



HMAS Torrens being sunk as a target by HMAS Farncomb SSG-74

UNDERWATER SHOCK MODELLING

Modern navy vessels are required to undergo an exhaustive structural assessment process to ensure they are robust enough to survive shocks from underwater explosions (UNDEX). Videos of the sinking of HMAS Torrens (search on Youtube) provide a particularly dramatic demonstration of the destructive power of modern torpedoes and underline the need for appropriate vessel design.

Babcock Pty Ltd has a significant maritime presence in Australia and New Zealand. Babcock is investing heavily in local infrastructure and intellectual capital to develop further capability for supporting Australia's current and future submarines and surface ships. A part of that

investment is directed towards forging strategic alliances with key stakeholders in the overall naval enterprise, as described below. When an underwater explosive charge detonates, there are two principal products: a shockwave and a bubble of hot, high-pressure gas. These effects result in a nearby vessel being subjected to a pressure profile (see chart on page 2)



Plume generated by underwater explosion at DSTG at Fisherman's bend, Melbourne

Shockwave

The shockwave travels very quickly (initially above the speed of sound in water, itself an eye-watering 1500m/s), and causes a near-instantaneous pressure rise, followed by a more gentle decay. The effects of this shockwave on a nearby structure are complicated by potential reflected shockwaves from boundaries such as the sea floor and the free surface. The boundaries of these reflected shockwaves will

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influence the reflected pressure profile and shock wave energy. In most cases, the geometry of the local environment (in particular, the depth of charge, depth of vessel and depth of sea) will also result in these shock waves arriving at different times at the target vessel and interfering with each other, resulting in a very complex pressure-time history.

Gas bubble

When detonated at sufficient depth,

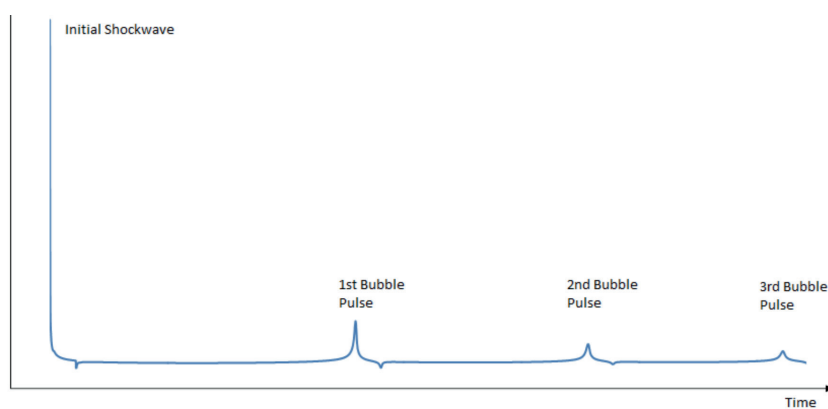


Chart showing pressure profile resulting from UNDEX

the gas bubble from the explosion is confined by water on all sides. As the gases within it are at high pressure, the bubble expands, moving a large body of water with it in all directions. Inertial effects from this accelerated mass of water result in the bubble expanding beyond the equilibrium position determined by hydrostatic pressure at that depth. This continues until the fluid inertia effects become less significant than the hydrostatic pressure, at which point the bubble begins to collapse. This contraction phase occurs at a much faster rate than the expansion phase and results in a large pressure pulse being emitted into the surrounding water.

This process repeats until the bubble either breaks onto a surface (i.e. it breaches the free surface or impacts on an adjacent vessel) or loses most of its energy to viscous effects (typically after the 3rd or 4th bubble pulse). When the explosion occurs close enough to the target vessel, the gas bubble suffers a violent collapse, with a resultant water jet that is typically much more

destructive than the initial shock. The pulses emitted during the bubble oscillation have a lower peak overpressure than the initial shockwave, but each pulse lasts for significantly longer, meaning that the accelerations imposed on the target vessel may be even more severe than those from the initial shockwave. The loading on the target vessel from these

depending on the size of the explosive charge, its standoff distance and its orientation relative to the vessel. These effects are too complex to be readily described in terms of design requirements, so acquisition contracts typically provide equipment suppliers with simplified shock criteria to enable the design to proceed.

Experienced engineering judgement and interpretation is needed to apply these traditional design criteria to distributed items (such as torpedo tubes), and the simplification necessary for practical design means that there is a significant risk of over-design or, worse, under-design. Advances in computational methods, coupled to very fast modern computers have resulted in Fluid Structure Interaction (FSI) becoming a credible tool to model real structural behaviour when subjected to UNDEX.

