



Australian Government
Department of Defence

F-35

AUSTRALIAN
INDUSTRY
PARTICIPATION

THE JOURNEY TO \$1 BILLION





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FOREWORD



The Hon Christopher Pyne MP
Minister for Defence Industry

More than 50 Australian companies have been involved in the Joint Strike Fighter programme which is behind one of the greatest technological leaps in military aircraft that we have ever seen.

Due to the strength of Australia's defence industry, it has now directly shared in more than AU\$1 billion of production contracts since the Howard Government committed to the programme in 2002. It is one of the great successes for the Australian defence industry with benefits extending throughout the supply chain.

To commemorate this significant milestone, The Journey to \$1 Billion booklet showcases our industry's contribution to the global F-35 Program, detailing the history of their journey and achievements so far.

With the Joint Strike Fighter programme moving to full rate production in the coming years, this is just the start for Australia's defence industry involvement in this programme. As it continues to prove its global competitiveness, performing better than initial Defence forecasts, Australian industry involvement is expected to exceed AU\$2 billion by 2023, supporting more than 5,000 jobs nationally.

Reaching AU\$1 billion is an incredible milestone. It is attributable to the hard work and dedication of many Australian companies and their employees, along with their ability to innovate and drive costs down. This is a highly competitive, international project, and it's a testament to the resilience and strength of our industry that we have been so successful.

I have great pride and confidence in the capability of the Australian defence industry and will continue to advocate for them as we identify further opportunities in the sustainment phase of the programme.

MESSAGE FROM HEAD JOINT STRIKE FIGHTER DIVISION



Air Vice-Marshal Leigh Gordon, AM, CSM
Head Joint Strike Fighter

The global F-35 Program will deliver a fifth-generation capability that will transform the way Australia and the F-35 International Partners operate in the modern battlespace. The aircraft is designed to network and integrate with our own forces and be interoperable with our allies, ensuring a capability that is truly joint-by-design. It will contribute to the development of a fifth-generation Air Force that will be prepared to fight and win in the air, space and cyber domains as part of a joint Australian Defence Force.

As a fundamental input to capability, industry's role with Defence is transforming as well. Now more than ever, Defence is championing proactive engagement with Australian industry to foster better outcomes, investigate new ideas and maximise technological advantage. The Memorandum of Understanding (MOU) between the United States F-35 Joint Program Office (JPO) and participating nations reinforces the importance of indigenous industry participation: "To promote new, as well as continued, involvement of the industries of the nations of the Participants in the production, sustainment and follow-on development of the JSF Air System."

The opportunities arising from the Government's early commitment to the F-35 Program, along with the skill and talent already residing within Australian industry, has resulted in Australia being competitive on a global scale. Production work has resulted in Australian-built components on every F-35 aircraft produced to date. Whilst Australian partnership in the global design and development program entitles participating countries to bid for work on a best-value basis, it is impressive that over AU\$1 billion in production contracts has been awarded so far. From 2018, production volume for the F-35 will start to increase, eventually doubling. This presents even more opportunity for Australian industry to achieve more than AU\$2 billion in F-35 production contracts by 2023.

Australia has also been successful in JPO assignments for sustainment roles. A range of Australian companies have received US Government assignments as part of the F-35 Global Support Solution including: F-35 air vehicle and engine depot maintenance; a range of component repair work; and a regional warehouse function. Although these assignments are not yet contracts, they support the Australian Government's goal to position Australia as the F-35 maintenance and support hub for the Asia-Pacific region. This is in line with the Australian Government's broader vision for fostering a globally competitive, sustainable and innovative defence industry.

The F-35 Program is also about much more than just the delivery of a new fighter capability. Australian industry involvement in the program provides a platform for engagement with major international defence and aerospace companies and opportunities for participation in the development of new and emerging technologies. This engagement and participation will ensure that there is knowledge and skill transferral to Australian companies – building resilience and strengthening Australia's economy.

"The F-35 Program is building a strong industry base that supports the global F-35 capability and Australia with long-term benefits"



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MESSAGE FROM THE CHIEF EXECUTIVE OF LOCKHEED MARTIN AUSTRALIA



Vince Di Pietro AM Chief Executive
Lockheed Martin Australia New Zealand

Just as the F-35, the world's most advanced fifth-generation fighter, will be a symbol of Australia's defence capabilities for decades to come, so too will it represent a pinnacle of Australian industry expertise.

Later this year, Australia will welcome its first two F-35 aircraft to their new purpose-built and permanent home at RAAF Base Williamtown, complete with Australian-made components, Australian pilots and Australian maintenance crews.

Once Final Operational Capability is declared the F-35 will be the backbone of Australia's future air combat operations, enabling superior performance, enhanced interoperability, and unprecedented airborne information dominance.

As one of the nine original F-35 Lightning II partner countries, Australia benefits significantly from an industrial participation program that engages local industry in both manufacturing and through-life sustainment support opportunities.

Australians can be proud there is a suite of local industrial technology and know-how behind the more than 250 F-35 aircraft flying today, as well as every F-35 that will be produced in the future.

To date, over 50 Australian companies have contributed to the F-35 Program, representing a contracted value of over AU\$1 billion and supporting thousands of high-tech manufacturing jobs across Australia.

Thousands more direct and indirect Australian defence industry jobs will be created over the life of the F-35 Program.

To that end, Lockheed Martin works closely with Australian industry partners, investing in technology transfer and knowledge-building initiatives that enable the development of local capabilities, drive innovation and boost Australia's economy.

As the Original Equipment Manufacturer, we are committed to ensuring Australia is well placed to secure future F-35 production contracts, as well as to deliver the specialised capabilities required to sustain the F-35, including maintenance, supply, training, ICT support, engineering and fleet performance management.

That commitment extends to providing the fifth-generation thought leadership necessary to reveal the full potential of the F-35, through Australian contributions to the future development of the air vehicle and support systems and the realisation of a next-generation Joint Battle Management System for Australia.

INDUSTRY PARTICIPATION

- Australian industry has been involved in the supply chain for the production of the F-35 fleet since 2006.
- The cumulative total of Australian F-35 production contracts to date has reached over AU\$1 billion, with over 50 Australian companies sharing in this success.
- Significant opportunities will also become available to Australian industry during the sustainment and Follow-On Modernisation phases.
- Defence is working closely with the United States Government, Prime Contractors Lockheed Martin and Pratt & Whitney, and Australian industry to ensure that Australia gets the best outcomes for Australian industry capability and the F-35 Program.
- Australian Industry participation in the F-35 Program has led to sustained higher employment with more than 2,400 jobs created to date.
- In the lead-up to the planned arrival of the first two F-35 aircraft at RAAF Base Williamtown in December 2018, it is important to highlight the value Defence places on Australian industry.
- As a global Partner Nation, Australian industry is able to compete and be awarded contracts in the F-35 global supply chain on a 'best value basis'. Australia's success to date in receiving F-35 Joint Program Office assignments for regional Maintenance, Repair, Overhaul and Upgrade (MRO&U) opportunities demonstrates Australian industry's global competitiveness.

NEW AIR COMBAT CAPABILITY – INDUSTRY SUPPORT PROGRAM

- To assist Australian industry to develop capability and building capacity to successfully compete for best value contracts, the Australian Government has put in place the New Air Combat Capability – Industry Support Program (NACC-ISP).
- The NACC-ISP awards grants to Australian businesses to support the development of new or improved industry capability to win work in the global F-35 Program.
- The NACC-ISP is funded through the Department of Defence, Joint Strike Fighter Division and delivered with the assistance of the Department of Industry, Innovation and Science, through the Centre for Defence Industry Capability (CDIC) and AusIndustry.
- As at December 2017, AU\$16.7 million (GST inclusive) in grants have been awarded. This is expected to grow to AU\$24.1 million (AU\$21.9 million GST exclusive) by 2023.
- A range of other industry support programs have seen Government and industry work closely to ensure Australia remains internationally competitive.

These programs include:

- a. The former Skilling Australia's Defence Industry Program and the similar services of the Centre for Defence Industry Capability;
- b. Next Generation Manufacturing Investment Program; and
- c. State-based Innovation and Investment Funds.

KEY TARGETS FOR THE F-35 INDUSTRY

1. More than AU\$2 billion in Production contracts by 2023.
2. More than AU\$5 billion in Production contracts out to the end of Production in 2038.
3. AU\$6-9 billion of work in support of the F-35 across its life, including Sustainment and Follow-on Modernisation activities.

F-35 PROGRAM

- The F-35 is the most capable and affordable aircraft to meet Australia's future threat environments.
- The Australian F-35A Project is on schedule to meet Initial Operating Capability in 2020.
- 11 nations have confirmed orders to acquire the F-35, already there are over 290 aircraft operating from five different countries. The eventual fleet will number more than 3,100 worldwide.
- The global F-35 Program is providing Australian industry with the opportunity to demonstrate and deliver leading-edge technical capability.
- In addition, it provides a global platform for Australian industry to participate in the development of new and emerging technologies.

F-35 PRODUCTION CONTRACTS BY TOP FIVE INDUSTRIES (CUMULATIVE TOTALS)*

Industry	Proportion
Aircraft Manufacturing	34%
Specialised and Other Machinery and Equipment Manufacturing	31%
Professional, Scientific and Technical Services	18%
Other Industries	9%
Polymer Product Manufacturing	8%

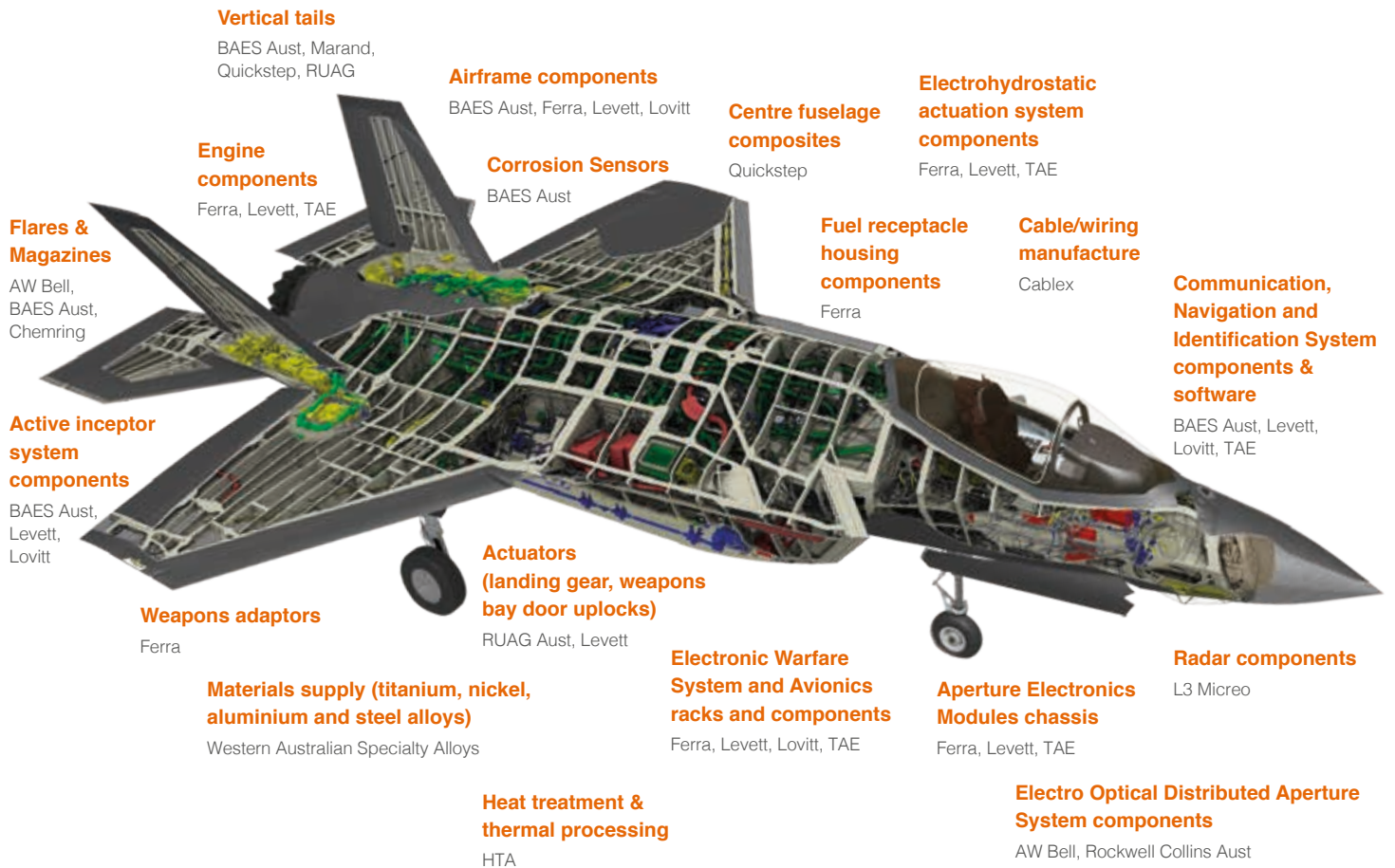
Other industries include: Basic Chemical Manufacturing, Basic Non-Ferrous Metal Manufacturing, Electrical Equipment Manufacturing, Professional, Scientific, Computer and Electronic Manufacturing, and Computer Systems Design and Related Services.

