AMATEUR BOAT BUILDERS' ASSOCIATION

February — March 2023

TORTUGA

"TORTUGA" under full sail in Fremantle Harbour

For our March Toolbox visit, we were fortunate to enjoy a wonderful sunny afternoon, a truly beautiful, historic vessel and an enthusiastic, knowledgeable and generous host in Doug Watson.

Doug's boat "Tortuga" was launched in 1952 as a sailing crayfishing boat at the Back Brothers Yard in North Fremantle. Rumour has it that her keel was laid in 1929 then the Great Depression and the Second World War delayed the build.

Luigi Santaromita had her built and in the late 1960's her mast was struck for a large deckhouse forward and she sailed no more.

In 2018 she was bought by the Watson family and bought back to a sailing vessel which is now one of the most used vessel at Fremangtle Cruising Yacht Club.

"Tortuga" was eased down the Ways in 1952 from the Back Brothers Ship-wright Yard in North Fremantle, she was christened "A Buongiorno" after the main financial backer. She had a water line length of more than 40 ft and displaced just under 20 tons.

The Priest christening A.Buongiorno before launching

Buongiorno launch day, North Fremantle 1952

She was the pride of Fremantle's crayfishing fleet and honourably used regularly for the blessing of the fleet to carry the Magdalen statue with many dignitaries treading her decks for that special events. Otherwise it was just Luigi Santaromita and his crew who sailed her combing the reefs and filling her hold with tons of West Coast Crays.

She was rigged as a gaff cutter with clean lines on deck, no deck house just that lovely sweeping sheer.

Buongiorno in late 1950's. Doghouse aft

Buongiorno, port tack hard on stiff breeze

A Buongiorno sailed the Fremantle crayfishing grounds until the 1960s when her mast was cut down and a large doghouse was indignantly plonked forward masking the elegant looks of a forgotten era. She then became “Maree Lou” and steamed out to her fishing grounds with her bow high followed by a cloud of smoke and noise.

As she is today. Renamed “Tortuga” and looking splendid after much work by Doug.

Doug's treated his timber with Deks Olje and gets help from his kids to maintain its magnificent appearance. He also uses good quality house paint which looks great. Note the traditional rigging installed by Doug. A recent addition was the gangplank that is lowered from the side of the boat with integral folding legs. Simple but effective.

Doug Watson is a Perth boy and has great memories of the time he spent on Garden Island at his parent's holiday house. Doug trained to become a shipwright after receiving a scholarship to attend the Wooden Boat Building School in Tasmania. He worked on the restoration of the 1874 Tall Ship, James Craig which is based at the Australian National Maritime Museum in Sydney. Doug's main interest was in rigging of traditional ships.

The Tall Ship, James Craig

To learn more about the restoration of the James Craig, read out September October 2012 Newsletter in the "Journals" tab of our website ABBA.ORG.AU

As well as the James Craig, Doug worked on building the Endeavour replica in Fremantle. To further his knowledge and interest in traditional boat rigging, Doug move to Europe. He had hoped to learn from the artisans who undertaken traditional rigging during their working life. Unfortunately people with these skills were few and far between so Doug had to hone his skills in other ways. Looking at examples of his workmanship on Tortuga and RoseF, his quest for knowledge has been successful.

While living and working in Europe, Doug owned his own Tall Ship, "Fiddler's Green". Doug said that it was a hard job but he was able to sail her on his own. Imagine that.

Renamed "Anny", she now sails out of Charlestown in the UK.

Thanks again Doug for hosting a memorable ABBA Toolbox and for some of the pictures and words in this article.