Babcock is sponsoring a PhD project in this domain through the Research Training Centre for Naval Design and Manufacturing (RTCNDM), an Australian Research Council-funded centre. Babcock's PhD student (author De Candia) is currently located onsite at DSTG at Fishermans Bend in Melbourne, where he is working together with experienced shock modelling and FSI experts to plan, conduct and analyse a suite of experimental tests to determine the



effects of near-field UNDEX on a fully submerged vessel. The data from these experiments will be used to better understand the loading mechanisms on submarines subjected to UNDEX and to improve procedures for assessing mounted equipment. State-of-the-art techniques will be used to correlate FSI simulations with these experimental results for both near- and far-field UNDEX, allowing the development of a design tool to improve assessment of naval structures for shockwave and gas bubble effects. The collaborative approach adopted for the project through the RTCNDM is expected to bring significant advantages that could not be realised from industry, academia or DSTG working alone. The close links fostered across these domains will

help ensure that acquisition bodies, platform and equipment designers and acceptance authorities all benefit from dissemination of the research findings. The common understanding that is developed will help ensure that future naval platforms are safer, more cost-effective and ultimately more capable than ever before. Acknowledgements The authors acknowledge the support of the Research Training Centre for Maritime Design and Manufacturing (RTCNDM) in this investigation. The RTCNDM is a University-Industry partnership established under the Australian Research Council Industry Transformation grant scheme (ARC IC140100003). The RTCNDM is a collaborative undertaking between six industrial partners (Babcock, ASC Pty Ltd, Austal, PMB Defence Engineering Pty Ltd, Serco Defence and Thales

Australia Ltd), three universities (Flinders University, University of Tasmania and University of Wollongong), as well as the Defence Science and Technology Group (DSTG – formerly DSTO) and the Defence Materials Technology Centre (DMTC). Overall, the RTCNDM supports ten PhD students and three postdoctoral researchers who are engaged with a range of projects in the naval domain.

STEVEN DE CANDIA / MAX RADCLIFFE

Steven De Candia is a PhD candidate working with the Australian Maritime College at the University of Tasmania and the Maritime Division of DSTG. Max Radcliffe is Chief Engineer at Babcock's Submarine Systems and Design Centre based in Osborne, SA

GLOBAL ENGINEERING DEBATE

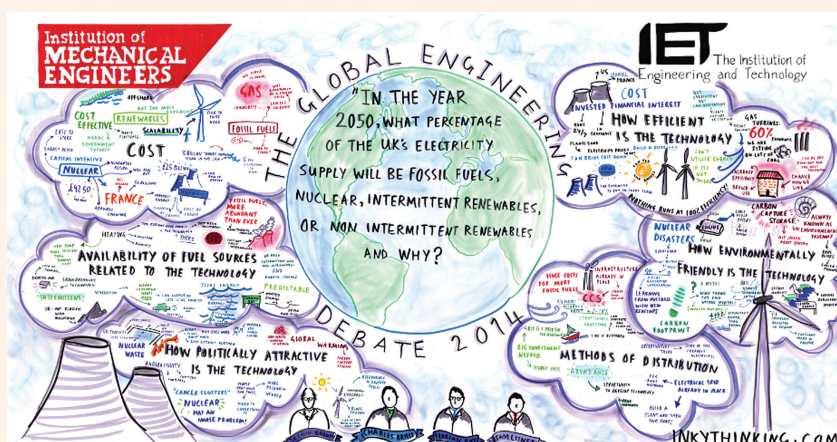
The Global Engineering Debate (GED) is an initiative created and administered by the Young Members of the Institution of Mechanical Engineers from across the world. Its purpose is to create a platform where young engineers around the globe can debate the key issues that affect the current and future generations of engineering professionals. In 2015 the GED was launched at the IMechE HQ at Birdcage Walk in Westminster, and further events have taken place in Hong Kong and across the globe.

In October we held the Australian leg of the IMechE Global Engineering Debate, which in 2015 was on the subject of Energy, and in particular "Which energy technologies should Australia expend most of its resources in developing to ensure the continued security, affordability and environmental acceptability of Australia's electricity supply?"

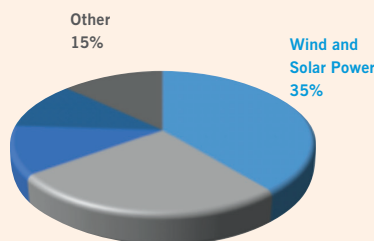
The event was ably chaired by (the appropriately named) Neil Watt, Manager of Network Planning & Development at CitiPower. In the debate we had four excellent speakers, each of whom fought the corner for the particular energy technologies they were representing. Speakers included the former Australian Chief Scientist, Professor Robin Batterham, who took on the task of representing Nuclear Power. The debate was well attended, and generated a lot of interest from the audience with more questions asked than we had time to cover. The audience took part in a live poll before and after the debate using their smart-phones, the results of which are shown below.

The event is set to take place again this year, with this year's global topic being Transport. If you would like to help organise this year's debate, or are passionate about a particular Transport Technology please get in touch.

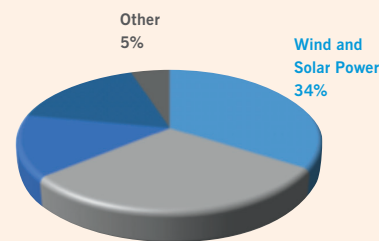
KHALID ABDULLA
Victorian YM rep



BEFORE DEBATE



AFTER DEBATE



VICTORIAN SPEAK OUT FOR ENGINEERING

The Victorian round of the Speak Out for Engineering competition was held on 29th November in Melbourne. In keeping with the idea of enhancing the skills of young engineers, it was fitting that the venue was the Old Engineering building at Melbourne University.

