

Formula SAE - Competition History 1981 - 1996

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Abstract

The Formula SAE Student Design Competition was initiated at the University of Texas at Austin in 1981. The event was conceived as a road-racing counterpart to the established SAE Mini-Baja competition. The first Formula SAE event attracted four cars and the total involvement was approximately 100 people. Sixteen years later the event had grown to 76 vehicles and over 2000 involved participants. The event has become one of the premier engineering design events and has strong corporate support.

From 1981 through 1990 the event was hosted at the university level. In 1991 General Motors hosted the competition, followed by Ford in 1992, and Chrysler in 1993. Since 1994 the event has been jointly staged by a consortium with representatives from GM, Ford, Chrysler, and SAE acting as the steering team. This consortium effort has resulted in greater usage of the event as a place of professional recruitment of entry level engineers.

This paper presents a brief year-by-year history of the event, along with overall results and statistics for each year.

Pre-History

Most engineers over the age of say, forty, cannot recall anything like Formula SAE while they were in school. Early engineering design competitions were more or less simple on-campus events like egg drops where the intent was to design the most damage resistant box. Challenging? Sure. Interesting? Maybe, but not exactly enticing to a motorhead.

In the mid 1970's, several universities began hosting local student design competitions with off-road vehicles. At one of them, Fred Stratton, from the Briggs and Stratton Corporation, was a design judge. It was through Fred Stratton and his colleagues that the SAE - B&S connection was established. Bob Catterson, now retired from B&S, recalls that many B&S engineers were active within the SAE Milwaukee section, particularly with student activities. With support from both the Milwaukee Section and B&S the first SAE Mini-Baja® arose. The success of this event convinced SAE International to support this event at other locations throughout North America.

The SAE Mini-Baja® took its name from the famous Baja 1000 off-road race in Mexico. The first SAE Mini-Baja competitions took place in 1976 and quickly became three annual regional competitions. These events established a standard format; a day of static events; design, cost, and presentation, followed by a day of individual performance events, capped off by an endurance event on the third and final day. The emphasis at Mini-Baja is on chassis design as each of the teams uses an identical 8hp B&S engine that cannot be modified. At every competition, engineers from Briggs and Stratton have participated to insure conformance to the rules.

Over the past twenty years, the SAE Mini-Baja has been successful beyond anyone's expectations. The credit for the success can be shared by many people but special thanks must be given to Briggs & Stratton - to date they have donated well over 1,000 engines to the cause plus countless hours of technical support at all of the events.



1981 - Having big name judges at Formula SAE started in the first year. The gentleman in the plaid shirt is famed race driver/engineer Jim Hall who flew in to be a design judge at the event. The car shown is the entry from the University of Texas at Austin.

SAE Mini-Indy

In 1978, Kurt Marshek, then at the University of Houston (Texas) contacted the SAE Educational Relations Department to discuss a variant of Mini-Baja. How about a similar competition for on-road, road racing vehicles? Both SAE and Briggs and Stratton were receptive to the idea and planning for the 1979 SAE Mini-Indy began. Kurt Marshek recalls that one of the potential sites investigated was the Texas World Speedway. Ultimately the competition was held on the campus of the University of Houston. With the speed potential an unknown, the decision was made to use 5hp B&S engines for all competitors. Thirteen schools entered and eleven competed that first year with the overall winner from the University of Texas at El Paso.

As many organizers have found, the work in building a car can only be exceeded by the work to organize the event and there were no takers after 1980. Having seen the potential of the event, Mike Best, Robert Edwards and John Tellkamp, students at the University of Texas at Austin approached Dr. Ron Matthews with an idea - how about another Mini-Indy, but with some changes? Let's make the rules more open, let it be as unlimited as possible. It was desired that this new competition would take the cars to the next higher level of engineering. The Baja competition was great for chassis design, but many students wanted to work on engines as well. The new rules would keep engine restrictions to a bare minimum. ANY four stroke engine was allowed for the first four years, with power limited by a 1 inch (25.4mm) intake restriction.

With grass roots support from his students, Ron Matthews contacted the SAE Educational Relations Department and set the wheels in motion. To differentiate this new event from the Mini-Indy, a new name was sought. To better reflect the road racing nature of the event, and increased engineering content, the Formula SAE name was adopted in favor of Mini-Indy.

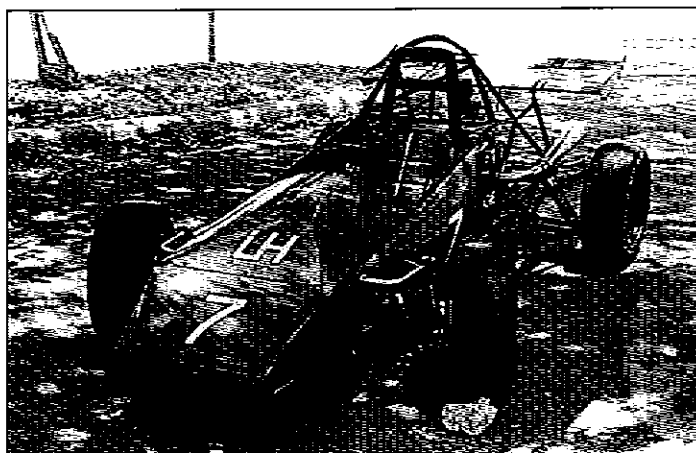
1981

Ron Matthews remarked, "That first Formula SAE was small, but truly national in participation. Six schools said they would attend, but only four showed up. Stevens Institute (New Jersey), The University of Tulsa (Oklahoma), The University of Cincinnati (Ohio), and The University of Texas at Austin. The judges also reflected a national event, with judges from General Motors, Ford, Southwest Research Institute, a variety of oil companies, and perhaps most notably famous race car driver/engineer/car owner Jim Hall, who flew in from the Indy 500 specifically to serve as a judge." The first day's static judging was for "Best Appearance" and "Excellence in Engineering and Design Creativity". The following two days were spent with performance events. For scoring purposes, equal weight was given to acceleration, maneuverability, and fuel economy with a double score for the endurance event.

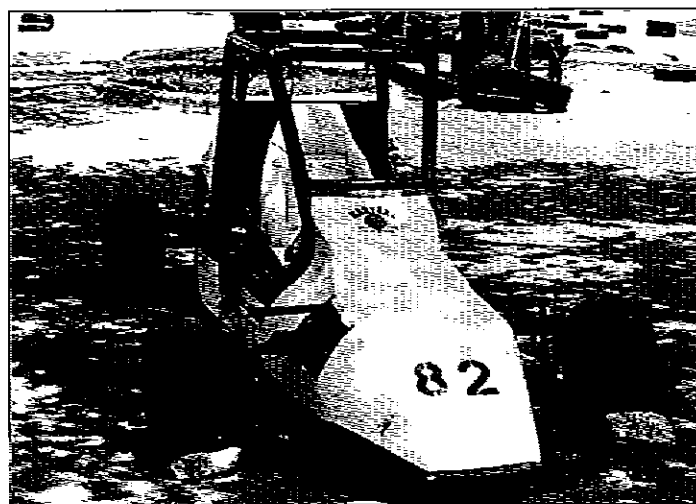
The overall winner of the inaugural Formula SAE was the team from Stevens Institute.



1981 - Hopefully no one would design a Formula car like this today! It is amazing that the driver would risk his feet in that thing. Cars like this have greatly sped the safety rules evolution over the past 16 years.



1982 - The University of Houston produced some of the nicest vehicles of the first competitions. The team finally won the race in 1984 but since no photo of the 84 car could be located, here was their 1982 effort.



1982 - This entry from Nicholls State University more closely resembled a sprint car than a conventional Formula car. Designing cars for the first few competitions was very challenging as there were far fewer reference points.

1982

To entice more schools to compete, a second category was created in 1982 for cars powered by Briggs and Stratton engines. It was hoped that schools would consider entering a modified Baja car to gain experience with the competition.

A significant rule change was added for 1982. The first Formula SAE rules, patterned after Mini-Indy did not require suspension and thus several of the cars were simply large karts. From now on Formula SAE would require four wheel suspension. Even with this change the entire rules package for 1982 was only four pages.

UT Austin won the Formula class while UT Arlington made an impressive debut with 1st and 2nd in the Briggs & Stratton class. The first international entry, the Universidad LaSalle (Mexico), was another highlight of 1982, entering a car in the B&S class.

1983

Although the separate Briggs and Stratton class was eliminated, two UT Arlington cars finished 1st and 3rd with modified 8 hp B&S engines, in large part due to fuel economy. The powertrain variety was as follows; a 550cc Kawasaki, a 250cc Honda, a 250cc Kawasaki, a 450cc Suzuki, a 600cc Honda, two 11 hp Briggs & Stratton, and two 300cc Sachs Wankels.

1984

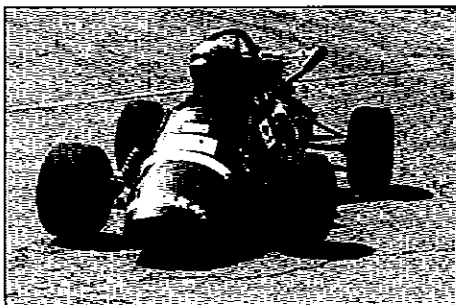
The last competition hosted by UT Austin drew eight entries. Among the notable advances in Formula SAE technology was the first ever all composite vehicle, entered by UT Austin.

