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**Minister for Defence
Leader of the House
Federal Member for Sturt**

SENATOR THE HON LINDA REYNOLDS CSC

**Minister for Defence Industry
Minister for Emergency Management North Queensland Recovery
Senator for Western Australia**

STEVEN MARSHALL MP

**Premier of South Australia
State Member for Dunstan**

MEDIA RELEASE

NEW AIR DEFENCE CAPABILITY

The Federal Government today announced it will improve the protection of Australian troops through the purchase of a new short range air defence capability using Australian designed and built radars and vehicles.

Minister for Defence, the Hon Christopher Pyne MP, and Minister for Defence Industry, Senator the Hon Linda Reynolds CSC, said the Government is committed to providing the Australian Defence Force with the best capability to protect Australia's national interests.

"This new air defence capability will do just that by combining world leading Australian radar technology with a highly effective air defence system that will contribute to the protection of our service men and women from modern airborne threats," Minister Pyne said.

"The capability will be based on the Raytheon/Kongsberg National Advanced Surface to Air Missile System (NASAMS) which is used by several countries including the United States.

"Australia's version of NASAMS will use advanced radars designed and manufactured by Canberra-based company CEA Technologies.

"The CEA radar that has been so successful on our ships will now be integrated into an Australian designed and built vehicle.

"I'm delighted to announce that one of Australia's most innovative technologies will be used to enhance the effectiveness of NASAMS and contribute to one of the world's best short range ground based air defence systems."

Minister Reynolds said Australian industry will play a vital role in the AUS \$1.5 billion project to buy the short range air defence capability, which will replace the Army's current ageing RBS-70 man-portable very short range air defence system.

"Australian industry will secure more than AUD \$1 billion of the total investment in acquiring and maintaining the short range air defence capability," Minister Reynolds said.

"Today's announcement will create opportunities for Defence exports generating employment for at least 100 Australian workers over the projected life of the capability

"This project is further proof of the Government's determination to build a sovereign and sustainable defence industrial base as a national strategic asset, and is another example of Australian industry playing an integral part of a world-beating capability for the Australian Defence Force."

(Premier of SA's office liaising directly with O/MINDEF for comment regarding SA investment)

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Authorised by Senator the Hon Linda Reynolds CSC, Minister for Defence Industry, WA, Australia.

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NEW AIR DEFENCE CAPABILITY

Source : Joint Media Release - Minister for Defence, the Hon Christopher Pyne, MP; Minister for Defence Industry, Senator the Hon Linda Reynolds CSC; Premier of South Australia, the Hon Steven Marshall MP, 25 March 2019

The Morrison Government today announced it will improve the protection of Australian troops through the purchase of a new short range air defence capability using Australian designed and built radars and vehicles. Minister for Defence, the Hon Christopher Pyne MP, and Minister for Defence Industry, Senator the Hon Linda Reynolds CSC, said the Government is committed to providing the Australian Defence Force with the best capability to protect Australia's national interests.

"This new air defence capability combines world leading Australian radar technology with a highly effective air defence system that will contribute to the protection of our service men and women from modern airborne threats," Minister Pyne said.

"The capability will be based on the Raytheon/Kongsberg National Advanced Surface to Air Missile System (NASAMS) which is used by several countries including the United States.

"Australia's version of NASAMS will use advanced radars designed and manufactured by Canberra-based company, CEA Technologies.

"The CEA radar that has been so successful on our ships will now be integrated into an Australian designed and built vehicle, the Thales Hawkei.

"I'm delighted to announce that one of Australia's most innovative technologies will be used to further enhance the effectiveness of NASAMS and contribute to one of the world's best short-range ground based air defence systems."

Minister Reynolds said Australian industry will play a vital role in the \$2.5 billion project to buy and sustain the short-range air defence capability, which will replace the Army's current ageing RBS-70 man-portable air defence system.

"Australian industry will secure more than \$1 billion of the total investment in acquiring and maintaining the short range air defence capability," Minister Reynolds said.

"Today's announcement will create opportunities for defence exports generating employment for at least 100 Australian workers over the projected life of the capability.

"This project is further proof of the Government's determination to build a sovereign and sustainable defence industrial base as a national strategic asset, and is another example of Australian industry playing an integral part in developing world-class capability for the Australian Defence Force."

Much of this work will be done at the new Raytheon Australia Centre for Joint Integration, which will be built in the defence industry precinct at Mawson Lakes with a \$50 million investment from Raytheon.

Premier of South Australia, the Hon Steven Marshall MP, said the South Australian Government is proud that Raytheon Australia has decided to call Mawson Lakes home for their new Centre for Joint Integration.

"This project will create new high-tech jobs and supply chain and export opportunities for our defence industry, with work to be undertaken at Raytheon Australia's Centre for Joint Integration in South Australia," he said.

"This significant facility strengthens South Australia's position as a key strategic hub for Raytheon Australia, one of the largest defence companies in the Australian market. It will accelerate growth in the defence sector and supports future Raytheon programs across maritime, aerospace, cyber and systems integration," said Premier Marshall.

GOVERNMENT PLEDGES NEW MISSILE SYSTEM AS LABOR BOOSTS HEALTH AND ENVIRONMENT

Source : Nicole Hasham The Age March 24, 2019 (syndicated to The Canberra Times and SMH)

A re-elected Morrison government would spend \$2.5 billion bolstering Australia's capacity to intercept enemy aircraft through the purchase of a new short-range air defence system.

The government said the new missile launchers and radars would improve the protection of Australian Defence personnel and better guard Australia and its critical assets. The measure was first flagged several years ago, and recently signed off by cabinet.

The system would focus on the interception of enemy aircraft, but would also be able to defend against helicopters, cruise missiles and unmanned aerial systems.

It would replace the current ageing RBS-70 air defence system and have far longer range, more lethal missiles and a better radar system.

Defence Minister Christopher Pyne said the capability combined Australian radar technology and a “highly effective air defence system” to protect against airborne threats.

The investment would comprise an Australian version of the National Advanced Surface to Air Missile System, a short-to-medium range system used by nine countries including the United States, Norway and Oman.

It would use advanced radars designed and built by Canberra firm CEA Technologies. The radars and missile system would be mounted onto the Thales Hawkei armoured ground vehicles.

The spending involves \$1.5 billion to acquire the system and \$1 billion to operate and maintain it over two decades.

Minister for Defence Industry Linda Reynolds said the project had great export potential and would create at least 100 Australian jobs over its life. Much of the work would take place at a new Centre for Joint Integration at Mawson Lakes in South Australia, established by US-based defence contractor Raytheon.

In election commitments by Labor, the party is on Monday expected to announce \$14 million over four years for nine Environmental Defenders offices across Australia. The offices would provide free legal representation to community groups and individuals on environment cases deemed to be in the public interest. The service’s federal funding was abolished under the former Abbott government, and it has struggled to survive on state funding and donations

In a statement, Labor environment spokesman Tony Burke and shadow attorney-general Mark Dreyfus said the party “recognises that Australians are becoming increasingly concerned about the destruction of our natural environment under the Liberal-National government”.

