



## OVERCOMING ADVERSITY AT FORMULA SAE-A

**The University of Wollongong claimed their first ever win in the Formula SAE-Australasia competition, held at Calder Park from 8th to 11th December 2016.**

Shattered wings tend not to allow for a win in formula racing, let alone with student engineers. However, this is exactly what University of Wollongong (UOW) Motorsport achieved at the 2016 Formula SAE-Australasia competition.

The team faced some challenges with the front wing during the event, when the vehicle collected a cone at high speed and suffered delamination of a carbon fibre panel. This was rectified by opening a rear flap to decrease rear downforce and drag, hence balancing the aerodynamics. The ad-hoc change allowed the UOW Motorsport 2016 campaign racer, named 'Hollie', to perform competitively and conquer the championship. Hollie is an open wheel style internal combustion vehicle,



powered by a Honda CBR-RR 600cc bike engine. The power plant's key features include Jap cam pistons with a 14:1 compression ratio, a custom 3D printed nylon 12 intake and a 4-2-1 configuration titanium header exhaust pipe. There is also a custom built aluminium 6000 dry sump plate, three stage dry sump pump and fuel tank with Holley HydraMat reservoir system. All assembled by UOW students.

Each year, UOW Motorsport's student run team designs and builds a new car, which in 2017 will incorporate a electric vehicle to bring new research and technologies to use in this arena.

For more information, contact Brett McAuley (2017 UOW Motorsport Principal) at: [mbsm964@uowmail.edu.au](mailto:mbsm964@uowmail.edu.au)  
The team appreciates any and all support.

**Brett McAuley, UOW Motorsport**

### Did you know?

*The Formula SAE-A event is a four day long competition centred on the design, construction and racing of an internal combustion or electric race car. The competition presents students with the opportunity to develop skills in design, management, manufacturing, communication, research and business operations in a real world environment.*



# RACING THE M16

**Monash Motorsport team  
aim for eighth consecutive  
win at 2016 Formula  
SAE-A , but are pipped to  
the post by the University  
of Wollongong and  
Universitat Politecnica de  
Catalunya.**

The Monash team of university students design, build and drive their own open wheel race cars in the international Formula SAE-A competition. They recently unveiled their latest vehicle, the model M16, and were hot favourites to win amongst the 37 teams competing at Calder Park.

Team Leader Jenny Kwong said that the team have put in a huge effort.

"We have spent the last year designing the M16 with a strong focus on driver

training and concept utilisation. The car is a simple design that has been heavily tested to validate the concept".

In the Formula SAE-A Student competition, Monash Motorsport raced against teams from across Australia, New Zealand, Asia and beyond. They also competed in the UK and European events earlier last year. "Our team vision is to be the most respected F-SAE team in the world. This vision is built upon our values of learning, performance, professionalism and camaraderie," Jenny said.

Monash Motorsport competed in three international F-SAE events in 2016, racing at Silverstone, the Red Bull Ring and the Hockenheim Ring. Although their final results weren't as spectacular as they may have hoped, they scored highly in many of the static events and gained invaluable experience.

Jenny became the leader of the team this year while completing the final year of her double degree in science and mechanical engineering. She said that the Monash Motorsport team has been a big part of her life for the last four years. "I've found my place within Monash Motorsport. We're a team that celebrates everyone's strengths, so it

doesn't matter if you're a woman in engineering, how much you love cars or if you've ever picked up a power tool before. Ultimately, the one thing everyone on the team has in common is an unwavering passion for our project and a strong desire to learn and achieve," she said.

Team members of Monash Motorsport regularly go on to complete internships and find paid positions within the automotive industry and professional racing teams. Jenny eventually hopes to be involved in the Dakar Rally as an engineer, closely monitoring race results by day and using the evenings to tweak the vehicle for the the next day of racing.

