

## IMECHE PRESIDENT MARK HUNT VISIT

IMechE President Mark Hunt will visit Australia and New Zealand in January for a tour of the region. A full complement of activities is planned for his stay with opportunities to meet the president and listen to him speak available in most of the states.

Mark will arrive in Australia on the 19th of January, spending the 19th and 20th of January in Perth before moving on to Melbourne for the 21st and 22nd, Sydney for the 23rd and 24th and Brisbane for the 25th and 26th. He will then depart for New Zealand on the 27th of January. Mark will be meeting with various groups in each of the states and will give a version of his Presidential address "From Young Member to Youngest President" in all regions. Members are encouraged to attend the dinners and talks. Full details are included on page 4.

Mark Hunt was elected president of the IMechE in May 2014 and became youngest ever President of the Institution of Mechanical Engineers in its 167-year history. He is also the first Royal Air Force Officer to be President.

Mark was recently recognised with an OBE for his outstanding achievements and service to the community in the New Year Honours List announced on 30 December 2014. Mark has been recognised for his work as an Officer in the RAF.

Mark, 42, succeeds Patrick Kniveton,

Head of Engineering Improvement at Rolls-Royce Marine Power, who became President in 2013.

Mark said of his appointment:

"I am thrilled to lead one of the fastest growing professional engineering institutions."

"I want to use my year as President to demonstrate what engineers have to offer society, and to broaden public awareness of how engineers are improving the world we live in. I also want to help galvanise action to inspire the next generation of engineering innovators and work hard to encourage more diversity in the industry."

"My challenge to every engineer is to ask themselves what they have done today to improve society and then to tell someone about it. We need to be proud of our engineering achievements."

A Chartered Engineer, Mark is experienced in forming, training, motivating and leading teams worldwide. As the youngest Liveryman of the Worshipful Company of Engineers, he indulges his 3 passions: promoting the engineering profession whilst championing education and charitable causes.



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## NAVAL HISTORY AFLOAT IN MELBOURNE

*In late October of 2014 on a pleasant Sunday afternoon, Victorian IMechE members were treated to a dedicated tour of HMAS Castlemaine which is permanently moored alongside Gem pier at Williamstown.*

HMAS *Castlemaine* is a Bathurst class corvette that was constructed during the Second World War. After a distinguished service the vessel was gifted to the Maritime Trust of Australia in 1973 and is now maintained and preserved as a floating museum by a passionate and knowledgeable group of dedicated volunteers.

HMAS *Castlemaine* was one of sixty corvettes commissioned in 1941 for deployment into the Pacific War effort. Originally designated as 'Australian Minesweepers', the vessels are generally known as Corvettes. The ship design was originally conceived as a local defence vessel for the Royal Australian Navy (RAN). However, the emerging need during the Second World War for minesweeping and anti-submarine capabilities meant the initial concept was modified. The Bathurst Class design has similarities to the British Bangor class corvette but was designed specifically for the Australian Oceanic region/conditions. Over the course of World War Two, a total of 60 ships were constructed at various shipyards across Australia.



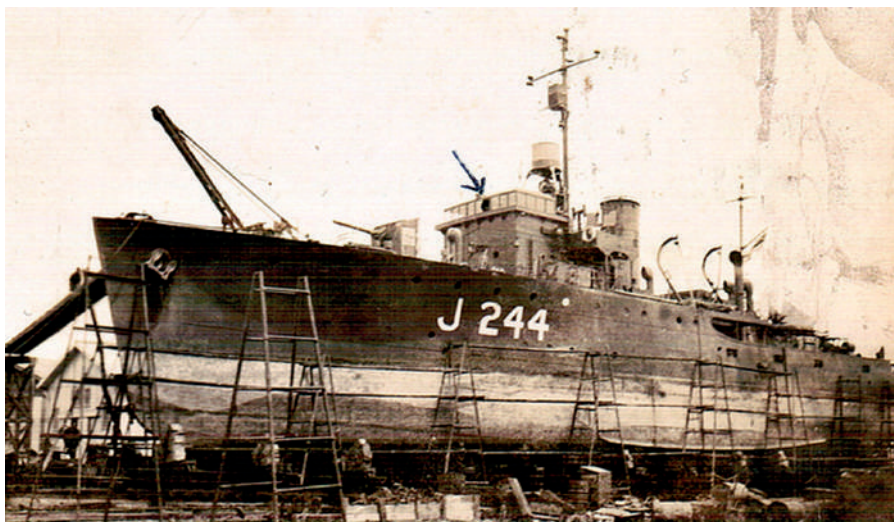
*HMAS Castlemaine berthed at Gem pier, Williamstown.*

It is somewhat fitting that HMAS *Castlemaine* is now permanently moored no more than a stone's throw from her historical birthplace at the Williamstown dockyard, then known as HM Naval Dockyard. The yard was responsible for the construction of 8 Bathurst Class Corvettes over a 2 year period. Interestingly, the Williamstown dockyard later passed to Tenix Defence where all ten ANZAC class frigates were constructed. Tenix Defence was subsequently acquired by the defence giant BAE Systems in 2008 and in recent times the shipyard has been responsible for commissioning the

two massive Land Helicopter Docks (LHDs).

