Research Activity (Joseph Katz)

FIELDS OF RESEARCH

- Internal combustion engines: cooling, carburetion, power plant optimization.
- Passenger car safety.
- Two phase flow cooling. Heat transfer and heat exchangers.
- Wind tunnel measurements, including laser Doppler anemometry in two phase flows.
- Non conventional naval propulsion e.g.: undulating propellers, swimming fins.
- Non steady aero and hydrodynamics, potential flow and general fluid dynamics.
- UAV/General aviation piston engine cooling and drag reduction post-stall-spin aerodynamics.
- Automotive and race car aerodynamics, and dynamics.
- Lifting body airplanes, transonic wings, and stall resistant configurations.
- Unmanned airplane design (mostly configuration development)

PROFESSIONAL EXPERIENCE

1986-present	Professor, (Chair; 96 to 2009) Aerospace Engineering and Engineering Mechanics, SDSU, San Diego CA.
1984-1986	Senior Research Associate, NASA-Ames, 40 x 80 Wind-Tunnel Branch, Moffett Field, CA.
1982-1984	Head of Automotive Program, Mech. Eng. Dept., Technion, Israel.
1980-1984	Senior Lecturer, Mechanical Engineering, Technion, Israel.
1978-1980	Research Associate, NASA-Ames, 40 x 80 Wind-Tunnel Branch, Moffett Field, CA.
1977-1978	Research Associate, Dep. of Aeronautical Engineering, Technion, Israel.
1973-1977	Engineer and instructor, Dep. of Aeronautical Eng., Technion, Israel.
1972	Consultant, Teledyne Continental Motors Co., Michigan (3 months).
1966-1969	Military service - at present captain (res.).

AWARDS

1. 1988 SDSU Outstanding Faculty Award.
2. 1988 SDSU Meritorious Performance and Professional Promise Award.
3. 1995 SDSU Outstanding Faculty Award.
4. 1996 SDSU Alumni Association Board's Outstanding Faculty Award.
5. 1997 NASA Space Act Award, for creative development (of the code PMARC).
6. 1998 SDSU Outstanding Faculty Award.
7. 2002 SDSU Outstanding Faculty Award
8. 2003 SDSU Outstanding Faculty Award

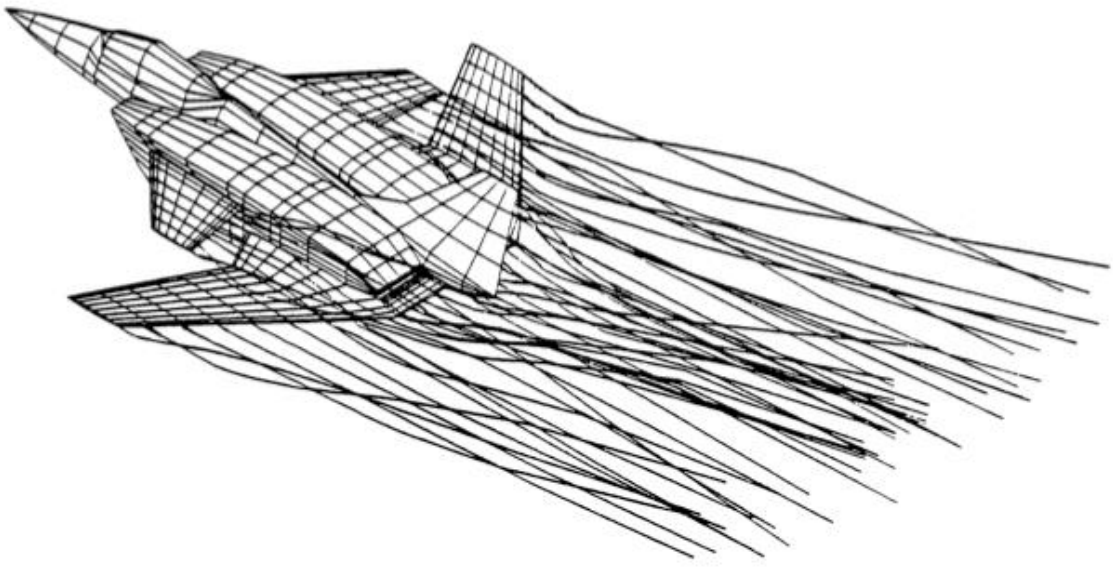
9 2003 NASA Creative Development: Software Release Award
10. 2004 SDSU Outstanding Faculty Award
11. 2007 AIAA San Diego Outstanding Contribution to Aerospace Education
12. 2015 SDSU, College of Engineering, AE Favorite Professor

