



**ENGINEERS
AUSTRALIA**

ENGINEERING HERITAGE AUSTRALIA

HERITAGE AWARD ASSESSMENT



AUSTRALIAN WAR MEMORIAL

REL30087

Australian War Memorial Technology Collection

**A Nomination for an Award Under the
Heritage Recognition Program of Engineers Australia**

Location: Canberra, Australian Capital Territory

HERITAGE AWARD ASSESSMENT

The Administrator
Engineering Heritage Australia
Engineers Australia
Engineering House
11 National Circuit
BARTON ACT 2600

Name of works: Australian War Memorial Technology Collection

This collection is nominated for an award under the Heritage Recognition Program of Engineers Australia.

Location: Canberra, Australian Capital Territory (ACT).

Owner: Commonwealth Government of Australia, Canberra.

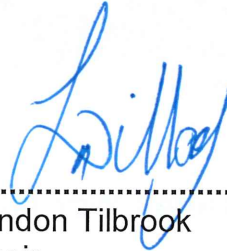
The owners have been advised of this nomination and a copy of the letter of agreement is at Attachment A.

Access to site: Much of the collection is on display at the Australian War Memorial (AWM) in Canberra on a daily basis, with the majority of the remaining items held at the AWM Annex (Treloar Technology Centre (TTC)) in Mitchell in the ACT, which is opened several times a year for public access.

Nominating body: Engineering Heritage Canberra
Canberra Division, Engineers Australia
Engineering House
11 National Circuit
BARTON ACT 2600



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Robert Breen
Secretary
Engineering Heritage Canberra
18 August 2016



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Lyndon Tilbrook
Chair
Engineering Heritage Canberra
18 August 2016

1. BASIC DATA

Item Name

The Australian War Memorial Technology Collection.

Location

The AWM is in the Canberra suburb of Campbell. The TTC is in Canberra suburb of Mitchell.

Address

AWM: Top of ANZAC Parade, Campbell, ACT

TTC: 8 Callan Street, Mitchell, ACT

Local Government Area

The Legislative Assembly of the ACT.

Owner

The Commonwealth of Australia.

Current Use

AWM: Public War Memorial.

TTC: Conservation and storage site for AWM collection.

Former Use

N/A

Designer

Charles Bean formed the original concept for the Australian War Memorial during his service as the Official War Historian, while he endured the horrors of the Western Front in 1916. At the same time, John Treloar had been appointed to head the newly created Australian War Records Section (AWRS) in London, responsible for collecting records and relics for a future museum and to help the Official Historian in his work. Together they began the nucleus of the Collection in 1917 through the collection of 'relics' from the battlefields, with orders given to all AIF soldiers to undertake collecting for the projected museum on an opportunity basis and, in this way, 25,000 relics were gathered during WW1. However, the AWM building at Campbell in the ACT to house the collection was not completed until 1941.

Treloar was to become the inaugural Director of the AWM in 1920 whilst Bean edited the 12-volume Official History of Australia in the War of 1914–1918, a task that took him many years to complete.

Maker/Builder

Many and Various. See descriptions of selected representative items.

Physical Description

Many and Various. See descriptions of selected representative items.

Physical Condition

Items in the collection are expertly conserved according to the aspects of significance being displayed. See descriptions of selected representative items.

Modifications and Dates

The collection is being continuously added to with items collected from conflicts extending from the pre Federation through to the present.