Fiddler's Green

CORROSION IN AUSTENITIC STAINLESS STEEL

ABBA's 51ST year since incorporation started with the potentially dry topic of corrosion in Austenitic Stainless Steel. Luckily for those at our February meeting, ABBA President, Rob Bingham gave a very interesting presentation where all of us learnt something. The knowledge presented has the potential to prevent your yacht mast and rigging from falling over or you beloved boat slowly sinking in its pen or at its mooring. Rob's talk drew lots of questions and contributions from those present.
Rob is Fellow of the Institution of Engineers Australia with a Bachelor of Mechanical Engineering and a Masters of Biomedical Engineering. With these qualifications and as a boat owner he is the ideal person for this presentation.

Properties of Austenitic Stainless Steel

- Excellent corrosion resistance.
- Non-magnetic when annealed.
- Rapidly work hardens with cold work.
- Not hardenable by heat treatment.
- Ductile and readily formable.
- Excellent weldability.
- Hygienic with excellent cleanability.
- Good performance at high temperatures.

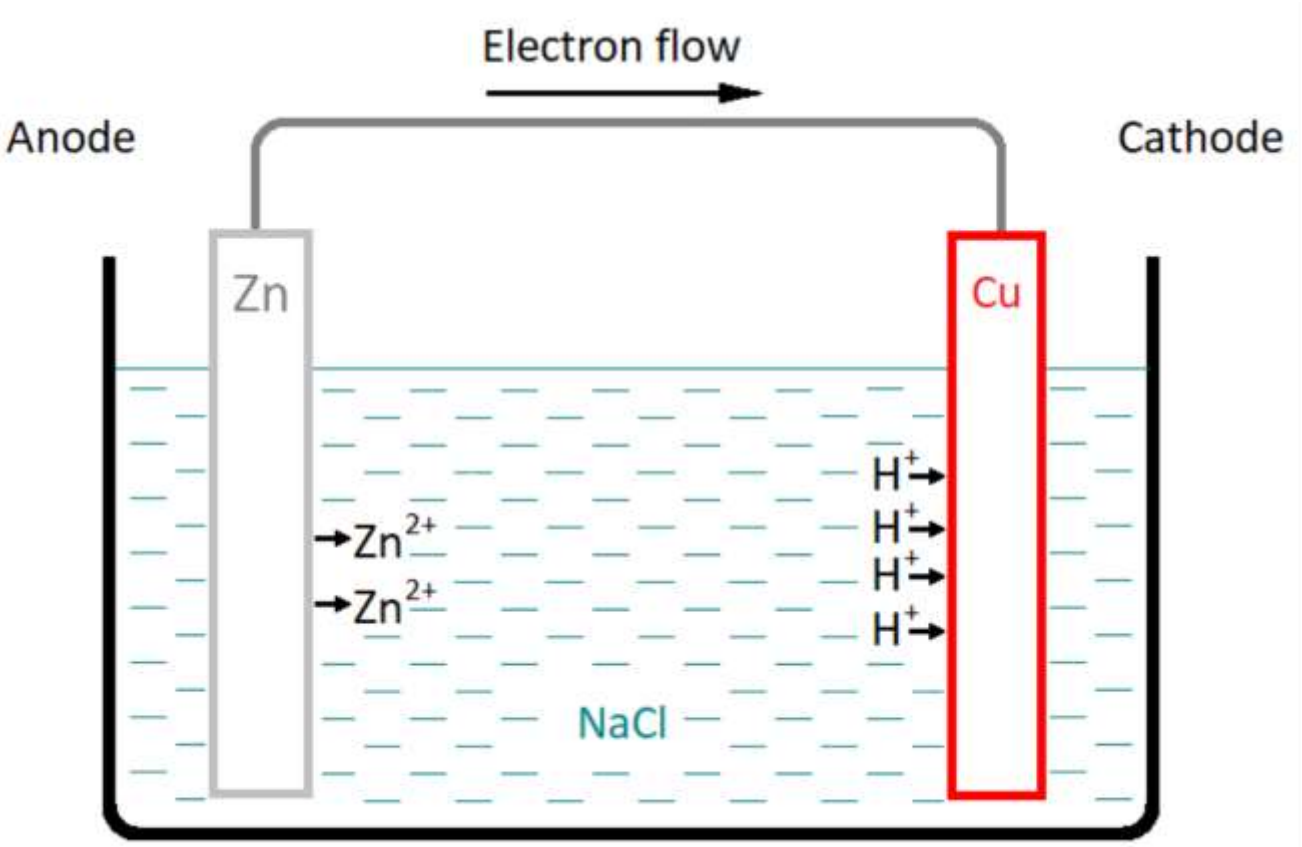
Definition of Corrosion

The destruction of a solid body through an unintentional chemical or electrochemical reaction starting at the surface.[1]

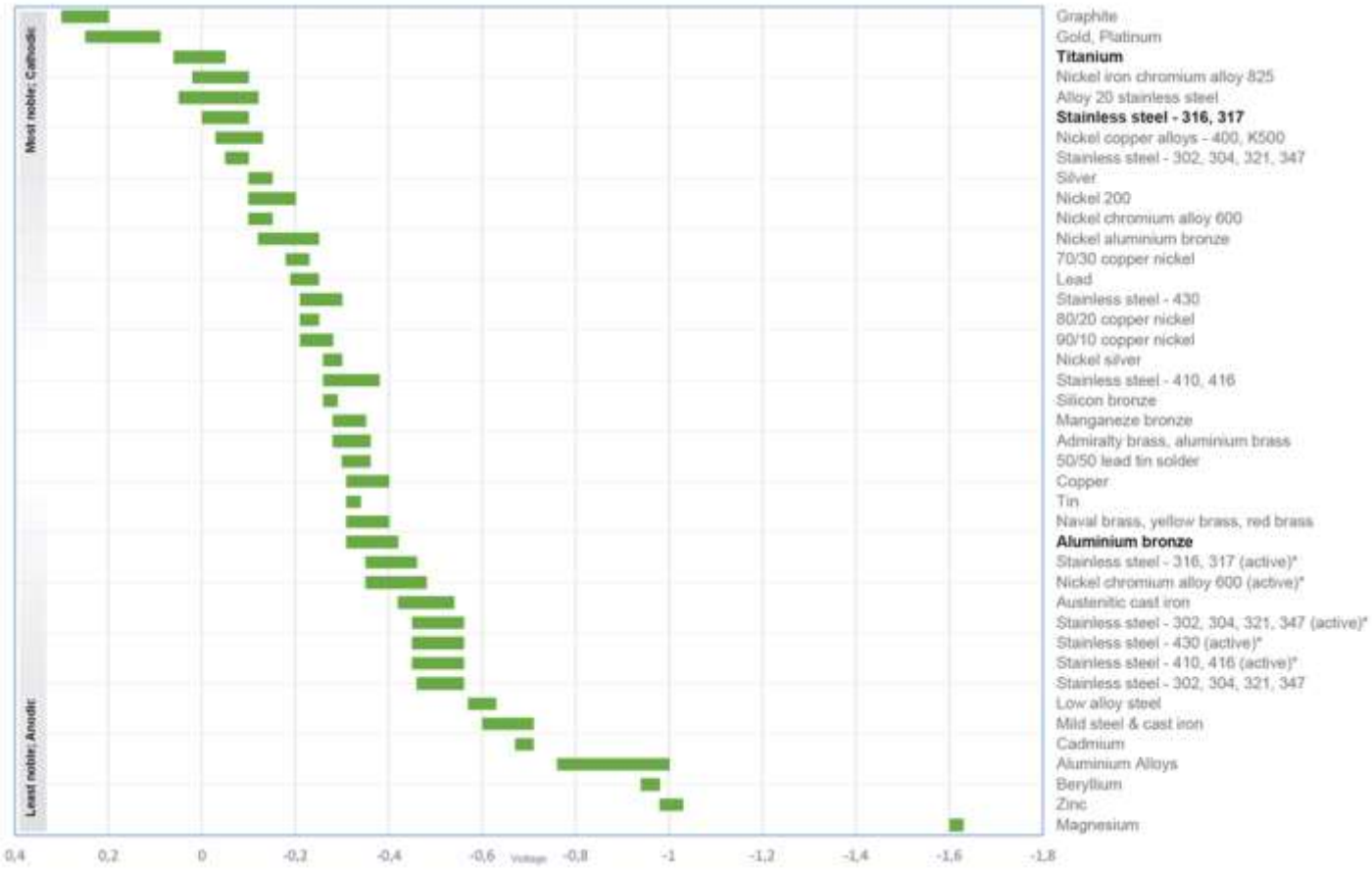
In metals this is generally through an electrochemical action ie. A flow of electrons from an anode to a cathode.