BOOKS

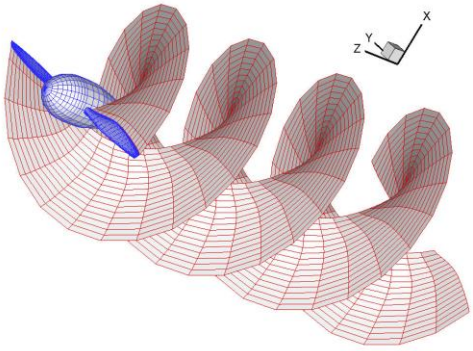
1. Katz J., and Plotkin A., "Low-Speed Aerodynamics: From Wing Theory to Panel Methods," McGraw-Hill Book Co., New York, NY, 1991.
2. Katz J., "Race-Car Aerodynamics," Robert Bentley Inc., Cambridge, MA, 1995.
3. Katz J., and Plotkin A., "Low-Speed Aerodynamics - Second Edition," Cambridge University Press, NY, 2001.
4. Katz J., "Race-Car Aerodynamics," - Second Edition, Robert Bentley Inc., Cambridge, MA, 2006.
5. Katz J., "Shooting in the Ivory Tower," Dorrance Publishing, Pittsburg, PA, 2007.
6. Katz J., "Introduction to Fluid Mechanics," Cambridge University Press, 2011.
7. Katz, J. "Automotive Aerodynamics," Wiley and Sons, April 2016.
8. Katz, J. and Yingchao Z. "Aerodynamics of High-Performance Vehicles," published in Chinese, 2019.

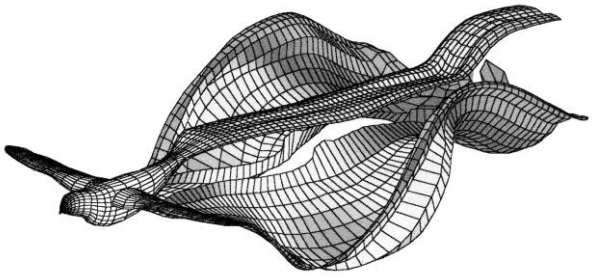
SAMPLE PROJECTS
(just to show that fluid dynamics can be found everywhere)

Development of Computational Methods: The code PMARC is an unsteady potential flow based model developed at, and with, the support of NASA AMES Research Center.

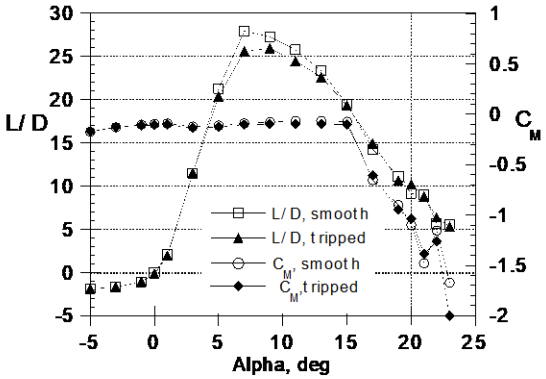


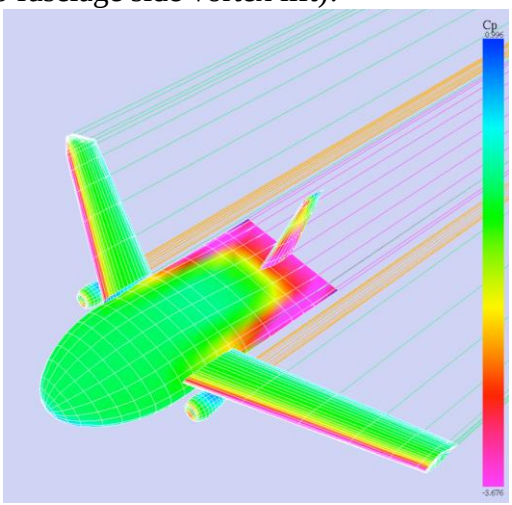
Unsteady flow modeling: for example, flow over a propeller and flapping flight