Historical Notes

The function of the AWM (and in this case, its collection), is highlighted in the **Australian War Memorial Act 1980 - Sect 5** (in part below, **author's bold underline**):

Functions of Memorial

The functions of the Memorial are:

- (a) *to maintain and develop the national memorial referred to in subsection 6(1) of the Australian War Memorial Act 1962 as a national memorial of Australians who have died:*
 - (i) *on or as a result of active service; or*
 - (ii) *as a result of any war or warlike operations in which Australians have been on active service;*
- (b) *to develop and maintain, as an integral part of the national memorial referred to in paragraph (a), **a national collection of historical material;***
- (c) **to exhibit, or to make available for exhibition by others, historical material from the memorial collection or historical material that is otherwise in the possession of the Memorial;**
- (d) *to conduct, arrange for and assist in research into matters pertaining to Australian military history; and*
- (e) *to disseminate information relating to:*
 - (iii) *Australian military history;*

- (iv) *the national memorial referred to in paragraph (a);*
- (v) **the memorial collection;** and
- (vi) *the Memorial and its functions.*

Heritage Listings

There are no identified listings specifically for the AWM collection, although the memorial as a whole has the highest Australian level of recognition through its inclusion in the National Heritage List. While the collection is regarded as an integral component of the *Australian War Memorial and the Memorial Parade* for inclusion in the National Heritage List, coverage of the collection is generalised. This generalisation is illustrated in the extracts below from the 20 April 2006 citation when the AWM was listed in the National Heritage List:

*The AWM building is a purpose built repository, reflecting the integral relationship between the building, commemorative spaces **and the collections.***

*The AWM **collection contains unique objects** including a Lancaster bomber and the largest collection of Victoria Crosses in the world.*

*The AWM has a unique and **important function in the nation in collecting and displaying objects and records on Australians' experience of war.***

*The [heritage] values are expressed in the fabric of the place which includes: the main building; the Hall of Memory; **the collections;** the surrounding landscape; and Anzac Parade.*

<http://www.environment.gov.au/system/files/pages/02bb3756-548d-4f76-a4cd-0872efadbcc3/files/10588903.pdf>

2. ASSESSMENT OF SIGNIFICANCE

Historic Significance

- a. **A work is important in the course, or pattern, of cultural history.**

The AWM collection has tremendous historical significance, both within Australia and internationally, and this continues to grow as the collection itself grows. A great deal of the significance of the AWM and one of the key reasons that it attracts approximately a million physical visitors a year is the technology collection. The collection is also fully documented and available for viewing on the AWM website at:

<https://www.awm.gov.au/search/all/>

A central tenant of the AWM is that all of the items in the technology collection must have been used by or against Australian Forces on operations. Therefore as an example, C-47B Dakota and Sabre aircraft are in the collection as they had

distinguished service use in WW1 and the Korean War respectively, however the Mirage jet fighter which was used by the RAAF for many years never saw active service and therefore an example is not retained as part of the collection.

Many such items have become icons of both Australian and World history, such as the water drip self-firing rifle from the Gallipoli withdrawal (see AWM Collection H19321, J00364 and GO1291¹) and the German V-2 (A4) rocket (Relic 12324), the world's first guided ballistic missile and the precursor launch platform for modern space exploration.

Historic Individuals or Association

b. A work has strong or special association with the life or works of a person, or group of persons, of historical importance.

All of the items in the collection tell a story, and a great deal of time and effort is put into discovering and recording that story for each item by the AWM staff. This is terribly important to the staff and indeed, the Charter of the AWM. Thus a broken worn rifle that saw service in Gallipoli and later on the Western Front, is seen as far more important as part of the collection than a perfect specimen that was only used for training purposes in Australia.

Creative or Technical Achievements

c. Creative or Technical Achievement: A work is important in demonstrating a high degree of creative or technical achievement.

Nothing spurs technological development like a war, and many of the items in the collection have great significance due to their being the first of their kind in the development or deployment of new technologies. Other items display the creative genius of soldiers, sailor and airman whilst deployed. At annex B is a list of notable items from the AWM technology collection which display these attributes.

d. Research Potential: A work has potential to yield information that will contribute to an understanding of cultural history.

The collection contains many items and 'sub-collections' which have international recognition as research sources. An example in the collection of WW1 German artillery pieces which is understood to be the widest and best collection of its type in the world, and is of particular interest to modern European military researchers.

e. Social: A work has strong or special association with a particular community or cultural group for social, cultural or spiritual reasons.

