

COMPETITION
SPRING 2021



Founded by



DARTMOUTH
ENGINEERING



welcome



15th annual

Welcome to the 15th Annual Formula Hybrid+Electric International Competition!

In a year redrawn by Covid-19, we are so grateful for the resilience and ingenuity shown by all those involved in 2020's competition. In less than six weeks, Formula Hybrid+Electric morphed from our usual on-track format to a successful virtual competition—via 70 hours of Zoom with our teams, ESF Deep Dive Reviews, Project Management presentations, the Design Event presentations, and 11 Sponsor Expo Sessions. Many thanks to everyone for showing that the spirit of Formula Hybrid+Electric is alive and well.

This year, as we take another lap of virtual competition, we're delighted to welcome 16 teams. And we're pleased to be racing ahead with some new aspects of our events. In true Formula Hybrid+Electric spirit, we decided to add some components to help keep the competition exciting, educational, and innovative. With the generosity of iRacing, we were able to offer all of our teams free licenses to configure virtual cars to compete at the New Hampshire Motor Speedway, without having to leave the basement! We were also able to offer an opportunity for all teams, both Hybrid and Electric, to plan an Optimal Hybrid vehicle. Whether it's the first time an EV team has designed a hybrid or the finessing of a prototype of a seasoned Hybrid team, we hope the teams will find the sparks of inventing and refining both valuable and fun.

Though we would prefer all of this to be on track and in person, we are committed to the health and safety of all of our students and volunteers. If there is one thing we have learned from this past year, it is the unwavering commitment and resilience of our Formula Hybrid+Electric family and how much we miss the unpredictable track conditions in Loudon, New Hampshire.



Mike Chapman, Director
Michael.C.Chapman@dartmouth.edu



Co-founder and Director Emeritus
doug@formula-hybrid.org



Jessica Kinzie, Coordinating Manager
jessica.d.kinzie@dartmouth.edu

Formula Hybrid Competition Organizers

“The world’s leading online racing simulation portal... the setup of a virtual car mirrors that of a real car.”

spotlight





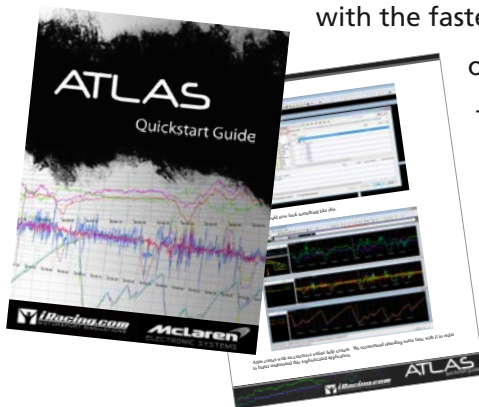
iRacing to the Rescue

When COVID-19 threw a wrench into this year's Formula Hybrid+Electric competition, new sponsor **iRacing** sped to the rescue.

The world's leading [online racing simulation portal](#), iRacing gave each FH team five iRacing driver licenses, licenses for an open-wheel race car and the New Hampshire Motor Speedway, and access to McLaren Applied's ATLAS telemetry and data-acquisition software. Teams provided their own physical steering wheels and pedals. And then it was off to the virtual races.

With iRacing, the setup of a virtual car mirrors that of a real car. Each team is using a virtual USF 2000 racecar, where tire pressures, spring rates, brake bias, and ride height can be configured in the same way as the real car, and students have to test different setups. At competition, each team's "blue ribbon" drivers will take its virtual car on track. The drivers will give feedback to the teams, and the teams will have a chance to modify their car's setup. The drivers will run a few final laps, with the fastest lap winning. And unlike

our in-person events, we'll finish with a session with all virtual cars on the track at the same time.



Q&A

Angela Tagariello iRacing Manager of Sales and Marketing

We asked Angela to tell us about what racing—and iRacing—mean to her.

Q: What sparked your interest in cars and racing (real and/or virtual)?

A: I've always loved cars, but never followed racing until I worked for iRacing. When I get the chance to use the SIM I love it. It's incredibly fun, and I've gained a lot of respect for anyone who races virtually or within the real world. It's so much more than just "going fast!"

Q: What road did you take to get to your current position?

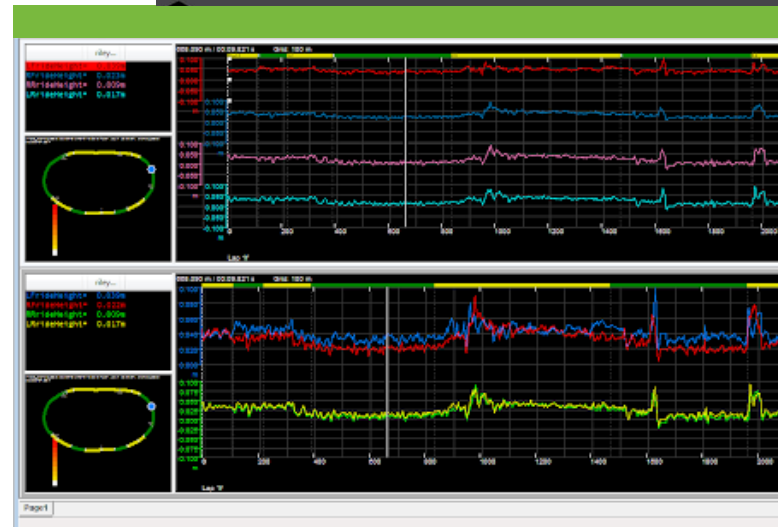
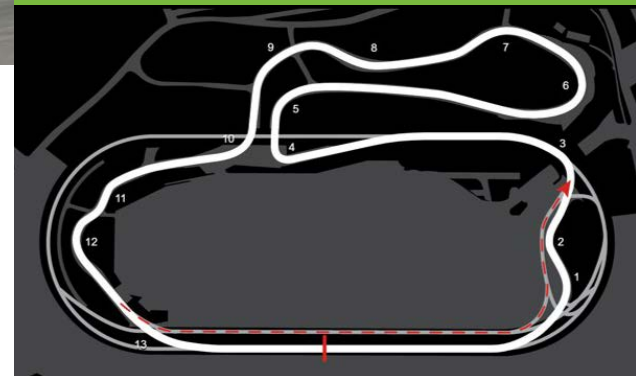
A: Prior to iRacing I worked for an educational software division within a large publishing company. I started with iRacing in 2008, right before we released the software to the public. Since then the company has grown, giving me the opportunity to grow within it as well.