The variety of powertrains during this era was vast; Triumph 750 twin, 300cc Sachs Wankel, four, 500cc Yamaha single, 400cc Honda four, 250cc Honda single, and a 600cc Honda in the winning car from the University of Houston

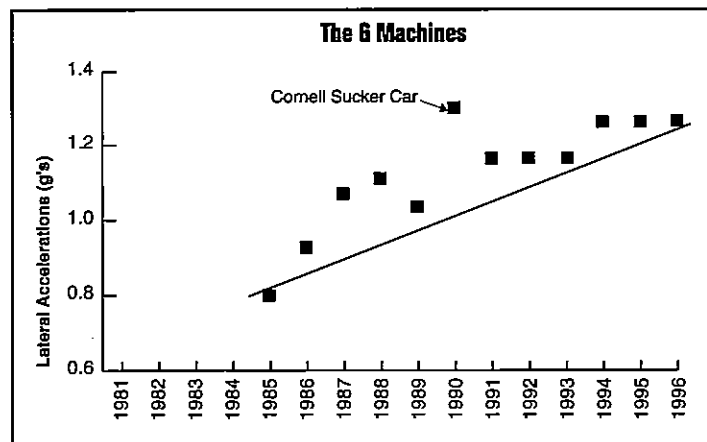
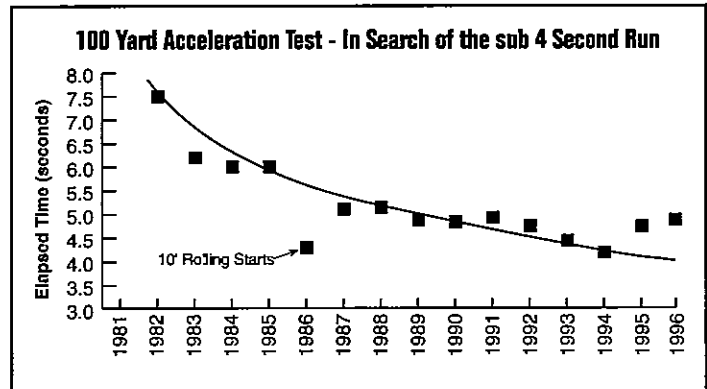
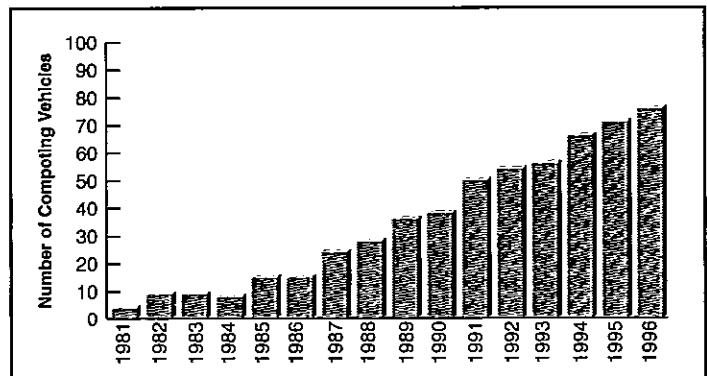
It is interesting to note that the first four years saw consecutive improvements in acceleration times but increasingly poor fuel economy - it was obvious that the students were willing to sacrifice efficiency for performance!

The rules for 1984 noted that "Because this is an engineering design competition and not a test of driver skill, a 2 second penalty will be assessed every time a tire is lifted off the ground during a turn."

Although all teams used pump gasoline, diesel, methanol, and ethanol were all legal fuels.



1984 - The first ever composite car at Formula SAE was this entry from the University of Texas at Austin.



The growth in the formula SAE competition has been impressive. As can be seen in the graphs, both the quantity and quality of the entries has increased since 1981

1985

After nurturing the event for four years, the University of Texas at Austin turned the event over to their colleagues/rivals across the state in Arlington. Bob Woods initiated a major rules rewrite and the competition scoring was revised to include the static events as a portion of the overall awards using a 1000 point scale. The scoring system mimicked the schedule refined for Mini-Baja over the years. UT Arlington entered two cars in 1985 and took first and third places overall with the entry from the University of West Virginia in second.

Perhaps the biggest change was the introduction of the cost report. In 1984 the rules simply stated that "The total project cost, excluding student labor, must not exceed \$2000." Now, for the first time, students were faced with submitting a report for the *manufacturing* costs of 1000 units. The maximum accepted value was \$4500 per unit.

New rules for 1985 included the addition of the engine displacement cap at 610cc and a reduction in the intake restriction to 23mm.

1985 saw the first entries with forced induction; West Virginia running a supercharged 300cc Sachs Wankel and Marquette running a turbocharged 550cc Kawasaki.

1985 was also the first year of organized SCCA participation with 20+ SCCA workers from the Texas Region handling flagging and scoring.

1986

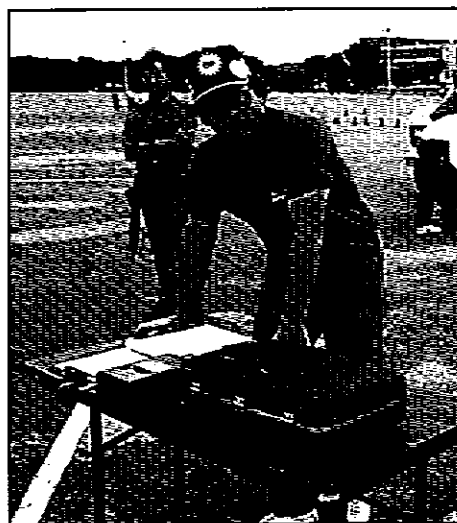
For the first time, Formula SAE moved out of Texas. Lawrence Institute of Technology (now known as Lawrence Technological University) hosted the event on their Southfield, Michigan campus. This Texas-Michigan alternation would last thru 1990. Moving to Michigan brought the event into the backyards of the big three and increased auto industry visibility immeasurably. Each of the big three plus numerous suppliers donated money to offset the expenses of running the 1986 competition.

Event organizer, Wayne Brehob, noted in his event write up that the split between air cooled and water cooled engines was roughly 50:50. Four of the 15 cars were running forced induction; two superchargers, two turbochargers.

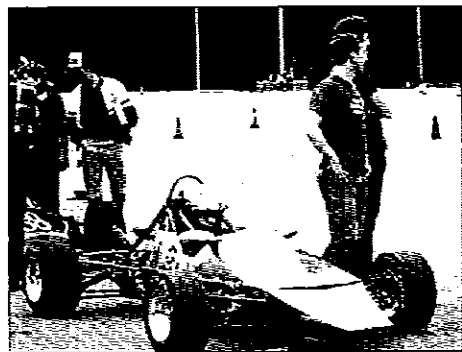
The University of Texas at Arlington won their third championship in a close battle with the rookie entry from the University of Maryland. It was a very rewarding win as 1986 marked the start of prize money being awarded. Volkswagen of America sponsored a \$1000 award to the overall first place team.



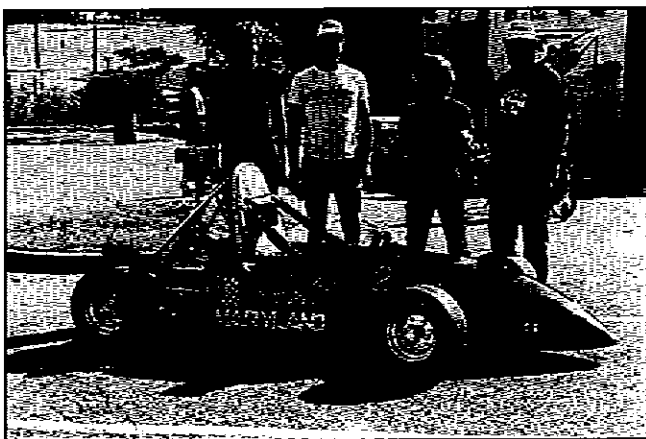
1986 - The official weigh in for Lawrence Tech at the 1986 event.



1986 - It just isn't a Formula SAE event without Bob Sechler, Manager, Educational Relations Division, SAE International. No one has figured out if this event is keeping him young or aging him prematurely. The smile would indicate the former.



1986 - If the helmet and driver of car #10 (Brown University) looks familiar, it is because he would soon transfer to Cornell and lead their 1987/88 team. The driver is Jay O'Connell, who was writer: up in AutoWeek after the event as having the looks and talent of Elio de Angelis.



1987 - The winning car from the University of Maryland in 1987. The gentleman on the right is faculty advisor Dr. Dave Holloway. Ten years after this success Dave was elected SAE International President. Coincidence?



1989 - Ed Bass, 1989 Race Director, helped expand the event from the campus and deeper into the local automotive industry with the SAE South Texas Section acting as host to the event.



1989 - The now infamous Cornell sucker car. What would Jim Hall have thought?

1987

Skidpad performance reached a milestone with the first cars to pull in excess of 1.0g the University of Texas at Arlington (1.09), and Cornell (1.04).

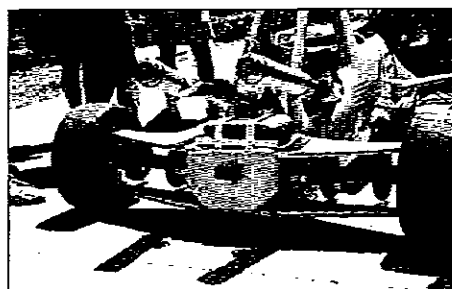
Another milestone was the first appearance of fuel injection with the University of Maryland and UT Arlington entries. It was obvious that both of these teams had worked out any bugs prior to the competition as they finished first and second overall.

The choice of powertrains was evenly split between the 600cc Kawasaki Ninja and the 500cc Honda Hurricane with each having about 40% of the field.

1988

There was no sophomore slump from Cornell. The team did their homework over the year and won their first Formula SAE championship in 1988.

The big news for 1988 was the introduction of an official methanol fuel (M85) class. The US Department of Energy, through the Argonne Laboratory, sponsored additional awards for best methanol fuel conversion, best methanol fuel economy, as well as best overall methanol placement. Now, with a strong financial incentive, teams began pursuing the methanol fuel option for their race engines. The University of Maryland won \$2500 in prize money for their M85 efforts in 1988.



1989 - Drexel University used various composite materials for many vehicle components, including the chassis, roll bar, suspension components, drive axles, and fuel cell.



1989 - Composite chassis entry from Cal State Northridge.

1989

The hottest event to date, the 103°F Texas sun was rough on cars, drivers, and spectators. A record 36 cars from 31 schools competed. Event chairman Ed Bass noted "The 1989 competition was the first to be jointly hosted by an SAE Section (South Texas), and a University (The University of Texas at San Antonio)." It was also the first time the host school did not compete - was that Southern hospitality, or evidence that the only thing more time consuming than building a car is organizing the event? The San Antonio community embraced the event with the Mayor signing a proclamation of "Formula SAE Weekend". The local paper failed to do their homework though labeling the front page photograph as Formula Sigma Alpha Epsilon!!

The Kawasaki 600cc Ninja engine was the powertrain of choice with almost 50% of the field and three of the top four overall finishers including the winners from UT Arlington.

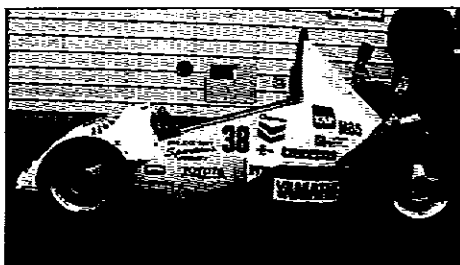
New awards for 1989 included Safety Design, won by Cal State Northridge, and the Rookie of the Year award won by Western Washington University. Rules changes for 1989 included the elimination of rotary engines.