“Properly funded EDOs can make sure the environment has a voice in the courts, assisting all kinds of Australians to protect their natural surroundings. That includes farmers, who make up a significant proportion of EDO clients,” it said.

Labor is also expected on Monday to pledge to end the remainder of the Morrison government’s Medicare freeze in the first 50 days of government if it wins office in May.

It says the move would mean Medicare rebates for 100 GP items, including family counselling, urgent after-hours care and mental health care, would increase and patients would pay less in out-of-pocket costs.

Labor would end the freeze in July this year, one year earlier than under the government’s schedule.

The announcement coincides with a Labor campaign set to launch on Monday targeting Prime Minister Scott Morrison’s cuts to health services when he was treasurer, and his opposition to the banking royal commission.

An article was published in The Advertiser but is only available online by paid subscription

AUSTRALIAN-FIRST FACILITY TO SUPPORT ARMY AND INDUSTRY DEVELOPMENT

Source : Defence Connect. 25 March 2019 Stephen Kuper

Defence Minister Christopher Pyne has officially confirmed a major milestone for the Army’s \$2.5 billion inner tier air and missile defence system.

Defence Connect can confirm that Defence Minister Christopher Pyne was joined by South Australian Premier, Steven Marshall, Norwegian ambassador Paul Gulleik Larsen, Chief of Army, Major General Rick Burr, and other senior Defence and industry executives to announce that the National Advanced Surface to Air Missile System (NASAMS) has been selected for the Australian government’s Short Range Ground Based Air Defence program, known as LAND 19 Phase 7B.

Minister Pyne and Minister for Defence Industry Linda Reynolds said the government is committed to providing the Australian Defence Force with the best capability to protect Australia's national interests.

"This new air defence capability combines world leading Australian radar technology with a highly effective air defence system that will contribute to the protection of our service men and women from modern airborne threats," Minister Pyne said.

The NASAMS acquisition brings transformational change to the Army's existing force protection capability, including a progression from man-portable GBAD capability to a fully networked and distributed system, these advancements allow the Army to counter complex air threats beyond visual range and significantly increases protection coverage for Australian soldiers.

Minister Pyne added, "Australia's version of NASAMS will use advanced radars designed and manufactured by Canberra-based company CEA Technologies. The CEA radar that has been so successful on our ships will now be integrated into an Australian designed and built vehicle, the Thales Hawkei."

Michael Ward, managing director of Raytheon Australia, said, "NASAMS and Raytheon's unique EO/IR passive sensor gives Australia one of the most advanced short-range ground-based defence systems in the world."

System integration and final assembly will take place in the new, \$50 million Raytheon Australia Centre for Joint Integration, which will be built in the defence industry precinct of Mawson Lakes.

"This centre is a \$50 million investment by Raytheon Australia and will incorporate an office block and a specialised integration facility. Importantly this facility will be a change in strategy for Raytheon Australia, the facility will be our first production facility in country and it will become one of the major NASAMS production and support facilities outside the US," Ward told Defence Connect.

At the ground breaking earlier today, Ward thanked the South Australian Premier for providing support from the government of SA for the facility.

Raytheon Australia anticipated the creation of about 200 jobs over the next year during the construction of the building and an estimated 300 additional jobs in the coming years for those working on LAND 19 and other integrated air and missile defence projects, including the combat system upgrades to the Hobart Class destroyers.

Minister Reynolds said Australian industry will play a vital role in the \$2.5 billion project to buy and sustain the short-range air defence capability, which will replace the Army's current ageing RBS-70 man-portable air defence system.

"This project is further proof of the government's determination to build a sovereign and sustainable defence industrial base as a national strategic asset, and is another example of Australian industry playing an integral part in developing world-class capability for the Australian Defence Force," Minister Reynolds said.

Raytheon Australia and partner Kongsberg are building sovereign capability in this area, as evidenced by their national industry roadshow where the companies engaged with almost 200 local firms. Additionally, Raytheon Australia has ambitions to export elements of the system from the new Adelaide facility.

"LAND 19 will provide the inner tier of the air and missile defence capability with the Hobart Class providing the outer tier of the national air and missile defence. As a result of this, Raytheon can say that the integration centre will be focused on force protection with a focus on supporting Australian industry content and we are proud to say that our solution for LAND 19 will incorporate at least 50 per cent Australian industry content," Ward added.

NASAMS is a short to medium range air defence system owned by nine countries and has been integrated into the US National Capital Region's air defence system since 2005. In addition to the US, Norway, Finland, Spain, the Netherlands, Oman, Lithuania, Indonesia and one undisclosed country have chosen to depend on NASAMS for homeland defence and the defence of critical assets.

Raytheon is a technology and innovation leader specialising in defence, civil government and cyber security solutions. With a history of innovation spanning 97 years, Raytheon provides state-of-the-art electronics, mission systems integration, C5I products and services, sensing, effects and mission support for customers in more than 80 countries.

RAYTHEON AND KONGSBERG PROVIDING SHORT RANGE GROUND BASED AIR DEFENCE FOR AUSTRALIA (AUD) \$1.5 BILLION SYSTEM PROVIDES WORLD LEADING FORCE PROTECTION

Source : Raytheon Website 25 March 2019

MAWSON LAKES, South Australia – Today Raytheon Australia and KONGSBERG Defence & Aerospace joined Defence Minister, the Hon Christopher Pyne and South Australian Premier, the Hon. Steven Marshall, to announce that the National Advanced Surface to Air Missile System, NASAMS, was selected for the Australian Government's Short Range Ground Based Air Defence program known as LAND19 Phase 7B.

NASAMS is a short to medium range air defence system owned by nine countries and has been integrated into the U.S. National Capital Region's air defence system since 2005. In addition to the U.S., Norway, Finland, Spain, The Netherlands, Oman, Lithuania, Indonesia and one undisclosed country have chosen to depend on NASAMS for homeland defence and the defence of critical assets.

"NASAMS and Raytheon's unique EO/IR passive sensor gives Australia one of the most advanced short range ground based defense systems in the world," said Michael Ward, Managing Director of Raytheon Australia."

The NASAMS acquisition brings transformational change to the Army's existing force protection capability, including a progression from man-portable GBAD capability to a fully networked and distributed system. These advancements allow the Army to counter complex air threats beyond visual range and significantly increases protection coverage for Australian soldiers. The system will eventually become the inner tier of Australia's integrated air and missile defence capability.

System integration and final assembly will take place in the new Raytheon Australia Centre for Joint Integration, which will be built in the defence industry precinct of Mawson Lakes with a (AUD) \$50 million investment from Raytheon. At the groundbreaking today, Mr. Ward thanked the South Australian Premier for providing support from the government of South Australia for the facility.

The centre will be the company's first production facility in Australia. Raytheon Australia anticipates the creation of approximately 200 jobs over the next year during the construction of the building and an estimated 300 additional jobs in the coming years for those working on LAND19 and other integrated air and missile defence projects, including the combat system upgrades to the Hobart Class destroyers.

