Army

Army research and development plan 2015

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Introduction

The Army Research and Development (R&D) Plan is the foundation for collection and development of decision support information that underpins Army's modernisation. The R&D Plan has an enduring relevance to the Army's modernisation processes. The plan streamlines the Army's research activities while providing enhanced accountability and transparency regarding decisions about future capability.

In the short term, the plan ensures the Army's continued relevance in the current operating environment and informs strategic perspectives of the future operating environment. In the medium and long term the plan enables the establishment of benchmarks around research lines of effort and allows the Army to chart progress of its modernisation initiatives. This R&D plan allows the Army to remain at the forefront of evolution and revolution in land warfare to enhance detection and mitigation of potential strategic shock.

Research and development timeframes and priorities

Research and development construct

Each of the Army modernisation lines of effort have a number of Army R&D requirements. Each of these contain a set of specific requirements that are prioritised and spread across three planning horizons.

Time frames

Development and implementation of this plan accords with the three planning timeframes described in the Army Modernisation Plan. The three specified timeframes are:

a) **Short term:** R&D tasks for the current Army, including the current year, plus one more. The short term represents the current and next budget cycles and includes those modernisation activities that can effect action in the Army in being. This represents those approved and funded research areas to be integrated into the current Army.

b) **Medium term:** R&D tasks from the short term out to ten years. This includes modernisation actions that will affect the Army in the current Defence Investment Plan and Defence Management Finance Plan timeframe.

c) **Long term:** R&D requirements beyond ten years. This represents the period beyond current financial plans and is a 'procurement bound' ahead. It includes aspirational goals and needs for future Army, including R&D support for decision-making on activities that require long lead-time action such as facilities and capital equipment acquisition.

Priorities

Each of the specific requirements are prioritised according to the taxonomy in Table 1 below.

Table 1: Army R&D Plan prioritisation hierarchy

Priority		Description
1	Essential	Indicates a requirement that is essential to continuing capability development. Without it, force modernisation will not be possible. If an 'essential' requirement cannot be met by Defence Science and Technology (DST) Group, then the Army **must** seek to address it via alternate sources and agencies.
2	Important	Indicates a requirement that is important, but not essential for continuing capability development and/or force modernisation.
3	Desirable	Indicates a requirement that is beneficial, but not important to informing capability development and/or force modernisation.

Sources and agencies

The Army seeks to obtain the most robust, rigorous, independent responses to its R&D requirements. Given the breadth and scope of the Army R&D requirements there is no one organisation that can address each of the specific requirements by itself. Therefore, Army must use a range of sources and agencies both internal and external to the Department of Defence.

Support from internal sources and agencies. Internal sources and agencies include:

a) **Experimentation:** the Army's R&D efforts are underpinned by experimentation as appropriate. The Army contributes to joint experiments and the conduct an analytical campaign based on the Army Experimental Framework, as described below.

b) **Defence Science and Technology (DST) Group:** DST Group is the primary organisation that supports the Army's R&D requirements within Australia and on operations.

c) **Test and evaluation:** 'preview' test and evaluation is another mechanism that can be used to inform Army's needs. The Australian Defence Test and Evaluation Office include Army trial managers who are available to plan and manage preview test and evaluation in support of Army.

d) **Procurement agencies:** the Defence Capability Systems Life Cycle includes a number of areas requiring R&D support. Thus the DST Group Land Science and Technology program includes a large number of tasks in support of capability acquisition where procurement agencies are the clients on behalf of the capability manager. DST Group coordinates the Capability Technology Demonstrator program on behalf of Capability, Acquisition and Sustainment Group and the Defence Industry Realisation Fund.

Support from external sources and agencies. External sources and agencies include:

a) **Defence industry:** Army is committed to continued collaboration with Defence industry to help the Army better understand and achieve its modernisation needs and aspirations. In addition to a series of roundtable discussions across a number of themes, Defence industry is included in this plan through the Capability Technology Demonstrator and Defence Industry Realisation Fund programs and other collaborations, such as the Defence Materials Technology Centre. The outcomes of this continued collaboration are rolled into the Army's needs development efforts.

b) **Academia:** in addition to the links provided by DST Group, the Director General of Strategic Planning – Army (DGSP–A) is the Army's primary point for engagement with academia. DGSP–A coordinates funding for directed studies, primarily through the Army Research Scheme, but also Chief of Army's scholars or other options.

c) **Army Research Scheme:** the Army Research Scheme seeks researchers to investigate topics that will inform future land force modernisation and capability development. Topics are relevant to operational matters and the context in which war takes place.

d) **Allies and partners:** the Army understands that smooth and effective integration with allies and partners is a combat multiplier. Therefore, harmonising R&D requirements for force modernisation and capability development at the beginning of the Defence Capability Systems Life Cycle greatly increases the likelihood of good interoperability and by extension successful operations. Obviously, not every requirement is common across every ally or partner, therefore a range of bilateral, trilateral and multilateral forums are utilised.

