SOVEREIGN INDUSTRIAL CAPABILITY PRIORITY INDUSTRY PLAN

Land combat and protected vehicles and technology upgrades

August 2020
SECRETARY OF DEFENCE AND CHIEF OF THE DEFENCE FORCE FOREWORD

We are pleased to release the “Land combat and protected vehicles and technology upgrades Industry Plan”, which is a key deliverable of the 2018 Defence Industrial Capability Plan.

This Industry Plan was developed in close consultation with experts from industry and Defence to scope the industrial capabilities that need to be delivered or supported by Australian industry. This will encourage a framework for investment in these capabilities and provide guidance to Defence personnel on the importance of maximising Australian industry participation in relevant Defence contracts.

A long-term partnership between Defence and defence industry will enable informed and timely decisions, including the necessary investments in workforce, infrastructure and intellectual property.

This Plan addresses workforce and skilling requirements and forecasts the technological developments that may influence future defence capabilities. The Plan also outlines the broader defence industry and innovation initiatives to support capability requirements. It lists key actions for Defence to help defence industry support the “Land combat and protected vehicles and technology upgrades Sovereign Industrial Capability Priority”.

A priority for Defence is to ensure that our people receive the support necessary to succeed in their mission to defend Australia and its national interests. Australia’s defence industry is critical to enabling Defence preparedness and delivering warfighting advantage.

We thank the many Defence personnel and defence industry representatives who volunteered their time and expertise to help develop this Plan. We look forward to continuing to build and strengthen our partnership in delivering the products and services needed to support the Australian Defence Force.

Greg Moriarty
Secretary
August 2020

Angus J Campbell, AO, DSC
General
Chief of the Defence Force
August 2020
In 2018, through the Defence Industrial Capability Plan, Government identified the first ten Sovereign Industrial Capability Priorities (Priorities). These are critical to Defence and must be developed or supported by Australian industry.

These Industry Plans, as well as the overarching Implementation Plans, build on the Defence Industrial Capability Plan to identify the critical industrial capabilities that underpin each Priority to enable informed and timely defence capability decisions. Defence requires a level of access to, or control over, the essential skills, technology, intellectual property, financial resources and infrastructure within the Australian defence industrial base to preserve sovereign interests and realise the benefits associated with such interests. This Industry Plan helps both Defence and industry better understand opportunities and trade-offs associated with sovereign capability, and should be read in conjunction with the relevant Implementation Plan.

Key content for Defence readers:
This Industry Plan supports the Government, Defence project managers, those involved in force design, and others focused on capability acquisition and sustainment. This Plan provides information and guidance to help Defence align its capability decisions with the strategic intent of the Department and broader Whole-of-Government policies, including:

- The critical industrial capabilities to be developed in Australian industry to support this Priority (pages 6, 16-17) as well as the capability enablers to protect Australian sovereign interests (pages 6, 39-41).
- A description of the industrial base and market dynamics to support planning and consultation, including preparing for and undertaking market solicitation, such as requests for information (pages 21-38).
- The actions to be taken by Government to support development of this Priority (distributed throughout pages 18-41 and consolidated in Annex A).

Key content for industry readers:
This Industry Plan details specific areas of focus for Defence, enabling industry to support growth of sovereign capability by investing in those capabilities identified as critical (for example, in workforce, technology or infrastructure). The Plan includes:

- An explanation of the policy environment, the definition of Defence sovereignty and what it means to contribute to a Priority (pages 10-11).
- Identification of the critical industrial capabilities and capability enablers related to this Priority and Defence's intent to access or control particular aspects (pages 6, 16-17, 39-41). This will support industry's business planning and investment decisions, as well as Australian Industry Capability Plans that align with Defence priorities.
- Existing support levers available to industry to develop Defence industrial capability (Annex B) and the specific actions to be taken by Government to support this Priority (distributed throughout pages 18-41 and consolidated in Annex A).
EXECUTIVE SUMMARY

Land combat and protected vehicles deliver a broad range of capabilities and technologies to the Australian Defence Force (ADF), from protection systems to advanced command and control functions and the ability to deliver lethal effects. Today, these vehicles are a node in a complex networked environment able to collect, segment, and analyse data and communicate with other ADF assets or allies. The evolution of land combat and protected vehicle technologies presents a clear commercial opportunity for Australian industry now and into the future.

This Plan outlines the underlying critical industrial capabilities and enablers for land combat and protect vehicles and offers a future technology roadmap at an industrial capability level. It does not focus on any single industry organisation or any specific future or ongoing Defence tender process.

Land combat and protected vehicles are integral to the joint force. They are central to ADF warfighting capability. In increasingly complex and uncertain environments, these vehicles provide lethality, firepower and mobility for soldiers while collecting and disseminating on the ground information across the network. The next generation of vehicles is pivotal in enabling coordinated joint effects for the ADF, ensuring it remains flexible and adaptable to meet current and emerging threats.

A major recapitalisation is under way within Army to replace some of its land combat and protected vehicle platforms. This is driving a resurgence in industrial activity as prime contractors seek greater manufacturing and assembly footprints in Australia to service these major programs, as well as generate export opportunities. The ability of Australian defence industry to upgrade, update and modify land combat and protected vehicles, including the on-board technologies, will be essential if current and future ADF fleets are to take advantage of the technological evolutions enhancing survivability, situational awareness, lethality and mobility.

To protect our sovereign interests, Government, defence industry and academia must work together to prioritise skilling and actively invest in the growth and preservation of this important sub-sector. This part of the sector is particularly collaborative, with small businesses coming together and engaging in a way that fosters support and goodwill.

Digitisation and the adoption of additive manufacturing and artificial intelligence will positively affect this sector. Accordingly, identifying specific workforce requirements as a result of digitisation, additive manufacturing and artificial intelligence is central to successful implementation.

Workforce presents a considerable challenge for the land combat and protected vehicle sub-sector. The increasing demand for qualified engineers, programmers and scientists must be managed to preserve the critical skill sets necessary to implement advanced manufacturing processes and support systems integration. This challenge is widely acknowledged across the defence sector and requires dedicated effort from all relevant parties to address.

Within this environment, four industrial capabilities are identified as critical. Australia seeks to have access to or control over certain elements of each and to support or influence related defence industry investment. Developing these critical industrial capabilities will ensure the availability and operational effectiveness of land combat and protected vehicle platforms when and where they are needed by the ADF. These critical industrial capabilities are not ordered by priority or importance.
To ensure Australia retains the identified critical industrial capabilities, Government seeks to build the following capability enablers in partnership with industry over the next decade, starting with the Government actions listed in this Plan:

- Investment in the development of indigenous autonomous systems capabilities, inclusive of a highly skilled workforce and intellectual property that enables ongoing and agile evolution of land combat and protected vehicle technologies
- Establishing processes and governance mechanisms to enable systems integration expertise to grow within the Australian small-to-medium enterprise base
- Comprehensive and structured data collection and analysis techniques for the assessment and dissemination of user and vehicle performance information, and enabling situational awareness for end users in deployed, networked environments

Recognition of land combat and protected vehicles as a Sovereign Industrial Capability Priority emphasises the significance of these platforms to the ADF now and in future. Understanding the full life-cycle of land combat and protected vehicles - from planning to acquisition, through to sustainment and disposal - is essential to ensuring appropriate investment in research and development, workforce, equipment and facilities (capital expenditure). The establishment of strategies that enable greater small-to-medium enterprise protection and participation are also necessary as Australia embarks on some of its largest land projects in decades.
Successful implementation of this Priority

This Industry Plan describes Defence's priorities for the next three to five years in terms of investing in land combat and protected vehicles and technology upgrades. Success in the execution of this Plan will also enable the following industrial landscape in 2022-2024 and beyond:

- Australian industry's role in component manufacture, systems integration, and land combat and protected vehicle assembly continues to grow, generating new intellectual property in country and enhancing global supply chain opportunities.
- Australia's reputation in the design, development and production of world-leading protected mobility vehicles continues to be enhanced with increasing demand for export.
- Effective collaboration among industry, academia and Defence enables investment in the development of autonomous technologies and the growth of sovereign expertise in this field.
- Access to intellectual property and a skilled workforce enables execution of light-to-heavy grade repair activities.
- Industry's and the ADF's support infrastructure for land combat and protected vehicles are optimised.
- Communication between fleets and domains and across the ADF is progressively streamlined, with protocols and technologies established to network and securely transmit data.
- The release and implementation of key Defence policies and frameworks, such as those related to the Generic Vehicle Architecture and the Vehicle Standard Operating Environment, enhance the competitiveness of Australian industry and provide opportunities to offer cutting-edge products to the ADF.
- The adoption of digitisation across the industrial base is enhancing competitiveness, efficiency, quality and safety in production.
- Collaborative relationships have been established between Defence and industry to define data-informed support and maintenance requirements, including implementation of the Chief of Army's Land Force Maintenance Directive.
- Development and implementation of capability-based support models is enabling proactive investment in the sustainment capability Defence needs, and providing guidance to industry in terms of research and development requirements to enhance resilience.
Features of this Industry Plan

This Industry Plan describes the “Land combat and protected vehicles and technology upgrades” Priority and specific sovereign capability requirements across four key areas. These are standardised across all Industry Plans and are presented in the diagram below.

**Sovereign Industrial Capability Priority**

**Land combat and protected vehicles and technology upgrades**

**Critical industrial capabilities**

- Determination of government access or control requirements
- Protection technologies
- Integration, networking and communications
- Vehicle and system upgrades
- Sustainment

**Enablers**

- Autonomous systems capability
- Growing systems integration expertise within the Australian small-to-medium enterprise base
- Vehicle data collection and analysis

**Government actions**

- Implementation and communication of Defence strategies and policies
- Development of capability-based support models
- Enhancing the Australian Industry Capability Program
- Engineering development program
- Standardised architectures
- Development of land vehicle data strategy

**Available support**

- Defence industry and innovation programs
- Defence industry grants
- Other Defence support opportunities
- External support and collaboration opportunities
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STRATEGIC CONTEXT

The case for a sovereign industrial base

Sovereign industrial capabilities are considered operationally critical because of the essential strategic advantage they provide to the ADF. They must be developed and supported by Australian industry because overseas sources do not provide the required security or assurances of access and supply. Australia needs to strategically consider how we develop, maintain or enhance these capabilities and the degree of access to, or control, we need now and in future.

Sovereign Industrial Capability Priorities are those industrial capabilities assessed as:
- operationally critical to the Defence mission;
- priorities within the Integrated Investment Program over the next three to five years; or
- in need of dedicated monitoring, management, and support due to their industrial complexity, government priority, or requirements across multiple capability programs.1

The initial Sovereign Industrial Capability Priorities2 are:

On a case-by-case basis, the Australian Government will make judgements about the optimal level of access to or control over each Priority. It does not automatically mean that a defence capability has to be designed, developed, manufactured or maintained in Australia; for each Priority, the level of sovereignty may vary. Defence sovereignty is made up of many elements and may include:
- access to resident technical design capabilities; for example, to modify or upgrade systems;
- the ability to test and ensure that equipment is operationally ready for service or to be returned to service;
- access to, or control of, the facilities, technologies and intellectual property that underpin our defence capability within Defence and Australian industry;
- access to allied capability that supports our warfighting advantage; and/or
- the ability to protect foreign-sourced, controlled, technologies employed by the ADF.

‘Access’ refers to the availability of key assets within Australia, able to be used by Defence, if required. ‘Control’ is more likely to be obtained by Defence through Government ownership or exclusive rights to a critical asset such as specialist machinery or infrastructure.

The priorities represent only a subset of Australian defence industry capability. They identify a number of elements of the Australian defence industrial base at a capability rather than a company or technology level. This is to encourage innovation and development in the technologies and capabilities most essential for Defence.

### Sovereign Industrial Capability Priority development

The priorities were developed through a rigorous assessment framework which considered the strategic, capability, and resource dimensions of industrial sovereignty against the needs of Defence. Consideration of industrial capabilities was balanced against Defence’s priority to provide the ADF with cost-effective, cutting-edge capability which maximises Australian industry involvement.

Management and support for the priorities starts at the very beginning of Defence planning and continues throughout the Force Design Cycle and Capability Life Cycle, including the Australian Industry Capability Program, into Government grants and initiatives to support industry directly. The Australian Industrial Capability Program remains the critical lever for Australian industry involvement in supporting the priorities and Defence’s broader capability needs.

### Policy framework

The 2016 Defence White Paper sets out a comprehensive, long-term plan for the defence of Australia and its national interests. Australian industry will continue to play a major role in its delivery.

The 2016 Defence White Paper is complemented by:

- the Integrated Investment Program, which outlines $200 billion of Defence capability investment and provides industry with the certainty to invest in people and infrastructure;
- the 2020 Defence Strategic Update, which sets out the Government’s response to our changing environment;
- the 2020 Force Structure Plan, which builds on investments made in the 2016 Defence White Paper in response to rapid changes in the global strategic environment; and
- the Defence Industry Policy Statement, which provides the foundation to take the partnerships between Defence and industry to new levels of cooperation, with a focus on stronger, more strategic partnerships and closer alignment between industry investment and Defence capability needs.

Industry’s role as a Fundamental Input to Capability was officially recognised in the Defence Industry Policy Statement, with Government formalising the pivotal role defence industry plays in generating military capability and supporting the ADF.
Modern battlefield advantage increasingly relies on technological advances such as integrated communications and networks, in addition to speed and manoeuvrability. A number of major procurements and upgrade programs are under way providing Australian industry opportunities to support the delivery of advanced next generation land combat and protected vehicles, including the increasingly sophisticated technologies integrated in and between platforms.

The 2018 Defence Industrial Capability Plan intends that Australian industry support the ADF to meet the challenge presented by today’s operational environment and tempo. Industry needs both the capability and capacity to design, develop, manufacture and integrate new systems and equipment, as well as the ability to upgrade and update these.

For the purpose of this Plan, “upgrade and update” are defined as follows:

- An ‘upgrade’ is an improvement to the quality or usefulness of a system or platform, or a change that incorporates a new function or component. An upgrade is generally connected with design changes to improve the systems’ capability or performance.

- An ‘update’ is the process of making a system or platform more modern or up to date. This term is generally used in connection with data or information, rather than design changes.

Ensuring Australia develops the sovereign capability to maintain lethal, relevant and effective capabilities in future requires broad Australian industry involvement across a number of vehicle acquisition and sustainment programs.