Raytheon Australia and KONGSBERG are building sovereign capability in this area as evidenced by their national industry roadshow where the companies engaged with almost 200 local firms. Additionally, Raytheon Australia has ambitions to export elements of the system from the new Adelaide facility.

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AIR FORCE TROOPS' NEW DEFENCE SYSTEM IN SA

Source : Manning River Times - Emily Cosenza March 25 2019

A 2.5 billion air defence missile system is to be based in Adelaide

Australian troops will have access to a new \$2.5 billion short-range air defence capability based in South Australia.

Missiles will be mounted onto vehicles and are designed to destroy enemy aircraft, drones or missiles from beyond visual range.

The air defence missile system will include world-leading radar technology and an air defence system for protection against airborne threats at the facility's new home in Adelaide's north.

Defence Industry Minister Linda Reynolds says Australian companies will secure more than \$1 billion of the total investment through acquiring and maintaining the new system.

"It will create opportunities for defence exports generating employment for at least 100 Australian workers over its projected life," she said.

Defence Minister Christopher Pyne said the capability would be based on the Raytheon/Kongsberg National Advanced Surface to Air Missile System (NASAMS) which was used by several countries including the United States.

"One of Australia's most innovative technologies will be used to further enhance the effectiveness of NASAMS and contribute to one of the world's best short-range ground-based air defence systems," Mr Pyne said.

Raytheon has also invested \$50 million into the project.

The advanced radar will be designed and manufactured by Canberra-based company, CEA Technologies.

South Australia's Premier Steven Marshall said the project would create 500 construction and maintenance jobs along with export opportunities for the defence industry.

"This facility strengthens South Australia's position as a key strategic hub for Raytheon Australia, one of the largest defence companies in the Australian market," Premier Marshall said.

"It will accelerate growth in the defence sector and supports future Raytheon programs across maritime, aerospace, cyber and systems integration."

500 jobs in missile defence project

JADE GAILBERGER

WORK will start today on a centre in Adelaide's northern suburbs where the nation's \$2.5 billion short-range air defence missile system will be assembled, creating 500 jobs.

About 200 workers will build Raytheon Australia's Centre for Joint Integration at Mawson Lakes over the next 18 months.

Another 300 staff will be based there for a decade, assembling and maintaining the National Advanced Surface to Air Missile System.

They are rugged vehicles with missiles mounted on the back that will allow the Army to counter airborne threats from beyond visual range.

CONTINUED PAGE 2

FROM PAGE 1

It is designed to locate and destroy enemy aircraft, drones or missiles. Defence Minister Christopher Pyne and Premier Steven Marshall will today attend the official launch of works on the centre.

The new, short-range air defence capability, announced in 2017, is expected to transform the Australian Army's protection of its ground troops on overseas missions.

Mr Pyne said the \$2.5 billion purchase would combine world-leading Australian radar technology with an air defence system that would contribute to the "protection of our service men and women from modern airborne threats".

Systems engineers who worked on the Air Warfare Destroyer project, as well as other defence industry professionals, will work on the major project.

Mr Marshall said it would create hi-tech jobs and supply chain and export opportunities for SA's defence industry.

"This significant facility strengthens SA's position as a key strategic hub for Raytheon Australia, one of the largest defence companies in the Australian market," he said.

"It will accelerate growth in the defence sector and supports future Raytheon programs across maritime, aerospace, cyber and systems integration."

Australia is the 10th nation to acquire and adopt the NASAMS technology, replacing the Army's current ageing

RBS-70 man-portable air defence system.

It will boast Australian-designed and built radars from Canberra-based company, CEA Technologies, integrated with an Australian vehicle, the Thales Hawkei.

Raytheon Australia managing director Michael Ward said Norway's Kongsberg Defence

and Aerospace, which makes missile canister launchers, would also use the Mawson Lakes centre in assembling the air defence system.

"The system will eventually become the inner tier of Australia's integrated air and missile defence capability," Mr Ward said. Defence Industry Minister Linda Reynolds said

Australian industry would secure more than \$1 billion of the total investment in acquiring and maintaining the short-range air defence capability.

"This project is further proof of the Government's determination to build a sovereign and sustainable defence industrial base as a national strategic asset," she said.



FIREPOWER: The National Advanced Surface to Air Missile System, which will be assembled and maintained in SA.



DEFENCE | INDUSTRY | INTEGRATED

WORLD LEADER!

The Enhanced NASAMS passes Gate 2

VOL 38 - SPECIAL SUPPLEMENT 1

Initial
PointSMART BUYING
ANDREW McLAUGHLIN

The decision to pursue a Single Supplier Limited Tender for LAND 19 Phase 7B when it achieved Gate 1 Commonwealth approval in April 2017 caught many by surprise.

The Enhanced NASAMS solution is an extremely potent and lethal air-defence system, one which will maintain operational relevance for years to come as part of a broader integrated air and missile defence capability, and which has some very potentially attractive growth options.

CASG says its newly-introduced Smart Buyer principles "enables project teams to identify key project risks and use that risk analysis to develop tailored project execution strategies." This is a strategy that could go horribly wrong if not applied prudently.

Under Smart Buyer, it would have made perfect sense at the time to go with a low-risk proven system such as the 'baseline' NASAMS 1 system which is already in service. Importantly, it is already integrated with US air defence architectures through its operational employment in Washington DC since 2005, and has also been sold to several allied nations since.

But what stands out for special mention is the bold and effective cross-department

and defence industry decision-making associated with the project which has saved considerable time and money. And working on the assumption the weapon system is likely to be used in anger at some point in its service life then it will inevitably save lives, too.

It is easy to forget that 2016 was a year of significant change for the Department of Defence, not least due to the release of the new White Paper and associated defence industry policy and organisational changes, and it would therefore have been easy to trial Smart Buyer on a low profile, low value project.

So the decision to implement the new Smart Buyer methodology in early 2017 for LAND 19 Phase 7B was both courageous and wise which, so far, appears to have resulted in a world-beating capability with a significant amount of Australian innovation and content. This is something for which a significant amount of credit must go to all parties.

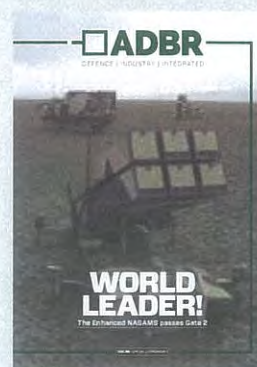
The central role of CASG supported by Army as the customer and the Raytheon-led industry team should not be understated.

And while there is still plenty to be done to achieve an operational capability, they should be congratulated for the stellar progress to date. ■

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COVER

The Raytheon/KONGSBERG Enhanced NASAMS has been selected for the LAND 19 Phase 7B Short-Range Land-Based Air-Defence (SRGBAD) requirement. RAYTHEON CONCEPT IMAGE

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■ LAND 19 PHASE 7B

WORLD LEADER!

LAND 19 Phase 7B progresses to Gate 2 with the Enhanced NASAMS solution

BY ANDREW McLAUGHLIN

The world's most advanced short-range ground-based air defence (SRGBAD) system will soon enter service with the Australian Defence Force, following the successful Gate 2 milestone approval of the Project

LAND 19 Phase 7B SRGBAD program.