An important mission of the Collection is to assist Australians to remember, interpret and understand the Australian experience of war and its enduring impact on Australian society. By telling a story about the service of Australians in wartime, it

¹ Note that an original example of a 'Drip' Rifle is not in the AWM collection, however photographs, replicas and written records are held.

serves to tell an important story of Australia itself. In many cases the story to be told is one of ingenuity and engineering innovation in the face of the hardships, deprivation and vital necessity of war.

A very high percentage of Australians have either served in the ADF or had friends or family who have. Consequently, the collection has a particularly strong association with these people who relate to particular items in the collection; a great uncle who flew in Lancasters, a son who served on HMAS Perth II, or a Vietnam veteran who was 'Dusted-Off' by an Iroquois.

f. **Rarity: A work possesses uncommon, rare or endangered aspects of cultural history.**

Many of the items in the collections are 'one-offs', the last remaining complete examples. When the story behind that rare item and its significance to the Australia war experience is added to its engineering heritage, the sum total is an object and story of great importance.

g. **Representativeness: A work is important in demonstrating the principal characteristics of a class of works.**

The AWM technology collection as a whole is the most comprehensive and well documented collection of its type in Australia and is one of the leading examples internationally. Therefore as a collection of military technology, it is important in displaying as complete a collection across all fields as is possible in Australia. Individually, many of the items in the collection demonstrate important characteristics of the class. A good example is the collection of German WW2 guided weapons. While important as one of the most complete collections of such items, they are extremely valuable research items whereby the characteristics of early guided weapons can be investigated and demonstrated.

h. **Integrity/Intactness: A work is intact as built or has been modified, with a description of such repairs or modifications.**

As a world leading research and archival 'museum', the AWM follows the principles of the Australian Institute for Conservation of Cultural Material (AICCM) *Code of Ethics and Code of Practice*. Consequently the principles of integrity and intactness, and the recording of 'build status' are very important. A good example of the painstaking research and effort the AWM puts into the integrity and repair of technology within the collection is the restoration of the German *Albatros D.Va* WW1 fighter aircraft. From fragments of original fuselage fabric recovered from the aircraft as received by the AWM, research uncovered a matching fabric to the same specification was available from a manufacturer in Germany (most likely the original manufacturer). The work carried out of this aircraft, and every other conservation, preservation or restoration task is extensively recorded and archived.

Statements of Significance (This is the summary of the above criteria assessments which best explains the cultural heritage significance of the work.)

The technology collection of the AWM is the most complete and well documented collection of its type in Australia and is one of the leading examples internationally. The collection spans all types of military technology and there are innumerable examples of technology which are significant due to innovation, rarity or cultural significance.

Assessed Significance

Given the national significance of the AWM collection, it is assessed that it be clearly adjudged suitable for award of as an **Engineering Heritage National Marker**.

Considering the interest by international visitors and researchers in the collection, and the overseas origin of many (most) of the objects, the collection could well meet the requirements for an **Engineering Heritage International Marker**.

Images with Captions

See Annex C.

Interpretation Panel

An Interpretation Panel will be drafted in conjunction with the AWM. Given the nature and importance of the AWM, it is likely that any agreed Panel would be installed at the Mitchell Technology Centre site rather than at the AWM in Campbell. This is supported by the fact that the Mitchell site houses the majority of the technology collection and is where all 'in-House' conservation work is undertaken.

Interpretation of the individual items on display in the AWM is a matter for the memorial's professional staff.

- Annexes:**
- A. Copies of Owners' Letters of Agreement.
 - B. Examples of Items within the AWM Collection that are of Engineering Significance.
 - C. Photographs of Items from the AWM Technology Collection.

References:

AWM website: <https://www.awm.gov.au/>

AICCM *Code of Ethics and Code of Practice*

<https://aiccm.org.au/sites/default/files/docs/AICCMBusinessDocs/CODE%20OF%20ETHICS%20AND%20CODE%20OF%20PRACTICE%20Australian%20Institute%20of%20Conservation%20of%20Cultural%20Material.pdf>

Australia's Military Aircraft, Ross Gillett, ISBN 0 73160363 X, 1987.