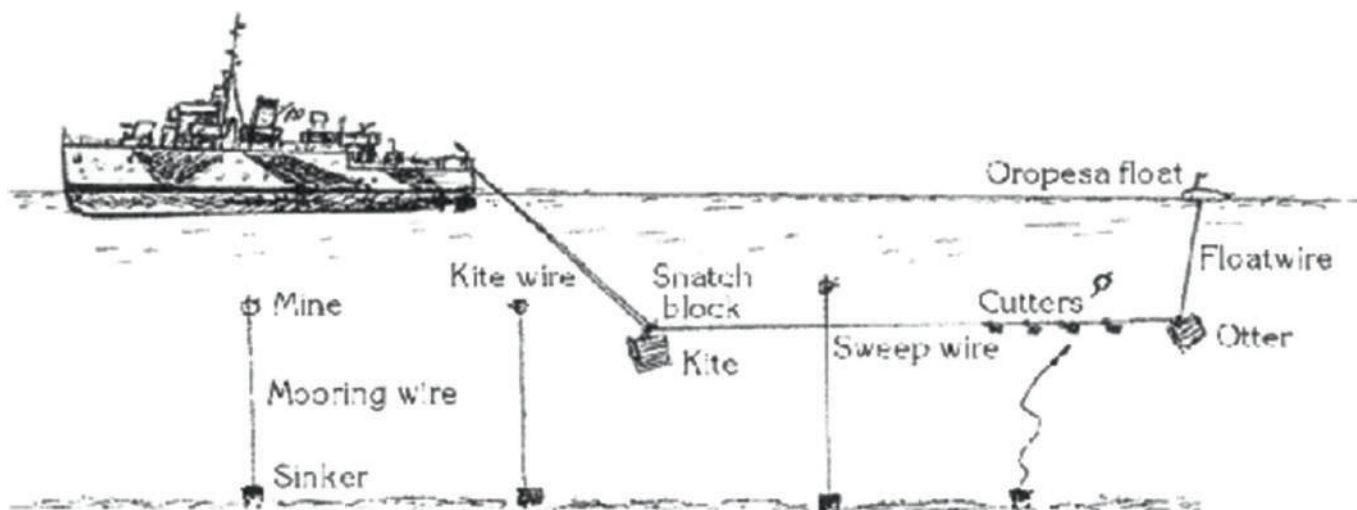
The HMAS *Castlemaine* has a displacement of approximately 650 tons and an overall length of 57m (186ft). Crew numbers ranged from 70 to 100 mission dependant. Armament consisted of three 20mm Oerlikon anti-Aircraft guns, one 4 inch (102mm) gun and two ½ inch (12.7mm) machine guns. At the stern of the vessel are mounted two racks and throwers to launch depth charges for anti-submarine warfare.

Propulsion consists of a two propeller, two shaft configuration which is driven by two triple expansion steam reciprocating engines. Steam is provided by a pair of three drum boilers providing steam at 210psi (1420Kpa) allowing a fully loaded top speed of 15.5knots. The steam was also used to power two electrical generators, minesweeping winches, the anchor winch, steering gear and various pumps. As an added interest, HMAS *Castlemaine* volunteers have successfully managed to turn the original engines over using an innovative compressed air system instead of steam. This ensured that a visit to the machinery space by IMechE members was the highlight of the tour.



*HMAS Castlemaine under construction.*





Minesweeping technique.

During the Second World War, contact mines were moored to the seabed with a length of wire cable and a heavy sinker. This made them hard to observe and would ensure contact/detonation would occur on the ship's hull below the waterline. Contact mines are inherently buoyant; the main method of minesweeping was to cut the mooring. Once afloat, the mine could be destroyed by small arms fire. Mine sweepers are purposely designed with shallow draught to enable this function. HMAS *Castlemaine* minesweeping capability consisted of towing a torpedo-shaped float via a wire cable. Another wire was fitted with cutters and angled across the direction of travel and kept in position and desired depth by a kite and otter arrangement as per the image above.

On entry into service, the HMAS *Castlemaine* was initially involved in escorting vessels up the east coast of Australia. She was then engaged in operations against the Japanese occupation of Timor, specifically supporting allied troops. Later she was involved in minesweeping Northern Australian waters and additional escort duties. In the latter part of the war the vessel was engaged in survey duties along the north coast of Australia. In 1945 she sailed to Hong Kong where she took part in the Japanese surrender ceremony and carried out minesweeping duties. On returning to Australia the ship was immobilised at Crib Point, Victoria and used for

many years as a training hulk. In 1973 the ship was presented by the Australian Government to the Marine Trust of Australia.

At the start of the tour, IMechE members were privileged to experience a dedicated briefing on the ship's specifications, service record and ongoing upkeep. Nearly all areas of the ship are accessible for viewing and the vessel has been lovingly restored to its World War Two condition. A number of IMechE members commented that the dedicated volunteers were incredibly knowledgeable about all aspects of the ship and their enthusiasm was humbling. It should be highlighted that HMAS *Castlemaine* is the last floating example of a Bathurst corvette in the world. The volunteer team is hopeful of securing a short time in the BAE Systems

Williamstown dry dock in 2015 to enable essential hull maintenance to be carried out. The team is always looking for volunteers keen to help preserve a piece of Australian Naval history.

The HMAS *Castlemaine* is open to the public on Tuesdays and weekends and costs \$6 for adults, \$3 for children or \$15 for families. All proceeds go toward the ongoing maintenance and upkeep of the vessel. ■

For more information visit <http://hmascastlemaine.org.au/>.

**MATTHEW COOK**  
Senior Mechanical Engineer

IMechE Victorian Panel, Committee Member



IMechE Victorian members boarding the HMAS *Castlemaine*.

## IMECHE PRESIDENT MARK HUNT BENG (HONS) MA MBA FCMi CENG FIMECHE RAF

Mark was elected the 129th President of the Institution of Mechanical Engineers in May 2014, the youngest President in the 167-year history of the Institution.

His intent is to promote vision, consistency of strategic thinking, creativity and daring across the global engineering profession to seize the opportunities presented and to draw the profession, government and society more closely together for mutual benefit.

