

Scope of Design Experience: (600 points)

The SAE Collegiate Design Series Supermileage Competition originated in 1980 as a partnership between SAE and Eaton Corporation. The Competition was held continuously at the Eaton Marshall Proving Grounds for 40 years. The worldwide pandemic COVID-19 disrupted the 41st year by requiring the elimination of the dynamic demonstration of hardware; the 41st event was converted to a static, virtual event to continue the goal of providing an educational opportunity for entered teams. The uncertainty of universities being capable of fielding teams, building Supermileage Competition vehicles, and being allowed to travel to the Marshall, MI, event site have resulted in the need to propose an alternate challenge for the 42nd Supermileage Competition for 2021.

The traditional Supermileage Competition requires university teams to design and develop a one-person, single-cylinder engine vehicle capable of achieving fantastic fuel economy during a 6-lap attempt around an approximately 1.6-mile-long, banked, oval track. The track topography includes a generally level road surface at the starting line followed by a banked, left turn that leads to a substantially long, gradual uphill climb into another banked left turn that ends in an approximately 7% downward sloping hill before returning to the level road surface leading to the finish/start line.

To provide a substantial engineering design effort that places longstanding teams and newly participating schools on a similar level, the 2021 event challenge is to propose a vehicle capable of still achieving amazing fuel economy over the 9.6 mile course while navigating the oval track in a clockwise path. The task will require teams to repower the theoretical vehicle to climb a 7+% grade, make right turns, and shift the center of gravity to accommodate the vehicle left being on the uphill side of the banked turns. The substantial activity is configuring the power train to climb the 7+% hill. The new design twist reflects one of the realities of driving in the occasionally hillier road regions of the world where performance and fuel economy are both still desired.

The challenge to the teams is to complete a design analysis plan for the proposed vehicle. As part of the design effort, teams should consider extra things beyond the basic design task. Teams should also address if there are constraints outlined in the rules which, if revised or modified, would enable the team’s design goals to be achieved and even significantly exceeded.

The required use of the Briggs & Stratton Junior 206 engine as the sole source of propulsion would be removed, but the requirement that all propulsion energy comes from the iso-octane fuel would remain. Most teams would be required to design a multi-speed gear train instead of a simple direct drive system. Some might even elect to have a hybrid-electric drive train.

All other aspects of the design proposal remain unchanged.

Written Design Report: (300 points)

The written design report must be submitted by the date indicated on by the action deadline date in the appendix. *\*New this year, teams will be submitting their written design reports online at* [*www.saesupermileage.com*](http://www.saesupermileage.com)*.*

The written design report must be limited to a maximum of twenty-five (25) pages not including supporting data in an appendix. Material in an appendix will only be reviewed if referenced in the report body. Teams should still reference C1.4 for design report contents to be included but not limited.

A maximum of three hundred (300) points will be awarded to the written design report. Late report submissions will still be assessed penalty points per the rules.

Verbal Design Report Presentation: (300 points)  
The traditional Supermileage Verbal Design Presentation remains an essential part of the competition with some basic changes continued from 2020; verbal design presentation will continue allowing prepared materials and have total value of 300 points.

Each team will provide three team members for the presentation. The verbal design report should demonstrate the team’s understanding and application of the engineering principles that support their design.

The following three aspects are still the focus on the report:

Team Participation Program Knowledge Technical Knowledge

Team Participation:

• Team members

• Team skill sets

• Organizational structure

• Continuity plan

• Organizational problem-solving strategies

• Lessons learned

Program Knowledge:

• Mission statement

• Timing plan

• Program funding

• School support

• Design tools

• Manufacturing plan

• Design decision methods

• Program problem solving systems

• Lessons learned

Technical Knowledge:

• Fuel economy essentials

• Technical resources

• Technical tools

• Technical problem-solving methods

• Lessons learned

Submission Requirements:

Written Design Report

Submission Deadlines:

Document will be due on April 15, 2021 before 11:59 PM EST

Teams will submit the written design report online SAE Supermileage website under the My Team's Report & Document Submissions area.

Static Presentation Judging Date:

On the static event day, participating teams will have a virtual face-to-face meeting with several judges who will evaluate the teams’ design analysis plan.

All teams will be assigned a specific time to present on May 13th or 14th. A team’s static schedule will be supplied at a later date.

* Teams will be assigned a 35-minute time slot
  + 35-minute session will break down as follows:
    - 5 minutes for logging on and greetings
    - Presentation segment 25-30 minutes with approximate time distribution of session
      * 13-16 minutes teams slid presentation
      * 9-12 minutes’ questions and team responses
    - 5-minute judges’ feedback
* Teams are encouraged to create a PPT for presentation on their vehicle design.
* Teams are encouraged to have all engineering related material to their vehicle design and presentation readily available on their computer to share on-screen with judges.
* Judges will provide feedback on presentation and written report at this time.
  + Written report judge feedback summary will be provided by email to report submitting email address(es) at least two days before virtual verbal meeting.
  + Verbal report feedback presented verbally by judges during last five minutes of virtual report session.