Wikipedia: https://en.wikipedia.org/wiki/Main_Page

Acknowledgments:

Director and Staff of the AWM

Annex A to EHA Heritage Award Nomination - Australian War Memorial Technology Collection

Letter of Agreement from AWM



Dr Brendan Nelson
Director

21 July 2014
File: EXEC10065-001347

Mr Lyndon Tilbrook
Chairman
Engineering Heritage Canberra
Engineering House
11 National Circuit
BARTON ACT 2600

Dear Mr Tilbrook,

Thank you for your letter dated 18 June 2014 proposing the Australian War Memorial Collection be nominated for an award under the Engineering, Heritage Australia Recognition Program.

I am happy to agree for the Memorial's collection to be nominated. I would ask that the Memorial be consulted on the wording to be used for the nomination and, if successful, the interpretive panel and its placement.

If you could please contact the Assistant Director Corporate Services, Mrs Rhonda Adler, at rhonda.adler@awm.gov.au or (02) 6243 4233 to ensure full consultation in this process I would be most grateful.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Brendan Nelson', with a large loop at the end of the first name.

Brendan Nelson

Here is their spirit, in the heart of the land they loved, and here we guard the record which they themselves made. C.E.W. Dean

GPO Box 346
Canberra ACT 2601
tel: (02) 6243 4262
web: www.awm.gov.au

Annex B to EHA Heritage Award Nomination - Australian War Memorial Technology Collection

Examples of Items Within the AWM Collection that are of Engineering Significance²

Artillery

Armstrong 12 Pounder RBL Field Gun (Relic 30087). The Armstrong 12 Pounder in the AWM collection dates from 1864 when it armed the Victorian Horse Artillery. The significance of the Armstrong 12 Pounder RBL Field Gun lies in it being one of the first practical breech loading artillery guns and that it was the first Australian artillery weapon to feature on-gun traversing.

6" Armstrong Naval Gun (80 pounder) (Relic 10183). The 6" Armstrong Naval gun in the AWM collection was originally fitted to HMS *Gayundah* and was manufactured in 1884. The significance of the 6" Naval Gun (80 pounder) is that it was the first generation of British 6-inch breech loading naval gun after the Royal Naval switched from muzzle-loaders in 1880, thus representing a very significant jump in technology. Multiple charges, projectiles and fuze types could be used.³

French 75 mm Canon (Relic 4996.001). Manufactured in 1897, the *Canon de 75 mm modele 1897* is considered the forerunner of all modern artillery pieces. The significance of the *Canon de 75 mm* is that for the first time it combined an effective axial recoil system, an automatic fuze setter, a quick acting breech and fixed ammunition.

German WW1 Artillery Collection (Various IDs). The AWM's collection of German WW1 artillery pieces is one of the largest and most extensive in the world. It is the subject of considerable interest to researchers because of its near complete nature.

Vehicles

Bushmaster Prototype (Relic 31116.001). The Bushmaster is a protected 4 wheel all-wheel drive military transport vehicle, known as a Protected Mobility Vehicle. Developed in Australia in the late 1990's by Thales based on an overseas design, the Bushmaster has become a great success in Australian service. The Bushmaster has also been exported to foreign services. The significance of the Bushmaster is that it was the first protected transport vehicle in Australian Defence Force service that featured a 'V' hull that provided true protection from road mounted explosives. The AWM hold several examples including a Prototype, 2 battle damaged examples, and a complete example.

² A short description of the engineering heritage significance of selected items has been included.

³ See National Australian Archives, NAA: A1194, 17.10/5962, *Instructions for the use of 6 inch rifled breech loading Armstrong gun and naval carriage and slide.*

Cruiser Tank (Relic 08478). The Cruiser Tank was designed and manufactured in Australia (commencing in 1940) following a Government decision to support the project based on the lack of suitable equipment being available from the UK or USA. The significance of the Cruiser Tank is that the main hull, forward transmission housing, turret and mantlet were all cast as single units, the first time that such a design had been attempted worldwide.