For all the latest news about the Monash Motorsport team's progress, you can follow them via their official Facebook page: <http://www.facebook.com/monashmotorsport>

Jenny Kwong - Monash Motorsport

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The Monash Motorsport Team, proudly displaying their Model 16 Racing Vehicle



# MORE INFORMATION ON THE M16

## Key attributes

- Engine: Single Cylinder KTM 510 engine with Garret Turbocharger
- Weight: 203 Kg
- Suspension: Double Wishbone, Willwood brake callipers, 3D printed Titanium uprights, Carbon wheel shells.
- Full aerodynamics package
- Top speed on track: 117km/h

## New features

- An all new suspension system which increases overall chassis stiffness but reduces unsprung mass.
- Advanced materials such as carbon fibre wheel shells and 3D printed titanium uprights.
- Increased cooling from dual radiators and a quieter exhaust and muffler system.
- Weight savings from improved aerodynamics package and manufacturing methods.
- Manual shifter replaced with ergonomic, pneumatic paddle shifting system.

## Lessons Learnt

The car needs to be fast on paper, but also reliable and properly set up for the conditions at each event. Meanwhile, drivers need training, experience and preparation to safely push the car to its limits. Next year's cars need to be simple, reliable, and have a low parts counts. Commonality between the two cars (Electric and Combustion) will be essential to enabling delivery of both cars within an extremely aggressive time frame and ensuring easy maintenance.

## Biggest challenges

Visiting Europe was a sizeable challenge as the team had to pack everything into a shipping container two months before the campaign even began. The team had to compete in three European competitions, compared to two in previous years.

## Best feature

The Monash team faced real challenges this year but grew in technical knowledge and on a personal level. One of their favourite features on the car is the set of carbon and aluminium wheels that really shows off the car and provide significant weight savings.



# A MESSAGE FROM OUR CHAIR

**In his final address as**

**Australia Chair, Leslie**

**Yeow previews the AGM**

**in March and renews calls**

**for volunteers to help the**

**institution.**

Compliments of the season to all the Membership. I trust we have all had an enjoyable Christmas and New Year.

As we look forward to 2017, we have first on our agenda the Annual Branch face to face meeting and AGM which is being held at the Rendezvous Hotel in Perth on the weekend of the 11th March.

The Regional SOFE (Speak Out for Engineering) Final will not be held immediately after the Branch Meeting as is usual, because it was already held in Christchurch in December 2016.

The SOFE had to be held earlier this time as we wanted to enable the winner to attend the Rest of World SOFE Final which is being held in Kuala Lumpur, Malaysia on the 26th February.

Congratulations to Mr Lucien Nguyen of WA who won the Regional Final in Christchurch. He will go on to represent Oceania at the Rest of World Final.

Congratulations also go to those who won the State Heats.

To all the Young Members reading this News Bulletin- as you can see,

this is a fun way of getting involved within the Institution.  
To the Members who will be in Perth during early March, please join us at the Rendezvous Hotel for the AGM where we will be presenting the Annual Report, Financial Report and confirming the office bearers for 2017. Please contact your local Panel to determine exact timing.

While it is pleasing to see Young Members participate in events such as the SOFE, it is a challenge for the Panels to retain enthusiastic members for any length of time due to their increasing mobility and professional obligations.

I believe this challenge can be addressed through ensuring that the Institution remains relevant and an exciting one to belong to.

Those of us who have already established ourselves as professional engineers could assist their local Panels by volunteering a bit of time, by either making a presentation or getting involved in the organisation of events.

Who better to provide a face to modern day engineering than those of us who are already in the profession? It is a good opportunity to meet people and encourage new practitioners to the profession.

I cannot believe how quickly the last two years have gone by. This will be my last note in the News Bulletin as Chair of the Australian Branch, as a new one will be elected in March at the AGM. I will however continue to serve the Branch as Immediate Past Chair for a year and will continue to work on initiatives I was unable to complete during my tenure. One of

those is the application to the BPEQ to enable the IMechE to become an assessor to admit candidates as Registered Professional Engineer Queensland (RPEQ).

I would like to thank all of those who assisted me over my two years as Chair and trust you will welcome and assist the new Branch Chair when he/she takes over in May.

**Leslie Yeow, Australia Chair**

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# THE FUTURE OF LOCAL TRANSPORT IN AUSTRALIA

The distance travelled by passengers throughout Australia has been rising consistently since the 1960s and is set to continue upwards. In 2014 the total number of kilometres travelled was around 190 billion, up from just 20 billion after the Second World War.

Currently, the personal car accounts for about 80% of all urban passenger transport throughout Australia. However, the use of cars within the major capital cities is becoming a less viable option due to population density increases and the car's relatively low passenger capacity.