State / Territory	Proportion
Australian Capital Territory	1%
New South Wales	13%
Queensland	9%
South Australia	9%
Victoria	65%
Western Australia	3%

**Information provided by the Centre for Defence Industry Capability*

F-35 AUSTRALIAN INDUSTRY PARTICIPATION

Key Australian companies who have shared in AU\$1 billion in F-35 Production contracts



DESIGN AND PRODUCTION SUPPORT TO F-35

Engine removal & installation trailer

Marand

Landing gear handling fixtures and canopy/ universal slings

Varley

Engine prognostics & health management software

PHM Technology

Pilot & maintainer training courseware

KBR Aust

Joint Strike Missile integration

BAES Aust

Engine lift fan removal-installation trainer

Marand

Production Tooling

Marand, Hofmann Engineering



AW Bell was founded as a patternmaking business in 1952, providing a solid foundation for understanding the needs of the casting industry. The family company started in the automotive industry and has successfully passed through three generations.

AW Bell is now a supplier of complex metal parts using rapid prototyping, investment casting, sand casting and production machining technologies. It also specialises in the manufacture of tooling and patterns for sand casting and investment casting industries.

Today, the business still has a highly regarded patternmaking facility employing a team of skilled tradespeople. However, with the decline of the automotive industry, AW Bell strategically invested over AU\$4 million in improving its capacity and accessing innovation opportunities to support the F-35 Program.

This appetite for continuous improvement and research and development has been critical to the company's success.

“We now have the credibility and technical standing to get the attention of major US defence and aerospace companies.”

Sam Bell CEO AW Bell

F-35 PROGRAM INDUSTRY PARTICIPATION

AW Bell has been involved in the F-35 Program since 2007 when the Department of Defence's Joint Strike Fighter Division introduced AW Bell to Northrop Grumman Corporation Electronic Systems (NGES) for consideration to supply casting and machining of the chassis assembly for the F-35 Electro-Optical Distributed Aperture System (EODAS). It took seven years of negotiation and commitment for AW Bell to become qualified by NGES to supply the castings for the EODAS. The investment by AW Bell and the Department of Defence paid off when NGES approved AW Bell's castings, using its newly developed Aluminium Billet Equivalent (ABE™) casting process, in December 2014. AW Bell received the first purchase order in May 2015.

AW Bell now supplies three components of the F-35 EODAS chassis assembly to Northrop Grumman and successfully achieved 'First Article Inspection' within four months from receipt of order using the company's ABE™ investment casting process. Independent testing by Northrop Grumman confirmed AW Bell's ABE™ process is class-leading, with the ability to achieve higher mechanical properties than any of its global competitors.

AW Bell also became a qualified supplier with Marand Precision Engineering in 2011 after Marand secured a sole-source supplier arrangement for the very complex F-35 Engine Removal and Installation Trailer. The purpose of the trailer is to remove and replace the F-35 engine for maintenance purposes. AW Bell produces about 19 different components for Marand for the F-35 Engine Removal and Installation Trailer, which are precision-machined castings in a range of materials.

AW Bell also successfully proved its capability in the manufacture of electronic warfare countermeasure magazine castings with BAE Systems Australia, which led to the first production order in 2014.

AW Bell is now the only approved casting supplier of F-35 flare magazines worldwide.

TRANSFORMING AUSTRALIAN INDUSTRY

In 2010, AW Bell commissioned a world-class metallurgy researcher from the Commonwealth Scientific and Industrial Research Organisation to explore the possibility of creating cast aluminium components with similar mechanical properties as aluminium billet material. The collaboration resulted in AW Bell developing the unique, best-practice ABE™ casting process.

AW Bell has also successfully transitioned its business away from traditional automotive component manufacturing into high-end aerospace technologies, and now exports to Europe, Asia and North America.

NEXT STEPS

AW Bell's ultimate goal in the F-35 Program is to be the preferred supplier for both machined castings for the EODAS chassis assembly produced for NGEs, and for the electronic warfare flare magazines produced for BAE Systems Australia.

RELATED LINKS

For further information, refer to AW Bell's website:

www.awbell.com.au



2007

Started in F-35 Program and opened discussions with Northrop Grumman

SEP 2010

CSIRO engaged to support development of ABE

2011

Signed long-term agreement with Marand for engine trailer

2011

Signed long-term agreement with BAES Australia for flare magazines

2012

Started conversation with Northrop Grumman on EODAS cooling tubes

MAR 2012

NACC-ISP grant awarded for EODAS chassis

DEC 2013

Received first flare magazines order

2014

EODAS chassis qualification completed

MAY 2015

First EODAS chassis order received

JUN 2015

NACC-ISP grant awarded for EODAS straightening fixture and cooling tubes

BAE Systems Australia is one of the largest Defence suppliers in Australia and a key supplier to the F-35 Program. Its parent, BAE Systems plc, is one of Lockheed Martin's principal partners in the design, build and maintenance of the F-35 capability.

BAE Systems plc was formed by the merger of British Aerospace and Marconi Electronic Systems. BAE Systems Australia was expanded by the acquisition of Tenix Defence in June 2008. The headquarters of BAE Systems Australia is at Edinburgh Parks, South Australia, and it operates at sites across the country in support of its local and international defence and security customers.

As a key global partner, BAE Systems plc, holds approximately 13-15 per cent work share globally of each F-35 aircraft (excluding propulsion) and plays a major role in the Program across multiple markets. Globally, BAE Systems plc provides the Vehicle Management Computer, Active Inceptor System, Electronic Warfare Counter Measures suite, crew life support and escape systems, fuel system, aft fuselage, and horizontal and vertical tails. For the carrier variant (F-35C), BAE Systems Australia is responsible for the production of outboard wing tips.

BAE Systems Australia has been maintaining and upgrading fixed wing and rotary aircraft under performance-based contracts with the Royal Australian Air Force for more than 15 years and is a principal partner in the F-35 Program in Australia producing titanium components for the F-35 vertical tails.

Bringing military aircraft expertise that is critical to the airframe, systems and sustainment, the company currently employs around 1,800 people on the program in the United Kingdom, the United States and Australia.

F-35 PROGRAM INDUSTRY PARTICIPATION

BAE Systems Australia began in the F-35 Program in July 2004 when it was selected by its parent, BAE Systems plc, as the work share partner in Australia to produce wiring boards and assemblies, cable assemblies and selected electronic components.

Recognising the opportunity available to the company, BAE Systems Australia invested significantly to position itself for further production contracts and the potential long-term sustainment opportunities once aircraft were flying in the Asia-Pacific region. One of the key investments BAE Systems Australia made was in Williamtown, New South Wales, where the company established new buildings designed to support the Lead In Fighter / Hawk 127 Program and the F-35. The facility was an investment for the future air combat capability and is a globally recognised fast jet support facility.

In addition to making the required investments, BAE Systems Australia has built strong relationships with several key international partners in the F-35 Program, including Lockheed Martin, Northrop Grumman and Kongsberg Defence & Aerospace. The company has also undertaken a broad array of work for its parent company, BAE Systems plc.

Through these companies, BAE Systems Australia has had a broad range of contracts for the global F-35 Program, including:

- specialist corrosion sensors that will support the aircraft's advanced prognostics capability to support on-condition maintenance actions;
- manufacture of various airframe component parts, such as vertical tail components;
- the Audio Communication Equipment module for the Communications, Navigation and Identification system;
- engineering and technical support; and
- integration of the Joint Strike Missile.

TRANSFORMING AUSTRALIAN INDUSTRY

BAE Systems Australia also supports several other Australian companies in the F-35 Program. For example, BAE Systems Australia is working with Levett Engineering to deliver components for the Active Inceptor System and with Marand to provide titanium components for the Vertical Tails fitted to the F-35A Conventional Take-Off and Landing (CTOL) variant.

BAE Systems Australia's involvement in the F-35 Program has introduced new capability into Australia. A key example of this new capability is the company's investment in a titanium manufacturing capability in support of Marand's manufacture of the F-35 Vertical Tails.

In March 2011, BAE Systems Australia and Marand signed a Memorandum of Understanding to deliver 722 vertical tail ship sets to BAE Systems plc in the United Kingdom valued at approximately AU\$750 million.

To support delivery of the titanium components to Marand, BAE Systems Australia commenced the construction of an AU\$10 million titanium manufacturing facility in Edinburgh Parks, South Australia, in August 2012. The build was completed in December 2013. The purpose-built facilities in Edinburgh Park included the acquisition of a new Starrag BTP5000 – a two-tonne machine designed to cut and shape titanium up to five metres long and to within 30 microns (half the width of a human hair) – to meet the precision requirements of aerospace design. In support of this opportunity, the South Australian Government provided BAE Systems Australia with financial assistance to establish the facility.

This experience has allowed BAE Systems Australia to pass this knowledge on to local industry. BAE Systems Australia has shared its knowledge with RUAG Australia (treatments) and Axiom (machining), helping South Australian industry transition out of automotive into complex defence and aerospace work.

“The F-35 Program has been central to enabling the growth and capability upgrade of BAE Systems Australia’s Williamstown facility. On a broader level, the Program has had a dramatic impact on our national business as it has given us the platform through which to build on our aerospace sustainment capabilities, notwithstanding the significant manufacturing share that BAE Systems Australia is responsible for at the global level, some of which is provided from our advanced manufacturing facility at Edinburgh Parks in Adelaide.”

*Steve Drury Director Aerospace
BAE Systems Australia*

BAE Systems Australia has also worked to support other Australian companies to successfully obtain contracts in the F-35 Program. For example, in 2011 BAE Systems Australia signed an agreement with AW Bell Pty Ltd in Victoria to supply into the F-35 Program. This led to BAE Systems Australia facilitating an opportunity for AW Bell with BAE Systems, Inc. in Nashua, United States, for the casting of two variants of flare magazines. BAE Systems Australia remains committed to helping enhance Australia’s industrial benefits from the global F-35 Program.