British Mark IV Tank (Relic 05040.001)⁴. The British were the first to introduce armoured vehicles to the battlefield with prototypes developed in 1915 and used on the Western Front from 1916. The Mk IV held in the AWM collection is the oldest tank in the southern hemisphere and is considered the most complete example in the world. However it did not serve on the battlefield, coming to Australia in 1918 for War Bond rallies following manufacture. The AWM collection also includes wreckage/souvenirs taken from the first tanks used in action in 1916. The Mark IV Tank represents the quantum leap in technology that the introduction of the tank made to the battlefield. Once its early unreliability issues were solved, the tank broke the stalemate of trench warfare, its mobility and firepower changing the face of land warfare forever.

Aircraft, Aircraft Components and Air Launched Stores

The AWM has an extensive collection of over 30 complete aircraft together with numerous examples of engines, aircraft weapons and aircraft components.

CA-27 Avon Sabre Aircraft A94-954 (Relic 44405). The Sabre was a successful American designed jet fighter, which first flew in 1947 in prototype form. Once permission was granted for it to be manufactured under licence in Australia, engineers at the Australian Government Commonwealth Aircraft Corporation undertook a study to improve on the design, and successfully incorporated the Roll-Royce Avon jet engine and Aden 30mm cannons into the design. The Avon Sabre first flew in 1953 and boasted improved performance over the original American design (in final versions, roughly 50% more thrust). With its increased fuel capacity and improved armament, the Avon Sabre is generally regarded as the supreme version of the Sabre⁵. Avon Sabre A94-101 was the first aircraft in Australia to break the sound barrier, doing so on 21 August 1953. The significance of the Avon Sabre is that it demonstrates post war Australian capability to take an overseas design of a complex item of combat equipment and improve its performance to world's best status through the integration of replacement sub-systems.

Stirling 'Window' dispenser Merryfull design (see Relic P09781.001)

'Window' consisted of thousands of metallic strips dispensed by Allied WW2 bomber aircraft over Europe in order to blind and confuse German radar systems. The Merryfull dispenser was designed by FLTLT C.J. Merryfull of the RAAF and was one of the earliest window dispensers deployed from 1945 on RAF aircraft as a defence against detection by German radars.

⁴ The Mk IV tank held by the AWM (Relic 05040.001) 'breaks' the AWM's general rule of only collecting items which have been used in operations. However it is retained because of its significance in War Bond raising during WW1 and obvious importance as the most complete example in existence.

⁵ See: <https://www.airforce.gov.au/raafmuseum/research/aircraft/series2/A94.htm>

Bushranger UH-1H Gunship (Relic 45529). The UH-1H was a standard American designed and manufactured transport helicopter. Whilst in service in Vietnam with the RAAF, a requirement arose to provide an armed escort capability to the unarmed UH-1 helicopters. In theatre, RAAF armament officers and fitters developed the 'Bushranger' modifications to the standard UH-1H. Based on an American example, the RAAF improved on the design, adding forward firing rockets, door guns and multi-barrelled machine guns in order to satisfy the armed escort requirement. The significance of the Bushranger lies in it representing the long-standing ingenuity of the Australian serviceman in-theatre to develop technological solutions to an immediate capability need. The example held by the AWM is the first UH-1H modified to Bushranger configuration.

ME262 Jet Fighter (Relic 8385.001). The example in the AWM collection is the last complete 'Jabo' version in the world. The significance of the Messerschmitt Me 262 is that it was the first jet fighter in history to enter operational service. Fast and heavily armed, this revolutionary aircraft opened a new era in aerial warfare.

ME163 'Komet' Rocket Powered Aircraft (Relic 08386). The Me163B aircraft was first introduced for operational use in July 1944 and were the only operational rocket powered fighter of the Second World War. With a top speed of 960 kph, its significance lies in being the fastest aircraft used operationally in WW2. It employed several novel technologies (the rocket propulsion system principle amongst them) which required considerable effort and expertise to bring to operational use, particularly given the restrictions placed on wartime Germany.

