Formula SAE-A Newsletter

Volume 2, Issue 1 **April 2003**

April 2003 Contents:

E-mail addresses

Make sure you have contacted SAE-A to register your email address! This newsletter will only be distributed electronically and is the best way to keep up-to-date with Formula SAE-A 2003.

Newsletter Contributions

Teams and/or sponsors who wish to include (or comment on) information in this newsletter can do so by emailing formulasae@sae-a.com.au with the details. This is a fantastic opportunity to brag and boast about your progress!

Technical Advisor

Pat Clarke
Contact: fsaetech@ozemail.com.au or mobile: 0414 984 695.

FSAE Dates

US: 14 May - 18 May 2003
UK: 4 July – 7 July 2003
Aus: 4 Dec – 7 Dec 2003

SAE-A Admin Update

Welcome to the 2003 year of Formula SAE-A. Firstly I would quickly like to congratulate and thank everyone involved in the success of last years event in Carrum. To all the teams and universities who worked tirelessly throughout the year it was great to see so many world class vehicles in action. Congratulations especially to Wollongong for taking out the overall win. Full results are included.

Also the event wouldn't have happened without the support of our sponsors and volunteers, particularly the Consortium and host Toyota. A special mention to all of the dedicated individuals who braved the freezing conditions on the Thursday to set up for the event. Thank you.

A de-brief session was held following the event and based upon this feedback an Event Report was prepared which included recommendations for the future. If you would like to receive a copy of this report please let me know.

2003 is shaping up to be another exciting year for Formula SAE-A. The consortium host is Mitsubishi with the event being held at Tailem Bend in South Australia from Thursday 4 to Sunday 7 December 2003.

We have three new Australian teams committed to the project, University of Newcastle, Australian Defence Force Academy and Curtin University of Technology. There are also rumours that Central Queensland University are considering putting together an entry. We have also had some interest from overseas teams which is encouraging.

I am happy to advise that Pat Clarke will continue on in his roll as technical advisor and he more than welcomes all communication with teams. You can reach him on the details opposite.

Current activities from my end are the locking in of sponsorship and recruiting of new sponsors, working with the consortium on the coordination of the competition as well as reviewing potential venues for the 2004 competition.

Finally, before I sign off I would like to wish the University of Wollongong all the best for their US campaign. The team has committed to making the trip to Detroit in May and we are more than confident that they will represent Australia well.

Don't forget to order your copy of the 2002 Video an order form is attached.

Regards,
Erin Heasman ☺
Event Manager

Pat Clarke – FSAE-A Technical Advisor

Welcome to all the teams in Formula SAE Australasia for 2003. Again, the SAE have seen fit to appoint me the Tech Advisor, and already my mailbox is full of questions and requests for clarifications as the new designs get underway. A special welcome to the new teams from Newcastle, ADFA and Curtin, all of whom have lost no time in contacting their Tech Advisor.

A reminder to all teams of the protocol of lodging technical requests. Ideally, all requests should go to your Faculty Advisor first, but in any case, any tech request to me should be copied to your Faculty Advisor. Although I will try help with queries on Cost and Presentation etc, these really should be sent to Erin, who will forward them to the appropriate person.

I will clarify rules and give technical interpretations, and am perfectly happy to act as a sounding board for your kite flying ideas, however, I will not help you design the car, nor instruct you on what design decisions you have to make. I may make some recommendations, but they are just that, recommendations and there is no need to follow them.

I will keep your secrets safe, so feel free to talk openly about your questions. It is irritating when I get repeated questions all hedging about the point because the team is nervous about divulging their design secrets. I repeat, your design secrets are safe with me!

Over the years, several teams have found I am a good person to talk with when it all seems to be getting too difficult and you need someone to talk to. Feel free to contact me.

I am leaving for the US in 4 weeks to act as a design judge at the FSAE competition in Pontiac Michigan. This will be my first visit there since 1996, so I am looking forward to seeing how the US teams have evolved in the last 7 years.