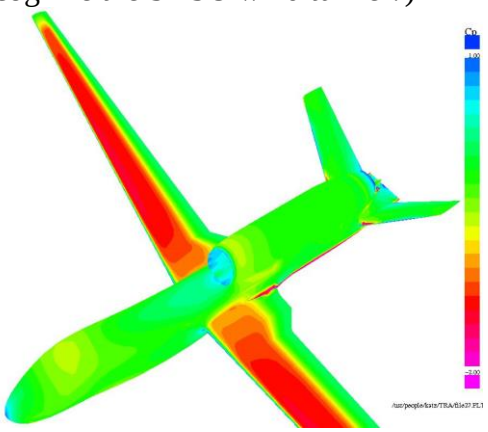


Lifting body configurations: Note that this configuration 'refuses' to stall). At higher angles the pitching moments lifts the tail (due to fuselage side vortex lift)!

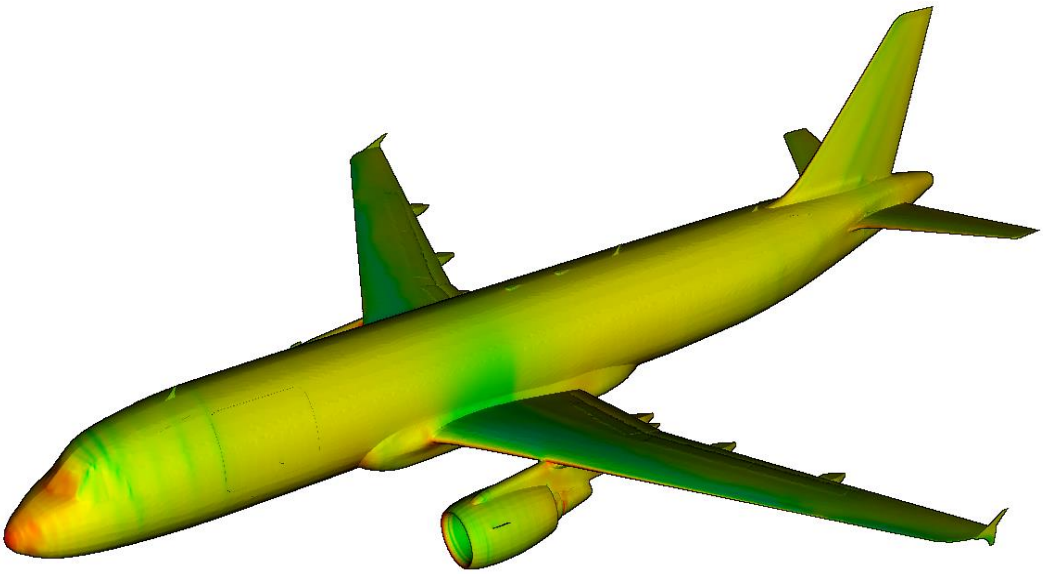


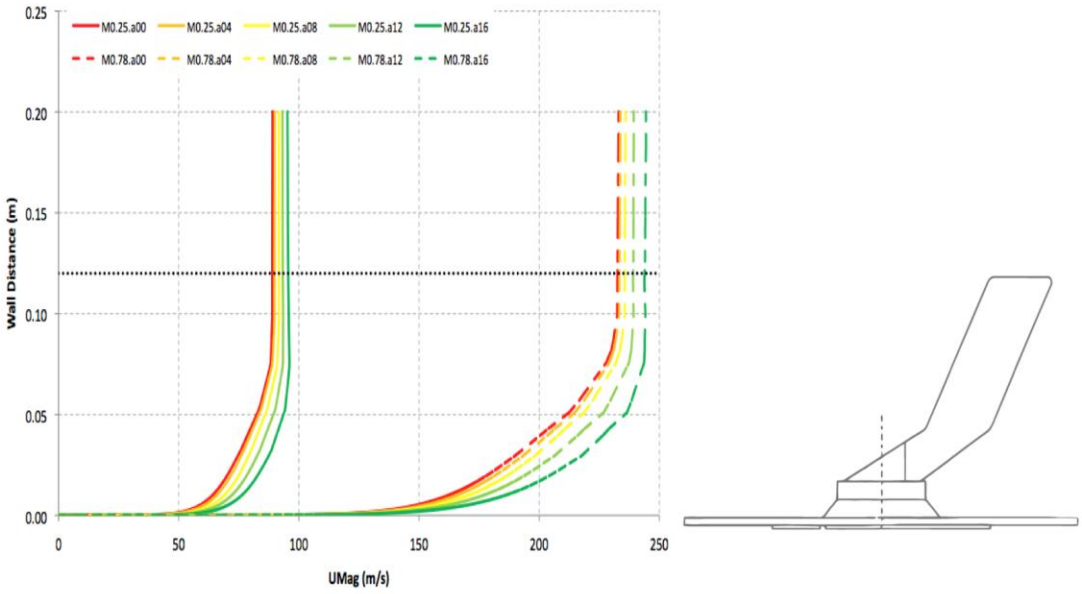


UAV Aerodynamics: Global Hawk (can you recognize the SDSU wind tunnel?)

