.

Another weapon, famous for being designed and built in Australia, the Owen submachine gun, was also now in service. Lithgow didn't figure in its early history. Evelyn Owen, who had joined the Army as a private, had been seconded to the Army Inventions Board. Owen's prototype, which was test-fired back in 1939, was modified and eventually produced at Port Kembla by John Lysaght—a company to that point better known for manufacturing corrugated roofing. Production and maintenance of the Owen machine carbine would eventually move to Lithgow.

The end of the war in 1945 didn't bring unqualified joy to Lithgow. A war-footing cladding of jobs and homes and security unravelled once more. On the factory message boards, retrenchment notices were being posted well before hostilities ceased.

Postwar survival

The postwar survival of the Lithgow Small Arms Factory was assisted by a powerful advocate. The new Prime Minister, Ben Chifley, happened to be the local federal member of parliament. He had frequently cited the plant as essential to national security. A former Treasurer and Minister for Post-War Reconstruction, Chifley was a champion of full employment and industrialisation, helping drive the development of the Snowy Mountains Scheme and Australia's first mass-produced motor car, the Holden.

While there was promise, there was also reality. The outbreak of peace meant Lithgow suffered a serious setback with its number one customer, the Army, which no longer had use for its number one product, the .303 calibre SMLE.

As ever, the idea was to sedate the giant and keep alive the nucleus of an arms industry: a core of equipment and expertise that could again be reawakened. Sewing machines, pencil sharpeners and golf club heads were turned out. Unsurprisingly, the most successful product was a weapon. A deal was struck with Slazenger to produce sporting rifles. Military-grade engineering helped generate an enthusiastic market for a small range of .22 calibre hunting rifles but no profit to the factory, which by 1948 was trading at a loss of over £200,000.³

The military arsenal largely stagnated. Stocks of Owen guns were modified, and the remaining inventory was either scrapped or refurbished.

The outbreak of the Korean War in 1950 again re-energised the factory, an increased workforce in the main attending to the maintenance of existing stock. Australian ground forces in Korea fought with the same weapons that were used in World War II.

7.62 x 51 mm

The next key development in the story of Australia's small arms industry wasn't so much a war as a calibre change. In 1954, a decision, long in contemplation, was made to abandon the imperial .303 and go metric.⁴

War, if of the cold variety, was still in the background. NATO needed a projectile that could match the penetration and stopping power of Soviet small arms.

A critical lesson for the allies, drawn from half a century of conflict, was the need for standardisation and interoperability. A bewildering array of guns and ammunition used by coalition partner nations made logistical support hellishly difficult.

Coming to an agreement was as much of a challenge. The UK's preferred 7 mm round gave way to the US preferred 7.62 mm round.

The new service rifle selected by Australia to replace the .303 came from neither ally. Australia, along with Canada and Britain, selected the Belgian-made Fabrique Nationale, alternatively known as the L1A1 or the SLR.

As with all new weapons, there was immediate controversy, and critics rounded on every detail. The gas-operated rifle had many more moving parts that could go wrong. With a shorter barrel than the .303, it was still a touch heavier. A marked advantage was the loss of the laborious bolt action, which manually loaded rounds one by one. The SLR was, as the initialism declared, a self-loading rifle: a gas-operated piston automatically replaced a spent round. Further, its magazine carried twice as many bullets and muzzle velocity was improved.

But at Lithgow it was all good news. A condition of the purchase of the L1A1 was that it again be built to print under licence in Australia. At much the same time, the Liberal government reintroduced compulsory military training, which meant more men in uniform and more demand for guns. But not L1A1s, as it turned out.

In 1956, the factory received its first £6 million order for 110,000 L1A1 rifles two years after the calibre-change announcement. The acquisition process was tortuously slow: the Department of Supply came to be known by some as the Department of Suspense.

Retrenchments at Lithgow continued through the early 1950s, and expenses mounted. New equipment had to be purchased, technology upgraded, and specifications altered yet again to suit imperial measurement.

Malaya

Australian soldiers, now well into a 13-year confrontation with communist insurgents in Malaya, continued to use the trusty .303 SMLE. The first L1A1s fired in anger later that year by 2 Royal Australian Regiment (RAR) were Belgian imports.

Not until October 1958 were the first locally made L1A1s handed over to 2RAR, and then came another lengthy interregnum as they were rolled out to other regiments.

As was demonstrated, bringing a new weapon into service was no quick trip to the supermarket. The process, from selection to acquisition to production to testing to training to implementation, took the best part of a decade, but by 1960 Lithgow was smiling.

Over the years, there would be a lot of criticism of a lazy, insulated, public-sector, go-slow, shop-steward culture, but there was also pride aplenty and pockets of excellence. The engineers, toolmakers, metallurgists, die-casters and barrel-setters had learned to make a good weapon and, in doing so, minute by minute, progressively reduced the man-hours involved.

Workforce numbers were now on a roller-coaster upswing to more than 1,200. Export orders had arrived from New Zealand and Ghana. In time, further customers were found in Malaya, New Guinea, India, Uganda and Tanganyika. While the government abandoned compulsory military training in 1959 as too expensive, something else was in the air.

Vietnam

By 1960, the US deployed its Military Assistance Advisory Group to South Vietnam to oppose communist insurgents, amid some talk that Australia would follow suit. The Australian Army Training Team arrived in Saigon in 1962.

Two years later, the Australian Liberal government revived national service (as conscription was called) and in 1965 legislated new powers that would allow conscripts to be sent abroad.

When Australian defence personnel deployed to Vietnam in force in 1966, conscripts among them, the assault rifle they carried was the Lithgow-made L1A1. Lithgow also supplied the L2A1 (a rapid-firing version with a strengthened barrel), as well as Owen guns. In 1966, the latter would be replaced by the new 9 mm F1 submachine gun, which was the progeny of a union between Army designers and Lithgow engineers and looked every bit the Owen's ugly sister.

By the late 1960s, with the Vietnam conflict approaching stalemate and increasingly strident public opposition, troop withdrawals became more likely and production of the L1A1 slowed. The Vietnam experience had exposed deficiencies in a weapon with a European provenance. The Australians appreciated its robust construction and stopping power but found it heavy and unwieldy in close jungle confines.

Back at Lithgow, when weapons were returned for refurbishing, matchsticks were often found jammed in the trigger group. As issued, the Australian version had been re-engineered to prevent fully automatic fire, which was costly in ammunition and barrel wear. The match trick became an unauthorised modification.

In response to a need for greater versatility and agility in the jungle, the US-made Colt M16 was issued to selected soldiers, such as lead scouts. Back at Lithgow, there was immediate concern that the factory's principal product was about to be superseded.

5.56 x 45 mm

In 1976, 11 NATO nations came to an agreement regarding the testing and selection of a second standard calibre to complement the 7.62 mm. The ubiquitous .22 well known to sporting shooters across the globe was decreed as a benchmark.

Prior to that, US weapons engineer Eugene Stoner, who worked at the Armalite division of Fairchild Aircraft, had developed a small-calibre high-velocity combat rifle. His prototype AR-15 had demonstrated marksmanship advantages when tested against the US 7.62 mm standard-issue M14 of the day.

While initially the US Army was reluctant to embrace the new design, in 1964 the rifle entered service in Vietnam as the 5.56 mm calibre Colt M16, which was an automatic rifle equipped with a 20-round magazine. The immediate advantage was a significant weight saving. The M16 was not only lighter, but its smaller bore meant the soldier was able to carry more ammunition.

Rushed into service, it ended up costing lives as weaknesses were swiftly and tragically exposed. Dead soldiers were found on the battlefield with weapons half stripped. Rifles had jammed in the heat of combat. Ammunition was mismatched. Cleaning protocols and equipment hadn't been rolled out. The enemy's rugged and reliable Russian-designed 7.62 mm AK-47 was overmatching its new American rival.

It took more years and more lives before the errors were fixed, and in 1969 a more reliable M16A1 was allowed to formally replace the M14.⁵

That year, Australian troop numbers in Vietnam peaked but would soon scale down. By the end of 1972, veterans of an unpopular war were home.

The long peace

For Defence personnel, Australia entered a period of marking time. And, in Lithgow, the usual discomfort was felt as Defence orders fell away. Commercial customers were also becoming harder to find, the long partnership with Slazenger having halted in 1971.

Another worry followed the 1972 change of federal government. The Australian Labor Party (ALP), out of office since 1949, was now in power. The party was commonly regarded as according defence spending a lower priority. In counterpoint, the local electorate historically voted for it. The ALP stood for jobs, and local members before and since Ben Chifley had actively protected the workforce. Over time, the principal rationale of keeping Australia safe became enjoined with a motive to sustain employment.

As it happened, after the Whitlam government controversially lost office in 1975, the New South Wales western plains electorate for the first time voted in a Liberal representative. The new Member for Macquarie, World War II veteran Reg Gillard, happened to be the Lithgow mayor, who if anything was even more sensitive to job losses.

So, on the factory floor it made little difference. While the manager dashed off on a world trip forlornly hawking an already outdated rifle, the factory turned out spare parts, pruning shears and handcuffs. When the factory whistle blasted, the soundwave reaching every corner of Lithgow, a workforce mustered in numbers that had changed little through the peaks and troughs of the preceding decade. As Wayne Gurney put it, 'The factory was the community. As kids we came over and met Dad and walked home. The town would set its clock by the 5 to 7 steam-whistle.'

The smalls arms factory was more than the town's largest employer. The shopkeepers, school teachers, sporting coaches and the entire community were jolted alert to an enduring reality that their fortune was tied to the manufacture of firearms.

After stepping away from the mayoral office, the new federal member made enquiries about new orders, which weren't forthcoming—for the foreseeable future.

The Small Arms Replacement Program

Meanwhile, within the ranks of the Defence community a team was forming to investigate the acquisition of a new rifle. The Small Arms Replacement Program (SARP 3, as it was known) was the third such search following the procurement of the .303 inch SMLE and 7.62 mm L1A1. This, itself, was an indicator of the required service life: the operational span of those two weapons covered 70 years.

The new weapon would be 5.56 mm calibre. In 1980, NATO standardised the smaller second calibre already adopted by the US.

By the time tenders in Australia closed in July 1983, the ALP was back in power. Expressions of interest arrived from the US, Canada, France, Belgium, Austria and Israel.

Britain, now a member of the European Economic Community, wasn't in the race. The UK's once strong small arms industry was in decline. Having twice lost out to the US in the competition for a uniform NATO round, the UK embarked on a program called Small Arms for the Eighties (SA80). The so-designated SA80 assault rifle, with its bullpup design, which placed the magazine to the rear of the trigger, was originally manufactured by Royal Ordnance in Enfield and later Nottingham. Heckler and Koch subsequently upgraded the SA80 to the SA80A2.⁶ The erosion of research, design and development expertise in the UK meant this substantial modernisation program would have to be sent offshore to Germany.

No doubt the tyranny of distance made it harder for Australia to take such a leap. Placing an order in a time of global crisis to a country that may also be under threat and then waiting for the gun with all its ancillaries to be shipped in bulk across the globe is the tallest of orders.⁷

So, again, a condition of the weapon being licensed for local manufacture remained a primary consideration. The choice of what individual weapon that would be called for forensic research and something like over-the-horizon radar. As a support team member told me, 'It's like buying a new TV, times one thousand. You want something that's as futureproof as possible.'

Little Lithgow, with factory buildings dating back to 1911, would be obliged to make a weapon that met international standards in the face of competition from modern industrial giants.

The specifications criteria were classified, in that they defined presumed existing threats. While a Cold War benchmark of penetrating a helmet at around 800 metres endured, the post-Vietnam experience showed that kill-zone distances were closing and most small arms combat was occurring within 400 metres.

The preference was now for lighter semi-automatic or automatic weapons. At the ADF's Monegeetta testing facility north of Melbourne, Armaments Testing Officer Tony Byworth explained the golden rules for weapons engineers engaged in testing and selection:

Basically, it has got to be fit for function, and it's got to be what the soldier wants and needs. It's got to be light to carry. Also, accurate and reliable, which is probably the most important.

Lieutenant Colonel Peter Leahy, CO of 8/9 RAR, remembers informal preliminary trials of a range of contenders undertaken at the School of Infantry at Singleton, New South Wales. He saw a bunch of rifles lined up on a table. It's believed the field comprised the Fabrique Nationale Carbine, Galil, Heckler and Koch 41, M16-A2 and what he remembers as 'a funny plastic weapon down the end. It was the Steyr AUG. We left it to last but took some notice when we fired it. It had a lot of heft. We thought it all right.'

M16-A2 vs Steyr AUG

After a desktop evaluation, the field of prospective rifles was narrowed to two. The favourite, predictably, was a weapon already familiar to the ADF: the US Colt M16-A2. It would face off against a lesser known and somewhat unlikely contender, the Steyr AUG, developed by the Austrian Steyr Mannlicher group. As its name suggested (AUG = *Armee-Universal-Gewehr* = universal army rifle), the Steyr was offered in a range of configurations and a choice of four barrel-lengths.⁸ Therefore, Steyr AUG came to be referred to as a family of weapons.

While the Colt M16-A2 conformed to the more conventional Armalite (AR) platform design, the Steyr was a bullpup. This configuration (as with the British SA80) placed the magazine behind the trigger, which allowed for a more compact weapon while retaining barrel length, which contributed to superior accuracy.

The M16—conventional, familiar and coming from a trusted ally—was the favourite from day one, or at least that's how the Americans appeared to see it.

Major Greg Sheppard, whose career closely tracked the evolution towards the Austeyr, having spent a good proportion of it as a small arms instructor, remembers when the weapons arrived at the ADF's Engineering Development Establishment at Footscray in Victoria:

The Steyrs came in a nice banded-up aluminium case, five weapons to a case with slots for magazines and accoutrements. The M16-A2s arrived in wooden packing boxes, rattling around loose, and when they unpacked them two M16s were broken. That was the difference in attitude of the two companies.

Weapons technician Clancy Smith recalls first laying eyes on the Steyr, with all its weight-saving, injection-moulded, glass-fibre-reinforced polymers. 'It didn't look sexy. It was green; it didn't look like a weapon; it didn't look like a real gun. It was something that looked like a toy. That can't be a gun. Guns are black and they're made out of steel and rugged stuff, not this crap.'

An estimated \$6 million was spent on a series of engineering and user trials between May 1984 and April 1985, the former undertaken at the Williamstown range.

The adverse conditions tests, which exposed both weapons to extreme heat and cold, dust, sand, water and even NATO-standard mud, saw the Steyr the winner. When the rifles were dropped onto concrete, the Steyr sustained some scratches, while parts broke free from the M16.

When fired from a fixed mount, again it proved to be more reliable and far more accurate than the M16. The Steyr's integrated telescopic sight was a big step up from the M16's iron sight. Advocates of the American weapon thought it an unfair contest, considering, as one put it, 'A trained monkey could hit the target with the Steyr.'

Years on, when Senior Engineering Manager Darren Christopher looked up the test results, he found that the AUG and M16 were 'equal in 21 of the 56 different requirement categories. The M16-A2 was better than the AUG in five; the AUG bettered the M16 in 29. The AUG failed in two and the M16 failed in 15. There was one requirement category in which both failed.'

In December 1985, an important announcement was delivered to staff at the Lithgow Small Arms Factory. The manager, Sid Silk, told assembled workers the factory had won government approval to manufacture 67,000 Steyr rifles and 4,320 Minimi light machine-guns. The project was costed at \$160 million, with up to 200 new jobs in the offing.⁹ The factory would also supply the New Zealand Defence Force with 18,000 Steyrs to meet an order worth \$22 million.

The news was more than welcome. Indeed, it was a massive reprieve, given that two years earlier the same manager had put staff on notice when he identified chronic production and efficiency shortcomings that loomed like a winter cloud over the factory's future.

In a memo to staff, he outed poor work practices that over generations had become habitual. Operating costs exceeded those of other munitions factories. Deliveries were behind schedule. Production costs were excessive. Production hours worked were too small a proportion of total hours. Quality control was 'abysmal'. Auditors identified poor financial control and little evident effort to revitalise a moribund culture.¹⁰

Dave Forbes, whose great-grandfather worked at the factory, joined as a 16-year-old apprentice toolmaker in 1981:

We trialled making gearboxes, car parts. The government wanted it kept running in case war did break out. But the old days were fat and lazy. The workers had tallies. If someone proved industrious, they were told to 'cut it out'. When I was an apprentice, motivation was feared. There were people there with no job to do. One woman walked around cleaning phones. A storeman sat by a pot-belly stove. We had canteen boys and tea ladies. The factory was like an old man's retirement home.

But there was also a residue of pride. Garry Sutherland, who lived nearby in Ordnance Avenue, was taken on in 1986:¹¹

We were like the soldiers. The factory made all three rifles for Australia. It made me come to work. You would hear the talk: 'My father worked here. My grandfather had a Lithgow .22.' It was a small town with thousands of eyes on us.

But with one product, one client and no orders, something had to give. For some time now, there had been talk of the small arms factory being sold off and its workforce retrenched. A corporatisation plan for all government-owned defence industry was under consideration.

In the same year Garry joined, production of the L1A1 assault rifle ceased. In the interim, it would remain Australia's primary service rifle. The Vietnam-era weapons are retained as ceremonial rifles to this day.

ADI

Through the 1980s, within the federal defence industry, the Lithgow Small Arms Factory alone was being subsidised to the tune of around \$15 million each year.

Achieving a standard of commercial competitiveness in a high-technology industry was not only an issue for the shop floor. Canberra at last bit the bullet and started a long overdue top-to-bottom reform of the defence industry.

In May 1989, a fully government-owned enterprise, Australian Defence Industries Pty Ltd (ADI), was formed. Defence Minister Kim Beazley called the initiative 'one of the most ambitious corporatisation exercises ever undertaken in Australia'.¹²

Lithgow's former master, the Department of Defence Support, was abolished and the Office of Defence Production subsumed. Major defence industry facilities for all services were brought under the ADI umbrella. There were retrenchments at the naval dockyards and the Government Aircraft Factory. At Lithgow, a chisel was taken to the old Commonwealth Small Arms sign, but the Steyr contract saved the factory from job losses.

The propellant and explosives factory at Mulwala and the ammunition factory at Footscray, which would move to Benalla in regional Victoria, also now answered to ADI.

While the bureaucratic superstructure was flattened a touch, efficient and productive synergy between the designers, manufacturers and users was still a work in progress.

The move became increasingly unpopular in Lithgow, where corporatisation was seen as a path to privatisation and serial retrenchments.

The F88

Just before the restructure, the Steyr, which in time would become the Austeyr, in its Australian variant was designated the F88.¹³ The first trial batch of 500 standard service rifles was delivered to the Army in November 1988, Australia's bicentenary year, marking the F88's formal introduction.

With local components yet to be fully sourced and not all new manufacturing equipment yet on line, the first weapons were something of a joint venture amalgam of Australian- and Austrian-made parts.

And some of the early factory runs were far from trouble free. The main problem with the early Steyrs was inconsistency. Some weapons fired true, but others repeatedly jammed.