1. Engineering Materials, Jastrebski, 2nd Ed,Ch15

Mechanism of corrosion



Galvanic corrosion



Stainless steel classifications

Stainless steels are classified by their microstructure.

Ferritic (AISI 400 series)
- Resistant to thermal fatigue, corrosion and stress corrosion cracking.
- Magnetic

Austenitic (AISI 200 and 300 series)
- Most common category
- 304 and 316 often referred to 18-8 (185Cr and 8%Ni)
- Used where corrosion resistance in aggressive environments is required
- Non-magnetic.

Martensitic (AISI 400 series)
- Used when corrosion and/or oxidation resistance are required along with either high strength at low temperatures or creep resistance at elevated temperatures.
- Magnetic.

Duplex (AISI 2000 series)
- Microstructure combining ferrite and austenite.
- Used where better corrosion resistance than 304 or 316 is required.
- Double the yield strength of austenitic and ferritic stainless steels
- Magnetic

The early 3 digit AISI classification system is currently being replaced by a Unified Numbering System (UNS).
Eg. AISI grade 316 becomes UNS grade S31600
The “S” indicates that it is a stainless steel.
The next 3 numbers indicate the AISI group
The last 2 numbers indicate the alloy variant within the 316 group
Eg. AISI grade 316L becomes S31603

Austenitic stainless steel composition

AISI Type	Composition %								
	C max	Mn max	P max	S max	Si max	Cr	Ni	Mo	Other
201	0.15	5.50-7.5	0.060	0.030	1.00	16.00-18.00	3.50-5.50		
202	0.15	7.50-10.00	0.060	0.030	1.00	17.00-19.00	4.00-6.00		
301	0.15	2.00	0.045	0.030	1.00	16.00-18.00	6.00-8.00		
302	0.15	2.00	0.045	0.030	1.00	17.00-19.00	8.00-10.00		
302B	0.15	2.00	0.045	0.030	2.00-3.00	17.00-19.00	8.00-10.00		
303	0.15	2.00	0.20	0.15 min	1.00	17.00-19.00	8.00-10.00	0.60 max	0.25 S
303Se	0.15	2.00	0.20	0.060	1.00	17.00-19.00	8.00-10.00		
304	0.08	2.00	0.045	0.030	1.00	18.00-20.00	8.00-12.00		
304L	0.03	2.00	0.045	0.030	1.00	18.00-20.00	8.00-12.00		
305	0.12	2.00	0.045	0.030	1.00	17.00-19.00	10.00-13.00		
308	0.08	2.00	0.045	0.030	1.00	19.00-21.00	10.00-12.00		
309	0.20	2.00	0.045	0.030	1.00	22.00-24.00	12.00-15.00		
309S	0.08	2.00	0.045	0.030	1.00	22.00-24.00	12.00-15.00		
310	0.25	2.00	0.045	0.030	1.50	24.00-26.00	19.00-22.00		
310S	0.08	2.00	0.045	0.030	1.50	24.00-26.00	19.00-22.00		
314	0.25	2.00	0.045	0.030	1.50-3.00	23.00-26.00	19.00-22.00		
316	0.08	2.00	0.045	0.030	1.00	16.00-18.00	10.00-14.00	2.00-3.00	
316L	0.03	2.00	0.045	0.030	1.00	16.00-18.00	10.00-14.00	2.00-3.00	
317	0.08	2.00	0.045	0.030	1.00	18.00-20.00	11.00-15.00	3.00-4.00	
D319	0.07	2.00	0.045	0.030	1.00	17.50-19.50	11.00-15.00	2.25-3.00	
321	0.08	2.00	0.045	0.030	1.00	17.00-19.00	9.00-12.00		
347	0.08	2.00	0.045	0.030	1.00	17.00-19.00	9.00-13.00		
348	0.08	2.00	0.045	0.030	1.00	17.00-19.00	9.00-13.00		
384	0.08	2.00	0.045	0.030	1.00	15.00-17.00	17.00-19.00		
385	0.08	2.00	0.045	0.030	1.00	11.50-13.50	14.00-16.00		