MIG-15bis Fighter Aircraft (Relic 20295). The Soviet designed and manufactured MIG-15 jet fighter was one of the first successful jet combat aircraft in the world and was made in large numbers. The success of the MIG was the spur for the West to design and manufacture second generation jet combat aircraft such as the Sabre.

Deperdussin Trainer (Relic 12614). The serial number CFS 5 identifies this aircraft as the 5th Australian Military aircraft, and it is the oldest existing aircraft in Australia. It also has fitted the earliest surviving radial engine in Australia (Anzani three cylinder). The aircraft was manufactured in 1912 and shipped to Australia in 1913 as one of the first four aircraft to equip the new military Central Flying School at Pt Cook. Unusually for an AWM Relic this aircraft has not seen active service but has obvious heritage value due to its great significance to Australian military and aviation history.

Aircraft Engine Collection. The aircraft engine collection of the AWM is extensive and important. It includes Australia's earliest surviving radial (on the Deperdussin) and one of the earliest rotaries – a Gnome 50hp. Examples of the very earliest centrifugal flow jet engines (RR Nene and RR Derwent), and axial flow jet engines (Jumo and RR Avon) are held, together with historically significant piston engines such as Roll-Royce and Packard Merlins, the Mercedes DIII, and a Benz IV.

Karinga Cluster Weapon (Relic 04840). Developed by the Australian Dept of Defence in the 1970's, the Karinga is significant as it was the first sub-munition dispensing weapon system developed in Australia, in order to provide the RAAF with

an anti-materiel and airfield denial capability. Similar capabilities from the USA at the time had serious shortcomings with respect to safety post deployment and a poor impact pattern of the bomblets on the ground, which the Karinga overcame. However it was not introduced into RAAF Service due to cost factors and a decision by Government following the adoption of international conventions effectively banning this type of weapon. The Karinga is one of the few items in the collection which has not seen active service.

Barra Sonar Buoys (Relics 35507 & 35508). The Barra sonar buoy is a passive aircraft launched receiver store that uses hydrophones to listen for the sounds made by a submarine. Currently deployed for use by the armed forces of both Australia and the UK, the Barra is one of Australia's most successful Defence joint development projects, working with the UK Ministry of Defence. Work started in 1964 to jointly develop a cutting edge aircraft deployed sonobuoy particularly suited to detect and track quiet submarines and ships. The significance of the Barra system is that it provided a significant improvement over previous systems in determining accurately the bearing of the target.

Radio/Radar/Navigation Equipment

Eureka Mk II (Type A1052) radio transceiver (REL29969). Used together with the airborne Rebecca transmitter, the UK developed Eureka provided a location and direction finding capability on the ground. It was used by Australian Z forces during WW2 to pinpoint their position to allied aircraft in order to improve the accuracy of aerial resupply. The significance of the Eureka is that this is the earliest use of this type of technology on operations by Australian forces.

LW/AW Radar (On display, Aircraft Hall). Radar was one of the most significant (and secret) technological developments of WW2. Several types of radar were developed in Australia following the transfer of knowledge from Britain, including the Light Weight / Air Warning (LW/AW) system. The LW/AW could detect both ships, at a range of up to 30 km and aircraft at up to 250 km. Much of the development work was done at the University of Sydney who also trained the first of the operators. The first LW/AW set was made in Sydney in 1940 and had the great advantage of being able to be readily assembled and disassembled for redeployment. The urgent requirement for the design and construction of the LW/AW radar and other electronic systems required by WW2 was the nucleus of Australia's booming post-war electronics industry. 'In all, some 150 LW/AW sets were made for the Australian and American forces, but the set on display in the Memorial is the only one still in existence. It stands here as testament to the momentous advances Australia made in science and industry during the Second World War.' (AWM)

Land Service Engineer Equipment

Furphy Water Cart (Relic 12474). The iconic Furphy water cart was a simple yet rugged means of supplying water to troops in the field during WW1. Designed and manufactured by John Furphy in Shepparton, Victoria, the Furphy water cart even gave its name to the 'passing on of rumours', as troops from different units would meet and pass on stories whilst they queued for water. The Furphy task cart is

significant as it is an early example of the impress into military service on a large scale of equipment designed and manufactured in Australia. The example in the AWM collection is a correct replica and was made by Furphy's Foundry.