FSAE-A 2003 is shaping up to be a great year. Although we have lost (temporarily, I hope) the Tasmanian and Uni of SA entries, we have the three new teams mentioned above. At this stage, we have an entry intent from Kettering University in Michigan, a perennial front runner in FSAE and FS, and we will have Dr Bob Woods and his UTA team back after an absence of a couple of years. Kenny Hassler will be having his final drive in the Formula, and that should be worth watching. We are also expecting more than one team from Asia, and who knows who else I may be able to persuade when I am in Pontiac.

Again, welcome to FSAE-A 2003, let's have fun learning.

Pat

Nuts and Bolts

At this time of year, the FSAE designs are blossoming in the fertile minds of the designers. Too often the teams get distracted by high tech when at this stage of the project they should be concentrating on the basics.

One of the basics that must be understood is that of fasteners. If the team doesn't have Carroll Smiths book on the subject, then I suggest you beg, borrow or ..er, well, buy one. Visits to teams to see how they are going often show that team members often do not have a good understanding of threaded fasteners.

At one team workshop, I watched a student trying to find a spanner to fit the nuts he was using to attach the fuel tank. He called to another that they had some dodgy nuts, that they fitted the bolts, but the spanners didn't fit. Intrigued, I wandered over to investigate and discovered he was using $5/16^{th}$ Whitworth nuts on UNC bolts, and to complicate matters was using a 13mm spanner to tighten them. The fasteners were obviously from a hardware store.

Shaking my head, I broke one of my rules and interfered in the vehicle construction. I picked up all the nuts and bolts and threw them in the waste bin. As the student looked on shocked, I instructed him to remove the rest of the hardware grade nuts and bolts and throw them out. This type of fastener has no place on any engineering project you care about.

Nuts and Bolts cont.....

Instead, I suggested he make a list of the fasteners he needed, and that he should then buy them from an engineering supply company, and that if he told the proprietor what he wanted them for, he would most likely get a discount and so it would probably cost no more.

Australia is a metric country, but the correct engineering solution is not always the use of standard metric fasteners. In aviation, metric fasteners are not used, and so high-grade aviation fasteners are in imperial sizes, and should be considered. Coarse threaded Metric rod ends seem to be particularly prone to failure under excess load.

Quality Allen headed screws from companies such as Unbrako make a very cost effective answer to the quest for high strength, low cost fasteners.

On another car I saw a piece of threaded rod in use as an engine mount bolt. This is a horrible solution, as shear loads should never be fed into the threaded part of a fastener. When a design judge sees things like this, he immediately questions the integrity of the entire design.

I dropped in to see one of the local teams through the week. With my eye now attuned to threaded fasteners, I noticed that this one had all the inner wishbone bolts inserted from underneath, and fitted with Nylok nuts. I guess there is nothing wrong with this, but just looking made me feel uneasy. Firstly I am not a fan of Nylok nuts on critical fasteners, and the loss of one of these nuts would allow the bolt to drop out and result in an immediate DNF.

Why would a Nylok come off? Because it is supposed to be a one-use item, yet most get used again and again. I understand that sometimes bolts need to go in from underneath, and regardless of which way they go, but if they are in a critical location I would always like to see them positively locked. This can be with wire, lock tabs, split pins, 'R' clips etc. Not only does this give a failsafe retention, but it is extremely unlikely that someone will mechanically lock the nut without checking that it is properly tightened.

On yet another car, I saw Nylok nuts used on the fasteners that secured the rear brake rotor to the aluminium carrier! This is crazy as the brake heat will quickly melt out the locking nylon ring rendering the car susceptible to potential brake failure. I only had to point to the nuts for the guys to realise their mistake, and before I left, some aviation style lock nuts had been fitted.

To be fair to these guys, they had a very neat arrangement on their suspension pushrods. Instead of using left and right hand rod ends, they were using two different right hand threads (One metric, one UNF). Apart from them saving a lot of money and aggravation in sourcing left hand threaded components, they have a much finer adjustment of push rod lengths. Nice touch, I like it.