In the event summary report, concern was expressed about the "large number of entries" which resulted in a "shortage of time in most events".

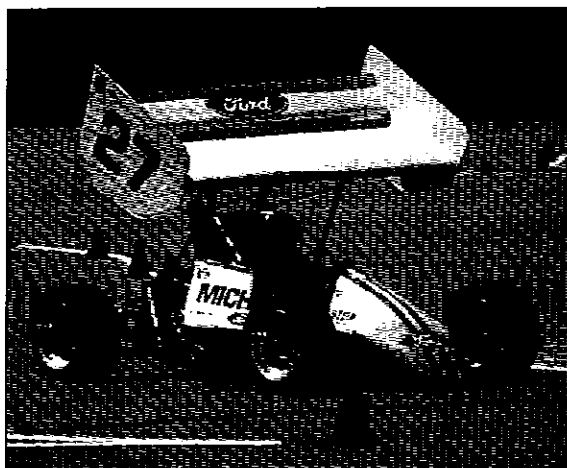
1990

Although it missed out on the big prize, the Cornell "sucker" car was the star of 1990. The Cornell students took a page from history and reinvented Jim Hall's 1970 Chaparral 2J CanAm car. The car featured powered ground effects and the resultant downforce was sufficient to pull a record 1.32 g's on the skidpad. Similar to many sanctioning bodies, the SAE rules committee subsequently banned powered ground effects.

UT Arlington's fifth Formula SAE championship was the first to be won by a turbocharged car.



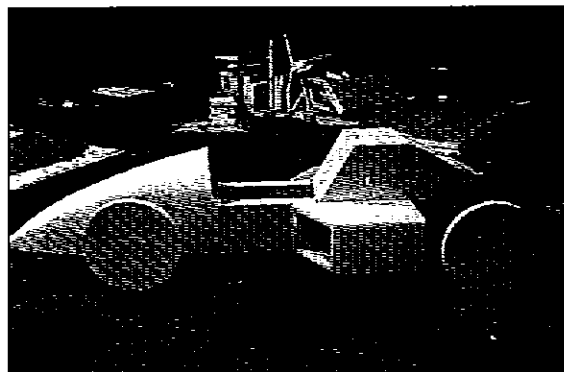
1991 - An impressive rookie entry from California State University, San Jose.



1991 - When the University of Michigan - Ann Arbor decided to use a wing in 1991, they went all out, running a huge WoO style "Hogshed".



1989 - As the competition grew, the attention to details grew. Here is the foam model that the Ohio State team made during the construction of their body panels, along with the finished product.



1991

General Motors, inspired by the great success of their GM SAE Sunrayce competition, deserves credit for moving Formula SAE from a relatively small university event to a major automotive industry happening. Students competing in the 1991 Formula SAE competition were exposed to top level GM corporate support of the event. The kick-off included opening remarks from then GM President Lloyd Ruess. Bob Stempel, then GM Chairman of the Board was seen throughout the event as well. The static events were held in the GM Design dome, while the dynamic events took place at the Milford Proving Grounds. Every student competing will no doubt remember the endurance event on "Black Lake" as being the ULTIMATE parking lot.

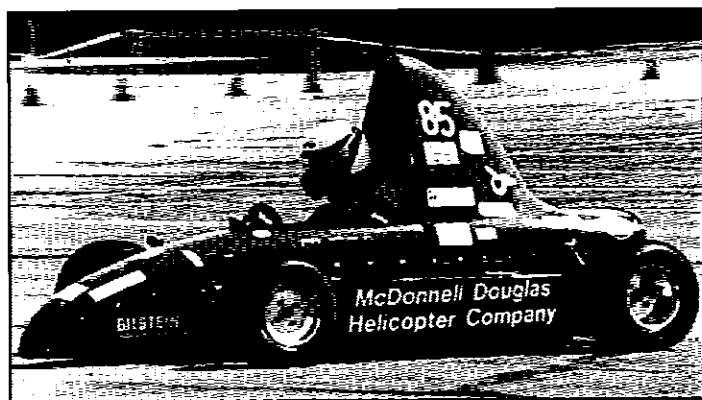
1991 saw the first significant use of wings on Formula SAE cars. The University of Michigan and the University of Missouri-Rolla both ran very large wings mounted midship above the driver. Although both cars were extremely fast in the dynamic events, not everyone in attendance felt the benefits outweighed the penalties. And as with most advances in racing, concern for speed and safety has led to restrictions on wing size and placement in subsequent years.

The overall winner was the team from Virginia Tech. Todd Bowland, the VT captain has since carved a special place in Formula SAE history by going directly from Formula SAE to the CART IndyCar series. Chip Ganassi Racing had offered a special award of a weekend with the team to the captain of the winning team. Todd impressed the team enough to secure full time employment. Todd now works as an engineer for Newman-Haas Racing along with three other Formula SAE grads!

1992

After the success of the 1991 event, GM was left in a bit of a quandary. They had raised the level of the event to where a return to a university parking lot was no longer desirable. Luckily, Ford had been having great success with hiring students with SAE design competition experience and agreed to host the 1992 event. A team of recent grads working at Ford acted as the staging committee with the events being held at various Ford facilities in Dearborn. Ford brought in Grand Prix greats Jackie Stewart and Bob Bondurant to help with driver education.

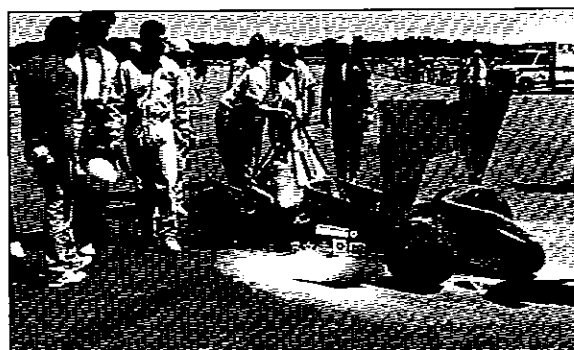
Cornell took their second win, utilizing a turbocharged Honda CBR600 engine. This engine would account for 40-50% of the field within three years.



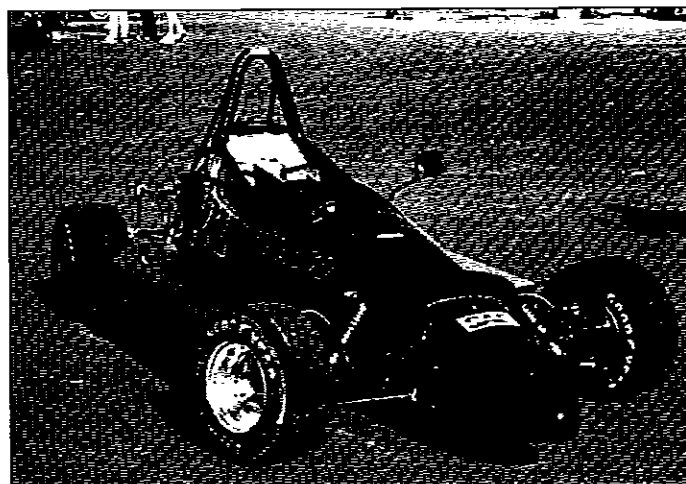
1992 - Winner of the static design event, Arizona State University.



1991 - Interested spectators, Bob Stempel (extreme right), and Lloyd Ruess (second to right) enjoy the 1991 competition, the first corporate sponsored Formula SAE event.



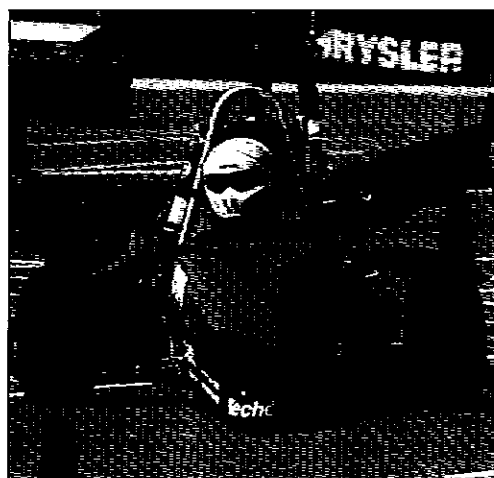
1991 - Among the winged entries for 1991 was the University of Missouri-Rolla. During the safety inspection there was concern as to how the wing would impede the driver if a quick escape was required. During the endurance race a small fire showed that the quick release attachments worked just fine.



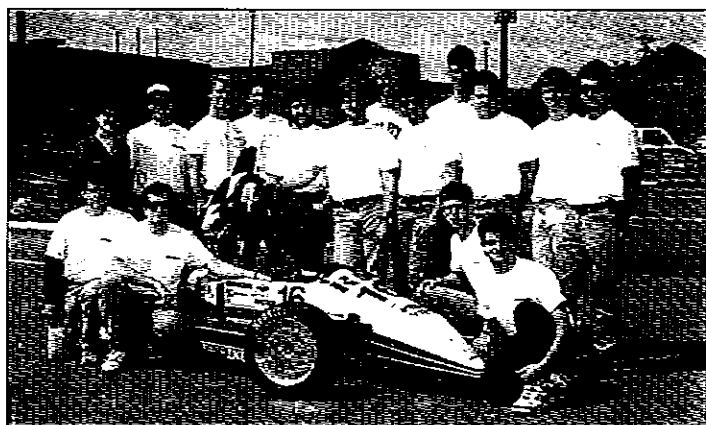
1991 - Possibly the first use of four wheel steering in a Formula SAE car - Western Washington University.



1992 - Jackie Stewart (dark glasses) and Bob Bondurant (to the right of Stewart) discuss the competition with students from the University of British Columbia.



1993 - Another superb car with a great graphics design from the University of Maryland.



1993 Rookie of the Year - The Rochester Institute of Technology.

1993

After GM and Ford, the natural choice for host company was Chrysler. Chrysler's magnificent new Auburn Hills Technical Center was the site and Chrysler provided the students with numerous opportunities to interface with its technical staff. Chrysler Vice President Francois Castaing, and a team of Chrysler engineers, played host while featured guests included racing legend Carroll Shelby, and racer/driving instructor Terry Earwood.