The solution to this problem is mass transport solutions (such as trains and buses), which are able to carry a relatively high number of people per unit space.

One of the biggest challenges associated with mass transport solutions is setting up the supporting infrastructure. Generally those systems which are

able to support highest passenger density and fast transit times, such as overground and underground trains, have higher capital costs. Those systems with lower capital costs, such as buses, use transport routes already in place but are still subject to the traffic restrictions and congestion problems known to car drivers.

Governments are often involved in the laying down of public transport infrastructure and spending, and will need to balance the costs with any operating restrictions.

In the city centres, high density transport solutions are often the favoured option for carrying a large number of people in a small space. However, the picture becomes a lot more challenging when you start to move outside of the city centre. Here, the population density decreases significantly, making it more difficult to justify the cost of these mass transport solutions. Research has indicated that people do not want to walk more than half a kilometre to reach the nearest available transport node. Therefore, the current best approach is to utilize a combination of car parks, trains stations and bus stops. In a low density, sprawling suburban area, the number of nodes required is high and this will not be feasible in all locations. Even the number of parking spaces required in a given location may be infeasible.

Here, maybe, town planners have a greater part to play. Clear direction on alternative transport solutions need to be provided during the town planning phase, acknowledging the use of the car as a convenient method of door-to-door transport, while at the same time providing easy links to high density transport solutions that run direct to the city centers.

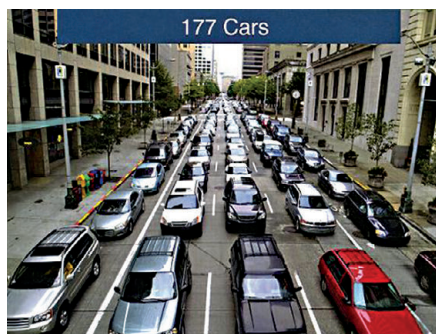
There are a number of tactics the authorities can use to encourage people to use the system and simplify the process. For example, in Curitiba, Brazil, buses run on dedicated lanes and a single ticket price applies for any journey. It is estimated that 85% of the population use the system.

Vienna and Hong Kong, renowned for their punctuality and systematic approach to transport, have an integrated transport network where passengers may seamlessly move between various forms of transport as required.

This approach has been mirrored in Melbourne, where a shared ticketing system applies to trains, buses and trams.

Khalid Abdulla - YM Chair

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Public transport has the potential to reduce congestion. As shown in cities like Vienna, it will only succeed if an integrated approach is taken to meet the needs of residents

# OCEANIA NEWS

**Do engineers value quantitative aspects or qualitative? In this article, our Oceania Chair considers the relative merits of each.**

The new year has commenced, and that means back to work. Can 2017 really throw up as many strange events as 2016? Just to be clear – that isn't a challenge to the world. Rather than moaning about things, I actually really enjoy what I do as an engineer, so hi ho, hi ho, its back to work I go!

One of our organisation's recent learning videos focused on the stereotyping of engineers vs. marketers (and I can hear you all turn the page at the thought of anything to do with marketing – but hear me out). The video suggested that the need of the stereotypical engineer to think through form and function would lead to sushi being advertised in the market place simply as 'cold, dead fish'. A funny notion – but very much one, which on reflection, I am guilty of doing.

As engineers we often talk of the form and function to the exclusion of value or how the product makes us feel. Ask a colleague about their car – do they say it's a pleasure to drive because of its luxurious seats, or is it the 170bhp, 4 wheel drive with traction control and supercharger (and no, I don't drive that – I drive a 2litre manual Mazda!)

As engineers we also seek to quantify everything. In a recent meeting of the Oceania Committee, we drafted up a one page dashboard of everything we've achieved for the region over the last few years. It was all x% increase in this, doubling of that. The qualitative, or value aspects were omitted. Maybe that was group-think at play, or maybe



it was a 'cold, dead fish' moment (once completed, we might publish the

dashboard here for you all to pour over – but back to my ramblings).

That theme works in another forum, too: membership and the perennial question as to why we might become (or remain) a member. We could (and often do) try to answer this quantitatively. A network of X hundred kindred engineering spirits, access to Y thousand books on the virtual library, 12 PE magazines a year (whether read electronically or on luddite paper like mine), and so on.