Coordination

The previous Army R&D Plan subsumed Army's master question list and Chief of Army's modernisation lines of inquiry plan to provide a unified approach to diagnosing and addressing Army's modernisation challenges. Their essential essence is captured in the specific requirements listed in the annexes for each of the Army modernisation lines of effort.

Army experimental framework

Background

Army's Experimentation and Research Management Section, in partnership with DST Group, provides Army's senior decision-makers with rigorous, robust and unbiased analysis. This analysis ensures informed decisions are made that are based on sound scientific process and tempered by expert military judgement. Experimentation and Research Management Section plans, controls and coordinates experimentation on Army's behalf in close consultation with DST Group to ensure they meet the senior officer decision support requirements. The following tools are provided under the Army Experimental Framework:

a) **Headline experiment:** this is a major biennial experiment conducted that can support complex and high-impact decisions that target key modernisation imperatives. A headline experiment is suitable for those arguments that require concurrence and/or decision in a wider Joint force or Government committee.

b) **Limited objective experiment:** the Army experimental framework can conduct up to five minor experiments over two years that can support complex questions with narrow scope. They provide Government decision-quality evidence for land capability decisions and are also suitable for high-level internal decisions (e.g. Force Structure Review).

c) **Land analytical decision support study:** the Army experimental framework can conduct up to six low-cost studies per year to answer relatively simple, short-notice questions that require greater analysis than is available within the Army.

d) **Agile support to Army modernisation.** The agile support to Army modernisation capability provides short-loop analytical support to answer simple questions attuned to an operational analysis team.

All these tools are most effectively applied to pre-decisional complex questions or where there is a requirement for credible, impartial evidence to inform decision makers. Army's senior leadership directs the efforts of Experimentation and Research Management Section to ensure optimal and timely responses.

Financial year 2015-2019 focus areas

During 2015 the Army is developing its Future Land Operating Concept 2015 (FLOC 15) and the supporting concepts. This is the basis for the experimentation topics for financial year 2015:

a) Limited objective experiment 1-15: FLOC 15 C3 & ISR concept development.

b) Limited objective experiment 2-15: FLOC 15 C3 & ISR concept analysis.

c) Limited objective experiment 3-15: Coastal, littoral, estuarine and riverine operations.

d) Headline experiment 16: Operations within future urban littorals (TBC).

Land analytical decision support study

A bottom-up approach is currently being adopted in selecting topics for Land analytical decision support studies and DGSP-A will approve Land analytical decision support study topics quarterly.

Links

The following links provide further insight to some of the topics mentioned above:

Army Strategic Planning Branch webpages
www.army.gov.au/Our-future

Capability and Technology Demonstrator Program website:
www.dsto.defence.gov.au/ctd

Defence Materials Technology Centre website:
www.dmtc.com.au

Army Research Scheme website:
www.army.gov.au/Our future/Research/Research-scheme

Army Experimental Framework website:
www.army.gov.au/Our-future/Research/Experimentation

Annexes

A Joint land combat R&D requirements

B Human performance R&D requirements

C Force protection R&D requirements

D Situational awareness R&D requirements

E Command, control and communication R&D requirements

F Logistic support to the force R&D requirements

Annex A

Joint land combat R&D requirements

The joint land combat Army modernisation line of operation optimises the combined arms fighting system for sustained close combat in complex environments against a lethal adversary to achieve decision.

Title	Specific requirement	Time frame
Priority 1		
Aircrewman workplace assessment	What are the risks to Australian Army Aviation carrying aircrewmen in CH-47 and MRH90 who are involved in out of seat tasks which include gunnery, clearances, HIET, hook, hoisting, supervision of passengers, cabin management and a range of other tasks that are yet to be documented?	Short
Breaching and demolition	What S&T support can be provided to enhance breaching, demolitions and methods of entry capabilities?	Short
	What research and advice exists into explosive firing systems?	Short
	What is the best design, and test, user filled charges and accessories that will allow current in service explosives to be used in novel and more effective ways?	Short
	What expert research and advice exists into emerging weapon systems, munitions and energetic materials that may enhance the method of entry and demolitions capabilities?	Short
	What information exists to inform current safety publications, measure overpressure and fragmentation patterns when firing explosive charges? Determine minimum safe distances and develop guidelines for planners for operations and safety staff for training.	Short
Multi-role helicopter (MRH) support introduction into service	What means can be adopted to allow use of the self-defence gun while conducting fast roping or rappelling tasks in the MRH90?	Short