A Chartered Engineer, Mark is experienced in forming, training, motivating and leading teams worldwide. As the youngest Liveryman of the Worshipful Company of Engineers, he indulges his 3 passions: promoting the engineering profession whilst championing education and charitable causes. Mark is an accomplished communicator, postgraduate educated in leadership

and business management, and strategic defence studies and international politics. When elected, Mark became the youngest Fellow of both the Chartered Management Institute and the Institution of Mechanical Engineers with whom he has 13 years' board-level experience as Deputy President, a Member of Council and a Trustee on the Trustee Board.

Mark has been an Engineer Officer in the RAF for 18 years. After university sponsorship and commissioning at RAF College Cranwell, he completed professional training and latterly an MBA at Cranfield University and the Joint Service Command and Staff College's advanced course at the UK Defence Academy.

Group Captain Hunt is now the Type Airworthiness Authority for the RAF's intelligence gathering, surveillance, target acquisition and reconnaissance fleets of Sentinel and Sentry aircraft. His last role was as Chief Air Engineer at the RAF's largest main operating base, Brize Norton, home of the Air Transport and Air-to-Air Refuelling Force and gateway to Defence operations. Prior to this, he was head of the airworthiness



and safety assurance group for the Hercules and Tristar air transport fleets responsible for supporting operations and enhancing capability to meet future security threats. His career has spanned appointments as Senior Engineer Officer on an operational Harrier squadron, predominantly in Afghanistan, and training young engineers at the Defence College of Aeronautical Engineering.

Mark has been married to Lisa for 17 years and has 3 sons. His personal best time for the marathon is 3 hrs 29 mins and for the sprint triathlon is 1 hr 10 mins.

### President Mark Hunt's Australian Visit Schedule.

Date	Time	Venue	Event
19th January	AM	Perth	Mark arrives
20th January	Day	Perth	Company visits including Australian Centre for Energy Process
	Evening	Engineers Australia WA division, 712 Murray Street, West Perth	George Stephenson lecture and reception followed by dinner with WA panel members
21st January	Evening	Melbourne	Dinner with Victorian Panel committee members
22nd January	Day	Melbourne	Company visits including Thales aircraft control centre
	Evening	RACV Club, 501 Bourke Street, Melbourne	George Stephenson lecture and dinner with Victorian Panel committee members.
23rd January	Lunch	Sydney defence force recruitment 201 Sussex st, Sydney	George Stephenson lecture and Q&A
25th January	Evening	Victoria Park Golf Course, Brisbane	George Stephenson lecture and dinner with Queensland Panel members
26th January	Afternoon	Lone Pine Koala sanctuary, Brisbane	BYO BBQ
27th January	Day	Wellington	Depart for New Zealand

## FROM THE CHAIR

Greetings!

There is no doubt that we all had a good and well deserved break. The festive season and time with family always help us revive and prepare for the challenges of time ahead. This is the time we all reflect on our achievements, scrutinise our plans, and set new goals and resolutions for the coming year.

Ten years ago, on the newsletter of my son's school, I read a very interesting story about establishing priorities. The story is so true and exciting that I kept the newsletter. It was written by the Headmaster, and the original source is unknown. With his permission, I share this fascinating story with you.

'The Mayonnaise Jar and the Drink'

A professor stood before his philosophy class and had some items in front of him. When the class began, wordlessly, he picked up a very large and empty mayonnaise jar and proceeded to fill it with golf balls. He then asked the students if the jar was full. They agreed that it was.

The professor then picked up a box of pebbles and poured them into the jar. He shook the jar lightly. The pebbles rolled into the open areas between the golf balls. He then asked the students again if the jar was full. They agreed it was.

The professor next picked up a box of sand and poured it into the jar. Of course, the sand filled up everything else. He asked once more if the jar was full. The students responded with a unanimous 'Yes'.

The professor then produced two cans of coke from under the table and poured the entire contents into the jar, effectively filling the empty spaces between the sand. The students laughed.

'Now', said the professor, as the laughter subsided, 'I want you to recognise that this jar represents your life. The golf balls are the important things - your family, your children, your health, your

friends and your favourite passions - things that if everything else was lost and only they remained, your life would still be full. 'The pebbles are the other things that matter like your job, your house, your car. The sand is everything else-the small stuff'.

'If you put the sand into the jar first', he continued, 'there is no room for the pebbles or the golf balls. The same goes for life. If you spend all your time and energy on the small stuff, you will never have room for the things that are important to you. Pay attention to the things that are critical to your happiness. Play with your children. Take time to get medical check-ups. Take your partner out to dinner. Play another 18. There will always be time to clean the house, and fix the rubbish disposal. Take care of the golf balls first, the things that really matter. Set priorities. The rest is just sand'.

One of the students raised her hand and inquired what the coke represented. The professor smiled. 'I'm glad you asked. It just goes to show you that no matter how full your life may seem, there's always room for a couple of drinks'.

Focusing back on the Branch, 2014 was a tremendous year. We had a full programme with a diverse range of events and activities thanks to our volunteers' commitment and relentless efforts.

Uncontested nominations were received for all the positions in next year's Branch Committee; thus there is no need for voting.

The highlight of 2015, the Presidential visit we were eagerly looking forward to is now only a few days away. I encourage all our members to participate in the programme and to meet our leader Group Captain Mark Hunt and his wife Lisa. Details are elsewhere in this News Bulletin.

Remember our Presidential visit is a 'golf ball'.