If I think about how membership makes me feel – then my answer would be very different. I enjoy feeling connected to others who have chosen to be professional engineers (rather than just be qualified). I enjoy the linkage to the history of our profession – a tangible link to the likes of Stephenson, Whittle, and Whitworth. I feel pride at feeling attached (through professional association) to those great engineering triumphs celebrated by our Heritage Awards – several of which have been awarded here in Oceania. It's how I feel being a professional engineer that matters – not the numbers (and not necessarily the salary either).

As the Oceania Committee, we'll be starting our new year with a teleconference- a cost effective way to fine tune our ideas for the coming year. We will, as always, work with active volunteers in Australian and New Zealand, along with our kindred institutions, to ensure that the members here can derive as much benefit from their membership as possible. The challenge of doing more with the funds we have is a challenge that makes us all feel enthused.

Speaking of active volunteers – they are always difficult to come by, and maybe that's because we might be asking the wrong question. We often ask whether someone has the time (quantification) to do something, rather than seeking those who are motivated by how volunteering makes them feel and the value they can derive from it. Maybe ask yourself that question and see if you might like to play a more active part in your institution. That would surely be better than cold, dead fish!

Off to get lunch – which isn't going to be sushi today.

**Ian Mash**  
Oceania Chair

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# PANEL ROUNDUP

**Latest news from around  
the country.**

## WESTERN AUSTRALIA

This past quarter in WA has seen a focus on both our young and more experienced members alike.

A Fellowship Workshop was held last October to give the opportunity for those interested in becoming a Fellow some support with the development of an application. Jade Abbott, the Institution's Global Account Manager, ran sessions addressing how to document each of the required competencies. Feedback was provided on the day by Jade, ably assisted by local 'Fellows' who shared their real world experience with the panel. Special thanks go to John Morhall and Ken Tushingham for donating their time.

At the other end of the age spectrum, the Speak Out For Engineering (SOFE) competition, aimed at improving young members presentation skills, held its WA heat. Congratulations to Langdon Heath who won with his presentation on 'The Characteristics of Vibration and Sound Radiation of a Submarine Model'.

Unfortunately, Langdon was not able to attend the Oceania Region Final in New Zealand due to prior commitments, so WA was represented by Lucien Nguyen who spoke about 'The Psychology of Process Safety in Oil and Gas'. Lucien's presentation went on to win, so he has gone on to the 'Rest of the World' Final in Kuala Lumpur. Congratulations and good luck to Lucien!



On Saturday 11th March, Perth welcomes the committee and other states' chairs for the institution's Australian Branch AGM. Members are

welcome to attend to hear what we have done over the last year and to ask us questions. The AGM

is being held at Rendezvous Hotel, Mount St, Perth from 6.30pm.

Following the AGM, members are invited to a three course dinner for a cost of \$75 which includes beer, wine or soft drinks. For those interested in attending the dinner please contact Andrew Gagg before 1st March at: [wachair@imechenearyou.org](mailto:wachair@imechenearyou.org)

Also in March is a technical visit to Synergy's Kwinana Power Station which has the highest efficiency open cycle gas turbines in Western Australia. This is being held on Thursday 16th March at 2.30pm. To register your interest go to [nearyou.org](http://nearyou.org)

[imeche.org](http://imeche.org) and follow the links to the WA Panel home page.

Andrew Gagg, WA Panel Chair



## VICTORIA

As we enter the dawn of a new year, the Victorian panel begins to plan and roll out its programme of events for 2017.

Last year was extremely successful with a record breaking 15 events taking place and some real highlights which included a Yarra river cruise for the Christmas in July dinner, a rail focused series of lectures and site

visits and a lively global engineering debate, to name but a few.



This year, the panel will be exploring the energy sector as a theme, in particular renewable energy technology. This will hopefully result in a series of interesting and engaging lectures and site visits. Further engagement with Universities within Victoria will also be a focus. This will take the form of a University roadshow where IMechE Victoria members will visit universities to highlight the value of professional development and IMechE membership for students. We will also continue to build on our mentor/mentee programme which proved very successful in 2016.

Please note our first mentor/mentee gathering is planned for March 2017. As ever, our popular annual events such as 'Christmas in July' and 'Speak out for Engineering' will take place. We will also ensure there are plenty of opportunities for members to network and socialise throughout the year.