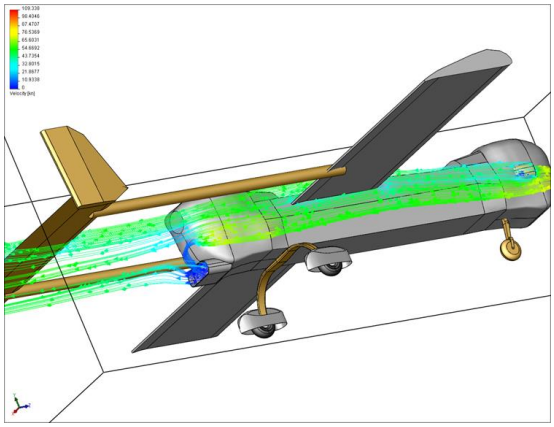


Aerodynamics of the A320 (mainly the angle of attack sensor). Note that boundary layer thickness is less than the sensor's height!

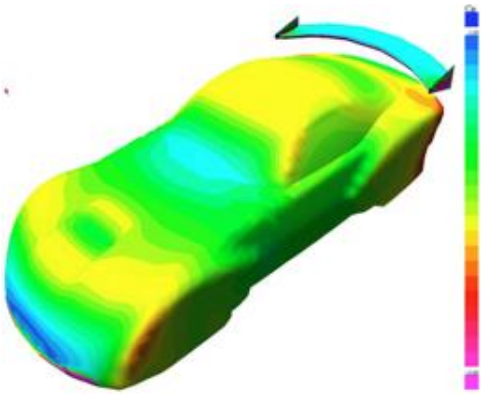




Re-engine of the E-Hunter UAV: in this project the engines were upgraded to a heavy fuel unit, requiring new propeller, and redesign of nacelles and cooling system