Title	Specific requirement	Time frame
Armed reconnaissance helicopter (ARH) introduction into service	What S&T support can be provided to assessing the vulnerability of the ARH in relation to the operational requirements involved with the low-level tactics, techniques and procedures?	Medium
	What S&T support can be provided to assist in assessment of the ARH platform vulnerability?	Medium
	What S&T support can be provided to assist in development of EW self protection measures for the ARH?	Medium
	What S&T support can be provided to assist in studying the vulnerability of the ARH platform?	Medium
Combined arms fighting system integration	What are the Combined Arms Team Capability Integration issues surrounding: C4I/Networking, architectures, amphibious, tactical ISR/fires?	Medium
	How can the Army best integrate its systems to optimise effectiveness within a combined-arms, joint, coalition environment?	Medium
Multi-role helicopter (MRH)support introduction into service	What S&T support can be provided to assist in development of electronic warfare self protection measures for the MRH?	Medium
	What operational analysis can be provided to assist the introduction into service of the MRH?	Medium
	What S&T support can be provided to assist in studying the vulnerability of the MRH platform?	Medium
Combined arms fighting system integration	What does the combatant need to maximise survivability in complex future environments (both mounted and dismounted)?	Long
M113AS4 survivability study	What are the relative risks associated with deploying M113AS4 on operations in relation to developing options that would improve crew and platform survivability and how can those risks be reduced to a level that is acceptable to the Army?	Long

Title	Specific requirement	Time frame
Priority 2		
Army aviation maintenance productivity tools	What diagnostic and monitoring systems exist within MRH90, ARH and CH-47D/F fleets to support maintenance and engineering?	Short
	What information is available from these diagnostic and monitoring systems within the MRH90, ARH and CH-47D/F fleets to support maintenance and engineering, but is not currently used to full potential?	Short
Engagement systems	What S&T support can be provided to enhance engagement systems capabilities?	Short
Load carrying for Army aircraft	What S&T support can DST Group provide to enable slung loads on the Army aircraft to be cleared for flight?	Short
Armed reconnaissance helicopter (ARH) introduction into service	What implications impact the development of the ARH capability particularly concerning the integration of the Capability, Acquisition and Sustainment Group equipment deliverables into the combined arms teams?	Medium
	What S&T support can be provided to assist human/machine interface with equipment?	Medium
	What S&T support can be provided to validate flight & slung load modelling?	Medium
	What S&T support can be provided to understanding the lethality of the ARH weapon systems?	Medium
Army aircraft risk reduction	How can improved modelling of rotor wake be used to better represent vortex ring and similar states?	Medium
	How can the rotor interference modelling capability in FLIGHTLAB be tested?	Medium
	How can suitable operational procedures be developed for the MRH90 in the reciprocal velocity obstacle environment?	Medium
Army aviation maintenance productivity tools	What additional systems would the ADF need to acquire to make best use of extant on-aircraft (MRH90, ARH and CH-47D/F fleets) information systems?	Medium
	What third party diagnostic and analysis monitoring systems are available to support MRH90, ARH and CH-47D/F engineering and maintenance?	Medium
	What maintenance and engineering activities do the identified third party diagnostic and analysis monitoring systems within the MRH90, ARH and CH-47D/F fleets support?	Medium
	What benefits, in terms of manpower and resources, could be expected from the utilisation of the identified diagnostic and monitoring systems?	Medium

Title	Specific requirement	Time frame
CH-47F acceptance into operational service	What research assists the acceptance into operational service and in-service capability management of the CH-47F capability particularly concerning the integration of the Capability, Acquisition and Sustainment Group equipment deliverables into the combined arms teams?	Medium
Joint fires and effects system	What extended range fires system provide enhanced response, persistence and reliability to land combat?	Medium
Multi-role helicopter (MRH) support introduction into service	What can be done to assists with human/system integration?	Medium
	What S&T support can be provided to validate flight & slung load modelling?	Medium
	What S&T support can be provided to assist with preventative maintenance usage limitation requirements of the MRH?	Medium
	What can be done to assists with human/system integration?	Medium
	How can MRH flying characteristics be tested?	Medium
Force projection	How can S&T support be provided to inform future force projection capability development decisions covering insertion, extraction and support of ADF special operations, commensurate with current and emerging threats and operating environments?	Medium
Combat survivability of aircraft	What are the improved survivability, operational doctrine and tactics for Army aviation assets, in accordance with the Countermeasures Development and Validation (CMD&V) Master Plan 12-17?	Enduring
Priority 3		
Nil		

Annex B

Human performance R&D requirements

As the enduring nature of war remains a primarily human endeavour provides human performance is at the forefront of Army's modernisation program. The purpose of the Human performance Army modernisation line of effort is to ensure Army's personnel, as individuals and teams, maintain an edge over potential adversaries in a crowded, contested, connected and lethal future land warfare environment.