Q: What benefits will students gain from the iRacing and McLaren Applied integration?

A: When a student uses the McLaren software with iRacing, the amount of data that can be analyzed will allow the student to pinpoint what needs to be adjusted to perform better within iRacing and/or a race car. This will help while using iRacing, but ultimately it will help with the same real-world adjustments and data.



[Click to ride the New Hampshire Motor Speedway](#)



Q: What do you see as the future of virtual racing?

A: It will only continue to grow. It's always been fun and a great learning tool, but the competition side continues to grow and that's extremely exciting and fun to watch.

Q: What impact has the pandemic had on your business?

A: The pandemic has changed our business in so many ways. It's forced us to think outside of the box, and so far it's been very successful. One example would be the Pro Invitational series, which was televised in 2020. Real world cup drivers using iRacing software in a competitive setting is an amazing sight.

specifications





R.V. College of Engineering

Team Name	Ashwa Racing
Car Name	RZX21-H
Advisor	Dr. Ravindra S. Kulkarni
Country	India

+ Click to meet the team.

Vehicle Specifications

DRIVE TYPE	Hybrid
ACCUMULATOR	Battery Liyuan 2,560 W·h
DRIVE MOTOR	MotEnergy ME1114 24 kW @ 5,000 RPM
ENGINE	Honda CBR 250R 249.6 cc 19.5 kW @ 8,500 RPM
FUEL TYPE	Gasoline
GENERATOR	N/A
REGEN BRAKING	None
WEIGHT	310 kg*
UNIQUE FEATURES	Parallel Hybrid architecture with overrunning clutch, electronic throttle and angled master cylinder brake pedal assembly

1

SRM Institute of Science and Technology, Chennai

Team Name	Hybrutos Racing
Car Name	
Advisor	Dr. P. Nandakumar
Country	India

+ Click to meet the team.

Vehicle Specifications

DRIVE TYPE	Hybrid
ACCUMULATOR	Battery ThunderSky Winston 1,917 W·h
DRIVE MOTOR	Saietta 119R 22.5 kW @ 3,751 RPM
ENGINE	Bajaj Auto 4-906 45493 (KTM Duke 200) 199.5 cc 18.97 kW @ 10,000 RPM
FUEL TYPE	Gasoline
GENERATOR	N/A
REGEN BRAKING	None
WEIGHT	275 kg*
UNIQUE FEATURES	Powertrain coupling with switchable modes. Data acquisition system. Aramid Fiber accumulator container. Aero Package. Variable Intake Manifold.

2

University of Victoria

Team Name	UVic Formula Hybrid
Car Name	Unicorn
Advisor	Dr. Zuomin Dong
Country	Canada

+ Click to meet the team.

Vehicle Specifications

DRIVE TYPE	Hybrid
ACCUMULATOR	Battery UVic
DRIVE MOTOR	Zero Motors 75-5 34 kW @ 4,300 RPM
ENGINE	KTM 250 SX-F 250 cc 31 kW @ 13,000 RPM
FUEL TYPE	Gasoline
GENERATOR	N/A
REGEN BRAKING	Rear
WEIGHT	265 kg
UNIQUE FEATURES	Chain drive with coupling shaft for reduced weight and simplified tensioning. Simulink designed control scheme with multiple drive modes and variable regen braking.

3

Milwaukee School of Engineering

Team Name Mozee Motorsports

Car Name

Advisor Dr. Matt Schaefer

+ Click to meet the team.

Vehicle Specifications

DRIVE TYPE	Hybrid
ACCUMULATOR	Battery Energus 3,888 W·h
DRIVE MOTOR	Parker GVM142 44.1 kW @ 7,650 RPM
ENGINE	Helvenco Swissauto 250 249.6 cc 29.8 kW @ 10,150 RPM
FUEL TYPE	Gasoline
GENERATOR	N/A
REGEN BRAKING	Rear
WEIGHT	370 kg
UNIQUE FEATURES	Team designed isolation circuits and associated printed circuit boards. Custom designed gearbox enables parallel powerplant configuration. Multiple engine tunes for events.

University of Wyoming

Team Name Wyoming Motorsports

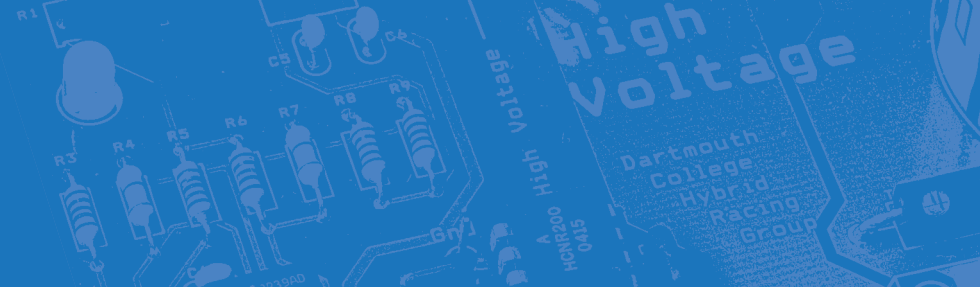
Car Name 7220 Honey

Advisor Robert Erikson

Vehicle Specifications

DRIVE TYPE	HIP
ACCUMULATOR	Battery Samsung Bosch SDI 4,347 W·h
DRIVE MOTOR	MoteEnergy 1616 55 kW @ 3,300 RPM
ENGINE	N/A
FUEL TYPE	Gasoline
GENERATOR	N/A
REGEN BRAKING	None
WEIGHT	320 kg
UNIQUE FEATURES	





University of Vermont

Team Name	Alternative Energy Racing Organization
Car Name	CleanSpeed 5
Advisor	Dustin Rand

+ Click to meet the team.