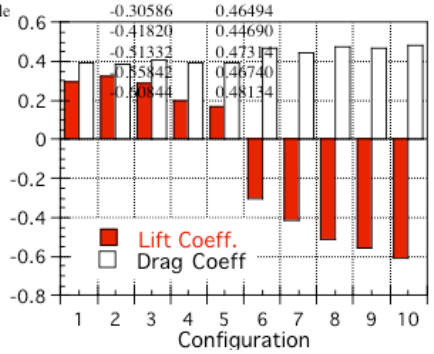


Development of the Devon GT Sportscar

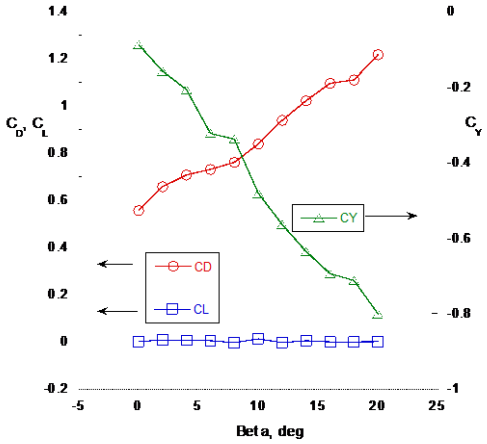


Wind Tunnel Results

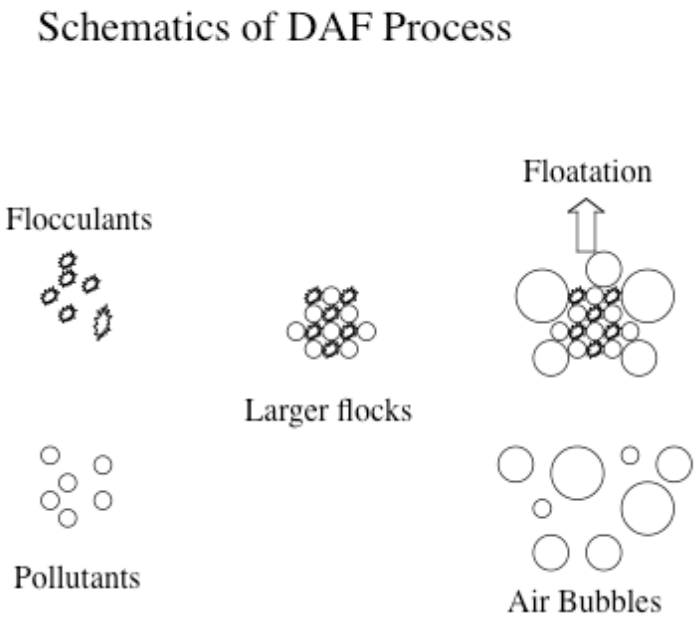
	CL	CD
Baseline	0.29684	0.39032
Partial side vents	0.32636	0.38786
Full side open	0.28536	0.40918
Base + 10mm F. splitter	0.19844	0.39360
Above + underbody VG	0.17056	0.39360
Baseline + rear wing at 0 angle	-0.30586	0.46494
Above + 10mm splitter	-0.41820	0.44690
Above + wing angle at –4	-0.51332	0.47314
Above + underbody VG	-0.35842	0.46740
Above+ VG + dive plates	-0.40844	0.48134