The only problem for the organizers was the temperamental Michigan weather as part of Saturday's schedule was rain delayed. The only problem for most of the teams was the car from Cornell which won its second straight championship.

1994

After having rotated through each of the big three, a major decision for 1994 was needed. Would the automakers continue this rotation? What would be the best scenario for the students? In the spirit of USCAR and the many consortium efforts of the big three, a Formula SAE consortium was created for 1994. The consortium would be staffed by two representatives from each of the automakers with one representative from the SAE Educational Relations Division staff. The Pontiac Silverdome was chosen as a central neutral site, and Coventry Consulting was retained for event management.

The overall win went to the University of Michigan-Ann Arbor.

1995

With the teams returning to the same site for a second year, 1995 had a familiar feel for many people. The growth continued with 84 entries and 71 actual cars at the event. After missing out on the top spot for the past four years, UT Arlington finally added their sixth win and did it with a significant difference - a smaller engine. The winning car utilized a 400cc Honda engine against the typical 600's. The UT Arlington logic was that given the intake restriction they could achieve almost the same power as a 600 while picking up significant advantages in fuel economy, weight, and cost over their rivals.

Head design judge Carroll Smith commented that it was not just a few teams making significant improvements - he remarked that the entire field was increasingly competitive. The dynamic numbers back up this observation, the winning skid-pad time in 1989 would not have made the top 25 in 1995.

Among new specialty awards for 1995 was the Vehicle Recycling Partnership Award for best use of recycled materials/design for recyclability - won by the University of Washington.

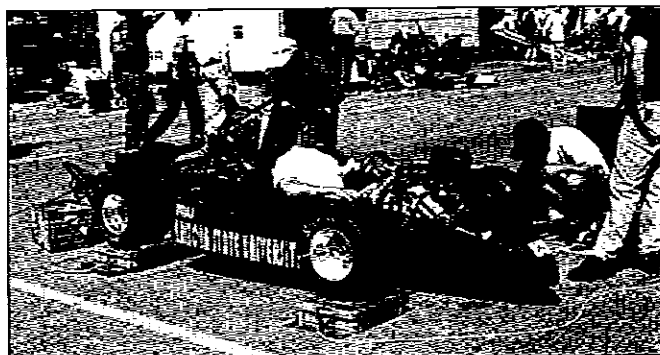
After Saturday's track events, over 300 students and volunteers gathered at the Motorsports Museum & Hall of Fame in nearby Novi. The students gathered to see the new display highlighting the SAE Collegiate design series, including both a Mini-Baja and Formula SAE racer.



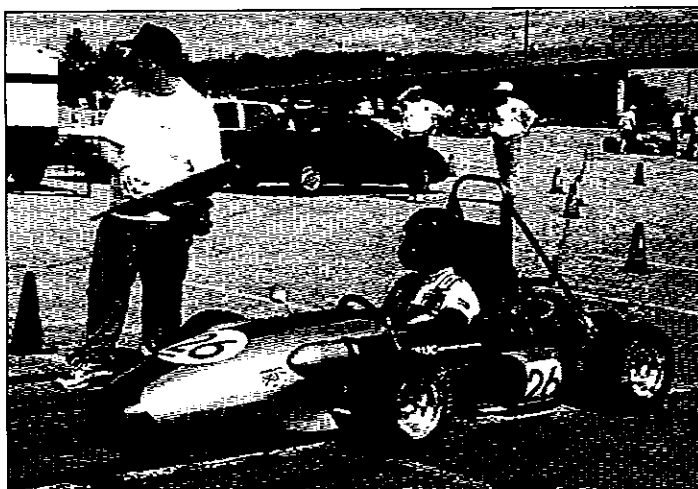
1994 - Advancements in Formula SAE technology have also been on the organizers side. This hydraulic tilt table was a welcome relief to those who had staffed the manual tilt inspection previously.



1994 - Having won the inaugural competition in 1981, Stevens Institute finally made a return to the 1994 competition.



1994 - As the cars became more sophisticated, so has the support equipment with which to set up the cars. ASU brought along their own digital scales to the 1994 competition.



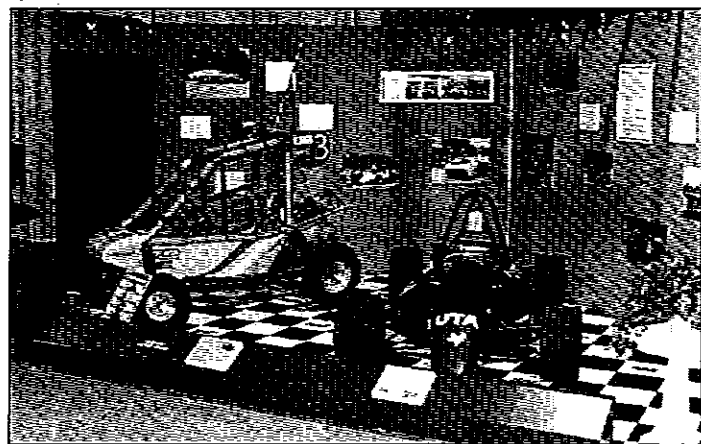
1995 - Western Washington University's 1995 entry featured composite tubes as structural frame rails. The car was nicknamed the rocket launcher.



1994 - Like any racing event, a Formula SAE weekend just isn't complete without at least one major cloud of smoke from an engine asked to give just a little more power than it was designed to produce.



1995 - Head Design Judge, Carroll Smith (Dark hat with band), confers with the University of Texas at Arlington faculty advisor, Dr. Bob Woods (baseball cap), as to how the Arlington team optimized their suspension geometry.



1995 - Formula SAE and SAE Mini-Baja now receive constant public attention at the Motorsports Hall of Fame of America in Novi, Michigan. The Student Relations Committee of the SAE Detroit Section constructed the display prior to the 1995 competition.



1995 - For those team who did not get enough racing at the Silverdome, slot cars were the prime entertainment at the Motorsports Hall of Fame.



1995 - The Society of Automotive Engineers is over 60,000 members worldwide. To keep everything organized, a staff of 300 is headquartered in Warrendale, Pennsylvania. A small group forms the Educational Relations Division. Pictured left to right are Stacey Bush, Tammy Edinger, Lori Pail, and Lynn Puskar.



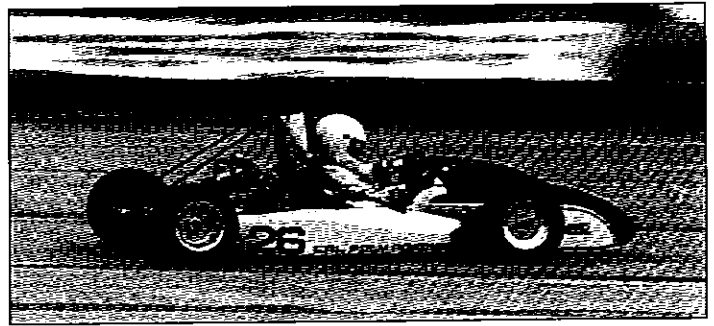
1995 - The gentleman wearing the mirrored sunglasses is a vacationing Patrick Head. When not visiting Formula SAE, Mr. Head is the technical director of the Williams Grand Prix team.

1996

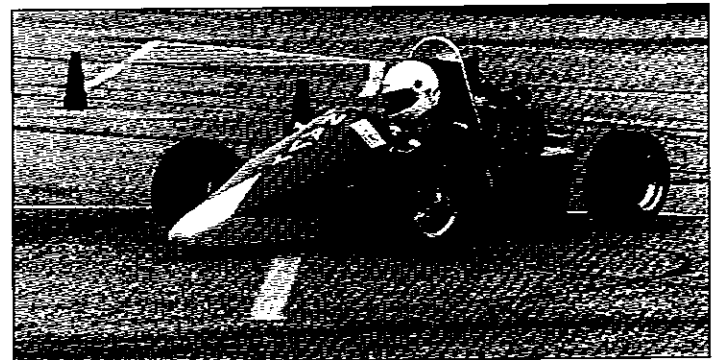
1996 continued the evolution of the immediate past. The continued use of the Pontiac Silverdome as a site, and Coventry Consulting to assist with event management made this the smoothest run event to date. To put the growth of the event into perspective, it should be noted that over 300 engineers acted as judges and volunteers during the three day event.

The 1996 competition drew a record 99 entries from which 76 cars made it to the competition. The large volume of cars was such that Friday's events were quite hectic due to a morning rain delay. Saturday's endurance runs also extended beyond the normal operating hours. It was noted that things were much easier in the days when more of the cars broke down early in the event!

A notable detail change was having the design judging finals take place AFTER the endurance race. The five finalists were the Ecole de Technologie Supérieure (ETS), Cornell University, Lehigh University, Georgia Tech, and the University of Texas at Arlington. Carroll Smith, along with Alec Purdy, Roman Slobodinskyj, Ken Sperry, and Steve Lyman spent about two hours carefully examining and comparing the cream of the crop. In addition to what they observed statically, they had notes from having watched two days of dynamic track events. Once the numbers were crunched and the five were ranked. Carroll did a walkaround of each car, starting with fifth place. Carroll reviewed the relative merits of the five cars noting that the level of competition was such that any one of these cars would have clearly won the previous year. In the end, the team from ETS was awarded the perfect 150 design score with UTA but one point behind.



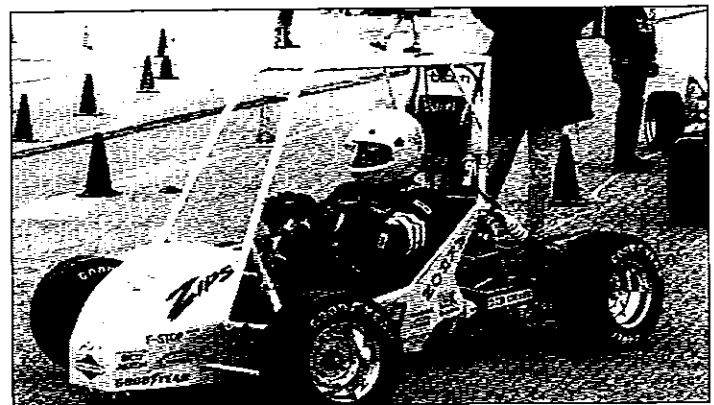
1996 - The graceful looking Cal Poly Pomona entry at speed.



1996 - A notable rookie in 1996 was a team from the US Naval Academy. This was the first time a military institution had entered Formula SAE. The Navy team is hopeful of enticing some of their more traditional rivals to future competitions.



