Dr V Kliatzkin

1. **General analysis of energy balance of energy producers or users**.

   This work include in principal general description of any kinds producers and users of energy.

   Current value of power produced or used may be presented in the next form:

   $P = C_d * V^3 * A_d/(2*G) + C_u * V * W + AC * W + W * Sin(SL) + P_{ch}$

   Where AC – Mass of object,

   A_d – Air density,

   C_d – Aerodynamic coefficient

   C_u - Coefficient of friction

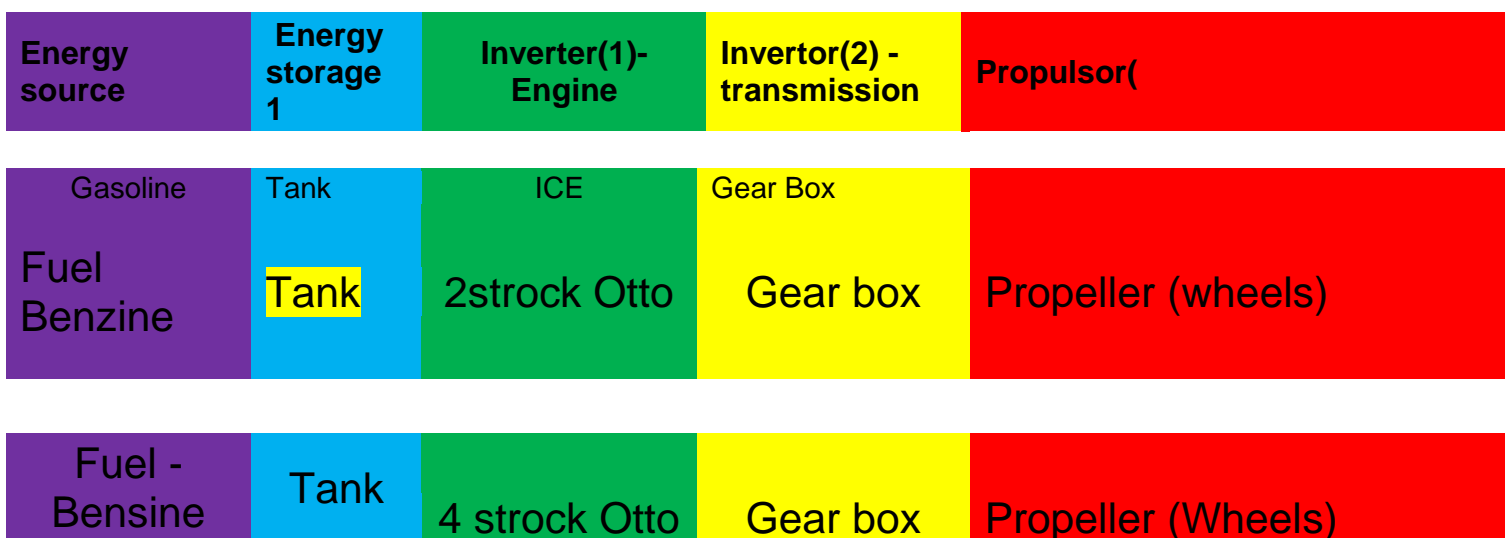   G – Gravitation coefficient

   P – Power

   P_{ch} – Charge discharge of Energy storage

   SL – Slope (Up, or down)

   V – Speed of rocket, plane, car, train, detail in tooling, wind turbine etc.

   Structure of any power producer, consumer may be presented in next form (sample for aviation and car system:

Energy source	Energy storage 1	Inverter(1)- Engine	Invertor(2) - transmission	Propulsor(
Gasoline Fuel Benzine	Tank Tank	ICE 2strock Otto	Gear Box Gear box	Propeller (wheels)
Fuel - Bensine	Tank	4 strock Otto	Gear box	Propeller (Wheels)

Fuel Solar	Tank	2strock Diezel	Gear box	Propeller (Wheels)
Fuel - solar	Tank	4 strock diezel	Gear box	Propeller (Wheels)
Fuel	Tank	Gas Turbine	Gear box	Propeller (Wheels)
Fuel	Tank	Gas Turbine	Gear box	Jet
Fuel	Tank	Gas Turbine	Gear box	Fan
Fuel	Tank	Rocket Engine	NA	Jet
Fuel	Tank	Rocket Engine	NA	Jet
Fuel	Tank	Rocket Engine	Satellite	Jet

Needed parameters: base Knowledge in power systems, Common analysis System analysis. Math Lab, Office, inclination to Analytic words.

2.CADCAM ICE project for Hybrid scheme of car.