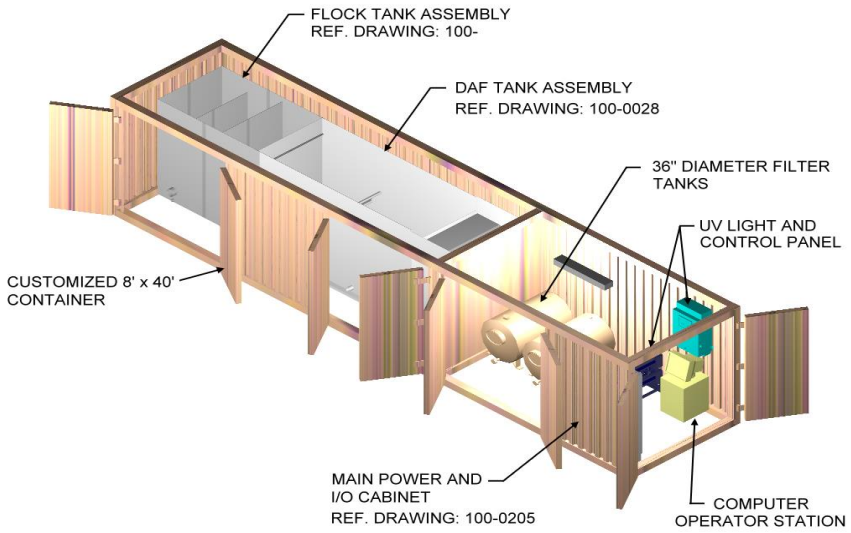


Motorcycle aerodynamics: Full scale wind tunnel testings

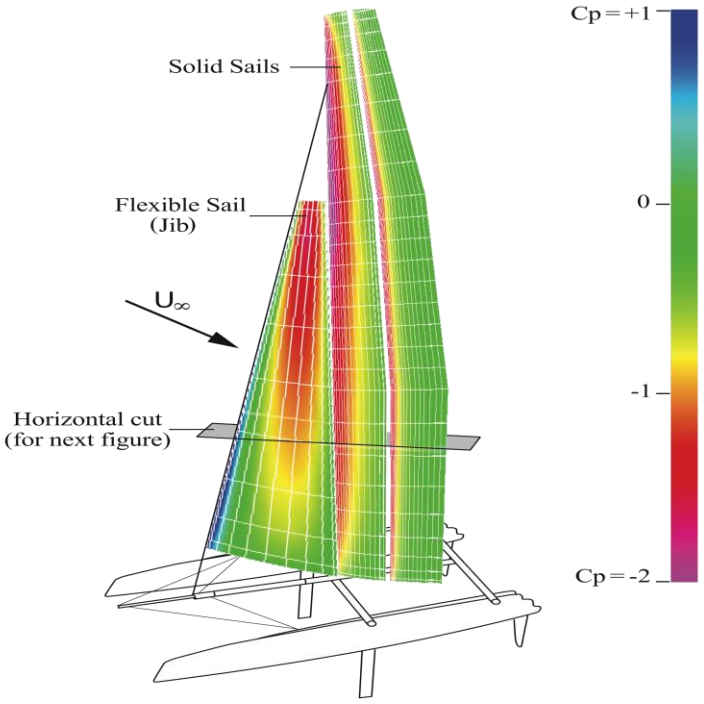


Water purification using the dissolved air bubble floatation method (DAF):

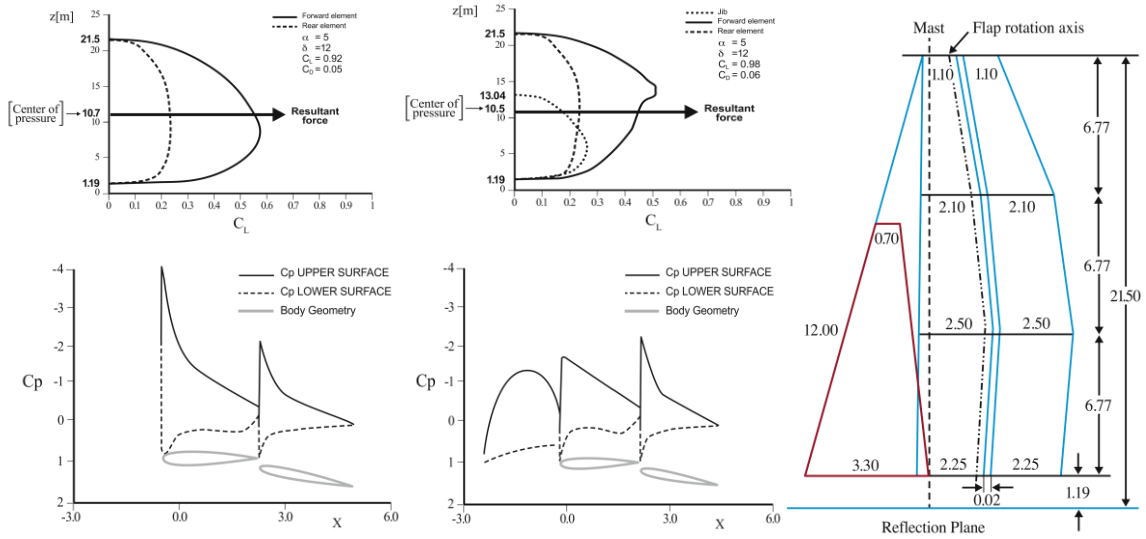




Sail design for competition boats (both rigid and flexible)