Vehicle Specifications

DRIVE TYPE	Electric
ACCUMULATOR	Battery Energus 5,184 W·h
DRIVE MOTOR	Emrax 228 109 kW @ 6,500 RPM
ENGINE	N/A
FUEL TYPE	N/A
GENERATOR	Rinehart PM100
REGEN BRAKING	Rear
WEIGHT	363 kg*
UNIQUE FEATURES	Integrated Data Acquisition System. In-dash display for real-time data analytics. Wireless data transmission to base station.

202



Yale University

Team Name	Bulldogs Racing
Car Name	BR16
Advisor	Corey O'Hern

+ Click to meet the team.

Vehicle Specifications

DRIVE TYPE	Electric
ACCUMULATOR	Battery N/A 3,563 W·h
DRIVE MOTOR	(2) EMRAX 207 MV 80 kW @ 6,000 RPM
ENGINE	N/A
FUEL TYPE	N/A
GENERATOR	N/A
REGEN BRAKING	None
WEIGHT	300 kg
UNIQUE FEATURES	Independent 2-Motor Powertrain. Torque Vectoring and Launch Control via IMU Feedback. Programmable Driver Interface.

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Dartmouth College

Team Name	Dartmouth Formula Racing
Car Name	Cherri
Advisor	Raina White

+ Click to meet the team.

Vehicle Specifications

DRIVE TYPE	Electric
ACCUMULATOR	Battery Bespoke 6,750 W·h
DRIVE MOTOR	(2) Emrax 188MV 100 kW @ 6,500 RPM
ENGINE	N/A
FUEL TYPE	N/A
GENERATOR	N/A
REGEN BRAKING	Rear
WEIGHT	280 kg
UNIQUE FEATURES	Bespoke gearbox and housing. Sophisticated dual-motor drive system.

204

Rensselaer Polytechnic Institute

Team Name	Rensselaer Formula Hybrid
Car Name	Xplöd
Advisor	

+ Click to meet the team.

205

Vehicle Specifications

DRIVE TYPE	Electric
ACCUMULATOR	Battery Team-Built 6,100 W·h
DRIVE MOTOR	EMRAX 208 68 kW @ 6,000 RPM
ENGINE	N/A
FUEL TYPE	N/A
GENERATOR	N/A
REGEN BRAKING	None
WEIGHT	240 kg*
UNIQUE FEATURES	Carbon fiber bodykit. Full-vehicle telemetry system. Team-built 568 cell li-ion battery pack with custom AMS.

Illinois Institute of Technology

Team Name	IIT Motorsports
Car Name	Hawkrod-S21
Advisor	Mahesh Krishnamurthy

+ Click to meet the team.

206

Vehicle Specifications

DRIVE TYPE	Electric
ACCUMULATOR	Battery AllCell 5,184 W·h
DRIVE MOTOR	(2) EMRAX 188 70 kW @ 8,500 RPM
ENGINE	N/A
FUEL TYPE	N/A
GENERATOR	N/A
REGEN BRAKING	None
WEIGHT	250 kg
UNIQUE FEATURES	Electric motor torque vectoring. Inline powertrain. Actively controlled adaptive aero. Teensy central controller. Touchscreen equipped dashboard. Wireless dynamic data logging. Error detecting and troubleshooting.



Northeastern University

Team Name	Northeastern Electric Racing
Car Name	NEU21
Advisor	Andrew Gouldstone

+ Click to meet the team.

207

Vehicle Specifications

DRIVE TYPE	Electric
ACCUMULATOR	Battery 3,560 W·h
DRIVE MOTOR	Emrax 228 100 kW @ 5,500 RPM
ENGINE	N/A
FUEL TYPE	N/A
GENERATOR	N/A
REGEN BRAKING	Rear
WEIGHT	400 kg
UNIQUE FEATURES	Team's first vehicle. Custom in-house accumulator. CAN communication system. Modified GM 10 bolt differential.

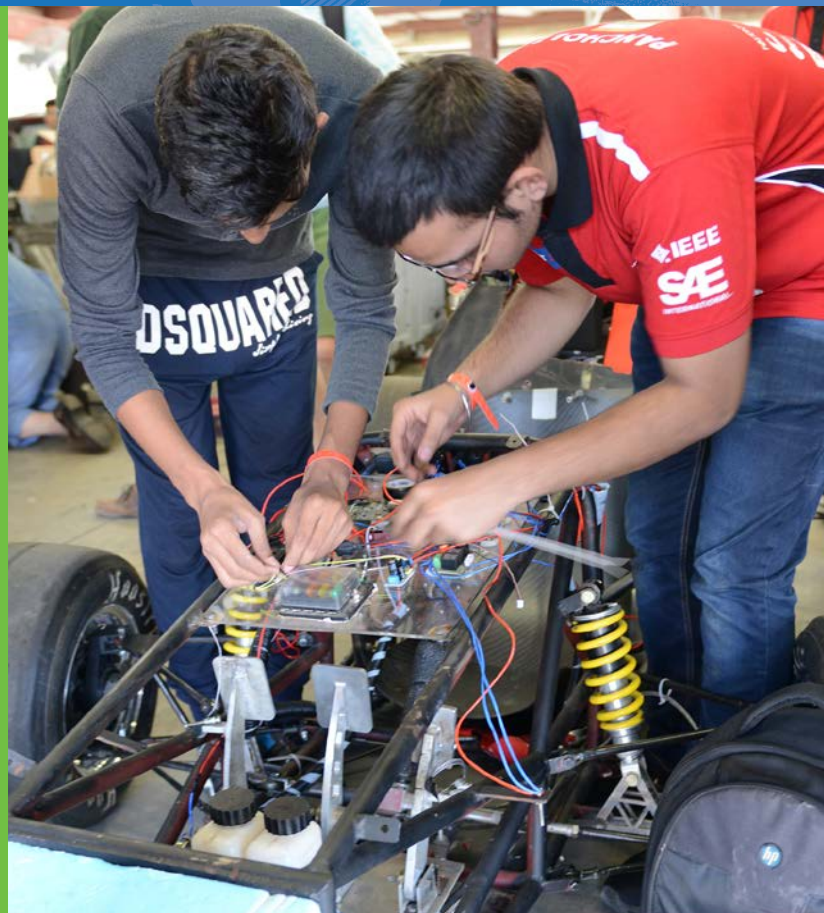
Indiana University Purdue University Indianapolis