This Industry Plan includes both combat vehicles and protected vehicles. These variants are defined as follows and include a range of current and future in-service fleets:

- Combat vehicles – vehicles operated in sustained close combat and designed to generate warfighting advantage through lethality and protection systems.
Examples include, but are not limited to, the M1A1 Abrams Main Battle Tank (and its replacement, the M1A2 Main Battle Tank being acquired under Land 907-2); the Australian Light Armoured Vehicle (and its replacement, the Boxer Combat Reconnaissance Vehicle, being acquired under Land 400 Phase 2); and the M113 Armoured Personnel Carrier (and its replacement, the Infantry Fighting Vehicle, being acquired under Land 400 Phase 3). A quantity of both the M88A2 Armoured Recovery Vehicles and Armoured Engineering Vehicles (and bridges) will be acquired under Land 907-2 and 8160-1 collectively.

- Protected vehicles – vehicles designed to enable the safe movement of personnel and/or equipment through a conflict environment, however, not designed for sustained close combat.

This Plan does not address unprotected military vehicles. Although these vehicles are excluded from the scope of this Plan, it should be noted that at the sub-system level (such as the command and communication systems) there is a degree of commonality between land combat, protected and other vehicles.

Land combat and protected vehicles seek to achieve a balance between firepower, mobility and protection. These three requirements are commonly known as the iron triangle, and have guided the development of these vehicle platforms for decades.

The importance of these three factors has not changed. However, there are now an additional three considerations that defence forces are seeking to drive capability overmatch through armoured vehicle capabilities: networking, adaptability and autonomy.

The vision for land combat and protected vehicles and related technologies

The role of land combat and protected vehicles has evolved to meet new threats and better operate on the battlefield. Historically, they were considered a means of transporting human and physical assets which also provided ground forces with mobility, protection and lethal effects. While the requirement for these vehicles remains the same, they are now seen as a node in a complex communications and sensor network used to collect and distribute data. Modern vehicles: have enhanced stealth through the application of signature reduction techniques; are more mobile through improvements in power and drive train technology; and enable better reconnaissance and surveillance outcomes in land-based combat zones through the use of integrated sensors and communication equipment. As Defence continues to invest in processes and technologies that facilitates data collection and dissemination across platforms and domains, the significance of these vehicles in operations will continue to grow.

Land combat and protected vehicles, and their associated technologies, have evolved considerably over the past few decades. Enhancements to armour compositions and functions, the incorporation of missiles and other advanced munitions, and the steady advancements in networking capabilities, are among the capability improvements that underpin the strategic importance of these vehicles to the ADF. The ability of vehicles to securely transfer information between on-board systems and other ADF platforms is key to securing a warfighting advantage.

The ability to continue taking advantage of technological advancement through updates and upgrades to vehicles, now and over the platform's life of type, will help ensure they remain fit-for-purpose across a range of mission types and operational environments. This requires support from a resilient and innovative industrial base, and the ability to undertake a wide range of production and support functions in Australia.
The command, control, communications and computers capability within and around military vehicles is continuously being considered against the threat environment. Sovereign access to, or control over, a range of these capabilities is needed to enable the ongoing upgrade and integration of critical systems and sub-systems. This will help ensure that the ADF is able to respond rapidly to changes in its operating environment and advances in technology.

**Australia’s land combat and protected vehicles timeline**

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**KEY**
- Blue dot: Into service
- Purple dot: Out of service
- Black dot: Technology upgrades

**Techologies used by land combat and protected vehicle variants**

**Combat vehicles**
- Combat vehicles require sensors that enable data collection, robotic and autonomous functions, the turret, including fire control, soft-kill, hard-kill and active protection systems, as well as highly durable ballistic armour and fire protection. These requirements are in addition to the capability requirements for standard protected vehicles.
- Industrial complexity can be identified in the ability to manufacture, certify and repair vehicle armour, but the capabilities required to undertake these functions can be limited in the Australian sector or restricted by original equipment manufacturers through security and intellectual property provisions.

**Protected vehicles**
- Technologies integrated onto, or into, protected vehicles can include sensors to support situational awareness, communication and battle management systems, and lethality systems such as remote weapon stations and integrated weapon modules. Protection is provided through ballistic armour and blast protection.
- Industrial complexity is driven by integration within and across the vehicle fleet.

Figure 1. Technologies used by land combat and protected vehicle variants
By virtue of the roles of combat vehicles and protected vehicles, commercial sensitivities associated with the protective materials, and the complexity of technology operating inside the vehicle, these vehicle types require different levels of support and expertise within the industrial base. This Plan acknowledges that, in a globally connected world with deeply entrenched supply chains, it may not be possible from either an economic or capability perspective for Australian industry to do everything. In light of this, the Plan also seeks to differentiate between vehicle types where sovereign requirements and objectives vary.

**Existing sovereign capability**

Australian industry has deep expertise in the production and support of land combat and protected vehicles, stemming from the automotive sector which thrived in locations such as Geelong and Adelaide. While the design and build of these vehicles is, in many cases, the function of a global prime or its Australian subsidiary, hundreds of small-to-medium enterprises provide the supply chain backbone and critical in-country support functions. During the development of this Plan, it was evident that a substantial number of those organisations supporting Defence had their origins and built their expertise in the commercial automotive sector and continue to deliver products and services across a variety of industries.

Ongoing collaboration between Defence, Thales Australia and the broader small-to-medium enterprise base has also enabled an extension of this support with ongoing integration and capability assurance activities. These aim to realise continued enhancements to the Bushmaster and other protected vehicle fleets over their operational life. Supacat's High Mobility Transporter variants have also been manufactured, assembled and sustained by Australian industry, with Supacat fulfilling its first export of the High Mobility Transporter Vehicle from Australia to New Zealand in 2018.

BAE Systems' M113 Armoured Personnel Carrier and General Dynamics' Australian Light Armoured Vehicle are soon to be retired from service, after 56 and 25 years in service, respectively. Throughout their service, the fleets were subject to various upgrades and modifications by Australian industry.

Innovative Australian companies such as Electro Optic Systems design and supply remote weapons stations across a range of platforms, with world class armour produced by Bisalloy utilising Australian-made Blue Scope steel. Australian subsidiaries of companies such as Elbit Systems Australia and L3 Harris have also provided long term support to vehicle fleets through the integration of, and ongoing support to, the battle management system and tactical network radios, respectively. Australian companies like TAE Aerospace and Thomas Global have provided close support to fleet sustainment, TAE providing a heavy grade repair capability of the AGT-1500 tank engine, and Thomas Global providing electronic products and systems in support of other combat vehicles.

Extensive logistics support facilities have been established across ADF units and throughout the Joint Logistics Command network, the latter benefiting from multi-million dollar upgrades as part of the Defence Logistics Transformation Program delivered over 2012-2015. Joint Logistics Command engages industry partners to provide extensive support for land materiel maintenance and warehousing and distribution, a substantial part of which relates to land combat and protected vehicles support. Joint Logistics Command equipment maintenance is primarily focussed on equipment sustainment and some upgrade activities.

Joint Logistics Command engages a national maintenance service provider and numerous regional small-to-medium enterprises to conduct trade repair functions. Engagement with original equipment manufacturers is typically completed by the Capability Acquisition and Sustainment Group. Joint Logistics Command services may also be integrated into the sustainment of fleets as a part of establishing a broader vehicles support concept.

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**Export success for the Bushmaster protected mobility vehicle**

The last two decades have seen Australian troops deployed to various operational environments, putting our training and military capabilities to the test. The Bushmaster was developed in cooperation with the ADF to provide high levels of both mine-blast and ballistic protection, along with world-class mobility and communication capabilities. No Australian soldiers have been killed as a result of improvised explosive device strikes against the Bushmaster on operations.

Recognition of this is reflected in the global demand for this vehicle. The Bushmaster is among the strongest Australian military exports of the past decade. Since 2006, 150 vehicles have been sold to defence forces in New Zealand, the United Kingdom, Japan, Indonesia, Jamaica, Fiji and the Netherlands. Including associated support and upgrade work this has generated over $200 million in revenue and provided continuity to the manufacturing facility in Bendigo, Victoria. Thales Australia, supported by the Australian Defence Export Office, has significant vehicle export campaigns under way.
Given the publication of the Robotics Roadmap for Australia in 2018 and the broad utility of this technology set, there is a lively and expanding national robotics and autonomous systems ecosystem. Technology clusters, the Trusted Autonomous Systems Defence Cooperative Research Centre, academia, and a plethora of small-to-medium enterprises afford a potential opportunity to build Australian industrial capability in support of robotic and autonomous systems. The opportunity to harness this capability will continue to be factored into future land combat and protected vehicle platforms to sustain a technology capability edge.

Critical industrial capabilities

These could be an essential skill, technology, intellectual property, financial resources, infrastructure or some other industrial element that underpins the Sovereign Industrial Capability Priorities. Hence, we need assured access to, or control over them, to ensure the ADF's capability advantage.

When considering the design, development, manufacture and integration of land combat and protected vehicles and related technologies, four critical industrial capabilities have been identified to leverage current, emerging and disruptive technologies into capabilities which are ready for acquisition and integration into, and onto, existing and future platforms.

**PROTECTION TECHNOLOGIES**

Design, development and industrialisation of survivability and signature reduction material technologies and processes.

Protective materials - such as armour made from steel or aluminium, or transparent and composite armour - are essential survivability technologies that protect the on-board crew, cargo and other military systems. We need specialised welding and fabrication capabilities to enable the continued design, development and manufacture of protected vehicles in Australia, and to support assembly and repair of combat vehicles. Access to the requisite intellectual property, experienced metallurgists and qualified ballistic armour welders will be essential so these survivability systems for protected vehicles can be upgraded domestically over the life of the vehicles. An original equipment manufacturer's security and proprietary interests may restrict Australian industry participation in the development and upgrade of armour systems for combat vehicles. Where this is the case, establishing a sovereign armour production capability for these variants may not be cost effective or necessary as long as responsiveness can be assured through contracts.

Defence requires Australian industry to have the ability to design and develop technologies that provide effective physical and electronic signature management and to integrate these technologies onto and into combat vehicles. This provides Defence with surety and confidence when technological evolutions and changes in the threat environment occur and industrial support is required to modify and upgrade vehicle systems. These technologies are designed to reduce the platform's multi-spectral and thermal signatures and to minimise electronic emissions. While not essential for the technology itself to be manufactured in Australia, access to the intellectual property and a skilled workforce necessary to effect system updates and upgrades, and to integrate disparate systems, is required for industry to support the ADF in generating warfighting advantage.

**INTEGRATION, NETWORKING AND COMMUNICATIONS**

Vehicle and combat system integration, in particular the expertise to develop and implement solutions that enable interoperability of hardware and software, and the secure acquisition, analysis and dissemination of data.

As a node in a complex communications network, land combat and protected vehicles are best able to generate enhanced operational outcomes for joint operations when on-board systems are integrated effectively. The secure and uninterrupted distribution of data is required among other vehicles in the fleet, with other joint warfighting nodes in the multi-domain battlespace, and through to headquarters or command locations. The ADF's immediate aspiration for integration, networking and communications is to enable the transmission of data across platforms and operating environments, including the ability to interoperate with coalition partners. This critical industrial capability refers to both integration design and physical integration.
The ability to rapidly collect, analyse and distribute information, including the fusion of synthesised and assured data from different sources, has a direct impact on warfighting advantage. It provides greater visibility of the battle space to a larger number of battle groups/elements, and supports more informed decision-making. The interaction of hardware and software, in particular, the networking of systems and integration of sensors and weapons systems, enhances information exchange, situational awareness, lethality and survivability, with opportunities for offensive and defensive action more readily identified. Combat vehicles will continue to require both passive and active protection systems in future, and ongoing development of the software incorporated into these systems, leveraging technologies such as those enabling automated decision-making, will be critical for maintaining a capability edge as threats evolve.

Australian industry has the expertise to deliver the integration, networking and communications required in support of many land combat and protected vehicles. However, the underpinning technologies are rapidly evolving. As a result, there is a need for ongoing investment in the Australian workforce. Applying these skills requires understanding the platform and system design, making the retention of experienced individuals critical.

Access to intellectual property that enables hardware and software integration is another critical requirement. Australian industry should partner with Defence and other specialists to assess data collected and/or generated by sub-systems to develop Australian-designed solutions for ADF requirements. Australian-designed solutions would increase sovereignty by ensuring greater access to critical intellectual property.

**VEHICLE AND SYSTEM UPGRADES**

The systematic upgrade of vehicle systems at both the system and sub-system level including configuration management, interoperability and rigorous testing considerations prior to undertaking physical changes to the vehicle.

Technologies underpinning land combat and protected vehicle systems and sub-systems will need to continually evolve over the life of the vehicle platforms. Incorporating enhanced communications systems, sensors, weapon and fire control systems, and protection technologies into these fleets will require modelling, simulation, systems engineering, software engineering, configuration management and logistic support analysis capabilities. This will support the definition, design, test, acceptance and incorporation of design changes. Australian industry capability is also required for more transformational upgrades, which impact across fleets and sectors. For example, modifications to enable the use of alternative fuels, (such as those based on hydrogen), hybrid and high-density power supplies.

Vehicle and system upgrades will continue to be enabled by computer-aided design, modelling and simulation technologies. These draw upon established data models. These models define the physical and electronic attributes of the platform and its systems and sub-systems, performance metrics and environmental forces. Developing a system for land combat and protected vehicle power generation and distribution is also enabled by computer-aided design capabilities, with simulation enabling insights and adjustments to the design to occur before physical modifications are made to the platform. All vehicles subject to modification and upgrade must be tested prior to being introduced back into service, with simulation providing a more efficient and cost effective means of undertaking this testing.

**SUSTAINMENT**

The ability to forecast maintenance requirements, undertake platform, system and sub-system maintenance, and support update and upgrade enabled by data, a highly skilled technical workforce, and fit-for-purpose Australian infrastructure.

Depending on the platform variant and its operational profile, a land combat or protected vehicle may have an in-service life of up to 30 years. Fleet availability is critical for preparedness, which in turn requires effective planning and execution of platform and system maintenance and upgrade. Effective planning requires data, and the increasing prevalence of data collection and analysis tools (including but not limited to health and usage monitoring systems and predictive modelling technologies) enables continuous evolution of maintainability and reliability. These technologies allow for maintenance methodologies and practices to be optimised, which in turn allows for more informed contractual arrangements and enhanced preparedness.
Responsibilities for maintenance vary between platforms and systems, depending on specific operating concepts and the resultant contractual requirements. However, as a general principle, the Government's intent is that Defence and industry work together to optimise vehicle sustainment in Australia through the effective planning, scheduling, and execution of light, medium and heavy grade repairs. The original equipment manufacturer in many cases will undertake platform and system upgrades, noting intellectual property rights; however, where possible, these will occur in Australia. In theatre, the ADF must ensure that it is able to perform those maintenance tasks that enable land combat and protected vehicles to remain operational, which may include undertaking battle damage assessments and battle damage repairs where feasible. This may have implications for the workforce, skilling, access to intellectual property and engineering data, and support and test equipment.