Project creation of gasoline 2 stroke 650 - 750cc engine 80-90kW with spring intake walves, direct injects, air and liquid cooling option, and turbocharge. Single body include carter, cylinders and head of cylinder. Engine must be adopted to work in high torque energy storage i.e. Output characteristic as close as possible to propeller characteristic and possibility to work in regime On/Off with short time of On part (1min). Engine must be adequate to work to 1000 hours on the output power without change any parts include plugs, radiators, filters and cooling ventilator.
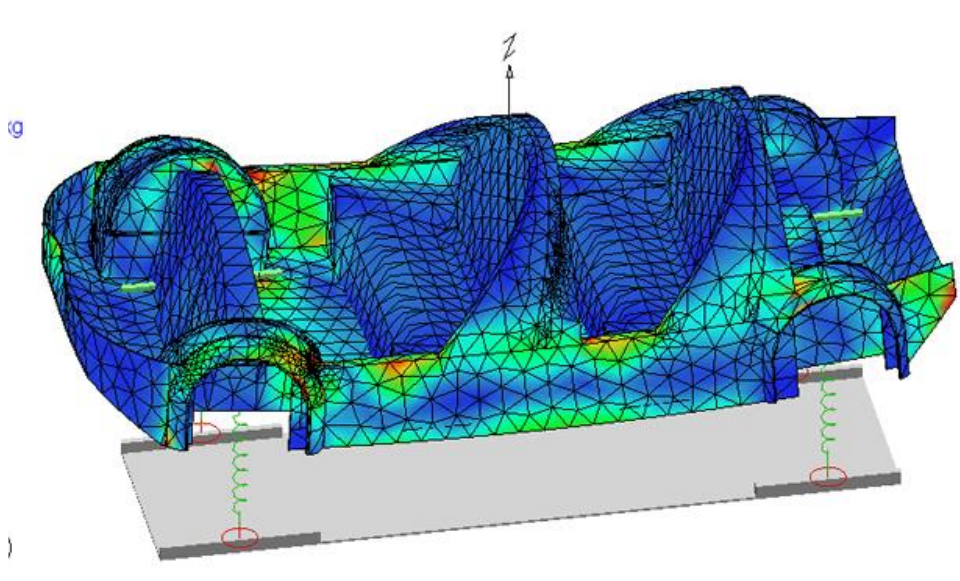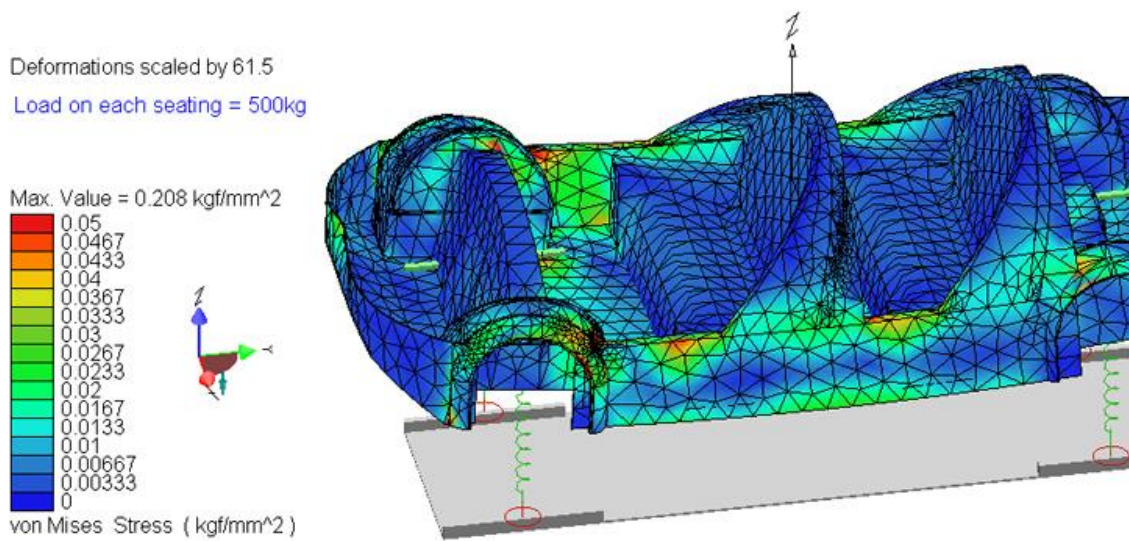
Stages of project:
1. Thermodynamic and gas dynamic calculations.
2. Choice of standard parts (pistons, bearings, plugs, system ignition, and fuel injection.)
3. Dynamic and preliminary stress calculations.
4. Solid works design and final stress calculations.
5. Design of press form for investment casting of block carter.
6. Building and output testing of engine.
   Needed parameters for project team.
   Flow dynamics – base, Solid works – prefer serious base, include Structure and CFD option. Desirable in producing experience.