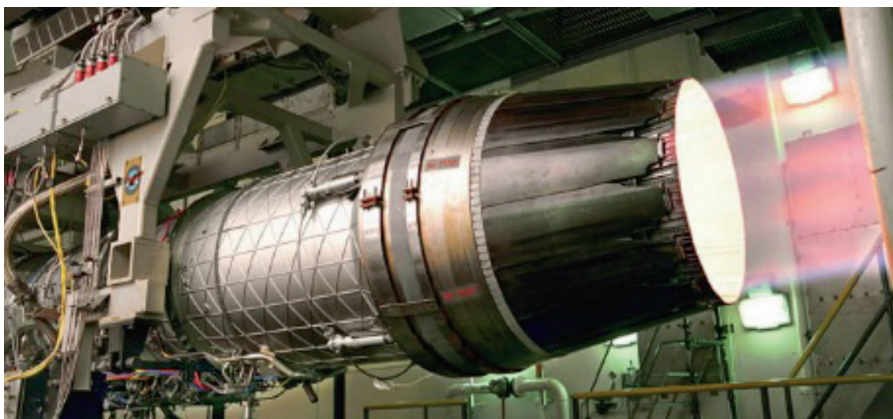
The event was very well supported, with five speakers and an audience of more than 30. The topics covered were quite diverse; from the geometry of aircraft gas turbine exhaust nozzles, through to encouraging school students to be enthusiastic about STEM subjects by taking part in robot competitions.

The winner of the competition was Alireza Mohammadi who talked about the need for, and early stages of the development of, new tools to enable minimally invasive surgery. His prize was £300. Second place went to William John Teare for his talk on gas turbine nozzle geometry. His prize was £200.

Alireza gave a well measured presentation, outlining the need for improved surgical tools and how these might be developed. Whilst some of the other competitors tackled more technical subjects, the aim of the competition is to improve the presentation skills of young engineers. The majority of marks being allocated for presentation, and only 10% being allocated for technical content.

First prize winner has the opportunity to compete in the Oceania Regional Final, which will be held at the University of Tasmania On Saturday 12 March 2016. The winner from the Australian competition will have the opportunity to compete in the Asia Pacific Regional final.

**BRIAN CARTER AND ROSHAN
DODANWELA**



Victorian Speak Out for Engineering runner up was William John Teare for his talk on gas turbine nozzle geometry

FROM THE CHAIR

Welcome to the first News Bulletin for 2016. I trust everyone had a pleasant Christmas and New Year.

There are a number of events scheduled for 2016. The first one is the Australian Branch AGM which will be held on Saturday 12 March at the Grand Chancellor Hotel in Hobart, Tasmania. While the morning will provide a chance for the Australian Branch Executive Team to meet, discuss and plan for the direction of the IMechE in Australia for 2016 and beyond, the Regional Final of the Speak out for Engineering (SOFE) will also be held at the same venue after the conclusion of the meetings in the morning. Since the SOFE Final in Melbourne in early 2015, a competitor from New Zealand has also participated in this completion thus making it a regional competition. This is a worthwhile event to attend if you plan to be in Hobart in mid March. The next event is the annual Engtravaganza, where Members visit a local location of engineering interest. It will be held on Sunday in Hobart after the AGM on Saturday. Please refer to NearYou on the IMechE website for more details.

I would like to take this opportunity to thank all the volunteers who provide their valuable time to assist in the Institution's activities. One of the recurring ones are those who organise and participate in the increasing number of Professional Review Interviews (PRI) around

the country. As the name and professional credentials of the Institution becomes increasingly familiar amongst local Engineers, I anticipate a steady increase in the need to perform ever more PRIs to admit potential candidates into Professional Membership of the Institution. To this end, I would welcome assistance from the Membership to ensure that potential candidates are interviewed in a timely manner. Please go to the NearYou page of the IMechE website to contact your local Panel if you wish to volunteer.

Your Panel works hard to organise events throughout the year like technical visits and the like in your individual States. However, occasionally, the numbers attending are so low that it no longer makes the visit worthwhile. Perhaps it is time to contact your local Panel to advise what kind of events you would like them to organize or maybe assist with the organization. Once again, visit the website and NearYou!

The Australian Branch is what you make of it. With our collective energy, I am confident that we will be able to achieve much this coming year. I look forward your participation and working with all of you in 2016 to make this Institution a vibrant one that is full of activities and fun to be a part of.

LESLIE YEOW

AustraliaChair@imechenetwork.org



and business lies. There have been a number of extremely high profile examples where engineers have had to make these business / greater good assessments. Thirty years ago the Challenger space shuttle exploded on take-off, killing all 7 astronauts on board. The previous night, four of the engineers working

prosecute individual engineers if they believe that they are responsible for a particular action which results in the breaking of laws, or damage to people or property. In reality though, head management are normally held accountable for the actions, possibly for financial reasons more than any other. It will be interesting to see how the US EPA go after VW, and the wider implications for the automotive world.

EDITORIAL

The VW vehicle emissions scandal has had far reaching consequences for not only the VW group, including Audi and Skoda, but also other vehicle manufacturers and engineers of all spectrums.