Please let me take this opportunity to wish all members a happy and safe new year and I look forward to seeing you at the next event.

Matthew Cook, Victorian Chair



## QUEENSLAND

The Queensland Panel end of year event was a XXXX brewery tour. The tour took us on a journey through one of Brisbane's greatest attractions, on a remarkable exploration of the world of XXXX 135-year history and world class brewing methods.

A technical presentation on Integrated Condition Monitoring was held, providing a great CPD opportunity and networking with fellow engineers. Over 50 engineers from across South East Queensland attended, representing a wide variety of industries including Road, Rail, Mining, Aerospace, Oil and Gas.

Prior to the technical presentation, our QLD Panel Young Member Chair (Ibrahim Shahin) ran through an IMechE Pathways to Chartership presentation, explaining and promoting the benefits of IMechE membership.

Wood Group (formerly SVT Engineering Consultants) put forward a highly experienced gentleman by the name of Mike Yardley. Mike has twenty five years' experience in engineering from trade experience in NZ Army, followed by specializing in vibration condition monitoring. It promised to be a great talk with a full house in attendance.

Mike covered a wide range of subjects on the matter of integrated condition monitoring starting with a company's' maintenance strategy, various monitoring techniques/technologies, challenges and limitations of those technologies, and data analysis. There were some great questions following on from the case studies which tied the presentation together. Mike demonstrated the value and importance of integrated condition monitoring.

Wood Group generously invited all those who attended to evening drinks in order for the attendees to continue to engage with fellow engineers from a variety of industries.

The Queensland Panel is planning on hosting many more exciting events for our members in 2017 so look out for local notifications! If you are based in Queensland, please ensure you update your profile to receive local notifications.

Alfredo Mendez, QLD Chair



A visit to the famous XXXX brewery is just one event that our members have enjoyed during the last three months

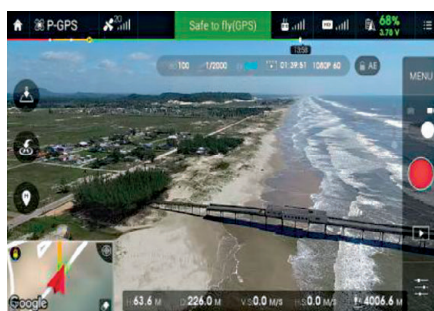
# DRONES: ONE INVENTION, MANY POSSIBILITIES

Drones have been used by the military since the 1930s. But over the last few years, they have taken on roles in the consumer and commercial sectors, mostly famously as quadcopters. There can be little doubt that drone technology, along with public interest in them, is advancing at a rapid pace.

One of the main reasons for drone proliferation has been the miniaturisation and mass production of Micro-electromechanical systems (MEMS), such as smartphone accelerometers and other sensors. MEMs allow stabilisation and safety features to be incorporated into aerial platforms with minimal weight penalty and low cost.

Basic recreational drones, well within the range of a birthday gift budget, are an excellent way to appreciate the technology involved. Although easier to fly than conventional remote control aircraft, they still depend on operator skill and are mainly designed for entertainment, taking low quality snapshots or annoying the cat.

Mid-range drones open up a much broader range of possibilities for enthusiastic consumers and the commercial sector. These products often come with GPS location sensing, high definition video recording and



*Many drones can be controlled and monitored via a tablet or smartphone*



*There is no doubt they are fun to use, but as these people have discovered, drones have many benefits for professional engineering companies*

smartphone based control with live telemetry. They may feature the ability to pre-programme routes or track an object using software based algorithms known as Video Analytics. Many drones can return home and land automatically in the event of low battery or signal loss, while others have the capability to detect and manoeuvre around obstacles.

Mid range drones cost a few thousand dollars or less, so engineers and other professionals will appreciate the low financial commitment involved in their trial for work purposes. The most obvious applications are aerial surveying or visual inspections - particularly over inhospitable or hard-to-access terrain. However, a number of other uses have been publicised by the IMechE and other media outlets, from wildlife monitoring to package delivery and crop dusting. The main limitation, at least for the next few years, is likely to be battery technology- which has not developed as quickly as some other areas and continues to limit aerial endurance as well as payload capacity.

