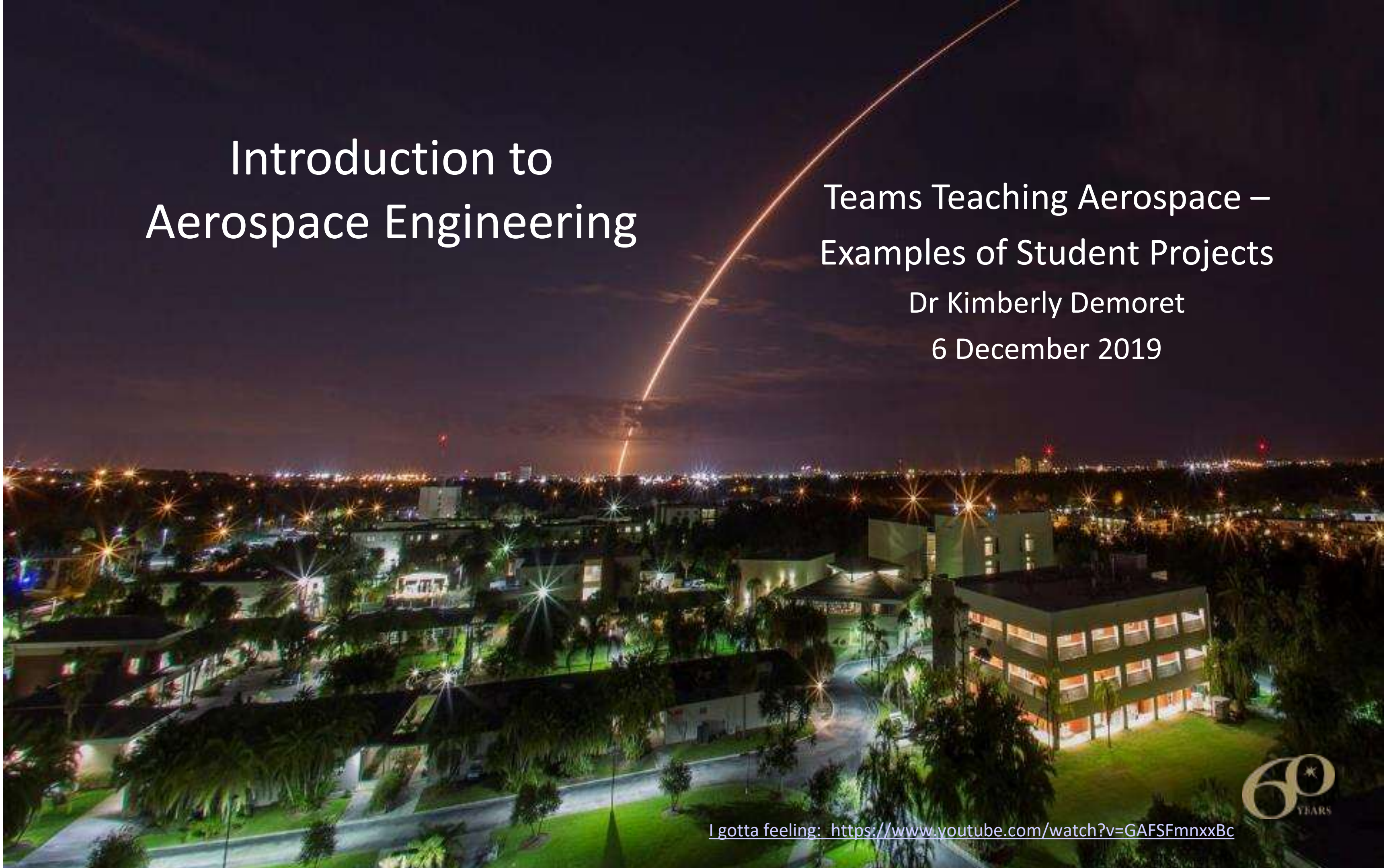


Introduction to Aerospace Engineering

Teams Teaching Aerospace – Examples of Student Projects

Dr Kimberly Demoret

6 December 2019

I gotta feeling: https://www.youtube.com/watch?v=GAFSFmnxxBc

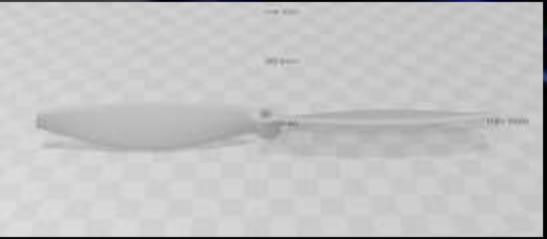
Team AirSub group 19

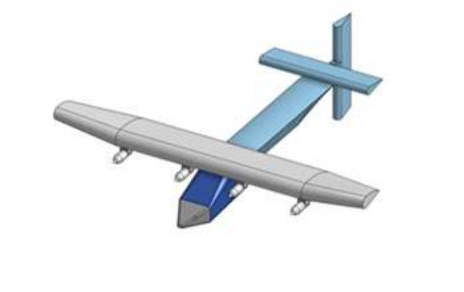
Submersible Aircraft

A vehicle capable of moving in air and underwater.