The design pack had been transferred to Australia, where the weapon was to be produced from equivalent materials. A modern multi-million-dollar hammer-forging machine to produce cold-forged chrome-lined barrels was installed, and technicians from Austria spent 'more than 18 months virtually removing every nut and bolt in the machine and upgrading all of its controllers and electronic componentry'.¹⁴

Salvatore Spitaleri, a senior specialist engineer who joined the Army's Engineering Development Establishment (EDE) at this time, saw Lithgow 'finding its way' as it confronted a more complex build:

A part of the weapons system siphons gas to supply energy. One half generates the energy while the other consumes it. There were early flaws in the pins and springs and pistons with rings of 10 mm diameter that had to be machined to very tight tolerances. This was an area of great challenge to ADI. Moving parts weren't driven sufficiently rearward. There wasn't enough oomph in the system, manifesting in frequent stoppages.

Another engineer attached to SARP 3 in 1989 was Roland Stott:

Austria is a landlocked country, and saltwater corrosion is something they didn't have to worry about. From the early production, there was some issues with rusting in a few minor components and we had a fairly large task at one stage to do corrosion protection through the whole gun and in the end only a few components made it. When added up there were 200 components, and virtually every one of them had to get changed.

Some parts were outsourced for production elsewhere; the plastic butts were to be made by a racing yacht company in New Zealand, and the magazines by a broom company in South Australia.

An Austrian design engineer, Horst Wesp, arrived in 1990 to interpret drawings thought to be deficient in crucial detail. On the factory floor, toolmaker Dave Forbes watched as older employees transitioned:

They had to adapt to new technology. Imperial to metric. Plastics, polymer, glass fibre and 5.56 from 7.62. Barrel-forging methods changed. I had learned metric at TAFE but for others it was a brand-new language.

Tensions between Defence engineers and ADI began to simmer. The former saw a 'she'll be right, just get it out the door' attitude. Greg Sheppard recalls a senior engineer and his factory counterpart 'getting into a late-night punch-up at a Lithgow motel and having to be separated.'

Salvatore Spitaleri thought one problem at ADI was a shortage of specialist engineering skills:

One of the challenges for the manufacturer was geographical. It was placed near the Blue Mountains. The pool of expertise available was sometimes limited. Sad to say, the relationship between our organisation and the manufacturer wasn't great because we were seen as the police and we were disappointed about build quality.

Spitaleri recalls one critical incident:

Lithgow would submit permission for a deviation if a standard wasn't met and we would assess the criticality. Was it OK? Did it need to be remachined or scrapped? The directive was found to be ignored. The receivers simply moved on a trolley after hours as if they had been reworked.

It was the source of a poor relationship that grew worse and led to the removal of Lithgow's right to carry out its own quality assurance. Removing accreditation was a big call, but Lithgow was reluctant to take all the blame. A counter-argument to explain the reduced cycling rate and stoppages of the F88 was less about shoddy work practices than mismatched projectiles. New F1 ammunition using a different propellant had been introduced, and Australia adapted a variant of NATO standard SS109 double-based propellant ammunition.¹⁵

A reduction in generated pressure was, according to the factory floor, more the cause of stoppages. The New Zealand Defence Force had the same problem marrying its initially acquired Austrian-manufactured weapons with Australian-produced single-based propellant ammunition. The fix was a minor enlargement of the vent and gas plug. Lithgow blamed the Defence evaluation team for missing something so simple.

Debut

At Lithgow, there was considerable fanfare when, after 12 months of trial and error, the fully functioning Australian-made rifles were loaded on semitrailers outside the old small arms factory canteen. The *Lithgow Mercury* reported that ‘a container load of the rifles left under tight security and under a military police escort.’¹⁶

‘We wound up with a half-decent rifle’, recalls Jim Grant, a plain-spoken Scot who on exchange as a warrant officer from the British Army was commissioned in 1989. Major Grant was there for the rollout, tasked with providing one hundred training courses for all three services.

He immediately found that ‘It was much easier to train on than the SLR’, but for all that there was common and predictable resistance to change. The SLR was not only familiar, it had veteran status. ‘A lot of people had them in Vietnam as standard and they wanted a black rifle.’ In contrast, the dark khaki Austrian bullpup with its smaller .22-like round was like the girl left sitting at a country dance: ‘It had been developed in Europe and didn’t have the feel and familiarity of wood and metal. The diggers didn’t see plastic gear as real.’

Soldiers who would configure their kit to suit the SLR found that the rearward magazine obstructed their pouches.

At that stage, Anthony Pratt, who would go on to become a shooting instructor, had been in the Army just six years:

An opinion at the time, not entirely unwarranted, was the Steyr wasn’t as durable and robust as the SLR. The thing was made quite well. The accuracy was there. You make things of looser tolerance and you pay for it in accuracy, but it goes up in reliability—and vice versa.

For others less acculturated, the F88 was a revolution. Range instructor Greg Sheppard, who was also engaged with the training program, remembers a female soldier struggling with the SLR. ‘She had trouble cocking the thing, which was common. In firing 100 rounds she hit the target twice. The poor woman came off the mound in tears.’ It took some urging from Sheppard to persuade her to try the new weapon:

The target went down at 200 metres. It went down at 300 metres. She walked off the mound with a smile that split her face in half. This was in front of her mates who saw she couldn’t hit a battleship with an SLR. My counter to people who said we should have kept the SLR because we needed 7.62 has always been, ‘Would you rather miss everywhere with a 7.62 or hit somewhere with a 5.56?’

Sheppard came to see further virtues:

Target shooters will tell you the best configuration for a firearm is to have the weight between the hands. It gives you the best balance and the best off-hand shooting capability. The old SLR was a problem in thick bush. Compact firearms have an advantage, particularly when you consider the Steyr AUG had the same length barrel as a full-length M16. Ergonomically, it's a far better thing to carry. I've said this from the day I first became converted.

All across the services, instructors reported improved accuracy. Jim Grant had to help rewrite the qualifying tests used to attain the coveted marksman's skills at arms crossed-rifles badge: 'With the Austeyr, we now found that 85% were passing.'

A key explanation for dramatically improved accuracy was the F88 Austeyr's integrated optical sight, as opposed to the open iron sight on the SLR. A donut-like black ring or reticule was featured in a 1.5 magnification Swarovski Optik-designed telescopic sight. It acted as a basic rangefinder, a man-sized target filling the donut at 300 metres and, further, the sight doubled as a carry handle.

A translucent detachable magazine carried 30 rounds, 10 more than the SLR's, which meant soldiers didn't have to be so attentive to mentally counting off rounds.

The Austeyr's popularity, particularly among the uninitiated, was also down to its reduced kick. The SLR, in comparison, bucked like a bull. Also, in an instant the F88 transformed from a rifle to a machine-gun. Pulling the trigger half way produced semi-automatic fire, and pulling it the full distance produced fully automatic fire. If the shooter wanted to be more discriminating and preserve ammunition, a single shot lockout button at the base of the trigger blocked the final-stage pressure. The changes generated widespread approval, as the reduced recoil and steadier rate of fire made it easier to keep eyes on the target.

Across the beach

One dampener on emerging enthusiasm for the F88 came from trials conducted at Swanbourne in Perth. One of the many roles of Australia's Special Air Service Regiment (SASR) is helping to evaluate and develop new equipment. Amphibious and assault swimmer operations were a spearhead of expertise, so beach trials were conducted.

For missions involving full immersion, say via parachute or submarine, weapons would be contained in waterproof bags, but for assaulting across a beach they needed to be at the ready.

Salvatore Spitaleri remembers them ‘swimming with these weapons in the sandy surf. Probably the worst thing you can do to a mechanical system is throw a handful of sand in there.’

An SASR water operator also recalled the trial. ‘There were big problems across the beach. We thought it rubbish—unwieldy and incompatible with other coalition weapons systems.’ Another operator remembers tumbling in the shore break at Swanbourne and trying to fire the Steyr. ‘We would get one shot off and it locked.’ He thought the issue had more to do with sand than salt water. ‘The Austrian weapon was made to a better grade. Tolerances were tighter, so sand seemed to jam more than with the American M16.’

RAN clearance divers reported similar problems, complaining that the butt filled with water and added weight, and that the telescopic sight also became waterlogged.

The most serious concern from both quarters was hydrostatic lock—a condition whereby incompressible liquid introduced into, say, a weapon or a piston engine causes damage and dysfunction. If water is contained in a rifle and it’s fired, the barrel can split. This is an issue for all weapons, but accentuated perhaps for smaller bore, thinner barrelled rifles. To counter an obvious concern, soldiers are taught to tilt and drain the barrel. And condoms, which on exercise might otherwise be considered a curious accessory, have proven value.

When exposed to salt water, the F88, with return springs enclosed in a tube, needed maintenance. The gas system was also more prone to retaining water, so the barrel and butt had to be removed and drained. This might call for an armourer flushing it with fresh water and oiling it.

One of the SASR operators told me, ‘We had to break it open to drain it—something you didn’t need to do with the M16.’ Hardly ideal if you happened to be under fire. Another trial was undertaken with additional equipment meant to provide waterproofing. ‘They dumped us out the back with the Steyr in a plastic bag. It was ridiculous.’

Engineer Roland Stott clearly recalls the SASR complaints. ‘We actually ran a trial at work and the M16 was worse.’ The test involved a tank, filled with a water–sand combination churned by an outboard motor, into which the weapons were dunked and fired. As expected, neither was a good swimmer, but testers insisted the F88, with its stronger hammer-forged barrel, was superior in containing pressure.

SASR wasn’t convinced. While the shorter carbine version remained on issue to the land and air troops, water operators were issued M16s. SASR resistance to the Steyr was and is still seen by some as more evidence of ‘special forces exceptionalism’.

As Lieutenant General (ret.) John Caligari put it, ‘At the time, the joke in headquarters was that if the Army had chosen the M16, [the special forces] would have gone for the Steyr.’

On the other hand, difference is a defining element of special forces. In Vietnam, troopers with more specialised and discrete tasking were issued with the M14, modified L1A1s and the M16. But over time, whether fair or not, the story from Perth that the new bullpup weapon made in Lithgow was useless across the beach became a given that was hard to overturn.

Equally, according to Lieutenant Colonel Paul Nathan, an ordnance specialist and undoubted subject-matter expert, the prejudice had some foundation in fact: ‘The original versions of the F88 that were fielded to SASR had a number of reliability issues. We had Australianised the F88 and that led to compromises, which created a lack of faith.’

Warwick Spencer, then with ADI, has a similar view:

Bringing the Steyr on was an issue in itself. It was a completely different manufacturing process to the original SLR, gone from steel and wood to plastics. Plastics, although rigid, if you don’t understand them well, have an ability to hold some memory and not end up in the dimensional tolerance you planned them to be. There was a lot of learning with respect to bringing the weapon on. I think that was one of the reasons it left a taint with [special forces], as they were the ones who got the first Steyrs. While they were conforming, they weren’t the best made.

Field punishment

As every mother will tell you, if you’re looking for a new way to break something, hand it to a bunch of young males. A controlled testing environment can never match the rough and tumble of exposure in realistic conditions. And in Big Army, as it’s known, further problems, to be expected when new weapons are introduced, were emerging.

The F88’s unconventional design, which placed working parts rearwards, meant the safety catch and magazine weren’t so readily in line of sight. Incidents of stoppages and negligent discharges (NDs) began to rise. According to Jim Grant, ‘It was happening irrespective of rank. People were forgetting to take the magazine off.’ Grant saw the problem as less with the weapon and more with training methodology that had to be adjusted. He proudly recalls that within a year the ND rate was dramatically reduced.

There was another learning curve in the cleaning and maintenance of the F88. At the Singleton School of Infantry's Depot Company, Grant remembers coming upon young soldiers, with rifles disassembled and propped against a wall. 'They were washing them in soapy water and blasting them with a fire hose.'

Similarly, and more notoriously, officer cadets at the Royal Military College, Duntroon, terrified by the prospect of dress inspection failure, were said to be jamming F88 parts into the dishwasher.

Grant, with a Scottish pedigree, thought the Aussies unusually tough on their equipment. When I asked for an example, he cited breakage of the MAG-58 (a 7.62 mm machine-gun bipod). 'I never saw one broken in the UK, but plenty were broken here. They were being smashed into the ground. If it can be broken, the digger will break it.'¹⁷

Capability Acquisition and Sustainment Group (CASG) Director Malcolm McKeith saw virtue in user trials, in that there was no better way to evaluate toughness:

Soldiers can always find new and unique ways of testing whether an item is robust enough. You would be amazed at how many weapons can go under a Land Rover's tyre inadvertently or a track of a tank, even worse.

The old maxim of 10 minutes of firing and six hours of cleaning prevailed. Over time, new protocols for weapons care and maintenance were introduced. The shift from steel and wood to plastics meant a lot of learning. Plastic can't be moulded to the same tolerances as machined steel. The use of lubricants had to be moderated—just one drop on the piston and a tiny smear over the bolt. Old methods that had applied to the SLR didn't translate. A petroleum-based cleaning agent was thought to cause the plastic hammer mechanism to swell. Via trial and error, weapons handling and maintenance protocols improved.

The rollout, as ever, was a case of hastening slowly. It was at least two years before F88s began to reach the regiments as replacements for the SLR.

Jim Molan, a later major general and senator, was commanding officer of 6RAR in 1991:

We were the first unit issued them, receiving both the new machine-gun [the F89 5.56 mm Minimi] and the Austeyr. They made a real impact. We were 10 times better off. The Steyr was so much easier to live with. You could sling it and use both hands. We could carry vastly more ammo. In the old days, a section might have a combination of M16, SLR and M60, which were big and bulky with a variety of ammunition.

Mick Reyne, who would rise to be a regimental sergeant major and serve at the Combat Arms Training Centre, agrees:

Those who were forward scouts and section commanders got the M16 and other members of the section got a machine-gun or the SLR and that's the way it was. When we introduced the Steyr, ... every rifleman was equal.

At this time, Leon Helmrich was a warrant officer with extensive small arms training experience:

I was first introduced to the Steyr through a Kangaroo exercise on HMAS *Tobruk*. I loved it. A great piece of kit. I loved the balance. Patrolling along you could cover arcs, read maps and look at your compass. The weight helped. We could carry more ammunition, the optics were better, and it was easier to shoot.

Back into action

International security developments meant that the F88 Austeyr would now be tested on operations.

Somalia

In early 1993, the F88 was tested on its first major foreign deployment: Operation Solace, a peacekeeping mission to Somalia. 1RAR would join a US-led coalition, UNITAF (Unified Task Force), to confront lawlessness and assist with humanitarian relief. The ordained rules of engagement were strictly defensive.

In the lead-up to deployment, Major John Caligari, as CO of Delta Company 1RAR, had ‘trained the hell’ out of his men but still found adjustment issues with the new rifle: ‘We loved it at first. It was so unique. But then we began to have issues with UDs’ (unauthorised discharges).

The safety catch, which pushes through the rifle above and behind the trigger assembly, was configured to SAFE or FIRE. Protruded to the right, the white dot indicated safe; to the left, the red dot signalled that the weapon was set to fire.

Familiarity hadn’t developed to the point that soldiers could instinctively tell which from which. John Caligari recalls:

We tried all sorts of remedies. We needed to keep fingers outside the guard. We experimented by using dental moulding around the safety. You can’t have a soldier believe the problem is with the weapon.

Private Troy Simmonds, who carried a Minimi in Somalia, saw the dental moulding remedy for the Austeyr succumb to decay:

The problem with the safety was when you put it down there was a risk the protruding button might be unintentionally switched to action. So, the moulding was built around it to stop that. But blokes found it could be more hazardous. If they suddenly needed to go to instant it was harder to push the button, and besides in time the moulding crumbled away.

At least one officer, Lieutenant Jan Van der Klooster, sheeted the problem home to something other than the rifle:

We had a good platoon, a lot of good soldiers in the platoon and some capable NCOs. We had some very capable soldiers, a couple of individuals who were very good, but we also had our fair share of problem soldiers. Subsequently, we had our fair share of issues over there, like unauthorised discharges.¹⁸

As it transpired, the only Australian soldier to be killed in Somalia, Lance Corporal Shannon McAliney, was shot by an F88. On 2 April, in the dead of night, another soldier handed McAliney his weapon, which discharged.

Initial suspicion fell on the new weapon, but those with a longer memory were able to point to a similar pattern of incidents in Vietnam.¹⁹ An extensive inquiry didn't find fault with the Austeyr. Lethal weapons, live rounds and stressed and fatigued soldiers are always a volatile mix. It wasn't the first accidental death of a serving soldier and it wouldn't be the last.

In general, in Somalia, with some reservations, the F88 was gaining approval. The lighter, more manoeuvrable rifle could be slung and kept out of the way. With so much of the mission devoted to crowd control, as John Caligari put it:

We could use a pick handle. We didn't want to shoot them, but the soldier had the weapon in hand when he needed it. He never put it down, which is important. In the past we have had people lose them.

While Australians in Somalia, in the main, demonstrated restraint in confrontations with militia, there were isolated gunfights pitting the Austeyr against a ubiquitous adversary: the Russian-designed Kalashnikov AK-47.

On 13 May 1993, soldiers guarding a warehouse spotted armed bandits in a crowd. As the eyes of an Australian private and Somali bandit locked, weapons were raised. As they say, the training kicks in. At 70 metres, the 5.56 mm round struck the Somali in the arm. His weapon hit the ground. The potent effect of the Austeyr and its smaller calibre projectile was graphically demonstrated:

The round had gone in his shoulder and came out his elbow and torn all the meat off the top of his arm ... The bandit subsequently died four hours later due to the seriousness of the wound and the Third World conditions of the hospital.²⁰

Cambodia

At much the same time, UNTAC (the UN Transitional Authority in Cambodia) formed a peacekeeping force in Cambodia. Australians and New Zealanders carried Steyrs. Paul Copeland, a signal troop sergeant, noticed dissimilarities:

The New Zealanders had a different optic sight system to the F88 with cross-hairs instead of the central circle. Their weapon drill was also different to ours and more in line with the traditional SLR drill than the slinged F88 rifle drill of the Australians.

In Cambodia, there were a few occasions when the F88 was fired in anger and, according to Copeland, 'I was aware of a number of UDs.'

Rwanda

In 1994, UNAMIR (the UN Assistance Mission for Rwanda) again had Australians deployed to Africa. The first contingent of Operation Tamar, comprising medical and logistics companies and infantry from 2/4 RAR, arrived in August. They confronted genocide: approximately 500,000 Rwandans had been murdered and a further 3 million displaced.

As in Somalia, Australian soldiers operated as peacekeepers. And despite being a further year on, the F88 was still being introduced. Indeed, before the second contingent arrived to replace them in February 1995, newly posted members were still receiving familiarisation training.

Rwanda was a horror show. With UN rules of engagement tightly aligned with peacekeeping, the soldiers had to call on every reserve of discipline and restraint as they stood before angry machete-wielding mobs intent on further rape and murder. The order of the day for UNAMIR was courageous restraint. The use of lethal force would exacerbate violence and add to the death toll. Fingers stayed off triggers.

Trav Standen, an SASR signaller with the first contingent, told me he zeroed and test-fired his weapon during pre-deployment, but never once fired it in Rwanda.

Deployed with the second contingent in 2005, Private Andrew Beddoe, who had trained on the SLR, came to like the Steyr partly because it was ‘idiot proof’. As in Somalia, ‘you could have it slung and still have easy access and get a sight picture in seconds.’