1996 - The winning team from the University of Texas at Arlington.



1996 - One of the more controversial entries of the year was the University of Akron's "Team Bajmula". The 8hp Briggs and Stratton powered car could be converted from Formula SAE specs to a race ready SAE Mini-Baja car in 30 minutes. The car in fact competed in both events in 1996, finishing 24th in Formula SAE and 1st in Midwest Mini-Baja.

The Future

After sixteen competitions the Formula SAE competition has literally grown by a factor of twenty. While many of the details have changed, the premise is still the same - providing a hands on learning experience, promoting great academia/industry interaction, all while doing what consumes many (most?) of those participating - playing with race cars.

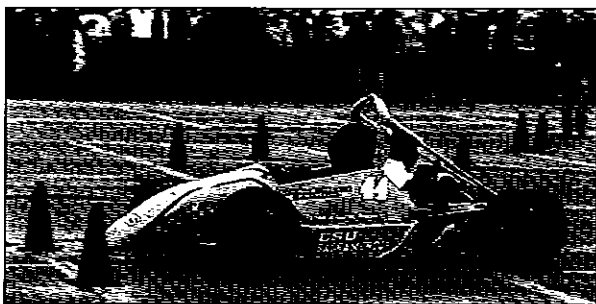
To date competing schools have come from 120 schools; the majority of the 50 US states, Canada, Mexico, and Puerto Rico. 1997 could see the first entry from overseas. The University of Leeds in England has expressed interest. Considering how much of the Formula car industry resides within the UK, this could push the competition to new heights.

Acknowledgments:

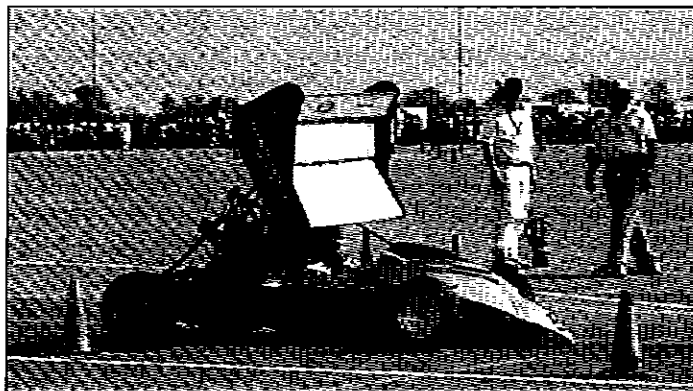
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References:

- 1 Matthews, R.D., Morton, R.K., and Wood, B.H. "The 1983 Formula SAE Competition," SAE Technical Per #831390
- 2 Woods, R.L., Richichi, J, Murray, D.W., and Lammons, C.S., "Formula SAE Student Design Competition," SAE Technical Paper #851568
- 3 Brehob, W.M., Hubbs, D.R., "The 1986 National Intercollegiate Formula SAE Competition," SAE Technical Paper #861304
- 4 Bass, E.A., Bendele, L.M., and McBroom, S.T., "The 1989 Formula SAE Student Design Competition", SAE Technical Paper #900840
- 5 Case, D.E., "The History of Formula SAE", 1996 Formula SAE Competition Event Program, pages 10-30. SAE 96-0540
- 6 Matthews, R.D., Worcester, D., Wood, B, and Ryan, T., "The 1984 Formula SAE Intercollegiate Competition", SAE Technical Paper #841163.
- 7 Beckel, S.A., Obregon, S, and Matthews, R.D., "The 1982 National Intercollegiate Formula SAE Competition", SAE Technical Paper #821093.
- 8 Case, D.E. "Student Talent", Racecar Engineering, Vol. 5, No. 3, pages 35-39, 1995.



1996 - A rookie entry from 1995 became a top ten contender in 1996, the entry from California State University, Sacramento.



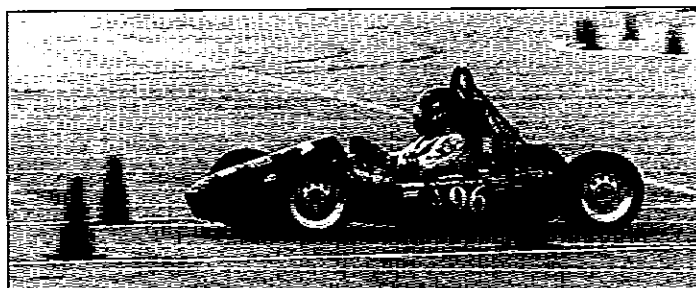
1996 - The advantages and disadvantages of wings are still highly questionable. When things went wrong with the University of Michigan's front wing brace, a large air brake was the result. The car had won the skid-pad event the previous day.



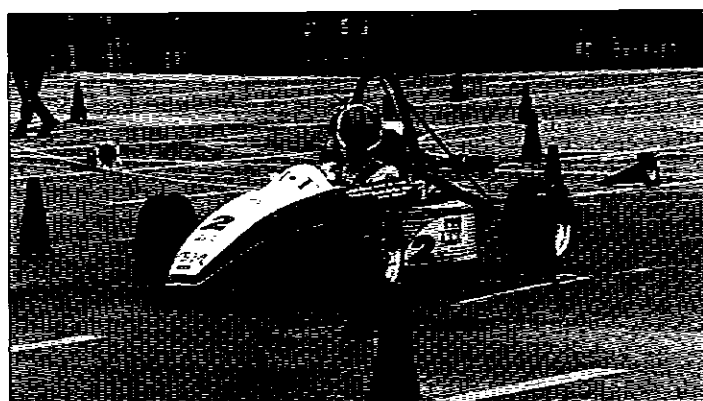
1996 - From left to right, Roman Slobodskyj, Steve Lyman, Alec Purdy, and Carroll Smith discuss the Lehigh entry during the design finals. These four, along with Ken Sperry spent over two hours reviewing the final five to determine the design winners. Afterwards Carroll gave a comprehensive rundown on each car's merits to all assembled. Those students who listened to Carroll's comments no doubt gained valuable insights for 1997.



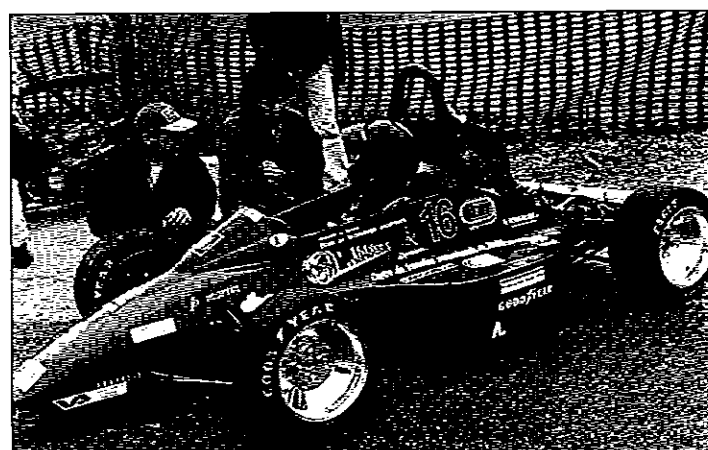
1996 - The top five in design, from left to right, Cornell (5th), Georgia Tech (3rd), ETS (1st), UTA (2nd), and Lehigh (4th).



1996 - The team from UT Arlington won an unprecedented seventh overall Formula SAE Championship. Once again it was a car and team that was strong in every category.



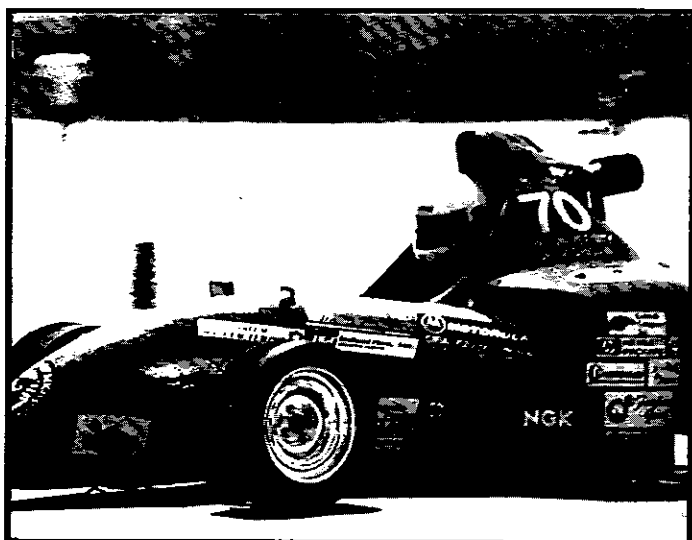
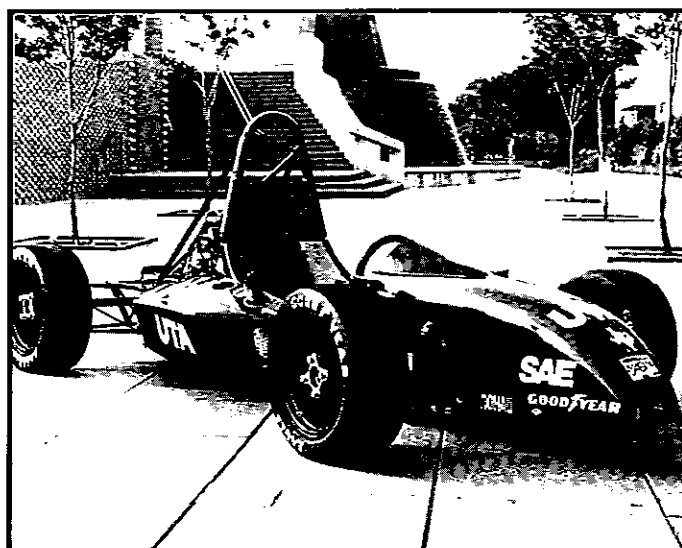
1996 - RIT continued its consistent form finishing second overall for the third year in a row.



1996 - First in design and third overall was this first class entry from Ecole de Technologie Superieure. Carroll Smith remarked that "this was the car that knocked our socks off" and continued by calling it "the most beautifully built Formula SAE car he had ever seen."