Ref: **Corrosion Resistance of the Austenitic Chromium-Nickel Stainless Steels in Chemical Environments**, *Inco*, Tech Sheet A-317

Difference between 304 and 316 Stainless Steel

Acid testing is one test that will separate 304 and 316 grades of stainless steel.

- Sulphuric acid strongly attacks 304 grade, producing green crystals and a dark surface, but its attack on 316 grade is slow and produces a brown surface
- Hydrochloric acid attacks 304 grade very rapidly and produces gas, but attacks 316 grade only very slowly.
- There are also proprietary test chemicals, such as Decapoli and Avesta 960 which detect the presence of molybdenum, a component of 316 grade, but not of 304 grade.

Corrosion Protection in Stainless Steels

Austenitic stainless steels self generate a thin (1.5 to 2.5nm), durable and stable passive layer of Chromium Oxide (Cr_2O_3) on contact with oxygen.

Stainless Steel Properties

Stainless steel properties vary with the alloy and amount of work hardening.
Typical properties are;-
Austenitic:
•Ultimate tensile stress 600 Mpa and Yield Stress 250 Mpa
•Work hardening may increase the yield stress up to 80 – 95% of UTS

Duplex:
•Ultimate tensile stress 700 Mpa and Yield Stress 450 Mpa
Cold working increases magnetism in alloys other than 310 and 316.

Factors Influencing Austenitic Stainless Steel Corrosion

Chloride concentration

The presence of chloride causes a destruction of the passive layer.

Flow rates

The lack of water flow over the material (stagnation) results in oxygen depletion and no regenera tion of the passive layer

Water Temperature

The higher the temperature, the greater the rate of corrosion. However, this has little effect below 100°C.

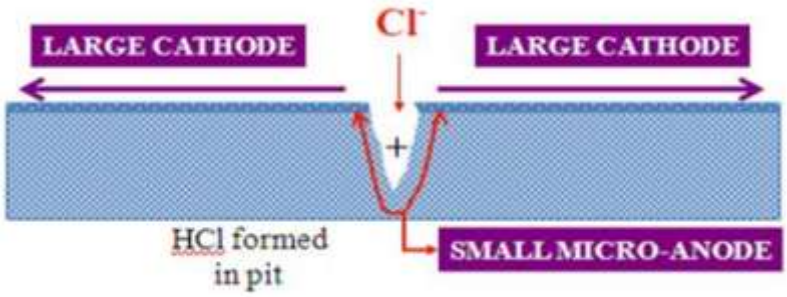
Marine growth

Biofilms (slime) and other marine growth restrict the amount of water flow over the passivated surf ace.