For the tiny Australian task force, the worst of it came in April at Kibeho, when revenge attacks inflicted more casualties. Outnumbered soldiers defending refugees under attack were at risk of being overwhelmed. Lance Corporal Andy Miller, knocked to the ground and assaulted, brandished his Austeyr but kept his cool as he rejoined his section, which fixed bayonets—a first for Australian infantry since the Vietnam War.²¹

Private Andrew Beddoe, spotting ‘what looked like the Rwandan Army forming up’, put his Austeyr down and grabbed a Minimi light machine-gun to stand in front of them. Beddoe remains angry at the horror and attendant helplessness. ‘There was nothing we could do. I suppose if we hadn’t been there a lot more people would have died. But all that death was just so unnecessary. I still have a lot of anger towards the UN.’

An Austeyr was involved in another injury when it impaled a medic in a vehicle accident. While there were no combat casualties, the mission inflicted many more battle scars—the great majority internal.

Changing goalposts

When weapons are selected and developed, the process happens in accordance with an understanding of existing users' requirements. Then, to the chagrin of designers, manufacturers and the soldiers sent out there to fight, unfolding world events have a habit of upsetting well-made plans.

The Steyr AUG had been developed in Austria in the 1960s and 1970s with the prospect of a war fought over the steppes of Eastern Europe in mind. Then, in 1989, the Berlin Wall came down and the rifle was enlisted on many a different front. The individual weapon designed for terminal effect—that is, to kill or incapacitate at distances of around 500 metres—was adjusting to a role that was looking more about deterrence and threat reduction.

The point of having a bayonet had been resurrected in Rwanda, at a time when many were arguing that it had become obsolete. Arguments about its retention persist to this day.

By 1998, the first efforts to build versatility into the system were being made. The F88 was already available in different forms. The standard F88 assault rifle had a 508 mm barrel length and was fitted with a bayonet lug. The shorter 407 mm carbine had no lug and provided better manoeuvrability in confined areas such as vehicles, ships and aircraft. And now a new F88S (Special) was added to the range: the 508 mm assault rifle integrated an AIMS (accuracy international mounting system) to fit a more advanced telescopic sight.

In some respects, the Austeyr was accommodating the past and the future as well as all known hemispheres. It had a large trigger guard designed to suit thick gloves and a European winter. Steamy jungles, sand and surf, the baking sun and Australian bulldust exposed the weapon to further challenges.

All in all, despite a range of unexpected requirements, the odd-looking, toy-like F88 Austeyr had so far performed well, principally as a tool of self-defence. But many further tests, most particularly in sustained combat, awaited.

The tempo builds

The Austeyr was also used on peacekeeping operations in Bougainville (1997–2002) and equipped Australian members of the Multinational Force and Observers in the Sinai (1995–1996). Sergeant Paul Copeland, who had repatriated from Cambodia after suffering serious injuries in a vehicle accident, had now recovered and was part of the team. He remembers the F88s mostly staying in the armoury, except for one telling outing when Australians competed in a military skills competition:

The Force Chief of Staff, US Army Colonel Frank Taddonio, a US Ranger, complained that we cheated because of the optic sight system on the F88. Our team outshot all other international teams, including the US Army parachute infantry regiment.

In contrast, Operation Pollard in 1998 sounded the death notice to the F88 by SASR. Glowering tension between Iraq and the US generated a request for military assistance. 1 Squadron SASR was part of a 200-strong Australian task force. It was working with American Special Operations Command, and there was concern about incompatibility of ammunition, come the need for a resupply.

And, again, there were complaints about poor reliability. A gush of RODUMs (reports on defective or unsatisfactory materiel) flowed to logistics engineers' in-trays. Up to this point, few RODUMs pertaining to the Austeyr were received. When clusters of complaints emerge, engineers sometimes become suspicious that someone might be trying to orchestrate an outcome, but the complaints had foundation: 'The RODUM detailed poor reliability due to ingress of sand into the working parts of the weapon while being operated under adverse conditions.'²² And, once more, investigation determined that the weapons came from an earlier, flawed production run.

One of the earned privileges of SASR is a greater degree of autonomy. The sensitive nature of its work, such as providing personal security details for VIPs, means that its personnel move discreetly within the corridors of power. In briefings leading up to the Sydney 2000 Olympics, Australia's Defence Minister was made aware of the Operation Pollard RODUMs and SASR's preference for a different weapon.

SASR thereafter procured the US-manufactured Colt M4, a shorter and lighter successor to the M16. While there were sound reasons for specialist soldiers acquiring a weapon with specialist capabilities, the circumstances of its acquisition generated lingering resentment.

On target

Australian Army bases stretching between the Northern Territory and Tasmania experience a variety of climatic conditions. While no base is exactly arctic (personnel who have been posted to Puckapunyal might disagree), Australians can get used to a multitude of seasons in a single day.

As ever, achieving accuracy called for a synergy of weapons and ammunition. The right combination finds a 'sweet spot', but get the mix wrong and it could be like putting petrol in a diesel engine.

When Dave Farrell entered recruit training at Kapooka in the late 1990s, he had never fired a rifle. Using an Austeyr, he topped his intake on the range: 'The best score I ever got was with a Steyr.' Farrell, who became proficient in the use of a wide array of weapons, remembers how, if shooting in the cool of the morning, he could achieve a tight grouping on a static target. With the same weapon zeroed identically but fired in the midday heat using uncertain ammunition, the strikes would be more scattered.

While little Australia struggled to keep up with the giants of the global munitions industry, in the lesser known but important field of 'ballistic temperature independence' there stalked a quiet achiever.

Conscious of bitter lessons from Vietnam, where tragic outcomes were found to result from chemicals burning faster, thus increasing chamber pressure and temperature, industrial chemists worked on developing a more stable propellant.

Smokeless powder, the successor to gunpowder, is essentially a product of acid and paper. In the second half of the 20th century, while other large producers, particularly in the US, moved to ball powder propellant, which was cheaper to produce in greater volume, Australia, with a lesser opportunity to diversify, continued to manufacture World War II-vintage single-based extruded propellant.

As Warwick Spencer, a senior manager and industrial chemist at the Mulwala Explosives Factory, explained:

By sticking with single-based extruded, we were able to tailor the product. We actually use less powder to achieve the same velocity and the reason for that's because of the way we control the burn rate. Without going too far into the technical, it's basically because we have a hole in the middle, so we can control the evolution of the burn rate. As it burns from the outside it gets smaller, so it slows up, but as it burns from the inside the area gets bigger, so it speeds up. Along with other controls, we minimised the velocity change over temperature ranges, which means the shooter hits the target regardless of temperature.

The propellant advanced a shooter's accuracy from being able to hit the centre of a target to precision standard—that is, being able to consistently group a series of shots dead centre.

In the mid-1990s, government-owned ADI rationalised its ammunition and propellant plants. The ammunition factory at Footscray was closed and a new facility was built at Benalla, close to the Mulwala propellant plant. The Albion and Maribyrnong plants had been shut down earlier, and the operation now folded into Mulwala, which in addition to propellants also manufactured high explosives.

The Mulwala factory doubled in size. Demand for the Australian-produced propellant from sporting shooters and military clients across the globe grew to a point where the factory operated around-the-clock shifts.

In contrast, Lithgow's productivity trajectory fell away. Demand in Australia would never be enough to sustain full production. In the mid-1990s, staff numbers fell to 120. The promise of exports faded. The New Zealand Defence Force complained about quality control. Malaysia chose to set up its own Steyr factory.²³

In 1999, ADI was privatised. It was sold to a 50/50 consortium of Australia's Transfield Holdings and the French Thomson-CSF multinational for just short of \$350 million.

Timor-Leste (East Timor)

Following the August 1999 East Timorese vote for independence, an outbreak of violence and murder gave rise to INTERFET (the International Force East Timor). In September, Australians led a protection mission comprising personnel from 22 nations.

Australians weren't the only soldiers carrying Steyrs. New Zealanders were similarly equipped, as were Malaysians and a small contingent from the Irish Defence Force.

Australia's SASR was now equipped with the Colt M4 but because numbers of M4s were at this stage limited, some troopers carried the Austeyr.²⁴ Both weapon systems shared the 5.56 mm calibre and provided very similar strike power. While engineers engaged in comparative trials saw the Austeyr as more accurate and reliable, the special forces operators favoured a suite of features found on the M4. A spectrum of prospective tasks—green roles (fighting jungle warfare) and black roles (more urban-based counterterrorism offensives)—called for versatility.

They liked the feel, balance, weight, fluidity of movement and modularity of the M4. The collapsible stock meant it could be adjusted for different sized operators, offering varied length of pull. Magazine changes were quicker, so soldiers were able to retain their sight picture without having to look down. Picatinny rails enabled the

mounting of a wider range of accessories, such as torches and lasers.²⁵ A grenade launcher could be fitted by an operator, whereas for the F88 an armourer was needed to fit or remove one.²⁶

Ambidexterity was another important issue. The bullpup design of the F88, placing the action beside the shooter's face, meant the weapon had to be reconfigured for left-handed users (unlike the UK's SA80, which was available in only right-hand form, so left-handers were instead trained to adjust). The F88 came off the Lithgow production line as a right-handed rifle. When arriving at the units, models for the left-handed had the bolts and ejection port cover switched by the armourers, so that spent cartridge cases didn't hit the user in the face.

Small arms instructor Jim Grant remembers a course in which a bulky Fijian police commissioner with a right-handed Steyr was 'lifting it to his left shoulder' and firing unflinching while a fusillade of hot brass peppered his cheek.

While a recurrent problem was to afflict the F88 in Timor, it had nothing to do with these identified shortcomings, but rather something that applied to all firearms.

On the very first day of the mission, a 5 Aviation corporal caused an unauthorised or negligent discharge (UD/ND) during an F88 handling demonstration. Two days later, an RAN able seaman was responsible for another. Then it was a combat engineer, an RAAF flight sergeant and numerous infantry members, up and down the ranks. The UD/ND reports echoed, literally, through the ongoing months. The severe prospective consequence of a UD/ND is such that tough penalties are imposed.

The UD/NDs were put down variously to incorrect unloading drills, weapons not being cleared when they were handed over, the magazine being on during the final function test (to check whether the weapon was working properly), and much more.

Fact had to be sieved from rumour and prejudice. Poor workmen are inclined to blame their tools, and unit pride has a way of presuming that deficiencies are more prominently observed in others. But the problem was occurring generally, across units, ranks and experience. Even the best trained soldiers in SASR had been guilty (although not in relation to the Austeyr).

Although the problem covered a suite of weapons, from pistols to a 40 mm grenade, which had been fired through the floor of a Black Hawk helicopter, the vast bulk of concern focused on the most commonly used weapon: the F88. Between September 1999 and February 2000, there had been 47 UD/NDs involving the Austeyr, again placing its design in question.

Old concerns about the safety button mechanism were raised but dismissed, as none of the reported UD/NDs was safety catch related.

Another worry was that fingers might be slipping on the large trigger guard, but, again, no such incidents were reported.

Did awareness of the magazine placement, behind line of sight, need to be raised? An inquiry report cited the expression ‘out of sight, out of mind’, but reasoned, ‘To blame the magazines [sic] position on the weapon ignores the majority who is [sic] competent and safe across Army’s spectrum of skill.’²⁷

Enlarging the size of the ejection port to improve the ability to inspect for the presence of a live round was considered. In poor light, it could be hard to be sure, and, if the operator had thick fingers, feeling wasn’t an easy option.

The sear setting of the trigger also came into focus. The bullpup design, which required greater distance between the trigger and hammer, called for a longer sear (or lever) to transfer force. Complaints had arisen, particularly from experienced shooters, that the Austeyr had ‘mushy’ trigger feel and lacked critical graduated pressure, but again there was no clear link to the rash of UDs.

Training Command came to a view that ‘failure to clear the breech and bolt face is a failure of operator diligence, not weapon configuration.’²⁸

A fix that had reduced the incidence of UDs was already in place. In the early 1990s, a barrel removal drill was introduced to make inspection of the chamber easier, in part because it could be.

The original design was such that the barrel could be removed without calling on an armourer. Common soldiers could pull it free with the press of a button. But this in turn gave rise to concern that the procedure might come at a cost to disciplined inspection of the magazine.

Warrant Officer Mick Reyne, who specialised for a time in safety policy, thought that training standards were watered down over time after the introduction of the Austeyr: ‘The weapon is inherently safe. It’s no more dangerous than any other weapon system out there. It comes down to good, solid training. You’ll make anything dangerous unless you’re trained on it correctly.’

Another explanation for the UDs was plain and simple fatigue. Australians take pride in active patrolling. One way to compensate for small numbers is to put people out there to ensure a cogent presence and leave a lot of footprints.

The Operation Warden/Stabilise mission in Timor-Leste was exhausting. There was a lot of patrolling in enervating heat and humidity, and fatigue was in the background when the worst occurred.

Fatal flaw?

In early August 2000, a troop from 2 Cavalry was operating near the East/West Timorese border. Trooper Marcus Saltmarsh, with eight years of Army service, was deployed as a reconnaissance scout in a five-man section. His best friend, Corporal Stuart Jones, known for his imposing size as ‘Monsta’, lugged the radio. Both soldiers carried Austeyrs.

Saltmarsh was originally issued a carbine, but during a wheel change of an ASLAV (Australian light armoured vehicle), the flat tyre fell on the weapon, breaking the plastic cocking handle. Snapping of the rigid cocking handles under pressure was a common enough occurrence. Upon his return to Balibo, the weapon was replaced with an Austeyr S (Special), which Saltmarsh recalls had already experienced a UD.

On 9 August, the cavalry troop was tasked with a dismounted patrol to block suspected militia moving back to West Timor. It was hard going, navigating boulders, creek lines, slippery shale, ravines and steep inclines. The men and their water rations were close to exhaustion by the time they reached their vehicle checkpoint.

Saltmarsh climbed into the ASLAV, which had limited space and a floor strewn with equipment. He reported: ‘I placed the weapon down on the ration boxes, never hearing of a weapon firing without the firer selecting the safety catch to instant and pulling the trigger. I felt it was safe because the safety catch was on safe.’ When asked by a comrade for cordial (better known as ‘jubie juice’) from the ration box, Saltmarsh reached to find it and heard ‘a loud explosion’. His close friend, Corporal Jones, was mortally wounded. Swiftly evacuated by helicopter, Jones died later that day.

Marcus Saltmarsh was charged after a 2000 board of inquiry found he was solely responsible, in that he hadn’t maintained control of his weapon. It took forever for a restricted court martial to later determine that Saltmarsh had no case to answer.

In the interim, the trooper went on to serve in Iraq, where he avoided carrying an Austeyr. He later undertook officer training to graduate from the Royal Military College. As a lieutenant, he would deploy to Afghanistan in a renewed decade of service, demonstrating perseverance, commitment and discipline.

But, as for Stuart Jones’s family, the pain doesn’t go away. The modern infantry rifle is no longer described as an individual weapon, but a weapons system, and central to that system is a flesh-and-blood operator. Saltmarsh, a human nucleus, endured ongoing personal pain for his role in the death of a close friend and a weight of grievance and demoralisation that settles like a toxic fog in a too often unforgiving military environment.

Lieutenant Saltmarsh would resign from the Army, and Senator Jacqui Lambie would take up his case. In doing so, she investigated the prospect of Austeyrs firing without the trigger being pulled.

At a Defence Estimates hearing, Vice Admiral Ray Griggs told Senator Lambie:

[T]here have only been nine reports of spontaneous discharges of the F88 Austeyr family of weapons, and that's across a fleet of around 56,000 weapons. Five of these discharges were caused by users exceeding the approved rate of fire and overheating the weapon, resulting in the chambered cartridge discharging due to excessive heat. The remaining four incidents were caused as follows: in 1998 a firing pin was found to be 0.5 mm too long; in 2003 an extractor was found to be broken; in 2003 a weapon was dropped in a possible materiel failure or procedural error; and in 2004 a firing pin was found to be broken.²⁹

While interrogating the F88's safety record, Jacqui Lambie was more suspicious than condemnatory. As an Army veteran, she had experience enough to describe the Austeyr as a 'brilliant' rifle.³⁰ Clearly, all weapons are dangerous (they're meant to be dangerous) and, given the data at hand, the ADF couldn't brand its primary assault rifle as systemically unsafe.

When I caught up with Marcus Saltmarsh, he told me with conviction, 'Nobody pulled the trigger on that weapon.' He contends the fatal incident isn't fairly described as an ND or UD, but as an AD (accidental discharge). Saltmarsh, with a pragmatic recognition of evolving weaponry, training and associated risks, further reflects, 'I have no malice towards the weapon.'

A known benefit of the Austeyr was its impact on training hours and costs. Because it was easier for users to achieve professional capability and accuracy, as well as maintain the weapon, not as much time was needed with recruits. But now the Timor experience had adjusted that thinking.

Briefing tours were made and an operators' *aide-mémoire* was produced, as well as a *Stay alert—stay alive* video and posters. The idea was to reinforce the principles of handling: safety, control, discipline and training. While no changes were made to handling drills and procedures, new criteria were established for weapons qualification.

Global war on terror

As is frequently observed, 11 September 2001 changed everything. As the Twin Towers in New York crumbled to dust, viewers across the world were engulfed by a rolling cloud of threat and conflict like nothing seen before. The new enemy

was indistinct, an out-of-uniform adversary from no defined nation-state using predictable instruments of attack. Fighting a ‘global war on terror’ called as much for hard thinking as for hard fighting.

But we assemble the defence force we have while we work out the one we need. When Australian soldiers walked off the ramp of US C-17 transport aircraft in southern Afghanistan in December 2001, they carried as their primary weapon the Colt M4.

Australia had deployed a squadron from SASR. In the subsequent 12 months, while spasmodic small arms engagements occurred, the essential work was patrolling and intelligence gathering. Major combat action was more likely to involve small teams camped on high ground, calling in air strikes. In the early 2000s, Australia was accelerating its education on how to fit a small khaki cog into a large multinational (mainly American) war machine.

When Lieutenant General Peter Leahy was appointed Chief of Army in 2002, he shaped up to a crowded horizon. In addition to the Afghanistan mission, Australians would soon deploy to Iraq. Closer to home, while the Timor-Leste commitment scaled down (to later be revived), the Regional Assistance Mission to Solomon Islands began to further challenge resourcing.

In his time as Chief of Army, Leahy would oversee a \$10 billion expansion. His Hardened and Networked Army initiative aimed to strengthen numbers as well as integrate and modernise equipment. The Enhanced Land Force initiative would add a battalion. The Army alone aimed to recruit a further 5,000 personnel a year.

At the end of 2002, Australia effectively withdrew from Afghanistan, only to return three years later.

The F88 SA1

From the late 1990s, ADF engineers and ADI collaborated to upgrade the F88.

Designated the F88 SA1, a new model replaced the integrated optical sight with a MIL-STD-1913 rail to enable the fitting of the Wildcat enhanced optical sight and the F7000 night weapon sight. This brought about the withdrawal of the F88S with the AIMS rail, which couldn’t be remodelled at Lithgow to the SA1.

In addition, by now a grenade launcher could be underslung. The F88 GLA (grenade-launcher attachment) lost the bayonet lug and foregrip to accommodate an interface bar, which was installed by an armourer. In this form, the Austeyr became additionally deadly. An attached M203PI, sourced from RM Industries, projected a 40 mm grenade.