Team Name	Jaguars
Car Name	Jaguar
Advisor	Dr. Jing Zhang
+ Click to meet the team.	

208

Vehicle Specifications

DRIVE TYPE	Electric
ACCUMULATOR	Battery Enerdel 2,500 W·h
DRIVE MOTOR	HPEVS AC9 14.72 kW @ 4,000 RPM
ENGINE	N/A
FUEL TYPE	N/A
GENERATOR	N/A
REGEN BRAKING	None
WEIGHT	300 kg
UNIQUE FEATURES	The car is easily transportable on the back of a pickup truck. The engine easily retrievable when the car is split into two pieces with removal of 4 bolts.



Lafayette College

Team Name	Lafayette Motorsports
Car Name	Sparky
Advisors	Dr. Jeffrey Helm and Dr. Chris Nadovich
+ Click to meet the team.	

209

Vehicle Specifications

DRIVE TYPE	Electric
ACCUMULATOR	Battery Lafayette Motorsports 4,920 W·h
DRIVE MOTOR	Emrax 208 68 kW @ 6,000 RPM
ENGINE	N/A
FUEL TYPE	N/A
GENERATOR	N/A
REGEN BRAKING	None
WEIGHT	430 kg*
UNIQUE FEATURES	Lafayette Custom Accumulators. Lafayette Custom Cooling Reservoir. Configurable Data Acquisition System.

Lawrence Technological University

Team Name	Blue Devil Motorsports
Car Name	The Model C
Advisor	Hamid Vajdani and Gary Lowe
+ Click to meet the team.	

210

Vehicle Specifications

DRIVE TYPE	Electric
ACCUMULATOR	Battery Enerplus Power Solutions 4,230 W·h
DRIVE MOTOR	Yasa 400 165 kW @ 7,500 RPM
ENGINE	N/A
FUEL TYPE	N/A
GENERATOR	N/A
REGEN BRAKING	Rear
WEIGHT	325.79 kg*
UNIQUE FEATURES	

Boston University

Team Name	Terrier Motorsport
Car Name	Scarlett
Advisor	Enrique Gutierrez
+ Click to meet the team.	

211

Vehicle Specifications

DRIVE TYPE	Electric
ACCUMULATOR	Battery Enerlux PS 4,608 W·h
DRIVE MOTOR	Emrax 208 68 kW @ 6,000 RPM
ENGINE	N/A
FUEL TYPE	N/A
GENERATOR	N/A
REGEN BRAKING	None
WEIGHT	350 kg
UNIQUE FEATURES	Improved strengthening of suspension system. Consistent wheel camber under variable loads.