Title	Specific requirement	Time frame
Priority 1		
Cognitively prepared	How can the Army improve the cognitive readiness of personnel so they are better prepared for complex operations?	Enduring
	What are the quantitative and qualitative measures of complex decision making ability in naturalistic settings?	Short
	What are the temporal, physical, cognitive, environmental and informational factors that limit the quality of decisions made by commanders now? How can we train commanders to overcome these in the future?	Short
	What healthy eating intervention strategies can be designed, piloted and evaluated to improve the eating behaviour of soldiers?	Short
	What cognitive developmental techniques can Army employ to assist in specialist skill development?	Short
	How valid is simulation for the assessment of decision making and its effectiveness and application range for training operational decision making.	Short
	What are the psychological conditioning techniques that Army can employ to improve the performance of soldiers in all roles?	Medium
	How can the Army use cognitive screening and profiling to improve the selection and employment of personnel in specialist roles?	Medium

Title	Specific requirement	Time frame
Physically augmented	What load sharing systems can Army employ to improve soldier physiological performance?	Short
	How can Army continually develop and improve individual equipment and clothing to survive and thrive on operations?	Short
	How can Army develop and enhance the skills and attributes of the individual soldier as a threat detector?	Medium
	What wearable technologies for physical preparation and monitoring can the Army employ?	Medium
Physically prepared	What can be done to assist Army in the development of generic and role-specific physical employment standards?	Short
	What are best practice screening and physical conditioning regimens for human performance optimisation and injury prevention in the Army's workforce and what are standards and competency implications for individual trades?	Medium
Organisationally adaptive	How can Army improve leadership at the individual, team and organisational level within Army to best support being an adaptive organisation?	Enduring
	How can Army quantitatively and qualitatively improve the recruitment of personnel and their selection for specialist trades?	Short
	How can Army doctrine and training continuum be improved to incorporate recommended training systems and technologies?	Short
	What collaborative and organisational decision making systems and technologies improve decision making?	Medium
	What methodologies can the Army use to improve education & professional mastery for specialist employment?	Medium
Personnel recovery	How can Army improve the physical rehabilitation of soldiers?	Enduring
	How can Army mediate the psychological effects for transition to civilian life?	Medium
	What can Army do to improve the collective health and welfare of the force?	Medium

Title	Specific requirement	Time frame
Cognitively augmented	How can Army exploit advanced computing, information and decision support systems and tools to support decision making?	Enduring
	What cognitive ergonomics and ergonomic systems can Army employ to improve soldier cognition and alertness and reduce cognitive load?	Short
	How valid is simulation for the assessment of complex decision making and its effectiveness and application range for training operational decision making.	Short
	What methodologies exist that validate simulations (i.e. Microworld) as a predictor of real-world performance?	Short
	What performance enhancing sleep and fatigue management techniques can be used effectively by Army?	Short
	What current or emerging autonomous systems can be employed by the land force in support of human and team performance?	Short
	How does computer-based simulation contribute to improved decision-making? What simulation-based education and training approaches can be utilised to enhance preparation of decision makers for the future land operating environment?	Medium
	What wearable technology for cognitive preparation and monitoring can the Army employ?	Medium
	What are the threats, opportunities and human limitations associated with teaming humans and highly autonomous systems?	Long
Priority 2		
Physically prepared	How can the combatant's combat load be reduced and managed without the need for load sharing equipment?	Short
	What are the emerging food technologies that Army can exploit to meet the nutritional needs of the future force including enhanced cognitive and physical performance, and how can Army most effectively and efficiently utilise fresh feeding and combat rations?	Short
Cognitively augmented	What methods to increase synthetic/simulation support to non-op decision-making can be used in Army?	Short