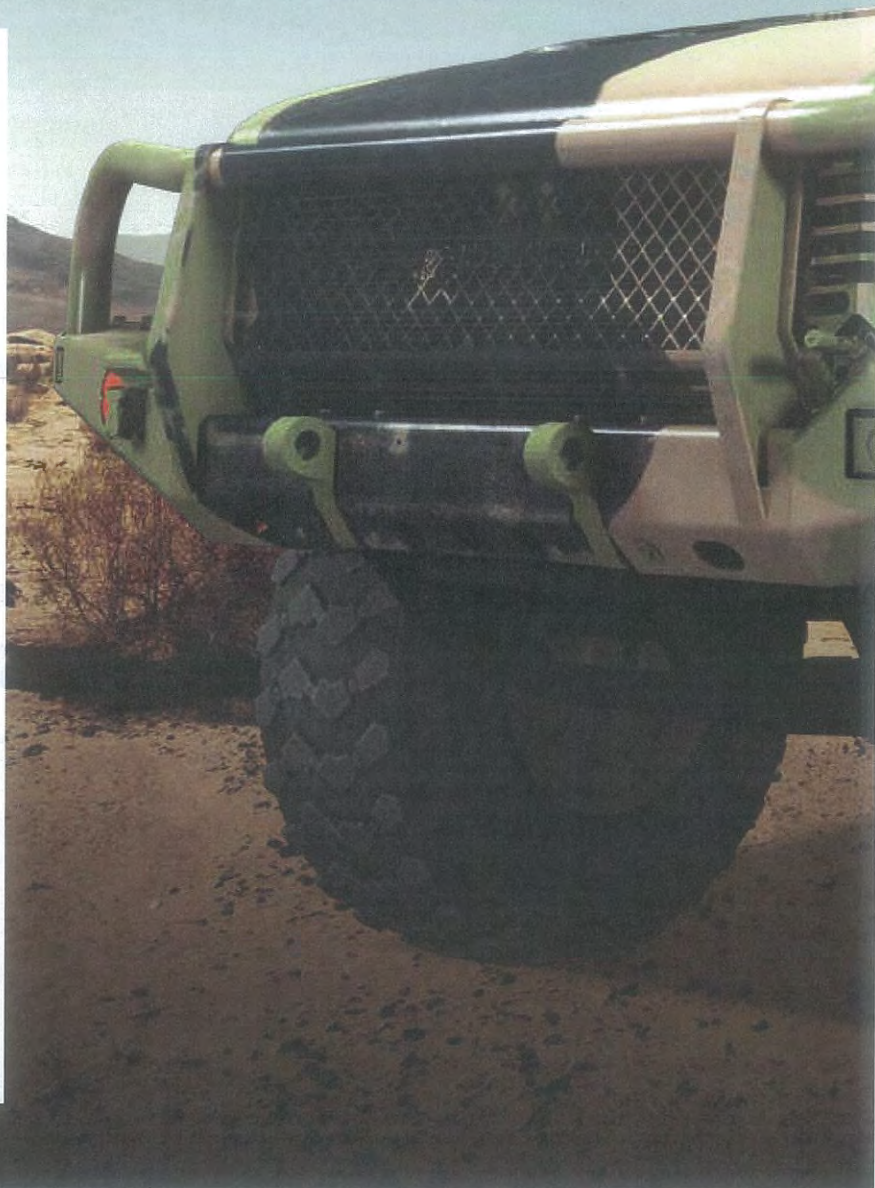
Defence Minister Christopher Pyne made the announcement of the selection of the Enhanced NASAMS option at a March 25 ceremony in Adelaide, while also announcing Raytheon Australia will establish a new Centre for Joint Integration (CJI) at Mawson Lakes in Adelaide.

"This Government is committed to providing our troops with the best capabilities to fight and win, and protecting them from threats from the air is a key part of that," Minister Pyne told ADBR. "As well as delivering significant and crucial capability to our Army, this project will also deliver hundreds of jobs."

The enhanced solution will feature a number of sensor, vehicle and integration options of Australian design added to the 'baseline' Raytheon/KONGSBERG National Advanced Surface-to-Air Missile System (NASAMS).

"This new air defence capability combines world-leading Australian radar technologies with a highly effective air defence system that will contribute to the protection of our service men and women from modern airborne threats," Minister Pyne added.

"I'm delighted that two of Australia's most innovative technologies will be used to enhance the effectiveness of NASAMS and contribute to one of the world's best short-range ground-based air defence systems. The Thales Hawkei vehicle and the world-beating CEA Radar will add a real Australian edge to NASAMS."





The High Mobility Launcher (HML) integrated with the Thales Hawkei PMV. RAYTHEON

BACKGROUND

The Australian Army picked up the surface-to-air missile (SAM) mission from the Royal Australian Air Force in the 1970s, initially with the very limited-range shoulder-launched FIM-43 Redeye man-portable air defence (MANPAD) system, and then with the acquisition of the British Aerospace Rapier short-range air defence (SHORAD) system in 1980.

Designed to defend beach-heads, insertion points and regimental headquarters against low-flying aircraft, with a short range of less than 10km Rapier had limited application beyond a point-defence role.

The Redeye was replaced with the SAAB Bofors RBS 70 MANPAD in the mid-1980s, and the fixed-launcher Rapier was replaced by additional RBS 70 equipment in the mid-2000s. This additional buy was accompanied with the introduction of an improved missile, which gave the RBS 70 a similar range to Rapier.

The RBS 70 has been continually upgraded in service and remains a capable short-range system. But with the proliferation of long-range air, surface and sub-surface-launched threats in the Indo-Pacific region, the ADF's platforms, people and infrastructure require much higher levels of protection.

The LAND 19 Phase 7B SRGBAD project is the lead element of the Commonwealth's broader land based Integrated Air and Missile Defence (IAMD) program, and it successfully passed its First Pass (Gate 1) approval milestone in April 2017.

The Gate 1 process was one of the first instances of Defence's then new 'Smart Buyer' risk-based decision-making framework, and saw a single-supplier limited request for tender (RFT) released to Raytheon Australia as prime system integrator (PSI) for the Raytheon/KONGSBERG NASAMS.

The requirement of LAND 19 Phase 7B is to provide mobile tactical-level protection from air and indirect fire threats to the Joint Force, and is designed to be integrated with the ADF's existing sensor network that includes Vigilare, the RAAF's E-7A Wedgetail AWE&C and C2 platform, and Navy's new Hobart class Aegis destroyers.

The 'baseline' NASAMS is an advanced short/medium range GBAD system that was originally developed for the Royal Norwegian Air Force (RNoAF), and is the most proven and fielded system in use by western nations. But part of the Commonwealth's requirements for LAND 19 Phase 7B was the option of the Enhanced configuration of NASAMS, one that would add significant capability and local content.

The baseline system comprises the Raytheon AN/MPQ-64F1 Sentinel air defense radar, the Mk 1 canister launcher which can carry six AIM-120 AMRAAMs, and the Kongsberg Fire Distribution Centre (FDC).