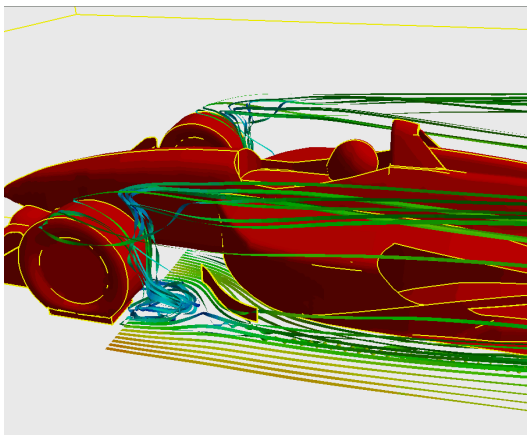


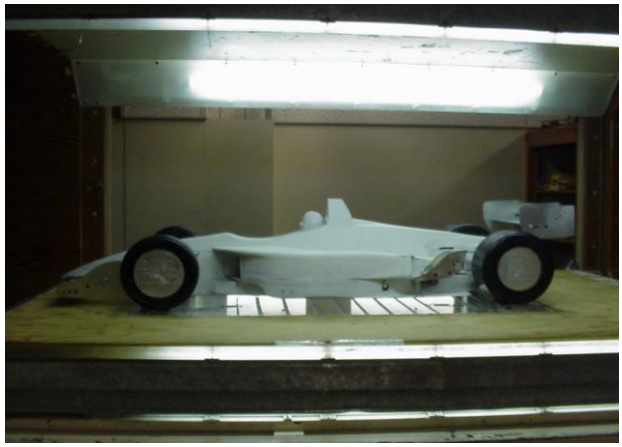
Method, Justification #2



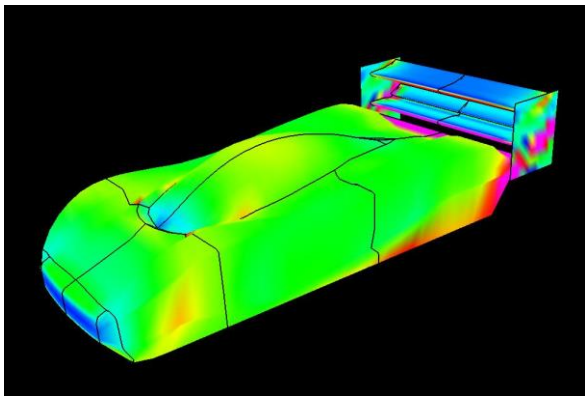
4

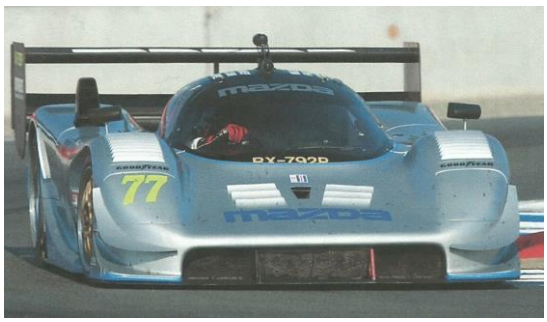
Race Car Design: Open-wheel race cars





Race Car Design: Prototype race cars

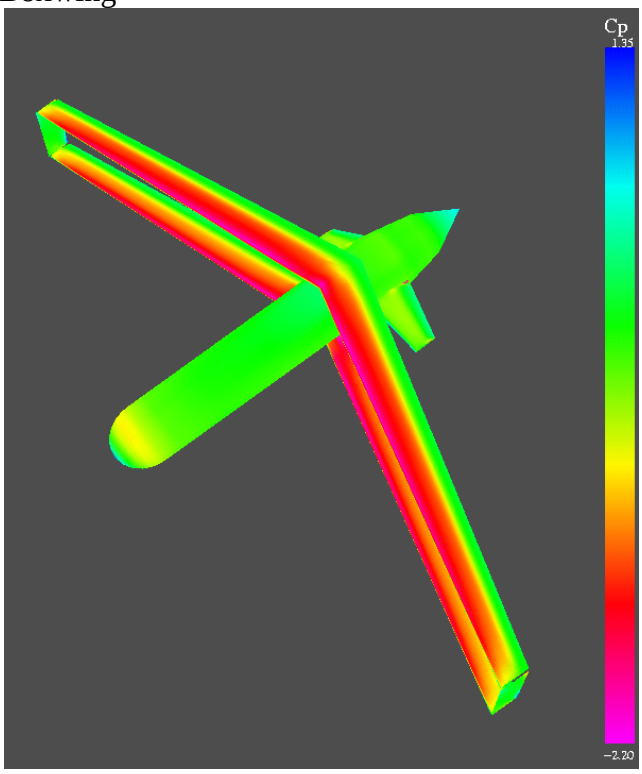