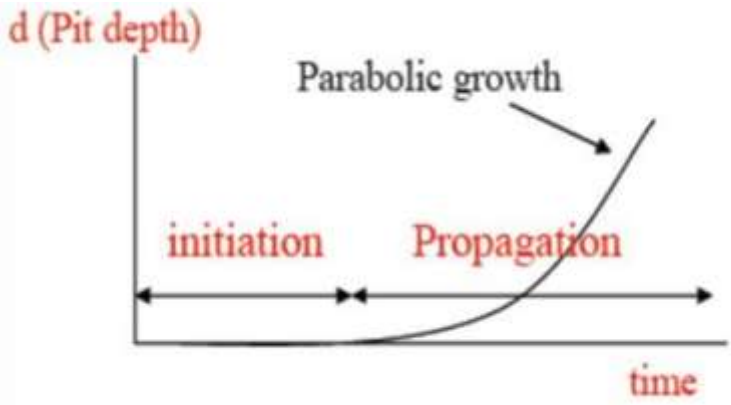
Biofilms occur in temperature ranges between 15°C and 40°C

Pitting Corrosion

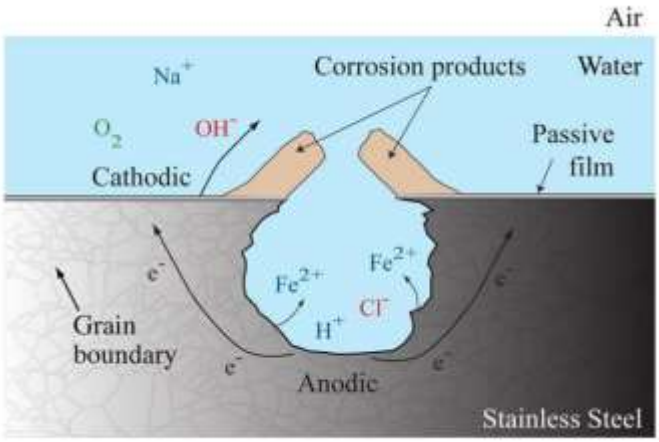
Pitting corrosion is a localized form of galvanic corrosion. It is initiated at a local imperfection in the passive layer, which can be the site of an inclusion, or a stressed area from bending or forming, or damage from impact (among other causes). Pitting corrosion takes place in neutral or acidic solutions containing chlorides (Cl-). The chloride ion penetrates the imperfection and begins the process of pit initiation.



The chloride ion creates a localized anode that is surrounded by the large cathode which is the undamaged surface. The rate of the growth of the pit (pit depth) accelerates as the pit progresses, with a time v depth curve that is parabolic.



As chloride in solution enters the pit, it spontaneously forms HCl (hydrochloric acid), which attacks the alloy. Iron atoms are removed via dissolution from the alloy crystalline structure, reacting and forming ferric hydroxide. As noted above, the rate of metal loss accelerates as the pit deepens. Factors that influence pitting rate include Cl- content, pH value, temperature, and the presence of oxidizing agents.



Ref: CHLORIDE-INDUCED PITTING CORROSION OF AUSTENITIC STAINLESS STEEL Report Author Dr. Brent Ekstrand, VP of Science & Technology Date 08/20/18

Stress Corrosion

- Stress corrosion is most common in 304 and 316 grades.
- Stress corrosion may be through directly applied stresses or residual stresses resulting from fabrication ie bending, forming or welding.
- Where parts are likely to have residual stresses, they should be annealed at temperatures above 870°C.
- Stress Corrosion facilitated by chloride levels ie salt (NaCl) in seawater (>4ppm) and high temperatures.

Intergranular Corrosion

- Exposure to very high temperatures (425 - 815°C) such as welding, precipitates chromium carbides. Removed by annealing.
- Carbides bind up a lot of Chromium at the inter granular boundaries thus depleting the surrounding iron leading to pitting corrosion.
- Carbides may also result in a discontinuity of the passive layer.

Crevice Corrosion

- Crevices either by design or as the result of crack allow the build up of stagnant water to accumulate.
- With no flow there is oxygen depletion (required to maintain the passive layer) a build up of chloride ions (to break down the passive layer).
- Corrosive attack within the crevice is proportional to the area of freely exposed (cathodic) material outside.
- Low flow rates result in deoxygenation.