The Enhanced solution adds advanced electronically-scanned array (AESA) and electro-optical sensors, an upgraded vehicle-borne high-mobility launcher (HML), and the adoption of the latest Mk 2 canister launcher. Both of these launchers will allow multiple types of effectors to be employed.

The Enhanced option's sensors including a mobile CEA Tactical (CEATAC) AESA fire-control radar which is deployed from a housing on the rear of a modified Thales Hawkei 2-door protected mobility vehicle (PMV) or on a towed trailer, a larger CEA Operational (CEAOPS) AESA search radar mounted on a Rheinmetall HX77 8x8 heavy truck, and a Raytheon MTS-A electro-optical infrared (EO/IR) sensor with a 5m telescopic mast and housing, also mounted on a Hawkei.

"What we're going to be providing to the ADF is a world-class short-range ground-based air-defence system," Managing Director of Raytheon Australia Michael Ward told *ADBR*. "And I say world-class, because this system has a number of enhancements which aren't generally fitted to NASAMS solutions around the world."

"It's been an interesting journey on how we got here," Ward said. "Of course, the Government exercised a smart buyer decision a couple of years ago to move out on a limited tender with us, and off the back of that we entered into a risk mitigation activity, or RMA."

"The introduction of an AESA radar capability into NASAMS is a first, with Australia seeking to leverage its investment in CEA Technologies' AESA radar capability instead of the Sentinel radar," Ward

added. "Two configurations of the radar will be utilised, with the CEATAC replacing Sentinel as the primary fire control radar, and the larger CEAOPS radar used for longer-range surveillance."

Other elements of the Enhanced NASAMS solution include Raytheon's high mobility launcher (HML) for AIM-120 or AIM-9X Block 2 missiles mounted on rotating base on a Hawkei PMV,

the KONGSBERG Mk 2 canister launcher, and the KONGSBERG air defence console in a containerised Fire Distribution Centre (FDC).

Raytheon also proposed that, in addition to the AMRAAM missiles that were already in ADF service with the RAAF, there was significant Government Furnished Equipment (GFE) already in or entering service that could be integrated with the system to reduce the cost of ownership and further enhance the system. This GFE included tactical communications equipment, tactical data links (TDL), and vehicles described above.

Following the 2017 Gate 1 decision, Raytheon Australia was asked to respond to a Risk Mitigation Activity (RMA) contract for a series of discrete work packages primarily designed to reduce the risk associated with the integration of the GFE elements into NASAMS.

"These RMA activities commenced in October 2017 and were completed by the end of 2018," explained Ward. "They were highly effective in understanding the risks associated with GFE integration, and assisted the Commonwealth and Raytheon to determine the exact GFE requirements – that is, what communications equipment, vehicle type and configurations, and sensors are required for the two NASAMS configuration options that were being considered."

'It's been an interesting journey on how we got here.'



A Haulmark trailer with a CEATAC radar stowed in its housing. CEA





ENHANCED SENSORS

CEA Technologies first unveiled a prototype of the CEAFAR Tactical Radar, or CEATAC – a land-based radar version of its successful maritime-based CEAFAR2 Active Electronically Scanned Array (AESA) – at last September's Land Forces 2018 exposition in Adelaide.

"This is an Australian-developed radar on an Australian-developed vehicle, which is a great outcome for Defence industry," Minister Pyne said at Land Forces. "It is fantastic to see two of our most high-tech, capable and innovative technologies brought together to meet a capability need."

The Hawkei-mounted CEATAC was developed as one element of the indigenous Enhanced option for the LAND 19 Phase 7B NASAMS-based air defence solution, and has been specifically tailored to be employed from a housing on the modified tray of a two-door Thales Hawkei PMV, and can also be mounted on a Haulmark trailer.

As the tactical sensor solution for LAND 19 Phase 7B, CEATAC is designed to provide flexibility for rapidly manoeuvring force elements. It comprises a common package of four fixed faces able to be installed on the Hawkei or on trailers, and may be used as a standalone system on the ground or on other vehicle surfaces including ships and larger vehicles.

CEATAC provides rapid high-volume scan for GBAD, airspace situational awareness and counter rockets artillery and mortars (CRAM) applications, each face includes multifunction radar capabilities including medium-range surveillance IFF and fire control, and the system has multiple onboard and offboard power supply options.

"From my perspective, this is just an excellent example of Australian industry contributing in a way we would envisage for a sovereign capability," Merv Davis, the then CEO of CEA Technologies told ADBR at Land Forces 2018. "More broadly, it highlights CEA's ability to take its architecture and repackage it very rapidly and very cost-effectively to deliver key capability."

"Army came to us and said, 'we have this requirement for a short to medium-range air defence system, by the way, we'd like you to fit it on the back of a Hawkei or on a trailer, what can you do?'," Davis recounted at the time, pointing to the prototype on display. "And to the engineering credit of the company, there it is, ready for trials less than 18 months later!"

CEA's Operational Sensor System, or CEAOPS is a scaled development of the CEAFAR2 system and has been developed from the company's previously-displayed Ground Based Multi-Mission Radar (GBMMR) prototype.

The CEATAC radar in the deployed position from a Haulmark trailer (Left) and a Hawkei PMV (Right), CEA



But unlike the multi-faced GBMMR system configuration, the CEAOPS radar features a large single-faced rotating AESA radar and four smaller fixed-face arrays, all packaged in a self-contained, standard 20ft ISO container footprint mounted on an Army Rheinmetall HX77 8x8 truck.

CEAOPS's primary function is to support Ground Based Air and Missile Defence (GBAMD) capabilities with radar and identification-friend-or-foe (IFF). The system provides a high-power, long-range capability for Integrated Air and Missile Defence (IAMD), and incorporates self-contained power and thermal management subsystems.

The CEAOPS system can operate integrated into a wider network or as a standalone system, and the configuration provides multiband surveillance, IFF, and fire control. The main array face provides long-range surveillance and all-mode IFF functionality. It is able to rotate up to 30 rpm for 360-degree coverage, or can be slewed to 'stare' in nominated sectors.

The four additional faces below the main face provide constant 360-degree fire control quality medium-range coverage in all methods of use, including while the vehicle is underway. It is suitable for transportation by air, sea or road, and can be operational within minutes of disembarkation.

An option which has also been selected for the Enhanced NASAMS is Raytheon's AN/AAS-52 Multispectral Targeting System (MTS)-A.

The MTS-A electro-optical/infrared (EO/IR) system is a high resolution, day/night imaging sensor suite with an integrated laser range finder and real-time tracking capability, and is already in service with the Royal Australian Navy on the MH-60R Romeo Seahawk helicopter.

The sensor will be packaged in a modular system contained within a standard Tricon container footprint, and will be mounted on a 5m telescopic mast to increase sensor coverage. The EO/IR sensor is centrally controlled by the FDC, contains an organic generator and battery power, and can be removed from the vehicle and placed on a building or structure.

The MTS-A will provide passive situational awareness for NASAMS meaning the system can still operate effectively in an electronically-challenging environment.