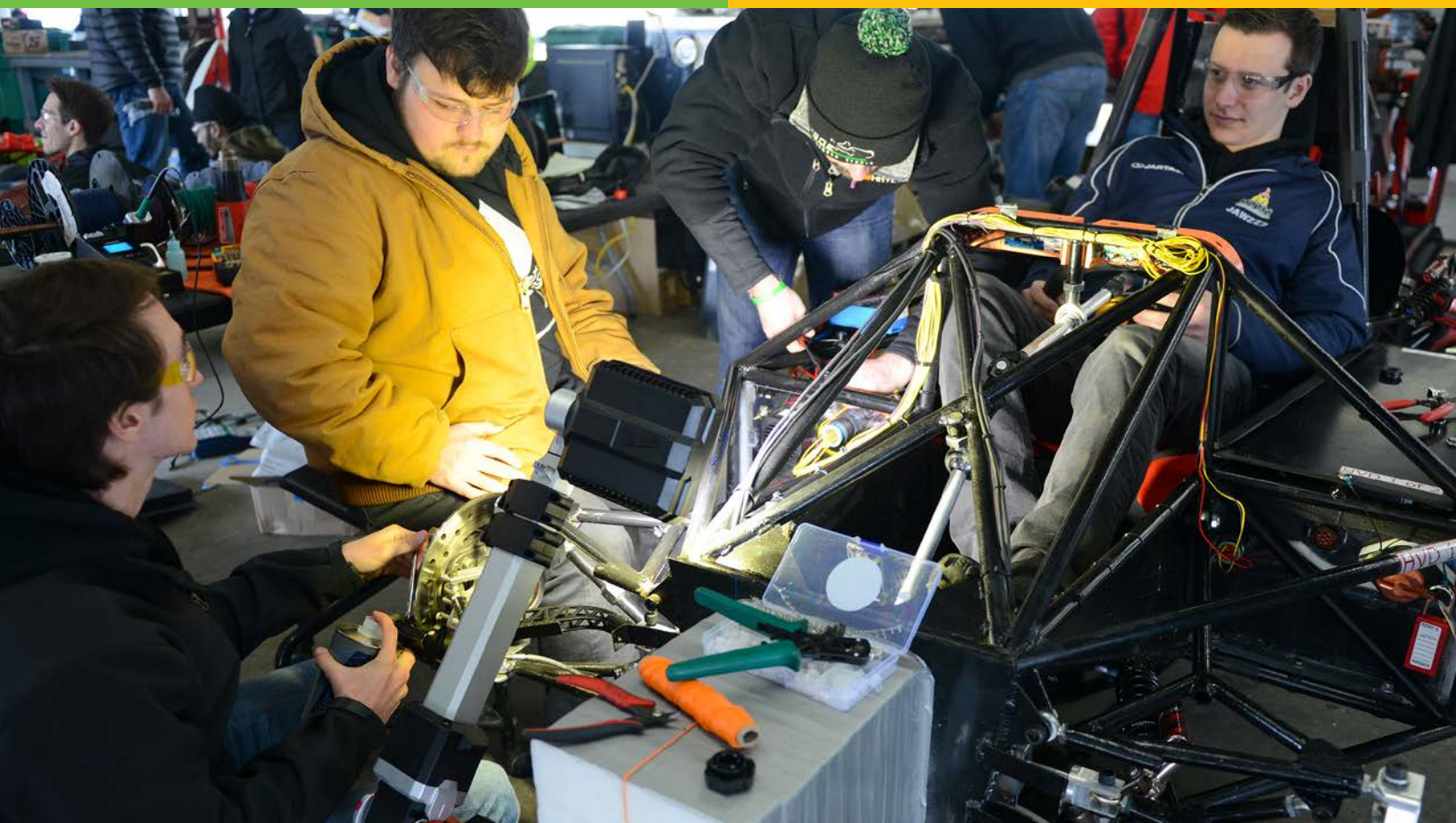
University of Waterloo

Team Name	Waterloo Formula Electric
Car Name	E-model 3
Advisor	Dongpu Cao
Country	Canada
+ Click to meet the team.	

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Vehicle Specifications

DRIVE TYPE	Electric
ACCUMULATOR	Battery Custom 4,233 W·h
DRIVE MOTOR	(2) Emrax 208 80 kW @ 6,500 RPM
ENGINE	N/A
FUEL TYPE	N/A
GENERATOR	N/A
REGEN BRAKING	None
WEIGHT	300 kg
UNIQUE FEATURES	Dual motor setup allowing for long-term controls developments. Custom accumulator with 18650 cells, optimized for points and reliability. Custom PCBs & Firmware including battery & power management units.



the teams





Dhruv Gupta
TEAM CAPTAIN

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VEHICLE DYNAMICS



Aryan Saraf



Aslin George



Achal Adiga



Aviral Roy



Omprakash J.



Sumukha Nadig



Anubhav Prasad



Keerthan Alva



Nithin G.



Yuktha Ram



Phalgun Bharadwaj

POWERTRAIN



Muhammed Faraaz



Mayan Simha



Hriday Sharadhi



Manang Jain



Monish C.



Adarsh Jamadagni



Srivaths Sreedhar



Harsh Songara



Abhishek B.



Vishal M.



Abhishek Malik

SPONSORSHIP & MARKETING



Prajwal Patil



Akshit Sinha



Rajat Dhruva



Protik Pandey
TEAM LEAD

[⌚ Back to specifications](#)

STRUCTURAL/
AERO



Satyasarathi Poddar



Aprameyan



Varun Lakhota



Abhishek



Kritish

POWERTRAIN



Harshendra Singh Rajpoot



Nipun Chaturvedi



Apurv

ELECTRICAL



Protik Pandey



Nishanth



Manidhar

DRIVETRAIN



Nivedita



Shreyansh

VEHICLE DYNAMICS



Abhijeet Gupta
Project Manager



Nikhil Chaudhary



Kartikeya Nagpai



Bidyudipta Das
Corporate



Siddarth Chauhan



Sahil Saraf



Nimish Yadav



Kartik



Aman



Jules Pare
TEAM CAPTAIN

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ELECTRICAL



Leah Connop



Ava Newell

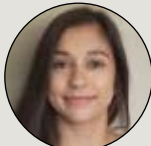


Brandon Clarkson

CHASSIS



Spencer Hancock



Brianna Dallinger



Connor Fedrigo

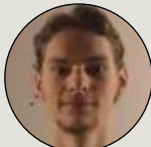


Matthew RW

POWERTRAIN



Cayenne Chen



Matthew Johnson



Tyler Hills

PACKAGING



David Johnson



Emikp Hourston



Emma Ratio-Roe

4

Milwaukee School of Engineering



Spencer Tiegs
PROJECT MANAGER



Peter Roloff
ENGINEERING
MANAGER



Issac Fralish
RULES & SAFETY OFFICER
SPONSORSHIP COORD.



Kevin Czajkowski
TREASURER



Connor Sadowski
MEDIA & OUTREACH

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POWERTRAIN



Dwight Maynor



Prey Patel

Kenzie Swinford
Emilio Diaz-Granillo

Carol Malagodi
Eirene Kowal

Ben Garvey
Nicholas Lamb

Kyle McComb
Ulises Triano

CHASSIS



Kyle Grimm



Jacob Strohmeier

Bailey Menarek
Joe Smith

Zach Hatseras
Gerbrand Truttman

Jordan Kopac

SOFTWARE & HARDWARE



Cody Jaworski
Software



Michael Scatena

Paige Rosynek

Xavier Robbins

Jack O'Sullivan

Noah Frandsen
Hardware



Kyle Prosser

Raul Velazquez
Camarena

SAFETY & ERGO



Connor Sadowski

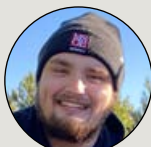
Ameed Abidalrahim

Tyler Brantner

SIDEPODS



Robi Roy



Christopher Imholte

202

University of Vermont



The University of Vermont



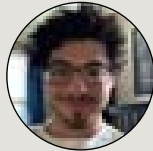
Jacob Evans
TEAM CAPTAIN

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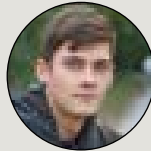
ELECTRICAL