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## OCEANIA REGION NEWS

Several of the plans put in place earlier this year by the Oceania Region Board have come to fruition during the last couple of months. Most of this focuses on New Zealand and has resulted in a much stronger structure, with volunteers 'on the ground'. Consequently I can welcome Nathan Williams as the New Zealand Young Member Representative, and Darren Sharpe as the Assistant New Zealand Country Representative. Darren has also accepted a position on the Oceania Region Board, a position that will give New Zealand a stronger voice during Board deliberations.

New Zealand held their inaugural Speak Out for Engineering competition in Auckland in November. The presentations given were to the high standard we have come to expect from our younger engineers. The competition was won by Eryn Kwon of Auckland. Eryn will now represent New Zealand in Melbourne in February 2015 in what will be a truly Regional SOFE final.

An additional success in New Zealand is the announcement of another Engineering Heritage Award. This is for a Woolf Double Beam Compound Steam Engine in Western Springs in Auckland. A full description of the engine will be provided in our next edition, and the Heritage Award presentation ceremony will be one of the highlights when the President visits New Zealand in January.

The IMechE President, Mark Hunt, and his wife Lisa, will start their 2015 tour of the Oceania Region in Perth, Western Australia, on 20 January. His programme, in each location, is a mix of meeting with members, industry, and academics, and giving his 2015 George Stephenson Lecture. Again, in each location, the President is keen to meet with and talk to as many members as possible. Consequently, dinners and other social events have been arranged around his lecture. A full version of his itinerary appears elsewhere in this edition. Please do take the opportunity to hear him deliver his address, "From Young Member to Youngest President", and the more the merrier. After Perth





the President will lecture in Melbourne Thursday 22 January, in Sydney Friday 23 January, and Brisbane Sunday 25 January. The party then moves on to Wellington 27 January, and Auckland 29 January 2015.

Also, further into 2015, I can now confirm that Belinda Herden, the Oceania Young Member Representative, and myself, have been invited to pay a visit to the Mechanical Engineering Department of the Papua New Guinea University of Technology in Lae. We have been invited there by Professor John Pumwa, the Head of Department. The visit to the 'Unitech' campus will take place on the 13 February 2015 and will be a full day of meetings with university staff and their mechanical engineering students. Belinda and I hope to convey the benefits of IMechE membership to both staff and students, recruit as many as possible, and look for ways in which the Australian Branch can assist members in what remains a deprived area. ■

**Ken Tushingham**  
Oceania Region Chairman

## EDITORIAL

The modern engineering environment appears to be governed by metrics. Processes, procedures and deadlines are all encompassing. Measurables to demonstrate the capability of processes and opportunities for

process improvement are critical and are reported to the highest levels of modern organisations. There appears to be little benefit of an efficient process if it is not possible to demonstrate the efficiency of that process. Six sigma and lean manufacturing are focussed on the capability of processes and identifying waste and error. Do these systems of engineering by numbers lead to a reduced level of creativity in the engineering field, which could be stifling for those working in a large corporation, or are these systems critical for the continued success of these businesses? Processes are in place to help an organisation function efficiently and to ensure that the optimum method of operation is used repeatedly. However, it is easy for these processes to take over a business and become

the sole reason for being. 3M found this out to their own detriment when they introduced six sigma throughout their company in the early 2000's. They slashed their operating costs and lost a significant amount of waste. However, their R&D department, which has always been synonymous with innovation was stifled and their new product introductions took a major hit. "We were letting, I think, the process get in the way of doing the actual invention," said Dr. Larry Wendling, staff vice president at 3M's Corporate Research Laboratory.

It seems that, for those looking to be a creative engineer, working for a small business or going it alone may be the only options. With these options comes an increased level of risk, so does this mean that with creativity there is inherent risk? The entrepreneur and start-up article included in this issue provides a good view of the risks and opportunities involved in going it alone and putting your own mark on the engineering landscape. ■

**Matt Proudlock** News Bulletin Editor  
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## YOUNG MEMBER NEWS

Every year at Christmas millions of children, as well as overgrown children such as IMechE YMs, receive gifts from loved ones on the 25th December. Every year, toy companies spend a lot of time and money selecting, designing and manufacturing the perfect toy for the market.



(Image courtesy of Demotix).

The toy business is a very serious business, as dramatised in the The Hudsucker Proxy. The competition gets stronger each year as the expectations of toy capabilities are raised and the disposable incomes dwindle. Looking around the stores at Christmas you will now see robots, interactive gaming and even LEGO with computers included. Gone are the days of sticks and hoops.

The great news for this increase in competition is that incredible stunts are posed by the marketing teams of the big companies. If any NSW YMs happened to walk past Sydney's Pitt St Mall over the holidays they will have seen the giant LEGO tree. The video that shows the lucky makers of the LEGO tree is worth a watch. The other benefit is that it creates some fantastically different engineering roles.

Toy companies require engineers. Theme parks require engineers. Outdoor adventure equipment manufacturers require engineers. Use the next 30 seconds to take a look around you. What can you see that is a fantastic idea? The chances are an engineer was involved to make that idea a reality.

Engineering is not only Oil & Gas, Mining, Railway and Energy. There are hundreds of different pathways you can choose. That is the beauty of being an Engineer. We have the skills to solve most problems, no matter how obscure.

**Amy Lezala**  
Young Member Chair

## OLD NEWS

As we welcome a new year, we pause for a moment to look back on a year of changes. Some Panel members have moved on to regional and international jobs and have resigned from the Panel. We wish them continuing success in their careers. One of our Panel members was successfully nominated for a Council position in the UK. Congratulations to her! The Panel completed a number of Professional Interviews to admit candidates as Corporate Members of the Institution. Congratulations to them on their election as Member and as Chartered or

Incorporated Engineers. The Panel was also pleased to have had a good turnout for the Annual Dinner in August and Students Evening in October at the University of Queensland.

