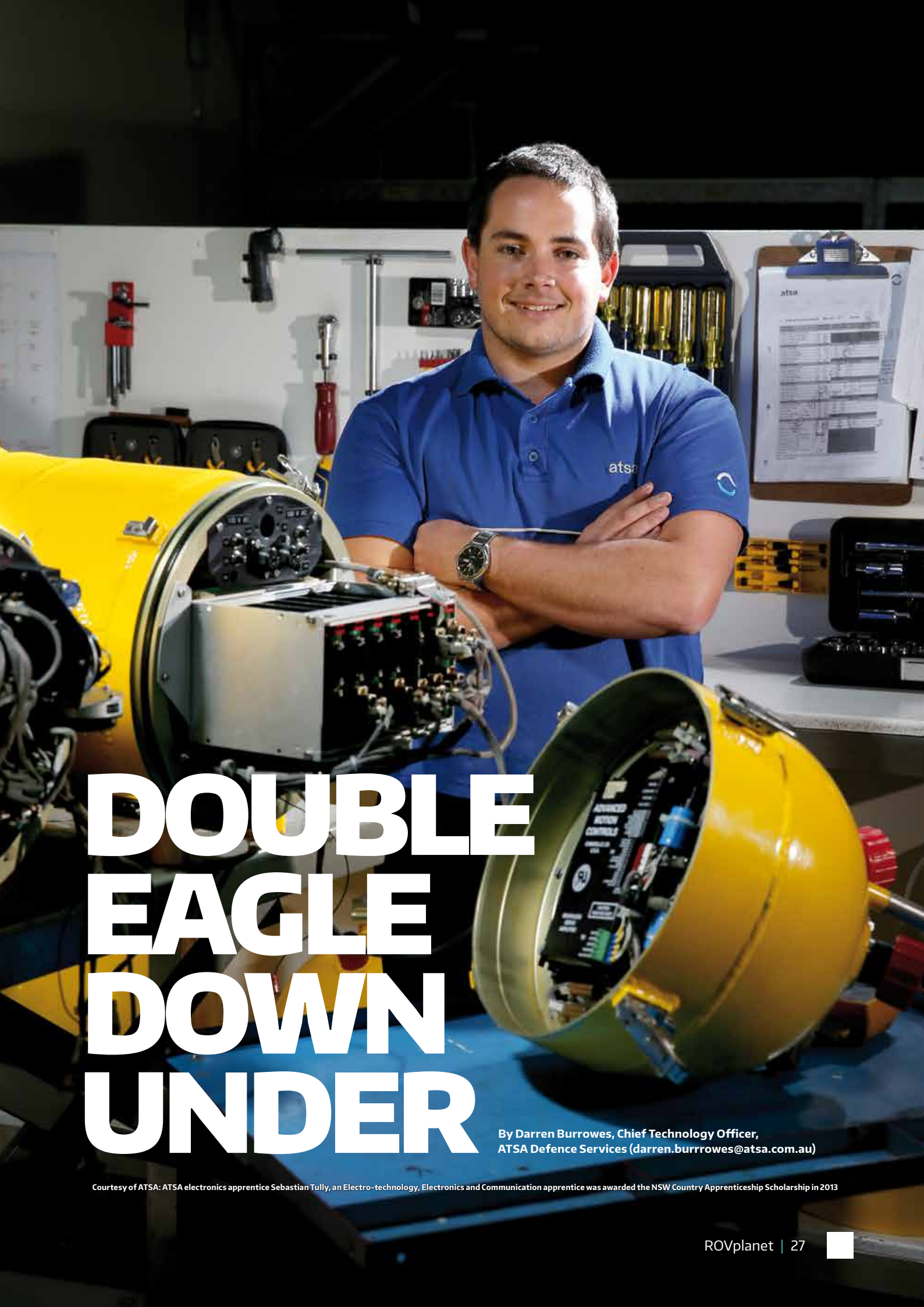

DOUBLE EAGLE DOWN UNDER

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Courtesy of ATSA: ATSA electronics apprentice Sebastian Tully, an Electro-technology, Electronics and Communication apprentice was awarded the NSW Country Apprenticeship Scholarship in 2013

The Double Eagle Mk II is arguably the world's most advanced Mine Disposal System, and is now in the service of seven navies worldwide. Incorporating advanced six degree-of freedom controls, thrust for speeds of up to 6 knots, and acoustic/magnetic signatures to meet STANAG requirements, the Double Eagle is an impressive and durable piece of technology. Having been used by the Royal Australian Navy (RAN) since 1999, the Double Eagle is operated from six HUON Class Minehunter Coastal warships and supported by ATSA Defence Services, from workshops in Newcastle, New South Wales, Australia.

BUILD PROGRAM AND SHIP INTEGRATION

The Double Eagle Mine Disposal System (MDS) was originally specified as the primary mine disposal equipment for the HUON Class Minehunter Coastal (MHC). The build program for these ships was completed between 1994 and 2003. During that time six highly advanced glass-reinforced plastic ships were built to a modified Gaeta design at the ADI (now Thales) purpose-built shipyard, also in Newcastle, NSW.