Industry is considered one of the nine Fundamental Inputs to Capability – recognition of the importance of the symbiotic relationship that exists between Defence and its industry partners. Defence is reliant on industry to augment its staff with competent, qualified and authorised experts who, working together as one team, can ensure the timely sustainment of vehicle systems and the associated generation of capability. There is an increasing need to cross train defence industry personnel to achieve the levels of 'technical mastery' expected – close working relationships and appropriate policy arrangements are necessary to ensure this is achieved.

**Defence acquisition projects and programs**

The critical industrial capabilities described in this Plan apply to a number of current and future projects and programs. The following sample is based on the relevant programs identified in the Integrated Investment Program:

- **Land 400 Phase 2**: Combat Reconnaissance Vehicle
- **Land 400 Phase 3**: Infantry Fighting Vehicles
- **Land 907 Phase 2**: Main Battle Tank Upgrade and Land 8160 Phase 1: Under Armour Bridging & Breaching
- **Land 8116**: Protected Mobile Fires
- **Land 121 Phase 3B/5B**: Medium Heavy Capability
- **Land 121 Phase 4**: Protected Mobility Vehicle – Light

For new tenders in these projects, the critical industrial capabilities described previously will be included in the Australian Industry Capability Plan requirements. These form part of Defence's procurement documents, and industry must address these requirements in a way that optimises the development of industrial capability in Australia. Beyond this, the evaluation process will continue to address an array of factors in accordance with competitive tender conditions, with value for money, among other key criteria, remaining an enduring Commonwealth requirement.

**Recent evolution in Defence policy and strategy**

To ensure Defence continues to deliver the capability required by Government and can effectively adapt to the changing operational environment, Army has developed a series of strategies, plans and doctrine to better support land combat and protected vehicle acquisition and sustainment. Included in Annex B are high level summaries of the policy intent and industry implications of the following strategies and policies: Army in Motion, Army's Robotics and Autonomous Systems Strategy and the Chief of Army's Land Force Maintenance Directive and Land Force Supply Network Directive. Policy currently under development, such as the Land Force Support Models, is also discussed at a high level in Annex B.

While not focused specifically on land combat and protected vehicles, these have wider impacts upon the overall direction of current and future capability, including how industry is able to supply and maintain this capability on an ongoing basis.

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3 This list is not exhaustive. There are a number of additional Defence acquisition programs which include specific technologies or systems that may be integrated into combat and protected vehicles, including Land 121 Phase 4 – Protected Mobility Vehicle – Light and Land 400 Phase 2 – Armoured Personnel Carrier which have been a program with Primes Thales Australia and Rheinmetall Defence Australia respectively.
### Implementation and communication of Defence strategies and policies

Defence will continue to develop and implement internal strategies and policies pertaining to the acquisition and support of land-based capabilities and technologies, including those applicable to land combat and protected vehicles.

Resulting from the implementation of these strategies and policies will be a series of decisions and potential changes to Defence priorities, preferences and the solutions being sought from industry (for example, the Land Force Maintenance Directive seeks greater support from industry in the delivery of cross-training the Defence maintenance workforce and the ability to undertake more maintenance in theatre).

Defence will continue to improve how it communicates requirements to industry through a wide range of fora including briefings to State Government and Industry groups, the Land Environment Working Group, Land Forces Conference, project industry briefings, and specific project-related Australian industry workshops.

**Timeframe for implementation:** 2021-2022.

### Development of capability-based support models

The development of capability-based support models, termed the Land Force Support Models, will be developed in collaboration between the Capability Manager and Capability Acquisition and Sustainment Group, in order to optimise proactive investments from both Defence and industry in the land vehicle support system, and streamline activity. These support models are designed at Gate 0 and evolved throughout the Capability Life Cycle. Army will continue to work with Capability Acquisition and Sustainment Group, Joint Logistics Command and industry to refine these models ahead of finalising capability support arrangements.

This will provide clarity of Defence’s requirements for industry to effectively invest in research and development.

**Timeframe for implementation:** 2021.

### Future trends and technological evolutions

In the time horizon of this Plan, technological evolutions such as the development and study of new materials intended to reduce system and platform weight, and to enhance survivability, are expected to be a key focus for defence industry. Investment in the development of an open vehicle architecture is paving the way for greater flexibility in the technologies incorporated into the platform is enabling research and development in the industrial base. The design and development of sensors, autonomous functionalities, high-density power supplies, efficient vehicle transmissions, and alternative vehicle track materials is expected to become increasingly common in this time horizon.

Autonomous and robotic systems\(^4\) to be integrated into land combat and protected vehicles are likely to be key technological advancements over the coming decades. Autonomous capability is intended to enhance combat performance through the ability to rapidly identify, analyse and respond to battlefield threats in a consistent manner, with or without operator intervention. Semi and fully autonomous platforms are being developed to provide defence forces with a safer alternative for approaching or engaging a target, transporting equipment in the battlefield, and, in some cases, may provide additional benefits as a decoy, in terms of stealth and manoeuvrability. These vehicles may be operated independently, or as a companion to manned fleets. The key advancement in developing this technology is in the inputs to the software, the application of automated decision-making, and the integration of technologies that will deliver this capability edge, more so than the physical adaptation from a traditional land combat or protected vehicle.

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\(^4\) Autonomy is the ability of a machine to perform a task without human input, and therefore, an autonomous system is a machine, whether hardware or software, which once activated, performs some task or function on its own. Autonomy is enabled by software, artificial intelligence and advanced robotics (Robotics and Autonomous Systems Strategy 2019).
The adoption of autonomous and robotic capabilities, including the underlying decision-making technology (artificial intelligence), in the ADF will span from high human input such as remote control through to fully autonomous machine activity. The introduction of these systems and capability advancements into service will need to be foreshadowed by the establishment of ethical frameworks guiding their use in ADF operations.

Beyond the initial three-to-five years of this Plan, further technology evolutions are anticipated to influence land combat and protected vehicle capabilities. Trends such as hybrid and electric propulsion as well as increased demand for electric-powered on-board systems mean new technologies are encouraged to satisfy the demand for increased power requirements. Advancements in communication technologies that enhance secure transfer of information and data between vehicles and across the ADF, and advanced simulation technologies that provide more integrated and realistic training, are two major areas of anticipated technology growth. The development of hardware and software that enables the deployment of land combat and protected vehicles capable of being either manned or used autonomously is also predicted to be an area of focus over the coming decade.

<table>
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<tr>
<th>0-5 years</th>
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<tr>
<td><strong>Communications</strong></td>
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<td>Adaptive Networking Wideband Waveform</td>
<td>Semi-automated context-based distributed information management system</td>
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<td><strong>Materials/Armour</strong></td>
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<td>Ultra high molecular weight polyethylene</td>
<td>Protection modelling systems (blast ballistic and chemical)</td>
<td>Composite armour solutions for evolving ballistic and blast threats</td>
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<td>Signature modelling capability</td>
<td>Electromagnetic spectrum disruptive-pattern paint schemes</td>
<td>Smart armour</td>
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<td><strong>Other (including operating systems)</strong></td>
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<tr>
<td>Open vehicle architecture standard</td>
<td>Combined arms teams simulation</td>
<td>Third/fourth generation active protection systems</td>
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<td>Lightweight ranging and imaging sensors</td>
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Figure 3. High-level technology roadmap for land combat and protected vehicles – areas of focus for industry
CURRENT AUSTRALIAN INDUSTRIAL CAPABILITY

The industrial base supporting the manufacture and sustainment of land combat and protected vehicles in Australia is growing, adaptable and diversified. Many have successfully pivoted from other sectors and also supporting other parts of Defence. Original equipment manufacturers and small-to-medium enterprises dominate this market, undertaking a range of manufacturing, assembly and integration functions, primarily for protected vehicles. With the high transferability of skills and resources within these businesses, the ADF represents one of many key customers of the sub-sector. Transformation continues within the sector, with key drivers including the cessation of automotive manufacturing in Australia and the increased adoption of digitisation in manufacturing processes.

Australian industry attributes

Extensive consultation during the development of this Plan and analysis of the National Defence Industry Survey Report 2018-19 has provided insight into the composition and characteristics of Australia’s industrial base. The data used in this section is based on survey responses from organisations that indicated an ability to generate the Defence Relevant Industrial Capabilities for this Sovereign Industrial Capability Priority. 5

Size and Composition

The majority of respondents to the survey who indicated an ability to support this Priority are small- to-medium enterprises 6, representing almost 80 per cent of the industry sample. A large number of these organisations are component manufacturers (approximately 65 per cent), with only four per cent indicating the ability to support end-to-end manufacture, assembly and support services. This is largely consistent with the structure of the supply chain supporting ADF land combat and protected vehicle acquisitions.

The diversification of Australian companies from automotive sector and into defence and other sectors will require a level of capital expenditure in new equipment and facility modifications, as well as investments in workforce training and certifications. Approximately 20 per cent of survey respondents supporting the sustainment and repair-related industrial capabilities of this Priority indicated investing $5 million or more in capital expenditure in the previous financial year.

5 The survey, administered by the Centre for Defence Industry Capability in 2018, required industry to complete a range of questions in relation to their business and the industrial capabilities able to be generated with a Defence application. Approximately 1,800 organisations responded to this survey and the data collected was self-reported, not validated through other sources; accordingly there are limitations in terms of data bias and representation of the sector.

6 The survey categorises organisations as: micro (up to 4 employees), small (5 to 19 employees), medium (20 – 200 employees) and large (200+ employees).
Small-to-medium enterprise base

Approximately 60 per cent of the small-to-medium enterprises who responded to the survey and indicated an ability to support this Priority had a contract with Defence at the time of completing the survey. These organisations were diversified across Defence sub-sectors. A quarter of the small-to-medium enterprises generates over $25 million in revenue annually, with three quarters of those involved in component manufacture.

Most current Defence suppliers generate up to 25 per cent of annual revenue from Defence customers, primarily through vehicle component manufacturing. Interestingly, at the other end of the spectrum, those small-to-medium enterprises currently generating 76 per cent or more of their annual revenue from Defence customers are predominantly delivering sustainment and repair services. This indicates a small-to-medium enterprise base with broad expertise and a level of flexibility in supporting different Defence platforms and domains.

The survey also indicated a number of other attributes of the small-to-medium enterprise community:

- There appears to be additional capacity within the supply chain, particularly in the provision of sustainment and repairs. Of those respondents with the ability to support Defence, but who are currently not, 62 per cent are actively seeking to supply goods or services both directly and/or as part of the Defence supply chain.
- More than 70 per cent of small-to-medium enterprise respondents with an interest in supporting future Defence projects (irrespective of whether they currently have a Defence contract) generate industrial capabilities specific to component manufacturing and the provision of sustainment and repair services. Taking into consideration the strategic direction of Defence with respective to Australian industry support (as described in Annex B) and the structure of current and future land combat and protected vehicle acquisition contracts, opportunities for small-to-medium enterprises are expected in the near term.

Innovation

The ability to continue to diversify and to generate outputs more efficiently and at a lower cost is at the core of competitiveness within this sector, with investments in research and development expected to be targeted at these outcomes. The survey, however, indicates limited investment in innovation among the responding organisations. Perhaps reflective of the nature of the industrial capabilities generated by the bulk of respondents – predominantly component manufacture and the provision of sustainment services – spending on research and development was reportedly less than $250,000 annually for approximately 70 per cent of respondents. Almost 50 per cent of these organisations also reported the same quantum of spending on capital expenditure, however, it is unclear whether this was to sustain current production outcomes or to uplift existing practices and technologies, in line with advanced manufacturing trends.

As illustrated, of those organisations producing in excess of $25 million in revenue, the most common level of investment in research and development is between $0 to $250,000. This translates to 50 per cent of these organisations investing less than one per cent into research and development. Of the same revenue group, the most popular investment category is between $5 million to $10 million in capital expenditure. This indicates that organisations are tending to invest more in capital improvement assets, such as building and equipment, as opposed to innovation and improvement of existing processes and products.
Collaboration

There is a reasonable level of collaboration within the industry sub-sectors, with over 33 per cent of participating survey respondents collaborating with another firm or research organisation on defence industry subject matter. The primary contributors to this were manufacturing, assembly and repairs; there were fewer in component manufacture and support services. This was reinforced through industry consultations whereby those who previously competed in motor vehicle manufacturing signalled that collaboration across industry, Defence and universities was vital to survival in this current environment.

Global connectivity

Almost 80 per cent of the organisations who responded to the survey and indicated industrial capabilities relevant to this sub-sector do not currently earn export revenue. Of those who have customers internationally, almost all are supplying into overseas defence or security forces, with only a small proportion exporting only to commercial customers. This reflects the positive reputation Australia’s defence industry has on the global stage, particularly those generating land combat and protected vehicle industrial outputs.

Industry consultation

Organisation focus

We met with organisations representing all parts of the value chain and the full suite of critical industrial capabilities, including academia, industry representatives and research institutes.

NOTE: Organisations with various locations in Australia have been mapped to their primary location relating to this priority, and in some instances, where the consultation was held...
Industry value chain

The Defence value chain presents the activities involved in the design, development, production, and through life support of the capabilities defined within this Priority. Enablers and inputs to each activity are assessed for their relative impacts with a view to understand the strengths and weaknesses of the domestic industry as well as to determine if action needs to be taken to ensure that Defence has the access or control it needs in relation to this Priority.

The value chains for land combat and protected vehicles have been analysed separately to ensure differences in the capability life cycle are accurately defined, and the impacts on Australian businesses can be attributed, relative to strategic importance. To support analysis of the industrial base, each of the value chains, presented over the following pages, includes the steps Defence considers critical in the generation of sovereign capability for each - design, develop, manufacture and integrate, as well as update and upgrade, as stated in the Defence Industrial Capability Plan.

Combat vehicles value chain analysis presented below indicates the greatest potential impact on sovereignty is within sustainment and modification/upgrades. Among the inputs most significant for these value chain activities are intellectual property, complex and/or cross platform systems integration, operational test and evaluation, Australian infrastructure and technical skills.

This analysis is consistent with the views of Australian industry, who indicated greater involvement in the support of these platforms, from a supply chain perspective, required mechanisms to be in place where intellectual property could be easily shared and, at times, modified, to enable integration of systems and sub-systems. Some small-to-medium enterprises identified two key barriers to their competitiveness; the ability to train and maintain a technical workforce, and to access specialist maintenance and vehicle test facilities.

While Australia does not have existing capability to manufacture combat vehicles or support large scale integration of systems, there is an intent to move towards this and to transition (where possible) foreign sourced parts and components to Australian companies for production. This intent is evident in the approach for Land 400 Phase 2.
Protected vehicles value chain steps indicate the greatest potential impact on sovereignty is within manufacture, assembly/integration and sustainment.