Galvanic Corrosion

- Galvanic corrosion is unlikely in Austenitic Stainless steels but still may occur.

Marine Growth

- Bio films have a catalytic effect on the oxygen reduction reaction by increasing cathodic efficiency thus increasing crevice corrosion. (eg. Desulfovibrio vulgaris)
- This catalytic effect is reduced when the water temperature lies in the region of 15° - 40°C

Stainless Steel Maintenance

- To improve corrosion resistance, frequently wash with soap and freshwater to remove salt encrustations, grease and dirt.
- Remove scratches and imperfections by keeping polished.

Austenitic Stainless Steel

- Austenitic stainless steels may not be perfect , but they are the best easily available materials we have for a seawater applications.
- The most common alloys available for marine applications are 304 and 316.

ADMINISTRATION NOTES

ABBA COMMITTEE

President	Rob Bingham	0419 995 422
Secretary	Bruce Cadee	0419 508 785
Treasurer	Andrew Minto	0415 852 333
Library	Rosemary Nayler	0427 717 050
Newsletter Editor	Bruce Cadee	0419 508 785
Website	Neil McKenzie	0424 533 063
General Committee	Chris Davis	0418 954 602
	Luis Gouveia	0477 172 881
	Bob Harrap	0407 991 901

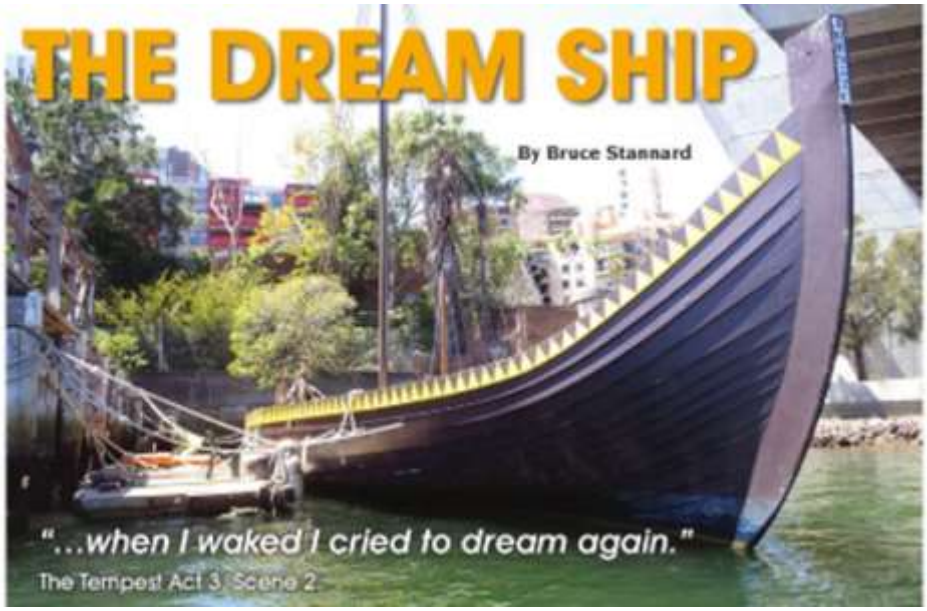
UPCOMING EVENTS— You can see below that we have another interesting and relevant program planned until June but there are some gaps in the second half of the year. Your committee is always looking for offers to make a presentation or host a toolbox visit. We would also appreciate ideas about what our members would like to see or hear about or potential leads that we can follow-up. Please e-mail cadeefamily@bigpond.com or call Bruce on 0419 508 785 or make contact with any of the Committee members above.