Throughout its journey in the F-35 Program, BAE Systems Australia has had a number of successes including:

- Since 2011 BAE Systems Australia has had orders totalling millions of dollars for the manufacture and supply of corrosion sensors;
- On 7 November 2012, BAE Systems Australia celebrated when the company’s first part built for an Australian F-35 was despatched to the US for installation on the first Australian F-35A, AU-01;
- BAE Systems Australia signed a contract on 27 August 2014, which commenced in 2015, to manufacture about 1,000 Audio Control Electronic (ACE) modules. The agreement initially augments Northrop Grumman’s in-house manufacturing of the ACE module but provides potential to become the single-source supplier with increased delivery quantities until 2036. As part of this agreement, BAE Systems Australia exports parylene-coated electronic components;
- In February 2015, BAE Systems Australia was assigned by the US Joint Program Office the F-35 Heavy Airframe Depot to conduct Maintenance, Repair, Overhaul and Upgrade (MRO&U) activities for F-35 airframes for the Southern Asia-Pacific region from 2018. The Regional F-35 Airframe Depot is currently being activated at BAE Systems Australia’s Williamstown facility in NSW;
- Under a long-term agreement signed in 2015 with Northrop Grumman Corporation, BAE Systems Australia began exporting high-end circuit boards and sub-system assemblies for the F-35. The company exports parylene-coated circuit boards, which are used in the F-35’s Communication, Navigation and Identification system and protect the boards from the harsh conditions in the aerospace environment;
- In August 2017, BAE Systems Australia was assigned by the US F-35 Joint Program Office the role of F-35 Regional Warehouse for Asia-Pacific. The regional warehousing capability will support the global F-35 enterprise with the supply of aircraft parts for Australia’s F-35 aircraft and other nations operating in the Asia-Pacific region;

- As part of the assignment made by the United States F-35 Joint Program Office in November 2016 for the component MRO&U of the F-35, BAE Systems Australia is expected to receive work for avionics, digital mission systems and life support systems, and for electrical systems and composites along with GE Aviation Systems Australia, Northrop Grumman, Rockwell Collins and Martin Baker;
- BAE Systems Australia has also been involved in the technical transfer of skills and technology relating to the Vertical Tail manufacturing processes from the United Kingdom, and the parylene coating capability and processes from the United States. In both these cases, staff training was required to ensure the specialised skills were attained to support the manufacturing processes. Further training and technology transfer will be required for the sustainment of the F-35 airframe and components as the aircraft arrive in the region; and
- BAE Systems Australia currently engages over 120 staff on F-35 contracts and estimates its role supporting the F-35 will lead to the creation of more than 200 high-technology jobs to service the F-35 during its anticipated 30-plus years of service.

NEXT STEPS

The further growth in staff engaged in F-35 activities will occur as the Program matures through its lifecycle. BAE Systems Australia also expects its Australian supply chain to grow in support of its work in the F-35 Global Support Solution within our region.

RELATED LINKS

For further information about BAE Systems Australia's work on the F-35 visit: <https://www.baesystems.com/en-aus/our-company/defence-solutions/solutions-in-the-air/jsf-interoperability-case-study>

To follow news from BAE Systems Australia and its teaming partners in relation to the F-35 visit: www.flightpath.net.au

For further information on BAE Systems Australia, refer to their website: <https://www.baesystems.com/en-aus/home>



JUL 2004

BAES Australia started in the F-35 Program

MAR 2011

BAES Australia signed MoU for vertical tail with Marand

AUG 2012

Titanium facility build in Edinburgh Parks, SA, commenced

NOV 2012

First BAES Australia part installed on first Australian F-35 (AU-01)

MAY 2013

First vertical tail part delivered to Marand

DEC 2013

Titanium facility build completed

AUG 2014

CNI ACE contract signed

DEC 2014

NACC-ISP grant provided to support CNI ACE contract

FEB 2015

Assigned regional depot MRO&U for F-35 airframe in South Asia-Pacific

MAR 2015

NACC-ISP grant provided for F-35 mechanical component electronic warfare suite

SEP 2016

CNI ACE qualification finalised

NOV 2016

BAES Australia awarded corrosion sensors contract

NOV 2016

Assigned part of component MRO&U

AUG 2017

Assigned Asia-Pacific regional warehouse



Ferra Engineering Pty Ltd (Ferra) was founded in 1992 and is one of Australia's largest independently owned Australian technology companies servicing the aerospace and defence industries.

Ferra is Brisbane-based and supplies aerospace sub-systems and sub-assemblies to some of the largest aerospace companies in the world, including Lockheed Martin, Boeing, Northrop Grumman, Airbus and Raytheon. Ferra specialises in the design, manufacture and assembly of complex integrated aerospace assemblies.

F-35 PROGRAM INDUSTRY PARTICIPATION

Ferra initially registered for the F-35 Program in 2002 and so far has provided about 100 different components for the structure of the F-35 aircraft. Major products include the Alternate Mission Equipment (AME) weapon adapters for Marvin Engineering, as well as various machining tasks for Northrop Grumman and F-35 Prime Contractor Lockheed Martin.

After Australia joined the F-35 Program in 2006, Lockheed Martin touted Ferra as one of the leading aerospace companies in Australia, largely due to Ferra's impressive manufacturing capabilities and proactive marketing. This has resulted in Ferra attracting a number of opportunities through the Lockheed Martin Industry Participation Plan and other F-35 Prime Contractors.

“Our successful involvement in the F-35 Program has resulted in Ferra building a strong reputation with Original Equipment Manufacturers in the United States and Europe. This has resulted in opportunities arising that may not have arisen if not for our successful involvement in the F-35 Program.”

Mark Arthur CEO Ferra Engineering

Ferra received its first F-35 contract in 2008 and has seen steady growth in demand for its parts and services. Ferra is currently the sole-source provider to Marvin Engineering in the United States for the AME. The AME has been the cornerstone of the success Ferra has seen on the F-35 Program. In delivering this product, Ferra undertakes complex supply chain management and sub-assembly.

TRANSFORMING AUSTRALIAN INDUSTRY

Ferra faced challenges in meeting expectations early in the F-35 Program, however, the company was able to resolve the issues through open and honest engagement with its customers. Ferra has since become one of Australian industry's F-35 success stories, obtaining about one tenth of the contracts Australia has won to date. This success has allowed Ferra to make a significant investment in its research and development, facilities and capital equipment. This underpinned Ferra's growth through 2010-2016, with an increase in revenue from AU\$6.5 million to AU\$21 million. Ferra has also worked to find innovative processes to reduce costs and lead time to ensure the company grows and remains profitable.

The AME manufacturing capability established in Ferra, and the size of Ferra's assembly area, has undergone significant expansion to meet the increased demand of the F-35 Program. The success with this contract, as well as others, has enabled the company to build an integrated supply chain that now includes over 30 Australian-based companies.

In 2013, as a result of the company's involvement in the F-35 Program, Ferra expanded its operations by opening a facility in Oklahoma in the United States. While this facility was initially established to support the F-35 Program, Ferra is now also using it to identify and drive additional business opportunities, resulting in increased work now performed at its Australian facility.

NEXT STEPS

Ferra intends to continue this trajectory and aims to grow to an AU\$50 million business by 2020. Central to this will be its F-35 AME contracts.

RELATED LINKS

For further information, refer to Ferra's website:

www.ferra.com.au



2002

Ferra started exploring F-35 opportunities

2008

First contract received

JUL 2010

EFIC grant approved

MAR 2012

NACC-ISP grant for AME improvements provided

2013

Oklahoma site opened

2016

Ferra surpassed AU\$20million in total revenue



GKN Aerospace Engineering Services Pty Ltd (GKN AES) was critical to the success of Australian industry participation in the F-35 Program, undertaking key design and support activities.

Based in Melbourne, Victoria, with offices in Sydney and Brisbane, GKN AES employed a full range of capabilities in airframe structural analysis and design, electrical engineering and systems installation design.

F-35 PROGRAM INDUSTRY PARTICIPATION

In 2002, the Australian Government joined the System Development and Demonstration (SDD) phase of the F-35 Program. This allowed Australia to contribute to the F-35's design and for opportunities for Australian industry to be part of the global F-35 Program to be identified.

GKN AES was the first company to receive a contract in the F-35 Program as a result of the decision to join the SDD phase and remains today as one of the success stories of Australian industry's involvement in the Program.

“For the first aircraft, some 1,000 parts were designed and released for manufacture by the Australian team”

*S R Walter
GKN Aerospace Engineering Services Pty Ltd*

In the early 2000s, the F-35 Prime Contractors, Lockheed Martin, Northrop Grumman and BAE Systems, quickly identified that a significant engineering capability and capacity would be required to deliver the design aspirations for the F-35. The Primes promptly moved to establish an engineering team to support their work on the F-35 Program.

At roughly the same time, GKN AES in Australia recognised the opportunity the F-35 Program presented and, in 2002, decided to actively pursue work in the F-35 Program. Due to the size and complexity of the F-35 Program it was clear to GKN AES that the traditional method of trying to acquire fixed scope packages of work would create erratic work flows and complex commercial negotiations due to the changes that were likely to occur through the program. Similarly, the practice of sending Australian engineers to the United States or United Kingdom, where the Prime Contractors were principally based, was not cost effective. The goal was to engage the JSF Primes by integrating virtual engineering teams into the core of the F-35 design activity. The aim was to operate in such a way that a GKN AES engineer sitting in front of a computer in Australia would perform the same work in the same way as the Lockheed Martin or Northrop Grumman engineer sitting in the United States, just in a different time zone.

Establishing a team to work seamlessly with the United States and United Kingdom had its challenges. However, GKN AES' experience in remote working and virtual teaming, along with knowledge gained from experiments in 24-hour “follow the sun” working, were applied with great success. Also of fundamental importance was the Northrop Grumman vision of an off-site / out-of-time-zone design capability.

After a successful marketing campaign, strongly supported by the Australian Government, GKN AES was invited to Northrop Grumman's offices in El Segundo in 2003 to discuss the creation of an engineering team. In November 2003, GKN AES was awarded a contract by Northrop Grumman for 18 staff (nine of whom were based in the United States) to support the design, analysis and manufacture of F-35 centre fuselage parts for 15 months.

In April 2004, the Product Data Management (PDM) node was identified by GKN AES and the Australian Government as an essential investment to obtain the hardware required in order to host a real time copy of the relevant design data and more efficiently perform the F-35 design services. Building on the high degree of confidence GKN AES had already established, the Prime Contractors supported the view that Australia was a natural location for the PDM node. With the support of the Australian Government, GKN AES established the infrastructure to enable remote access to Lockheed Martin to offer locally contracted F-35 companies access to the F-35 configuration system. The key benefits of the PDM node included:

- Australian industry being provided with the necessary infrastructure to work in close cooperation with global partners on the F-35, especially during the SDD phase; and
- improved competitiveness of Australian companies by providing real time access to configuration information for the F-35 that was not easily available outside of Lockheed Martin.

Over the next three years, the contract quickly expanded, peaking during 2006 with over 220 GKN AES designers and engineers being part of the F-35 Program, of which over 90 per cent were based in Australia. The United States based staff were responsible for liaison and “feeding” work to the engineering team in Australia.