With the established Australian industrial base in the manufacturing, sustainment and upgrading of protected vehicles, the ability to perform these processes is considered key to preserving the depth of capability currently in Australia. This enables continuity in support of the ADF and for other nations who also operate Australian-made vehicles. Global recognition of the superior performance of the Bushmaster vehicle, in particular, reflected in successful export outcomes suggests there may be a need to continue to grow capability and increase capacity within the Australian industrial base to deliver upon the heightened demand.

Preserving Australian capability requires ongoing access to and control of intellectual property, system design, and the facilities and workforce (both technical and non-technical) that underpin the production capability.

What do the value chains for land combat and protected vehicles have in common? The summary view indicates somewhat complementary requirements for sovereign protection. Both seek Australian capability and capacity with respect to technical skills and workforce to perform manufacturing processes through to modifications and upgrade; and both require access to facilities and infrastructure to enable through life support. Access to intellectual property to support vehicle assembly and modifications, complex engineering and integration capabilities to perform modifications over the asset’s life, and a responsive supply chain, all further impact sovereign outcomes and ADF preparedness.
Industrial processes supporting Sovereign Industrial Capability
Priority technologies

The industry supporting manufacture and sustainment of land combat and protected vehicles and associated technologies cannot be directly identified when looking at Australian economic data as the industrial classifications that underpin this Priority also apply to a range of industrial outputs (for example, general commercial vehicles). However, the ability for industry to utilise the requisite skills and technologies across multiple applications suggests analysis of the broader economy, leveraging Australia New Zealand Standard Industrial Classifications, is beneficial in determining the breadth and depth of industrial capability applicable to this Priority. Four industrial processes have been considered and are discussed in detail over subsequent pages:

- Motor vehicle and motor vehicle part manufacturing
- Fabricated metal product manufacturing (including metal coating and finishing)
- Automotive repair and maintenance
- Polymer product manufacturing (including tyre manufacturing)

Motor vehicle and motor vehicle part manufacturing

This industrial process includes the manufacturing, assembly and maintenance of motor vehicles or motor vehicle engines. There are many correlations with the industrial requirements of land combat and protected vehicles.

Industry observations

- Relative to other industrial groups, motor vehicle and motor vehicle part manufacturing has the smallest industrial footprint, representing five per cent of total businesses and 15 per cent of total employees across the analysis. This industry group generated more than 50 per cent of the total sales of the four groups in 2016-17.

- This segment attracts the highest average wages (approximately $73,000 per employee) of the four industrial processes considered within this analysis, noting that more than 33 per cent of the workforce achieves year 12 or below as the highest level of study. One explanation for this may be attributed to the ability of large manufacturing businesses to offer salaries at this level prior to the automotive decline, with salary levels preserved as the total number of employees declined. Between 2015-16 and 2017-18, the number of employees in this group decreased by 4.5 per cent.

- This group relies heavily on imported products and materials (approximately 40 per cent) to generate outputs, with the primary customer being households.

- A very small proportion of the outputs from this sector contribute to Defence (approximately one per cent, or $482 million), indicating high reliance on other industries to ensure viability and business continuity.
Other fabricated metal product manufacturing

This industrial process includes the manufacture of component parts with broad applications such as springs and wires, nuts, bolts and screws, and processes relating to metal coatings and finishings. Many of these parts and processes are required to produce and sustain the systems and sub-systems of land combat and protected vehicles.

**Industry observations**

- Similar to the aggregate of groups considered in this analysis, the majority of the businesses (80 per cent) within this industrial classification operates on the east coast of Australia, however, unlike other groups, businesses in this group are more distributed and have been identified in all states and territories. This reflects the diverse industrial need for fabricated metal products.
- This is the smallest employing industry of those analysed, accounting for 11 per cent of the total across all four industry groups. Sole traders are dominant in this group, with non-employing businesses representing 45 per cent. The need for specific accreditations and certifications to operate in Defence supply chains can present barriers for small business, and sole traders in particular, making it difficult to attract non-Defence suppliers to the sector where demand requires it.
- Engineering and technology-related qualifications comprise 25 per cent of the key skillsets underpinning this group. Both of which have been identified as critical skillsets in the manufacture and sustainment elements of this Priority. Enrolments in tertiary qualifications in these fields continue at a steady but relatively low rate.
- In 2015-16, four per cent, or $380 million, of the outputs from this industry contributed to Defence equipment.

Automotive repair and maintenance

The automotive repair and maintenance industrial process encompasses installing and repairing automotive electrical products and propulsion systems, repairing external body damage, and mechanical, repair and maintenance services for parts such as brakes, clutches, and gearboxes. This industrial process requires access to specialist infrastructure, test equipment and tooling, which can be specific to a particular class or variant of vehicle and results in some limitations on converting commercial capability to support land combat and protected vehicles.

**Industry observations**

- Of the four industrial classifications considered in this analysis, automotive repair and maintenance has the lowest average wage (approximately $48,000 per annum). The workforce's level of education has more than 40 per cent achieving year 12 or below as the highest level of study.
- Businesses in the automotive repair and maintenance category account for 75 per cent of the total number of identified businesses and employees across all four groups. Among the group, there is a high volume of small businesses. While there is a high concentration of east coast businesses, the group is distributed across all states and territories, reflecting broad industrial application for these products and services.
- Motor mechanics, motor vehicle parts and accessories fitters and automotive electricians represent more than 45 per cent of this workforce. Each of these occupations has relevant skill sets to support the ongoing maintenance of land combat and protected vehicles.
- Over 33 per cent of the workforce have studied in the automotive engineering and technology field. While this is a small field, enrolments have increased by 40 per cent since 2016. These skills can be utilised across all groups within this analysis.

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7 Categories of small businesses include non-employing businesses, micro businesses (businesses employing less than 5 people), and businesses employing 5 or more people, but less than 20 people (Australian Bureau of Statistics, 2001).
Polymer product manufacturing

Polymers are generally classified by their source of origin, including natural polymers that occur in nature (such as rubber) and semi-synthetic and synthetic polymers that require human intervention to modify or create (such as polyethylene, polypropylene, polystyrene, Teflon, and thermoplastic polyurethanes). Polymer product manufacturing refers to the industrial process that converts that material into a product; including both rigid and semi-rigid polymer products.

Polymer products are used in the manufacture of various vehicle components, including tyres, paint and coatings, and conveyor belts. Advanced polymers are used as part of combat technologies such as dissolvable polymers in sensors, with synthetic polymers having utility as an alternative to steel due to reduced overall weight. Polymers are also used across the broader economy to develop non-military products such as food and beverage packaging and construction materials, with military being a niche user of these products.

Industry observations

- 20 per cent of the polymer product manufacturing workforce have qualifications in engineering and technology, of which approximately 6.8 per cent represent mechanical and industrial fields.
- Relative to other groups, polymer produce manufacturing had the highest proportion of workforce with the highest level of study being year 12 or below (approximately 45 per cent). The average salary in this sector is approximately $70,000 per annum.
- In June 2018, there were approximately 3,000 businesses in Australia generating this capability, with 80 per cent located on the east coast, notably in Victoria (32 per cent). Over 50 per cent of these businesses are small businesses, hiring between 1-19 employees, and 11 per cent hiring more than 20 people.
- Over 25 per cent of the output from this industry support two construction-related industries (construction services and residential building construction) and a further 17 per cent to households. Defence is not a significant driver of demand within the polymer product manufacturing group.
- Australian made polymer products are generally consumed in country, with approximately 5 per cent of products generated by domestically being exported in 2016-17 (reflecting $1.1 billion in output).

National capability overview

There is considerable supply of technical expertise in this field, centred largely on the east coast of Australia. For example, automotive repair and maintenance, the most populous industrial classification, representing 75 per cent of total businesses with capabilities relevant to this sector, is concentrated in New South Wales, Victoria and Queensland. This is seen to reflect the quantum of vehicles used in those areas (many of which are private cars). Looking across all four industrial classifications, however, the geographic distribution is consistent, with Defence land vehicle assembly, support and test facilities primarily located in Victoria and Queensland, while also reflecting the large volume of inputs that come from the supply chains in South Australia and New South Wales.

A significant portion of companies across Australia able to generate capabilities relevant to this Priority (approximately 95 per cent) is categorised as small businesses⁸.

![Figure 6. State distribution of identified industries by number of businesses (2018)⁹](image)

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⁸ Categories of small businesses include non-employing businesses, micro businesses (businesses employing less than 5 people), and businesses employing 5 or more people, but less than 20 people (Australian Bureau of Statistics, 2001).

⁹ Source: Australian Bureau of Statistics catalogue number 81650.
This Priority aligns with the strategic intent of most Australian state and territory Defence strategies, with the strongest alignment evident with Queensland, Tasmania, New South Wales and Victoria. Defence-specific investments in Queensland are delivering advanced capabilities in heavy vehicle manufacturing, maintenance, modification, repair and overhaul. Victoria, Tasmania and New South Wales have all indicated ongoing interest and/or investments to support specialised vehicle activities within either design, manufacturing, and/or sustainment.

The impact of the automotive manufacturing sector is apparent in the Australian economic data. Consultation with those small-to-medium enterprises who pre-empted the change and diversified effectively suggest the real impact of the decline is yet to be felt in the defence sector.

The impact of the automotive industry in Australia has prompted change in the sector and across the economy. Consistent with macro trends, domestic demand for parts manufacturing is projected to decline significantly over in the next five years.

During consultations that informed the development of this Plan, organisations who previously focused on the automotive sector shared experiences of mergers, pivoting service, product and/or market offerings, as well as diversifying into other Defence and commercial sectors to enable viability and competitiveness. To a lesser extent, industry also sought growth through international markets with the low and declining Australian dollar previously attracting an export market. Per the Australian Bureau of Statistics data, more recent export initiatives have been met with varying success, with only 23 per cent of the organisations able to generate industrial capability relevant to this Priority currently exporting.

Global dynamics and opportunities

Defence forces across the globe operate a range of different combat vehicles accounting for variations in battlefield and mission requirements, user preferences, training and deployment activities. A nation's defence procurement policy also has a bearing on selection decisions. What is apparent, however, is the common objective to maximise build in a nation by investing in its land combat and protected vehicle capability and the broader defence industry. These policies impact global sector dynamics and opportunities, in particular where a procurement approach or process must be followed and/or a minimum of local build achieved. Looking specifically at land vehicles used in combat, there appears to be a preference for self-sufficiency and control of design among numerous international partners. This can make securing export sales challenging.

The Government continues to access the United States Government's Foreign Military Sales program to procure certain platforms and technologies. Australia's in-service Main Battle Tank, the M1A1 Abrams, was procured through Foreign Military Sales in the mid-2000s for interoperability reasons. The next iteration of Abrams to be procured under Land 907 Phase 2 Main Battle Tank upgrades will also have interoperability drivers. Foreign Military Sales procurements tend to present additional challenges for Australian industry seeking support and maintenance opportunities, with access to intellectual property and technical data governed by International Traffic in Arms Regulations. For these procurements, sustainment planning must be conducted effectively prior to acquisition, with careful consideration given to the level of support the ADF seeks for its land combat and protected vehicles in-country. Defence will seek to maximise opportunities for Australian industry in key functions such as sustainment and technology upgrades.

As illustrated by the evolution of in-country maintenance over the life of the M1A1 Abrams, Australian industry has developed the expertise to support the tank's gas turbine engines and, given the opportunity, could continue to do this and more to enhance sovereignty outcomes in line with this Plan.

Multi-billion dollar vehicle acquisition programs, such as the Land 121 program, and Land 400 Phases 2 and 3, have attracted global primes to set up Australian subsidiaries enabling greater participation and opportunity for Australian industry. Rheinmetall Defence Australia's Military Vehicle Centre of Excellence in Redbank, Queensland is an example of this. At this facility Rheinmetall will build the Land 400 Phase 2 Combat Reconnaissance Vehicles and provide maintenance of these vehicles and Defence's Land 121 truck fleet. In addition, the company plans to conduct maintenance of other Rheinmetall products from this location, including those operated by other militaries. With these global primes also competing for large defence force contracts in other nations, such as the upcoming Next Generation Combat Vehicle program in the United States, further opportunities are available to Australian small-to-medium enterprises who demonstrate requisite capability in the provision of sub-systems, components and other services to build into global supply chains.
Over the past ~15 years, sovereign capabilities in design, development and production of protected vehicles have been developed within Thales Australia and across the Australian industrial base.

Located in Bendigo, Victoria, this government-owned facility began operating in 1942 as the Bendigo Ordnance Factory, producing heavy artillery and naval guns. In 1999, the facility was privatised and operated by ADI before being taken over by Thales in 2006. Hoffman Engineering acquired five hectares of land and workshops in 2010 to perform heavy fabrication, machining, gearbox manufacturing and overhauls, and heat treatments.

The Thales facilities (including the service and support centre in Brisbane, Queensland) and its approximately 450 employees now manufacture and maintain the Bushmaster and Hawkei Protected Mobility Vehicles. The supply chain supporting the production of the Bushmaster and Hawkei vehicles is significant and predominantly Australian based. For many small-to-medium enterprises, work on these platforms has provided continuity to their operations and enabled investment in people and facilities, as well as diversification into other domains within Defence and adjacent industries.

### Bushmaster Protected Mobility Vehicle
- Procured under Land 116, beginning delivery in 2004
- Over 1,000 Bushmasters have been built and delivered to the ADF
- Nine variants of the Bushmaster have been developed: troop, command, mortar, assault pioneer, direct fire weapon, ambulance, electronic warfare, general maintenance and air defence
- New and refurbished Bushmasters are operated by eight defence forces across the world, including Australia, the Netherlands, United Kingdom, Japan, Jamaica, Indonesia, Fiji and New Zealand
- A wide range of mission fits have been integrated and modifications made to Bushmaster, including remote weapon stations, mine clearing equipment, counter improvised explosive device jammers, electrical power upgrades, communications equipment and ballistic and blast protection enhancements. Many of these requirements were operationally urgent tasks
- There are over 120 suppliers for the Bushmaster protected mobility vehicle, predominantly located on the east coast of Australia

### Hawkei Protected Mobility Vehicle – Light
- Procured under Land 121 Phase 4
- Announced by the Australian Government to procure 1,100 vehicles and over 1,000 companion trailers
- Approximately 100 vehicles have been built and delivered for testing, with remaining vehicles and trailers to be delivered between now and 2022
- The Hawkei provides a similar level of protection as the Bushmaster, but is smaller and lighter.
- Thales Australia invested over $50 million in the design and development of the Hawkei. The build phase alone contains more than 55 per cent Australian industry content
- There are over 90 suppliers for the Hawkei, again predominantly located on the east coast of Australia

The presence of the Thales protected vehicle business in Australia has enabled the provision of a tailored support system to the ADF and the ability to optimise operational availability. An in-country design house for the development and adaptation of in-service vehicles provides responsiveness and allows Thales and Defence to work together to ensure vehicles remain highly capable throughout their operational life. The effectiveness of this sovereign capability has been repeatedly demonstrated through the provision of support to evolve vehicle capabilities to meet varied operational requirements over the last decade.