May Toolbox Visit – Saturday 6th May 2 to 4 pm

A number of ABBA members are also members of the Bosun's Club at South of Perth Yacht Club. One of their activities is construction of two 22ft long, timber St Ayles Rowing Skiffs. Each boat accommodates four rowers and a cox. It is intended that the boat will be used for social and competitive events. At our Nov 2022 Toolbox, the first Skiff was nearly complete. On Saturday 6th May we are having another Toolbox to see the finished boat including the hollow wooden oars designed by ABBA committee member, Bob Harrap. The second skiff is underway and you will get to see the early stages of its construction by a group of very amateur, but now more experienced, boat builders. Bring along your rowing gear as weather permitting, you can have a go yourself and experience the resurgence of rowing in Perth and country areas.

June Meeting – Wednesday 7th June

Our June meeting will be on Wednesday 7th June in the Heritage Room at South of Perth Yacht Club, 7:00pm for a 7:30pm start. Royce Carrigg will tell us about the drama of building an 85ft Viking Boat in Perth and the intriguing story of her life.



ADMINISTRATION NOTES (Cont'd)

ABBA LOGO

Members are reminded that Bruce Cadee has made arrangements with Shaun Luong of Image Embroidery at 26 Tulloch Way, Canning Vale (Phone 9456 2324 Mobile 0403 250 389) for an embroidered ABBA logo. The logo can be applied to your own clothing (assuming it can be accommodated in their equipment) or to shirts, caps or hats purchased through Image Embroidery. Feel free to call in on Shaun to look at the limited range of clothing he has on site or visit the following web sites to choose your preferred style, size and colours. The weblinks below are only examples of the wide range available. Half chest measurements are included on the web sites to help ensure you select the correct size. Ladies styles are also available.

Clothing (excluding Logos)

Style 1300 – Aussie Pacific Mens Murray Polo, Navy/White/Ashe or White/Navy/Ashe - **$20.00 + GST each**
Weblink: http://www.aussiepacific.com.au/the-murray-polo-navy-white-s?color=Navy%2FWhite%2FAshe&primary_color=Navy&secondary_color=White

Style 1304 – Aussie Pacific Mens Eureka Polo, Navy/White/Ashe or White/Navy/Ashe - **$21.00 + GST each**
Weblink: http://www.aussiepacific.com.au/mens/polos/eureka-polo-sky-navy-s?color=Sky%2FNavy%2FAshe&primary_color=Sky&secondary_color=Navy

Hats/Caps (excluding Logos)

Style 4199 – Headwear Brushed Heavy Cotton Cap, White/Navy (many other colours available too) - **$6.50 + GST each Weblink:** http://au.headwear.com.au/productDetails.cfm?&prodID=53&prodCatID=2&pageNumber=1

(Also refer poly/cotton legionnaires hats Styles 4057 or 4126 for maximum sun protection under website sub heading 'Hats, Visor & Beanies' http://au.headwear.com.au/productList.cfm?&pCategoryID=7)

Style 4199 – Headwear Brushed Heavy Cotton Cap, White/Navy (many other colours available too) - **$6.50 + GST each (includes poly/cotton legionnaires hats for maximum sun protection under website sub heading 'Hats, Visor & Beanies')**
Weblink:

Style 4223 – Brushed Sports Twill Bucket Hat, White/Navy (many other colours available too) - **$8.00 + GST each**
Weblink: http://au.headwear.com.au/productList.cfm?&pCategoryID=7&page=2

To make your annual membership even more value for money, ABBA will pay for up to 2 logos per financial year to be applied to your items of clothing. The current cost to ABBA is $7.15 per logo. There is no intention for this to be an ABBA uniform so the choice of style and colour is totally yours. If you are seen wearing the logo while building, working on or using your boat or anywhere for that matter it might get people asking questions and wanting to join our association. You are free to deal direct with Image Embroidery but please ensure you get an itemised invoice showing a separate price for the logo and present this to our Treasurer for reimbursement. Bruce Cadee is happy to take orders and liaise with Image Embroidery if you wish.