1996		
Top 50 (Overall Ranking)		
	School	Points
1	The University of Texas at Arlington	887.51
2	Rochester Institute of Technology	787.40
3	Ecole de Technologie Superieure	764.90
4	Cornell University	707.33
5	Virginia Tech	705.61
6	Lawrence Technological University	658.39
7	Oregon State University	647.51
8	Universite de Sherbrooke	627.08
9	Cal Poly State University - Pomona	594.03
10	California State University - Sacramento	568.35
11	University of Akron - #13	558.14
12	The Ohio State University	523.17
13	Drexel University	509.49
14	University of Washington	498.87
15	Worcester Polytechnic University	482.78
16	Penn State University	448.75
17	University of Michigan - Ann Arbor	447.95
18	Auburn University	432.30
19	University of Missouri - Rolla	414.08
20	Georgia Institute of Technology	396.78
21	California State University - Northridge	395.05
22	Western Washington University	383.54
23	Universite du Quebec a Trois-Rivieres	374.71
24	University of Akron - #18	372.46
25	University of Cincinnati	367.24
26	University of Toledo	357.54
27	SUNY Buffalo	345.30
28	Michigan State University	345.16
29	University of Wisconsin - Madison #46	337.59
30	University of Waterloo	317.04
31	Universite Laval	299.84
32	Purdue University	285.84
33	University of Florida	276.56
34	Cal Poly State University - San Luis Obispo	252.47
35	University of Oklahoma	247.31
36	Lehigh University	236.26
37	University of Hartford	234.90
38	University of Michigan - Dearborn	226.44
39	Dartmouth College	226.12
40	United States Naval Academy	226.00
41	Queen's University	224.52
42	Brown University	221.58
43	Colorado School of Mines	196.96
44	Colorado State University	193.08
45	University of Missouri - Columbia	181.42
46	Rensselaer Polytechnic Institute	177.13
47	McMaster University	176.19
48	Nicholls State University	157.49
49	University of Connecticut - #21	151.11
50	Michigan Technological University	133.47

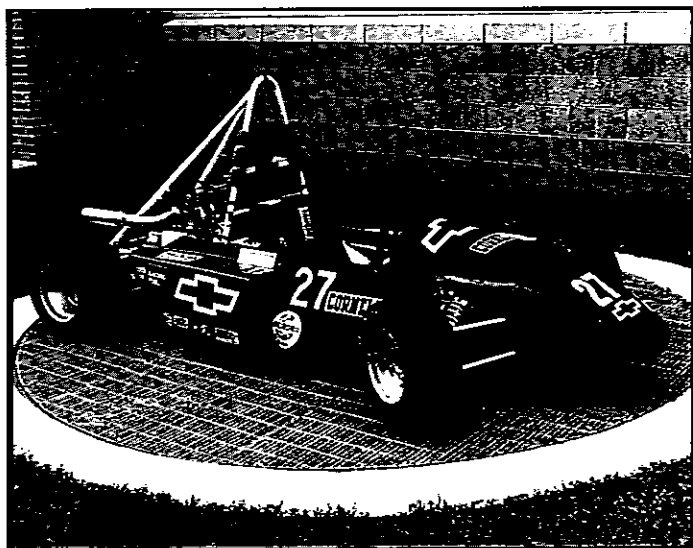
1995 Pontiac Silverdome Formula SAE Consortium	
1	The University of Texas at Arlington
2	Rochester Institute of Technology
3	Cornell University
4	Western Washington University
5	University of Michigan - Ann Arbor
6	Lawrence Technological University
7	University of Illinois - Urbana
8	University of British Columbia
9	State University of New York at Buffalo
10	California State Polytechnic University - Pomona
71 competing vehicles	



1994 Pontiac Silverdome Formula SAE Consortium	
1	University of Michigan - Ann Arbor
2	Rochester Institute of Technology
3	Cornell University
4	Universidad LaSalle
5	University of Florida
6	Georgia Institute of Technology
7	University of Illinois - Urbana
8	The University of Texas at Arlington
9	Rutgers University
10	University of Illinois - Urbana
66 competing vehicles	

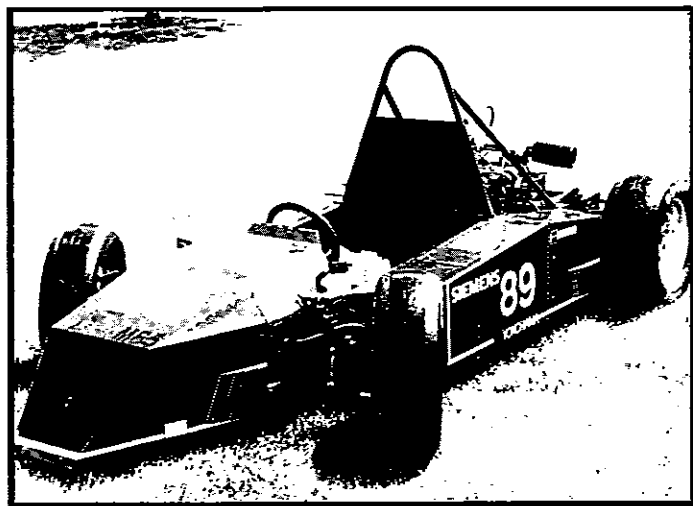
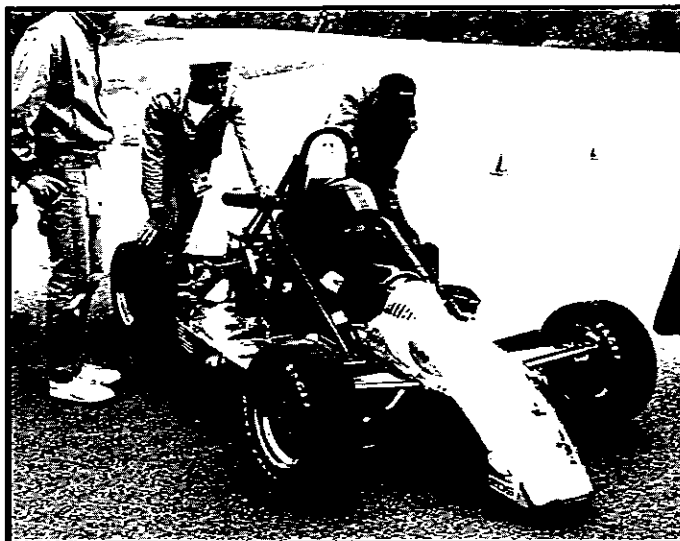
1993 (May 21) Chrysler Technical Center Chrysler Corporation	
1	Cornell University
2	The University of Texas at Arlington
3	Georgia Institute of Technology
4	University of Maryland
5	The University of Texas at Arlington
6	Virginia Polytechnic Institute
7	University of Washington
8	Rochester Institute of Technology
9	Marquette University
10	Ecole Polytechnique de Montreal
56 competing vehicles	





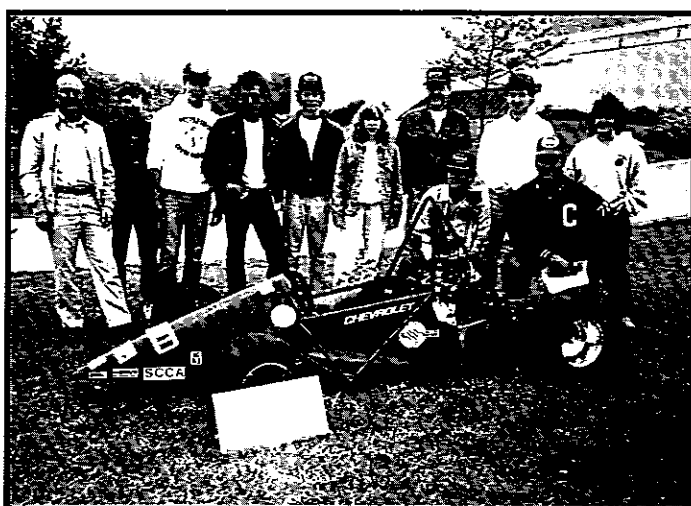
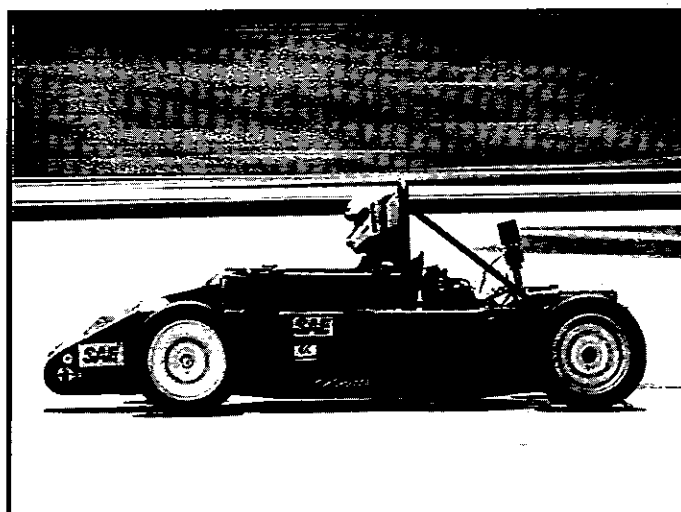
1992 Ford Research & Engineering Center Ford Motor Company	
1	Cornell University
2	The University of Texas at Arlington
3	Virginia Polytechnic Institute
4	West Virginia University
5	California State University, San Jose
6	University of Illinois
7	University of Michigan - Ann Arbor
8	University of PittsburghPittsburgh
9	University of Waterloo
10	University of Akron
54 competing vehicles	

1991 General Motors Technical Center & Proving Grounds General Motors Corporation	
1	Virginia Polytechnic Institute
2	The University of Texas at Arlington
3	University of Missouri-Rolla
4	University of Waterloo
5	University of Michigan - Ann Arbor
6	Georgia Institute of Technology
7	University of Washington
8	Lawrence Technological University
9	University of Missouri - Rolla
10	University of West Virginia
50 competing vehicles	