Export of the Bushmaster presents an opportunity for the Australian supply chain and for the ADF. A larger global customer base may enable greater certainty while also facilitating longer term and more deliberate research and development and production activities, which support longevity of the supply chain.
Workforce and technical skills

In 2017-18 there were 221,944 people employed across the four identified Australia New Zealand Standard Industrial Classifications with relevance to this Priority, increasing from 212,590 people in 2015-16, equating to four per cent growth. According to the Australian Bureau of Statistics, these four classifications represented less than two per cent of the total Australian workforce in 2017-18.

Automotive repair and maintenance is the primary contributor to workforce and sector growth, increasing by nine per cent since 2015-16. The growth in the value of imports and greater demand for repair and maintenance services are anticipated. The workforce continues to be redirected from automotive manufacturing to repair and maintenance, bridging the skills across the value chain.

Across the four classifications, approximately 40 per cent of the workforce are represented by those where the highest level of education is Year 12 or below, and a further 30 per cent of the workforce are technical professionals primarily in the engineering and technology fields, with roles such as Automotive, Mechanical and Industrial Engineers. The remaining 30 per cent reflect a range of supporting business services operating in the sector.

During the consultations, industry discussed the depth of expertise across a range of technical skill sets, generated largely as a result of on-the-job training and extensive experience across a variety of applications. Among these were welders, in particular those working with protective materials, electricians and machinists.

The structure of the Australia New Zealand Standard Industrial Classification framework was not designed for data collection and analysis to describe the communications, electronics and integration capabilities that complement the automotive industrial classifications referred to in this section. Based on broader research and consultation with industry, the breadth of tertiary qualified professionals needed to support this sub-sector was reinforced, as was the need for the workforce to transition from traditional manufacturing skill sets to those which enable the optimisation of technology; for example, machinists with advanced programming capabilities. The ability to employ the workforce of the automotive manufacturers does not necessarily translate automatically into the specific skilled professionals needed for this sub-sector.

Figure 7. Number of employees by industry group

Across the four classifications, approximately 40 per cent of the workforce are represented by those where the highest level of education is Year 12 or below, and a further 30 per cent of the workforce are technical professionals primarily in the engineering and technology fields, with roles such as Automotive, Mechanical and Industrial Engineers. The remaining 30 per cent reflect a range of supporting business services operating in the sector.

During the consultations, industry discussed the depth of expertise across a range of technical skill sets, generated largely as a result of on-the-job training and extensive experience across a variety of applications. Among these were welders, in particular those working with protective materials, electricians and machinists.

The structure of the Australia New Zealand Standard Industrial Classification framework was not designed for data collection and analysis to describe the communications, electronics and integration capabilities that complement the automotive industrial classifications referred to in this section. Based on broader research and consultation with industry, the breadth of tertiary qualified professionals needed to support this sub-sector was reinforced, as was the need for the workforce to transition from traditional manufacturing skill sets to those which enable the optimisation of technology; for example, machinists with advanced programming capabilities. The ability to employ the workforce of the automotive manufacturers does not necessarily translate automatically into the specific skilled professionals needed for this sub-sector.

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10 Source: Australian Bureau of Statistics catalogue number 81550
Key workforce requirements include, but are not limited to:

1. **Technology integration**: systems engineers and other technical professionals with core systems integration skills and deep experience working on specific land combat and protected vehicle platforms are needed to manage the configuration and upgrade of platforms over time.

2. **Data analytics**: the ability to collect, interpret and analyse the information coming out of the vehicles, both environmental data and vehicle performance data, is critical to ensure effective sustainment practices are established and enable preparedness. While the data analysis capability may reside within Defence, there is a need for industry to support this through the design of the data collection function and the ability to implement enhancements to systems and processes revealed through the analysis.

3. **Robotics and artificial intelligence technologies**: the ADF and industry are increasingly embracing evolving automation technologies, including autonomous capability and machine learning. Access to a variety of engineering skill sets, including software, robotics, mechanical and electronic engineers, software developers, programmers and computer technicians, are expected to be required in much greater volumes to support land combat and protected vehicle activities across the value chain.

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## CASE STUDY

**W&E Platt Mounts and Ordnance - growth fuelled by local expertise, performance and understanding**

W&E Platt based in Ingleburn, New South Wales, is a 100 per cent Australian-owned enterprise, incorporated in 1980 with over 35 years of combat-focused design and manufacturing experience. W&E Platt specialises in the design, manufacture and installation of weapon mounts for combat and protected military vehicles including the Bushmaster and Hawkei Protected Mobility Vehicles.

The company has consistently demonstrated required performance and reliability in training and operational environments. W&E Platt has worked closely with the Australian and international defence forces and original equipment manufacturers to understand their requirements, develop concepts, undertake prototype build and test validation. Platt weapon mounts and accessories are designed using in-house Solid Edge 3D Computer Aided Design and Finite Element Analysis with the FEMAP engineering analysis program, which enables the company to offer innovative and broader solutions to bespoke requirements, including rapid prototyping and testing.

This significant local capability has enabled outstanding responsiveness to urgent Australian operational requirements. W&E Platt also work particularly well with the ADF to prepare and supply complete technical publication packages including documentation for installation, operation, maintenance and training to ensure the capability can be fully introduced into service. Tight production schedules are met with the use of an in-house manufacturing capability.

W&E Platt has supported the Australian Army’s conditions-based maintenance philosophy to drive on-going maintenance costs down. The company’s “Inspect and Repair Only As Needed” service ensures that the customer pays only for the repairs that are actually required to return an item to a serviceable/as new condition.

In addition to the capabilities supplied to the Australian Defence Force, W&E Platt products have been successfully exported to over 40 countries including: United States, Canada, New Zealand, United Kingdom, France, Poland, Netherlands, Sweden, Finland, Czech Republic, Spain, Italy, Germany, Turkey, Brazil, Peru, Chile, Colombia, UAE, Kuwait, Saudi Arabia, Malaysia and Indonesia.
Assets and infrastructure

Defence and industry contribute to this Priority through specialist assets and infrastructure used in the research, design, manufacture and sustainment of land combat and protected vehicles and associated technologies.

The ongoing repair, maintenance and upgrade of land combat and protected vehicles and associated sub-systems requires access to fit-for-purpose facilities and a technically skilled workforce to meet both training and operational requirements. The motor vehicle and motor vehicle part manufacturing industrial group will need to continue monitoring sector trends and adapt accordingly in order to remain competitive (e.g. adopting Industry 4.0 to increase automation, reducing costs, and enhancing precision of components).

Figure 8. Summary of assets and infrastructure enabling land combat and protected vehicle activity

Facilities for land combat and protected vehicle testing, support and maintenance

Defence requires independent test, support and maintenance facilities to validate performance of vehicle systems and sub-systems across each step of the value chain. Industry requires access to facilities to continue innovating their capability, and improve proof of concept and production to ultimately lead to contracts with Defence.

Key facilities supporting land combat and protected vehicles are the ADF’s unit-level maintenance facilities and seven Joint Logistics Command business units located in all states. ADF unit maintenance facilities are capable of light and medium grade maintenance. Joint Logistics Units provide additional light and medium grade maintenance capacity and limited heavy grade repair, modifications, and vehicle upgrade capabilities. Industry facilities have typically focussed on the manufacture and assemble activities bespoke to Defence vehicles at the whole of platform level and are less specialised at the component manufacture level. Industry also support vehicle maintenance activities through either dedicated facilities specific to select vehicles or through more generic heavy vehicle repair and maintenance facilities servicing an array of commercial and Defence clients. In addition to supporting maintenance activities, Defence industry continues to invest in their own facilities to support ongoing research and development, manufacturing, test and evaluation, and in time, vehicle assembly where this provides value to Defence.
Grades of repair and maintenance

<table>
<thead>
<tr>
<th>Grade of Maintenance</th>
<th>Description</th>
<th>Responsible (generic case)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operator maintenance</td>
<td>Maintenance carried out by equipment operators, including minor repair, part replacement, minor adjustments, parade servicing, scheduled servicing and non-technical inspections.</td>
<td>ADF unit operator</td>
</tr>
<tr>
<td>Light grade repairs</td>
<td>Maintenance tasks that can be carried out in the unit by maintenance personnel of the unit, using portable tools and a limited range of fast moving repair parts.</td>
<td>Defence</td>
</tr>
<tr>
<td>Medium grade repairs</td>
<td>Maintenance tasks that require greater engineering capacity than what can be provided by unit maintenance personnel and technical support sub-units. These tasks are limited to assembly and module replacement.</td>
<td>Defence, and in some instances, industry partners</td>
</tr>
<tr>
<td>Heavy grade repairs</td>
<td>Maintenance tasks that require extensive engineering facilities. These include repairs to individual components, overhaul of assemblies and modules, and overhauls and rebuild of major items of equipment.</td>
<td>Original equipment manufacturer, industry partners, or Defence, where feasible</td>
</tr>
</tbody>
</table>

Table 1: Grades of repairs and maintenance

The other key facilities supporting the testing, support and maintenance include both Defence and industry owned and operated facilities.

### Defence operated facilities

Victorian-based Land Engineering Agency managed facility, Monegeetta, is an accredited test service provider for land vehicles. In addition to the vehicle testing range which spans in excess of 30 kilometres, the facility includes climatic testing chambers, communications testing, thermal imaging equipment, electromagnetic chamber, and live fire facilities.

### Industry operated facilities

Privately owned facilities, such as Australian Automotive Research Centre, have been used previously when industry do not have access to specialist Defence testing facilities such as Monegeetta. The Centre, located in Victoria, is a vehicle proving ground used to test passenger cars through to heavy vehicles in a range of terrain and driving conditions.

Construction of the Military Vehicle Centre of Excellence located in Redbank, Queensland was recently completed. The $117 million investment into the 11 hectare facility is intended to support the military vehicle industrial network and enhance Australian industrial participation in major land combat and protected vehicle programs such as the Combat Reconnaissance Vehicles being procured under Land 400 Phase 2. This facility will be able to provide industry with access to support vehicle design, manufacturing, testing and training facilities, electromagnetic capability chamber and simulations. With the exception of disposal, this facility will be able to support industry in the end-to-end value chain.
Risks to domestic industry

The industry supporting this Priority is mature, adaptable and diversified, many having successfully pivoted from other sectors and other parts of Defence. Noting impacts from the Australian automotive industry, and requirement for adaption of rapidly evolving technology, this industrial base needs to continue to build resilience to remain competitive in an international marketplace.

Increasing competition for technical workforce

There is high and increasing competition for a technically skilled workforce, which is continuing to impact across businesses and industry sectors. Over the past decade, workforce requirements have shifted from a traditional blue collar, heavy manufacturing workforce towards more technology and engineering-focused requirements. This is being driven by transformative processes and technologies, such as additive manufacturing and machine learning, and digitisation across the economy.

There is still demand for technical trades; however, industry reported that these resources can be hard to attract if they aren't already in location (apparent reluctance to relocate) or if they can generate a higher income elsewhere. The inability to preserve some specific skillsets as the automotive industry continues to decline poses a particular challenge to both manufacturing and sustainment businesses. There is a need to understand the foundational aspects of a product or task to effectively transition and deliver in an advanced manufacturing environment, or where systems integration requires extensive ‘hands on’ experience.

Engineers, programmers and other technical backgrounds are highly sought after, and it has been widely reported that projections of the volume of trained professionals coming out of vocational education institutions and universities in Australia will need to increase to meet the future demands of the defence industry. Competition for workforce is high, particularly among primes, and is expected to increase as more Defence programs start delivering, such as the Naval Shipbuilding Program. This competition is driving high wages, which small-to-medium enterprises cannot compete with, making it more difficult to attract and retain trained staff in roles, especially in regional areas. In some cases, it was suggested that the loss of workforce to primes also resulted in the inability to deliver against prime contracts and subsequent loss of work. Industry indicated that due to these challenges, they are forced to look for skills from overseas. Migration restrictions and extensive lead times, along with Defence security requirements, limit the success of this approach.

The challenge in attracting and retaining a pool of skilled workers, in the volumes needed by the defence sector, presents a key risk to sovereign capability as related to land combat and protected vehicles. Government and industry will need to continue to work with high schools, vocational education institutions, and universities to address this.
Transition of the manufacturing industry

With the rapid pace of technological change in this sub-sector, there is a need for industry to pre-empt and adapt production and support capabilities to remain relevant and competitive within the Australian industry and internationally. These technological advancements often come at a high capital cost; putting pressure on business to make timely and informed investment decisions.

Introducing automation and digitisation to the production environment, while initially costly, can shorten production timelines, reduce processing and labour costs, and potentially enhance product quality and output. Businesses who do not adapt to these approaches are at risk of becoming non-competitive as their customers source the same, or a similar product, offshore for less cost.

With the introduction of these technologies comes a shifting requirement for skills and workforce – less hands-on technical work, and a greater focus on processes and programming. With this comes a need to also up-skill the workforce to align with new business processes.

Continuity required to retain a competitive sector with the capacity needed

The key industries supporting this Priority are mature and diversified, but have been highly change affected in recent decades. Businesses in the automotive manufacturing sector have pivoted parts of their operations into different industries and/or moved into different parts of the value chain, to remain viable. Governments, industry associations and others should continue to offer proactive support to these businesses to encourage investment in facilities and workforce; to ensure they continue to operate and deliver high-quality outcomes for Defence.

Small-to-medium enterprise vulnerabilities

A common theme across the industry consultations in the development of this Plan was the vulnerability felt by small-to-medium enterprises in their relationship or interaction with prime contractors, including around intellectual property ownership and work share.

Some small-to-medium enterprises stated that the time allocated to respond to prime contractor-issued requests for tender often prohibited securing work share, with primes (anecdotally) claiming that no local industry capability exists because the responses received in the limited timeframe were not up-to-standard. Unlike primes, in a small-to-medium-sized business, the individuals responding to a request for tender do so in addition to their standard role – there are no bid teams.

During the development of this Plan, it was reported by industry that, to win a tender with a prime, often the intellectual property associated with their product is required to be transferred to the prime under the contract. Businesses reported that they conceded to the intellectual property transfer to remain competitive, but many do not have confidence that this will not be used as a means of consolidating work share, which would have a negative impact on suppliers.