At the National SOFE Final held in Adelaide in February, Caitlin Prior from the University of Queensland won the National SOFE and was presented with the John Burt Memorial prize for her efforts.

January 2015 will see us welcoming the President of the Institution, Mr Mark Hunt, to Queensland for two days, the 25th and 26th of January as his final location in Australia during his tour "Down Under" before he heads to New Zealand. Please join the Panel in making this a memorable Australia Day for the President. A Dinner has been planned for the Victoria Park Golf Course on the evening of the 25th January where Mark will be delivering his George Stephenson Lecture. A BYO BBQ event has also been planned at the Lone Pine Koala sanctuary on 26th afternoon.

The Panel will be convening its AGM on the evening of the 18th February at the Tiered Theatre of the Brisbane Square Library from 1730 - 2000. Please join us for the meeting, as elections are being held for all Committee Positions on the Panel. If you have ever wondered what happens during the year and wish to be involved in the organization of the events, please join us on the Panel. Some have been on the Panel for many years and new ideas from new people are always welcome.

The Panel wishes all Queenslanders compliments of the Season and look forward to an eventful year ahead.

**Leslie Yeow**  
QLD Panel Chair

## News Bulletin Quiz

The first person to email the editor with the answers to the quiz below will win a high quality IMechE prize and the illustriousness which goes with it.

1. How old was Mark Hunt when he became IMechE president?
2. What percentage of entrepreneurial ideas fail?
3. Where will the 2014 Speak Out for Engineering regional final be held?
4. What class of boat is HMAS Castlemaine?
5. What does the coke represent?

Please send your entries to: [AustraliaNews@imechenetwork.org](mailto:AustraliaNews@imechenetwork.org)

## NSW NEWS

It has been a very quiet quarter for the NSW panel, however the NSW Mechanical Chapter has continued to host a number of interesting technical presentations in conjunction with EA and ASME at the Engineers Australia auditorium in Chatswood.

In November we had the extremely popular presentation by Shane Rolton on 3D printing.

This presentation focused on the various types of 3D printing technologies, and attempted to dispel the hype associated with these emerging technologies.

Introduced 30 years ago, 3D printing has become an enabling technology, another tool available to designers and manufacturers.

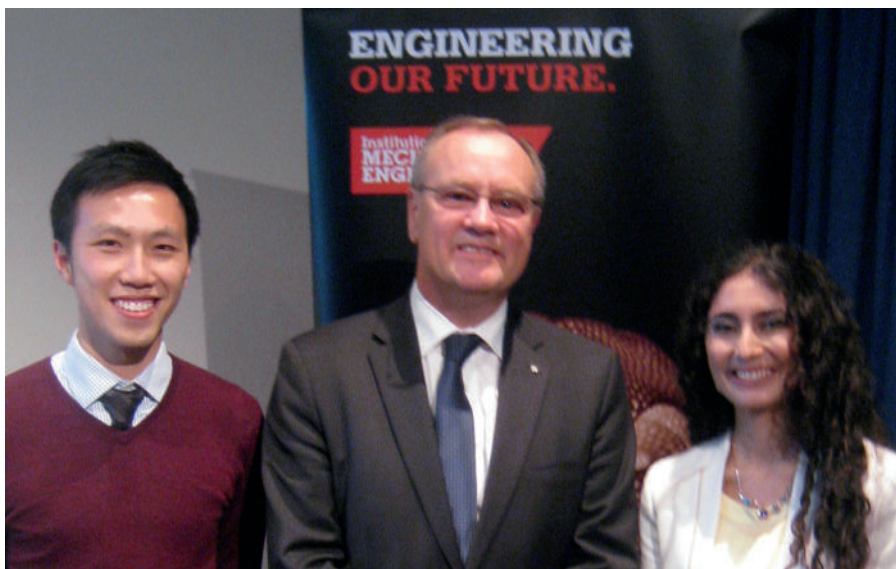
Shane helps clients turn the real world into the digital world using 3D laser scanning and 3D printing so that engineers, managers, designers, artists and animators can manufacture, design, animate, inspect and analyse faster and more cost effectively.

There's nothing like the Christmas spirit to bring out the 'Awesome Nerds' in all of us. On Monday 8th December the NSW IMechE committee launched their first annual Christmas competition "12 days of Christmas" we gave out a total of 12 prizes to 12 lucky NSW members which was our way of saying have a very merry IMechE Christmas!

Best holiday wishes and Happy New Year from the NSW Committee.

**Monika Sud**  
NSW Panel Chair





Victorian Panel Chairman Andrew Lezala (centre) with Adrian (left) and runner up Ala Abuelfilat (right).

## VICTORIA NEWS

The Victorian Panel had its speak out for Engineering competition on 17 September. There were five presenters representing three universities. We received ten applicants and had to limit participation to five due to time constraints. The competition has become popular in Victoria as it's backed by university staff at Melbourne, Swinburne and Monash universities. The winner was Adrian Lai from the University of Melbourne, whose presentation was on bio mechanics of the knee joint.

A site visit was organised to HMAS Castlemaine, a historic WWII Bathurst-class corvette which is docked in Williamstown. The tour was open to members of the IMechE and Engineers Australia.

There was a good turnout and the attendees spent a pleasant Sunday afternoon touring the ship and its museum. Attendees were invited to finger food and drinks at a hotel in Williamstown after the tour. The food and drinks were sponsored by Metro Trains Melbourne.

In November the Victorian Panel welcomed new committee members Khalid Abdullah (Victorian panel Young Member Representative), Paul Draper, Niranjana Panchal, William Bailey and Anthony Concannon. We are keen to start a mentoring program for young

engineers and also a program to promote engineering and membership with the IMechE in schools. These programs will be rolled out in 2015.