The F88 SA1s were provided first of all to arms corps such as infantry, cavalry and engineers. Although the process was begun in 1998, they weren't accepted into general service until 2003. This was a further step towards improved versatility and answering some of the challenges posed by that shadowy rival, the Colt M4.

In the same year, Australian troops crossed the border into Iraq. The first incursion was by 1 Squadron SASR, equipped with the M4.

Iraq

Special Forces Task Group Redback One fought a brief and action-filled desert campaign at the vanguard of the 2003 Iraq invasion.

When the 450-strong Al Muthanna Task Force deployed to Southern Iraq in 2005, it was nowhere near the same white-knuckle ride. The initial role of Operation Catalyst was the protection of Japanese construction engineers and the training of local Iraqi security forces.

Australian cavalry, infantry and headquarters elements carried the Austeyr as their individual weapon. The main complaint this time was less the ingress of sand or UDs as the lack of action.

Compared with much of the rest of Iraq, Al Muthanna was a quiet province. The Australians would later relocate to the Talil Air Base as the Overwatch Battle Group (West). The ADF was also based in the capital, Baghdad.

From there, on 21 April 2006, news of an Australian soldier in Iraq being accidentally killed immediately advanced speculation about further problems with the Austeyr.

The Age reported that:

few details of the incident are available, but speculation has already pointed to the role of the Army's F88 Steyr assault rifle ... Defence commentator John Farrell, publisher of *ANZ Defence* magazine, said dealing with military weapons was inherently dangerous. 'While an excellent assault rifle in its own right, the F88 has a number of features that make it susceptible to accidental discharge,' he said. 'Chief amongst these is a cross bolt safety catch, which can be switched from safe to fire simply by lying the weapon on its side, and the arctic trigger guard, which by its very nature, is a much larger area for obstacles, articles of equipment and clothing to penetrate.'³¹

The Austeyr was again innocent. As many readers are aware, Private Jake Kovko had been accidentally killed by his Browning 9 mm pistol. And, as we also know, perception too often defeats reality. Internal and largely misguided disquiet about this ugly-duckling weapon was now going public.

Despite a constant loss of corporate knowledge as experience cycled in and out of the ADF, despite the urgent growth in recruiting and an accelerated training burden, and despite the F88's increased lethality compared to its predecessors, the incidence of UD/NDs was in steady decline.

Complaints did emerge from Operation Catalyst about equipment failure, such as stress fractures in body armour, but not so much about the Austeyr. According to then Captain Michael Bassingthwaighe, Adjutant for Overwatch Battle Group (West) 1 in Iraq in 2006, 'UD/NDs were a rarity and from what I can recall were in single digits.'

Anyone on base watching Australian soldiers come and go could see strict observance of protocols for weapons handling. The Timor-Leste experience demonstrated too many soldiers to be too trusting of themselves, so a buddy system was introduced, becoming formal doctrine in 2007.

This required mates to mutually check for chambered rounds. Another developed routine was the test firing of cleared weapons into tilted sand-filled safety drums known as 'unload bays'. More apparent than in Timor was a new routine of clearing weapons at the range and the like, before entering secure patrol bases.

Afghanistan: the reconstruction phase

While there had been little opportunity to test the combat prowess of the Austeyr in Iraq, that wouldn't be true of its next major outing.

In 2005, Australian special forces redeployed to Afghanistan, this time to Uruzgan Province. They were tasked with ground truthing (intelligence gathering) and clearing the valleys of a resurgent Taliban in anticipation of the arrival of a reconstruction task force (RTF).

In 2006, RTF1, a 400-strong component of the large International Security Assistance Force, made camp. Most were Army engineers, but ongoing security concerns meant that a company of infantry was added for the sake of force protection.

When the soldiers left their fortified base at Camp Holland, Tarin Kowt, their principal weapons were medical supplies, water tanks, portable generators and bags of cement, given the objective of providing humanitarian relief and at least the foundations for nation building. So, both hands were regularly full, while the Austeyr, with which all members of the conventional forces were equipped, was generally slung.

For the most part, special forces took the hard fight to the enemy, conducting raids on Taliban leaders and bombmakers. In contrast, the kinetic role of conventional forces was more restrained.

This led to some dissonance out there on what passed as a front line. Lieutenant General Peter Leahy's *I'm an Australian soldier* manifesto identified nine core values, the first being 'Every soldier an expert in close combat'. Skill at arms was a requirement for combat units and non-combat units alike.

Engineers building bridges and checkpoints could be seen as soft targets. The patrolling infantry, there to provide protection for the engineers as well as the locals, were similarly vulnerable. Rules of engagement emphasised courageous restraint and self-defence.

It called for a new kind of bravery to be out there constantly patrolling under threat of ambush or being blown to bits by an improvised explosive device (IED), all the while holding the finger one impulse clear of the trigger.

Infantry and cavalry units patrolled regularly to provide a protective cordon as the engineers got to work.

The insurgents came to swiftly understand the limits on coalition aggression. A Talib might fire on coalition forces, hide his weapon and reappear as a farmer, thereby claiming immunity. Children were commonly appropriated onto the battlefield to act as spotters and transport ammunition and IEDs.

The coalition came under intermittent attack, typically from a tree line or mudbrick compound. The insurgents commonly fought with 7.62 mm AK-47s, 7.62 mm PKM machine-guns and rocket-propelled grenades (RPGs). Sometimes their numbers included trained marksmen, but as often as not they were opportunist part-time fighters with basic 'shoot and scoot', 'spray and pray' techniques.

When the Australians responded, the stand-off nature of the contacts meant their heavier weapons tended to be more effective. Against thick mudbrick walls, assault rifles and lighter machine-guns had little penetrating power. The ASLAVs' 25 mm Bushmaster cannon and sweeps by Dutch Apache gunships and US F15s obliterated Taliban firing positions. The other piece of equipment to make a key contribution was body armour. Australian soldiers would feel a jolt and a shoot of pain and take cover, to see one or two flattened 7.62 rounds fall from their kit. Hardly popular to wear, particularly in the mid-year heat of the fighting season, the 11-kilogram MCBAS (modular combat body armour system), which could be an awkward fit with the 3.6-kilogram-plus Austeyr, was saving lives.

The force protection units did a fine job protecting the engineers, who rarely had to down tools as fighting erupted. For all that, Captain Liam Hansen kept his weapon close for all of his tour with RTF2. He laughs when he recalls coming home, waking in the middle of the night and reaching instinctively for his rifle: 'We had it with us all the time, to the point you would feel more naked without your rifle than without your clothing.'

A customer at war

Also transported home was a cold ration of reality to shake a struggling Defence Materiel Organisation (DMO) by the shoulders. The soldiers weren't the only ones on a war footing. Since operational tempo had begun to build through the 1990s, the supply chain had come under increasing pressure.

The old system of buying individual components and trying to make them fit had to change. Gone were the days when one bog-standard rifle was obliged to suit all.

In 2000, procurement responsibility was removed from the service chiefs and handed to the DMO (a new quasi-independent entity), which was meant to apply a more businesslike approach to defence support.

Through the subsequent decade, politicians began to feel the heat. As more and more Australian soldiers deployed abroad, parents and loved ones collecting news of inadequate equipment banged off letters to their local members.

A modernisation program to better equip the soldier, Land 125, was implemented and restructured in 2004 to provide 'realistic increments of integration over time using an evolutionary acquisition concept'.³²

There was a way to go, and setbacks were to come, but it was a start.

Land Engineering Assistant Secretary Shane Aitken told me:

I think a lot of the improvement in the last 15 years has come through the need to service a customer who is actually at war. I joined the organisation in 1983. After Vietnam had finished. There was no money. There was no need. We were servicing a training Army. I could count on one hand the number of successful projects we delivered in the early days of my career. When you got to Timor and then Iraq and Afghanistan and you were equipping a fighting soldier, it really shook the organisation.

Thales

Soon after its part in the joint acquisition of ADI, the French consortium Thomson CSF was renamed Thales. After 2001, Thales, a growing multinational munitions supplier, applied a business focus to network-centric warfare and force interoperability, which became a massive growth area as Western nations united in confronting an amorphous enemy.

In October 2006, Thales increased its half-share in ADI to 100% ownership. So, an Austrian rifle transmogrified to an Austeyr would now be made by a French company named after a Greek philosopher.

Thales Australia, which manufactured the ADF's much-admired Bushmaster protected mobility vehicle (PMV) at its Bendigo plant, employed 3,500 people across the nation. In 2006, just 120 of them worked at the Lithgow Small Arms Factory, which now acquired a new trading name: Lithgow Arms.

The uncertainty that had afflicted generations of workers hovered, a ghost among the machines. There was nothing in the order books. The factory was down to upgrading, servicing and storing weapons. And now the takeover by the world's ninth largest defence company, with its head office in Paris, sent more shivers through the place.

Wayne Gurney, who had joined when 1,360 workers walked the floors, observed the redundancy process: 'People got a tap on the shoulder through the 1980s and 1990s. We ended up being left for the most part with the people who wanted to be there.'

Manufacturing operation manager Bruce Hutton recalls the change-management struggle: 'Workers were wedded to an old style of doing things. Technology races and a change of guard was needed.'

Salvatore Spitaleri, a senior specialist engineer with Defence who had come to see a slothful work culture as particular to the Lithgow Small Arms Factory, was encouraged by the change: 'Thales brought their sophisticated processes. We saw that, post-Thales, discipline at Lithgow greatly improved.'

Len Ashworth, editor of the *Lithgow Mercury*, who had reported continuously on the roller-coaster fortunes of the factory, came to see it as a positive for the town: 'Most of the sackings happened under ADI. Even though modern production doesn't need as much workers—since Thales, they actually started putting people on.'

Thales Australia saw opportunity and attuned its business plan closely to the materiel challenges ahead. Renewed instability led Australian forces back to Timor-Leste in 2006. The Solomon Islands deployment was ongoing. Australian forces were still in Iraq, and demand on resources in Afghanistan steadily increased.

Afghanistan: the mentoring phase

In Uruzgan Province, the inkblot strategy of gradually expanding trust and confidence in a new democratic government meant getting out further into Taliban-contested badlands.

More active patrolling increased the risk to Australian soldiers, particularly from IEDs, as well as increasing the likelihood of small-arms engagements.

In 2008, while reconstruction work continued, mentoring became an additional responsibility, so Australians patrolled more often with an Afghan partner force, mostly from the newly raised Afghan National Army. At first, the Afghans carried the same assault rifle as their adversary, the AK47. In time, they would be rearmed with reconditioned US M16-A2s, the very weapon the Austeyr faced off against in the 1980s. Drawn from old US inventory, it wasn't popular with the Afghans.

The benefits were uniformity of 5.56 mm ammunition resupply and a less confusing soundscape on the battlefield. It was generally easier to hear rather than see the enemy, so situational awareness of your own location in relation to allies and the enemy was mightily assisted by the distinctive sounds of various weapons (more on this below).

The CO, Lieutenant Colonel Shane Gabriel, emphasised active patrolling when Mentoring and Reconstruction Task Force (MRTF) One arrived in 2008, so his soldiers spent most of their deployment 'outside the wire'. While getting up close and personal with the enemy had been more the remit of special forces, now conventional forces were engaged in more and more firefights, with the Austeyr lifted to the shoulder.

An early example of the weapon engaged in a desperate action came in January 2009. Patrolling out from Patrol Base Buman in the hostile Kakarak area, Lieutenant Ben Gooley (who is now a major) and Sergeant John 'Matt' Lines (now a regimental sergeant major) were the only two Australian members of a 25-strong patrol sent to cordon off and search a compound of interest. They approached, unaware that a *shura* (meeting) of Taliban commanders with a large protection force was taking place.

The ambush was triggered when the patrol, advancing along a narrow road, was parted by an RPG. Gooley heard a loud crack, saw a white flash and was 'put down on my arse'.

The patrol came under attack from both sides of the road. Two Afghan soldiers were wounded while the rest clung to the earth, 'digging in with their eyelids' and not returning fire.

Gooley and Lines were about 25 metres apart, and Lines was forward around a small bend, which meant they couldn't see one another: 'I saw the enemy. They were only 100 metres away. When they pushed up on the left flank I had good sights on the ones popping up and down, but less so from the ones in the buildings who stayed hidden.'



Main entrance to the Lithgow Small Arms Factory in 1962 celebrating 50 years of the factory. Image courtesy ThalesGroup Australia.



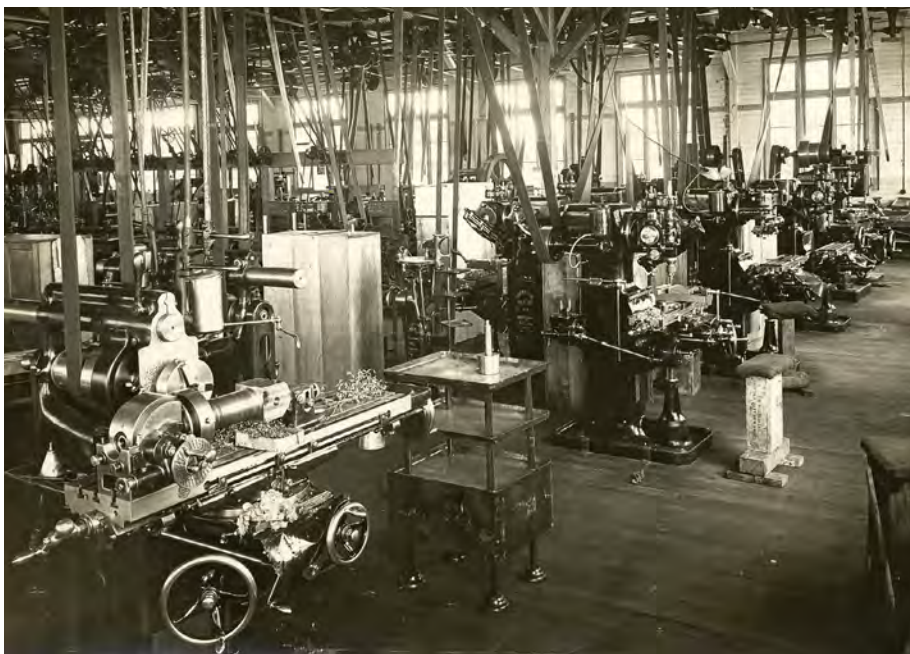
Building 52, the main office and manufacturing building in Lithgow today. Image courtesy ThalesGroup Australia.



Factory assembly line in the 1960s. Image courtesy ThalesGroup Australia.



Thales Australia employee inspecting the barrel of an EF88. Image courtesy ThalesGroup Australia.



The small arms factory toolroom in 1918. Image courtesy ThalesGroup Australia.



New Okuma LT2000EX mill turn lathe for EF88 bolt production.
Image courtesy ThalesGroup Australia.



Able Seaman Don Mason is assessed on the strip and assembly of an F88 Steyr by Leading Seaman Boatswain's Mate Brett Howard, as part of trade testing being conducted onboard HMAS *Tobruk*. Photo: Australian Department of Defence, [online](#).



Boatswain's mates onboard HMAS *Success* conduct continuous training of the F88 Steyr from the flight deck. Photo: Australian Department of Defence, [online](#).



Lessons in firing an F88 Steyr by infantry soldiers from the 8th/9th Battalion of the Royal Australian Regiment, at the Weapons Training Simulation System, Queensland, 2013. Photo: Australian Department of Defence, [online](#).



The EF88 Austeyr rifle with Specter DR sight, image intensifying sight, forward grip (with bipod), visual illuminating device, and laser-aiming illumination device (PEQ-16) entered service in 2016. Photo: Australian Department of Defence, [online](#).



Private Chris Gagliardi of the Mentoring and Reconstruction Task Force patrols the streets of Tarin Kowt, Afghanistan. Photo: Australian Department of Defence, [online](#).



An Australian soldier in Iraq holds an F88 Steyr assault rifle fitted with an assortment of equipment, including the new laser attention gaining device. Below that is a night aiming device, and to the rear is an optical sight. Beneath the barrel of the weapon is a grenade launcher attachment. Photo: Australian Department of Defence, [online](#).

Lines carried an Austeyr GLA with an M203PI attachment. The enemy pushing up on the left were met with well-placed strikes of 40 mm grenades. ‘When I saw them peeking and the flash points along the *quala* [compound], I put a grenade into the wall.’ For Taliban approaching on the half right, the sergeant was able to take aimed rifle shots at riflemen on top of the *qualas*.

Gooley, to the rear, was mightily relieved when he heard his sergeant’s weapon open up. The ‘whoomph’ of 40 mm grenades punctuated the rattle of enemy AK47s and PKMs and the hiss and roar of more incoming RPGs. Gooley could see ‘muzzle flashes in all the windows of the *qualas*, like a Christmas tree’.

He also opened up with his Austeyr. An SA1, equipped with a six-times magnification ACOG (advanced combat optical gunsight) gave him a clear sight picture:

I shot at three to four guys and definitely saw them fall over. You can’t always tell whether it is a kill. It isn’t like in the movies when they throw their arms in the air. They relax and there is this definite slump.

But Gooley thought Lines’s Austeyr GLA was the ‘battle winner’ as the infantry sergeant popped up, took aim and lobbed 40 mm grenades at Taliban advancing on two flanks: ‘It stopped them closing up.’

The fighting had kicked off just before midday. When they were able to withdraw two hours later, the Australians were exhausted. As well as draining all their water, Gooley had used five and a half of the 10 magazines he carried. Lines fired the same amount of ammunition as well as 10 of 11 40 mm grenades (he’d kept one for a ‘last stand’). An estimated 10 to 12 enemy were killed. Matt Lines would later be awarded the Medal for Gallantry.

In the test that really matters, despite being outnumbered and outgunned, the Austeyr, with its notably improved modularity, had triumphed.

Lines told me he ‘always found it to be a good weapon, robust and reliable. I never had any drama with it.’

In the same area three months later, MRTF1 lost Corporal Mathew Hopkins in another gunfight. Hopkins was struck by a 7.62 mm round, and was the first member of Australian conventional forces on the mission to be killed by small arms fire.³³

Back in Australia at the time, there was some reporting of weapon failures. Documents uncovered by Channel 7 claimed that ‘Steyr rifles used by Australian Defence Force (ADF) personnel have had persistent problems with locking, jamming, misfiring and faulty springs.’³⁴

In response, the Army said of its 70,000 Austeyrs, ‘faults were minor and only affected a relatively small number of weapons.’³⁵ As with the earlier UD problem in Timor,

stoppages in the Austeyr were considered more likely to be the fault of the operator rather than the weapon.

Like many experienced soldiers, Matt Lines prioritised weapons maintenance:

Our battle practice was 100%. The weapon had to be clean and mint. We would use the buddy system ahead of an operation to inspect the weapon and make sure it was in the best possible shape. And after an op, every single time we would sit together at a table and all clean the weapons system together. Your rifle is your lifeline, so it had to be done perfectly. Because if you have to move quickly, you have to know it's reliable.

While some soldiers complained that the Austeyr's plastic magazine was prone to cracking and that the gas piston system was harder to clean in the field, records from operational use showed no evidence of catastrophic failure.

It was true, however, that complaints about gear not standing up to the rigours of deployment or proving unsuited to the operating environment were filtering back. Equipment was being purchased in bulk with that one-size-fits-all approach, meaning that what had worked in Timor was expected to work in the Middle East.