Defence will continue to work closely with industry and strive to ensure Australian small-to-medium enterprises are provided better opportunities to contribute to Defence procurement, including through enhancing the Australian Industry Capability Program.
Enhancing the Australian Industry Capability Program

Defence will enhance the Australian Industry Capability program through contractual and non-contractual mechanisms with a focus on cooperation, communication, contracting and compliance.

Defence will establish an independent Australian Industry Capability Audit Program to validate Australian Industry Capability performance against contracted commitments.

This program will ensure that our procurement continues to contribute to an advanced, capable ADF, which is supported by an enduring Australian industrial base.

Timeframe for implementation: Late-2020.

Small-to-medium enterprises seek strategic direction from primes and the Commonwealth to guide industry investment

Land 400 Phase 2 and 3 represent two major acquisition programs in the land vehicle domain for several years to come. For those among industry who have secured, or are in the process of securing, long term roles in these programs, there is a level of certainty in the future Defence pipeline. Where available, through life support plans will provide industry with sufficient knowledge of anticipated future upgrades, permitting certain investments in innovation and capital projects, as well as the foundation for diversifying into other programs or industry sectors. Availability of Defence through life support plans at a time where such investments can be made, is limited, as is an enterprise-wide view of build, upgrade and support requirements. This is for industry to navigate, and it is at their own commercial risk to take to invest in research and development or in other capability enhancing systems and technologies.

For the most part, industry acknowledge the positive changes that have occurred in recent years since the formal recognition of industry as a Fundamental Input to Capability and the enhanced support, collaboration and consideration provided by Defence. Where information sharing can continue to be proactive, industry will be more prepared and better able to provide innovative, cutting-edge solutions to Defence. Industry have estimated a five-to-seven year timeframe required for developing and introducing new technologies. Where requirements are unknown or sufficient time isn't permitted for development, industry won't be able to develop, test and validate new technologies that generate the best capability advantage for the ADF, presenting a risk that the capability procured is dated prior to, or shortly after, being introduced into service.
Maximising Australian industry participation

**Long-term viability of Australian industry is not dependent on Australian manufacture or ownership. Strengthening local industrial capacity will be achieved by maximising industry activities across systems and sub-systems, and across the land combat and protected vehicle value chain, while embracing collaboration.**

Australian industry has proven its capability to design, manufacture, sustain and upgrade protected vehicles through previous Defence vehicle programs. Building on the Government's ambition to maintain this capability and grow Australia's market presence, there is a significant ongoing export opportunity for protected vehicles, building on the success of Hawkei and Bushmaster export profiles.

Based on initial advice from the Land Force Maintenance Directive, the starting position for contracts would seek for all land combat and protected vehicles to be able to be maintained in Australia, up to and including third line maintenance and battle damage repairs, with system and sub-system upgrades executable by local industry.

With respect to combat vehicles, there is an intent to increase assembly and maintenance in country, where possible, acknowledging limitations in relation to Foreign Military Sales procurements. It is anticipated that the primary design and certain manufacturing functions may continue to reside overseas. However, these activities would be welcomed by the ADF where industry could deliver a cost effective and technologically suitable platform.

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**CASE STUDY**

**FormCUT – innovation through collaboration**

FormCUT is a specialist designer and manufacturer of foam and packaging products for specific Defence materiel. The company, based in Adelaide, has operated since 1999 and has been active in both Defence and other commercial sectors; previously working with SAAB Australia, Thales Australia and Electrolux.

In recent years, FormCUT formed a partnership with Redarc and Intelli Particle to develop new targets for the Australian artillery. This partnership was formed in response to Army's requirement to rigorously test the SMArt155 anti-armour modular artillery projectile. This precision guided munition uses infrared and radar sensors to target vehicles in operation and, until recently, had not been tested in an operational environment due to an inability to realistically generate vehicle thermal signatures without large complex equipment setup.

The collaboration between FormCUT, Redarc and Intelli Particle produced a low-cost, low-power, easy-to-replace and environmentally friendly target that generated a realistic vehicle thermal signature that the SMArt155 could detect. These targets were used in Exercise Chimera, where Defence performed the first test of the SMArt155 in an operational environment. Following this success, FormCUT and Intelli Particle formalised a partnership called IntelliForm.

FormCUT pointed out several advantages to collaborating, such as it:

- allowed Intelli Particle to have support when working with Defence for the first time. Intelli Particle had concerns around intellectual property protection when working with Defence.
- could allow small-to-medium enterprises to form the supply chains that both Defence and the primes want. By complimenting each other's skills, the risk for Defence and primes to use small-to-medium enterprises within their supply chains would be reduced.
- means that the small-to-medium enterprises do not have to mould their entire business to suit a particular prime, and can instead focus on producing products.

Defence is supportive of these types of collaborative arrangements as they often lead to faster development of agile solutions.
BUILDING INDUSTRIAL CAPABILITY

Industry capability enablers

Broad consultation with Defence and industry, analysis of the value chain, and deep consideration of the ADF's strategic ambitions and outlook, has resulted in the identification of three key enablers that underpin Defence's enduring land combat and protected vehicle capability. These are: investment in the development of an indigenous autonomous systems capability, processes and governance to grow systems integration expertise and participation among small-to-medium enterprises, and more structured processes for collecting and analysing performance data for people and vehicles, and for collecting and disseminating environmental data.

1. Investment in the development of indigenous autonomous systems capabilities, inclusive of a highly skilled workforce and intellectual property that enables ongoing and agile evolution of land combat and protected vehicle technologies

Significant technology strides are being taken in evolving semi-autonomous and autonomous vehicle capabilities. Investments are being made by defence forces across the globe in incorporating a range of autonomous vehicles on the battlefield, with the uses spanning from intelligence gathering through to logistics support.

Defence requires access to, or control over, the development and ongoing evolution of autonomous technologies to ensure precision of operating patterns and behaviours reflect that required of the ADF; with a key attribute of autonomous technology being artificial intelligence and machine learning.

Defence is undertaking concept development ahead of developing capability requirements, but it is expected that industry will lead the exploration and development of autonomous systems and related capabilities. Civilian demand for technology such as autonomous trucking, public transport and cars will likely drive industrial investment.

These technologies present significant opportunities to the ADF in enhancing warfighting capability, while also potentially removing soldiers from the future battlefield. A commitment to investment by Government and others must compliment a clear direction from Defence on priorities and objectives. A delay in investment may lead to a missed opportunity in developing an indigenous capability.

While autonomous systems and associated technologies will mature considerably in coming years, it is unlikely that such systems will be introduced into service in the three-to-five year timeframe of this Plan. Defence will continue to conceptualise the autonomous systems and future capabilities required by the ADF, and provide direction and clarity to industry to align appropriate investment in research, development, systems design, and workforce skilling.

2. Establishing processes and governance mechanisms to enable systems integration expertise to grow among the Australian small-to-medium enterprise base

The ability to undertake modifications and upgrades of systems and sub-systems to the desired effects for the ADF is critical in the pursuit of sovereignty for land combat and protected vehicles. To enable this, industry needs access to a skilled workforce to execute integration requirements (both hardware and software), and facilitate planning for ongoing upgrades and modifications, while meeting minimum asset availability requirements. Furthermore, the demand for integration skills will increase as the ADF continues towards a joint force, including the requirement to support interoperability with allied nations and open architecture.

Small-to-medium sized enterprises are well placed to support the systems integration functions, which are often managed closely with the platforms' prime and/or original equipment manufacturer. While primes may be reluctant to share intellectual property with other primes, this is less so with small-to-medium enterprises. Small-to-medium enterprises are either supplied minimum levels of intellectual property, or are required to replicate it to configure the systems to the desired specification to meet the ADF's requirements. Where small-to-medium enterprises are able to generate their own intellectual property as part of this activity, it provides them with an enhanced offering. Further processes and parameters regarding access to intellectual property provisions would optimise the upgrades and modification process, while enabling agility for ongoing enhancements.
The ability to reconfigure a land combat or protected vehicle to better suit the battlefield environment can enhance warfighting capability. Similarly, the rate of technological evolution makes sustaining a warfighting advantage much more difficult. To continuously meet the ADF requirements, access to intellectual property and a skilled workforce is pivotal.

**Engineering development program**

Working within the Defence Industry Skills Support initiatives, specifically the Defence Industry Internship Program and School Pathways Program, Defence will explore options of an engineering development stream or program focused on students and graduates with an interest and appropriate qualifications to support a career in the defence sector, focused specifically in the software, robotics, mechanical, systems and electronic engineering fields. This program will seek to identify and incentivise students with these skillsets to pursue careers in the Australian land combat and protected vehicle technologies industry.

The program, subject to security requirements and interest from industry partners, would provide participants with rotations across Defence and industry facilities and factories, enabling on-the-job skills development.

Timeline for implementation: 2021

**Standardised architectures**

Defence is specifying standards to support enhanced integration and interoperability of systems and platforms to enable industry to make more informed decisions in relation to research and development and other investments.

Of note, the Australian General Vehicle Architecture (GVA) was published in December 2017 and the Vehicle Standard Operating Environment (VSOE) is currently being developed. These standards will define integration parameters and governance requirements applicable to land combat and protected vehicles and related technologies.

Defence will seek to continue to implement the standards as practicable, and as part of this, pursue a communications approach with industry that supports awareness and understanding.

Timeline for implementation: Early 2021.

**CASE STUDY**

**Boeing Defence Australia – Enabling the joint force**

Although traditionally known as an aerospace company, Boeing Defence Australia identified similarities across the air and land domains, particularly in the communications, combat and data management, and electronic architecture requirements.

Boeing Defence Australia leveraged its experience from joint operations and communications projects and applied the technology and concepts in the land space. As the land domain becomes more information-centric, with increased requirements for command and control, Boeing Defence Australia is able to apply their command and control experience from aerospace and joint operations to standardise the equipment used to handle data within a variety of vehicles, including those used for land combat. As part of Land 2072 Phase 2B Project Currawong, Boeing Defence Australia designed and produced the new Integrated Battlefield Telecommunications Network. The electronic architecture design and integration delivered through this project has enabled the development of scalable and easy-to-operate communications capabilities delivered in a mobile headquarters vehicle.

To support assembly and testing of the communications network delivered under Project Currawong, Boeing Defence Australia opened a $7.5 million assembly and test facility in Queensland in October 2019.

To maximise their ability to work across domains Boeing Defence Australia has moved to a capability model matrix organisation structure with capability managers responsible for their capability across domains.
Comprehensive and structured data collection and analysis techniques for the assessment and dissemination of user and vehicle performance information, and enabling situational awareness

Land combat and protected vehicles have moved from a safe mode of transportation to a node in a complex communications environment. In both operational and training environments, land combat and protected vehicles are collecting a significant volume of data, including vehicle performance and situational surroundings, most of which has an opportunity to be further leveraged to increase the physical performance of the vehicle and to gather intelligence.

Gathering and analysing vehicle performance data, such as that from the health and usage monitoring systems, is critical to understanding not only how the vehicle is performing, but how elements, such as time idling, impact the performance and overall longevity of the vehicle. The data has the potential to enable modelling and simulation of specific environments and scenarios to generate performance assessments, all of which can inform sustainment planning and upgrade cycles.

As the role of land combat and protected vehicles has evolved, largely driven by technology evolution, it has enabled the possibility of the collection of real-time situational data (including imagery) and distribution through a secure communication system in operational environments. The dissemination of data between platforms and domains equips the joint force with a more holistic battlefield understanding, leading to tactical advantage.

The utility of the data is multifaceted, however the ability to collect, analyse, understand, and distribute information is underpinned by having access to a skilled workforce. Furthermore, due to the often sensitive nature of data collected in contested environments, such as images from cameras and sensors, there is a need for control over secure data storage to protect integrity of data.

**Development of land vehicle data strategy**

To support the ongoing acquisition and sustainment of vehicles, and in particular, the design, development and upgrade of the critical industrial capabilities identified within this Sovereign Industrial Capability Priority, Defence will develop a land vehicle data strategy. The strategy will seek to define data collection, analysis and distribution, as well as data ownership requirements. The intent would be to iteratively incorporate all ADF land vehicles into the strategy with a view to achieve maximum commonality in the data parameters, where this is feasible.

The strategy is intended to provide a clear message to the Defence community and to industry with respect to the data Defence seeks to collect, preferences in terms of data format, storage locations, analysis methods and decision making requirements. Ownership of vehicle input and output data will be clearly defined and used to understand usage and performance attributes and impacts of the platform and the user. Provisions for data sharing within the fleet, across the joint force and with international partners will also clearly articulated.

Timeline for implementation: 2021
This Plan includes the following actions to be taken by Defence and/or Government to support the “Land combat and protected vehicles and technology upgrades Sovereign Industrial Capability Priority”. Although responsibility has been attributed to a particular branch, group or agency, it is expected that a broader group of Defence and Government stakeholders will participate in, or contribute to, the action.

Actions that may be taken within Defence to support preparedness of the Government workforce and infrastructure supporting this Priority are not included in this list.

<table>
<thead>
<tr>
<th>Theme</th>
<th>Government action</th>
<th>Responsible</th>
<th>Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementation and communication of Defence strategies and policies</td>
<td>Defence will continue to develop and implement internal strategies and policies pertaining to the acquisition and support of land-based capabilities and technologies, including those applicable to land combat and protected vehicles. Resulting from the implementation of these strategies and policies will be a series of decisions and potential changes to Defence priorities, preferences and the solutions being sought from industry (for example, the Land Force Maintenance Directive seeks greater support from industry in the delivery of cross-training the Defence maintenance workforce and the ability to undertake more maintenance in theatre). Defence will continue to improve how it communicates requirements to industry through a wide range of fora including briefings to State Government and Industry groups, the Land Environment Working Group, Land Forces Conference, project industry briefings, and specific project-related Australian industry workshops.</td>
<td>Army/ Capability Acquisition and Sustainment Group</td>
<td>2021-2022</td>
</tr>
<tr>
<td>Development of capability-based support models</td>
<td>Defence will lead develop capability-based support models, termed the Land Force Support Models, in order to streamline activity and optimise investments from both Defence and industry in the land vehicle support system. The support models are designed at Gate 0 and evolve throughout the Capability Life Cycle. Defence will continue to work with industry to refine these models ahead of finalising capability support arrangements. This will provide clarity of Defence's requirements for industry to effectively invest in research and development.</td>
<td>Army/ Capability Acquisition and Sustainment Group</td>
<td>2021</td>
</tr>
<tr>
<td>Enhancing the Australian Industry Capability Program</td>
<td>Defence will enhance the Australian Industry Capability program through contractual and non-contractual mechanisms with a focus on cooperation, communication, contracting and compliance. Defence will establish an independent Australian Industry Capability Audit Program to validate Australian Industry Capability performance against contracted commitments. This program will ensure that our procurement continues to contribute to an advanced, capable ADF, which is supported by an enduring Australian industrial base.</td>
<td>Capability Acquisition and Sustainment Group</td>
<td>Late-2020</td>
</tr>
<tr>
<td>Theme</td>
<td>Government action</td>
<td>Responsible</td>
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</table>
| Engineering development program | Working within the Defence Industry Skills Support initiatives, specifically the Defence Industry Internship Program and School Pathways Program, Defence will explore options of an engineering development stream or program focused on students and graduates with an interest and appropriate qualifications to support a career in the defence sector; focused specifically in the software, robotics, mechanical, systems and electronic engineering fields. This program will seek to identify and incentivise students with these skillsets to pursue careers in the Australian land combat and protected vehicle technologies industry.  
  