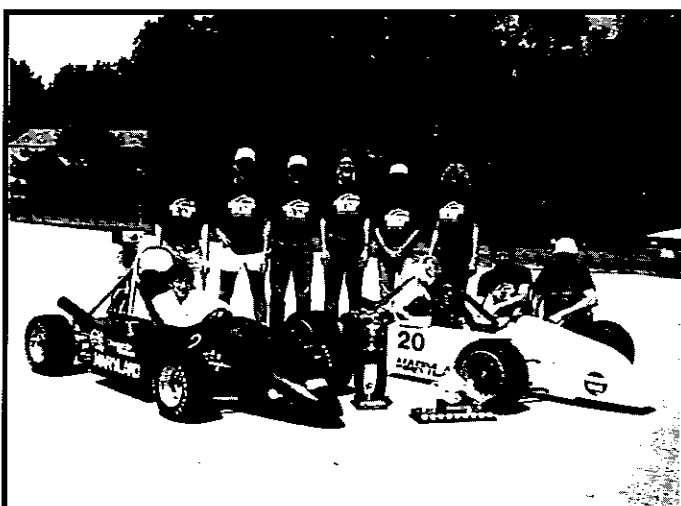
1990 Lawrence Technological University	
1	The University of Texas at Arlington
2	Georgia Institute of Technology
3	Cornell University
4	University of Missouri-Rolla
5	Comell University
6	Michigan State University
7	University of Washington
8	University of Michigan
9	Ecole Polytechnique de Montreal
10	Worcester Polytechnic University
38 competing vehicles	

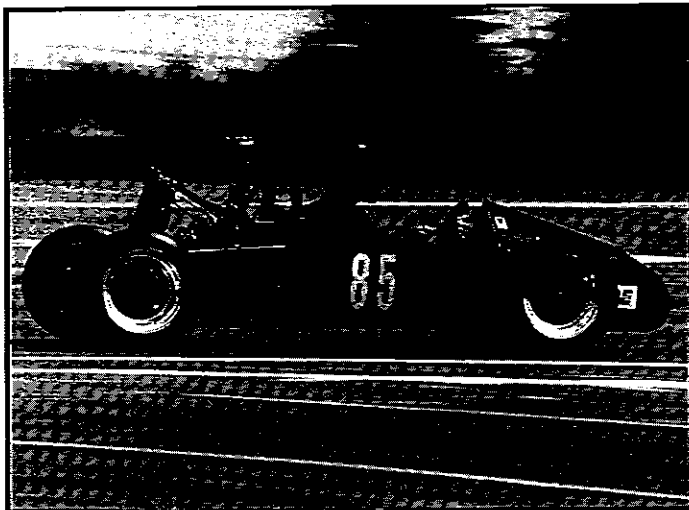
1989 SAE South Texas Section	
1	The University of Texas at Arlington
2	Virginia Polytechnic Institute
3	Cornell University
4	Virginia Polytechnic Institute
5	Mankato State University
6	University of Waterloo
7	Lawrence Technological University
8	Western Washington University
9	University of West Virginia
10	Rose Hullman Institute of Technology
36 competing vehicles	



1988 Lawrence Technological University	
1	Cornell University
2	University of West Virginia
3	The University of Texas at Arlington
4	Lawrence Technological University
5	Mankato State University
6	The University of Texas at Arlington
7	Rose Hullman Institute of Technology
8	University of Waterloo
9	Lawrence Technological University
10	Virginia Polytechnic Institute
28 competing vehicles	

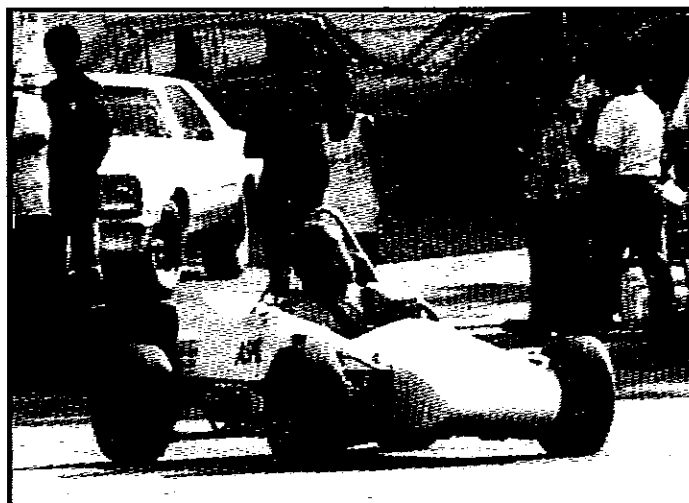
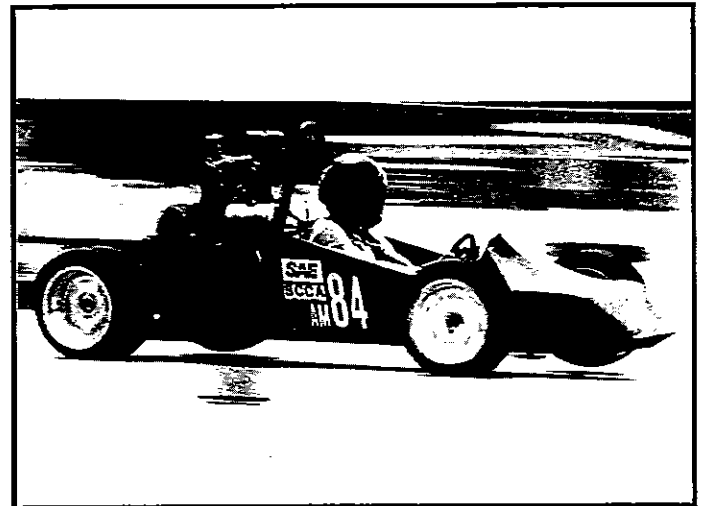
1987 The University of Texas at Arlington	
1	University of Maryland
2	The University of Texas at Arlington
3	Cornell University
4	University of Waterloo
5	University of Maryland
6	Lawrence Technological University
7	University of West Virginia
8	Louisiana State University
9	University of Houston
10	Ecole Polytechnique de Montreal
24 competing vehicles	





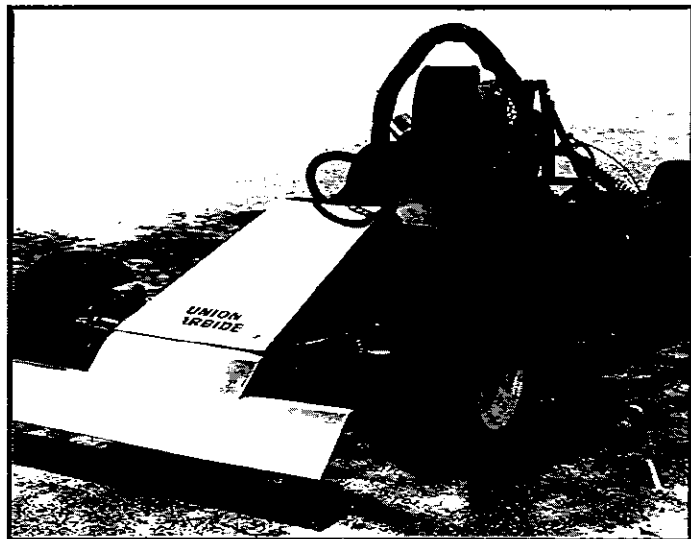
1986	
Lawrence Technological University	
1	The University of Texas at Arlington
2	University of Maryland
3	Ecole Polytechnique de Montreal
4	The University of Texas at Austin
5	Lawrence Technological University
6	University of West Virginia
7	The University of Texas at Austin
8	Louisiana State University
9	Arizona State University
10	Nicholls State University
15 competing vehicles	

1985	
The University of Texas at Arlington	
1	The University of Texas at Arlington
2	West Virginia University
3	The University of Texas at Arlington
4	Lawrence Technological University
5	Louisiana State University
6	University of Cincinnati
7	Ecole Polytechnique de Montreal
8	Arizona State University
9	Milwaukee School of Engineering
10	Texas A&M University
15 competing vehicles	



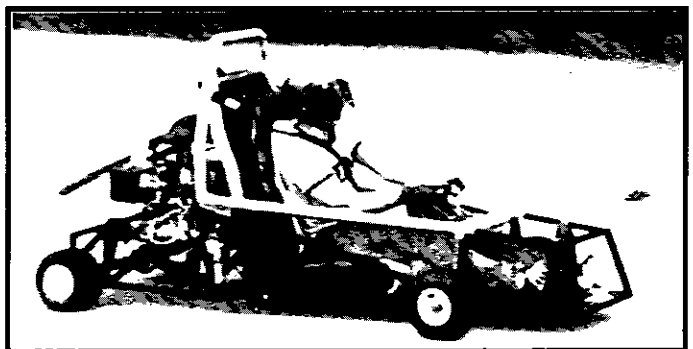
1984	
The University of Texas at Austin	
1	University of Houston
2	Texas A&M University
3	The University of Texas at Arlington
4	The University of Texas at Austin
5	The University of Texas at Austin
6	Nicholls State University
7	Lawrence Technological University
8	Milwaukee School of Engineering
Appearance: The University of Texas at Arlington	
Engineering: University of Houston	
8 competing vehicles	

1983 (May26-28)	
The University of Texas at Austin	
1	The University of Texas at Arlington
2	University of Houston
3	The University of Texas at Arlington
4	Marquette University
5	Texas A&M
6	The University of Texas at Austin
-	Nicholls State University
8	Michigan Technological University
9	West Virginia University
Appearance: The University of Texas at Austin	
Engineering: West Virginia University	
9 competing vehicles	



1982	
The University of Texas at Austin	
Formula	1 The University of Texas at Austin
	2 University of Illinois at Urbana
	3 University of Houston
	4 Nicholls State University
B&S	1 The University of Texas at Arlington
	2 The University of Texas at Arlington
	3 Southern Methodist University
	4 Universidad LaSalle
	5 The University of Texas at Austin
Appearance: University of Houston	
Engineering: University of Houston	
9 competing vehicles	

1981	
The University of Texas at Austin	
1	Stevens Institute of New Jersey
2	University of Cincinnati
3	University of Tulsa
4	The University of Texas at Austin
Appearance: The University of Texas at Austin	
Engineering: The University of Texas at Austin	
4 competing vehicles	