Many countries have now recognised recreational and commercial drones in airspace laws. There are still some issues to overcome regarding public liability and the consequences of malfunction, but companies can mitigate these risks by using certified

operators, reputable equipment and carefully hazard assessing the environment in which the drone is to operate.

It is often said that necessity is the mother of invention, but sometimes the potential uses of an invention are only fully realised after its introduction. Drones certainly appear to be following this pattern.

Whether you think of them as toys or tools, be sure to consider how the multitude of skills possessed by drones can help overcome your business's next engineering challenge.

Nic Coulthard, Victorian Panel

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# LASER BASED VISION AIDS

**Research from the University of Melbourne could equip the vision impaired with an improved view of the world.**

In News Bulletin 176, you may remember an article on the Asian Pacific Design Competition which challenged students to develop technology for the hearing impaired. Persons with vision impairment also face considerable challenges in their daily lives but could soon find things easier, thanks to a device developed at the University of Melbourne.

Associate Professor Elaine Wong has a nine year old son who is vision impaired. After his birth, Elaine decided to use her skills as a mechatronics engineer to improve the quality of life for her son and others who have a limited view of the world. Along with Professor Marimuthu Palanswami and Dr. Aravinda Srihara Rao, Elaine created an optical Laser device that detects impending, non-



*Elaine has used the properties of the humble Laser to develop life changing devices for the less fortunate*

protruding changes in the surrounding terrain.

Traditional methods used by the vision impaired to avoid hazards include white tactile sticks and guide dogs. While these are great for detecting protruding objects, they are less effective at informing the user of drop offs, kerbs and potholes, as well as fences and lamp posts. The Laser device developed at the University of Melbourne is an effective solution to this problem. In effect, it is capable of 'seeing' and understanding its surroundings.

Using a technique that many of us will recognise from the development of

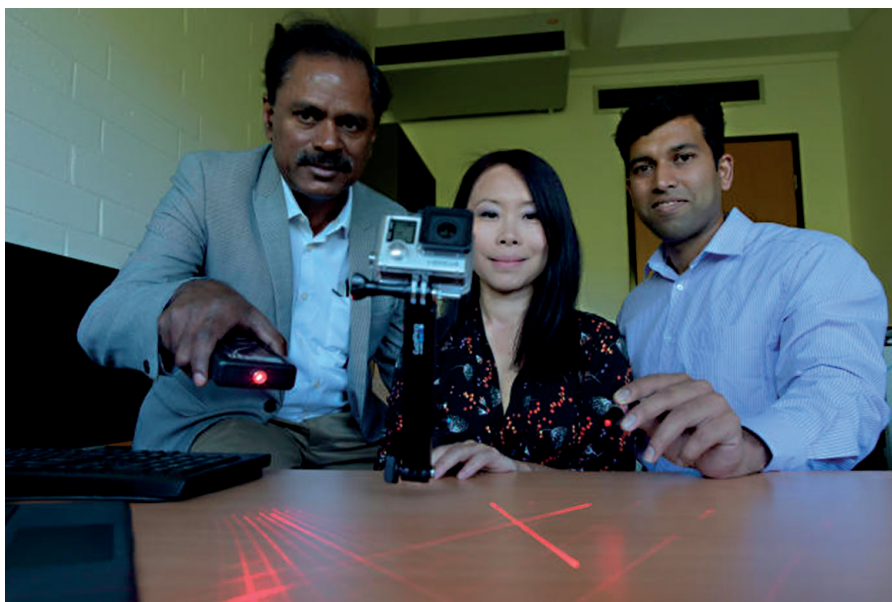
self-driving cars, the Laser continually scans the path ahead in a grid pattern and analyses the resulting series of dots (sometimes referred to as a Point Cloud) to identify defined hazardous as programmed into the software. A warning can then be issued to the user, through either sound or vibration, to prompt avoiding action.

The team has tested the device in real-world environments, including areas of Melbourne prone to potholes. There is still work to be done to refine the system and resolution, but it is hoped that many improvements will arise from the use of different types of Lasers.

Once the system has matured, attention will be turned to miniaturizing the device into something that is light and portable. The device could eventually be attached to a wheelchair or walking stick.

To read more on this story, head to [pursuit.unimelb.edu.au](http://pursuit.unimelb.edu.au) where it was originally published.

