

Automotive Scene

Formula SAE revs up Canadian engineering students

By **Bill Vance**

Every May for 25 years teams of keen young engineering students have descended on southeast Michigan to compete in small formula-style racing cars they have conceived, designed and built from the ground up. And every year volunteers, mostly race engineers from car companies and suppliers, come to judge all aspects of the cars and to give advice. Not coincidentally, they are also identifying potential recruits as astutely as any NHL scout prowls junior hockey arenas.

The annual event is the [SAE Collegiate Formula Design Series](#), known as Formula SAE (FSAE). It is sponsored by SAE, formerly the Society of Automotive Engineers, to promote automotive design innovation

among university engineering students. Demand has resulted in a second event, FSAE West, in California. SAE sets down general design parameters, and leaves it to the students to let their imaginations fly.

The open-wheeled racing cars must have a wheelbase of at least 1524 mm, and have four wheels not in a line. Engine displacement is limited to 600 cc, with any configuration or number of cylinders, and supercharging/turbocharging allowed. The great leveler is that the engine air intake is limited to 20 mm in diameter, which requires sophisticated airflow management. Safety measures like roll cages, fluid retention, a quick escape route from the vehicle and front impact crash protection are required. Even metal tubing wall thickness is specified, and to ensure compliance judges drill holes in the tubes

to measure them.

The cars are judged on static criteria such as design, a presentation on manufacturing and marketing strategy, and a cost analysis (careful records must be kept of all material costs, and even things like inches of welding and milling machine time). The cars are judged dynamically in acceleration, slalom, skid pad, economy and durability events. At least four different drivers must participate in dynamic events.

While some big well-funded American teams have tended to dominate the standings, Canadian universities acquit themselves very well. University of Waterloo finished fourth overall out of 129 at the Michigan event in 2005, with Ryerson University standing tenth. Almost all Canadian engineering schools enter, with at least 15 scheduled for 2006.

A university need not have a huge engineering enrollment to excel. The University of Guelph's Gryphon Racing Team, under faculty advisor John Runciman, associate engineering professor, entered for the first time in 2003. "We were quite proud of what the students achieved," said Runciman. "We went from nothing to a complete car in under a year with an all volunteer

crew carrying a heavy academic load, and finished in the mid-40s."

For 2004 Guelph went to four-wheel drive, an FSAE first, and finished a commendable 17th overall. "We hoped for rain," said Ben Beacock, the main technical designer for the first three cars, "but unfortunately it didn't come."

Guelph stayed with 4wd for 2005, but recognized that 4wd always involves a trade-off among dynamic ability, speed and weight. The weight of SAE cars is in the 180 to

227 kg range, with a few over and under. (Guelph's 2005 car weighed 256 kg.)

Guelph powers its cars with an inline, 4 cylinder, 600 cc Suzuki water-cooled motorcycle engine, a fairly typical choice, although engines have extended from Queen's University's turbocharged one cylinder, to a University of Western Washington experimental V-8.

While the Suzuki provides 112 hp with a 15,000 rpm redline, the air restriction limits Guelph to around 50 hp at 12,000 to 13,000 rpm. This is enough to provide 0 to 80 km/h acceleration in the 3 second range. Its 2006 car will have rear-wheel drive.



Guelph University's Gryphon Racing Team all-wheel-drive racing car is powered by an inline, 600 cc, four-cylinder Suzuki engine (right).



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