Title	Specific requirement	Time frame
	How can Army build a robust training and education system for future environments?	Enduring
	How can Army select, recruit and retain the right people in an increasingly diversified future workforce (age, gender and ethnicity)?	Enduring
	What future methods and approaches will deliver training outcomes most effectively?	Short
	How can simulation best support operational planning and experimentation?	Short
	What healthy eating intervention strategies can be designed, piloted and evaluated to improve the eating behaviour of soldiers?	Short
Organisationally adaptive	How can Army learning organisation principles be compared and contrasted with Army learning organisation culture each year and what are suitable interventions can be used to improve as a learning organisation?	Medium
	How can science be used to assist Army in cultivating the systems, people, processes and culture that enables it to learn, share and apply knowledge, thus, adapting to changing environments?	Medium
	How can Army best utilise simulation systems and technologies for collective training and rehearsal?	Medium
	What can be done to improve the effectiveness of the short, medium and long learning loops in functional commands?	Medium
	What is the impact of new technologies on force structure and personnel roles, and flow-on implications for recruitment standards and demographics?	Medium
Priority 3		
Cognitively prepared	What biases and heuristics are manifested in training for future operations, and how can positive effects be harnessed and risks mitigated?	Medium
Physically augmented	What physical performance enhancing techniques and supplements can be used to improve health and well-being?	Enduring
Cognitively augmented	What cognitive performance enhancing pharmacological products, dietary supplements and non-pharmacological methods can be utilised by Army ethically and safely to improve health, wellbeing and performance?	Medium
Organisationally adaptive	What is the most robust and appropriate methodology for analysing the maturity of organisational adaptability from a systems perspective (i.e. in management structures, processes and supporting technological systems).	Short

Annex C

Force protection R&D requirements

Force protection of the Army's finite resources (personnel and equipment) remains an Army imperative – Army must be able to protect itself against the range of existing and evolving threats.

Title	Specific requirement	Time frame
Priority 1		
Ballistic protection for vehicle operations	What S&T support can DST Group provide in support of developing and improving ballistic protection for vehicle operations?	Short
	What S&T support can DST Group provide in support of developing and improving ballistic protection for vehicle operations?	Short
	What is the weld quality and integrity in deployable armoured vehicles (other vehicles may also be assessed but PMV (is the directed priority for immediate effort)?	Short
	What modelling is required to assess the response of vehicles and occupants to underbelly blast and potential survivability improvements (other vehicles may also be assessed but PMV is the directed priority for immediate effort)?	Short
CBRNE Defence	What S&T support can be provided to assist in improving the Army's CBRNE defence capability?	Short
Improved physical force protection of ADF personnel and fixed military structures	What is the improved level of protection from concrete spall liners, pre-detonation screens and alternate wall materials?	Short
Signature reduction for equipment & vehicles	What does a review of threat ISR system/weapon seekers indicate are key signature management defeat technologies?	Short

Title	Specific requirement	Time frame
Ballistic protection for vehicle operations	What should the base levels of protection and mobility for land force vehicles be (e.g., active protection systems and ultra-strong lightweight materials)? Split into two queues: 1. Spt review of base level protection – imp, DST Group 2. Mtls – imp, allies & partners, DST Group, DMTC, DSI	Medium
	What are the ballistic and blast protection technologies suitable for enhancing the physical protection of deployable armoured vehicles (particularly for the PMV and ASLAV IPTs), drawing on lessons learned from operational incidents?	Medium
	What is the feasibility of specific armour and survivability systems to protect deployable armoured vehicles against ballistic and blast threats?	Medium
	What S&T support can DST Group provide in support of developing and improving ballistic protection for vehicle operations?	Medium
	What are the characteristics of new and emergent ballistic protection materials?	Medium
CBRNE Defence	What S&T support can be provided to assist in improving the Army's CBRNE defence capability?	Medium
	What does the Army require to develop and enhance laboratory support for CBRNE (including TIC & TIM) analysis?	Medium
	What are the future support requirements for deployable CBRNE (including TIC & TIM) analysis capability?	Medium
	What does the Army require to develop an enhanced deployable CBRNE (including TIC & TIM) detection, diagnostic and analytical capability?	Medium
	What standoff radiation detection capability exists for high and low energy signature radiation sources?	Medium
Counter-surveillance	How can the Army advance surveillance and counter-surveillance capabilities; validate the various means of detection; and develop means to improve current capability to reduce signature or defeat detection means?	Medium
	How can the Army develop capability to detect and counter adversary surveillance and targeting of soldiers and vehicles with optical sights?	Medium
	What surveillance & counter-surveillance approaches developed in the last decade will be rendered less effective by a return to austere, low signature operating practices?	Medium