GKN AES undertook work for both Lockheed Martin and Northrop Grumman on all three variants of the F-35: F-35A Conventional Take-Off and Landing (CTOL); F-35B Short Take-Off and Vertical Landing (STOVL); and F-35C carrier variant (CV). This involved a broad array of work on the F-35, including:

- CTOL centre fuselage upper skins;
- STOVL centre fuselage;
- inner wing for the CTOL and CV;
- CTOL/CV Aft Weapons Bay;
- design and substantiation of airframe structure components;
- structures – metallic and composite;
- systems installation design;
- flight test fit outs;
- ground test support;
- support to production;
- concepts surrounding sustainment; and
- weight reduction trade studies.

“GKN’s participation on programs such as [F-35] has created unprecedented opportunities for Australian engineers to work on the most technologically advanced aircraft, employing state of the art tools and processes, and has demonstrated to the global aerospace primes that Australian engineering is of a world standard.”

*S R Walter
GKN Aerospace Engineering Services Pty Ltd*

As a direct result of successfully performing in the F-35 Program, growing the work and building a record of performance in Australia, including demonstrating the benefits of 24-hour working, GKN AES had undertaken over 1 million engineering hours, designed some 3,000 distinct parts amounting to 12 per cent of the airframe by part number and made a major contribution to the F-35.

GKN AES was an active member of the JSF industry team using its experience to support other Australian tasks in interpreting design requirements, contacts in the program and compliance with International Traffic in Arms Regulations.

In 2009, the all engineering services activities within GKN were sold to an Indian engineering services business. This organisation was focused on Airbus and other European opportunities and decided to close the Australian operation. As a result of the JSF activities undertaken by GKN AES, there are now a large number of Australian aerospace engineers with significantly enhanced capabilities and experience spread throughout Australian industry and the global aerospace industry.



HTA offers thermal processing services to the metal industry. The Queensland family-owned business was established in 1979 and has four branches in Brisbane, Sydney, Melbourne and Los Angeles, United States.

Over the years, HTA has grown from a one-person, one-building operation to a company with over 65 people located across Australia's east coast and now established in the United States.

Beginning in 2001 with ISO 9001 accreditation – the international standard for quality management – HTA developed its systems to the point of successful accreditation in 2008 to AS 9100 – the global quality standard for aerospace manufacturing. HTA then went a step further, obtaining the aerospace accreditation from the United States National Aerospace and Defense Contractors Accreditation Program (NADCAP) in 2009. Obtaining these quality standards provided the necessary building blocks for HTA to begin competing for aerospace contracts. HTA's quality systems continue to develop with additional NADCAP processing scope achieved in 2010.

F-35 PROGRAM INDUSTRY PARTICIPATION

HTA has supplied to the F-35 Program since 2010 and is proof of the benefits the F-35 Program has provided to Australian small and medium enterprises.

HTA has been central to the success of other Australian companies in the F-35 supply chain, supporting companies across the nation to be more internationally competitive and provide a higher quality product to their customers. HTA's support of RUAG, AW Bell, Lovitt Technologies and Marand in Victoria, Ferra Engineering in Queensland and Levett Engineering in South Australia has significantly contributed to Australia's success in the F-35 Program.

TRANSFORMING AUSTRALIAN INDUSTRY

Participation in the F-35 Program has encouraged HTA to undertake significant and sustained research and development to develop innovative technologies and processes for the Australian market. The F-35 Program has provided a foundation and platform for showcasing the company's unique and world-leading processes while enhancing the skills and technical ability of HTA's staff. This has enabled its customers to reach into industry and find solutions to previously unavailable technology and manufacturing methods.

HTA has experienced significant growth leading to the expansion of its facilities in Brisbane and Melbourne as a direct result of the F-35 Program. To date, HTA's additional investment in aerospace and defence projects has included new equipment, expanded facilities, improved quality systems, increased employment and increased employee skills. HTA's success in the F-35 Program has also opened up several new revenue streams for the company, including:

- numerous aerospace and defence platforms and projects (other than F-35);
- international expansion via the set-up of HTA Los Angeles – a heat treatment facility based in California, United States; and
- aluminium vacuum brazing (AVB) projects (including new projects in non-defence and new advanced technology sectors).

HTA has also been an industry leader in innovation through its in-house research and development program. One example of HTA's innovations resulting from the F-35 Program is a vacuum-hardening process. This world-leading processing technique removed a number of manufacturing steps and led to HTA being the only thermal processing company in the world to be approved by Goodrich Landing Gear to provide vacuum processing with high-pressure gas quenching for F-35 landing gear components. Partner Nations in the F-35 Program are not approved for this method, which creates advantages for Australian industry through technology innovation and application. This innovative methodology has now been applied to HTA's newest purchase in 2016 of another furnace with a higher pressure quenching capability, opening up new and exciting research and development opportunities. This was only the fourth furnace of its kind anywhere in the world, and it provides a substantial benefit for Australian markets and customers.

Another example of innovation undertaken by HTA is the development of a new aluminium vacuum brazing (AVB) process to provide processing for the F-35 Program. The AVB process is unique and in very short supply throughout the global aerospace industry and emerging technologies sectors. In this way, AVB is a major development of new intellectual property for Australian manufacturing and for next-generation aerospace and defence thermal processing.

These innovations allow for future industry expansion into new projects and markets that haven't been previously accessible for Australian industry. The gains for HTA as a result of this innovation have been wide reaching, including opening up access to international markets, international recognition for HTA's processing technology, new revenue streams and new marketing opportunities. In addition, the AVB process has been key to the development of domestic markets in the area of green and emerging technologies.

“Participation in the F-35 Program was the motivation for HTA to undertake significant and sustained research and development in order to develop innovative technologies and processes for the Australian market. The F-35 Program has also provided a foundation and platform for showcasing our unique and world-leading processes to the world, and will easily extend to F-35 sustainment, global supply chain partners and repair, maintenance and overhaul opportunities. The benefits of the Program, in terms of increased capabilities and expansion and growth, have been substantial and will be enduring for HTA and for Australian industry.”

*Dr Karen Stanton
Director Strategy and Corporate
HTA Global*

The F-35 Program was also the primary driver for new development and expansion plans recently completed at HTA. The expansion has enabled new thermal processes not previously available in Australia, including:

- vacuum titanium processing;
- vacuum carburising;
- argon atmosphere processing;
- neutral hardening;
- nickel alloy steel processing; and
- alloy steel processing.

Expansion of facilities and processes at HTA are a direct result of involvement in the F-35 Program. The new processes are required to fill gaps in F-35 supply chains and to ensure Australian industry is able to compete on all available work packages. The expanded facility at HTA will also fill gaps in Australia's advanced manufacturing industrial framework. These gaps have been identified in response to customer demand and marketing analysis indicating that long-term demands for services provided by HTA are increasing exponentially.

NEXT STEPS

In preparation for the ramp up of the F-35 Program, HTA has expanded its physical site footprint, procuring new processing equipment, hiring and training additional staff, and increasing its processing capability and capacity.

RELATED LINKS

For further information, refer to HTA's website: hta-global.com



1979

HTA established

2001

ISO 9001 accreditation

2008

AS 9100 accreditation

2009

NADCAP accreditation

2010

Started in F-35 Program

JUL 2011

SADIP grant for QLD site

JUL 2012

SADIP grant for VIC site

AUG 2012

NACC-ISP grant provided for new thermal processing solutions

NOV 2015

NACC-ISP grant provided to increase processing capability and capacity

MAY 2016

NACC-ISP grant provided for final article inspection of vacuum chassis



F-35 PROGRAM INDUSTRY PARTICIPATION

KBR has developed training programs for pilots and maintainers for the F-35 Program as part of the Northrop Grumman-managed global training and courseware development capability since 2005. KBR has continued in the Program as a courseware developer, providing services to sequence the maintainer courses for the Israeli and Australian trade groups.

At inception, the courseware and training program included six organisations, of which KBR was the only one outside the United States. As the F-35 Program has matured and the number of organisations providing these services has reduced, KBR has continued to provide training and courseware services for the Program. Through its participation in the Program, KBR's Government Services business in Australia has expanded its offering to provide training solutions globally.

More recently, Lockheed Martin has also seen other aspects of KBR's training capability through the development of the F-35 Maintainer Virtual Reality Demonstrator, which has been demonstrated to Lockheed Martin Rotary and Mission Systems in Orlando, Lockheed Martin Aerospace in Fort Worth and Lockheed Martin Australia in Canberra. KBR developed the virtual reality prototype to support higher capacity training of F-35 support crew. The prototype was developed in less than a month using KBR's Canberra-based technical team, demonstrating the depth of expertise in its Australian capability.

KBR's Government Services Asia-Pacific team is based in Canberra and coordinates government services for the Asia-Pacific region. The team delivers large and complex projects and training systems to Defence, corporate and government clients. KBR measures its success through a commitment to its customers, people and belief in doing 'Zero Harm'.

KBR Government Services delivers full life-cycle support in program and project management, systems engineering, test and evaluation, integrated logistics support, asset management, consulting, mission planning, modelling, simulation and training, which all drive project success.

“The F-35 Program has been an exciting and fulfilling 12-year journey for our people. It is a program where we are proud of our contribution throughout acquisition and where we look forward to the next stage of in-country support.”

*Rob Hawketts
Vice President Government Services APAC
KBR*

TRANSFORMING AUSTRALIAN INDUSTRY

KBR has been committed to the F-35 Program since joining in 2005, and sent its staff to the United States to attend the Program's familiarisation course in 2008. KBR brought this knowledge back to Australia and has utilised it to further enhance its delivery to the F-35 Program.

In addition to the F-35 courseware program, KBR Modelling, Simulation and Training has supported the Australian Defence Force in programs including:

- training design, development and delivery for acquisition and sustainment of the ARH Tiger helicopter;
- development of the ARH Virtual Avionics Systems Trainer;
- development of the MRH-90 Virtual Systems Trainer and the Landing Helicopter Dock (LHD) Ship Walk-Through Computer Model; and
- development of LHD training and the ongoing delivery.

In addition, KBR has provided training and performance support for several systems implementation programs in Defence spanning finance, human resources, health services and estate management.

NEXT STEPS

KBR is an established provider of training solutions to Defence and will continue to focus on growing its modelling and simulation capability. Participation in the F-35 Program has assisted in raising awareness of KBR's local capability and in pursuing ongoing sustainment training support on the Program, in addition to other Defence capabilities.

RELATED LINKS

For further information, refer to KBR's website: www.kbr.com



2005

Started in F-35 Program

2008

Attended training in the US

2009-15

Courseware development and delivery

2016

Resequencing

2017

Virtual reality prototype developed

Levett Engineering Pty Ltd (Levett)

was formed in 1989 and is a privately owned Australian company and a precision component manufacturer and assembler of systems. While it is primarily an exporter of aerospace components, it has a client base that includes the defence, aerospace, medical, electronics and commercial engineering sectors. Levett commenced operations in April 1989, and has moved premises three times as the company expanded its facilities.

Before the F-35 Program, Levett was a small machine shop with a domestic customer base. The company was facing an uncertain future due to its customers outsourcing work to Asia, and the downsizing of the manufacturing industry in Adelaide and Australia more broadly. During this phase of business, Levett was operating one shift per day, five days per week. The Australian Government's investment in the F-35 Program opened a pathway for Levett to transition into the aerospace sector and become a growing exporter within the market.

F-35 PROGRAM INDUSTRY PARTICIPATION

Levett spent many years building relationships with F-35 Prime Contractors Lockheed Martin and Pratt & Whitney, as well as Original Equipment Manufacturers (OEMs), by making frequent visits to the United States and the United Kingdom. Levett also hosted visits to its facility by the Primes and OEMs to demonstrate its readiness to these companies through frequent audits and gaining AS 9100 – the global quality standard for aerospace manufacturing.