The Environmental Protection Agency (EPA) in the U.S. takes a very tough stance on polluters of any description, and they declared some years ago that CO2 and other greenhouse gases constitute toxic air pollution. This means that anyone producing these gases is subject to strict requirements and possible fines for non-compliance. In the case of automotive vehicles, the responsibility has been laid with the vehicle manufacturers rather than the final user. Vehicle manufacturers are all aware of the rules and spend large resources ensuring that they are compliant with all of the homologation requirements in each region. However, they must still produce vehicles people want to buy at a production cost that makes a profit. This is where the balance between civic responsibility

on the project had tried to stop the launch due to concerns that the seals on the rocket boosters would not hold in cold temperatures. The engineers' managers and NASA overruled them, and the rest is history. The engineers involved have had to live with that memory for the rest of their lives. Risk management is a large and growing field in engineering, but sometimes even risk management itself can pay the price for poor decisions based on perception of the correct path. Take the instance of the Ford Pinto; the vehicle was alleged to have a fault which allowed for the fuel tank to explode upon rear impact. It turns out that the vehicle was as safe as most other competitor vehicles. The mistake was made in analysing the risk to the company by putting a dollar value on the loss of life to try and analyse the risk to the company accordingly. Clearly engineers have a responsibility to do the right thing, for both their employers and the wider world. However, keeping everyone happy is not always easy and where does an engineer's responsibility end? The U.S. legal system has the ability to

MATT PROUDLOCK

News Bulletin Editor

AustraliaNews@imechenetwork.org

YOUNG MEMBER NEWS

As you may be aware I have taken over from Amy as the Australian YM Chair. I'm pleased to announce that there have also been a number of recent new YM appointments across Australia: Nisha Nijhar who is a student at the University of Melbourne has taken



Nisha Nijhar

Victorian Young Member Chair



Ibrahim Shahin

Queensland Young Member Chair



Challenger space shuttle exploding shortly after take-off



Young Members visit Carnegie Wave Energy tour

over from me as the YM Chair in Victoria.

Ibrahim Shahin who works at BG Group is now the YM Chair in Queensland.

Sam Wong who works at Rio Tinto is now the YM Chair in Western Australia.

Please make the new YM Chairs feel welcome, get in touch with them about any ideas you have for events you would like to see in your area, and help them in getting up to speed in their new roles.

The first big national YM event of the year will be the 2016 EngTravaganza which will take place on Sunday 13th March in Hobart. It will be co-located with the Australia branch AGM, and the national finals of the Speak out for Engineering competition. We are still in the process of finalising plans for the EngTrav-2016, but at the moment the front-runner is a group tour of the Tasmanian Transport Museum, but please get in touch with myself or Nisha if you have ideas for fun engineering-related activities in the Hobart area (that can be done on a Sunday!).

In October last year the Western Australia YM panel organised a well-attended and successful tour of Carnegie Wave Energy, based in North Fremantle. Many thanks to Rory Mulligan and others for organising it. Carnegie Wave Energy are the inventors, owners and developers of the CETO wave energy technology that converts ocean swell into zero-emission renewable power and desalinated freshwater. Presentations were given by Daniel Taylor (Carnegie's

Research & IP coordinator) and Jamie Pickles (Carnegie Graduate Engineer). The tour included an opportunity to get up close to one of Carnegie's prototype wave energy converters (see photo). There was great interest from everyone who attended and more questions than could be accommodated in the time available.

KHALID ABDULLA
YM Chair

OCEANIA NEWS

No doubt by the time you read this, Christmas will be a long time ago. But, sitting writing this in mid January means I'm still in that reflective mood the holidays always invoke. Christmas day was the usual present unwrapping and playing with toys (both my 8 year old and me for that matter). One present my daughter received was the Goldieblox product – a construction set aimed specifically to appeal to girls. My daughter and I spent a good hour building a working merry-go-round. Perhaps I should be more specific, my daughter spent the hour following the instructions, and I spent an hour resisting the

temptation to jump in and do it for her. I was successful in not jumping – and therefore I got to witness my daughter's pride in completing the build, and enjoyed the learning opportunities the processes provided. (Now I'm sure I could have designed and built a better one but that is beside the point). My point is that this hour provided me the chance to reflect that perhaps the gender gap in engineering can be helped by such things. By specifically targeting the product to girls, and packaging the product that way, then this is a undoubtedly girls toy – and as I'm constantly told by my daughter – girls and boys are very different!

The fact that the construction process introduced her to gearing, pulleys, drive belts and many good mechanical engineering concepts is by the by. It was a toy that my daughter enjoyed, and it introduced her to creating mechanical engineering objects. More of that for the 8-10 year olds, and we might yet have a more gender balanced engineering population!

Since my last update I have again had the opportunity to visit HQ for the International Chairs Meeting on a Tuesday, and to participate in Council on the Wednesday. Key elements of this:

- Stephen Tetlow (CEO) talking of a Federated Approach working with the other Professional Engineering Institutions (PEI) in the UK, and around the globe (something we do very



Goldieblox toys featured by Time magazine as one of the best for teaching Engineering to the next generation

effectively with IEAust and IPENZ here in NZ).

- A review of the IMechE Vision and Mission is currently ongoing

- Membership is now at 112,961!

More locally, the State based SOFE competitions have been run and won, and preparations are well underway for the regional final to be held in Tasmania in the coming months.

Planning has matured for a range of learned society activities across NZ and Australia – at which participation, and attendance is warmly welcomed.