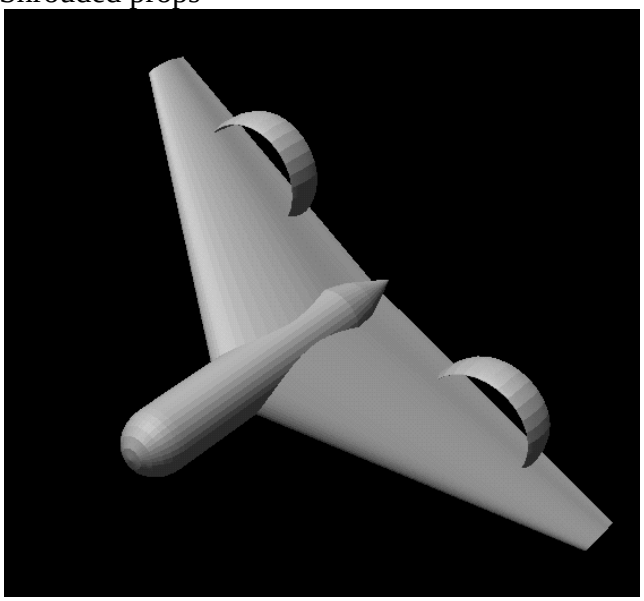
Race Car Design: Sprint cars

Unique (e.g., strange) Configurations

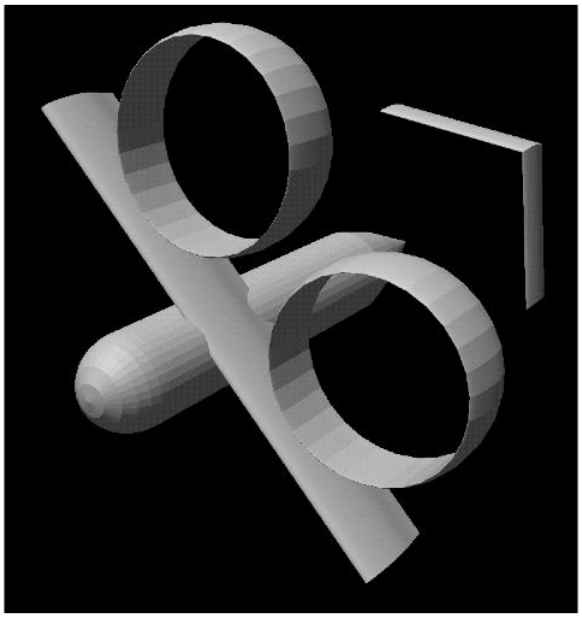
Boxwing

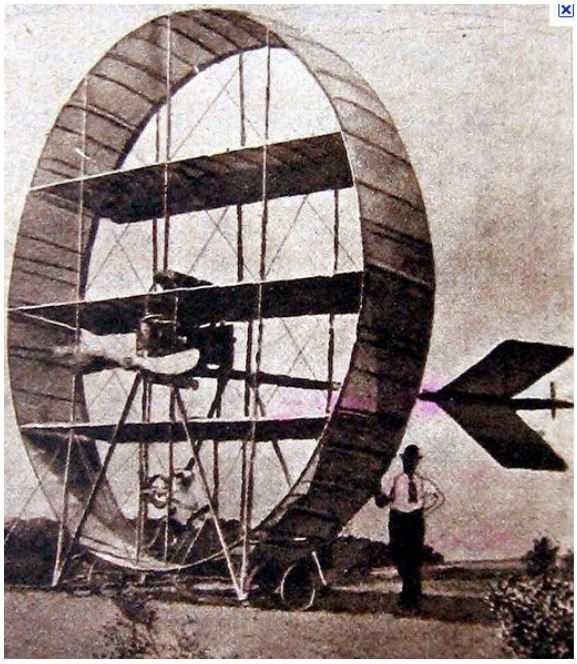


Shrouded props



Tilted shrouded props (e.g., for vertical takeoff)





Just to show that we are not the first!

The Walkovitz wing