EFFECTORS

The AIM-120 is the principle armament of the NASAMS system, and debuted in the early 2000s.

The AMRAAM is in service with the RAAF on its F/A-18 Hornets, Super Hornet and F-35A fighters, and on March 14 it was announced that Australia would buy up to 108 AIM-120C-7s for its LAND 19 Phase 7B NASAMS system.

But Australia's Enhanced NASAMS capability will be the first operational NASAMS with the ability to fire both AMRAAM and the infrared Raytheon AIM-9X Block 2 missile, using a common ground rail on the HML or in the Mk 2 canister launcher.

As with their air-launched counterparts, these two missiles are complementary. For NASAMS they will provide additional flexibility to the system so it can fire active radar-guided AMRAAMs or the passive optically-guided AIM-9X Block 2s, thus making the system very difficult to suppress or defeat.

The AIM-9X Block 2 is the latest derivative of the venerable AIM-9 Sidewinder family of infrared air-to-air missiles. The AIM-9X Block 2 incorporates agile thrust-vectoring rear fins and a high off-boresight (HOBS) capability.

The new infrared sensor uses a staring focal plane array, and the latest Block II version adds a lock-on-after-launch capability via a datalink, improved aerodynamics, and longer range to what has been described publicly as "near beyond visual range". The RAAF ordered 49 AIM-9X Block II missiles as part of a larger US Navy order in January 2019, and already has the AIM-9X Block I in service on its F/A-18F and EA-18G.

In the future, the AIM-120D currently entering service with the RAAF may also be employed from NASAMS, as might the developmental, surface-launch only AMRAAM-ER which reportedly has 50 per cent longer range than the current air-launched missile, and a 70 per cent improvement in altitude coverage.

The AMRAAM-ER is essentially a RIM-162 Evolved Sea Sparrow (ESSM) airframe and booster with an AIM-120C-7 guidance section, although with some key enhancements to the aerodynamics and rocket motor. The AMRAAM-ER will further extend the NASAMS' range well beyond the current SRGBAD envelope. A development AMRAAM-ER was successfully tested with NASAMS in August 2016, and wind tunnel testing of the definitive configuration was completed in January 2019.

Importantly, all the missiles employed by NASAMS are common to their air-launched counterparts, and can be drawn from common stocks.

An Army HX77 truck with the CEAOPS radar in the deployed position. RAYTHEON





An AMRAAM being launched from a KONGSBERG Mk 2 canister. RAYTHEON

VEHICLES

As with the Enhanced NASAMS option, the Commonwealth requested the option of integrating the system's sensors, command and control, and effector elements onto vehicles already in service with the Australian Army.

While it was clear the CEAOPS radar and the Mk 2 canister launcher would need to be integrated with the medium or heavy trucks being procured through LAND 121 Phase 3B/5B and thus, there would be plenty of space and reserve power and cooling to accommodate these, the integration of the FDC proved more problematic.

It was initially planned to integrate the FDC with the Thales Bushmaster PMV, while there were some initial doubts raised about being able to successfully mount the HML on the Hawkei PMV.

"We did some work as a subcontractor to Raytheon and Kongsberg to determine the feasibility of installing the missiles on the Hawkei and the FDC on the Bushmaster," Thales Australia's Director of Product Line and Marketing for protected vehicles, Paul Harris told ADBR. "We thought the Hawkei would struggle because the missiles are quite large, while we thought the Bushmaster would be okay. But it actually turned out to be the other way around.

'The Hawkei integration presented no real particular challenges in terms of the configuration and layout.'

"In fact, the Hawkei integration presented no real particular challenges in terms of the configuration and layout," Harris added. "Given the size of the missiles and the size of the vehicles being what they are, in terms of payload and capacity it was actually pretty straightforward."

The Hawkei with the HML brings real flexibility to the battery commander. "First, there was a requirement to have an ability to get air defence capability down on the ground quickly," said Harris. "But the other advantage of the Hawkei installation was that, despite being a low-profile vehicle compared to a truck, if you require the assets to manoeuvre to different terrain, or up a mountain or hilltop, then you could use the Hawkei to complete your air defence positioning."

With the Bushmaster, while it was agreed the integration of the FDC was possible, there were some issues with organic power and thermal management with little margin for any growth, and there were ergonomic issues in the cramped rear compartment.

"We could have overcome the heat and power issues with auxiliary power units and a reinforced air-con system," said Harris. "But when we had Army's air defence regiment guys come by, it was actually the ergonomics that was the main issue.

"The internal space is taken up by those large control panels, even when we put them to one side like a command area. When they had a driver, a control officer and the two operators, having five guys moving in and around the vehicle with all their gear was just too much of an ergonomic compromise for their liking."

MK 2 CANISTER LAUNCHER & HML

The KONGSBERG Mk 2 canister launcher is the latest generation canister launcher for NASAMS.

The Mk 2 provides a multi-missile capability, and is capable of firing the AIM-120 AMRAAM variants, AIM-9X Block 2 and the new AMRAAM-ER missiles. Internally, the Mk 2 has a new common launch rail and electronics, and the canisters are extended to accommodate the larger and longer AMRAAM-ER. It can hold up to six missiles in the reloadable canisters, and the loadout can be a mix of missiles depending on the mission.

For Australia, the Mk 2 Canister Launcher will be configured for AMRAAM, but for future applications is easily upgradable for AIM-9X Block 2 and AMRAAM-ER missiles with only a software modification. The Mk 2 Canister Launcher will be integrated on a flatbed pallet with a hook lift mounting point so it can be easily loaded or unloaded from the HX77 8x8 truck.

The Raytheon High Mobility Launcher (HML) that will be provided for LAND 19 Phase 7B has also been upgraded with the same common launch rail and new electronics as the Mark 2 canister launcher. The launcher raises the missiles up to 30 degrees and can be rotated 360 degrees, and will give the HML a multi-missile capability for the AMRAAM, AIM-9X Block 2, and AMRAAM-ER.

FIRE DISTRIBUTION CENTRE

The Fire Distribution Centre (FDC) is the Battle Management Command, Control, Communications, Computers and Intelligence (BMC4I) system for NASAMS and other air defence and precision fires

applications, and provides fire control for the system.

The FDC provides the ability to network sensors, launchers, and other FDCs in a hard real-time network, and has an extensive datalink capability to provide tactical information exchange with higher echelon and lateral units using a range of tactical datalinks and message formats.

The FDC will be housed in a 13ft air-conditioned shelter on the back of an HX40M truck. It can also be configured as a Battery Operations Centre (BOC) for control of multiple NASAMS fire units, or for providing a higher-level coordination element, and will contain the latest generation of the Kongsberg Air Defence Console (ADC).

The LAND 19 Phase 7B FDC will be integrated with the CEATAC and CEAOPS AESA radars and the MTS-A EO/IR sensor, and will also have the functionality to effectively employ multiple missile types.

In addition to meeting LAND 19's SRGBAD requirements, the system's FDC will be the first NASAMS capability to include embedded C-RAM sense, warn and locate (SWnL) functionality. This will allow the SRGBAD and C-RAM SWnL functionality to be provided from a single command & control (C2) system.