Rifles/Carbines

Remote Firing (Water Drip) Rifles (Replica on display in WW1 Gallery). The drip rifle was invented by Lance Corporal W. C. Scurry of the 7th Battalion, AIF, with assistance from Private A. H. Lawrence. Drip (or "pop off") rifles were self-firing rifles used at Gallipoli to deceive the Turks during the evacuation of December 1915. A common arrangement consisted of two kerosene tins placed one above the other, the top one full of water and the bottom one with the trigger string attached to it, empty. Water would trickle into the lower one, and the rifle would fire as soon as the lower tin had become sufficiently heavy to work the trigger. The Drip Rifle is significant in demonstrating the engineering ingenuity of combatants in all conflicts, finding technological solutions to problems they faced in times of great hardship.

Owen Gun (Relics 30622.001 to 30622.010 & 10990). The AWM holds several examples of the Owen gun, including the prototype which was home made from mainly .22 (short) calibre rifle parts with a 'wheel' drum magazine operated by a coil spring. This weapon was made by Evelyn Owen as the prototype to the later production models made at Lysaght's factory in Port Kembla, New South Wales. The Owen gun was significant because it was a very successful Australian developed weapon system that filled a need during the critical shortages faced during WW2. It was simple, robust and effective and survived the harsh climatic conditions that Australian servicemen faced in the Pacific theatre of war.

Nordenfelt Mk 1 Five Barrel Gun (Relics 07327 - & AWM10737.005) & Mk 1 Ten Barrel (Relic 05627). Invented in 1873 in Sweden but manufactured in the UK, the Nordenfelt was a multi barrel (organ pipe) gun which was used by the Victorian Nordenfelt battery from 1885. Whilst the technology employed by the Nordenfelt was quickly rendered obsolete, its significance lies in it being the first automatic weapon operated by Australian Colonial military forces.

Nordenfelt 1885 (Relic 5172). The Nordenfelt 1.5" 6 lb quick firing gun was used through to the early 20th century in Australia both in shore and ship applications. Its significance is that it is one of the earliest medium calibre guns which incorporated a number of novel design features to enable reliable yet quick firing operation.

MG34 Machine Gun (Relic AWM31375.001). The MG32 is an air cooled machine gun used by the German armed forces in WW2. The significance of the MG34 is that it introduced the concept of the General Purpose Machine Gun (GPMG) to the battlefield and was the first of a series of weapons through to the present time, namely the MG42, MG1 and MG3 which represent the standard by which other GPMG are judged. The example held in the AWM collection is a particularly significant example, having been captured during the action in Libya in 1941 in which CPL JH Edmondson won the Victoria Cross, and as a result is highly prized by 2/17 Australian Infantry Battalion.

Guided Weapons

V-1 (Fi-103) Flying Bomb (Relic 07112). Together with the A-4 (V-2) rocket, the V-1 was the very archetype of the terror weapons used by the German armed forces during WW2. A surface to surface weapon, the V-1 was essentially a pilotless aircraft powered by a pulse (duct) liquid fuel motor. Designed and developed through 1942 and 1943, a total of nearly 25000 of these weapons were produced with over 9000 being fired at England in 1944. The V-1 is significant as it was the first successful surface to surface guided missile. A significant amount of other material on the V-1 is held in the AWM collection.