Levett then began delivery of straightforward components, such as the tubes and vane covers for the F135 engine.

The F-35 Program has benefited from Levett's niche in titanium and alloy machining. Levett has led Australia's breakthrough into F135 engine component manufacture for over a decade. Building a strategic supplier relationship with Pratt & Whitney during that period, Levett continues to expand its responsibility and the scope of work it undertakes in support of F135 engine production and follow-on development phases. Levett has paved the way for other Australian companies to enter the Pratt & Whitney Global Supply Network.

Undertaking work for Lockheed Martin and Pratt & Whitney demonstrated Levett's capability. Subsequently, Levett won work with major subcontractors on the F-35, such as Northrop Grumman, BAE Systems (both in the United Kingdom and the United States) and Harris Corporation.

Successfully completing contracts for Lockheed Martin, Pratt & Whitney and other members of the supply chain has resulted in Levett expanding the number of components manufactured and its complexity. Levett now manufactures fracture critical engine components and a broader range of airframe, mission systems and vehicle systems components for Lockheed Martin, Harris Corporation, Northrop Grumman and BAE Systems.

A cornerstone of Levett's success has been its ability to maintain and build customer relationships. The company invests heavily in these relationships by conducting multiple visits each year to its customers, resulting in Levett having a broad range of customers on the F-35 Program.

A testament to the benefits of its relationship management and capability as a manufacturer is that Levett was awarded 'Blue chip' supplier status – 100 per cent on time; 100 per cent quality – by Lockheed Martin. Levett is now expanding its scope of services to manufacture, integrate and supply airframe component assemblies.

Levett has also earned a trusted preferred supplier status across the BAE Systems Global Network. Levett continues to grow its avionics sub-assembly manufacturing capabilities to include sub-assembly integration and test in high-value niche product lines, including the active inceptor and avionics components in the F-35 Program.

Levett is highly awarded, receiving a commendation from the Department of Defence in 2015 for its work on the Australian F-35A Project, and winning a Business South Australia manufacturing export award in the same year.

Levett also receives very high supplier ratings from its customers. The company was nominated in the top two of 30 suppliers to BAE Systems plc, Rochester – and was the only company nominated outside the UK.

TRANSFORMING AUSTRALIAN INDUSTRY

Being part of the F-35 Program has also led to other tangible benefits beyond the Program. Achieving world-class standards through the F-35 Program has allowed Levett to bid for non-F-35 aerospace work. Commercial and military aerospace companies like Boeing are more prepared to do business with Levett as a result of its F-35 work because they know Levett has demonstrated the capability to reach the exacting standards required of F-35 suppliers.

Because F-35 production is over a period of about 25 years, Levett has made long-term investments in new machining centres, machine tool metrology and a new factory that will assemble aircraft components. Levett has invested several million dollars into new machining centres at its Elizabeth South site near Adelaide.

Levett has also taken advantage of the access to world's best practice manufacturing techniques the F-35 Program has afforded. This has included learning from Lockheed Martin, which sent out an engineer for six months to work with Levett to further improve its quality and delivery.

The company is now working with its own supply chain with a similar approach to Lockheed Martin's. Levett contracts work out to a number of suppliers in Adelaide, providing training to enable those companies to improve quality systems, sustain production and employ people. Levett's training gives its suppliers improved skills to win other work and to invest in staff, equipment and facilities.

The F-35 Program hasn't come without its challenges for Levett. In the early years, the challenge was the substantial level of up-front investment, such as attaining specific certifications and accreditations to become eligible to bid for contracts with the F-35 Primes and OEMs. Levett also needed to demonstrate a capacity to meet production demands.

Overarching all these issues is the complexity of being a manufacturing exporter in a commodity driven economy. Australian manufacturers directly compete with United States-based manufacturers for F-35 components. The natural resource booms and busts cause swings in exchange rates, which are difficult to hedge given the uncertainty of production volumes. As the F-35 Program moves to longer-term fixed production volume contracts, Australian industry will be more able to manage these swings.

“On a rough measure, Levett is now able to machine components twice as fast as before because of the processes learnt through our training related to the F-35 Program.”

*Paul Levett
Managing Director
Levett Engineering Pty Ltd*

Levett draws on its local and overseas supply chains. Levett imports raw materials (particularly metal billets) from the United States, and uses Electromold and RUAG as sub-contractors in Australia to provide surface finishing of its components. Levett has an in-house line for assembly of aerospace components.

NEXT STEPS

Levett is now scaling its working capital to acquire the inventory levels of raw materials and finished goods required to meet full-rate production.

Levett's F-35 achievement is considered a model for how the Australian industry can evolve and compete successfully in the global aerospace market. With the F-35 Program continuing to mature, production ramping up and an increased focus on sustainment, Levett is well positioned to secure additional work moving forward.

RELATED LINKS

For further information, refer to Levett's website:

www.levett.com.au



2003

Began pursuit of F-35 Production contracts

2007

Achieved AS 9100

2007

Won first F-35 contract with Lockheed Martin

2008

Received first production contracts with BAE Systems plc

2011

Received first production contracts with Harris

NOV 2011

SA loan facility funded one-off expenses in early F-35 production phases

APR 2012

NACC-ISP grant awarded to improve productivity for Lockheed Martin contracts

AUG 2012

NACC-ISP grant provided for new thermal processing solutions

2013

Received first production contracts with Northrop Grumman

2014

Achieved 'Blue' supplier status with Lockheed Martin (100% on-time and quality)

2015

5-year agreement with P&W signed for engine components

MAY 2015

NACC-ISP grant provided for support qualification for BAE Systems work

MAY 2015

NACC-ISP grant provided to support qualification of F135 engine components

JUN 2016

NACC-ISP grant provided to support qualification for 100 parts for Lockheed Martin



LOVITT TECHNOLOGIES AUSTRALIA

Lovitt Technologies Australia (Lovitt) was founded in 1954 and had a background primarily manufacturing cutting tools and components for the automotive industry. Over the years, Lovitt has evolved and embraced contemporary precision engineering technologies. It now provides precision-machined tools, components, parts and assemblies to customer designs and specifications within the aerospace and defence industries.

F-35 PROGRAM INDUSTRY PARTICIPATION

Lovitt manufactured its first part for Lockheed Martin on the F-35 Program in 2006, after many years of visits by Lockheed Martin and lengthy negotiations. At the time, Lovitt was also involved in two other development programs – the Airbus A380 and the Boeing 787, both of which had their own challenges. Learning from these challenges, Lovitt's engagement on the F-35 Program was approached with caution.

Over the ensuing years a strong business relationship grew with Lockheed Martin. As the relationship blossomed, so did Lovitt's work statement. From 2006 to 2013, Lovitt shipped about 5,500 parts to Lockheed Martin, but sales remained at no more than 10 per cent of the business's turnover.

During this time, Lovitt formed new business relationships with various United States and United Kingdom-based manufacturers on the F-35 Program. As a result, another core capability was introduced to the Australian industry supply chain with the introduction of Electromold.

In August 2012, the then Minister for Defence Materiel announced the first shipment of an entirely Australian manufactured component that would be fitted to the F-35. The precision component, which formed part of the structure to attach the aircraft's wings to its fuselage, was manufactured by Lovitt.

In 2013, Lockheed Martin challenged Lovitt with larger and more complex components and minor aircraft assemblies. Lovitt accepted this challenge, believing the company was mature enough to deliver and the F-35 Program's production forecast had stabilised. This new work statement and scope required Lovitt to invest in equipment, technology and people. Lovitt was starting to transform.

In recognition of Lovitt's continuing importance in the F-35 Program, on 3 May 2017 the company received the prestigious 2016 Top Performing Supplier Award from Lockheed Martin. The award placed Lovitt in the top two per cent of suppliers among 1,400 in the Lockheed Martin global supply chain.

TRANSFORMING AUSTRALIAN INDUSTRY

During various industry briefings, Lockheed Martin indicated that an in-country chemical processing capability was a necessity for manufacturers in Australia to be successful in the F-35 Program. In 2008, a decision was made to transform Electromold from a generalist chemical processing shop into an aerospace chemical processing shop that could support the F-35. This was a significant decision as the investment required in quality systems, auditing, people, training and equipment was substantial. It was also significant because, as there was no approved commercially available chemical processing in Australia, aerospace manufacturers had at that time no option but to send their product overseas to have the chemical processing undertaken.

In 2009, after a relatively large investment in time and money, Electromold received Lockheed Martin approval, followed closely by the necessary industry approval provided by the National Aerospace and Defense Contractors Accreditation Program (NADCAP). During this time, Boeing, as part of its global supply chain activities, had made it clear that in-country processing was a pre-requisite for Australian manufacturers to be considered to participate in its 'Office of Australian Industry Capability' programs. Consequently, Boeing, Federal and State governments, and industry (including Lovitt) assisted Electromold to obtain the knowledge and funds necessary to obtain the Boeing approvals. A roadblock inhibiting Boeing work coming into Australia was finally removed, paving the way for a more competitive aerospace industry in Australia.

Electromold processed its first aerospace component in 2009 following approval of its procedures and controls by Lockheed Martin for the F-35 Program.

For the next few years, Electromold waited for the F-35 Program rates to increase and for the 'critical mass' of work to arrive to justify the investment. In total, Electromold invested around AU\$800,000 into setting up F-35 processing and NADCAP approvals.

The aftermath of the global financial crisis (which substantially slowed Electromold's commercial work) and changes to the F-35 Program's production meant the Electromold business experienced financial pressure. Recognising this, in 2013 Lovitt purchased Electromold from the previous owners as it had become critical to the Australian defence industry supply chain and to the future of aerospace metallic parts manufacturing in country.

“The F-35 Program was the impetus to establish commercially available in-country wet processing, removing a roadblock hindering manufacturers participating in the F-35 and various other aerospace production programs, and thus enabling various niche Australian manufacturers to begin to organise themselves into an industry.”

*Marcus Ramsay
Managing Director
Lovitt Technologies Australia*

From 2013 to 2015, Lovitt invested about AU\$5 million to increase its capacity. Among these investments was the installation of a Makino T1 machining centre. At the time, this was the only one of its kind in Australia and the 10th installed worldwide. This machine is specifically designed for efficient machining of large titanium components and runs around the clock.

Another of Lovitt's key investments was the installation of a Mitutoyo Coordinate Measuring Machine with an in-built laser scanner, which has allowed Lovitt to measure complex assemblies in minutes rather than hours without even touching the part.

In 2015, the Electromold business, under Lovitt's management, grew significantly on the back of increased activity of the various, mostly F-35 related, manufacturers within Australia. Electromold has continued to expand operations since its purchase by Lovitt. In order to keep up with demand and continue to support Australian industry, Lovitt withdrew some of its own work (which it sent overseas) from Electromold to free processing space. This helped to ensure customer deliveries continued to be met.

Globally, the F-35 Program has benefited greatly from Lovitt's manufacturing capability in aluminium and titanium components and Electromold's chemical processing capability. Electromold has successfully embedded itself into the Australian defence industry's supply chain and supports a number of F-35-related opportunities for companies such as Levett, Ferra, Lovitt, Marand, Quickstep, HTA, Varley and AW Bell.

Lovitt is dedicated to helping develop and grow Australian industry capability and capacity. Lovitt's supply chain for the F-35 Program includes over 15 other Australian companies that have benefited from the company's continued involvement in the F-35 Program. Additionally, recognising the importance of a processing and surface coatings capability in the F-35 supply chain, Lovitt's purchase and reinvigoration of Electromold in 2013 secured a cornerstone of this capability to the Australian defence industry supply chain and to the future of aerospace metallic parts manufacturing in-country.