NASAMS IN SERVICE

The ADF will initially acquire two NASAMS batteries under LAND 19 Phase 7B, and the capability will be operated by Army's 16 Regiment at Woodside near Adelaide, before moving to Edinburgh by 2023.

An Australian Army NASAMS Fire Unit will comprise an FDC, a CEATAC radar, an MTS-A EO/IR

A graphic showing an Enhanced NASAMS battery. Front to back - a Hawkei with HML and AMRAAMs, a Mk 2 canister, an HX40M with FDC, a Hawkei with CEATAC radar, a Hawkei with MTS-A, and an HX77 with CEAOPS radar, RAYTHEON





sensor, and a number of canister and/or HML with AMRAAM missiles. It is expected that a fire unit will comprise an Air Defence Troop, and that three Troops will make up a Battery.

Despite the new technology and much greater capability offered by the Enhanced NASAMS, the Army doesn't anticipate having any difficulty integrating what is essentially a new capability into its ranks.

"We're buying a proven, world leading system," Director General Systems and Integration at Army Headquarters, BRIG Richard Vagg told *ADBR*. "The integration aspects of this enhanced solution are significantly reduced because we're buying a mature system that we know works."

"The FDC and canister launcher come fully integrated out of the box," he added. "We understand Link-16 and how it communicates. We understand the FDC and how it networks with the joint fires system. So, in terms of an integration risk, I'm really confident that the risk here is low. And the FDC will link Army to joint and coalition partners through a number of networks."

The FDC will also interface with Army's Advanced Field Artillery Tactical Data System (AFATADS), as well as the Elbit Battle management Systems (BMS) currently being delivered under Project LAND 200.

For deployment, the NASAMS is compatible with all ADF strategic transport assets including the RAAF's C-17 Globemaster III airlifter and the Navy's Canberra class LHDs.

"The Enhanced NASAMS will equip Australian troops with a world-leading capability," said BRIG Vagg. "It'll enable us to fight and win. It's a capability that not only makes us ready now, but will make us future-ready."

THE CAVE

One of the key development elements or 'tools' used by Raytheon in the RMA was the company's 'CAVE' Automated Virtual Environment simulation and integration lab in Canberra. The CAVE allows high-fidelity three-dimensional models of systems to be checked for form, fit and function, and for modifications to be modelled and demonstrated.

"One of the things that we did in the RMA was the integration of the system onto Australian vehicles," said Michael Ward. "So we used our CAVE to do a lot of that integration work by modelling in 3D the integration of the systems onto the back of vehicles. We worked very closely with Thales and Kongsberg who were able to provide us CAD information and dimensions of their vehicles, so it's incredibly accurate."

The CAVE has 320 degrees of 72 ultra high-definition 3D video screens which allows customers such as Army and CASG, or partner company staff wearing 3D glasses to walk through the vehicles, to pull apart systems and do fit checks using laser pointer controllers, and to study ergonomics and other potential space, cooling and power requirements.

"Not only can you just lay out the design and walk through it, but we can open it out so people can see the layout and how the design fits," said Ward. "So, that has saved us a lot of time – we were able to do that part of the RMA in about three months for less than a million dollars, whereas if you'd tried to do it physically on the vehicles we'd need years to do it."

Raytheon Australia's Cave integration and simulation lab in Canberra allowed high-fidelity vehicle integration modelling to be conducted and demonstrated. RAYTHEON

'It's a capability that not only makes us ready now, but will make us future-ready.'

In addition to the CAVE, Raytheon also activated a new Warfighter System Integration Facility, colloquially known within the company as the 'Battle Lab'.

"What we have done over the course of the last couple of years is to establish the command and control system for LAND 19 in that Battle Lab," Ward explained.

"We have a number of KONGSBERG air defence consoles and other software and hardware in there, and during the RMA, the full communications bearer system as well. So during the RMA, we were able to not just model but practically bench test the system in the Battle Lab."

AUSTRALIAN INDUSTRY CAPABILITY

Raytheon Australia and KONGSBERG have worked closely to maximise Australian Industry Capability (AIC) for the LAND 19 Phase 7B program, and boast an AIC of about 60 per cent for the Enhanced NASAMS solution.

A quick summary of the AIC components shows the solution has an Australian prime systems integrator; the Australian-produced FDC; Australian-designed and produced CEA AESA radars; an Australian-designed and produced EO/IR sensor solution – although the MTS-A itself is sourced from the US; the integration of the canister launcher kits and final integration testing for canister launchers in Australia; the assembly and integration of the HMLs; and the longer-term Australian-based sustainment of the system.

"The in-country design, integration, and verification and validation activities, coupled with significant local manufacture and assembly, will establish significant sovereign expertise and experience in NASAMS," said Michael Ward.

The Australian-designed Hawkei PMVs and the in-service Rheinmetall trucks were not included in the AIC consideration, as these are considered GFE and were procured under other programs.

During the RMA, Raytheon Australia and KONGSBERG engaged with a substantial number of Australian suppliers and SMEs on roadshows across Australia. Raytheon says 184 Expressions of Interest (EOIs) were registered, 145 face-to-face meetings were held between Raytheon and Australian small to medium enterprises (SMEs), and 78 companies were pre-qualified as being potentially suitable as suppliers.

In the first round of work packages, 21 companies have been approached by Raytheon Australia, and the company expects further work packages to be released to industry during the life of the program.

The Enhanced solution has also realised potential export potential, in particular for the EO/IR sensor solution, the FDC as a second supplier to KONGSBERG, CEA's AESA radars, the Thales vehicles, and the potential to provide sustainment to regional operators.

Both Raytheon and KONGSBERG expect to make further announcements as to what companies they have engaged to provide work for the program. For Kongsberg, this is an opportunity for the Norwegian

company to firmly establish itself in Australia after two decades of sales of systems such as the Penguin air-to-surface missile to the RAN, of working with Boeing on the E-7A Wedgetail program, and with Raytheon on the SEA 4000 air warfare destroyer.

"There is a long history where we transfer technology and enhance our ability in certain industries and bring them with us on the international market," Eirik Lie, the President of KONGSBERG Defence and Aerospace told ADBR. "And you know, Australia is an important market for KONGSBERG in general."

KONGSBERG's acquisition of Rolls-Royce Marine will give it an initial Australian footprint of about 70 employees, and the company will conduct manufacturing and assembly of key components of the NASAMS systems including FDC production and Mk 2 canister launcher integration at the CJJ which will be established at Mawson Lakes.

"We will have more employees, but at the same time we will use a supply chain that will enable us to be able to deliver on the program," Mr Lie explained.

"So we are building up the supply chain and supporting our operations in Australia.

"As part of this we did an AIC round in all states about a year ago to survey potential candidates to participate in the program," he added. "I think we met with some hundreds of companies and we did actually find some golden eggs in there, which was very interesting, and this broad list of companies has

been shortlisted down to a few.