Title	Specific requirement	Time frame
Helicopter operations in degraded visual environments	What are the enhancements to the safety of helicopter operations in degraded visual environments (watching brief)?	Medium
Improved physical force protection of ADF personnel and fixed military structures	How can S&T support be used to develop design guidelines and methodologies for technical design and non-technical design of physical force protection?	Medium
Improved physical force protection of ADF personnel and fixed military structures	How can the Army maximise the use of robotics and autonomous technologies to enhance physical protection of ADF personnel? To what extent can unmanned systems replace or supplement manned systems in this area?	Medium
	How can S&T support be used to develop design guidelines and methodologies for technical design and non-technical design of physical force protection?	Medium
	What advances in materials technology can be affordably incorporated into the Army's next generation of personnel and vehicle physical protection systems?	Medium
	What physical protection does the combatant need to maximise survivability in complex future environments (both mounted and dismounted)?	Medium
	Will the land force be required to develop more dispersed headquarters and decentralised logistics infrastructure in its future operating concepts to reduce exposure to long-range kinetic attacks?	Medium
Night vision device platform compatibility	What are the equipment performance implications, cockpit displays and other aircraft lighting systems, and visual performance limitations when using night vision devices in the Australian environment?	Medium

Title	Specific requirement	Time frame
Signature reduction for equipment & vehicles	How can the Army maximise the use of robotics and autonomous technologies signature reduction? To what extent can unmanned systems replace or supplement manned systems in this area?	Medium
	What advances in materials technology can be incorporated into the Army's next generation of personnel and vehicle signature reduction systems?	Medium
	What are possible signature reduction solutions utilising and adapting, where possible, existing broadband electromagnetic and acoustic signature management technologies developed for RAN and RAAF platforms?	Medium
	What are the effective service life, low-cost quality assurance assessments and effectiveness in the visible spectrum of various broadband camouflage systems including those with the ability to defeat TI/II sensors and radars?	Medium
	What does the Army need to change about its platform optics Signature Management to defeat retroflective ISR systems?	Medium
	What signature reduction does the combatant need to maximise survivability in complex future environments (both mounted and dismounted)?	Medium
	What vehicle and force hotspots require priority signature management solutions?	Medium
	What are the enemy signature based threats and how can land force vulnerability and signature control measures be identified?	Medium
	What signature management capabilities are required by lands forces on operational deployment for vehicles and equipment?	Medium
	What human observer search performance data set can be obtained for optimisation of detection assessment tools?	Medium
	Are any technology demonstrator models able to be developed for signature management solutions?	Medium
	What signature vulnerabilities does a reinforced combat brigade, or it constituent elements, exhibit across the electromagnetic spectrum?	Medium
Ballistic protection for vehicle operations	How can the Army maximise the use of robotics and autonomous technologies to enhance ballistic protection? To what extent can unmanned systems replace or supplement manned systems in this area?	Long

Title	Specific requirement	Time frame
Priority 2		
Improved physical force protection of ADF personnel and fixed military structures	What are the results of testing Australian explosive ordnance storage options?	Short
	In what ways can future land forces work with other government and non-government agencies to restrict or deny access to lethal technology?	Medium
	Will regional powers, armed with connected networks of long-range sensors, precision-guided missiles and other anti-access technologies have the capacity to seriously inhibit the projection of land forces?	Medium
Priority 3		
CBRNE Defence	What rationalisation of decontamination solutions will enable optimisation of required fleet size?	Medium

Annex D

Situational awareness R&D requirements

Situational awareness and understanding of the battlespace, acquired through exploitation of current and emerging intelligence, surveillance, target acquisition and electronic warfare (ISTAREW) capabilities integrated with combat systems remains an imperative for the Army.

Title	Specific requirement	Time frame
Priority 1		
Collection, fusion and targeting	What S&T support can be provided to enhance collection, fusion and targeting capabilities?	Short
	How can the Army learn from and refine the process of collection, collation (incorporating a common operating picture) dissemination and targeting?	Medium
Integrated C4ISTAREW capability to support Army and Defence joint operations	What are the interrelationships between Air-Land Integration Cell and the All Source Cell and identify opportunities and barriers to improved integration?	Medium
Integrated land ISTAR system logic	What are the networked information management requirements, capabilities and processes for the tasking, collection, processing and dissemination of a tactical reconnaissance capability in a future complex urban environment?	Medium
	How can the current and near-term networked information management requirements and processes for the tasking, collection, processing and dissemination of a tactical recon capability be determined (this should focus on bottom-up information capture and/or fighting for information in a complex warfighting environment)?	Medium