George Spearing



Dominic Gasperini



Daniel Morton

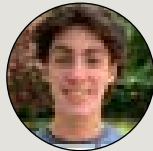


Lindi Hang

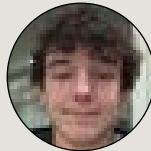
MECHANICAL



Jacob Evans



Brody Lustberg



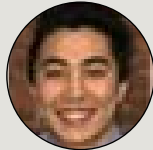
Charlie Sharpiro



Jason Murray



Ricky Caron



Logan Park



Katie Neuharth



Conor Borek



Ben Payson



Jean Wang
TEAM CAPTAIN



Maeganty Rushyendra
TREASURER



Shreyas Raman
PROJECT MANAGER



Clarence Rodgers
CHIEF ENGINEER



Vishnu Murale
SOCIAL CHAIR



Hannah Forbes
MEDIA & OUTREACH CHAIR

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MECHANICAL



Tucker Hansen
Manufacturing



Tucker Hansen
Design



Hanah Leventhal



Aidan Gannon



Nihil Kanthan

ELECTRICAL &
COMPUTER SCIENCE



Jeacy Espinoza



Angelica Pelcastre



Patrick SebaRaj



Madeline Dobson

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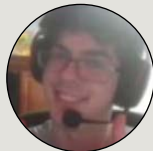
Sean Park
TEAM CAPTAIN

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SUSPENSION



Timon Littleford



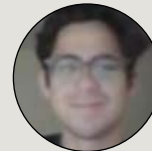
Omri Eilat



Alex Belokobylka



David Wiser

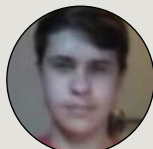


Ammar Barbee

AERODYNAMICS



Clint Roe



Tom Makowka

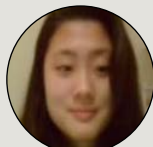


Bruno Morgado

ELECTRONICS



Kevin Li



Chrissie Shen



Lindsey Vogelmann

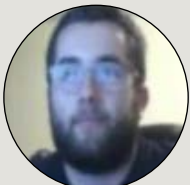


Suyash Jain

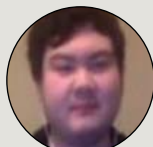


Henry Lamkin

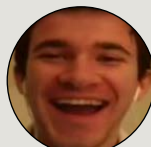
POWERTRAIN



Ben Rosoff



Robin Zuo



James Mester



Ava Kelly
PRESIDENT



Saurabh Saluja
VICE PRESIDENT



Juan Lopez
TREASURER



Kasia Staron
SECRETARY

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ELECTRICAL



Dominik Chraca



Jorge Bravo



Raj Ghandi



Deep Trapasia



Charlie Steenstra

SUSPENSION



Aleksander Woody

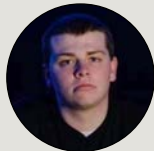


Matthew Madej

CHASSIS



Jason Rigo



Nathan Scott

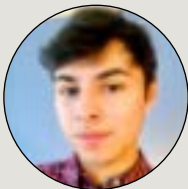


Joel Saju



Marvin Calo

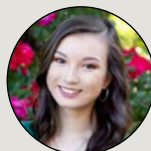
AERO



Victor Robinson



Tewodros Assefa



Elizabeth Kasprzak



Sophia Villacarlos

POWERTRAIN



Matthew Politis



Safa Azad



Gregory Corsello
PRESIDENT

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BUSINESS



James Chang-Davidson
Vice President



Austin Hoeft
Treasurer



Abe LeMole
Project Management



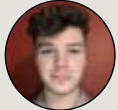
Zach Putnam
Marketing



Adin Moses
Asst. Treasurer



Julian Newquist
Project Manager



Tom Doyle
Manufacturing



Viraaj Kurri
Asst. Treasurer



Ed Lam
Project Manager



Pranav Casula
Training



Micah Kim
Development



Emma Wyatt
Project Manager



Sofia Varner
Recruitment



Ezra Stasky-Frank
Outreach Team



Pui He
Asst. Proj. Mang.



Alex Patane
Compliance



Der Chi Lin
Asst. Proj. Mang.



Kevin Yu
Software Engineer



Dan Lawson
Asst. Proj. Mang.



Rahul Rao
Software Engineer

MECHANICAL



Jake Farlow
Chief Mechanical Engineer



Thomas Herbert
Mech. Project Lead



Casey Sauer
Mech. Project Lead



Rachel Fox
Mech. Project Lead



Jake Brown



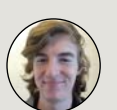
Eric Cardoza



Walter Stadolnik



Shane Keenan



Nick Scholl



Quincy Webster



Bronwyn Spears



Logan Pfahler



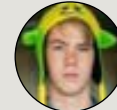
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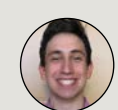
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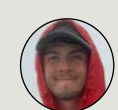
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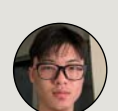
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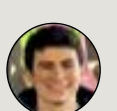
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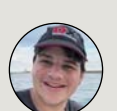
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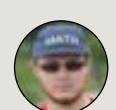
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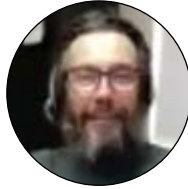
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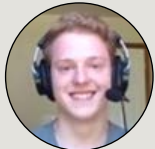