In November, a few Panel members made an informal presentation to members of the Melbourne University Mechanical Engineering Students Society. We spoke about what it takes to be a Professional Engineer and spoke about our own career experiences as engineers. There was a lot of interest and the Society is keen to work closely with the Victorian Panel and host more networking events and technical presentations.

We also bid farewell to Vince Pendlebury, a very active committee

member who moved overseas with employment. The Panel will also bid farewell to Matt Springer and Hugh Evans in 2015. Matt made a tremendous contribution to the Australia Branch and the Victorian Panel and is responsible for reviving the Young Members chapter in Victoria. He was also News Bulletin editor and maintained the Australia Branch social media channels. Hugh served as the treasurer of the Victorian Panel for nearly two years and brought in new ideas and enthusiasm into the Panel. We wish them both all the very best.

Andrew Lezala, the Chairman of the Victorian panel and CEO of Metro Trains Melbourne, presented a talk titled "A high-speed rail solution for Australia". This event was organised as a joint technical presentation with Engineers Australia and hosted at the Engineers Australia auditorium in North Melbourne. It proved to be hugely popular with an attendance over 110.

## PUBLIC PERCEPTION OF RISK

Imagine a future scenario where you are able to choose the manner of your passing from a shortlist of alternatives. Faced with such a stark choice, what would you choose? Would you choose lung cancer or bone cancer? A car crash or a plane crash? Diabetes or Cholera?

When couched explicitly in these bleak terms, none of these options appears



Brian Carter elaborates on the intricacies of sweet wrapper design when meeting with Melbourne University Mechanical Engineering Student Society.



especially attractive. In a roundabout way, however, the average person favours the first option for every pair of alternatives listed above.

Radiation from a nuclear accident is rightly considered dangerous; naturally-occurring radon, not so much. Yet the latter causes 21,000 deaths from lung cancer in the US alone, while deaths due to bone-seeking strontium-90 from nuclear fallout and accidents are almost unknown. After the 9/11 terrorist attacks, Americans avoided flying and took the car instead, leading to an estimated 1500 additional deaths on US roads. Deaths from infectious disease in Australia are very low, while diabetes killed more than two thousand Australians in 2011 alone; yet it is infection that we fear.

Risk perception and communication are complex fields, drawing extensively on research in disciplines such as psychology and philosophy; and they have a wide-ranging effect on public policy. This article can only hope to scratch the surface on the issue.

### Experts vs. the Public

Experts and laypeople often have widely differing views on risks. In many cases, public perception of risk does not correlate well with measurable probabilities. These discrepancies are due to a wide range of factors, and this is in part due to a broader view taken by the public versus the experts who typically focus on mortality levels (which is, of course, the approach taken above). Furthermore, and not surprisingly, the public is less confident in the completeness of experts' knowledge than the experts themselves are.

Trust, then, is an important artefact in risk communication. It does not matter how insistent an expert is in telling the public that a technology is safe. More information will simply harden attitudes and lead to a more entrenched position. Expertise itself may be regarded with suspicion, and especially if the experts themselves are (or appear to be) aligned with a government or political position.



In some cases, scepticism may be reasonable. An event that has been shown by a probabilistic risk assessment to be of very low probability inevitably relies on largely subjective assumptions about some very small individual probabilities. If subjective judgments are being made, what separates the expert from the layperson? In many cases, however – for example in the management of responses to pandemics – expert knowledge is unequivocally vital in formulating the best practice. The problem becomes one of risk communication, which will be covered in a future article.

### How are decisions made?

People use heuristics – simple and efficient subconscious rules – to help them make decisions when faced with uncertainty. These are shortcuts that allow us to feel comfortable with a decision, by addressing a different issue. “How safe are GMO foods?” is a difficult question to answer comprehensively for anyone, let alone a layperson. So the brain substitutes a different question that is much more manageable: “How do I feel about GMO foods?”.

The availability heuristic makes it easier for people to make judgments when faced with uncertainty. It makes events seem much more common if people can think of an instance when an event occurred. Rare events that receive extensive media coverage are easily recalled, and consequently judged to be more probable. This leads people to fear shark attacks and violent crime because these events make the news. Countless car accidents do not.

### How people judge risk

Where experts typically focus on fatalities, the overall palatability of a risk as perceived by laypeople is influenced by other factors. These factors include voluntariness, familiarity, control, catastrophic potential and whether a hazard is natural or artificial.

Voluntary risks are far more acceptable than involuntary ones. This is hardly surprising, and research shows that where benefits are perceived, risks are more palatable; pleasurable activities are judged to be less risky than unpleasant ones.



are instantly remembered. Nuclear power “ticks most of the boxes” to be perceived as highly risky. The Fukushima power plant suffered a disastrous failure in the 2011

Familiarity also influences how people judge risk. The large number of car crashes means that people feel able to assess the risk. Very rare events cannot be understood in this context, and so can be weighted disproportionately. Car accidents are also tolerated because of the control factor. Drivers are in control of their car; they have an opportunity to influence the outcome of any event, even if in many cases, this opportunity for influence is only perceived.

People are typically intolerant of risks that have catastrophic potential, where large numbers of people could be killed. Finally, risks that are natural are perceived more favourably than those due to human activity. A flu pandemic could kill millions, but few people lie awake at night worrying about it. In fact, the opposite is true: for example, many warnings about the 2009 swine flu pandemic were treated with indifference and even contempt.

### Recap

Laypeople and experts judge risks differently, according to different metrics and concerns. Common activities that are pleasurable and allow people to feel in control are readily accepted, while unfamiliar large scale technologies are viewed with much more circumspection.