"We look at it from a long-term perspective, meaning we establish strategic partners for the long run. And if what they are doing has skills, then they will become a part of our supply chain worldwide. NASAMS has a unique architecture so that it can be expanded with functionality and capability. Those capabilities that we add through the system in Australia can be then exported further to other countries that have the same requirements."

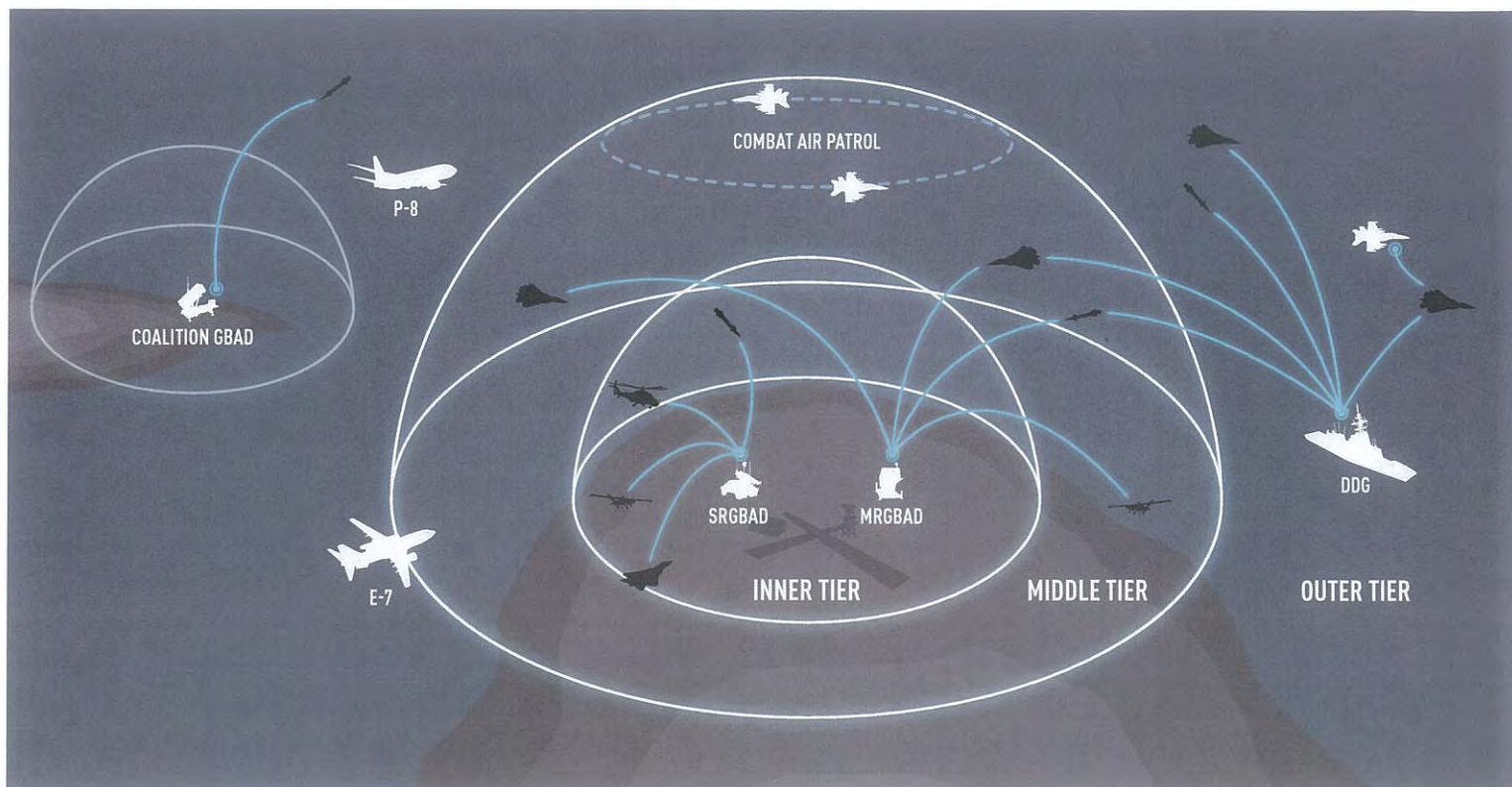


A mast-mounted MTS-A EO/IR sensor will enable passive detection and targetting for the Enhanced NASAMS.
RAYTHEON

'We are building up the supply chain and supporting our operations in Australia.'

A Hawkei PMV with the CEATAC radar deployed.
RAYTHEON





A graphic showing how the inner tier SRGBAD NASAMS capability will fit in with the Hobart class outer tier and the planned AIR 6500 Phase 2 MRGBAD middle tier.

RAYTHEON

The KONGSBERG Air Defence Console (ADC) has been integrated into the NASAMS Fire Direction Centre (FDC).

RAYTHEON

CENTRE FOR JOINT INTEGRATION

The establishment by Raytheon Australia of the new purpose-built Centre for Joint Integration (CJI) at Mawson Lakes will support not only the LAND 19 program but a range of future projects. Importantly, it will bridge a looming 'valley of death' of systems integrators who are transitioning from the SEA 4000 air warfare destroyer program.

Although initial planning focuses on the use of the CJI in its initial 10 years, Raytheon anticipates the facility could be used to support other emerging programs over several decades.

"Representing an investment by Raytheon in the order of \$50 million over 10 years, the CJI will initially provide LAND 19 with critical capabilities in assembly, integration, test and activation, acceptance into service, depot repair, warehousing and in-service support," said Michael Ward.

"It will also support selected avionic and electronic repairs and modernisation activities for other critical programs. In addition, the CJI will enable the consolidation of existing Raytheon Australia work currently dispersed, and will act as the company's South Australian headquarters."

Raytheon anticipates the programs it will manage at the CJI will generate up to 300 new direct jobs over the next 10 years through LAND 19 Phase 7B, upgrades to the SEA 4000 Hobart class destroyers, and systems integration work on the SEA 5000 Hunter class frigates. In addition, it expects up to 200 jobs will be created during the CJI's construction phase.

The CJI itself will consist of two key elements; a Core Facility and an Integration Facility.

The Core Facility will include office accommodation for Raytheon, Commonwealth and subcontractor staff, as well as customer engagement, training and laboratory space. The Integration Facility will include vehicle assembly and integration bays, vehicle sub-staging areas, warehousing, flexible use workshops, tooling and consumables, a battery store and extensive covered hard-standing.

The Australian Army expects to take delivery of its first NASAMS battery in 2022 and to declare an initial operational capability (IOC) in 2023. Following the delivery of the second battery, the establishment of a stable sustainment organisation, and the completion of a move from Woodside across town to new base facilities at Edinburgh, NASAMS is expected to achieve a full operational capability (FOC) in 2025. ■



A concept graphic of a military missile launcher vehicle in a desert. The vehicle is a light-colored, rugged truck with a flatbed. On the flatbed, a launcher cradle is tilted upwards, holding five white missiles with dark fins. The vehicle is parked on cracked, dry earth. In the background, another similar vehicle is visible, along with a tall, thin antenna or mast. The sky is a pale, hazy blue.

CONCEPT GRAPHIC