Check out the Near You pages:

<http://nearyou.imeche.org/near-you/>

oceania/Australia. Congratulations are also due to Darren Sharpe, who in addition to being our lead in NZ, has also been appointed as Chairman – National Executive of the Mechanical Engineering Group (A Technical Interest group of IPENZ)

The Oceania Regional Committee is meeting again face to face in Auckland at the end of January (and we have invited the CEO and National Executives of IPENZ to join us for part of the day). The intent of the day is to reflect on what the IMechE achieved in 2015; to see what we can do better in 2016; and to look at how we can

collaborate with IPENZ during the coming years. All contributions to our thinking from the membership are welcomed – if you have a good idea, a gripe or a revelation – feel free to share it. We welcome the feedback – as after all, we're all volunteers working for the good of our institution.

Anyway, now my daughter's safely in bed, I'm off now to build that better merry-go-round!

IAN MASH

Oceania Chair

Insights into F1® racing and the challenges of managing change in a dynamic environment

Presented by Richard West



FRIDAY 11 MARCH 2016

A Technical Lecture presented by the Institution of Mechanical Engineers Australia Branch

Time: 5.30pm for a 6:00pm start

Venue: Engineering Lecture Theatre 201
University of Tasmania
Sandy Bay Campus

Cost: Free

RSVP <https://nearyou.imeche.org/near-you/oceania/Australia>

Contact: Roshan Dodanwala

Email: AustraliaSec@imechenetwork.org

Notes: Refreshments will be provided

Formula 1® Motor Racing today is a complex interaction of technical and commercial challenges linked to the demands of a highly pressured season featuring twenty one races taking place across the globe from March until November.

Combined with rapidly alternating global economic conditions, new and challenging emerging markets, and faced with a diverse range of increasingly mobile and selective consumers from differing cultures, it is both a sport and a business in which the teams have to encourage and encompass constant change if they are to be competitive both on and off of the track.

Richard West, a renowned international business and motivational speaker has worked with the best in the sport. Originally trained as an automotive mechanic, he moved into the commercial world of motor racing in the 1980s and subsequently held senior commercial roles with the McLaren, Williams and Arrows Teams. He was also a main board Director of the TWR Jaguar sports car teams, winners of the Le Mans and Daytona 24 Hour sports car races in the 1990s. Latterly in the new millennium he went on to revitalise the British Touring Car Championship in the United Kingdom and in his career he has raised in excess of USD165m worth of sponsorship.

He has worked alongside a total of nine World Drivers' Champions including Alain Prost, Niki Lauda, Keke Rosberg, Nigel Mansell, Damon Hill, the late Ayrton Senna and Michael Schumacher.

Today he works for some of the world's most influential businesses as a speaker, facilitator and learning and development coach and now runs a major motorsport based training programme based in Melbourne Victoria for the rail industry. He will share with us a unique insight into Formula 1® racing, the challenges it faces and how the top personnel, teams and manufacturers continually attain peak levels of business and sporting performance and how adapting to change can open up endless opportunities for those wishing to take up the challenge.

More info can be found at: www.richardwestassociates.com

REGIONAL NEWS

Victoria News

Much like the majority of 2015, the latter part of last year continued to be a busy time for the Victorian panel. We held a number of events which included: the Global Energy Debate, an IMechE quiz night, ran the Victorian leg of the Speak Out for Engineering (SOFE) competition and finished the year with a lively Christmas function. For IMechE Victoria, it must be said that 2015 was a stellar year! We enjoyed visits from both the IMechE President and Vice President, hosted the Australian Branch Committee Meeting, the Annual General Meeting and the Australian SOFE competition final. The panel also kicked-off a mentor/mentee programme, held our annual 'Christmas in July' dinner and presented a number of really interesting technical lectures that were delivered throughout the year. We also held several social networking nights where fellow members had a great opportunity to meet up for a light-hearted chat over a cool beverage. While 2015 may prove a tough act to follow, the panel will continue to work hard and offer members some diverse and interesting events for 2016. To kick start the year, there will be a series of exciting lectures and site visits focused on rail. First off the rank will be a lecture presented by Victorian panel member Paul Draper detailing the new trains for Wellington, New Zealand. This will be followed by a lecture on both thermal rail remote monitoring and rolling stock monitoring. The series will culminate with a site visit to the Puffing Billy workshops and include a relaxed lunch. Please let me take this opportunity to wish all Victorian members a Happy New Year and I look forward to seeing you at the various events throughout the year.

MATTHEW COOK

Victorian Panel Chair

QLD News

We held a committee meeting in the Brisbane city library and it was pleasing to see the amount of support. The discussion generated some good ideas to attract new talent to

the group, and to grow the IMechE within Queensland using the various social media tools available to the group such as LinkedIn. We believe that mass mail outs to our members would not be effective and we need to be creative to engage. We completed several PRI interviews, which was excellent as the committee are all busy, and this effort from the volunteers is greatly appreciated by the committee, candidates and IMechE. As always we can always use more volunteers for the role, it creates engagement and encourages networking to some extent as interviewers get to meet and work with other interviewers, meet candidates etc. We still have planning to do for 2016 and the bulk of this will be decided at our February committee meeting, invites will be sent out soon.