Nuclear power presents a striking example. It has the potential to provide a low-carbon baseload power but is viewed with trepidation and fear. People do not derive pleasure from nuclear power, and it is difficult to understand. Lay people have no control in the event of an accident, which can have catastrophic potential, and it is highly technological. Accidents receive saturation media coverage. Accidents like Chernobyl and Fukushima

tsunami that resulted in meltdowns of three of its reactors, release of radiation and severe local environmental damage. But if the power plant failure was a disaster, the tsunami itself was an unadulterated tragedy that resulted in the deaths of more than 15000 people.

As the international community pursues low carbon options for a secure energy future, perhaps it is worth remembering that not a single one of those deaths was due to radiation from Fukushima. ■

**Max Ratcliffe**

South Australian Panel Vice Chair

## SPEAK OUT FOR ENGINEERING TASMANIA

On the 16th September a Speak Out for Engineering competition was held for the first time in Tasmania. The Victoria Panel worked closely with Dr Jason Lavroff, Senior Lecturer at the University of Tasmania, to enable this to happen. As well as winning £300 and a medal, the winner of

the Tasmanian competition will be given the opportunity to go forward to compete against the winners from the other States, in the Australian final of the SOfE, which will be held early in 2015.

Brian Carter from the IMechE Victoria Panel and Bob Muirhead, a Tasmanian IMechE Member, acted as judges. Ed Williams, a student from the University of Tasmania School of Engineering, was awarded first prize for his excellent presentation entitled “Design and Optimisation of a Formula SAE Suspension System.” Ed covered a lot of ground during his presentation, as he guided the audience through the complexities of designing a suspension system for a small racing car.

The runner up was Juugraj Singh, also a student from the Engineering School, with a presentation entitled “Energy Analysis of Thermally Driven Desalination Systems.” Juugraj compared three different energy sources for powering a desalination plant: geothermal, waste heat and solar hot water. The two families of desalination plant he considered were: multi-stage flash and multi effect distillation.

The Tasmania competition was well received, although the audience was small. The first year is of course always a learning exercise, and Dr Lavroff is already planning a bigger and better event for next year. ■

**Brian Carter**

Victorian Panel Member



Competitors and judges of the Tasmanian Speak Out for Engineering competition. (Left to right) Juugraj Singh, Ed Williams, Brian Carter and Bob Muirhead.



## ENTREPRENEURS and START-UPS

Crossroads Tech Start-up Report stated that 47% of US jobs are at risk of being automated in the next 20 years. Jobs are not permanent, locations are not permanent and workers are returning to low security work styles such as contracting. This group is already 25 to 35% of the workforce in most of the industrialised world.

As a nation we need to affect systemic change now. Entrepreneurialism is at the heart of this retooling. Australia has one of the lowest rates of start-up formation in the world and one of the lowest rates of venture capital investment in the world.

### Entrepreneurs

An entrepreneur is somebody who has a business idea and commercialises it. The success level of entrepreneurs is low, since about 80% fail. World-wide research on entrepreneurs indicate that about 6.5% of them will employ up to 30 employees where only 1.6% of them will employ about 100 employees. 75% of entrepreneurs are aged 20 to 39. The Kauffman Foundation, in a 2009 survey of 549 company founders, determined that 98% of founders ranked work experience and luck as critical factors.

### Business idea

Business ideas come from a variety of areas:

- Working in an industry / service and seeing a need
- Growth markets
- Professionals creating a new product / process
- New platform technologies e.g. internet
- Creative skill becomes a career which becomes a business
- University / research spin-offs
- Personal problem solutions.

### Life readiness

What does one do next? First of all you must assess the feasibility of the idea. Do I want to start a new business with all the risks involved including failure? Can I afford to leave what I am doing where I may have a good income? What about my family? How much do I know about the industry? How long will it take to establish the new business? When will I be able to leave my current job?

### Start-up process

Start-Ups are all about unknowns; it is a faith-based initiative. First, the entrepreneur has to define the product they are going to offer customers, then prepare a specification, conceptual and detail drawings, and product function tree.

During this process, the nascent entrepreneur, must research the business idea, speaking to friends, and experts like business mentors. Simultaneously, define the idea's "Value Proposition", what is the product or service giving the customer, what problem is being solved by the product.

### New business viability

The major question, is there a business?

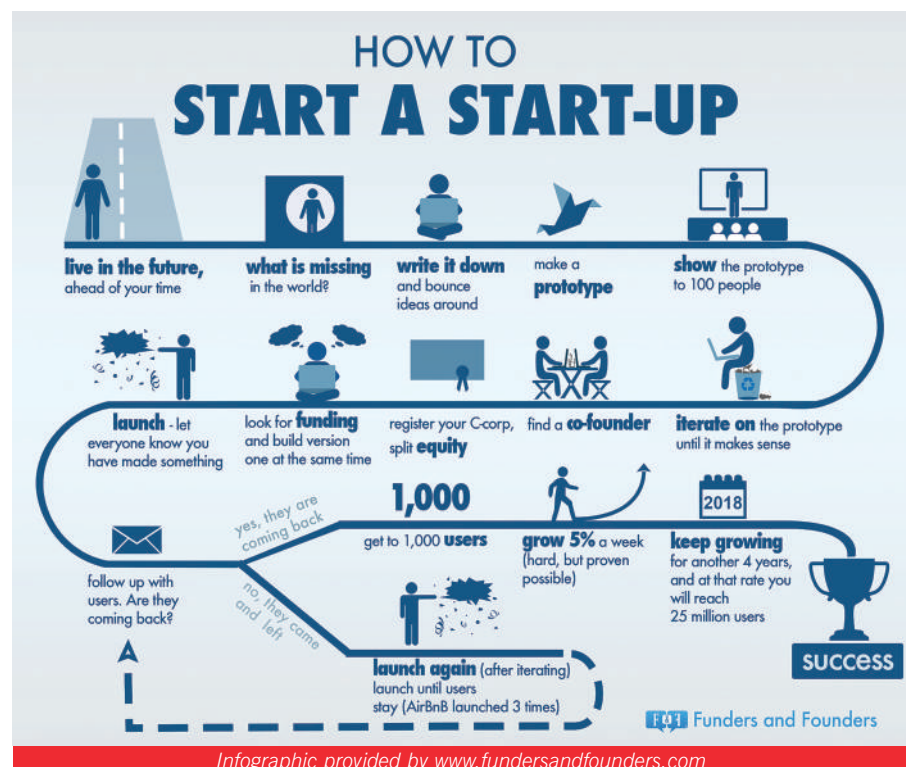
Is there a market for the product or service? What kind of market is it, for instance a new product into an existing market or cloning a business model that has been successful in another country.