3. Structure analysis one detail body of car

Deformations scaled by 61.5

Load on each seating = 500kg

Max. Value = 0.208 kgf/mm^2

0.05
0.0467
0.0433
0.04
0.0367
0.0333
0.03
0.0267
0.0233
0.02
0.0167
0.0133
0.01
0.00667
0.00333
0

von Mises Stress (kgf/mm^2)

Test program: Bending 2g, Torsion2g, Shok in front1g& 10g, Shock in back1g &10g, Shock in side 2g&10g, Shock in roof 5g. Material special 3D composite sandwich.
Needed team with good control in Solid works especially in option Cosmos.

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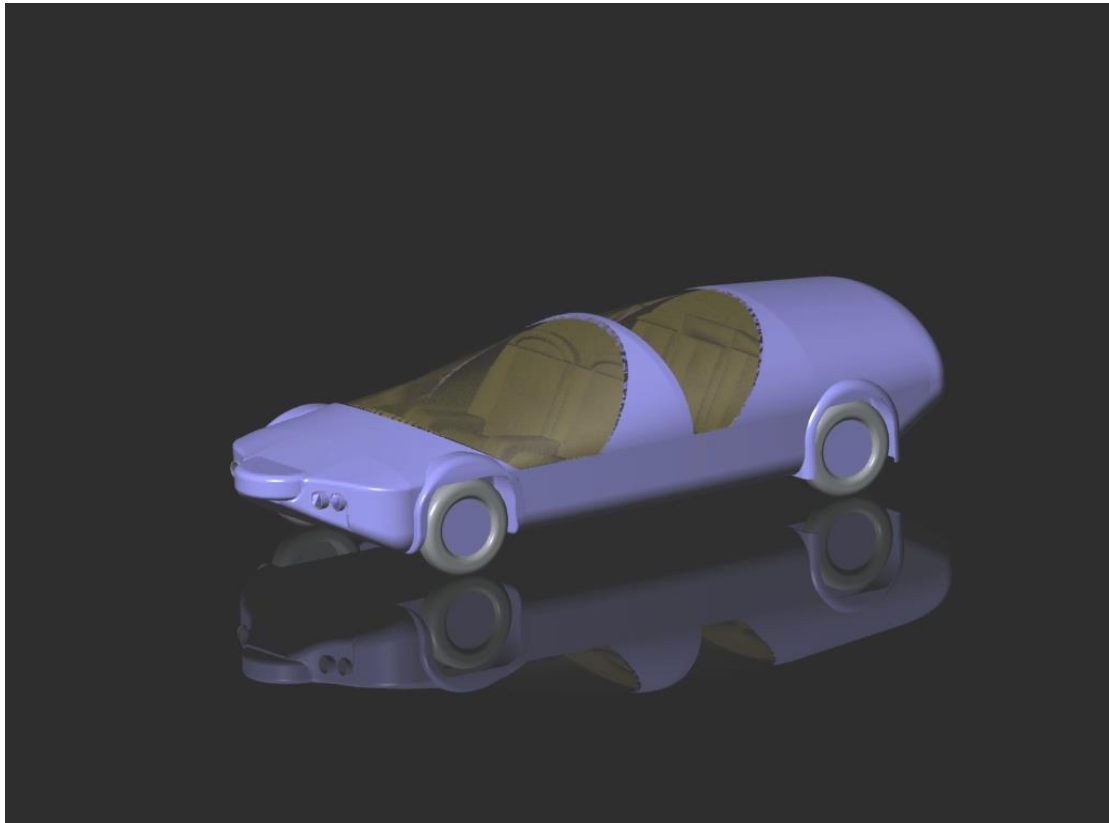
Object of final work: Air flow investigation of passenger car with Solid work CFD option.

Target determination of vector aerodynamic force i.e. coordinates of aerodynamic focus and value and vector components direction. Especially attention for flow around rotating wheels and his housing. Min 2 direction must be investigated: front to back and 10 deg to longidutional axe. Needed team Good experience in Solid Works CFD. Base knowledge in flow investigation.

5.Analytical analysis balance between renewable and fossil fuel energy.

Priority problem of renewable energy source are his COE and as result possibility of competitions with conventional – fossil fuel base of energy. Needed student with good erudition in state of the art of different energy source and possible perspective of development. Investigation must be developed on the phone decreasing (without damping) cost of fossil fuels and receive control of fossil fuel price to developed countries - first of all USA. Second part of work are content possibility for using resources cost decreasing of wind turbine via transfer producing technology as close as possible to installation site. This transport problem may be attacked from two positions: First- using for producing standard detales produced in many countries,
  (this design solution are developed and tested in Israel.) Student must be oriented in Matlab and design in Solid Works. Possibility for description economy results of different technology process.