Title	Specific requirement	Time frame
Management of ISR	What are the risks, options and implications associated with the integration of ISR systems with command and battle management systems, the supporting network and enterprise systems?	Medium
	What are the land and joint tactical ISTAREW information exchange requirements and how can the information be best utilised and/or processed at each node?	Medium
	How can mission critical information be best presented to commanders without imposing unacceptable temporal and cognitive imposts?	Medium
	What are the most effective cyber defence technologies and methods for deployed networks and systems?	Medium
Land tactical ISTAR operations and systems analysis	How can S&T support be provided to assist the Army in understanding and applying ISTAR capabilities that can be used to support operations and position commanders and forces in future battlespaces?	Long
Priority 2		
Integrated land ISTAR system logic	How can the current and near-term networked information management requirements and processes for the tasking, collection, processing and dissemination of a tactical recon capability be determined? (This should focus on bottom-up information capture and/or fighting for information in a complex warfighting environment.)	Medium
	How can an integrated and robust conceptual framework be developed within which to address tactical intelligence capability (i.e dynamic tactical enemy threat awareness)?	Medium
	What tactical land ISR systems and capabilities are optimal for employment in the combined arms team?	Medium
	What is the optimal sensor mix and balance of ISR systems to support land operations within a joint environment?	Medium
	How can tactical intelligence be captured, processed and disseminated in the networked battlegroup to support the implementation of the networked battlegroup and the SoS experimentation program?	Medium

Title	Specific requirement	Time frame
	Examine & report on the effective and efficient ways to record store and mine large volumes of data to determine critical information for decision makers.	Medium
	What robotic and/or autonomous technologies offer the most effective enhancement to ISR?	Medium
Management of ISR	What methods can be used to improve the dissemination of relevant ISR information to all levels of command?	Medium
	How effective can future land ISR concepts be in improving the ISR capability of a combat brigade?	Medium
	Examine & report on the convergence of biotechnology and other ISR technologies to improve targeting to reduce collateral damage in complex urban environments.	Long
Priority 3		
Nil		

Annex E

Command, control and communication R&D requirements

The Army's ability to command and make timely decisions is central to its ability to conduct joint land combat. This line of effort includes all aspects of C4: command, control, communications and cyberspace.

Title	Specific requirement	Time frame
Priority 1		
Networking the land battlespace	How can S&T support be provided to support development of the Army's concepts, doctrine, risk management and implementation options for a networked land battlespace?	Short
Information actions	What can the Army do to defend critical networks against cyber attack, while also being prepared to operate in a degraded network environment?	Medium
	What can be done to ensure that Australian access to and use of digital systems and capabilities of our partners does not increase Australia's vulnerability?	Medium
	What is the nature and characteristics of the increasing dependence on ICT/RF networks; and what are the risk mitigation measures to the disruption of those networks?	Medium
	Will the land force be required to develop more dispersed headquarters and decentralised logistics infrastructure in its future operating concepts to reduce exposure to cyber attacks?	Medium
C2 and information management	Which skillsets must the Army maintain to ensure that operations are not compromised in an information-degraded environment?	Medium
Land networking	What methods and technologies should the Army employ to ensure the resilience of the land network?	Medium
	What are the ongoing requirements for strategic, operational and tactical communications networks to support an expeditionary force? How will these be assets be protected?	Medium
	What are the most effective measures that the Army can employ to mitigate the risks associated with operating in an contested and constrained information-degraded environment?	Medium

Title	Specific requirement	Time frame
Priority 2		
CBRNE Defence	What rationalisation of decontamination solutions will enable optimisation of required fleet size?	Medium
C2 and information management	What methods and technologies offer the most effective way to extract meaning from large volumes of data?	Medium
	What are the key technological and conceptual innovations that the Army can exploit to improve command and control, especially with regard to operational planning and execution?	Medium
Modernisation of mission command	How can tactical headquarters best capitalise on new and emerging technologies in conducting joint operations?	Medium
	How does the Army improve the level of trust in digital systems to overcome the need for data cross-verification?	Medium
Land networking	What are the unintended consequences of the introduction of a digital network to land forces and what are the options for mitigating or exploiting these?	Medium
Networking the land battlespace	How can S&T support be provided to support development of the Army's concepts, doctrine, risk management and implementation options for a networked land battlespace?	Medium
	What techniques and technologies are most efficient for the use of electromagnetic spectrum including electromagnetic spectrum sharing?	Medium
Modernisation of mission command	For which capabilities can the Army accept the risk of relying on provision of information from joint capabilities as a result of modernisation of mission command?	Long
Priority 3		
Land networking	How does reliance on, and interdependence with, civilian and commercial networks constrain land forces in employing a full range of effects in operational theatres?	Medium

Annex F

Logistic support to the force R&D requirements

Army, as part of the joint force, must develop a robust logistics, administrative and personnel support system to sustain the land force.