The Double Eagle system was tightly integrated into the overall MHC Combat System, with the pilot console incorporated into the ship's Operations Room. Interfaces between the MDS and the Tactical Data System (TDS) have enabled designation of the ROV to contacts of interest directly from the TDS, while information from the MDS could be received and displayed on all TDS consoles as required.

Courtesy of ATSA: ATSA Design Engineer, Curtis Schur, with the Mk2 Portable Operator Control Board developed by ATSA for the RAN

The integration into the ship platform required positioning several elements of the system within the tight restrictions of a warship. The console is now located forward in the Operations Room, together with other elements of the Combat System. This has ensured that the MDS is at the heart of tactical operations. An Automatic Tension Control (ATC) winch is located on 02 Deck, with the ability to manoeuvre in a wide arc around the ship without risk of fouling the tether on the ship's structure. The specialized power for the ROV is generated by a Power Control Unit (PCU) located in a diesel generator space.

Two ROVs (or Mine Disposal Vehicles) are located on the Sweep Deck, ensuring 100% redundancy in the event of the loss of one vehicle in action. The tether (umbilical) to the vehicles could be swapped from one vehicle to the other in the event of damage. Each ROV is capable of carrying the 50kg Danish Mine Disposal Charge (DAMDIC). A ship-fitted specialised magazine and hoist arrangement enables loading of the charges directly from the magazine to the ROV thus minimising requirements for the handling of ordnance.

SEA TRIALS AND NEW CAPABILITY

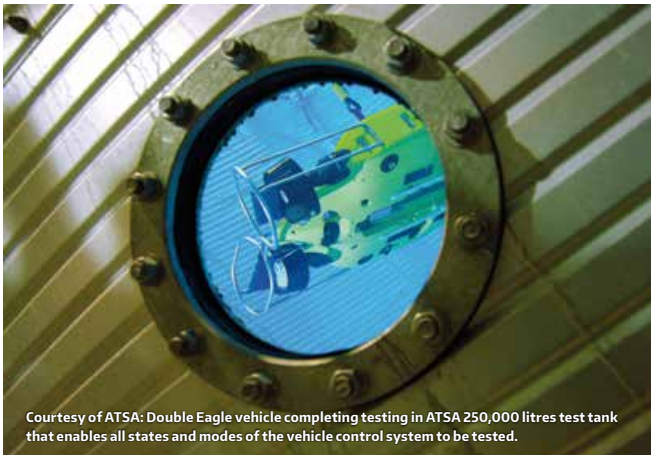
Initial sea trials and training were conducted for the Double Eagle in the first-of-class ship, HMAS Huon. The trials conducted off Newcastle and in Jervis Bay showed that the Double Eagle represents a quantum leap in performance compared with the previous RAN ROV: a PAP Mk2. The method of operation of the PAP was simple; dive towards the seafloor where a drag weight was used to control altitude. Manoeuvring was similar to driving a tracked vehicle, where port/starboard and forward/backward controls are the only control options.

In comparison the Double Eagle ROV, can be pitched down so that full forward thrust from two 5kW thrusters can be used for rapid transit to the seafloor. When near a contact of interest the highly manoeuvrable Double Eagle has the ability to move through six degrees of freedom so that rolling, pitching, and rotating are all options for closer investigation of mine-like contacts. Six 400W thrusters positioned around the vehicle provide for full control authority. The "Reference Adjust" function has introduced the capability to balance vehicle thrust against the prevailing current. This means that from an adjusted setting delicate manoeuvres are possible for situating the vehicle for best aspect on a contact. The vehicle provided a stable platform for operation of the Reson 6012 sonar, colour, and black & white cameras.

An interface to the Tactical Data System provided for designation of contacts directly to the ROV. Using the Computer Aided Tracking function the ROV can be automatically piloted from launch to contact with the pilot operating "hands off".

Courtesy of ATSA: ATSA instructors with Royal Australian Navy electronics technicians as they complete a full disassembly/assembly of a Double Eagle Mk 2 ROV

Courtesy of ATSA: RAN technicians where trained by ATSA Defence Services for several years in Double Eagle system fault-finding and shipboard maintenance



Courtesy of ATSA: Double Eagle vehicle completing testing in ATSA 250,000 litres test tank that enables all states and modes of the vehicle control system to be tested.

THROUGH LIFE SUPPORT

Through Life Support (TLS) is a highly important element for systems operated by the Navy that can be in-service for multiple years. Support for the Double Eagle System is provided by ATSA Defence Services, based out of a specialised facility located in Newcastle, NSW. As a service partner for Saab Dynamics, ATSA provides all levels of support for the system, as well as a proactive approach to responding to evolving RAN requirements in the face of changing operational and tactical environments. The facility at Newcastle provides the opportunity for maintenance, modification, and modernisation of all aspects of the Double Eagle system.