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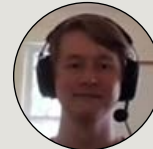
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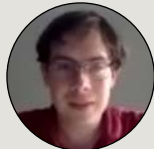
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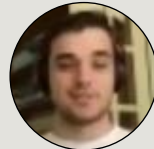
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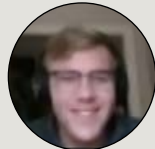
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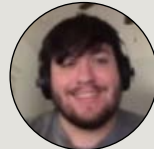
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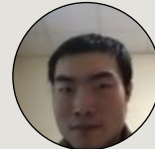
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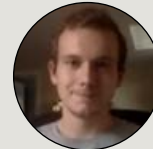
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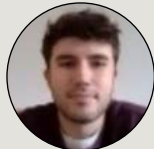
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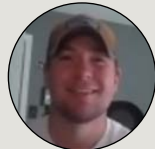
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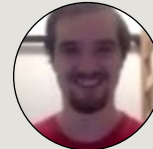
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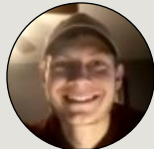
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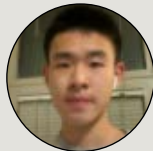


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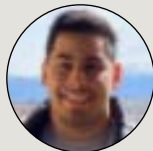


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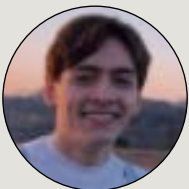


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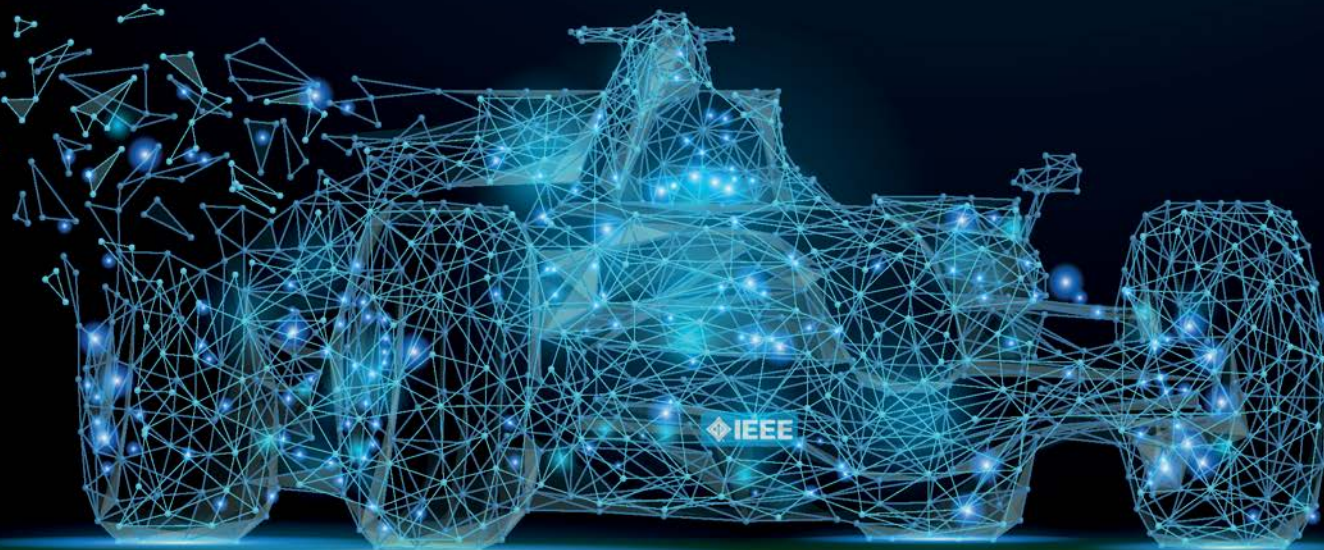
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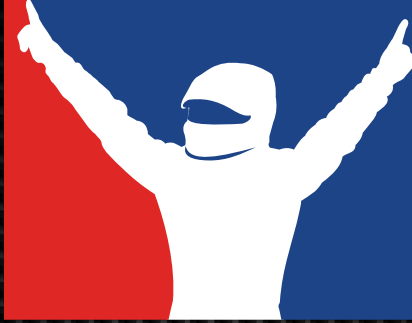