The biggest problem was soldiers being overloaded and combat load carriage equipment failing. The soldier at the centre of the integrated soldier system was in danger of becoming an afterthought.

But, at this stage, the Austeyr was off the hook. A lessons report for the period commented:

The F88 fitted with the ACOG sight was extremely effective with the soldiers able to conduct reflex engagements at close range utilising the sight's 'red-dot' arrow and accurate first round engagements out to 600 metres using the sight range [graticules]. The GLA fitted to the F88 was reliable and was utilised effectively in every engagement.

The F88 SA2

While grumbles about reliability problems with the Australian individual weapon were then found to be unfair, that wasn't the case when MRTF2 came into theatre in May 2009.

Twenty years after the introduction into service of the F88, and 35 years since its original concept, the path was cleared for a midlife upgrade. In November 2008, the *Army* newspaper would report that 'The Steyr family of weapons is set to remain the individual weapon for the Army out to 2020—and a series of improvements are underway.'³⁶

In October 2008, Thales Australia had been contracted to conduct a ‘factory thorough rebuild’ of Austeyr variants over the next five years at an estimated cost of \$84 million. Warwick Spencer from Thales saw the earlier model ‘losing out on functionality compared to the M4, with the new model, the next evolution, predominantly around providing the tailorability required as we went into Iraq and Afghanistan.’

The F88 SA2, introduced as MRTF2 deployed, had greater modularity, a longer upper rail and a side bracket to fit a torch or laser night aiming device. It weighed in a touch heavier at 4.8 kilograms, loaded.

The understated and monotone hue was now gone. The two-tone F88 SA2 had a dark khaki undercarriage and a light brown upper to match the desert uniform.

Program Manager, Small Arms, Lieutenant Colonel Paul Nathan remembers the colour selection process:

We did that work with the then DSTO [Defence Science and Technology Organisation], and they have got all the smarts about what’s the best colour for the likely threat environments. They came up with a colour scheme that was ideally suited to all these different environments and matching uniforms and everything. But one of the original colours was a pinky colour. I understand the logic for it, but my Director General at the time said when DSTO briefed him, ‘I acknowledge that advice. We’re not having pink on our weapon’, so they picked colours close to that, but not the ideal colour.

Lieutenant Andrew Hastie from 2 Cavalry was issued with an Austeyr carbine. The shorter 407 mm barrel assisted manoeuvre in the tighter confines of armoured vehicles. On his first deployment, Hastie recalls ‘being worried more about IEDs’, but there were also problems with the Austeyr:

We would go to the range and there was something wrong with the plastic rubbing against the bolt, which wouldn’t return all the way. I remember having no faith in the F88 and having to doubly make sure my pistol was working.

The RODUMs flooded back to Australia, causing alarm and consternation. Some 58% of issued SA2s were found to demonstrate one or more faults. Lieutenant Colonel Paul Nathan told me:

Some of their manufacturing processes and quality control had changed. An example was in the butt stocks. They were being manufactured by a company in New Zealand. They would make the butt stock in two halves and they would slightly warp as they were pushed together. This affected the geometry of the butt.³⁷ So, we had cracking butts, problems with misalignment with the face of the bolt, which could mean the weapon couldn’t chamber a round.

There were also problems with firing pins and trigger pressure. Soldiers looking for a quick fix had taken to loading incomplete magazines.

Chief of Army Lieutenant General Ken Gillespie issued a recall notice. He confronted ‘a crisis of confidence’ with not only the 5.56 mm weapon but body armour, boots, pouches, radios and more, adding, ‘The supply chain system was built on old concepts that had to change.’ MRTF2 was relieved of its SA2s and re-equipped with older, more reliable SA1s.

The recall also affected the subsequent rotation of Mentoring Task Force One into the theatre. Commanding Officer Lieutenant Colonel Jason Blain recalled:

Fortunately, we were able to get everyone to zero the replacement weapons in AMAB [Al Minhad Air Base] or Australia. I recall telling the task force on parade that we can trust the Steyr and our non-SA2 rifles would do the job just fine, and indeed they did on deployment. The soldiers weren’t overly fussed, as I recall.

The first problem with the F88 SA2 upgrade, according to Warwick Spencer, was that it set out ‘to achieve something that the original Steyr AUG platform wasn’t originally designed to do’. His ADF counterpart, Lieutenant Colonel Paul Nathan, accepted that Thales wasn’t solely to blame:

Some of the problems were production faults that Thales came to accept; some of them were changes that linked back to Commonwealth-initiated designs, and when improvements to the weapon came to fruition maybe some of those changes weren’t the best.

The Army’s Land Engineering Agency (formerly the Engineering Development Establishment or, as the wags had it, ‘Everyday Easy’) and Thales collaborated on SA2 design improvements. The engineers drew together, hunched over the same problem. The main feedback from the front was of the rifle failing to fully lock with a full magazine after manual cocking.

In subsequent months, 700,000 rounds were poured down range at Lithgow, while across at the factory tolerances were finessed. More thousands were fired at Maribyrnong by the Land Engineering Agency. The testing and evaluation process set out to increase the ‘mean rounds before stoppage’ requirement.

Adjustments were made to the butt, gunlock, spring lock, hammer mechanism and ejection port cover. At the completion of testing and evaluation of four randomly selected weapons, each firing 6,000 rounds, there had been two stoppages.³⁸

Paul Nathan told me:

So, we addressed all of those issues with Thales and that led to a greater part of 12 months of effort. We also did a body of work with Thales where we were optimising the weapon and the ammunition, and they made adjustments to some of their ammunition as well. Thales adjusted a number of their processes, and we got to the point by the end of 2010 the weapon was reintroduced back on operations.

Regrettably, while the work improved the accuracy and reliability of the Austeyr, confidence had taken another mighty hit. In Afghanistan, incidents of troops in contact (TICs) were scaling up. This was largely because special forces were extending areas of operation beyond Uruzgan into even more hostile precincts. SASR, Commandos and Incident Response Regiment engineers were much admired by conventional forces. At Tarin Kowt, you could see them coming and going from their exclusive compound at Camp Russell, looking like Jedi Knights. And, of course, special forces were not only allowed more freedom to customise their gear, but also carried the M4, so an understandable but not necessarily fair presumption that it had to be a better weapon took hold. Adding to that, the genuine issues that emerged with the F88 SA2 meant another setback for the image of the awkward, heavier and now motley coloured bullpup.

The Christmas tree effect

It seems fair to point out that complaints about equipment weren't prominent among expressed grievances when I visited soldiers in theatre (in 2007, 2010 and 2011). But for all that, it was clear something wasn't working. The issue was less a single item of equipment as the ensemble. The 'Christmas tree effect', as it was known, revealed kit being continually loaded on, with not enough consideration to the stress on the soldier.

At Patrol Base Wali in 2010, I watched a digger at the end of a long patrol, struggling through 40°C heat hauling a heavy electronics countermeasure machine, waited until he reached the gate before collapsing.

As Deputy Commander Joint Task Force 633 Afghanistan in 2009, Brigadier John Caligari had seen the problem for himself. Later, as a major general and Head of Modernisation and Strategic Plans—Army, he sought a fix: 'We were putting so much weight on the soldier. It was distracting from his protection because he couldn't move.'

Lieutenant Colonel Ben McLennan, who took a lead in developing the ADF's Soldier Combat Systems Program, thought the burden was also affecting 'cognitive ability—the soldier's ability to think as well as fight'.

Also apparent was a lack of trust in the DMO. It's common (and not always fair) for soldiers to believe they're being cheated and to presume their equipment was made by the lowest bidder. Beyond dealing with genuine equipment issues, Ben McLennan encountered 'a natural scepticism towards what the Army provides its people'.

The challenge to the DMO wasn't from the soldiers alone. Stories of dodgy procurements, favouritism and conflict of interest proliferated in media reporting. And within senior levels of the ADF there was concern that the stronger commercial focus of the DMO had come at a cost to the benefit of military experience.

As one senior officer explained, 'They would buy 40 years of cutlery not because it was needed, but it was a good deal.' Purchases tended to be static, with big orders made less often, when smaller, more frequent and flexible orders were more appropriate.

Major General John Caligari argued for a refocus on spending priority, fast-tracking acquisition to the front line. Products such as pouches that soldiers were personally purchasing, would, after quality control was assured, be issued by Defence: 'Half the problem were our own processes. The old system meant working through six months' worth of committees before anything was delivered.'

Diggerworks

After a gruelling nine and a half hour Senate Estimates hearing in 2010, which examined the agility of procurement and supply-chain problems, a new entity, Diggerworks, was created.³⁹ Then Chief of Army Ken Gillespie credits John Caligari with the initiative, which he says was 'all about listening to the soldiers'.

So, improved responsiveness behind some desks in Canberra and Melbourne translated to greater agility in the field. Some 17,000 centurion-like MCBAS body armour units were replaced with the lighter and more effective TBAS (tiered body armour system), which was a much better fit with the 'soldier system' and the Austeyr. With the MCBAS, the bulky upper pads made it harder to get the rifle butt into the shoulder. Add to that an ill-fitting helmet slipping over the eyes and the sight picture could be lost at a critical moment.

The TBAS was less restrictive, allowing soldiers to stay lower and more quickly acquire targets. An enduring 'length of pull' problem of the one-size-fits-all Austeyr was eased. A plan to supply different sized butt plates for different sized soldiers was dropped now that the TBAS advanced flexibility.

New magazine pouches, which were easier to access, further improved fluidity of movement. According to Lieutenant Colonel Ben McLennan, 'The way we now carry the rifle is different because of body armour.' Working with the Modernisation

Branch on soldier combat systems, McLennan had watched what he saw as the ‘very encouraging professionalisation of capability development in Army—and broader Defence’.

In June 2011, Diggerworks was formalised, in partnership with the Army, DMO and DSTO; the initiative was part of a reset that would eventually see development and procurement move back to Defence. Its inaugural director came straight from operations. Colonel Jason Blain oversaw the transformation ‘to a fantastic methodology that you wish could be found in peacetime as well as wartime. When you are at war that burning platform is there to get things fixed quickly.’

Afghanistan: the withdrawal phase

In 2011, Australia announced the beginning of a transition process—a phased withdrawal that would have most of the troops home by the end of 2013.

When the Australian arithmetic for Afghanistan was done, 3,500 TICs were counted, the majority involving special forces.

Conventional forces, with some frustration about being tethered to a protective role, counted a not inconsiderable 500 TICs. The Austeyr, compared to the special forces’ M4, wasn’t so often engaged in protracted gunfights.

But at Derapet in 2010, when 35 Australian soldiers from Delta Company, 6RAR, and 20 Afghan National Army soldiers were ambushed by approximately 100 Taliban, it performed well. For the most part, the personal weapon laid down covering fire in support of heavier weapons. As was constantly demonstrated, range was critical, the underslung grenade launcher proving effective at distances out to 350 metres.

The more common TICs were sporadic, involving fleeting exchanges of fire. Weeks earlier, a different patrol from Alpha Company, 6RAR, came under attack. With no clear sight picture, they retaliated, and the Austeyr was swift to bring on target and lay down concentrated fire. When the dust settled, the Australians advanced to find spent cartridges, a blood trail and a young Afghan male lying dead from a 5.56 mm gunshot wound to the head.

The officer commanding Combat Team Alpha, Major Jason Groat, says the Austeyr performed well. In six months, he remembers one ND involving the weapon: ‘It was by an experienced operator and the result of extreme fatigue after an exhausting patrol. He was shattered.’

One combat team commander with experience and objectivity presented this overview:

In an OK Corral situation, in close engagements the M4 is going to win, but it isn't so well suited to 600 metres targetry. The Steyr isn't so fitted to human movement, but it's more reliable and more accurate at longer distances, so for me is the better general-purpose weapon.

But the most animated argument about the merits and suitability of weaponry during Australia's longest war was less Austeyr versus Colt M4 than 5.56 mm versus 7.62 mm.

An SASR sniper told me that, after multiple deployments, 'Of all the blokes I killed, the only ones to drop straight away from a 5.56 were the ones hit in the head. Otherwise they would keep moving.'

In Helmand Province in 2011, a lance corporal and two fellow Commandos equipped with M4s fired on an insurgent to see him go down, and then to some astonishment approach the Australians to ask for help. 'He realised he was in a bad way. When we provided combat first aid, we were amazed to discover he had been shot nine times by 5.56 rounds and he was still able to keep going.'

Captain Kris Reilly from Delta Company, 2 Commando, recalls a DSTO scientist visiting and being made aware of a perceived undermatch: 'He straight away allocated a budget to purchase 7.62 mm HK-417s [as a secondary weapon], which we got quite quickly, as did every rotation from then on.'⁴⁰

An off-the-shelf replacement?

At the time of the drawdown from Afghanistan, attention had already turned to a next-generation assault rifle.

An obvious answer to the question of what the new assault rifle should be was to go to the market—apply some Diggerworks initiative and buy something fresh off the shelf. There were plenty from both special and conventional forces barracking for an obvious choice.

The Colt M4 and all its AR platform variants had become a clear favourite with many Australian allies. For the past decade, our Anzac partner, New Zealand, had expressed rising disenchantment with the Steyr. A 2011 New Zealand Ministry of Defence report found it 'ineffective at ranges greater than 200 metres'.⁴¹

New Zealand would embark on its own small arms replacement program, eventually purchasing the MARS-L, a US-manufactured Lewis Machine and Tools M4 variant that would have a life of type of 15 years. Complete with sights and a training package, 9,000 rifles were acquired for NZ\$59 million,⁴² or about NZ\$6,500 per unit.

The current Austeyr sells to the ADF for \$2,700, plus \$1,700 for the grip and day sight. The maximum mission system cost is approximately \$27,000, taking in the rifle, grip, sights and the combination of thermal imager, image intensifier and clip-on laser aiming device.

A common refrain through the ranks in Australia was, ‘Why not just get the M4? It works and it’s a lot cheaper.’⁴³

But, unfortunately, it’s not that simple. Given that a weapon system can’t be replaced every year, it needed to have a shelf life that would at least meet medium-term requirements. And, given that since Federation, governments of all persuasion required that the rifle be Australian-made, a brand new weapon would add significant manufacturing costs.

‘To introduce a new weapons system is always more expensive than it is to upgrade an existing one’, explains Darren Christopher, a reservist warrant officer as well as the ADF’s Senior Engineer, Lethality Program:

In some way, shape and form, because you have to buy more spares; more gauges, more tools and the rest. All the options that were proffered up as being potential solutions, all had shorter barrels so for the most part were less lethal. And, secondly, they were all pretty much firing the same sort of bullet.

Another consideration was that in its home country, while the M4 was widely in use, it also had its critics, a common complaint being that a weapon derived in the 1950s had to be nearing its use-by date. As far back as 2003, the US began a search to replace the M4, with no clear successor in sight.

Another consideration was the maintenance of the familiar, recognisable, visual signature of the bullpup weapon and the retention of muscle memory in associated drills.

All this added up to Defence and Thales engineers and project managers continuing to see a winner in the Austeyr. And to Warwick Spencer from Thales, the new weapon wouldn’t be yet another iteration of the original Steyr AUG:

We were no longer building to print. Thales Australia was now the original equipment manufacturer. This would be the first time it had been done in Australia [with the principal service rifle]. Nowhere else in the world was there such a patent. The Steyr people had changed their involvement. There were corporate changes over the years, where we had worked closely and moved apart, and the license agreements had now gone through their time of life.

EF88: the development phase

At Thales, the testing experience of upgrading the F88 SA2 helped give shape and confidence for a new evolution, which would represent a near complete redesign.

In December 2011, a contract for Project Land 125 3C Enhanced F88 was signed with Thales Australia. The ADF's project director was Major Simon Johns:

Thales Australia is focussing on meeting a demanding user requirements [brief] by addressing the human factors and design elements associated with the weapon through a reduction in weight and improvements to its balance.⁴⁴

Thales leaned forward. Warwick Spencer reflected:

For the Land 125 program we took an interesting tack—we went to the Commonwealth and asked for the requirements for the weapon. We had to separate people from their views of what a weapon should look like and get down to what you want the weapon system to do in the field. What do you want its reliability to be? What do you want its probability of hit to be? What do you want its maintenance intervals to be? Go down to the core.

Thales also went to the soldiers to consider wants as well as needs:

We looked at perceptions that weren't in the requirements. Is it necessary to have those in the system to achieve the primary goal? No. But if you have it, is the end user going to be happier? Yes. So we tried to evolve some of those into the space.

The ADF's Tim Donegan became the project manager:

One of the challenges was reputational. There's argument between M4 and the Steyr. One of the goals was to reduce the amount of weight or the mass of the system, make it more ergonomic, shift the centre of gravity rearward, give greater mounting option for the ancillaries, remembering we were creating a system as opposed to an individual weapon.

There were plenty of changes, the most notable seeking to match some of the preferred features of the M4. A bolt release catch was relocated to facilitate a faster magazine change and assist the shooter to maintain eyes on the target.

Picatinny rails were added, including a small one under the barrel to accommodate a grip or bipod or grenade launcher. A right-hand rail could mount a laser, out of the way of the sling. The top rail was lengthened to take a grenade launcher sight, an improved day sight and in-line optics such as image intensifiers, as well as thermal imagers. The day sight could now be permanently mounted. When night vision was

needed, a device clipped in front, removing the need to replace and re-zero the weapon. A double-action, side-opening grenade launcher was enhanced to take a wider range of projectiles as well as modified, a trigger extension now reaching inside the trigger guard for speed of access. Unlike the SA2 GLA, it didn't need an armourer to go through the laborious process of removing the flash suppressor and bayonet lug and then heating the barrel to fit it. An operator could now easily remove and attach it.

There were plenty of other changes that assisted accuracy, robustness and reliability. A lighter, fluted barrel was now fixed, the inspection drill requiring removal having by then been binned.⁴⁵ A new folding cocking handle reduced the likelihood of breakage. The hammer pack was modified to improve reliability and facilitate silent cocking. Overall, the changes improved modularity and ergonomics by shifting the centre of gravity, while managing to bring the weight down by almost half a kilogram.⁴⁶

In December 2012, the DSTO Human Factors Team trialled the EF88 with 10 soldiers destined for East Timor. According to Major Simon Johns, 'They were encouraged to use the weapon in a manner natural to them and to provide their feedback on what they thought of it.'⁴⁷ Following the trial, Thales made further modifications as user testing continued.

Another, less conspicuous, change was also critical, according to Thales' then Director of Australian Munitions, Warwick Spencer. After more work at the Mulwala plant, new ammunition, synergised with the EF88 and designated 'F1A1' was introduced: 'I think the integration of the weapons system, the propellant, the ammunition and the weapon, is an absolute key. We had come to an understanding of how you can have a better net performance by integrating all of that.'

The other synergy to make a difference, according to Spencer, who had pulled the design team together, was less about parts and more about people:

The key to success is integrating the major stakeholders. You make sure the manufacturer, the end user and the engineering community within the Commonwealth have an opportunity to regularly meet and trust each other. I've seen that go through cycles. I've seen it when we have been at arm's length and I've seen it when we've been in the tent. We wouldn't have been able to do this if we didn't work as a three-way party inside the tent.

But, on one matter, the most visible at that, there was no common agreement.