MAINTENANCE PROGRAM

At the core of the maintenance program of the Double Eagle is the maintenance of the ROV itself. This maintenance commences with a complete "swim test" in ATSA's 8m x 5m test tank. The large test tank enables thorough tests of the ROV in all states and modes in order to identify any issues for further inspection and test. Because the ROV can operate in both an earth-referenced "global" mode and an internally referenced "relative" mode, there are a large variety of controls that can be tested in a six degree-of-freedom vehicle. The ATSA service team of experienced technicians and engineers work closely together to identity any faults and ensure that the vehicle behaviour is as originally specified, and is fully demonstrated in a final swim test.

Other components of the system are also subject to maintenance routines.

The Automatic Tension Control (ATC) Winch is a sophisticated system that can handle 1000m of ROV umbilical and can haul up to 1000kg. The winch can operate in an "auto-tension" mode, so that the umbilical is automatically paid-out and recovered as required in order to maintain a set tension level. This is very useful when the ROV is operating close to contacts and careful manoeuvres are required in a strong cross current and where movement of the ship is limited by suspected mine locations. In auto-length mode a set length can be specified, and when this amount of umbilical is paid out the tension is increased to maximum.

Maintenance of this system includes full mechanical and electrical checks, including service of the motor-drivers, load cell, and the umbilical itself. The umbilical incorporates two electrical conductors, two fibre optic conductors, and a Kevlar strength member overlaid with a polyethylene floatation jacket. An umbilical diameter of only 11mm is relatively small, resulting in very low drag when operating in areas of high current (as are commonly found in Australian waters).

The Power Control Unit (PCU) converts shipboard 440VAC power to a nominal 1500-volt and 10 amp supply for the vehicle. Careful and thorough maintenance of the high power circuits in the PCU is required to ensure reliability.

Courtesy of ATSA: Double Eagle vehicle undergoing being launched for a post-maintenance swim test in ATSA 8.0m diameter and 5.0m deep test tank

Courtesy of ATSA:
Double Eagle vehicle being recovered into a HUON Class Minehunter Coastal ship

The net result of the Australian-based maintenance program for the Double Eagle has been trouble free service. Many of the ROVs are in an "as new" condition ensuring that Navy can set mission requirements with no concern about system operation or reliability.

MODIFICATION

Responding to local needs a number of modifications have been designed, developed and implemented by ATSA Defence Services for the RAN.

Obsolescence of the original optoelectronic system has been addressed through development of new optoelectronic surface and vehicle units. To speed connection and disconnection from the vehicle, a new umbilical connector "Tether Connection Mk 2" was developed. This connector has incorporated a plug-and-play hybrid electrical/optical connector that enabled fast connect/disconnect to the vehicle without the need to breach the pressure hull to make connections. The Portable Operator Control Board has been modified from the original rather large and heavy unit, to a lighter plastic construction that eliminated corrosion issues and was suitable for upper deck use in all weather.

Local modification of the system components was conducted with the close cooperation of Saab Dynamics resulting in a fast response for the Navy to meet local needs, and a source of innovative developments for Saab: a win-win for both parties. The Tether Connection Mk2 has been further developed into a Mk3 variant for single-mode fibre operation and is in service with other Saab customers.

MODERNISATION

Modernisation of the Double Eagle fleet is now under consideration by the RAN. Saab Dynamics have taken a modular approach to development of the system providing flexibility for various Mine Countermeasure operations. The Double Eagle can be configured in three main ways: mine reconnaissance (remotely controlled or remotely performed), mine disposal, and rapid environmental assessment. Using a combination of propulsion packages, energy packages and payloads, the system can be configured to meet user needs. This modular systems approach presents the RAN with both highly capable and configurable options for extending the life of the Double Eagle system.

CONCLUSION

The RAN operates the world's largest fleet of Double Eagle Mk 2 Remotely Operated Vehicles under the harsh conditions "down under". With operation theatres ranging from the tropics (mine clearance in New Caledonia), to New Guinea (search for submarine AE1), and all along Australia's 35,000km coastline there are always challenges for ROV missions. A comprehensive support program for the system in Australia has enabled maintenance, modification, and modernisation activities to be completed using local resources. The net result for the RAN has been a highly performing and highly reliable system which is building significant experience in ROV operations and options for future capability development upon a sound and experienced industry base.

ABOUT ATSA DEFENCE SERVICES

ATSA Defence Services **www.atsa.com.au** is the specialised defence service arm of the BlueZone Group bluezonegroup.com.au of companies and is based in Newcastle, NSW, Australia's largest regional port facility.

ATSA provides excellence in support for the world's most advanced electronic systems. Core areas of expertise cover the full life cycle of all electronic systems, from initial development through to production, including technical support and training.

ATSA is more than a high-tech maintenance provider. ATSA has developed close partnerships with Original Equipment Manufacturers such as Saab Dynamics (Sweden), which enables provision of quality systems engineering solutions to all our clients and cooperation with Saab in product development and enhancement.