The program, subject to security requirements and interest from industry partners, would provide participants with rotations across Defence and industry facilities and factories, enabling on-the-job skills development. | Strategic Policy and Intelligence Group | 2021      |
| Standardised architectures     | Defence is specifying standards to support enhanced integration and interoperability of systems and platforms to enable industry to make more informed decisions in relation to research and development and other investments.  
  
Of note, the Australian General Vehicle Architecture (GVA) was published in December 2017 and the Vehicle Standard Operating Environment (VSOE) is currently being developed. These standards will define integration parameters and governance requirements applicable to land combat and protected vehicles and related technologies.  
  
Defence will seek to continue to implement the standards as practicable, and as part of this, pursue a communications approach with industry that supports awareness and understanding. | Army                                           | Early 2021 |
| Development of land vehicle data strategy | To support the ongoing acquisition and sustainment of vehicles, and in particular, the design, development and upgrade of the critical industrial capabilities identified within this Sovereign Industrial Capability Priority, Defence will develop a land vehicle data strategy. The strategy will seek to define data collection, analysis and distribution, as well as data ownership requirements. The intent would be to iteratively incorporate all ADF land vehicles into the strategy with a view to achieve maximum commonality in the data parameters, where this is feasible.  
  
The strategy is intended to provide a clear message to the Defence community and to industry with respect to the data  
  
Defence seeks to collect, preferences in terms of data format, storage locations, analysis methods and decision making requirements. Ownership of vehicle input and output data will be clearly defined and used to understand usage and performance attributes and impacts of the platform and the user. Provisions for data sharing within the fleet, across the joint force and with international partners will also clearly articulated. | Army/ Capability Acquisition and Sustainment Group | 2021      |
ANNEX B. RECENT EVOLUTION OF DEFENCE POLICY AND STRATEGY FOR LAND FORCES

The table below includes a series of policies and strategies already endorsed and publically available, as well as a number of others that are subject to ongoing development.

<table>
<thead>
<tr>
<th>Policy intent</th>
<th>Implications for industry</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Army in Motion</strong></td>
<td><strong>Released July 2019</strong></td>
</tr>
<tr>
<td>Policy intent</td>
<td>This document represents Army's contribution to Defence Strategy, and aims to evolve Army's ready now mindset to become an adaptive future ready mentality, and to meet existing and future operating environments. This includes initiatives for creating agile teams, educating personnel, transforming training systems, and partnering with Defence, government, allies, industry and academia to increase Army's capability and capacity. A subset to Army in Motion, Accelerated Warfare (future conflict) describes the challenge of Defence, Government, industry, academia and partners strengthening joint warfighting, including defining how we respond in creative and unrestrained ways to meet challenges of the rapidly evolving operating landscape.</td>
</tr>
<tr>
<td>Implications for industry</td>
<td>Industry has an ongoing opportunity to collaborate with Defence, fellow industry participants, Government and academia to influence the design and effects of future capability that will aid in meeting evolving threats and environments.</td>
</tr>
</tbody>
</table>

| Chief of Army's Land Force Maintenance Directive | **Released January 2019** |
| Policy intent | The Land Force Maintenance Directive was developed to provide guidance to Defence and others with respect to maintenance system risk and prioritisation of resources, directing a consistent approach to capability management that is sustainable, affordable and enables Defence to meet preparedness requirements. To support the development of maintenance systems for the land force, Chief of Army published requirements for maintenance of land capability, including land combat vehicles, defined across six key principles: Enabling raise, train, sustain; Align to readiness notice; Deployable maintainers and maintenance engineers; Integrated Network; Transition to Operations; Agility. |
| Implications for industry | Where applicable, these requirements will flow down to changes in contracts and support structures. The impact of these requirements vary from technical data accessibility requirements and the prescribed use of doctrine, through to the provision of field service representations. |

| Army's Robotics and Autonomous Systems Strategy | **Released October 2018** |
| Policy intent | The Robotics and Autonomous Systems Strategy identifies how Army can best use developing robotics and autonomous systems capabilities, what human-machine teaming could look and operate like, and consider how the ADF could operate with and alongside machines. This includes considerations of decision making, and the impact on existing and future platforms. |
| Implications for industry | The strategy provides awareness of Army's direction and priorities with respect to robotics and autonomous systems, enabling industry to plan and prioritise research and development, and investment activities. |
### Chief of Army's Land Force Supply Network Directive

**Policy intent**
A companion document to the Land Force Maintenance Directive, the Directive provides guidance to land programs, supporting enablers and industry on the land force supply requirement to inform supply network design, planning and execution across the Capability Life Cycle.

**Implications for industry**
These requirements, where applicable, will flow down to changes in contracts and support structures.

### Land Force Support System and Land Force Support Models

**Policy Intent**
The Land Force Support System is being developed as part of Army's operational concept document and will serve as guidance in the development of Land Force support models throughout the Capability Life Cycle.

The Land Force Support Models take into consideration operational demands, industry capability and the technology being employed, and once endorsed, are proposed to enable Army to direct the support model(s) to be analysed and presented for capability manager decision as part of project approval. Each of the draft models reinforce, to varying degrees, the requirement for Defence and industry to deliver supply and/or maintenance support. It is envisaged that the models will simplify project documentation and help communicate Army's requirement to the broader Defence environment and industry during Capability Life Cycle Gates 1 and 2.

**Implications for Industry**
Industry will be provided an opportunity to comment on the Land Force Support Models during their development. Once both the Land Force Support System and Land Force Support Models are endorsed, it is anticipated this will simplify and provide clarity to industry in terms of Army's requirements for support systems of different land force assets.
ANNEX C. SUPPORT THROUGH INDUSTRY PROGRAMS

This section discusses the support available to current and aspiring defence industry in support of this Sovereign Industrial Capability Priority and other Defence capabilities.

Defence industry and innovation programs

The Defence Innovation Hub and the Next Generation Technologies Fund comprise the integrated defence industry and innovation programs helping encourage innovation and growth in the Australian defence industry sector. This system will support companies that contribute to the generation of this Sovereign Industrial Capability Priority to innovate further, and position them to better support the ADF.

The 2020 Force Structure Plan aims to better bridge the divide between technology development and acquisition by strengthening the link between Defence's capability plans with industry policy initiatives, Defence's reform program, the 2030 More Together: Defence Science and Technology Strategy for innovation and clear resourcing plans.

Defence Innovation Hub

The Defence Innovation Hub brings together Defence industry, academia and research institutions to collaborate on innovative technologies that can be developed into capability for Defence. Funded at over $800 million over the next decade, the Defence Innovation Hub accepts proposals that are ready to enter the engineering and development stages of the innovation process, from concept exploration and technology demonstration to prototyping and integrated capability demonstration and evaluation.

Each year, the Defence Innovation Hub reviews and publishes its innovation priorities to help businesses plan their research and development activities. The Defence Innovation Hub’s innovation and investment priorities can be found at the following link: https://www.business.gov.au/centre-for-defence-industry-capability/defence-innovation/defence-innovation-hub/defence-innovation-hub-priorities.

The Defence Innovation Hub’s priorities align with the six Integrated Investment Program capability streams and the most relevant stream for this Priority is Land Combat, Amphibious Warfare and Special Operations.

Next Generation Technology Fund

Science and technology is a significant priority for Defence. Defence has to be prepared for the next evolution in the way war is fought. To do this, the Government has invested more than $164 million in 204 research activities and will make further investments worth approximately $1.2 billion over the next decade, through the Next Generation Technology Fund. This forward-looking program focusses on research and development in emerging and future technologies for the ‘future Defence Force after next’.
The Next Generation Technology Fund supports a number of collaboration initiatives such as the Emerging Disruptive Technology Assessment Symposium and the Grand Challenges program. These aim at bringing together the best thinkers in Australia on a particular topic and facilitating collaboration between Defence, industry and academia. The Centre for Defence Industry Capability gives advice as to whether a technology idea could be eligible for Next Generation Technology funding. There are also a number of funding initiatives managed through the Next Generation Technology Fund that companies who contribute to this Priority may wish to leverage. These include:

- **Small Business Innovation Research for Defence Program**: provides opportunities to Australia's small-to-medium enterprises to undertake research projects that will benefit Defence in the future. Successful Small Business Innovation Research for Defence project outcomes might be commercialised directly by the participant, be the subject of a separate development support application with the Defence Innovation Hub, or be adapted to support other Next Generation Technology Fund ventures such as a Grand Challenge.
- **Grand Challenges Program**: brings together small agile companies, large organisations and academic researchers with Defence Science and Technology Group scientists to collaborate and find solutions for highly complex strategic defence and national security challenges.
- **Small Business Exploratory Program**: accelerates promising science and technology of interest to Defence, from early-stage concept to a point where a proposal could be submitted to the Defence Innovation Hub.
- **Defence Cooperative Research Centres Program**: focusses on selective next generation research and development projects and high priority Defence capability needs. It is delivered through a collaborative network of industry organisations (particularly small-to-medium enterprises), researchers and Defence.

### Defence industry grants

#### Centre for Defence Industry Capability

The Centre for Defence Industry Capability, which resides within the Department of Industry, Science, Energy and Resources, remains the entry point for Australian businesses either working in or looking to enter the defence sector. They provide advice to industry on what initiative will best assist them depending on their stage of product development. The Centre has specialist business facilitators situated in capital cities around Australia who can be contacted to discuss opportunities for business related to this Priority. The Centre also provides guidance on business improvement, skills development, Defence market preparedness, and export and supply chain support. The Centre for Defence Industry Capability administers multiple grant programs, including:

- **Capability Improvement Grants** of between $2,500 to $150,000 for small-to-medium enterprises to fund part of the cost to engage a consultant or expert to support skilling or building capability in the business. Under the Defence Industry Skilling and Science, Technology, Engineering and Mathematics Strategy, the Centre will soon be offering skilling support grants to defence industry small-to-medium enterprises to reduce skills barriers and assist with retraining their workforce.
- **Defence Global Competitiveness Grants** of $15,000 to $150,000 for small-to-medium enterprises to fund up to half the cost of projects that are building their defence export capability. The grants aim to build a stronger, more sustainable and globally competitive Australian defence industry.
- **Under the National Defence Industry Skills Office**, the establishment of a new model of skilling support grants focuses on improving accessibility for small-to-medium enterprises and reducing the barriers faced by defence industry in up skilling or retraining their people.

Sovereign Industrial Capability Priority Grants

In November 2018, the Government launched the Sovereign Industrial Capability Priority Grants program. The Grants program allows Defence to improve the resilience of a Priority by providing funding to industry to ensure that Australian small-to-medium enterprises have the appropriate capacity and resilience to support Defence’s critical capabilities.

Grants of up to $1 million are available to fund capital equipment purchases (including specialist software and security infrastructure), non-recurring engineering costs, design activities directly related to the project; and workforce training and accreditation directly related to the project. The Grants are capped at $3 million over three years and are delivered through the Centre for Defence Industrial Capability. These grants directly subsidise the growth of industry in the industrial capabilities underpinning the priorities. This type of funding is for more mature companies that are able to fund at least 50 per cent of the funding and directly support the increased sovereignty outcomes for a particular Priority.


Capability Improvement Grants

Defence industry small-to-medium enterprises can also access government support to upskill and retrain existing staff by applying for a Capability Improvement Grant through the Centre for Defence Industry Capability. Capability Improvement Grants reimburse a business for up to half the cost of engaging a consultant or expert to assist with skills and training, to build the capability of the existing workforce and meet specific business needs.

Defence is also developing a new model of skilling support grants for defence industry small-to-medium enterprises. These grants will reduce the barriers faced by defence industry in upskilling or retaining their people, by offering financial support for training in trade, technical and professional skillsets. Defence will look at supporting innovative approaches to the provision of training, along with the more traditional ways of achieving accredited certifications.


Other Defence support opportunities

Capability Acceleration Fund

To ensure Defence’s innovation system has the capacity to meet the demands of future technological development, a new Capability Acceleration Fund will be introduced from the middle of this decade. Through this fund the Government will invest over $130 million this decade to support the intensive development of key disruptive technologies with industry beyond the early-stage research and demonstration stages, taking promising technologies all the way through to acquisition. This is intended to bring together industry participants, Defence personnel and technical subject-matter experts to provide the support needed to build prototypes to demonstrate capability and set requirements for future projects.

Australian Defence Export Office

The research, analysis and consultation undertaken to develop this Plan provided evidence of the number of Australian companies already pursuing export opportunities or supplying to overseas customers. The development of the Defence Export Strategy is intended to support these companies in their endeavours, and to encourage more small-to-medium enterprises to pursue export opportunities.

The strategy, released in 2018, outlines the Government’s plan to support Australian defence industry to achieve greater export success to build a stronger, more sustainable and globally competitive defence industry to support Australia’s Defence capability needs. Increasing access to international markets through exports will assist in reducing the risk to industry of having a single customer in the ADF. It will also support industry’s ability to sustain and grow their business through the peaks and troughs of domestic demand.

The Australian Defence Export Office provides a focal point for delivering the key initiatives of the strategy. It provides a coordinated approach to export support; working closely with Austrade, the Centre for Defence Industry Capability, Department of Foreign Affairs and Trade, the Export Finance and Insurance Corporation, state and territory governments, and Australian defence industry, to realise export success.
The Australian Defence Export Office also tailors support to industry on a case-by-case basis through the Australian Military Sales, Team Defence Australia, and Policy and Engagement functions. It has a number of initiatives that can be leveraged by industry, including:

- International advocacy for Australian defence industry exports
- Support from the Australian Defence Export Advocate including international advocacy
- Assistance from dedicated Business Development Managers in key markets
- Attendance at Team Defence Australia trade shows
- Targeted international trade missions
- Government-to-government sales and transfer of equipment
- Inclusion in the Australian Military Sales Catalogue
- Defence Global Competitiveness Grants (administered by the Centre for Defence Industry Capability)
- Landing Pads (administered by Austrade)
- Defence Export Facility (administered by Export Finance and Insurance Corporation)
- Market intelligence.