Any colour, as long as it's black

For the design phase, the Austeyr EF88 was again two-tone, this time with a coyote tan upper. User requirements had sensibly stipulated that the weapon system colour scheme should align with the soldier's uniform. With the desert uniform no longer in use, the experts at DSTO had found a colour match that was a good fit for the new DPCU (disruptive pattern camouflage uniform) and AMCU (Australian multicam camouflage uniform) now in use. The dark khaki components at the bottom would now be complemented with the tan upper.

And then, after all that expert advice, a lieutenant general, the Chief of Army, and a major general, the Head of Land Systems, made a captain's call that the weapon be black. Traditionalists such as former small arms instructor Leon Helmrich were stunned: 'The only thing that's black in the bush is a burnt stump.'

Since the Vietnam years, when it was found that black rifles stood out in the jungle, and in subsequent years when boots were changed from black to brown, a generation of soldiers was conditioned to the softening of their collective outline.

A former Program Manager, Small Arms, Paul Nathan, told me:

I think it's a nonsense. Here we have this wonderful camouflaged uniform and you have operators holding this black thing. It's exactly why we did that with the SA2, we identified colours that would help it blend into the soldiers' uniform and the environment they're operating in.

For Senior Engineering Manager Darren Christopher, the decision meant additional months of unexpected work: 'We then had to go through a cycle to make sure that the polymer colour change hadn't induced different softness or hardness or a life-cycle issue. It was difficult, but the customer got what he asked for.'

The decision to go black was never explained, inviting speculation that what occurred was a nod to all the illogic that permeates gun debate.

Black is severe, but also sexy. Special forces counterterrorism operatives, bedecked in black, carry black weapons. For urban operations, it's a less problematic colour choice.

In popular video games, such as *Call of Duty: Black Ops*, and movies, the cool weapons tend to be black and, for that matter, often M4s. The last time anyone remembers a funny-looking Steyr appearing in a Hollywood movie was in *Die Hard* in 1988 (the year the F88 was introduced), and that was in the hands of an eccentric European bad guy.

Soldiers, particularly the younger ones, are as much creatures of fashion as anyone, so to give them a weapon with a cool, industrial design and sex appeal was following a useful rationale—even if the result was a victory of style over substance.

Graham Evenden, Thales' Director of Integrated Weapons and Sensors, thought it a smart move. He recognised a need for an urgent reputational reset:

When the British upgraded the SA80 they made a much better weapon, but it didn't look appreciably different, so the bad reputation hung on. As the Steyr evolved it overcame flaws, but when soldiers got it, it looked the same, so a lack of confidence survived. There was a communication failure. Black made it more visibly different and brought about a mental shift.

The designers: CASG

Malcolm McKeith is a former Navy man who now wears a business suit. On the walls of his office are awards for excellence in project management. Down the hall in Victoria Barracks, Melbourne, is the War Cabinet room where critical decisions were taken in defence of Australia in 1942.

Along the creaking floors and corridors, which also house Diggerworks, important decisions on the defence of Australia proceed, but more via navigation. As Malcolm McKeith explains, 'We're the mediators between customer and supplier. We don't actually make anything ourselves.' As Director of Armament Systems, he has a role in tightening the circle between designer, manufacturer and user:

We lean heavily on building relationships and joining them together. Now, on the engineering side we're lucky we have engineers who know everything about weapons. On the project management side, it's a lot more soft, touchy-feely.

In 2015, the DMO, beset with problems, was disbanded. The First Principles Review found that:

the processes and the current capability development life cycle are cumbersome, excessively bureaucratic and inefficient. The organisation is more focused on process adherence than high quality capability outcomes.⁴⁸

Their work was often thankless. They were hapless intermediaries between an overdemanding client and an underperforming contractor being readily blamed for bad results that may have had nothing to do with it.

Shane Aitken became assistant secretary of the newly established CASG:

You have got a desk officer in Canberra who says this is what we want. We try to turn that into a technical specification so it can go to market. One of the previous heads of Land Systems looked at a request one day and said, 'They want the

bloody hover tank.’ So, the first step is to get a realistic requirement. We get all these RODUMs. If you want to have a funny day, look at them. So, there are all sorts of good-ideas fairies out there. With a weapon, a boot or a uniform, you open yourself up to 50,000 opinions.

Even more beneficial than the structural adjustment were organic changes begun on the battlefield and carried through with the development of the EF88. Thales did the initial evaluation, CASG followed up with integration testing, Diggerworks checked that the system aligned, and Defence Science and Technology (as it became in 2015) conducted user trials with soldiers in the field.

Darren Christopher told me:

We see our job as trying to prevent bad equipment getting to the soldier, so that the likelihood of them being killed or injured on the battlefield is reduced. I know sometimes it’s hard to see that from the soldiers’ perspective. They look at CASG and look at our role and wonder if we’re interfering. But we have no interest in that. We’re interested in making sure that the risks are understood, and the equipment does what we ask it to do.

Paul Nathan said:

We have this equipment in service for a long time. The F88 has been with us from the 1980s and the EF88 will be in use for another 10 to 15 years. It’s the principal fighting tool of the soldier, so we have got to get it right.

The manufacturer: Thales—Lithgow Arms

The factory is like a film set. A huddle of wartime housing still stands beyond the front gate. But along Lone Pine Avenue and Amiens Street, Lithgow, the majority of residents no longer answer the factory’s siren call.

The local hospital no longer treats a bleeding succession of locals, mostly young boys, who over the decades had managed to purloin live ammunition, detonators and the like. Beyond the manufacture of small arms, Lithgow also had a rail and mining industry, which additionally furnished all manner of mayhem.

Thales has now revived sporting rifle production, and Lithgow Arms produces up to 60 rifles a day for the civilian market. When they first debuted at a Melbourne trade show, Graham Evenden was pleased to discover that a strong reputation from generations past wasn’t forgotten: ‘We had a tiny booth, which soon attracted a 75-metre queue. There’s a lot of passion for an Australian-made product with a heritage dating back to 1912.’

The factory museum is the best place to get a sense of what it was like when 6,000 workers poured through the gate. A remarkable small arms collection, which includes the very first Australian-produced Steyr, draws a steady line of tourists.

Alongside, behind a security fence, are 57 buildings, of which only 12 are used by a workforce of 195. The worn outer shell is deceptive of the bustling 21st century within. On floors where workers once leant over lathes and stopped for ‘smoko’, hulking machines with no discernible interest in nicotine, caffeine or chit-chat soldier on, shoulder to shoulder.

Manager Bruce Hutton shows me the \$7 million Austrian barrel-swaging machine, ‘the only one of its kind in the Southern Hemisphere’. He’s a fan of the ‘lean manufacturing’ process, imported from Toyota, Japan. Lean (‘a philosophy rather than a set of tools’) has reduced the cost of manufacture by \$3.5 million. The 40 EF88s turned out a day now take 5.9 hours to build, compared to 11 hours a decade ago.

Bruce Gurney and I walk the worn steps to the Type 1 Armoury, ‘the only one of its kind in Australia’. We run into some of the older workers, who miss the certainty of the old days.

Across at the shooting range, kangaroos graze. They’re oddly unafraid of the men with guns, who have become familiar. Applied design engineer Richard Basladynski, a former corporal and combat engineer, was part of the team testing the EF88: ‘We have the ability to affect a soldier on the ground. The reliability of the weapon is critical. A soldier doesn’t want to come around a corner, face an enemy and hear a click.’

In July 2015, Thales Australia won a \$100 million contract to build 30,000 of the new EF88 assault rifles it had helped to develop.

Thales—Australian Munitions, Mulwala

The low-key nature of the factory on the fringe of a small country town belies its stature. Mulwala is better known for its poker machines than its propellant (that is, if you don’t belong to the global munitions industry). Needing access to plenty of clean water, the factory located to the banks of Lake Mulwala during World War II.

At the guardhouse, a poster states the mission: ‘Delivering a battlefield advantage’. Inside, there’s another displaying two side-by-side human targets. The one in the left, headlined, ‘Our Propellant’, shows a tight 15-round grouping, dead centre. On the right, under the heading, ‘Competitors Propellant’, an identical target has been perforated by 15 widely dispersed rounds.

The demand for high-quality, stable, single-based extruded propellant kept the plant, which was renamed Australian Munitions by Thales in 2012, in a continuous export mode for over 30 years. Its product is famous, particularly with sporting shooters, for properties that guarantee stability and reliability.

The facility also manufactures high explosives. Warwick Spencer told me:

It's a unique factory, the only one of its kind in Australia and rare around the world. It's also a unique business with a unique skill base. Explosives technology isn't taught at university. We have a small community who learn, train and evolve within the facilities. We have skill in applied research but also manufacture.

It's a major hazard facility, so there's a safety briefing before we begin our tour, with straps attached to footwear to counter static electricity. In 1996, an ADI worker was killed when there was a detonation in a mixer. Witnesses described an atomic-bomb-like blast and accompanying mushroom cloud. Warwick Spencer, who was 300 metres away, lost hearing in one ear.

Fortunately, the only rising cloud I see is of steam venting from myriad pipes that intersect laboratories, drying sheds and storage tanks. Three hundred and fifty employees keep the plant running around the clock to meet constant demand, but you see few of them. Warwick Spencer explains that, while the probability is low, the consequence is high enough to 'keep workers away from the coalface'.

He echoed a common sentiment across all three stakeholders:

The workforce regard themselves as key contributors to the defence of Australia. The work we do commercially here is to ensure we can supply the Commonwealth when they need it. They're very quality driven. I wouldn't say over the years I have seen the Commonwealth show the same understanding back to the workforce.

Thales—Australian Munitions, Benalla

The Mulwala plant operates in concert with another an hour's drive south across the Victorian border. Road transport delivers propellant manufactured at Mulwala to another facility outside Benalla for the production of ammunition.

The atmospherics are much the same: a large facility, unhurried, high-vis vests, more machines than human beings: 'We have 50 on the floor at the moment, 100 when running full eight-hour shifts.' John Hardwick and Shane Lucas show me around. Shane was one of six from the Ammunition Factory Footscray to move to Benalla in the 1980s, when the Footscray plant was closed. John arrived a little later: 'Benalla is far more efficient than Footscray. With fewer people we do the same work to equal standard.'

One member of the ADF, the quality assurance representative, is included in a workforce of around 300. Machines are fitted with cameras to speed up the inspection process: 'The camera system means one person can check when it used to take four.'

Up to 55 million rounds of various calibre bullets are produced a year. As I visit, an order for 38,000 50 mm rounds is being processed for Switzerland.

The workforce is drawn from a 100-kilometre radius. As at Mulwala, highly skilled workers tend to be recruited when they're older, perhaps starting a family and finding the prospect of rural life more appealing. For the younger workforce, Shane and John say the gap year initiative proved 'a godsend. They're highly motivated; they want to work. They often do a year and want to come back.'

One of the team leaders on a bullet line is an ex-sheep farmer from Strathbogie well used to using his hands to solve problems. Some frustration is expressed about levels of management and occupational health and safety strictures: 'There are procedures for everything. Gone are the days when if something broke you could climb in and fix it.'

While the bullets are Australian-made, as at Lithgow, key components have to be imported: 'The primer is purchased and the brass bell cups [which make the cartridges] are imported from Germany. We used to have a brass foundry in Australia, but now all the brass has to be imported.'

As I leave, there are parting words about the guns and bullets industry, which I had heard before and will hear again: 'We're unloved when they don't want it, and when they do want it, they can't get it back.'

The users: the ADF

It came as a surprise when I went out on to the range at Lavarack Barracks, Townsville, to talk to soldiers about what they thought about the EF88. Having already heard a lot along the way, I was coming to the view that, while the Australian assault rifle is not flawless, its story is essentially positive. I had come to agree with former Chief of Army Peter Leahy, who saw it 'as a good weapon with a bad reputation'.

Soldiers were lined up along a mound under shade cloth, being taken through drills by experienced instructors. So, interviews were undertaken and notes scribbled against bursts of gunfire and the smell of cordite. 'Two rounds head, two rounds chest', 'Peltors on, about to shoot', 'Assess what the fuck it is', 'Throw it around, let it help you. Use your momentum.' More bursts of gunfire, and shouts turning in my direction: 'Bolt shattering', 'Shit ejection port covers', 'Gas plugs crap', 'Magazine fucked.'

Such eloquently expressed feedback couldn't be ignored. And after all, these people are the ones who use the new EF88. A soldier tells me:

The old Steyr used to be fantastic. It used to be hard to beat. Must be a problem with the manufacturer. I have never seen so many weapons break over a short period ... It's shorter, but wide. It can be a problem in the tight cabin space of a PMV ... Things like bolts not picking up rounds, skipping over the top of rounds. Some left-hand ones the bolts have cracked ... Guys with longer arms have no way of managing the butt the way it is.

I ask what they like about it: 'The buffer system is very good. There's very little recoil. It sits quite high.'

It's hard to believe that what I'm hearing are diggers' routine gripes. The words of Major Greg Sheppard, once a senior range instructor and analyst at Army Lessons come to mind:

People have the impression that when soldiers talk about weapons, they know what they're talking about. Now, I did 40 years and one day in the Army. I spent the majority of that time trying to teach soldiers to operate weapons of all kinds. And I'm here to tell you that even our best soldiers, our special forces, are very good at doing what we teach them to do—to shoot them—but very few of them know anything at all about guns.

Some of the commentary I had just heard admittedly came from junior soldiers, but it also came from experienced instructors, who could hardly be regarded as knowing 'jack shit' about guns. Whether they're being entirely fair to the Austeyr, whether they've fallen under the spell of special forces, or whether this batch of EF88s is afflicted with teething problems are queries worthy of further exploration.

I seek out the regiment's fitter or 'gun plumber', Lance Corporal Matthew Booth, who concedes there have been problems:

There are a lot more components that appear to be breaking on them because of the plastic design. The biggest one we've had so far is the ejection port cover coming off. It's just a clip-in one. The old one would never come off, but after a bit of wear they can pop out.

But, overall, his feedback from the operators was that 'they quite like them', and from his point of view, 'I find them easier to inspect and maintain than the old SA2s.'

Warrant Officer Aaron Roberts, who joined back in 2001 and was able to watch the Austeyr's evolution, added perspective:

We have improved on it each time. It's a good weapons system. It isn't the best weapon system for combat. I know soldiers don't like it because it isn't an M4.

They see an M4 as an elite weapon system that all [special forces] use. Soldiers always want to look good and have the best bit of kit, and M4 has the best advertisement for any kind of weapon out there. And if they've got something nice and shiny everyone else wants it, because they want to be like them.

The first EF88s (the nomenclature E refers to 'enhanced', rather than the conventional 'experimental') were issued to 1RAR at Townsville in June 2015. The commanding officer was Lieutenant Colonel Jason Groat, the CO at Patrol Base Wali in Afghanistan in 2010. He took a robust approach to the introduction, stripping out all of the SA2s and taking on 600 EF88s equipped with 4x advanced combat optical gunsights. A reconnaissance platoon conducted an initial trial of the EF88, and over time the CO was, as he put it, 'sold': 'I did a marksmanship course and found I was hitting targets at 600 metres. The enhanced day sight is fantastic, world class. There was no way I would have done that with the old weapon.'

His successor at 1RAR, Lieutenant Colonel Ben McLennan, who had been a part of the Soldier Combat Systems modernisation program, is another fan. Considering this weight of top-down support, I asked him to try to reconcile the bottom-up criticism:

It's a surprise. When you introduce new equipment, whether it's boots or weapons, it must be supported by a marketing/communications plan. And an effective marketing/communications plan involves much more than a colourful poster, article, catchy jingle or an endorsement of senior officers and soldiers. You can't take for granted that soldiers and junior officers will naturally accept—or 'buy'—your equipment/product. 'Buying' your product means they'll commit their all to see past their natural scepticism, their biases, the rumours, half-truths, conjecture and nonsense and give the equipment a chance.

Fixes

As we've seen over a century, there are glitches with every new rollout. Beyond the kinks with bolts and ejection port covers there were bigger problems when it was found the wider weapon didn't fit existing vehicle brackets. Senior Engineer Darren Christopher recounted:

The EF88 weapon system was originally intended for mostly the infantry force plus some combat engineers, plus people who were doing forward observing. Special Operations Command wasn't part of the initial rollout; they were perfectly happy with their M4s and didn't want anything different. The initial buy was going to be around about between 10,000 and 15,000 weapons systems—just enough for those infantry forces. Army then changed their mind and said they were going to give it to everybody, and the weapon system was found not to fit into vehicles that were operated by clerks and medics and construction engineers and tanks and things like that.

An estimated \$5 million was required to modify vehicle brackets.

As to the colour, when Lieutenant Colonel Jason Groat received the first batch of EF88s there were directions 'not to cam it up'. But after day and night trials, photographs were taken, which showed the black standing out. From then on paint was allowed, and soldiers applied their own camouflage to break up the signature.

More fixes were to come.

Pre-combat veterans

The change that raised most doubts about the suitability of the Austeyr was less a fix to the weapon system than a change in the way it was to be used.

The battlefield encourages agility and adaptation, and upon return from Afghanistan there was keenness to retain a sense of urgency about lessons learned. With so much experience cycling out, a dynamic combat training continuum was designed to replicate battlefield scenarios. The push was for a total recalibration of the combat mindset to help shape what came to be termed the 'pre-combat veteran'.

Statistics gathered from the Middle East Area of Operations indicated that the fighting space continued to narrow, the majority of engagements occurring between 30 and 200 metres. The Afghanistan experience, in particular, generated strong arguments that the special forces had been overstretched while the infantry was underutilised.

A transfer of skills made sense, so in late 2016 an advanced combat shooting course was conducted at Majura, outside Canberra. The head of SASR's combat and firearms training program, with cogent experience of close-quarter battle, led a team tasked with training trainers to infuse new skills and drills into the battalions. The traditional 'this is the way we do things' mentality, to some disquiet, was overturned.

'Previously what we had was a range-centric approach, based on marksmanship. You lay on the mound and engaged targets at known distances', says Sergeant Mark Biviano, who would use the Majura experience to help form a new Combat Shooting Cell at the School of Infantry in Singleton:

Yes, we shoot a lot to develop fundamental skills, but then you add context, and the whole point of context is decision-making. Do I move left or right, forwards, backwards to a piece of cover? Do I engage high, low or mid from that cover; do I engage through that cover? Having completed my engagement, do I top up and move from my position?

'Context' refers to a dynamic as opposed to static experience. Trainees use non-lethal training ammunition, confronting ambiguous targets at varied distances, taking cover and changing magazines as they navigate 'range furniture' such as full-size plastic vehicles, facade walls and robot targets.

Mark Biviano told me: ‘Four to six seconds in a gunfight. That’s a long time. The thought process for a combatant to recognise an opportunity to place a full magazine on a weapons system before moving out from behind effective cover—that’s the combat mindset.’

A revision of both machinery and mindset improved the speed of magazine changes. The new bolt release catch is pressed, and the magazine falls away. And, if caught in the open, an emergency reload procedure meant the empty magazine could be left behind—a grave offence in the old days. But now there’s been a rethink: if there’s an opportunity to top up and retain your magazine, you do so. If not, let it go. As one instructor explained, ‘Look, an empty magazine is not worth your life.’

Their minds race as they constantly transition, five metres, to 75 metres, to 175 metres. All the while, as instructors watch and score, blast simulation punctuates the stutter of gunfire.