The intent of this article is to prompt all teams to think hard about the fasteners they use as they do their final assembly.

Some simple rules.

- Don't use hardware store fasteners. Use the best fasteners you can afford.
- Self tapping screws have no place on your car.
- Ensure the fastener is capable of carrying the load.
- Never feed shear loads onto the threaded part of the fastener.
- Nylok nuts should be disposed of after being removed. They are a one use component.
- Critical fasteners should be mechanically retained in a fail safe way.
- More than two or three threads protruding through the nuts is just extra weight to carry. Less than one full thread protruding through the nut is a nut that is going to loosen and fall off.
- Never extend the thread on a bolt by running a die nut along the shank.
- Never force the wrong nut onto a bolt.
- If there is ever the slightest doubt about a fastener, then bin it immediately.
- Sharp bolt heads inside the cockpit will hurt when you inevitably snag them. This is particularly true when that bolt head is in the foot well and snags your foot at the exact moment you are trying to apply it to the brake pedal.

Finally, one last hint. This may sound odd, but it is the only way I know to prevent you from taking the car on the track with a loose nut and bolt. Every time a threaded fastener is put on the car, it should be done up to its proper torque. I mean EVERY time, even on a test assembly. Never tighten fasteners finger tight with the intention of tightening them later. This is particularly true with Nylok type nuts. It is a very good work habit, and one recommended by all professional mechanics.

That's it for this month. By the time the next bulletin comes, I will have been to the US as part of the FSAE Design Judge team, and I will report on what was new there, and how the Aussie team from Wollongong fared.

2002 Overall Results

Car Number	University	Cost (100)	Presentation (75)	Design (150)	Acceleration (75)	Skid Pad (50)	Autocross (150)	Endurance /FUEL (400)	Total	Overall Rank
1	University of Wollongong	67.7	72.6	150.0	75.0	50.0	150.0	382.2	947.5	1
8	University of Western Australia	69.0	67.5	143.0	48.9	45.3	145.9	370.6	890.3	2
OO	Rochester Institute of Technology	77.9	66.8	115.0	66.8	46.5	136.3	359.4	868.6	3
22	University of Sydney	71.2	68.5	108.0	63.9	20.1	138.2	299.7	769.5	4
7	Swinburne University	60.1	72.1	143.0	42.3	40.3	100.0	253.0	710.9	5
5	University of Melbourne	58.0	60.8	78.0	0.0		115.5	363.7	676.0	6
61	Australian National University	57.3	53.3	120.0	56.4	32.8	106.8	246.2	672.8	7
16	University of Stralsund	85.5	69.9	96.0	63.9	45.0	100.4	203.6	664.3	8
27	University of Adelaide	69.8	75.0	88.0	57.7	30.3	72.3	199.7	592.8	9
41	University of Queensland	58.8	41.3	90.0	58.7	33.1	34.4	201.7	517.9	10
88	Monash University	57.0	74.7	126.0	61.5	31.8	149.1	0.0	500.1	11
3	University of Tasmania	74.8	64.7	90.0	61.5	39.2	69.9	87.0	487.0	12
69	RMIT	40.9	63.0	143.0	51.5	43.6	99.9	0.0	441.9	13
28	University of South Australia	50.0	56.2	91.0	13.6	19.9	15.1	185.4	431.2	14
63	University of New South Wales	57.7	55.5	123.0	54.1	20.1	60.3	0.0	370.6	15
21	Tokyo Denki University	33.0	56.7	113.0					202.7	16
4	Deakin University	24.0	55.5	66.0				0.0	145.5	17
13	University of Technology, Sydney	14.8		0.0				0.0	14.8	18

Event Video Now Available!

Purchase a copy to:

- Use for promotional purposes
- As an educational video about Formula
- Keep as a memory of the 2002 event

The video is available in PAL (Australian) or NTSC (International) format.

$25.00 (plus GST of $2.50)*

**Overseas customers exempt from paying GST*

To order your copy please complete the following information.