Matt Proudlock, Editor



*Associate Professor Elaine Wong (centre) with her colleagues Professor Marimuthu Palanswami (left) and Dr. Aravinda Srihara Rao (right)*

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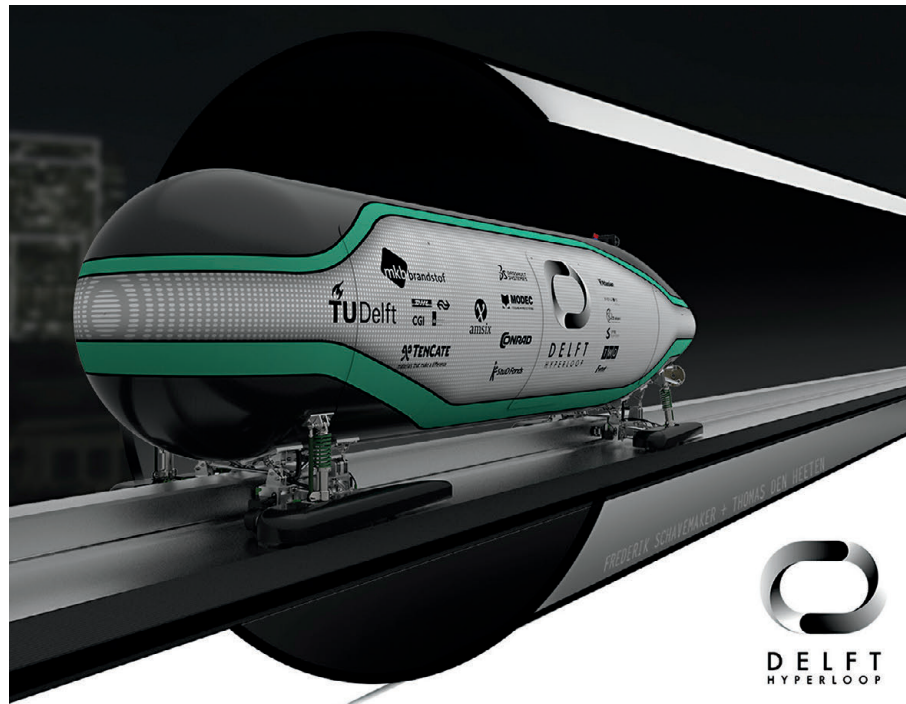
# SPACE X HYPERLOOP COMPETITION WINNER ANNOUNCED

**SpaceX sponsored  
competition enables  
University teams to test  
high speed prototypes in  
trial Hyperloop.**

The Hyperloop system promises to revolutionise terrestrial transportation. These closed loop low pressure tunnels have been talked about for some time, but SpaceX's Elon Musk recently invigorated the concept by building a trial loop in Hawthorne, California. A competition was then launched for university teams to come up with a pod design.

Out of 30 teams, three finalists were invited to test their pods in SpaceX's Hyperloop track: Delft University of Technology (DU Delft) in Holland, Massachusetts Institute of Technology (MIT) and WARR Hyperloop from the University of Munich. In January, the winner of the competition was announced as DU Delft.

Hyperloop principles are pretty straight forwards: a pod travels along at high speed in a low pressure tube. The pods are raised from the ground using either magnetic levitation or compressed air, which is sucked in through the front of the vehicle.



*Competition winners DU Delft in Holland developed this pod for the SpaceX Hyperloop*

A fan and compressor actively move air from the front to the rear of the pod, thereby eliminating the issue of pressure build up in the direction of travel.

The elimination of rolling resistance and reduction of drag lead to a system that is capable of extremely high speeds and is very energy efficient.

The original Hyperloop concept was put forwards in August 2013 and suggested a route between LA and San Francisco, with proposed speeds of up to 970 km/h and a travel time between the two cities of just half an hour. However, these systems have been proposed for many years prior and have never taken off commercially due to the high cost of implementation and some of the risks associated with travel.

The TU Delft pod is 4.5 m long and 1 m high and weighs in at just 149 kg through extensive use of carbon

fibre. During the competition, the pod reached speeds of 90km/h, but the team claims the prototype could reach and withstand speeds up to 1,200 km/h on a longer track.

SpaceX have announced a follow up competition later this year, focusing on the attainment of higher speeds.

**Matt Proudlock, Editor**

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

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