NEXT STEPS

Lovitt's commitment to collaborative partnering and its industry stewardship is a testament to the positive impact the company is continuing to make in Australian and global markets. With the F-35 Program continuing to mature and production ramping up, Lovitt is well positioned to secure additional work moving forward.

RELATED LINKS

For further information, refer to Lovitt's website:

www.lovitech.com.au



2006

Manufacture of first Lovitt F-35 part

2008

Electromold entered F-35 Program

JUN 2009

SADIP grant to support NADCAP accreditation

2009

First Electromold part delivered

SEP 2011

Electromold expansion project with AU\$1.34 million of Government support

AUG 2012

First entirely Australian made F-35 part shipped

2013

Lovitt purchased Electromold

OCT 2013

NACC-ISP grant provided to support Lockheed Martin production

JUL 2016

NACC-ISP grant provided to establish painted parts facility

MAY 2017

Lovitt awarded Lockheed Martin Top Performing Supplier Award



Marand is one of the most successful Australian companies in the F-35 Program to date, receiving about one third of the Australian contracts in the F-35 Program.

Marand became a supplier in the early days of the F-35 Program, back in 2002, and has since grown its presence and importance as a key member of the international supply chain. The company has benefited significantly from involvement in the F-35 Program, which has supported the company to expand into aerospace structures manufacturing. Working on the F-35 Program has also assisted in transitioning the business from being 80 per cent domestically focused, mainly in the automotive sector, to now being 70 per cent export focused in growing global aerospace markets.

F-35 PROGRAM INDUSTRY PARTICIPATION

In 2002, Marand received a contract for manufacturing engineering support in Palmdale, California. Lockheed Martin recognised Marand as a company that designed high-volume manufacturing systems but also had an aerospace tooling pedigree. This contract involved Marand placing engineers into Lockheed Martin's Palmdale research and development hub, 'Skunk Works', to assist with planning the production of the F-35's Leading Edges, which allow the aircraft to cut through the air.

The F-35 Program provided Marand with its first export contract when it won the competitive contract to design and manufacture the engine removal and installation trailer. Marand is now recognised as the Original Equipment Manufacturer (OEM) of the trailer worldwide. Marand was also the first global company to be awarded a support equipment contract in the F-35 Program.

In 2009, Marand received its first F-35 tooling contract from BAE Systems plc and continues to supply tooling to this day to the United Kingdom and four other F-35 Partner Nations. Marand also signed a long-term agreement with BAE Systems plc in 2011 for the manufacture of Vertical Tails for the international F-35A Conventional Take-Off and Landing (CTOL) variant. The project is expected to generate approximately AU\$750 million in revenue over 20 years. During the same year, Marand received its AS 9100 accreditation – the global quality standard for aerospace manufacturing.

In order to meet the production requirements for the F-35, Marand signed an agreement with the Ford automotive company in 2012 to use the old tool-room site at the Ford factory in Geelong, Victoria, relocating workers from its temporary Airport West facility in Melbourne. The company originally announced 20 workers would relocate to Geelong, but the success of the transition saw the workforce grow to about 50 within just six months. This production facility employs a mix of long-term Marand employees, ex-automotive employees and local apprentices recruited from the greater Geelong region.

In 2016, Marand won the detailed design and manufacture for the Engine/Lift Fan Removal and Installation Trainer (ELFRIT) for the F-35 Program. At least 90 per cent of the engineering and design work is undertaken in Australia.

“The F-35 Program has helped transform the Marand business and, with that, helped our employees and the communities in which they live.”

*Rohan Stocker
Chief Executive Officer
Marand*

TRANSFORMING AUSTRALIAN INDUSTRY

The F-35 Program has provided stable, long-term growing revenue that has enabled Marand to invest in its employees, further skilling them to take on the jobs of the future. For example, Marand was able to recruit and train more than 45 apprentices who have actively worked on and contributed to Marand's F-35 products. Marand has been able to absorb a large number of people out of the engineering and manufacturing workforce who were previously employed by the automotive industry – jobs that would have otherwise been unavailable. Without the opportunity to be engaged in F-35 work, it is unlikely other work could have been found to create this level of employment.

Participation in the F-35 Program has also led to many improvements within the company's business processes and systems. Both BAE Systems Australia and Lockheed Martin have provided Marand with considerable training, assistance, guidance and coaching in areas such as quality systems, proposal preparation, Lean manufacturing, supply chain management, relationship management and cyber security. This has made Marand more robust, capable and professional across all aspects of its business and has brought opportunities broader than the F-35 Program.

Marand has also expanded its Australian supply chain to deliver on its F-35 contracts. This has resulted in a range of local suppliers also having to grow and enhance their capabilities, with consequent growth in employment and business opportunities. Marand now has nine Australian companies directly involved in its F-35 Program supply chain, with several others enabling its manufacturing efforts.

NEXT STEPS

Marand is now an established supplier of F-35 Vertical Tails, with Australian-produced tails on the aircraft of several partner countries, including Australia. Marand's engine removal and installation trailers are now in use at all three Final Assembly & Check Out facilities, and Marand continues to supply rate tooling and innovative manufacturing solutions to F-35 suppliers in the United States and Europe. Marand is now turning its eye to broader sustainment opportunities, particularly in Ground Support Equipment and other non-flyaway equipment.

RELATED LINKS

For further information, refer to Marand's website:

www.marand.com.au



2002

Started work on F-35

MAR 2003

Started design contract for F-35 engine R&I trailer

NOV 2004

Manufactured install and removal adaptor to Lockheed Martin design

DEC 2005

Re-designed & manufactured I&R trailer adapters

FEB 2006

Technical services contract signed

MAR 2006

First Marand tooling contract for F-35 CTOL signed

MAR 2009

Received first tooling order from BAES UK

2009

Achieved AS 9100

JUN 2010

Awarded SADIP grant for training

2011

Vertical tails contract with BAES UK signed

OCT 2011

Awarded VIC government manufacturing grant

JUN 2012

Geelong manufacturing facility added

JAN 2013

NACC-ISP grant provided

NOV 2013

First Marand vertical tail installed on F-35

FEB 2016

ELFRIT contract awarded

MAY 2017

Marand produced Vertical Tails assembled to AU-003 – Australia's third F-35A



Quickstep Holdings Limited (Quickstep)

is an Australian company at the forefront of advanced composites manufacturing and technology development for the defence, aerospace, automotive and other advanced sectors.

The company was established in Perth in 2001 to develop the now patented Qure fluid heating technology for composites manufacturing. Quickstep, through its wholly owned subsidiary Quickstep Technologies, is today the largest independent aerospace-grade advanced composite manufacturer in Australia. Quickstep partners with some of the world's largest aerospace and defence organisations, including Lockheed Martin, Northrop Grumman, BAE Systems plc (via Marand) and Boeing Defence.

Quickstep has grown from what was a small research and development company in the early 2000s to become a key aerospace/defence composite component supplier in the Australian supply chain.

F-35 PROGRAM INDUSTRY PARTICIPATION

Quickstep became involved in the F-35 Program in 2009 when it signed its first major manufacturing agreement with Lockheed Martin and Northrop Grumman for the manufacture of F-35 composite doors and panels. Quickstep also signed memoranda of understanding with Marand and BAE Systems plc in the same year.

“We are the supplier for 32 composite components globally, ensuring that every F-35 made has Quickstep components as part of the aircraft.”

*Mark Burgess
Chief Executive Officer
Quickstep Holdings Limited*

Later in 2012, Quickstep successfully delivered its first F-35 part to Northrop Grumman in Coogee, Western Australia, marking a significant achievement in the company's F-35 journey.

The next big win for Quickstep came in 2014 with the signing of another long-term agreement, this time with Marand to support the production of composite parts for 700 sets of F-35 Vertical Tails, ultimately for BAE Systems plc. Building on the capability developed with Northrop Grumman, Marand worked with Quickstep to produce the Vertical Tail spars, fairings and skins.

To support this work, Quickstep requested support from the Australian Government's New Air Combat Capability Industry Support Program (NACC-ISP) and was granted AU\$250,000 to qualify for the production of fracture critical components. The Vertical Tails work led by Marand is expected to generate approximately AU\$750 million over 20 years. Quickstep delivered the first parts to Marand in the second half of 2015.

In 2016, Quickstep was qualified by BAE Systems plc to undertake the supply of composite parts for the F-35 Vertical Tail to Marand. This was a significant milestone, providing yet another opportunity for Quickstep to expand its supply in to the F-35 global supply chain.

Quickstep was also part of the team identified when Australia was assigned the component Maintenance, Repair, Overhaul and Upgrade of F-35 aircraft composites by the United States F-35 Joint Program Office in November 2016.

TRANSFORMING AUSTRALIAN INDUSTRY

The new work associated with F-35 production didn't come without its challenges, one of which was how Quickstep would fund the purchase of the required equipment, when contracts had not yet been put in place. This meant no bank was willing to lend Quickstep the funds required to establish the capability. Working with Marand and Ferra Engineering, Quickstep approached the Australian Government's Export Finance and Insurance Corporation (EFIC) for help, which resulted in an EFIC loan in 2010. The loan enabled Quickstep to make the necessary investments to be production-ready for the F-35.

Quickstep also realised it would need to expand its capacity to meet the demands of the F-35 Program. This was easier said than done, with the mining boom dominating available skills in the Perth region at the time. With the support of the NSW Government, Quickstep took advantage of an opportunity to take over a large facility Boeing was vacating at Sydney's Bankstown Airport in 2011. Subsequently, Quickstep closed its Western Australian plant in 2012. The Bankstown plant has since expanded to support the F-35 production ramp-up, with investment in two smaller autoclaves, a coordinate measuring machine, and a substantial refurbishment to get the facility up to the standards required for aerospace manufacturing.

Off the back of its approved supplier status to the F-35 Program, and following an international commercial tender program by Lockheed Martin, Quickstep was selected as the sole global supplier for the C-130J Hercules tactical transporter wing flap in March 2012. Qualification for the wing flap was completed July 2013, and a long-term agreement was signed in December 2013, with a five-year contract valued at US\$75 million signed and the first delivery occurring in February 2014. Quickstep now delivers two sets of the wing flaps each month. This contract provides Quickstep with diversity in revenue stream and longevity of export supply.

“As an approved supplier to the F-35 Program, Quickstep was selected as the sole global supplier for C-130J Hercules tactical transporter wing flap, under a five-year contract valued at US\$75 million.”

*Mark Burgess
Chief Executive Officer
Quickstep Holdings Limited*

In 2017, Quickstep completed a planned AU\$10 million capital expansion of its aerospace manufacturing facilities in Bankstown, including a capital investment program for the expansion of F-35 production, and the commissioning of an automated robot drilling cell for C-130J production. This takes the total investment made at the Bankstown site to around AU\$30 million and provides Quickstep with further production capacity to take on additional manufacturing work at the facility.

2005

ASX listed

OCT 2007

Munich, Germany facility opened

2009

Started in JSF program and signed agreements with LM, NG, BAES and Marand

LATE 2009

ISO 9001/AS 9100 qualifications achieved

JUL 2010

Export Finance Investment Corporation loan provided

2010

Passed Manufacturing Readiness Review for JSF parts

2011

Moved to Bankstown facility

2012

First JSF part delivered

2012

Quickstep accredited to LM process specs for F-35 parts & for the laboratory

2013

Bankstown accredited to LM process specs for F-35 parts & for the laboratory

NEXT STEPS

Through the advanced manufacturing facilities in Bankstown, and the new process technologies developed in-house, Quickstep has the potential to be a world leader in composites process technology solutions.