Mail order or Fax to: SAE-A Information Resource Centre
Suite 3, 21 Vale Street Tel: (03) 9326 7166
North Melbourne Vic 3051 Fax: (03) 9326 7244

Please send _____ copy/copies of Formula SAE-A Video @ $25.00 each plus GST and postage of $8.80 (Local/Interstate) or $15.00 (Overseas)

❒ **PAL** ❒ **NTSC**

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Company.....
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FSAE SEMINAR

"Whatever you can do, or dream you can, begin it. Boldness has genius, power and magic in it." **Goethe**

DO YOU KNOW WHAT YOU DON'T KNOW?

Modern racing has become extremely competitive. It's not only about finding the correct set up, it's also about understanding why a set up change is working or not, knowing how to quantify this advantage and knowing how to reduce the time and money spent on the racetrack to find the best set up. These seminars allow participants to improve the skills required to understand, analyze and predict racecar performance, which translates to faster lap times and better results.

MoTeC are pleased to announce that we have been able to secure Claude Rouelle for two dates, and have scheduled **TWO** Special **FSAE Seminars** for 2003, due to the success of last years course. To enable us to conduct the two seminars, we would require 35 participants at each venue, with a maximum limit of 50 at each, so to register your booking ensure you get in early to avoid disappointment.
These seminars are scheduled to take place as follows:

Melbourne: June 7th, 8th & 9th 2003
Sydney: July 7th, 8th & 9th 2003

The seminar will be conducted over three days, with the MoTeC Engine Management & Data Acquisition seminar held on the first day, and the two-day Race Car Dynamics and Data Acquisition Seminar, presented by Claude Rouelle, on the following days.

SEMINAR TOPICS INCLUDE:

• The nature of performance • Kinematics • Definitions and terminology • Dynamics
• Forces and characteristics of tires • Dampers • Data acquisition • Aerodynamics etc.

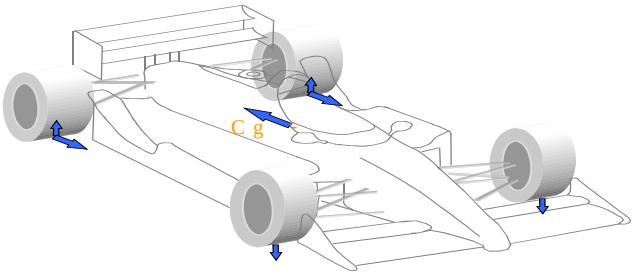
Cost for the seminar will be approximately $450.00 (TBC) per person for the three days. Cost is inclusive of the three -day course, all relevant course notes and documentation, and lunch/am/pm teas. To reserve your booking now or for more information please email donna.arbuckle@motec.com.au or phone +61 39761 5050.

For more information on Claude's Seminars and testimonials, please take a look at the following link attached http://www.motec.com.au/pdf/claude8p.pdf and our website www.motec.com.au

Please note: This seminar is strictly for students.

"I thought that the seminar was excellent. It provided key information to understanding, analysing and improving the design of F SAE (and other) vehicles, and in a way that motivated the students to integrate this knowledge into their projects." Dr Oliver Kennedy – Professor at Wollongong University

"His ability to reduce most technical situations to mathematical equations makes it easier for students to quantify the design decisions they make. I would recommend a Rouelle Seminar to anyone interested in the technical aspects of motorsport, whether they are involved or not." Pat Clarke – SAE Tech Advisor



Key Dates

Registration	29 August 2003
Safety Structure Equivalency Form	1 September 2003
Pre-Event Design Reviews	1 October 2003
Cost Report	31 October 2003
Competition Dates	4-7 December 2002

Participating Australian Universities 2003

Melbourne University

Swinburne University/Swinburne TAFE

Royal Melbourne Institute of Technology/RMIT TAFE

University of NSW/South Western Institute of Technology

Monash University

University of Technology Sydney

Deakin University

University of Newcastle

University of Adelaide

University of Wollongong

University of Sydney

Australian National University/Canberra Institute of Technology

University of Western Australia

University of Queensland

Australian Defence Force Academy

Curtin University of Technology

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