WOLFY DEMPSEY

QLD Panel Chair

NSW News

It has been six months since NSW gave an update, it was a busy last half of 2015 with lots of exciting presentations and social events. The NSW Panel have been doing a



Victoria panel will host a series of rail focused lectures in early 2016

university roadshow, and we finished off the season in September with Macquarie University presenting to the new Mechanical Engineering Department students on the various career paths one can take with a mechanical engineering degree, as well as the benefits of joining the IMechE as an Affiliate member and being involved in our young members group in NSW. The committee has found the University Roadshow very successful and we have had great feedback from students who have found the presentations insightful and interesting so we plan to run something similar again this year.

PROFESSIONAL ENGINEERING APP SURVEY

Your chance to give your feedback on the new Professional Engineering (PE) App.

PE's new app is available free of charge to all IMechE members.

The app contains everything from

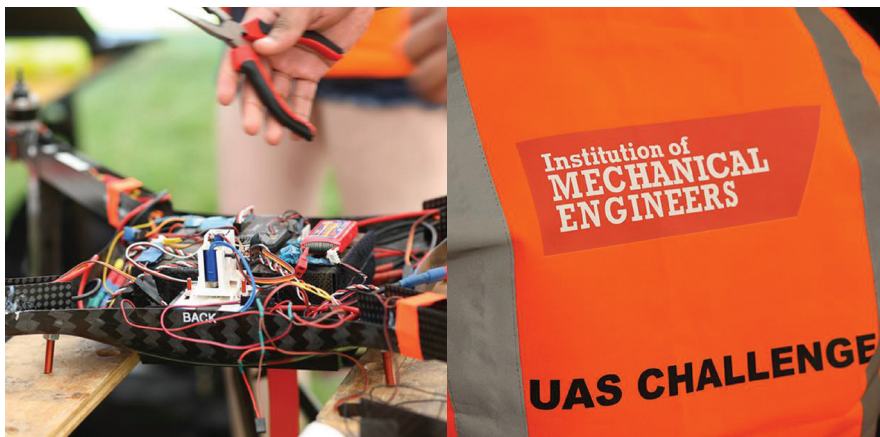
Professional Engineering magazine plus the best stories from the website.

PE App has attracted tens of thousands of downloads since launch and now we'd like you to let us know how we can make it better.

If you've used our app please answer our short questionnaire. Responses are anonymous and it won't take longer than two minutes. You can complete the survey at: <https://caspiamedia.wufoo.eu/forms/pe-app-survey/>.

Thanks
PE team





NSW SOfE contestant Yun-Hang Cho presented on the IMechE "Unmanned Aircraft Systems" competition and the University of Sheffield's Suimurq project.

The NSW Mechanical Chapter have had some technical presentations of late in conjunction with IMechE, EA and ASME at the Engineers Australia auditorium in Chatswood. In September IMechE committee members Russ Ross and Anna Davis had an evening of workshopping and discussion on how using and enhancing your social skills can help you improve the way you deliver your presentations. Russ and Anna have worked as mechanical engineers in the building design industry for more than 7 years. In addition to their technical knowledge and experience they have developed and honed the specific combination of skills required to work closely with clients, architects, developers, investors and multi-disciplinary engineers. 'The Presentation Blueprint' was an interactive workshop designed to help young engineers develop their confidence in public speaking and presentation skills. Russ and Anna guided the working group through a collection of interactive techniques and exercises that they could start to use immediately and covered the cornerstones of being a good presenter; your mindset, your delivery, your body language and your environment. The IMechE sponsors an international competition every year 'Speak out for Engineering' for young engineers. The aim is to encourage the development of presentation skills of engineers in industry. Monetary prizes are presented at each stage of the competition. The winner in NSW goes forward to the Australian competition which this year will happen in Hobart, Tasmania in

March 2016 and then from there can be sent to the regional competition. This year we had three fantastic topics being presented. Neal Fleming's presentation title was "I want to be an Engineer – not a Superhero". In 2009, a group of 5 year olds were asked what would be their dream job and the most popular answer was... "Superhero"! Is it realistic to think that one day the most popular choice could be "Engineer" rather than "Superhero"? His presentation looked at the challenges faced in encouraging children and young adults to pursue a STEM career and what the future may look like for budding engineers. Yun-Hang Cho from UNSW presented on the IMechE launch of their first Unmanned Aircraft Systems competition which was based off the success of formula student competition and aims to provide students with an engineering design experience in the aerospace field. In his presentation Yun talked about the journey taken by the University of



Mia Lion presented to NSW panel on Life in a Formula 1 team

Sheffield team, Simurq Aeronautics as they went through the stages of startup, recruitment, initial design, preliminary design review, test model, detailed design, critical design review, manufacture, assembly, flight readiness review, competition flight, contribution towards new manufacturing techniques, post competition development and impact on education and outreach. He discussed some of positive and negative effects of this un-trialled dual pronged approach and the managerial lessons learnt, which could be applied to other engineering projects.

Specifically his presentation discussed, the carbon fibre monocoque produced by the team with the Composite Systems and Innovations Centre which is the most geometrically complex electrically cured shape. Traditional curing processes require use of non-mobile energy intensive ovens or autoclaves. The team's contributions will allow in-the-field curing of carbon fibre enabling much stronger repaired parts, hence increasing safety in the aviation industry and beyond.