RELATED LINKS

For further information, refer to Quickstep's website:

www.quickstep.com.au

JUL 2013

NACC-ISP grant to qualify rapid, low cost curing for F-35 composites

2014

Signed long term agreement with Marand for vertical tail

OCT 2014

NACC-ISP grant to qualify for fracture critical components

2014

NADCAP qualification achieved for composites special process

2015

Qualified through Marand with BAE Systems plc for vertical tail spars

2015

NADCAP qualification achieved for non-destructive testing

2015

First deliveries of JSF Vertical Tail parts to BAE Systems plc

2016

First deliveries of JSF Vertical Tail parts to Marand

NOV 2016

Assigned part of component MRO&U



Rockwell Collins Australia (RCA)

is a wholly-owned subsidiary of Rockwell Collins Incorporated, a publicly-listed company in the United States. Rockwell Collins has been in operation in Australia since the 1960s and, over the past decade, has focused on developing local engineering and service capabilities tailored to meet the evolving needs of the Australian Defence Force.

F-35 PROGRAM INDUSTRY PARTICIPATION

RCA first sought work on the F-35 Program in 2007 by engaging its parent company and the Distributed Aperture System (DAS) Prime Contractor, Northrop Grumman, on opportunities that could be leveraged off the company's existing capabilities. The DAS is a 360-degree situational awareness system that warns of incoming aircraft and missile threats, as well as providing day/night vision, fire-control capability and precision tracking of friendly aircraft for tactical manoeuvring.

Although RCA had responded to multiple requests for information and prepared a number of proposals, focused attention was required for almost seven years in order for RCA to secure an agreement to manufacture the electro-optical (EO) assembly from the AAQ-37 DAS for the F-35.

TRANSFORMING AUSTRALIAN INDUSTRY

To build the capability for the EO-DAS work, RCA had to train staff and further develop its facilities and optics skills. To support this work, the Department of Defence provided funding to RCA through the New Air Combat Capability Industry Support Program (NACC-ISP) to assist in the establishment of the capability to manufacture the EODAS units.

“The F-35 Program has really helped Rockwell Collins Australia bring new capability and establish world-leading capabilities. It has been a great motivator for the entire Australian team.”

*Nicholas Gibbs
Managing Director
Rockwell Collins Australia*

The manufacture of the DAS optical assemblies created a new in-country capability that provides RCA with a competitive edge both in the production and sustainment of optical products.

NEXT STEPS

Although the F-35 Program work is only a small part of RCA's revenue, RCA have outlined a plan to continue to improve its performance and drive cost out of the production of the products it manufactures for the F-35. RCA has a strategic plan to build internal capabilities that will enable the company to be well positioned for future activities on the global F-35 Program.

The capability that was established to support the DAS manufacture has now also helped RCA win other optics-related work supporting the Australian Army.

RELATED LINKS

For further information, refer to Rockwell Collins Australia's website: www.rockwellcollins.com/Worldwide/Australia



2007

Started in F-35 Program and open discussions with Northrop Grumman

FEB 2014

NACC-ISP grant of AU\$250K provided to establish EODAS capability

APR 2014

Long-term agreement signed with Northrop Grumman

DEC 2014

Became qualified for EODAS

MAR 2015

EODAS facility established

SEP 2015

First EODAS unit shipped

APR 2017

100th EODAS manufactured

Together ahead. **RUAG**

RUAG Australia specialises in the design, engineering, manufacture, assembly, and Maintenance, Repair and Overhaul (MR&O) of subsystems to sub-micro tolerances. This includes hydraulic, electrohydraulic, structural and mechanical, actuation systems, oil/fuel, wheels and brakes, pumps, valves, oxygen components, fixtures and ground support equipment. RUAG Australia has a number of specialist areas including flight controls, undercarriage, environmental control systems and engine accessories.

RUAG Australia's core capabilities include:

- strip down, assessment, overhaul, repair, reassembly and test – MR&O;
- engineering design, development, implementation and certification for component repair;
- managing MR&O services for a wide range of aircraft systems;
- precision manufacturing and assembly of complex aerospace, defence and biomedical components to tolerances down to 0.000005 inches;
- highest quality, aerospace grade surface treatment and finishing; and
- research, development and commercialisation of advanced solutions.

F-35 PROGRAM INDUSTRY PARTICIPATION

RUAG Australia has been involved in the F-35 Program since the System Development and Demonstration phase in 2004, when the company was known as Rosebank Engineering. Rosebank Engineering became involved in the F-35 Program through the manufacture of 30 components for the weapons bay door Drive System Uplocks in partnership with Goodrich Sydney.

Over the next eight years, work continued to progress with a handful of key events occurring:

- 2004 – Uplock Manufacture and Assembly program for the F-35 began with four Uplock Actuator Assemblies for the weapons bay door for AF-1 for the F-35A Conventional Take-Off and Landing variant.
- 2008 – Landing Gear Manufacture and Assembly program began with four actuator types for CF-1 for the F-35C carrier variant.
- 2009 – Landing Gear Manufacture and Assembly program continued with four new actuator types for the F-35A and F-35B Short Take-Off and Vertical Landing variants.
- 2011 – Long-term Agreement signed for sole source of the F-35B and F-35C Retract and Downlocks Actuators and 50 per cent of the global share of F-35A Retract Actuators.

In February 2015, Rosebank Engineering was officially rebranded 'RUAG Australia'.

RUAG Australia had a successful 2016, both in continuing to secure F-35 manufacturing contracts and as part of Australia's assignments of work for the sustainment phase of the F-35 Program. RUAG Australia was approved as a special processing source for Vertical Tail components being produced for BAE Systems Australia in support of Marand, further strengthening Australian industry's capability to continue to support F-35 production. Later in the year, RUAG Australia secured the manufacture of Landing Gear Actuators for United Technologies Corporation in the United States after being chosen by National Machine Group to manufacture F-35 components to 2020.

“RUAG Australia has been manufacturing F-35 actuation and landing gear components continually since the design phase. Our advanced metal processing facility supports our manufacturing partners. And now, with Australia having been assigned component MR&O responsibilities aligned to our core MR&O capabilities, RUAG Australia is very much a committed, long-term partner to this Program. F-35 is the way of the future and RUAG Australia is proud to be a part of it. The F-35 Program is pushing the boundaries, driving technology and challenging industrial processes. It’s making us a smarter company.”

*John Teager
Chief Executive Officer
RUAG Australia*

TRANSFORMING AUSTRALIAN INDUSTRY

In January 2012, Rosebank Engineering and BAE Systems Australia agreed to establish a specialised automated metal finishing facility in Wingfield, South Australia, to complement BAE Systems Australia's efforts to manufacture components for the F-35.

RUAG Aviation, an arm of the Swiss company RUAG Schweiz AG, acquired Rosebank Engineering in December 2012. RUAG Group bought Rosebank Engineering as part of executing its global strategy and citing several synergies Rosebank Engineering had with its own operations. All 154 employees at the time were retained. For several years prior to its acquisition by RUAG, Rosebank had been following a steady and successful expansion program.

On 7 February 2014, Rosebank Engineering Australia opened the Wingfield processing facility to treat and finish F-35 Vertical Tail components manufactured by Marand for the global F-35 Program. These components require specialised capabilities and can only be processed in-country at this facility.

NEXT STEPS

RUAG intends to remain highly competitive in F-35 manufacturing contracts and in opportunities supporting Australia's sustainment assignments.

Since the award of the first tranche of component MRO&U to Australia in November 2016, RUAG has been positioning itself to ensure that it, and Australian industry, continues to be assigned F-35 work.

RELATED LINKS

For further information on the extensive capabilities of RUAG Australia, refer to its website:

www.ruag.com.au/en/ruag-australia



2004

Started in F-35 Program with Uplock program

2008

Started on F-35 Landing Gear program

DEC 2012

RUAG Group acquired Rosebank Engineering

2013

Heroux-Devtek engaged Rosebank for support on Landing Gear Actuators

FEB 2014

Adelaide processing facility opened at Wingfield

FEB 2015

Rosebank Engineering rebranded to RUAG Australia

NOV 2016

RUAG Australia assigned component MRO&U work

DEC 2016

RUAG Australia won Landing Gear Actuators contract for production to 2020



TAE Aerospace (TAE) is a privately owned Australian engineering company that commenced operations in 2000 with 30 staff in support of a single Defence maintenance contract. Organic growth and strategic acquisition enabled TAE to grow considerably and the company is now generating significant additional revenue while employing just over 230 staff.

TAE provides the following services:

- gas-turbine engine Maintenance, Repair and Overhaul;
- aviation component maintenance services including engine fuel controls, wheel, tyre and brake overhauls as well as maintenance of avionics and electrical items;
- advanced manufacturing and processing;
- gas turbine engine test cells design, upgrade and support; and
- specialised engineering services.

F-35 PROGRAM INDUSTRY PARTICIPATION

TAE has two pathways to support the F-35 Program. In 2007, the company investigated the potential to deliver niche Aluminium Vacuum Brazing manufacture in support of the F-35. The heat treatment capability used for supporting turbine engine maintenance was underutilised at the time and the F-35 represented a significant opportunity for the company to secure long-term work.

TAE engaged a number of international F-35 manufacturers and was successful in securing its first production contract in 2011 with Harris Corporation for the Communication, Navigation and Identification chassis.

TAE envisaged that, given F-35 work (on the F135 engine) would arrive as the existing 'Classic' F/A-18 work (on the F404 engines) would start to decline both domestically and regionally, TAE would be able to progressively make space available to match F-35 workload requirements.

TAE recognised that getting involved in the F-35 Program offered an obvious and smooth transition of its workforce and associated expertise from its involvement in F/A-18 Hornet and Super Hornet propulsion support. The transition to F-35 work would enable TAE to employ additional staff as F-35 regional program operational tempo ramped up.

In 2014, TAE secured a new contract to supply vacuum-brazed, liquid-cooled chassis for the Aperture Electronics Modules to Cobham Microelectronic Solutions in San Diego, California. Cobham is one of the key Original Equipment Manufacturers (OEMs) in the F-35 Program and this is one of the only Cobham contracts won by Australia as part of the F-35 Program. It has potential to open up other opportunities for Australian industry in Cobham's global supply chain.

In February 2015, the then Minister for Defence announced the United States F-35 Joint Program Office had assigned Australia the regional heavy engine Maintenance, Repair, Overhaul and Upgrade (MRO&U) facility for the F135 engine, which powers the F-35, with the work to be carried out by TAE. This assignment was made after the capability requirement was identified by the RAAF and represents a critical component of Australia's industrial capability. For TAE, the assignment provides a long-term, sustainable business in military propulsion. Additionally, given 'Classic' F/A-18 aircraft currently make up 15-20 per cent of TAE's work, F135 engine work is a core element of TAE's future business.

In 2016, TAE was able to secure an additional contract with Moog Inc, another key F-35 OEM, to manufacture components for the Electro Hydrostatic Actuation System (EHAS). EHAS is a self-contained actuation system, combining design elements from electric and electrohydraulic actuation. The EHAS receives power from an electric source and transforms an input command signal (usually electrical) into motion.

Later in 2016, TAE was part of the team expected to carry out the work assigned to Australia on the component (MRO&U) of the F-35 auxiliary power system by the United States F-35 Joint Program Office.