Another of the shooting instructors is Corporal Carlos Barrera:

I think the biggest quantifiable outcome to come from that’s the increase in speed and accuracy of combatants’ shooting. But one thing that isn’t so easy to quantify, that it has definitely made a massive impact to, is the combatant’s behaviour, on how he operates—his situational awareness around a battlespace, around his fellow operators in a battlespace environment. Of how he thinks, shoots, moves and communicates—and if he has to, apply first aid.

Corporal Karl Fabreschi also took what he saw at Majura back to Singleton:

In a nutshell, everything is more combat-focused. Every single drill we do, whether we’re shooting to be faster and more accurate, is far more practical because we link it back to a tactical why. Why do we do this drill in this manner? Why am I carrying my gun in this position? Why should I have my pistol holstered in this fashion? And the philosophy of teaching is far more student based.

In a short space of time, as one officer put it, ‘the training became a kind of a brand.’ At the range at Lavarack Barracks, the diggers heel and toe. Human movement is practised: a pirouette as in ballet, a sweeping motion as in golf. While some of the shooters aren’t entirely enamoured of their weapon, they do like the training.

Corporal Jamie Ogilvie said:

The difference that it has made has been huge. When you do those courses, you come out and go, ‘Wow, I have learned something, and I’m only going to get better at this.’ Now it’s almost ingrained as combat behaviour. It’s so good. We used to whinge that the ranges were boring but now they’re a lot better. Clerk corporals used to run the ranges, but now they put people in charge who treat us like adults.

After a component of the shooting continuum was introduced at the 1st Recruit Training Battalion, Kapooka, in July 2018, the response among instructors was much the same. According to the master coach, Warrant Officer Anthony Pratt, ‘We ran staff training sessions and the feedback was phenomenal. They enjoyed it. They thought it far superior to what we were doing previously. It’s definitely snowballing across the Army.’

A recognition that a newer generation will have lesser familiarity with firearms helps explain the improved teacher–student relationship: ‘We accepted the fact that, in the modern world, yelling at them on the range would only add to anxieties and fears about weapons.’

The master coach also found that the EF88 performed well: ‘By and large, the weapon being produced is far superior.’ Add that to the program, and ‘What we’re seeing is a higher rate of weapons confidence.’

Deflection

The techniques communicated via the special forces, as you would expect, were developed using their own assault rifle, the AR platform Colt M4. Beyond their already advanced skill sets, special forces operators tended to have greater familiarity with their weapons, personalising them and retaining them for longer periods.

Writing for ASPI’s *The Strategist* in 2015, a special forces firearms training expert, Warrant Officer ‘W’, identified the many reasons why he considered the Austeyr not up to the standard of the M4 in combat. In the main, the weapon’s fixed length made it difficult for soldiers of different sizes to achieve the ‘correct weapon position in the shoulder’. The bullpup system meant ‘soldiers must look down when conducting stoppage drills.’ And he cited an inability to achieve optimal cover by not being able to fire from both shoulders. ‘It’s really quite simple to train off-handed shooting if the weapon is capable of doing so effectively—which the Steyr, including the new EF88, isn’t.’⁴⁹

Another training facility at Lavarack Barracks is The Yard, where room clearance is practised. Young 1RAR infanters go through drills, entering the so-called ‘fatal funnel’. The less of your body that’s exposed, the better your chance of avoiding a waiting bullet. So, if you make entry on the right, better to switch your rifle to the left. But then with the Austeyr, if you do fire, ‘you have a strong chance of getting your teeth cracked.’ In a life-or-death encounter it’s a risk they would accept: ‘You would kill a bloke if you have to, but it’s not a first choice.’ Of the new EF88, they tell me it’s 100% more reliable, but they would still prefer an M4. Then a comment I was beginning to hear more often: ‘But as we’re getting more comfortable with this weapon, it isn’t so much of an issue.’

The Army sought another fix to enable ambidextrous shooting by committing \$500,000 for a case deflector subsystem to be fitted by Thales. Trialled at Singleton in 2017, an earlier prototype was unsuccessful, so off-handed shooting was for the moment removed from the program.

While the combat shooting continuum grew from the experience of the M4, as with the 1RAR foot soldiers, training had to be optimised for the weapon used. Carlos Barrera told me:

With the skills and drills being taught to us by special forces, we have to adapt some of the things. It's still effective. Could you improve and push that limit? Most definitely. Could you reach the limit of professional mastery with the Steyr? Probably not.

Back at CASG, among design engineers there was frustration at what seemed a constant and unwinnable game of catch-up. Every time one problem was solved, soldiers, many of whom didn't use the rifle anyway, found another. Nor was it easy for the government and the manufacturer to so constantly placate the retrospective. Once the tender is written, requirements are locked in.

Roland Stott, who was there at the beginning when the F88 bullpup went into production, can't recall off-handed shooting being a requirement:

This has only come up in the last year or so and it's the way special forces are training their people. Because they're our best users, people want to train the way they train. But, from an engineer's point of view, they get to train 32 hours out of a 40-hour week, whereas an average infantry soldier gets to train about five hours. He's doing other stuff. They don't have the bullets and the money, and the Army can't afford to train 10,000 people to that level. And now they're trying to teach them techniques that aren't for the EF88.

Some perspective is also useful. While the ability to shoot off-handed is desirable, as at least one special forces operator with many tours of Afghanistan admitted, 'It wasn't something I can ever remember needing to do.'

For all that, although argument would persist *ad nauseum* about the right weapon, there was no disputing the value of the training introduced and energised by the special forces. Lieutenant Colonel Ben McLennan said:

I think there's been a very effective transfer of skills from those who experienced routine close combat in Afghanistan—that is, SOCOMD [Special Operations Command]—to our conventional forces. It's a well-known principle to heed relevant 'lessons learned' from the last conflict to better prepare for the next one—and conventional Army's standard of training has profited immensely from SOCOMD's close combat experience, particularly in Afghanistan. The combat

‘lessons learned’ that SOCOMD transferred to the broader Army has had a profoundly positive capability impact on the broader Army. This desire to transfer those ‘lessons learned’ is of great credit to SOCOMD. It was almost serendipitous that this transfer of skills from SOCOMD to conventional Army transpired at the same time as the rollout of the EF88 and its ancillaries. In fact, we leveraged it to help ‘sell’ the weapon’s superior capabilities to a naturally sceptical market.

Bayonet versus suppressor

On the subject of one specific ancillary, the argument about how we fight and what we fight with clashes with a muffled bang. As special forces fought on in Afghanistan, they became more conscious of the lifesaving dividend of a suppressed weapon. The reduced sound and flash not only meant they were less likely to give away their position, but also helped them track the location of friendly and enemy forces. As one SASR sergeant put it, ‘Open up with an unsuppressed weapon and straight away you receive incoming.’

In addition, the new training regime found no need for a bayonet. A supplementary Army Combatives Program taught new methods of close fighting. As Company Sergeant Major, Charlie Company, 1RAR, Aaron Roberts explained: ‘No, we don’t use bayonets in training. We use a separate fighting knife because we identified we still need a knife, but the days of bayonet fighting are pretty much gone. I haven’t heard much more about the suppressors.’

While the EF88 could be fitted with a suppressor, the removal of a barrel lug meant it had to come at the expense of the bayonet. And this meant offence to traditionalists: many instructors continued to champion their pointed logic of bayonet fighting.

At Singleton’s School of Infantry, a bayonet assault course is still regularly run. Initial employment training instructor Sergeant Brendan Reid sees no reason why it can’t mesh with the combatives training:

The close shooting program teaches how to shoot on the move. The only difference between closing the distance with the enemy with a bayonet fitted should be the angle of the weapon. People still trying to put a bayonet through a chest plate—it boggles my mind. Why would you do that if the flank is open?

Historically, at the 1st Recruit Training Battalion, ‘Bayo Day’ was a rite of passage. And, despite the bayonet being lost from the new shooting continuum, at Kapooka, too, it remained fixed. Warrant Officer Anthony Pratt told me:

They still do the bayonet assault course as part of the challenge before they march out. There hasn’t been a lot of change in that since I joined the Army. It instils aggression and is more a resilience activity. But there’s a lot of debate about keeping it in the program.

As it turned out, bayonets, which could be purchased for \$90 per item, became a lesser priority on the Army's shopping list. But not suppressors. At an approximate cost of \$1,750 per unit, over a thousand suppressors and flash hiders would become available to selected units across the battalions. Consideration was given to the acquisition of a further 6,000 units after further testing and evaluation.

As Darren Christopher, who had oversight of the Land Engineering program, remarked:

We're lucky in Australia that we're able to spend what we spend on the soldiers. I can tell you factually in Land 125 3C, as far as I could see, nothing was knocked out on price. When we introduced the weapons system into service, Army HQ or elements of HQ believed we were equipping the [regular Army] soldiers as well as some special forces elements in the world. The image intensifier and thermal imager and laser combination that we're now issuing is very, very good.

A sovereign industrial capability

To go to the main reason why the Austeyr is retained as Australia's primary service rifle is to arrive at an expression not likely to be found in the weapon system's instruction manual: 'sovereign industrial capability'.

Australia's geography hasn't changed since 1907, when Prime Minister Alfred Deakin called for the creation of a local defence industry, or since 1942, when Japan came within close-fought battles of blocking the sea lanes.

The *2016 Defence White Paper* peered across the horizon at a looming risk of conflict in the Indo-Pacific, setting out practical and serious policy settings in response. The move to bring defence spending up to 2% of gross domestic product was accelerated.

Former Defence Minister Kim Beazley, who ushered in the corporatisation era following the 1987 *Defence of Australia* White Paper, in commenting on its 2016 successor said:

The DWP contains an industry policy which slams into reverse a 20-year drift towards off-the-shelf equipment acquisition ... The rationale then was self-reliance, optimising the ability to build and sustain as many of our platforms as possible.⁵⁰

In 2017, the government declared:

Over the next decade from 2017–18, the \$200 billion Integrated Investment Program demonstrates the Government's commitment to creating a more potent and capable Defence Force and growing a local defence industry that will create jobs and drive economic growth.⁵¹

In 2018, the Defence Industrial Capability Plan allocated up to \$17 million annually to support Sovereign Industrial Capability Priority Grants.⁵² In the same year, the budget for Land 125 Phase 3, delivering the EF88 and ancillaries, was approved at \$462 million. The estimated cumulative expenditure on the EF88 to that point was \$274 million.⁵³

New policy was attempting to square the circle—and do pretty much what Lithgow had struggled with for over a century: provide for an effective defence force as well as maintain a viable defence industry.

While in the space of a century the challenge became no less daunting, and there were many flat spots along the way, much had been learned. Australia was now producing its own assault rifle and evolving a munitions industry that, via a steady export trade, exceeded its self-sufficiency goal.

Major General David Coghlan, Head of Land Systems, said:

The lesson for Australia is the beauty of being able to have a weapon we can design and have the authority over and manufacture in Australia and sovereign capability. That has allowed us to produce a weapon that's been constantly upgraded and we've been able to do that ourselves in partnership with the company.

In addressing sovereign capability, one of the Austeyr's most influential detractors, Warrant Officer 'W', the head of a special forces unit's combat and firearms training program, wrote, 'I believe where we can, that we should produce or make military rifles in Australia—but not at the expense of capability for the soldier.'⁵⁴

While every member of Australia's volunteer defence force demonstrates devotion to country with their life, 'Made in Australia' brand loyalty isn't an obvious personality trait. Lieutenant Colonel Ben McLennan notes that 'The blowback we get on the EF88 is not dissimilar to that received on boots.'

Boots, boots, boots. This eternally vexing issue for foot soldiers was supposed to be made easier when regulations were relaxed, allowing diggers to choose their own. CASG made available a variety of boots that could be personally fitted, but, according to McLennan:

Some people will never be satisfied. By example, we acquired boots from a Melbourne-based company, to an excellent design, using superior materials, employing Australians and strengthening our economy. Our quality of life, now and in the future, relies on a strong economy—as does our nation's defence spending. But people don't necessarily make these connections. They shop online instead, often acquiring boots made of inferior and potentially unsafe materials. There's every chance that these boots are made unethically,

such as in developing-nation sweatshops. Finally, these same boots are never professionally fitted—risking at best a very uncomfortable experience, or worst, permanent damage to one’s feet. Even when you explain this logic, some can’t perceive it. They’ll buy \$500 boots via the internet despite Defence providing them with a superior, safer, properly fitted and homegrown product.

Recognition that the objective of pleasing everyone can’t be met runs parallel with another reality check about the degree to which Australia can be self-sufficient.

When the rifles are made, barrel steel is still imported. Critical ancillaries such as the laser aiming and illuminating device and the laser aiming, illuminating and ranging device are sourced from the US. The new suppressors come from New Zealand. The brass bell cups and steel penetrators for the bullets continue to be purchased from Germany.

Australia can’t draw on the industrial and technological capital of countries such as South Korea, let alone China and the US, but, as shown, with the right product, being smaller has its benefits.

Maritime surveillance radar production by CEA Technologies, the Thales Australia Bushmaster PMV and propellant from Mulwala are of world standard. The bulk of the product from the Thales Mulwala munitions plant is exported. Thales also makes available from its Lithgow factory an export version of the EF88, designated the F90.⁵⁵

Assistant Secretary Land Engineering, Shane Aitken, believes that:

Sovereign industrial capability is absolutely essential. As an Australian engineer, you know that it doesn’t matter who you buy your kit from; there’s always going to be danger down the track that they won’t be able to deliver. That’s why Mulwala and Benalla and those places are important.

Australia has prioritised local defence production to industries intrinsic to national security, such as shipbuilding and small arms production. I asked Warwick Spencer what would happen if Australia chose to go down the UK path and surrender sovereign capability in small arms production:

If we chose to do that, for starters you can never evolve something effectively to tailor for your own needs at the behest of prime suppliers. You also run the risk that at some point you can’t get the volume you want when you want it. You can say that about any munitions, be it a missile system or a fighter jet. You can’t be ridiculous and say Australia needs to manufacture everything, so that we can have unlimited supply whenever we want it. You have to draw a line somewhere. It’s feasible, in my view, to draw the line at the basic element: a bullet and a gun.

Current operations

By 2018, the Austeyr marked a quarter of a century of demonstrating proficiency and reliability in testing peacekeeping and war-fighting operations. David Coghlan is one of many to note its high regard among allies:

Soldiers from other countries would come up and admire the weapon and I remember being quite shocked. While we had become familiar, others saw it anew. The French and Brits were quite mesmerised, seeing it as light and slick.

On the fringes of the global defence estate, there are agendas aplenty.

Tony Byworth, with real expertise as an armaments testing officer at the ADF's Monegetta facility, laments the rise of the 'YouTube warriors':

My personal opinion is there are a lot of people who believe everything they see on the internet these days. Everyone is an expert and it's very difficult to disprove to everyone that this thing is working fine and all they want to believe is what they see on the internet.

After 38 years in the business, Warwick Spencer worries that some experts, even in uniform, have influence beyond their insight:

Everybody in a uniform considers themselves an expert on ammunition and rifles and that's dangerous. Certain people can influence outcomes not based on scientific thought process but on belief. The advent of the internet and the blogs makes everybody an expert. Then you've got the herd mentality of a collective, especially a group that likes to be different.

When you now observe well-trained and well-led Australian soldiers going through their drills with the EF88, while they won't perform to the level of special forces soldiers, lack of capability doesn't come to mind.

At Task Group Taji in Iraq, the black EF88 has been in service since 2017. According to one of the soldiers presently deployed, 'We carry it all the time and shoot it at the range a lot. It outshoots the M4.' According to Taji 5 Commander Colonel Steve D'Arcy:

The EF88 has proven itself an extremely reliable, accurate and versatile weapon, which has gained the praise of not only Australian personnel but also our New Zealand counterparts and coalition partners.⁵⁶

In New Zealand, the MARS-L, an M4 variant adopted in 2017, encountered problems as it was rolled out: 'Every single firing pin in the NZ Defence Force's 9040 new infantry rifle has been replaced after a number of the rifles broke.'⁵⁷ While some anecdotal accounts suggest disappointment with the rifle, the adoption of the

AR system solved length-of-pull and ambidexterity issues. Defence Minister Ron Mark considered the firing pin failure down to ‘minor issues’, citing the MARS-L as a ‘vast improvement’ on the Steyr.⁵⁸

The Austeyr EF88 was also deployed to New Guinea and the Philippines, again, as at Taji, in a training rather than combat role. And, again, the Australians were able to compare their new weapon with those from other participating nations—with maybe a ‘grass is greener’ scenario cropping up from time to time.

1RAR instructor Corporal Jamie Ogilvie remembers that when:

showing it [the EF88] to the New Zealanders, they were kind of jealous. Like they had these new M4s [the MARS-L variant], which everyone else wants, but when they saw what we had and the capabilities we had, they were, ‘Far out! Wish we had that.’

Another 1RAR instructor, Corporal Ricky Rhodes, has assumed agnosticism about the weapons:

The M4 and EF88 are both good. I get preferring what you’re comfortable with and the M4 being sexier, but I don’t think that’s the prevailing view. It’s more about functional capability. As a teacher, I adapt to them. \$50,000 worth of weapon system doesn’t matter, unless the user is well trained.

Future operations

The first rule, as ever, is that he who adapts fastest wins. ‘Accelerated warfare’ describes anticipated future danger. Chief of Army Lieutenant General Rick Burr has said:

The threats against us are accelerating in terms of the speed of cyber, the lethality of the weaponry, and the way in which information space is exploited, and therefore we need to accelerate our response to the threats.⁵⁹

In the same interview with ASPI’s Brendan Nicholson, Rick Burr said he was happy with the new rifle:

In fact, all of our individual soldier kit delivered under Land 125 is tremendous. I think our soldiers’ personal, individual equipment is probably the best in the world.⁶⁰

As the threat horizon stretches ever further, research is well underway to determine the requirements for a replacement rifle. Lethality remains the key objective. How that’s best achieved is under review. An enhanced operational round, the M855A1 with an external penetrator, means that even a 5.56 mm round has the capacity to penetrate armour.

Another commonly expected prospect is another calibre change. A 6.8 mm round would again transfuse the global, and more particularly American, military industrial complex.

On this, as Major General David Coghlan explains:

The jury is out. There are some studies that indicate a change of calibre might be prudent, but there isn't universal agreement at this stage. I think at this stage that will take a couple of years to settle. What's agreed is the weapons of the future need to be further integrated into the soldier as a system, so, rather than having independent sensors on the weapon and then independent sensors on the soldier, we need to integrate those into the soldier as a system. So, the ability to fire around corners, the ability to have the location of the weapon and a sight picture in the helmet are areas we need to progress next.

Senior Engineer Darren Christopher, who is overseeing the replacement assault rifle program, while recognising that improved interoperability remains another goal, makes the point that Australia can't presume that bigger and stronger allies will always be there:

The requirements broadly will be set to how we see ourselves fighting in the future. One of the things Australian soldiers have had to rely on their service weapon to do is operate in isolation from some of the air support and artillery support that other nations can bring to bear on the battlefield. So, for instance, other nations can get away perhaps with a weapons system which is a little bit less accurate and reliable and cheaper to run or throw away because they have a lot of air power and artillery that they can bring to bear almost instantaneously on the battlefield, whereas Australians don't.