Depending on the product, if it is a new-to-the world product in a new market, this means that the market must be created and this takes time and money. Is this a volume product? If so, look at outsourcing to a cheaper manufacturer in Asia, or if low volume local manufacture may be more suitable.

Capital expenditure is required since the entrepreneur must get a prototype made and this can cost a large amount of money (\$1m to 3m). The next task is to find a trial user, this could be difficult, and can take some time. The trial could mean modifications and more money. A prototype which is in reasonable shape, say about 80% market ready, is called the "minimum viable product" (MVP). The goal of the MVP is to build the smallest possible feature set.

### Marketing

Detailed market research could mean finding suitable customers depending on the product. The industrial market is relatively easy as the product will have a natural market which can be found



by a simple internet search. It is also important to estimate the market size for your product as this helps to decide whether the payoff from the new venture is worth the toil, sweat and tears. To help the entrepreneur define the size of the market, if going into an existing market, one can use IBISWorld Market Research Studies which define the market size, major players, growth of the market, structure etc. The above activities necessitate creating a marketing/advertising budget. The first sale is always very hard.

Pricing is a fuzzy area for entrepreneurs, in the writer's experience. Most entrepreneurs price too low, it is generally preferable to raise the prices. If there is a similar product in the market place already, the entrepreneur must follow the market-place.

All new companies should have a web-site to promote their products. Social Media is also important, as products can be marketed through Facebook, Twitter, LinkedIn and Pinterest etc. However Business to Business (B2B) products generally use LinkedIn and You Tube for videos.

## Finance

Sources of finance are wide ranging from banks to government organisations. For simpler products and services start-ups, banks like ANZ have started an accelerator program (ANZ Innovyz START) this year with eight start-ups. Seed money could be obtained by getting a credit card from a bank.

There are other sources of money like Venture Capitalists who are only interested in "Investment Ready" companies; i.e., new products which have found a market and made sales. They are only interested in investing amounts greater than \$1m. They also look for a "strong management team".

Another source of finance is "Crowd Funding". There are at least three: Kickstarter, Indiegogo and Pozible. Pozible is the most easily accessible site for Australians and it is the by far the largest Australian home-grown crowd funding platform hosting about 4,500 projects. Fees are charged by each of them at 2 different levels but generally from 4% to 9% depending on the funding arrangements.

## Intellectual Property (IP)

This is an interesting area since patenting is an ideal situation for protecting a new product's design but it costs a lot of money. To patent a new product world-wide could cost an entrepreneur about \$120,000. With some products it may be more suitable to register a design. However, the design is the overall appearance of the product and it must be distinctive. Registration initially protects your design for 5 years from the date the application was filed. The cost is about \$150.

## Business plans

The latest business plan approach is from Silicon Valley and Stanford University. Steve Blank and Bob Dorf

have recommended in their new book "The Start-up Owner's manual", the use of Alexander Osterwalder's "business model canvas" to diagrammatically illustrate how a company intends to make money. This is a one page sheet which has nine sections: Market size; Value Proposition; Customer segments; Channels; Customer Relationships; Key Resources; Key Partners; Revenue Streams and Cost Structure. It is a great idea for a budding entrepreneur to fill in this document which will provide him/her with a great view of the nascent company and business idea. ■

W.D. Ferme MBA. M.Sc. C.Eng.  
FIMechE  
Small Business Mentor

KEY PARTNERS	KEY ACTIVITIES	VALUE PROPOSITIONS	CUSTOMER RELATIONSHIPS	CUSTOMER SEGMENTS
Who are our key partners? Who are our key suppliers? Which key resources are we acquiring from our partners? Which key activities do partners perform?	What key activities do our value propositions require? Our distribution channels? Customer relationships? Revenue streams?	What value do we deliver to the customer? Which one of our customers' problems are we helping to solve? What bundles of products and services are we offering to each segment? Which customer needs are we satisfying? What is the minimum viable product?	How do we get, keep, and grow customers? Which customer relationships have we established? How are they integrated with the rest of our business model? How costly are they?	For whom are we creating value? Who are our most important customers? What are the customer archetypes?
	KEY RESOURCES		CHANNELS	
	What key resources do our value propositions require? Our distribution channels? Customer relationships? Revenue streams?		Through which channels do our customer segments want to be reached? How do other companies reach them now? Which ones work best? Which ones are most cost-efficient? How are we integrating them with customer routines?	
COST STRUCTURE		REVENUE STREAMS		
What are the most important costs inherent to our business model? Which key resources are most expensive? Which key activities are most expensive?		For what value are our customers really willing to pay? For what do they currently pay? What is the revenue model? What are the pricing tactics?		

Business model canvas template.

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