Year	Host / Location	Winning School	Engine (of winning car)	Entrants (#)	Actual Cars (#)	Top Performances			Intake Restriction	Cost Limits	Static Design Winner	M85 Class Winner	Rookie of the Year	Notes
						0 - 100m (secs)	Lateral g's	Fuel Economy (mpg)						
1981	UT Austin	Stevens Institute		6	4			85.0	25.4mm	2000 (Project cost)	The University of Texas at Austin		Stevens Institute (1st)	
1982		UT Austin	300cc Sachs single rotor Wankel with a Salisbury Torque converter	9	9	7.49		46.6	25.4mm	2000 (Project cost)	The University of Houston		UT Arlington (1st)	UT Austin (1st)
1983		UT Arlington	8 hp B&S modified to produce 13hp	11	9	6.20		45.1	25.4mm	2000 (Project cost)	The University of West Virginia		Marquette University - 4th	
1984		U of Houston	600cc Honda		11	8	6.02		36.4	25.4mm	2000 (Project cost)	The University of Houston		Lavergne Technological University - 7th
1985	UT Arlington	UT Arlington	500cc Honda V4	20	15	6.01	0.90	20.6	23mm	4500	The University of Cincinnati		Polk State University - 8th	Static events are part of total score for first time. 610cc limit added
1986	LTU	UT Arlington	500cc Honda V4	20	15	4.37*	0.93	14.2	23mm	5000	University of Maryland		University of Maryland	* Due to timing equipment, acceleration runs were done with a 10 ft rolling start
1987		Maryland	600cc Kawasaki		24	5.11	1.09	17.9	20mm	5500	University of Maryland		Cornell - 2nd	First fuel injected cars - U of Maryland and UT Arlington
1988	LTU	Cornell	600cc Kawasaki		28	5.15	1.11	25.0	20mm (Gas) 18mm (M85)	6000	Lawrence Technological University		Marquette State University - 8th	M85 class introduced
1989	UT San Antonio	UT Arlington	600cc Kawasaki with fuel injection	45	36	4.88	1.04	16.0	20mm (Gas) 18mm (M85)	6000	Cornell		Western Washington University - 8th	First year with prize money Rotary engines no longer legal
1990	LTU	UT Arlington	600cc Kawasaki with fuel injection and a turbocharger	52	38	4.85	1.32	24.2	20mm (Gas) 18mm (M85)	6500	University of Washington		University of Washington - 7th	
1991	General Motors Corporation	Virginia Polytechnic	600cc Kawasaki with fuel injection and a Polaris CVT	60	50	4.93	1.17	19.4	20mm (Gas) 18mm (M85)	7000	UT Arlington		Clarkson University - 20th	First year with industry host
1992	Ford Motor Company	Cornell	600cc Honda with a Warner Iishi RH-B3 turbocharger	62	54	4.75	1.17	18.1	20mm (Gas) 18mm (M85)	7500	Arizona State University		University of British Columbia - 28th	
1993	Chrysler Corporation	Cornell	600cc Honda I-4 with a Warner Iishi RH-B5 turbocharger	63	56	4.44	1.17	17.4	20mm (Gas) 18mm (M85)	8000	Cornell		Rochester Institute of Technology - 8th	
1994	Formula SAE Consortium	U of Michigan	600cc Honda I-4	75	66	4.19	1.27	37.2	20mm (Gas) 18mm (M85)	8000	UT Arlington		Universidad LaSalle - 4th	First year of Formula SAE Consortium
1995	Pontiac, Michigan	UT Arlington	400cc Honda I-4 with fuel injection and a turbocharger	84	71	4.75	1.27	18.7	20mm (Gas) 18mm (M85)	8500	UT Arlington		Oregon State University - 13th	
1996		UT Arlington	400cc Honda I-4 with fuel injection and a turbocharger	97	76	4.86	1.27	22.0	20mm (Gas) 18mm (M85)	8500	École de Technologie Supérieure		Auburn University - 18th	
				Totals	~ 680	559								

Appendix - School by school summary of results, 1981 - 1996

School	1996	1995	1994	1993	1992	1991	1990	1989	1988	1987	1986	1985	1984	1983	1982	1981
Arizona State University			42	14	20 & 48	48										
Auburn University	18															
Brown University	42		55	57							12					
California Polytechnic State University San Luis Obispo	34		61	56	55	51										
California State Polytechnic University - Pomona	9	10	56	16	31				17	13						
California State University - Northridge	21	32					17	16	16							
California State University, Fresno	Scratch	33	20	25 & 57	38											
California State University, Sacramento	10	49														
California State University, San Diego		47		33	55	46										
California State University, San Jose					5 & 26	31										
Clarkson University	54	54	71	24	32 & 55	20										
Cleveland State University		66	54		52	30	32	27	20							
Colorado School of Mines	43															
Colorado State University	44															
Concordia		40	73	44	55	38	28	24								
Cornell University	4	3	3	1	1 & 55	13 & 22	3 & 5	3 & 14	1	3						
Dartmouth College	39															
Drexel University	13	67	69	53	55			31								
Duke University	70	59	31	50	55											
Ecole de Technologie Superieure	3	16	26	10	43	33	31									
Ecole Polytechnique de Montreal	Scratch	35	36	63	45	23	9	32		10	3	7				
Florida A&M University / Florida State University	71	30														
Florida Institute of Technology					55											
Georgia Institute of Technology	20	11	6	3	21	6	2		23	12						
GMI Engineering & Management Institute	76	48	32 & 72		55C	39	33		19	20						
Instituto Tecnologico de Chihuahua	65															
Iowa State University	51	56	47	27	41	45										
Lawrence Technological University	6	6	57	41	18 & 55	8	13	7	4 & 9	6 & 23	5	4	7			
Lehigh University	36	81	28	62												

Appendix - School by school summary of results, 1981 - 1996

School	1996	1995	1994	1993	1992	1991	1990	1989	1988	1987	1986	1985	1984	1983	1982	1981
Lima Tech						29 & 41	24									
Louisiana State University				32	28		30			8	8	5				
Mankato State University								5	5							
Marquette University	Scratch	21	45	9	51	18	34	29	12	19	14	11		4		
McGill University	Scratch	23						26								
McMaster University	47		41	56	55											
Michigan State University	28	28	23	61	15 & 55	14	6	28								
Michigan Tech University	50	29	17	17	33									8		
Milwaukee School of Engineering		58			37	16	23					9	8			
Mississippi State University	67															
Monroe County Community College	73	63		43	49	50	38	33								
New York Polytechnic										22						
Nicholls State University	48				54	24	35	30			10		6	6	4 (FSA E)	
Oregon State University	7	13						19								
Penn State University	16	43	33													
Polytechnic University - Brooklyn	Scratch			51	53				11							
Purdue University	32		40 & 43	39 & 45	11	28										
Queen's University	41	19	39													
Rensselaer Polytechnic Institute	46	24	34 & 48	38	35											
Rochester Institute of Technology	2	2	2	8												
Rose Hullman Institute of Technology					30	43	20	10	7	15						
Rutgers		22	9		17	42										
Ryerson Polytechnic University	Scratch	80	65	59	55											
Santa Clara University	Scratch	39	75			35	18	20	22							
South Dakota School of Mines & Technology	64															
Southern College of Technology		61		46												
Southern Methodist University															3 (B&S)	
State University of New York - Stony Brook	Scratch	79														
State University of New York at Buffalo	27	9	11	37	47											

Appendix - School by school summary of results, 1981 - 1996

School	1996	1986	1994	1993	1992	1991	1990	1989	1988	1987	1986	1985	1984	1983	1982	1981
Stevens Institute			15													1
Syracuse University	60		37													
Temple University		31	19	36	40											
Texas A & M										24		10	2	5		
The Ohio State University	12	25 & 41	14 & 75	48, 49, & 55	19	17	27	25								
The University of Akron	11 & 24	15 & 17	12 & 16	11	6 & 34	12	15									
The University of Texas at Arlington	1	1	8	2 & 5	2 & 27	2	1	1 & 17	3 & 6	2 & 14	1 & 7	1 & 3	3	1 & 3	1 & 2 (B&S)	
The University of Texas at Austin	62	45	67	20	55	27	36	13 & 15	25 & 28C	17 & 21	4 & 11	13 & 15	4 & 5	6	1 (FSAE) & 5 (B&S)	4
The University of Texas at San Antonio	75	71														
Union College	Scratch	62														
United States Naval Academy	40															
Universidad LaSalle			4												4 (B&S)	
Universite de Sherbrooke	8	14														
Universite du Quebec a Trois-Rivieres	23	27														
Universite Laval	31	70	38	42	50	40										
University of Arizona	74	69	63				11	35			9	8				
University of British Columbia		8	29	34	26											
University of California, Irvine		73	30		42											
University of California, Santa Barbara	61				46	34	37									
University of Cincinnati	25	46	52	52						18	13	6				2
University of Colorado, Boulder	52		59													
University of Connecticut	49 & 66	44	66	40	55	32	12									
University of Evansville		84	70	60	44											
University of Florida	33	53	5	26	55	37										
University of Hartford	37	20	60	47												
University of Houston										9		14	1	2	3 (FSAE)	
University of Illinois at Champaign-Urbana	Scratch	7 & 42	7 & 10	15 & 28	9 & 25	49									2 (FSAE)	
University of Kansas	59	51	53													
University of Manitoba			75													

Appendix - School by school summary of results, 1981 - 1996

School	1996	1995	1994	1993	1992	1991	1990	1989	1988	1987	1986	1985	1984	1983	1982	1981
University of Maryland				4	16 & 24	25		11	13 & 14	1 & 5	2					
University of Massachusetts Lowell	69	72	68													
University of Michigan - Ann Arbor	17	5	1	13	7	5	8 & 22	22								
University of Michigan - Dearborn	38	64	74													
University of Minnesota Twin Cities	56	83														
University of Missouri Columbia	45	52	46	31	39			34	27			12				
University of Missouri Rolla	19		21	18	12 & 14	2 & 9	4	12								
University of North Carolina			75													
University of Oklahoma	35	55														
University of Pittsburgh	63	65	35	22	DQ	26	26	21								
University of Puerto Rico		38	18	30	29	47										
University of South Carolina		57	51													
University of Toledo	26	50	62													
University of Tulsa																3
University of Utah	55	60	64													
University of Washington	14	26	24	7	13	7 & 11	7									
University of Waterloo	30	68	22	35	8	4	14	6	8	4						
University of Western Ontario	57		44						24							
University of Wisconsin at Madison	29 & 58	34	50	12	22	44	21	7	21S							
University of Wyoming		36	58			36										
Virginia Polytechnic Institute & State University	5	12	27	6	3	1	25 & 29	2 & 4	10							
Washington University in St. Louis	53															
West Virginia University	68 & 72	18 & 37	13 & 49	21 & 23	4 & 23	2 & 21	16 & 19	9 & 18	2 & 15	7	6	2		9		
Western Michigan University								22	25	11						
Western Washington University	22	4	25		10	15		8								
Worcester Polytechnic Institute	15			19 & 29		19	10		18	16	15					

A total of 113 schools from the US, Canada, Mexico, and Puerto Rico have competed in Formula SAE over the past 16 years.