“The F-35 provides high technology career pathways for engine/propulsion staff, which is increasingly important given the trend for Australian civilian airlines to reduce or shut down indigenous propulsion depot capability.”

*Andrew Sanderson
Chief Executive Officer
TAE Aerospace*

TRANSFORMING AUSTRALIAN INDUSTRY

Until March 2015, TAE was owned by Air New Zealand. In a show of confidence in the company's future, TAE's senior management bought the company from its previous owner making the company entirely Australian owned.

TAE has also been part of the transformation story of several other Australian companies in its endeavours to support the F-35 Program. This includes supporting companies such as Levett Engineering in its work to supply engine parts to Pratt & Whitney for the F135 engine, as well as to Harris Corporation and Northrop Grumman for various vacuum-brazed components, such as the Multifunction Advanced Data Link and Antenna Switching Units.

NEXT STEPS

More recently, TAE has focused on delivering to its broad range of customers from the military to commercial airlines, and ensuring it keeps its promises.

TAE's success in the F-35 Program and the aerospace sector has placed the company in a strong position. With this success, TAE has established its own in-house aluminium vacuum brazing design capability allowing it to continue to move further up the supply chain and beyond 'built-to-print' contracts.

RELATED LINKS

For further information, refer to TAE's website:

www.taeaerospace.com



2007

Started in F-35 Program

2011

TAE won first F-35 contract

DEC 2011

NACC-ISP grant provided for qualification with BAES Australia

NOV 2012

NACC-ISP grant provided for qualification with Harris

FEB 2015

Minister for Defence announced assignment of heavy engine MRO&U to TAE

MAR 2015

Senior management bought TAE from Air New Zealand

2016

TAE won EHAS contract with Moog



Varley was established in 1886 as a small plumbing and boiler making business servicing the industrial maintenance and ship repair markets of the Hunter Region in NSW. Varley entered the defence industry in the early 1980s by building deployable military shelters for the Army.

Varley has since expanded its capabilities to include:

- defence and aerospace;
- marine services;
- specialised vehicles;
- rail;
- power;
- electric vehicles; and
- telescopic towers.

F-35 PROGRAM INDUSTRY PARTICIPATION

Varley became involved with the F-35 Program when the company began engaging with Lockheed Martin in April 2003. Varley's work on the F-35 Program cuts across both Lockheed Martin and Northrop Grumman. Varley provides the Landing Gear Handling System (LGHS) and Canopy Maintenance Sling assembly to Lockheed Martin, and manufactures the Aircraft Maintenance Sling for Northrop Grumman.

Varley commenced work on the LGHS in February 2004 and remains the Original Equipment Manufacturer (OEM) for this critical piece of support equipment. The system consists of a jack assembly and a set of six adaptors that hold the landing gear. The adaptors are tailored to suit the nose and main landing gear of all three aircraft variants: F-35A Conventional Take-Off and Landing, F-35B Short Take-Off and Vertical Landing and F-35C carrier variant.

In the same year, Varley responded to an initial request for a proposal to manufacture the Aircraft Maintenance Sling for Northrop Grumman. Varley has demonstrated significant success in undertaking this work, maintaining a rating of 100 per cent on Northrop Grumman's performance ScoreCard system since the first batch of slings were delivered in 2005.

Building on this work, Varley signed a contract with Lockheed Martin in 2005 to manufacture the Canopy Maintenance Slings, which are used to remove and install the canopy onto the F-35, requiring exacting movements given the accuracy with which the canopy must be installed. Varley has remained the OEM for the Canopy Maintenance Sling since 2005 and was also engaged to further improve the design of the sling in 2015.

Since Varley's involvement in the System Development and Demonstration phase of the F-35 Program, the company has maintained its status as a strategic supplier by demonstrating the ability to supply best-value products.

In 2008, Varley undertook the design and development of the field use variant of the LGHS. As the name suggests, this variant is for use in the field by F-35 crew, as opposed to the original variant that is utilised back at base.

TRANSFORMING AUSTRALIAN INDUSTRY

To this day, Varley is one of only two Australian companies that has designed, developed and manufactured equipment for the F-35 Program, earning it the coveted status of OEM. Becoming a successful OEM is one of the hallmarks of company maturity in the global defence industry. This positions Varley well in the competitive aerospace market.

Lockheed Martin has also been proactive in supporting Varley to continuously improve its manufacturing capabilities. In 2008, continuing its program of work to support Australian industry, Lockheed Martin invited Varley to participate in a Lean Manufacturing Training Program that provided a new set of principles and methodologies to identify cost reductions and improve schedule delivery. Those principles are now embedded within Varley and form part of the company's continuous improvement culture.

“The F-35 Program has provided Varley with the opportunity to achieve global recognition of our manufacturing strategy reflective of high-quality workmanship, innovation and our ability to work as a team with customers to deliver excellence in our products and services.”

*Victor Ugarte
General Manager Defence & Aerospace
Varley Group*

Throughout Varley’s involvement in the F-35 Program, the company has demonstrated strong performance in both quality and on-time delivery for Lockheed Martin to entrust Varley with self-certification status. This means Varley has the authority to certify work and send it straight to Lockheed Martin.

NEXT STEPS

Varley is committed to maintaining its role as a strategic partner in the F-35 Program and to continuing to supply its unique products to 2030 and beyond. Varley is focused on maximising its learning curve and implementing innovative manufacturing processes in support of one of the most important tenets of the F-35 Program – affordability.

RELATED LINKS

For further information, refer to Varley’s website:
www.varleygroup.com



APR 2003

Started in F-35 Program with Landing Gear Handling System (LGHS)

2004

First engaged Northrop Grumman

FEB 2004

First contract for LGHS with Lockheed Martin signed

APR 2004

Accredited by Lockheed Martin to provide ground support equipment

2005

First LGHS prototype delivered to Lockheed Martin

2005

Commenced canopy sling manufacture

2008

First LGHS field variant supplied

2015

Contracted to redesign canopy slings

2015

Long-term agreement signed with Lockheed Martin



Western Australian Specialty Alloys (WASA) in Canning Vale, Western Australia, opened its doors in 1993 and over the next decade established strategic customer relationships with Pratt & Whitney in 1995, Rolls Royce in 1999, and GE Aviation in 2000. WASA manufactures nickel and cobalt-based super alloy ingots and billets for aerospace, power generation, oil and gas, chemical and other specialty applications.

F-35 PROGRAM INDUSTRY PARTICIPATION

When the opportunity to supply into the F-35 Program presented itself in 1995, WASA was already a well-established and respected global supplier. WASA started its F-35 journey by becoming qualified for the melting of the powder alloy IN100 for Pratt & Whitney in 1998. WASA now supplies half of the master remelt IN100 for the F135 engine globally. IN100 is a critical alloy used in engine disc manufacture for the F-35, and WASA has supplied this material to Pratt & Whitney continuously since inception. WASA also supplies ME16 ingot for the powder atomisation process used to produce critical components for the Pratt & Whitney F135 engine.

As a super alloy production company, WASA is part of the critical supply chain for its customers who, in turn, directly support defence capability worldwide. WASA's melting capabilities have ensured that military propulsion systems developed by engine manufactures are able to meet the challenging demands of customers.

TRANSFORMING AUSTRALIAN INDUSTRY

In early 2002, Precision Castparts Corporation (PCC) acquired the balance of independent WASA shareholdings. The acquisition of WASA by PCC complemented its own strategy of a vertically integrated supply chain whereby the PCC group facilities manufacture all critical jet engine components. WASA's ability to manufacture rotating grade alloys gave PCC the opportunity to increase alloy sales to engine primes.

As part of its strategy, PCC acquired Overall Forge, a forging company based near Albury in New South Wales. WASA has since taken over the management and transition of Overall Forge into the supply chain of PCC globally. PCC has also signed off on an Australian development program, including the futures for WASA and Overall Forge.

One of the critical aspects of the F-35 Program in which WASA has successfully delivered is ensuring the materials supplied into the F-35 global supply chain are of the highest quality. WASA has established strong relationships with its international milling suppliers to ensure that Pratt & Whitney receive the required grade of materials. These relationships have opened up other opportunities for WASA to compete in the international marketplace.

WASA has increased its capabilities and capacity over the past 20 years to expand the range of alloys and products it can produce for the F-35 Program. WASA commenced accreditation for melting the latest generation powder alloy ME16 in 2012 with approval completed in 2014. It is estimated that this will lead to hundreds of thousands of tonnes of ME16 sales in coming years.

“The F-35 Program has been an integral part of the development of WASA since inception. The technologies developed as part of the Program have been transferred to other product lines, growing both technical capabilities and revenue in other market sectors and securing long-term contracts to support the long-term future of WASA.”

*Clive Reader
General Manager
WASA*

NEXT STEPS

The F-35 Program continues to be an important factor in growing WASA's business and manufacturing capabilities. The approvals obtained in developing new alloy processing methodologies are able to be leveraged outside the F-35 Program to increase market penetration. WASA expects its success in the F-35 Program will continue to assist in securing additional business development opportunities globally.

RELATED LINKS

For further information, refer to WASA's website:
www.wasa.com.au



1993

WASA established

1995

P&W contracts commenced

1997

ISO 9100 Certification qualified

1999

Rolls Royce contract commenced

2000

GE contracts commenced

2000

AS 9000 certification qualified

2002

PCC acquired WASA

2002

AS 9100 certification qualified

2005

Became approved supplier to Turbomeca

2013

Overall Forge acquired

2014

ME16 alloy qualification received

2017

Overall Forge received NADCAP certification

ABBREVIATIONS

AME	Alternate Mission Equipment
ARH	Armed Reconnaissance Helicopter
AS	Australian Standard
AVB	aluminium vacuum brazing
BAES Australia	BAE Systems Australia
CDIC	Centre for Defence Industry Capability
CNI	Communication, Navigation and Identification
CTOL	Conventional Take-Off and Landing
CV	carrier variant
DAS	Distributed Aperture System
EFIC	Export Finance and Insurance Corporation
EHAS	Electro Hydrostatic Actuation System
ELFRIT	Engine/Lift Fan Removal and Installation Trainer
EO	electro-optical
EODAS	Electro-Optical Distributed Aperture System
Ferra	Ferra Engineering Pty Ltd
GKN AES	GKN Aerospace Engineering Services Pty Ltd
GST	Goods and Services Tax
ISO	International Organization for Standardization
JPO	Joint Program Office
JSF	Joint Strike Fighter
Levett	Levett Engineering Pty Ltd
LGHS	Landing Gear Handling System
LHD	Landing Helicopter Dock
Lovitt	Lovitt Technologies Australia
MoU	Memorandum of Understanding
MR&O	Maintenance, Repair & Overhaul
MRH	Multi Role Helicopter
MRO&U	Maintenance, Repair, Overhaul & Upgrade
NACC-ISP	New Air Combat Capability – Industry Support Program
NADCAP	National Aerospace and Defense Contractors Accreditation Program
NGES	Northrop Grumman Corporation Electronic Systems
NSW	New South Wales
OEM	Original Equipment Manufacturer
PCC	Precision Castparts Corporation
PDM	Product Data Management
Quickstep	Quickstep Holdings Limited
R&I	Remove & Inspect
RAAF	Royal Australian Air Force
RCA	Rockwell Collins Australia
SA	South Australia
SADIP	Skilling Australia’s Defence Industry program
SDD	System Development and Demonstration
STOVL	Short Take-Off and Vertical Landing
TAE	TAE Aerospace
US	United States of America
VIC	Victoria
WASA	Western Australian Specialty Alloys