All companies seeking support from the office should be aware of their Defence export control obligations. More information is available at: http://www.defence.gov.au/Export/Office/

National Defence Industry Skills Office

The National Defence Industry Skills Office has been established to improve collaboration and coordination between defence industry stakeholders and maximise opportunities from wide-ranging investments to meet defence industry workforce needs. The National Defence Industry Skills Office will act as a single point of contact within Defence for industry skilling and Science, Technology, Engineering and Mathematics-related engagement and leadership. The National Defence Industry Skills Office is implementing the initiatives announced in the 2019 Defence Industry Skilling and Science, Technology, Engineering and Mathematics Strategy. The Strategy details how the Government will help Australian defence industry meet their workforce skills requirements over the coming decade. The National Defence Industry Skills Office will align efforts to ensure access to essential skills relating to priorities. Initiatives companies can leverage include:

- The School Pathways Program, which encourages student engagement in science, technology, engineering and mathematics, and introduces them to the many career pathways in defence industry.
- An additional 20 internships for the Defence Industry Internship Program, bringing total places to 70 students per year. This will provide engineering students with direct connections to defence industry by facilitating 12 week internships with industry small-to-medium enterprises.

The Defence Industry Internship Program

The Defence Industry Internship Program links third and fourth year engineering students with defence sector small-to-medium enterprises by sponsoring the industry placement component of their studies. The program specifically targets the engineering streams that are considered by defence industry to be in short or critical supply and aims to give student engineers a better understanding of the critical work performed by our defence small-to-medium enterprises. In 2019, 70 students were matched with participating companies to undertake internships. Continued support from industry is fundamental to the ongoing success of this program.

The Defence Industry Internship Program provides an opportunity for small-to-medium enterprises in defence industry who specialise in the design, manufacture, sustainment and upgrade of land combat and protected vehicles. Organisations currently employing electrical, mechatronic, software/systems and mechanical engineers are encouraged to apply to host an intern through the Defence Industry Internship Program and contribute to the professional development of the next generation of the Defence technologies workforce.


Defence Civilian Undergraduate Sponsorship

The Defence Civilian Undergraduate Sponsorship has been developed to attract students to undertake a degree through the University of New South Wales campus at the Australian Defence Force Academy in Canberra. This is a civilian-based sponsorship, with no military service obligations or requirements, and is open to those who may be interested in a career in Defence.
Defence runs this program annually, with undergraduate degree disciplines to be offered subject to change. In 2019, applications were being sought for the following options:

- Bachelor of Engineering (Mechanical, Electrical and Aeronautical) (4 years)
- Bachelor of Computing and Cyber Security (3 years)

The Defence Civilian Undergraduate Sponsorship offers coverage of the full tuition costs of the degree for eligible applications, plus an annual allowance to cover the cost of textbooks and equipment. During the sponsorship, students may have the opportunity to participate in paid work placements within Defence, which will provide exciting opportunities and give insight into how one of Australia’s largest organisations conducts business.

More information is available at: www.defence.gov.au/APSCareers/DCUS.asp

**Global Supply Chain Program**

The Global Supply Chain Program seeks opportunities for Australian industry, particularly small-to-medium enterprises, within the supply chain of multinational defence primes. This program facilitates Australian industry capability with the commercial needs of the eight prime contractors involved in the Global Supply Chain. Those are BAE Systems, Boeing, Leidos, Lockheed Martin, Northrop Grumman, Raytheon, Rheinmetall and Thales.

The eight primes are funded to establish Global Supply Chain teams to identify business needs and provide access to these to Australian companies, qualify eligible Australian supply chain contenders, provide ongoing support and feedback, and work alongside other primes to boost exports and uplift the small-to-medium enterprises.

**Defence TAFE Employment Scheme**

The Defence TAFE Employment Scheme is aimed at students looking to pursue a career in Defence by supporting their vocational education with practical, paid work experience. Defence TAFE Employment Scheme participants work part-time within the Australian Public Service whilst studying, and are paid a full-time salary.

In 2020, the following disciplines relevant to this Plan are being sought (noting these will continue to evolve):

- Victoria: Logistics/Business Administration/Leadership and Management, Engineering - Mechatronics/Software Communications/Electrical/Electronics
- Australian Capital Territory: Engineering, Computing/Cyber Security/Information Technology/Networking, Logistics/Purchasing
- New South Wales: Logistics, Information Technology/Networking
- South Australia: Engineering - Electronics and Communications

More information is available at: www.defence.gov.au/APSCareers/DTES.asp

**External support and collaboration opportunities**

Industry is able to access further support and collaboration opportunities with respect to the Land combat and protected vehicles and technology upgrades Priority through the organisations below. The list is intended to focus on opportunities specific to this Priority, and is not exhaustive. It is acknowledged that other schemes and programs are available at academic institutions and across industry.

**Defence Materials Technology Centre**

The Defence Materials Technology Centre facilitates cooperation with Australian industry, research and government agencies to advance technologies in Defence and related sectors in manufacturing engineering and applied science. The Defence Materials Technology Centre aims to strengthen Australian industrial capacity, and Defence and national security capabilities.

The Defence Materials Technology Centre operates through a co-investment model applying the funding from Defence or other Commonwealth agencies and leverages additional contributions from industry and research partners. Because of this, the Centre works closely with Defence to identify capability changes and future needs. The Centre then engages with industry and research partners to find solutions with advancing key technologies.
The Defence Materials Technology Centre focuses on the following capabilities relevant to this Priority:

- New manufacturing technologies
- Performance modelling, simulation and validation
- Design, production and joining of new materials
- Component repair and fabrication technologies
- Robotics and automation technologies
- Repair and life extension technologies
- Prognostics and defect detection capabilities
- Weight reduction, design integration and light weighting materials

More information is available at: https://www.dmtc.com.au/

Defence Science Institute

The Defence Science Institute was established in 2010 within the University of Melbourne and is funded by the Government of Victoria, Defence Science and Technology Group and the University of Melbourne. The Institute harnesses the capabilities of Victoria’s universities to deliver integrated multi-disciplinary solutions for the defence sector and facilitate the growth of defence science research networks between academia, Defence Science and Technology Group and defence industry. It aims to be a primary source for facilitating research and development connections that foster a globally engaged, competitive and innovative defence and national security sector.

The Defence Science Institute, guided by its advisory board and a research leaders forum, oversees five research programs that align to Defence research priorities. These programs include Human Protection and Performance, Propulsion and Energy Storage, Simulation and Modelling, Surveillance and Autonomy, and Cyber and Information Technology Security. Each program is led by a senior researcher from Defence Science and Technology Group or academia, who oversees the establishment of Defence Science Institute research projects.

The Institute does this by:

- Enhancing Defence-relevant research and development engagement between universities, industry and Defence
- Identifying Defence-relevant research and technology development opportunities on behalf of our stakeholders
- Providing advice on the Defence research and development environment (priorities, capabilities, needs and gaps)
- Connecting small-to-medium enterprises to research and expertise in order to strengthen their participation in Defence business
- Promoting and showcasing research and development and innovation in the private and public sectors

More information is available at: https://www.defencescienceinstitute.com/

Automotive Transformation Scheme

The Automotive Transformation Scheme commenced on 1 January 2011 and will run until 31 December 2020. It aims to encourage competitive investment, innovation and economic sustainability in the Australian automotive industry. The Automotive Transformation Scheme will achieve this in a way that improves environmental outcomes and promotes the development of workforce skills.

The Automotive Transformation Scheme provides businesses involved in the Australian automotive industry with cash payments to cover up to 15 per cent of the cost of investing in plant and equipment, and 50 per cent of the cost of investing in research and development, to encourage investment and innovation in the Australian automotive industry. Cash payments are also available for activities related to the production of motor vehicles, engines and engine components.

More information is available at: https://www.business.gov.au/assistance/automotive-transformation-scheme

Advanced Manufacturing Growth Centre

The Advanced Manufacturing Growth Centre was established in 2015 under the banner of the Australian Government’s Industry Growth Centre Initiative. The Advanced Manufacturing Growth Centre aims to drive cultural change, competitiveness, opportunities and innovation, transforming the sector from traditional industrial processes to cutting-edge, knowledge-based advanced manufacturing.
The not-for-profit organisation is an Australian wide network of manufacturers, universities, research institutions and export hubs that identifies projects and export opportunities, and helps businesses to take advantage of these opportunities.

The Advanced Manufacturing Growth Centre includes:

- **Advanced Manufacturing Early Stage Research Fund**: running from 2017/18 to 2020/21 supports small, industry-led pilot research projects which provide fast and tangible results, with funding between $100,000 and $400,000, matched 1:1 by industry contributions. This is designed for Manufacturing Readiness Level and/or Technology Readiness Level of between one and four.

- **Advanced Manufacturing Growth Centre Core Projects Fund**: aims to support projects fostering collaborative innovation between industry and research partners for commercial purposes. Advanced Manufacturing Growth Centre projects strive to connect into global supply chains, support advanced skills development within organisations, and facilitate best practice and knowledge sharing across the industry. This is designed for Manufacturing Readiness Level and/or Technology Readiness Level of between four and eight.


**Industry Mentoring in Science, Technology, Engineering and Mathematics**

The Graduate Research Industry Partnerships Industry Mentoring in Science, Technology, Engineering and Mathematics is an industry-led initiative of the Australian Academy of Technology and Engineering, and is funded under the Australian Government Industry Growth Centres Initiative. Industry Mentoring in Science, Technology, Engineering and Mathematics facilitates a one year industry mentoring program, connecting science, technology, engineering and mathematics PhD students (mentees) with high-level industry leaders (mentors).

In a one-year industry mentoring program, this program supports volunteer mentors and mentees meeting in a professional setting for one hour each month. The program also hosts state-level networking events to broaden the relationships between mentors and mentees across the industry. This initiative provides a diverse range of industry professionals the opportunity to engage with academia, share their mentoring skills, and ‘give back’ to the science, technology, engineering and mathematics community.

This program provides opportunities for industry and Defence to invest in the science, technology, engineering and mathematics workforce by increasing their understanding of the industry sector and strengthening their skills, as well as enhancing sector collaboration and professional networks.

More information is available at: https://imnis.org.au/

**Industry Specialist Mentoring for Australian Apprenticeships**

The Industry Specialist Mentoring for Australian Apprenticeships program provides specialist help, including an individual mentoring plan, to support apprentices who may be facing barriers in finishing their training. The aim of the program is to increase retention rate in apprenticeships, specifically in the first two years, increase completion rates and contribute towards the skills base within industries undergoing significant change. These industries include but are not limited to automotive repair and maintenance, metal product manufacturing, manufacturing, engineering construction.

More information is available at: https://www.australianapprenticeships.gov.au/programs

**Industry 4.0 Initiatives**

The Department of Industry, Science, Energy and Resources in addition to other government agencies and initiatives, have committed to a level of funding to support organisations in pivoting business operations to support the changing manufacturing sector dynamics, particularly around Industry 4.0. The following initiatives are those perceived to have an impact on the Land combat and protected vehicles and technology upgrades Priority:

- **Higher Apprenticeship Program**: up to $9.2 million committed for industry-led alternative apprenticeship training supporting five pilot initiatives. The Industry 4.0 Higher Apprenticeship Program is one of the five initiatives, managed through the Skilling Australians Fund, aimed at projected skills requirements for trained technicians. The program model is a traditional paid apprenticeship, with an additional enrolment in an Associate Degree with focus areas in advanced manufacturing processes, automation and robotics, internet of things, cloud computing, advanced algorithms, and smart sensors.
• **Investing in science and technology**: $2.4 billion of investment committed over the next 12 years in Australia’s research, science and technology capabilities. Funding includes supercomputers, satellite imagery, and leading research in artificial intelligence.

• **Artificial Intelligence and Machine Learning**: $29.9 million committed under the Taking Local Businesses Global initiative to enable Australian organisations to understand and develop artificial intelligence and machine learning capabilities. Funding extends to project research around these topics, and investment in a national ethics framework to outline the standards for adapting to such technology.

• **Artificial Intelligence and the Internet of Things**: the Australian Council of Learned Academies will be identifying the opportunities, risks and benefits of artificial intelligence, including the associated economic, social, environmental, ethical and cultural impacts that may be presented throughout the development of artificial intelligence technologies over the next decade. This investigation will also determine any associated findings, such as governance needs, education requirements and standards.


### Manufacturing Modernisation Fund

The Manufacturing Modernisation Fund is focused on supporting manufacturers in modernising organisations through adopting new technology and providing co-funded capital investment and associated workforce upskilling. The $50 million fund aims to support transformative manufacturing technology and processes for small-to-medium enterprises, while stimulating skilled job growth and demand.

Matched grants between $50,000 to $100,000 are available for small scale technology and efficiency investments, whereas grants between $100,000 and $1 million are on a 3:1 matched basis for larger scale transformative investments.


### Innovative Manufacturing Cooperative Research Centre

The Innovative Manufacturing Cooperative Research Centre is a not-for-profit organisation built to support Australian businesses, research organisations, associations and government departments in research-led innovation in manufacturing products, processes and services. This Centre co-funds approved projects on a 1:1 basis with the intent of supporting transformation of the manufacturing industry, while delivering tangible commercial outcomes.

With $40 million investment from the Commonwealth, the Innovative Manufacturing Cooperative Research Centre endorses project applications within the range of $500,000 to $6 million, with 50 per cent funded from industry. Further criteria includes a manufacturing focus; collaboration across industry, universities and other government institutions; and access to global supply chains. This contributes to sector transformation and sustainability (including Industry 4.0), while having a succinct commercialisation plan including return on investment.

More information available at: https://www.imcrc.org/

### Australian Postgraduate Research (APR) Intern

APR.Intern facilitates collaboration between industry and academia by providing a platform for industry to access various PhD disciplines for short-term focused research projects. This provides industry-based training of PhD students, providing industry with highly analytical research expertise to specific projects. APR.Intern is the industry arm of the Australian Mathematical Sciences Institute - a collaborative enterprise of Australia’s mathematical sciences.

APR.Intern currently partner with:

• **New South Wales Defence Innovation Network**: investing $230,000 to place 30 specialist PhDs into internships within New South Wales-based defence organisations over three years. This partnership matches New South Wales-based defence businesses with high-end expert PhD students from all disciplines.

• **Defence Science Institute**: providing financial support to businesses servicing the defence sector to support ongoing research challenges.

More information is available at: https://aprintern.org.au/
Please direct any questions on the Sovereign Industrial Capability Priority policy or the information contained in this Industry Plan to:
defence.icp@defence.gov.au