A-4 (V-2) Rocket and Meillerwagen (Transport Wagon) (Relic 12324). The V-2 in the AWM collection is largely intact and is understood to be 1 of only 18 remaining worldwide, and the most complete, retaining its full control compartment. The significance of the V-2 is that it was the world's first operational long range ballistic rocket powered missile. Post war the V-2 provided the immediate impetus for the space programs of both the USA and USSR. The Meillerwagen is one of three remaining worldwide and was used for transporting and erecting the weapon. Like the V-2 rocket the wagon is virtually complete.

Fritz X Air to Ground Guided Missile (Relic 36454). Developed by Germany from 1939 and used operationally during WW2, the significance of the Fritz X is that it was one of the earliest successful guided missiles and one of the very few to have achieved significant results in warfare.

Henschel HS 293 Glide Bomb (Relic 36422). The Henschel HS 293 is a German WW2 anti-ship radio or wire controlled, rocket powered guided weapon. Dropped from aircraft, the HS 293 was guided to its target by steering inputs from an operator on the launch aircraft. The significance of the HS 293 missile is that it was used in the first successful attack by an air launched guided missile, on 25 August 1943 when one was fired at HMS *Bideford*⁶.

Enzian Surface to Air Missile (Relic 33903). Developed by Germany from 1943, the significance of the Enzian is that it was the world's first guided surface to air missile. Though not operationally deployed during WW2, its design formed the basis for all future Ground Based Air Defence weapons.

POW Relics

Blower Fan (Replica) (Relic 21527). This 'Blower' fan is a replica of those used by Allied Prisoners of War in Europe. The blower used a hand cranked rotary fan to force air through a wind tunnel to the fire box to greatly increase the combustion of the fuel used to heat food. The blower housing, air tunnel and outer fire box are manufactured from tin, including the vanes of the fan. The fan is operated by a pulley wheel connected to the fan spindle by a belt. The fire box is insulated with a clay refractory and has a heavy wire stand over the top on which to balance the tin being heated. The apparatus is mounted on a wooden frame. Such blowers were commonly used by PoWs and all materials for their construction were scavenged.

⁶ Wikipedia. https://en.wikipedia.org/wiki/Henschel_Hs_293

POW Handmade Radio Receiver (Relic 23024). This small handmade radio receiver was manufactured by Signalman Sydney Sim during his incarceration in Changi Prison, c1942. The receiver was constructed from parts scavenged during his imprisonment. The significance of this receiver is that it represents tremendous ingenuity and courage under the most arduous conditions, to engineer a solution to the problem posed to the Changi prisoners, namely to obtain news from the outside world. That Sim and his fellow prisoners were able to successfully construct the receiver and then operate it undetected for several years attest to the skill and bravery of these men.

Miscellaneous. The collection holds a large number of miscellaneous items which display the ingenuity and bravery of POWs, particularly given the consequences if they were caught with these items. The objects include telescopes, tools and compasses often disguised or 'dual purposed' to hide their true purpose.

Additional Material

The thrust of this nomination and the examples cited so far in support have all been physical objects demonstrating the diversity and importance of the AWM collection. However, there is a tremendous amount of related non-physical material in the collection which is equally important in recording and conveying the story of the engineering activities of Australians at war, material such as photographs, film and written records. A particular example worth noting is the AIF Engineering Unit war diaries from WW1. Many of these have very detailed engineering drawings and descriptions of bridgework, bunkers, field obstacles, cooking facilities and the like, all accurately recorded from every theatre of WW1. They tell the largely unknown story of the application of the science of engineering by Australians to the unimaginable horrors of living and fighting at Gallipoli and the Western Front.

**Annex C to EHA Heritage Award Nomination -
Australian War Memorial Technology Collection**

Photographs of Items in the AWM Technology Collection



German WW1 Artillery Collection (part thereof)



Henschel Hs 293 Glide Bomb (German WW2)



German V2 (A4) Rocket and Meillerwagen (Transport Wagon)



AUSTRALIAN WAR MEMORIAL

REL31116.001

Bushmaster Personnel Mobility Vehicle (photo courtesy of AWM)