Title	Specific requirement	Time frame
Priority 1		
Army's future power and energy framework	What are the Army's power and energy requirements across the full organisational spectrum, ranging from the multi-role combat brigade to the infantry section?	Medium
	How can the Army optimise employment and management of power and energy in the field?	Medium
	What scope exists to implement a rationalisation of battery use for the dismounted combatant to 2030, which must include projected weight savings and numbers and types of batteries to be rationalised at the individual combatant, section, platoon, company, regiment and brigade size organisation?	Medium
	With the aim of combining functions to reduce cost, weight and complexity, what opportunities exist to adapt and/or adopt technologies in order to optimise system characteristics that support military requirements?	Medium
	What energy storage/distribution alternatives exist beyond general purpose petroleum fuels? What value is offered by alternative technologies such as synthetic fuels and bio-fuels and how will they satisfy high power operational military requirements while reducing reliance on petroleum fuels?	Medium
	What are the system requirements of power and energy demand and supply across the full organisational spectrum, doctrine, policy, fuel options, and operational performance?	Medium
	What are the system requirements of power and energy demand and supply across the full organisational spectrum, doctrine, policy, fuel options, and operational performance?	Medium
	What is the cost-benefit analysis to provide a 'marketing' driver to help the Army prioritise areas of investment within the power and energy framework?	Medium
	What evolving power & energy policies and developments of coalition partners (particularly the USA) might affect the Army's interoperability, future capability acquisition and power and energy framework?	Medium

Title	Specific requirement	Time frame
Combat service support force design	What S&T support can be provided to assist in developing and implementing the force design of combat service support capabilities in the future Army?	Medium
Land materiel capability management	What are the realisable benefits of implementing vehicle health and usage monitoring systems on G-Wagons?	Medium
Technical life of type study for LAV fleets	What is the technical life of type of each of the ASLAV, PMV and M113AS4 fleets of vehicles?	Medium
Priority 2		
Combat service support force design	What are the opportunities and risks for application of additive manufacturing within land force combat service support, and what are the attending force design and support delivery implications?	Medium
	What combat service support S&T opportunities and trends are evident in international Defence, industry and academic domains?	Medium
	What work value unit tools are suitable for use in analysing combat service support force structure?	Medium
	How can the Army reduce the risk attached to implementing the force design of combat service support capabilities in the future Army?	Medium
	What S&T support can be provided to assist in developing and implementing the force design of combat service support capabilities in the future Army?	Medium
	Are the Army's current tools for combat service support simulation and war gaming appropriate? How can they be improved?	Medium
Technical life of type study for LAV fleets	What armour upgrades can expand the life of type and operation envelope for M113?	Medium
Army's future power and energy framework	What tools or models are available to support planning and analysis of expeditionary power & energy requirements?	Medium
	How might Army improve operational performance and efficiencies of existing system/component architectures (recognising that JP-8 will be the standard for at least the next decade)?	Medium

Title	Specific requirement	Time frame
Land materiel capability management	What are early life trends of G-Wagon maintenance and sustainment performance, including description of key resource use?	Short
	How does the G-Wagon early life trends compare with other vehicle platforms?	Short
	What can be done to enable the Army to exploit causal relationships between availability and system variables in order to explore policies on land materiel maintenance?	Medium
	How can lead indicators and predictive assessments be provided on the system health across long lead times of 6, 12 and 24 months?	Medium
	How does the land materiel maintenance system optimise operational availability, and what definitions of appropriate measures and metrics would support enhanced fleet management performance, specifically M113 and tank?	Medium
	What are the benefits of implementing vehicle health and usage monitoring systems on specific land force equipment fleets?	Medium
	What are the benefits of adopting vehicle health monitoring systems and condition based monitoring practices for land vehicles?	Medium
	What does the Army require to develop land materiel sustainment performance measures and metrics?	Medium
	What simulation models of land materiel sustainment systems are most appropriate for assessing operational availability?	Medium
	How well are sustainment and intervention strategies working on designated vehicle fleets?	Medium
Priority 3		
Land materiel capability management	Is there a correlation between G-Wagon, vehicle health monitoring systems and Military Integrated Logistics Information Systems data?	Short
Combat service support force design	What commercial modelling tools can be adapted to support combat service support force modernisation reviews and force development analysis?	Medium