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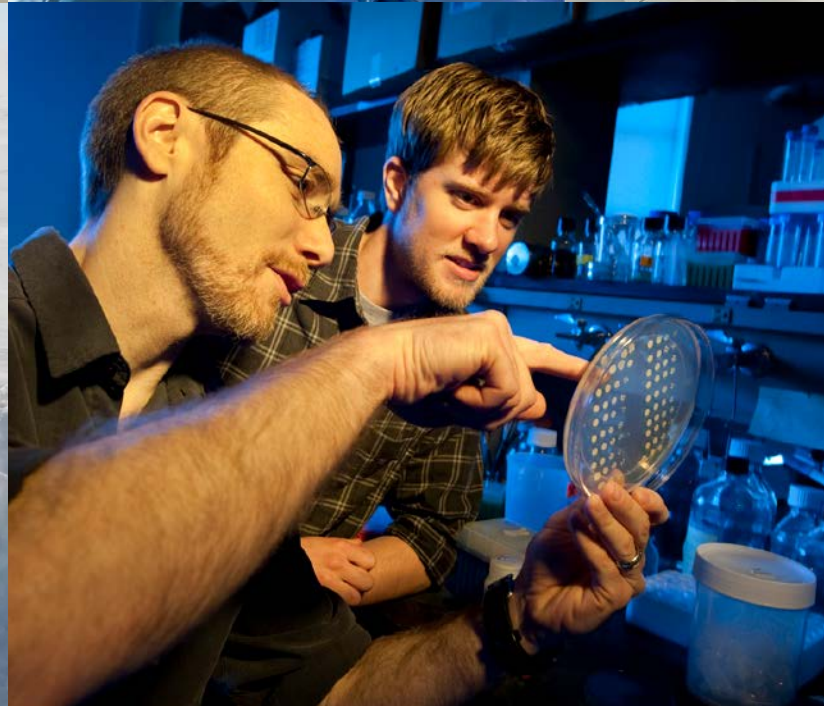
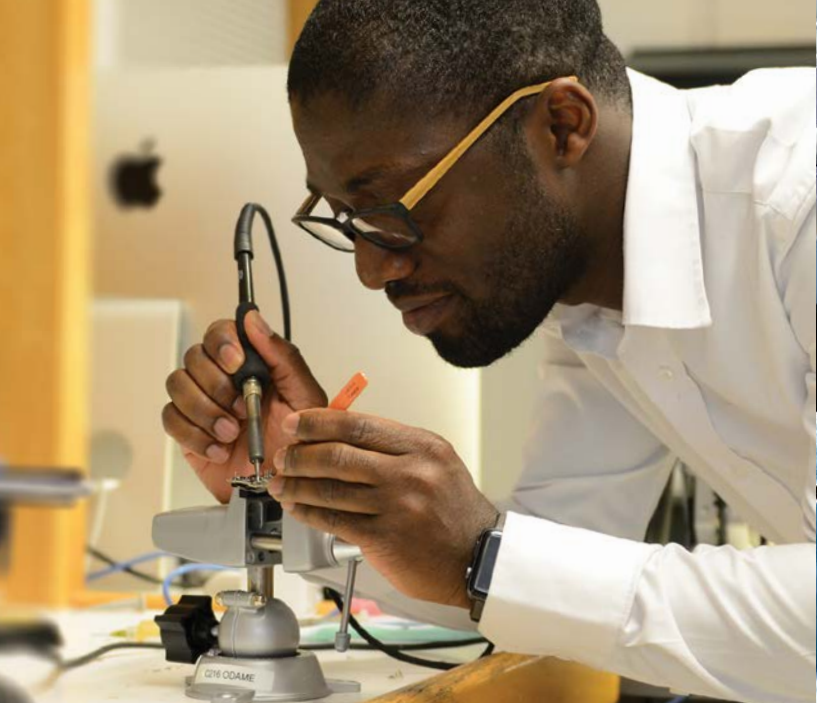
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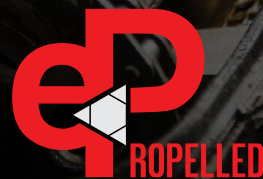
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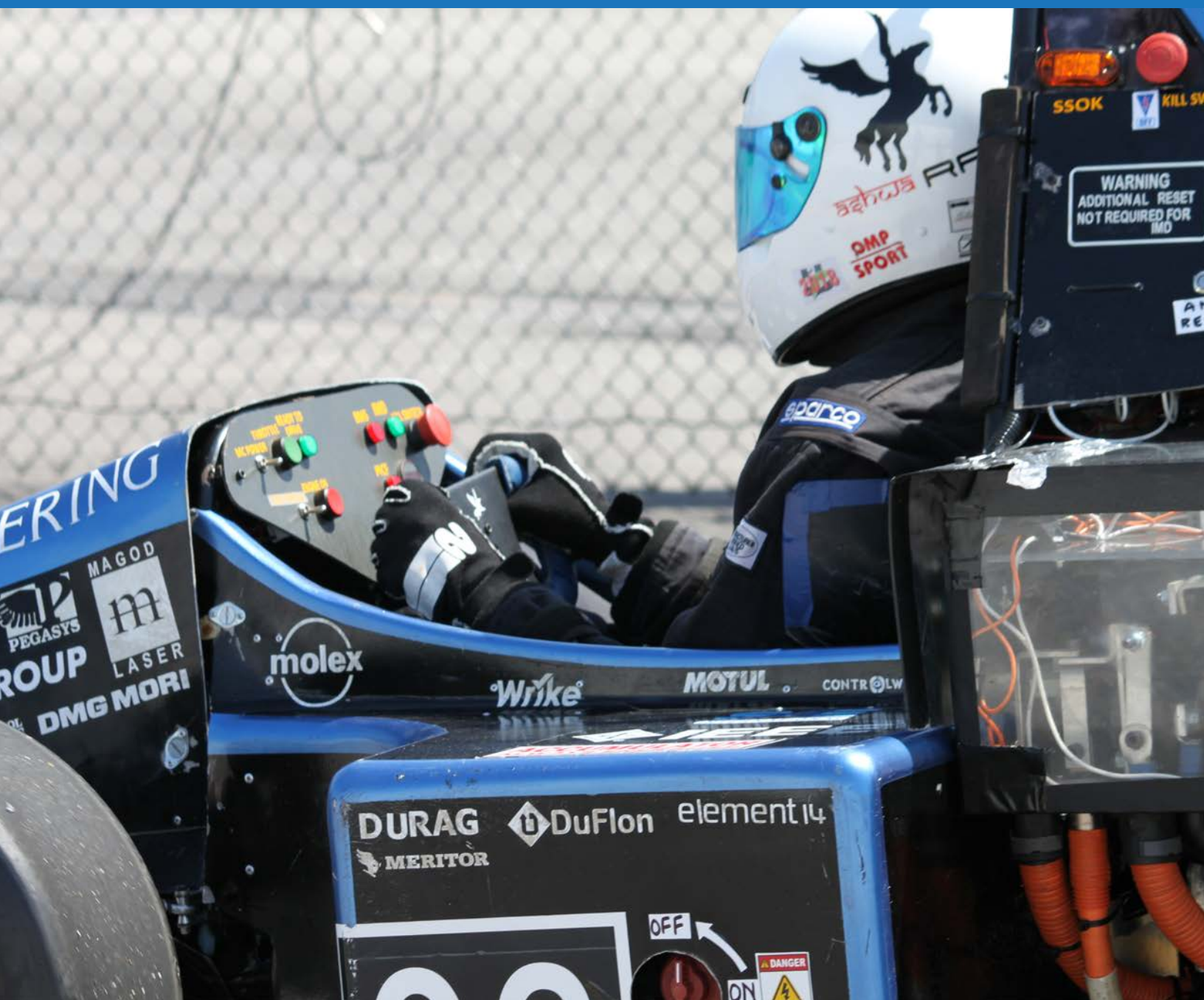


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