Australia also confronts realistic limits on defence industry capability. As ever, what needs to be nurtured are the necessary skills to multiply in a time of crisis. Warwick Spencer says:

Being in the industry so long, I'm a big supporter of maintaining a degree of sovereignty that keeps that core skills base alive so that if, sometime in the future, you need to expand that core skill base you've got the nucleus from which to do so. Because once you lose that nucleus, you can't do it.

Rifle envy

As I worked my way through this story, it became apparent that it was always wrong to allow the assault rifle debate to be framed as a competition between the Austeyr and the M4/M16.

All weapons have their strengths and weaknesses. Canvass the archives and firearms blogs across the globe and you'll note a fusillade of vitriolic commentary. Following the downgrading of its small arms industry, Britain struggled to build confidence in its troubled SA80: 'The firing pins broke, the magazine fell off, the bolt-release button broke, the triggers got stuck, the cleaning kit wouldn't clean, the cartridge cases wouldn't eject properly ...'⁶¹ Across the channel, the state-produced French FAMAS rifle is commonly described as 'a disaster'.⁶² There have been constant complaints, as well, in the US about an object of occasional reverence: 'In recent years, the M4 finished last in a sandstorm reliability test'; 'I saw first-hand what happens when your weapon jams up because of the harsh environments ... A weapons sergeant was shot in the face due directly to his weapon jamming. I just can't believe that after things like this happen, the Army is still buying more M4s.'⁶³

The choices open to future design and acquisition teams reach well beyond Australia's contest to choose a rifle back in the 1980s. On that occasion, the Steyr AUG won, fair and square. And subsequently, on the criterion that matters—how well the weapon performed in training and on operations—it continued to succeed.

But a good record hasn't commensurately generated a good reputation—and the critical confidence that goes with it. Lieutenant Colonel Ben McLennan puts it down to communication failure:

When you introduce new equipment, whether it's boots or weapons, you must have a marketing/communication plan. You need to convince them to see past their natural scepticism and give the equipment a chance.

A revolution in combat arms training, brought on to the considerable credit of Australian special forces, was offset by the attendant regeneration of unhelpful 'rifle envy'. The program, while raising skill levels, managed to lower confidence in the EF88 and revive a redundant 'we should have what they have' argument.

The tasking of special forces presupposes difference. Their 'Who dares wins', 'Without warning' creed calls for nimbleness. In the early days in Afghanistan, the special forces' choice of vehicle wasn't the highly protected Bushmaster but agile and open long-range patrol vehicles and short-wheelbase Land Rovers.

In parallel, the M4 suited the responsive and aggressive nature of special forces' closer quarter operations.

Equally, for conventional forces, as a general-purpose weapon the Austeyr demonstrated merit in lethality, accuracy and reliability. What wasn't fully expected when the Steyr was first rolled out was that building a good rifle was but a first step. The next was building confidence, and after that came the considerable task of communicating rounded comprehension.

Conclusion: the software is more important than the hardware

Soldiers develop a metaphysical affinity with their rifles. Among their peers, particular soldiers are admired for the way they carry their weapon. What impresses is less the rifle and more the confidence and experience on show.

Instructor Corporal Carlos Barrera told me, ‘When you see somebody walking around a FOB [forward operating base], the barracks or the bush, just the way he handles his weapon system is an indication of where he’s at.’

As is often pointed out, there’s no such thing as a perfect weapon. The SA80, the FAMAS and the M4 are no more perfect than the Austeyr. Design features more often associated with the bullpup system count it down on modularity and ergonomics. There are complaints that the cheek weld doesn’t work as well as with the SA2. Shooting instructors consistently rue a lack of hair-trigger precision. As one of them grumbled, ‘Same shitty triggers.’

With a new weapon under consideration, lessons from the past 30 years go to harmony. The Austeyr worked when rifle, bullet and propellant were effectively harmonised. The soldier as a system works when separate components are optimally integrated. And the relationship between the main stakeholders works when the silos are broken down, so that coherence is liberated.

Soldiers often say the thinking is more important than the shooting. The same plainly applies to the defence industry. Futureproofing, first of all, means the retention of critical skills.

For the soldier carrying whatever weapon is issued, it’s much the same. As Combat Shooting Cell instructor Sergeant Mark Biviano puts it:

I’m not interested in the thing. I’m interested in the methods. I’m more interested in the software than the hardware. Is the hardware perfect? Maybe not. The software is what really makes the hardware—I mean the thought process, the combat mindset, the ability to be a thinker, as opposed to just a shooter.

Notes

- 1 Tony Griffiths, *Lithgow's small arms factory and its people*, volume II, Toptech Engineering, Terrey Hills, Australia, 2006, 349.
- 2 Griffiths, *Lithgow's small arms factory and its people*, volume I, 133.
- 3 Griffiths, *Lithgow's small arms factory and its people*, volume I, 388.
- 4 The Lee–Enfield calibre, at 7.7 mm, was of similar proportion.
- 5 Modifications included an improved buffer, a chromed chamber and barrel and bolt assist. A program to ensure the provision of adequate cleaning equipment and training was also introduced.
- 6 In 1991, Heckler and Koch was acquired by the British Aerospace Royal Ordnance division. The contract to refurbish the SA80 was later undertaken by the newly merged BAE Systems. In 2002, Heckler and Koch reverted to German ownership.
- 7 An Australian-made assault rifle, the Leader T2 MK5, had been considered but rejected during the early trials.
- 8 A compact submachine gun (350 mm), a carbine (407 mm), a rifle (508 mm) and a light machine-gun (621 mm).
- 9 Griffiths, *Lithgow's small arms factory and its people*, volume II, 317.
- 10 Griffiths, *Lithgow's small arms factory and its people*, volume II, 306.
- 11 Ordnance Avenue, Lithgow, has a twin at Enfield Lock in the UK—Ordnance Road.
- 12 Daniel Cotterill, 'ADI, past, present and future', *Australian Defence Magazine*, 10 January 2008.
- 13 The nomenclature of international small arms designated F as an Australian prefix, M as American, L as UK etc. Greg Sheppard, who provided this background, further commented, 'The Austrians were pretty cheesed off when we altered their brand to Austeyr without their consent.'
- 14 'Land Warfare—Austeyr: small arms, big business', *Australian Defence Magazine*, 1 October 2008.
- 15 While a NATO standardisation agreement sought to standardise rifle cartridges, in practice there was often frustrating variation in ammunition quality at different points of manufacture.
- 16 'First shipment leaves ADI', *Lithgow Mercury*, 1 September 1990.
- 17 Australian soldiers I have spoken with disagree, citing the softer British soil as a more likely explanation for bipod survivability.
- 18 Bob Breen, Greg McCauley, *The world looking over their shoulders: Australian strategic corporals in Somalia and East Timor*, Land Warfare Study Centre papers no. 314, 2008, 60.
- 19 Robert Hall, 'Accidental discharges—the soldier's industrial accident in Vietnam and East Timor', *ADF Journal*, July–August 2001, 149:27–34.
- 20 Hall, 'Accidental discharges—the soldier's industrial accident in Vietnam and East Timor', 100.
- 21 John Connor, 'Bravery under fire', *Wartime*, Australian War Memorial, issue 39, Winter 2007. Andy Miller was awarded the Medal for Gallantry.
- 22 'F88 Austeyr safety and reliability', correspondence HQ CATC 1005-10-2, August 2000, 2.
- 23 Griffiths, *Lithgow's small arms factory and its people*, volume II, 348.
- 24 Indeed, while they're hardly in the majority, two SASR operators told me they had zero problems with the Austeyr, stating they preferred it to the M4.
- 25 The picatinny rail is a sawtooth mounting system developed originally at the Picatinny Arsenal in New Jersey, US.
- 26 Infantry battalions came to provide each section with two F88s fitted with M203s (grenade launchers). Prior to the introduction of the M203, the M79 grenade launcher was carried slung by a member of the section along with his F88.
- 27 Colonel PJ Hutchinson, 'Implications of Op Warden unauthorised/negligent discharges on the F88 Austeyr individual weapon family training', correspondence CATC 0784/00, Training Command, August 2000, 7.

- 28 Hutchinson, 'Implications of Op Warden unauthorised/negligent discharges on the F88 Austeyr individual weapon family training', 6.
- 29 Foreign Affairs, Defence and Trade Legislation Committee Estimates, 1 June 2015.
- 30 Correspondence, Jacqui Lambie to Marcus Saltmarsh, 22 November 2013.
- 31 'Australian soldier dies in Iraq', *The Age*, 23 April 2006.
- 32 Department of Defence (DoD), *Defence Capability Plan 2006–2016*, 14 June 2006, 116.
- 33 Corporal Mathew Hopkins was the ninth Australian soldier to be killed in Afghanistan. Of the seven Australian special forces soldiers killed to that point, three were lost as the result of small arms fire.
- 34 'Angry Army denies weapons unsafe, malfunctioning', *news.com.au*, 17 March 2009.
- 35 'Angry Army denies weapons unsafe, malfunctioning'.
- 36 'Steyr to stay until 2020', *Army News*, 27 November 2008, 7.
- 37 A similar fault with the butt occurred when the first F88 was developed in the late 1980s.
- 38 Incidents of stoppages were much more common when F3 blank ammunition was used.
- 39 Diggerworks is a derivation of a similar program, Gruntworks, established on behalf of the US Marine Corps.
- 40 The HK-417 was acquired through the Rapid Acquisition Program by Forces Command.
- 41 Kurt Bayer, 'Hated army assault rifles unlikely to be sold', *New Zealand Herald*, 20 June 2014.
- 42 Bayer, 'Hated army assault rifles unlikely to be sold'.
- 43 The US M4A1 purchased in a similar state to the \$2,700 EF88 is costed in Australia at approximately \$4,000 per weapon.
- 44 Sergeant Andrew Hetherington, 'Light, accurate, modular', *Army*, 16 February 2012.
- 45 The barrel removal drill was discontinued when weapons safety discipline improved to a point where UD/ND rates were no longer as serious an issue. There was further concern as well that the drill produced unnecessary wear. The removal function was sacrificed in order to save weight when the EF88 was developed.
- 46 The EF88, with its day sight, grip and full magazine, weighs 4.78 kg. The F88SA2, with its original day sight and full magazine, weighs 4.9 kg.
- 47 Hetherington, 'Light, accurate, modular'.
- 48 First Principals Review, *Creating one Defence*, 1 April 2015, [online](#).
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- 50 Kim Beazley, *DWP 2016: a throwback to a harder era*, ASPI, Canberra, 2 March 2016.
- 51 Treasury, *Budget 2017–18: Defence budget overview*, Australian Government, Canberra, 9 May 2017.
- 52 DoD, *Defence Industrial Capability Plan*, Australian Government, Canberra, 23 April 2018, [online](#).
- 53 DoD, *Portfolio Budget Statements 2018–19*, 'Soldier Enhancement Version 2—Lethality', in 'Table 64: Top 30 projects by 2018–19 forecast expenditure', Australian Government, Canberra, 129.
- 54 WO1 'W', 'The EF88 versus the M4/AR-15: a special operator's perspective'.
- 55 The ability of Thales Australia to export the F90 appears constrained. As former senator and major general Jim Molan points out, 'As a defence materiel advocate, critical to the sale is the question of whether or not the ADF is using it.'
- 56 'Thales EF88 completes first operational deployment with flying colours', *Defence Connect*, 9 November 2017.
- 57 David Fisher, 'NZDF new rifles—all 9040 of them—get firing pin replacements after breakages', *New Zealand Herald*, 19 September 2018.
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- 62 Steve Johnson, *The Firearms Blog*, 23 November 2011.
- 63 'The USA's M4 carbine controversies', *Defense Industry Daily*, 12 November 2018.

Acronyms and abbreviations

ACOG	advanced combat optical gunsight
ADF	Australian Defence Force
ADI	Australian Defence Industries Pty Ltd
ALP	Australian Labor Party
AR	Armalite
ASLAV	Australian light armoured vehicle
AUG	<i>Armee-Universal-Gewehr</i> (universal army rifle)
CASG	Capability Acquisition and Sustainment Group
CO	commanding officer
DMO	Defence Materiel Organisation
DSTO	Defence Science and Technology Organisation
IED	improvised explosive device
MCBAS	modular combat body armour system
MRTF	Mentoring and Reconstruction Task Force
NATO	North Atlantic Treaty Organization
ND	negligent discharge
PMV	protected mobility vehicle
RAAF	Royal Australian Air Force
RAN	Royal Australian Navy
RAR	Royal Australian Regiment
RODUM	report on defective or unsatisfactory materiel
RPG	rocket-propelled grenade
RTF	reconstruction task force
SA80	Small Arms for the Eighties (UK)
SARP	Small Arms Replacement Program
SASR	Special Air Service Regiment
SMLE	short magazine Lee–Enfield
TBAS	tiered body armour system
TICs	troops in contact
UD	unauthorised discharge
UK	United Kingdom
UN	United Nations
UNAMIR	UN Assistance Mission for Rwanda

ASPI case studies

ASPI case studies in defence projects is a series dedicated to telling the ‘warts and all’ stories of major undertakings in Australian defence procurement and project management. The ‘dates and dollars’ of defence projects are available in reporting from Defence and the Australian National Audit Office, so this series explores the less quantified but nonetheless crucial aspects of project management—the organisational, human and technological challenges that occur along the way. ASPI hopes that future project managers will be able to turn to this series to see how their predecessors dealt with the problems they faced, and be able to see how outcomes—good or bad—were shaped by events along the way.

In *Sticking to our guns*, Chris Masters delivers a cracking read about the ‘funny plastic weapon’ that replaced the Vietnam-era L1A1 assault rifle in the 1980s, the successors to which remain the ADF’s primary personal weapon. And what a history it is. Chris skilfully weaves the political, design, industrial, economic and battlefield factors that have driven decision-making about the weapon earlier known as the Steyr AUG, F88 and Austeyr and now known as the EF88.



About the author

Chris Masters remains the longest serving reporter with Australia's longest running public affairs television program, *Four Corners*. Between 1983 and 2010 he made over 100 programs for the national broadcaster's flagship series, many of them well remembered and some of them nation shaping.

'The Big League' in 1983 triggered the Street Royal Commission and judicial accountability. 'French Connections' in 1985, an international exclusive on the sinking of Greenpeace's 'Rainbow Warrior', earned Chris the highest award in Australian journalism, the Gold Walkley. His most famous report, 'The Moonlight State', investigating police corruption in Queensland, initiated the Fitzgerald Inquiry and a raft of reforms that reached across the nation. 'Inside a Holocaust' on genocide in Rwanda won a Logie award in 1994, and 'The Coward's War' on the Bosnian conflict from 1995, a further Walkley.

Chris is from a well-known media family. His mother, Olga (1919–1986), was a lifelong journalist and successful author. Older brother Roy is a sports reporter, Ian, a radio broadcaster and Quentin, a film producer. Younger sister Sue is a drama producer, and Deb, a documentary maker.

Chris has received two honorary doctorates, from RMIT University and the University of Queensland.

In 2013, his three-part series, *The Years That Made Us*, was screened on ABC TV.

His documentary journalism has featured at Australia's Centre for the Moving Image in Melbourne. His work also figures in the release after 30 years of Queensland government cabinet papers. *Sunshine Rebooted*, a joint production of the Queensland State Archives and Griffith University, was exhibited in 2018. Chris has also co-curated exhibitions for the Australian War Memorial, most notably *Afghanistan: The Australian Story* in 2017.

Beyond his long career at the ABC, Chris Masters has also worked for Channels Seven, Nine and Ten, SBS, News Limited and Fairfax Media and is currently a contributor to the Australian Strategic Policy Institute.

In 1999 he was awarded a Public Service Medal for his anti-corruption work, and in 2000, a Centenary Medal. In 2017 he was inducted into the Australian Media Hall of Fame.

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I'm grateful first of all to Kim Gillis, former Deputy Secretary, CASG, for coming up with such a good idea. When ASPI's Peter Jennings explained the purpose of these project histories, I was instantly on board. Big-ticket defence items draw relentless fire, and the resultant controversy inevitably generates more heat than light.

In consequence, a rounded understanding of why a particular piece of kit was preferred is hard to communicate in a conventional news cycle, let alone 240 characters.

My brief was to tell the bigger story but make it concise and readable. Limits on access to some key figures and official records increased the challenge, calling on time-honoured investigative skills. Thankfully, technical assistance was provided by defence experts, who filled in knowledge gaps and vetted content.

Malcolm McKeith from CASG was generous in introducing me to key locations and characters. Darren Christopher, infusing commitment and credibility, helped me steer a steady path through a battleground of claim and counterclaim.

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Tony Griffiths' work is also frequently quoted. His two-volume history of a century of armaments production at Lithgow was of immeasurable help when I was tracing the influential foundations of this story.

Lieutenant Colonel Ben McLennan was equally authoritative in accounting for the later evolution of the Austeyr, having helped with the modernisation of soldier combat systems and the introduction of the EF88, as Commanding Officer 1RAR.

I'm regularly encouraged when allowed to reach deep into the interior of Australian service life. Warrant Officer Matt Lines gave a lucid account of the capabilities of the F88 in the heat of combat. One after the other, the instructors at the ranges of Kapooka, Singleton and Townsville exuded unassuming professionalism as they went about their considerable work in extending capability. Captain David Caligari helped with introductions as well as my education regarding the contemporary combat mindset.

His dad, retired Lieutenant General John Caligari, happened to be another worthy contributor as one of the first to carry an F88 into action and later playing a key role in the advent of Diggerworks. Former Chief of Army, Lieutenant General Peter Leahy, and retired Major General Jim Molan provided further useful perspective.

I'm thankful also for the interviews with many weapons engineers and diggers alike, who spoke their piece. Greg Sheppard, Clancy Smith, Salvatore Spitaleri, Roland Stott, Paul Nathan, Jim Grant and Leon Helmrich stand tall among the frank and fearless.

As I and others have said, at the heart of any weapons system is a human being. I'm grateful to Marcus Saltmarsh for his willingness to relive a life-shattering experience.

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ASPI case studies in defence projects

Sticking to our guns: A troubled past produces a superb weapon

With *Sticking to our guns*, Chris Masters delivers a cracking read about the ‘funny plastic weapon’ that replaced the Vietnam-era L1A1 assault rifle in the 1980s, the successors to which remain the ADF’s primary personal weapon. And what a history it is. Chris skilfully weaves the political, design, industrial, economic and battlefield factors that have driven decision-making about the weapon earlier known as the Steyr AUG, F88 and Austeyr and now known as the EF88.

As with earlier ASPI case studies on defence projects, *Sticking to our guns* is designed to help those in Defence, industry and parliament and other interested observers to better understand the complexities of the business, all with the aim of improving how Australia equips the ADF.

Chris Masters is one of Australia’s best-known and most influential investigative journalists. He holds the record as the longest serving reporter on the country’s longest running current affairs program, *Four Corners*. Over 25 years he made a series of nation-shaping reports, among them ‘The Moonlight State’, which helped trigger Queensland’s Fitzgerald inquiry into police corruption.

Chris has received multiple awards for his work, including the premier Gold Walkley for his international exposé of the sinking of the Greenpeace boat *Rainbow Warrior*. He is the author of five best-selling books, including *Uncommon soldier: the story of the making of today’s diggers* (2013) and *No front line: Australian special forces at war in Afghanistan* (2017).