Jevan Arulampalam presented on Markerless Motion Capture: Concurrent Validity of Microsoft Kinect Cameras. The following presents a synopsis of his presentation:

One of the most effective tools used for biomechanical analysis is motion capture (MOCAP). Currently clinicians (surgeons in particular) must use highly specialised, expensive cameras in conjunction with a set of anatomical markers to produce accurate results. The invasiveness, cost, and inconvenience are limiting factors and make it difficult for surgeons to convince patients to undergo the analysis.

To this end markerless MOCAP is becoming an increasing field of interest as it is far cheaper, less invasive and does not require a highly trained technician. This study aimed to validate the accuracy of a markerless MOCAP system (iPi Soft) by running an experiment with both iPi SoftTM and ViconTM systems simultaneously and comparing the results of flexion/extension. The graphical results produced in MatlabTM, demonstrated that iPi Soft produces similar trendlines to Vicon and has high repeatability. With low cost systems such as iPi Soft,

clinicians and engineers can gather large amounts of accurate, dynamic data. This data will allow better designs of hip implants that are designed to patient-specific movements, rather than to averages.

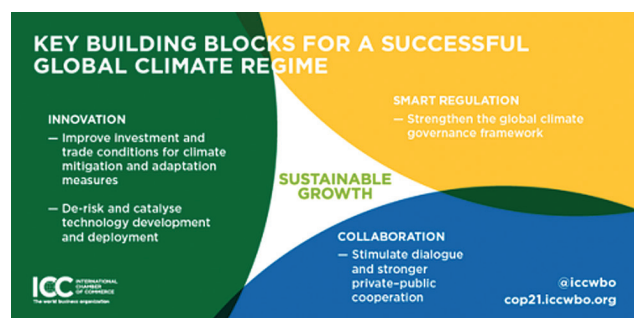
Thus it was concluded that iPi Soft is a feasible alternative for MOCAP and with further testing, can be easily transitioned to the clinical setting. The Speak out for Engineering event was well attended and the judging panel had a hard time coming to a consensus, a big congratulations to Jevan who came first place and Neal who came second place, Jevan will now compete in the National competition in Hobart.

In November, Mia Lion from EY presented on the various aspects and perspectives of being a team member in a Formula 1 Team. The presentation covered that Formula 1 requires that staff not only have a high level of technical skills, but also have the soft skills required to perform under pressure, including excellent communication skills, strict discipline and extreme team work ability. Mia started her career as a team member in the Renault Formula 1 Team and at the time, Mia was also the only female engineer on the team, bringing different challenges to the team and to herself.

From 2004 to 2006, Mia travelled all around the world to provide engine and gear box state of wear diagnostics to the F1 team engineers. Her work helped the teams to balance the engine and gear box performance and reliability.

The presentation was very well received with so many questions from the audience that we ran out of time.

A week after giving the presentation Mia welcomed her baby boy Tom to the family, congratulations Mia!



IMECHE'S VIRTUAL LIBRARY EXPANDS

The IMechE has made accessing the extensive contents of its online virtual library and archives easier with new search functionality.

The contents of the virtual library and archives are increasingly be made available to those members unable to visit the physical library at One Bird Cage Walk, London. Accessible here, the library contains more than 40,000 online books, journals, guides, records and databases.

Sarah Rogers, manager of information and library services at the IMechE, said: "The virtual library contains everything from subscriptions with the key scientific publishers to the latest business and trade journals, exclusively to IMechE members. In many cases you can get a free book. "But, the more content from different sources we had, the more confusing it was becoming to get what you wanted. The global search functionality has made it much easier, and we're expecting a real increase in users."

This year there has seen almost 300,000 'visits' to the virtual library, and more than 175,000 downloads of books and journals. Around 60% of users came from the UK, while the other top regions included the Netherlands, Germany, US, Hong Kong, UAE, Malaysia, Australia and India. Next year will also see the library team expand access to its archive and historical collections online for international members. The latest software will be used to render historical items in the archive in 3D online, while vital documents, such as the minutes of the first meeting of the Institution, will be made searchable.

Visit the Institution's Virtual Library today to find out more at:
<http://www.imeche.org/knowledge/library/virtuallibrary>



We look forward to another jam packed year of events in NSW, so watch this space and keep your eyes on our nearyou web page for details of upcoming events.

MONIKA SUD
NSW Panel Chair



PEOPLE, PLANET AND PROSPERITY

The end of 2015 saw one of the greatest events for global development take place. The United Nations (UN) held the annual Conference of Parties (COP), comprising nearly 200 countries. COP21, held in Paris in December 2015, brought together leaders of nations from around the world to commit to targets for helping extend the world's resources as well as improve living conditions for much of the human race. The targets have been titled the Sustainable Development Goals, or SDGs for short.

The SDGs originate from the eight Millennium Development Goals, the MDGs, which were agreed by the UN at the Millennium Summit in September 2000. The Millennium Summit was the largest gathering of world leaders in history and was the first global partnership where each of the nations committed to reduce extreme poverty. The deadline to deliver on the MDGs was 2015, at which point they would be reviewed and revised.

Attendees of COP21 discussed the revised goals, which had been reviewed in New York earlier in 2015. Within three weeks the 197 leaders needed to agree the targets which they would commit their nations to deliver. The SDG agreement is legally binding, creating high pressure for many poorer countries. One speaker stated that for the more affluent countries the agreement is about trade whereas for the poorer countries it is about survival. Due to the high pressure and short timeframe, interesting decision making techniques were used to overcome conflict.

The African representatives facilitated breakout sessions where an old tribal technique helped to overcome conflicts; each member of the session gave their aims and minimal requirements for acceptance which helped to speed up the negotiation process.

One of the most debated targets is that of climate change; whether to maintain 2.0°C or reduce the target to 1.5°C. This miniscule difference will impact the rising sea levels to a point which will determine the sinking or survival of many archipelagos around the world, namely Indonesia and the Marshall Islands. The agreed decision is to limit global temperature increase to 2.0°C above pre-industrial times and "endeavour to limit" them even more to 1.5°C. This is the type of compromise that could only have been agreed with the equal voice forum provided at the COP21 conference.

Further agreements include limiting the amount of greenhouse gases emitted by human activity to the same levels that trees, soil and oceans can absorb naturally as well as to review each country's contribution to cutting emissions every five years so they scale up to the challenge. It was also agreed that rich countries are to help poorer nations with financing in order to enable a switch to renewable energy, showcasing the truly global effort of the SDGs.

Progress on the SDGs are to be assessed in 2018 and every five years thereafter. This will ensure that each nation is maintaining the legal commitment signed in 2015. As the UN Secretary-General, Ban Ki-moon, said, "The seventeen Sustainable Development Goals are our shared

vision of humanity and a social contract between the world's leaders and the people... They are a to-do list for people and planet, and a blueprint for success."

The COP21 conference and the SDG agreement received a large amount of focus by the world's media. Many people had comments on the tough targets, particularly the question of how we are to deliver. One solution came to many minds; call in the Engineers. We love to solve problems and here the UN is providing 17 clear issues that need to be solved. Even Prince Philip has stated that Engineers hold the key to our future, stating "Everything that wasn't invented by God was invented by an engineer".

Now is the time for Engineers to step up and invent ways to meet the challenging SDGs in time for the 2030 deadline. The World Federation of Engineering Organisations (WFEO) is working to bring together the global engineering community. Bearing in mind that Australia ranked the third lowest in the Climate Change Performance Index, ahead only of Saudi Arabia and Kazakhstan, it is time for us to make a change.

Further reading: <https://sustainabledevelopment.un.org>, <http://www.wfeo.org/> and <https://germanwatch.org/en/9472> for the Climate Change Performance Index. Figure 1 - Millenium Development Goals (MDGs) agreed in 2000 and form the basis of the Sustainable Development Goals (SDGs) agreed in 2015

AMY LEZALA

Oceania YM Chair



IMECHE 2016 AUSTRALIA BRANCH AGM AND DINNER

HOBART, TASMANIA

The 2016 IMechE Australian Branch AGM (No.56) will be held on Saturday 12 March at The Hotel Grand Chancellor (1 Davey Street, Hobart). The AGM will be followed by a self-paid dinner at the hotel. Members of the IMechE (and partners) are welcome to attend the AGM and dinner.



The following members are the sole nominees for office bearer positions for 2015/16. They will be declared elected unopposed at the AGM and will take up positions during the third week of May 2016.

- Australia Branch Chairman: Leslie Yeow
- Australia Branch Hon. Secretary: Roshan Dodanwela
- Australia Branch Hon. Treasurer: Ken Tushingham
- Australia Branch Assistant Hon. Secretary and News Bulletin Editor: Matthew Proudlock
- Australia Branch Young Member Section Chair: Khalid Abdulla

The complete list of activities planned for the weekend starting Friday 11 March to Sunday 13 March 2016 is listed below. Members of the IMechE are invited to attend all of the events.

Date / time	Activity	Venue / Cost
Fri. 11 March 5:30 pm	Technical Presentation Lessons learnt from the F1 industry and managing change in a dynamic environment. Presenter: Richard West	Theatre 201, University Tasmania, Sandy Bay Campus (Free) Engineering Lecture of
Sat. March 12 3 pm – 6 pm	Speak out for Engineering 2015 Oceania Region Finals 1 Davey Street, Hobart	Hotel Grand Chancellor, (Free)
Sat. March 12 6 pm – 7 pm	Australia Branch AGM 2016	
Sat. March 12 7:30 pm – 10 pm (\$60 per person)	Dinner with Australia Branch Committee	Hotel Grand Chancellor
Sun. 13 March 9 am to 2:30 pm	"Engtravaganga" - Organised by the IMechE Young Member Section. Visit to the Tasmanian Transport Museum , ride on a steam train followed by lunch	TBC

Please address all *News Bulletin* correspondence to:

The Editor
IMechE News Bulletin
39 Bonsey Road,
Highton, Victoria 3216
Ph: (m) 0432 978 547
australianews@imechenetwork.org

Exec Committee:

Leslie Yeow
Roshan Dodanwela
Ken Tushingham
Ian Mash
Matthew Proudlock
Amy Lezala

Websites:

IMechE
www.imeche.org

Social Media

Twitter: @IMechE_OzYM

Check out the young members on Facebook as well! Follow the links on their nearyou page.

Please address all News Bulletin correspondence to:

The Editor
IMechE News Bulletin
39 Bonsey Road
Highton,
Victoria 3216
Ph: (m) 0432 978 547
australianews@imechenetwork.org