Major challenge:

A propeller capable of efficiently providing thrust in both environments.





SPARTA:
Solar Impulse

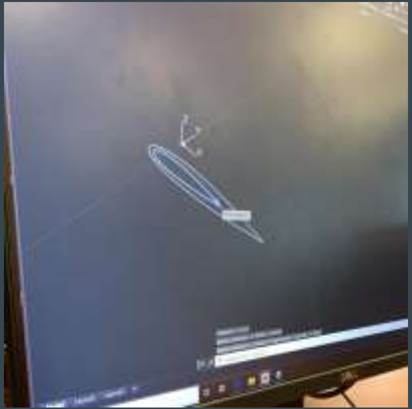
SOLAR Airfoils

This is the whole team:____. This is the first trip to the DSL to learn about CAD (all of them had little to no experience), and all the wonders 3D printing had to offer.

At the start, it was slow, but the group gradually made progress in creating the CAD model. The first model of the airfoil was made, and was a mess. It was unable to be 3d printed, and the team had to figure out how to fix it.

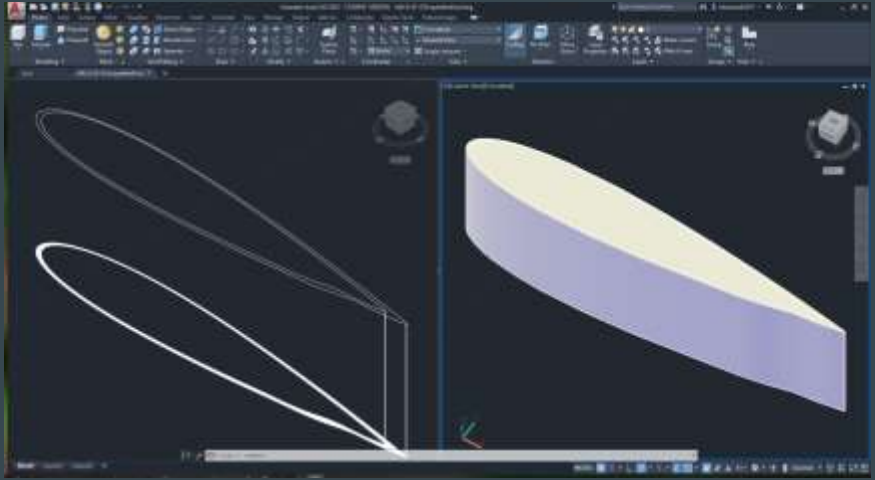
K. explaining to another student why the airfoil has that specific shape.

Progress being made on the model. It is currently not 3D, and not able to be 3D printed. The team met several times, and observed that good teamwork comes from good communication, openness about criticism and effort.



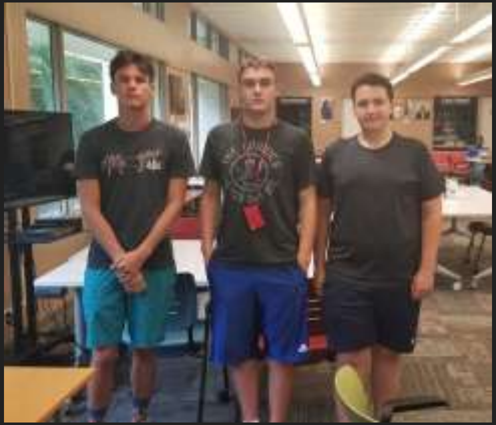
Figuring out how to extrude walls that aren't infinitely thin. It took lots of trial and error, but with a group effort, they figured it out.

The final 3D print



The final CAD model that was used to 3D print. The team learned that having proper communication is essential for success.

Everyone holding the final 3D of the airfoil

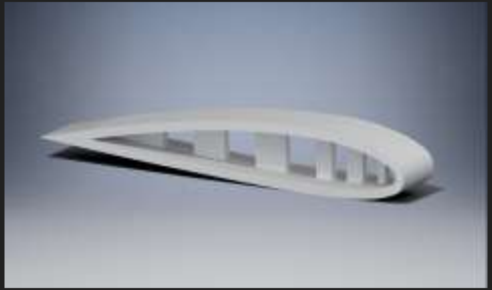


3D World

Group 6 - _______

The Concept of 3D Printing

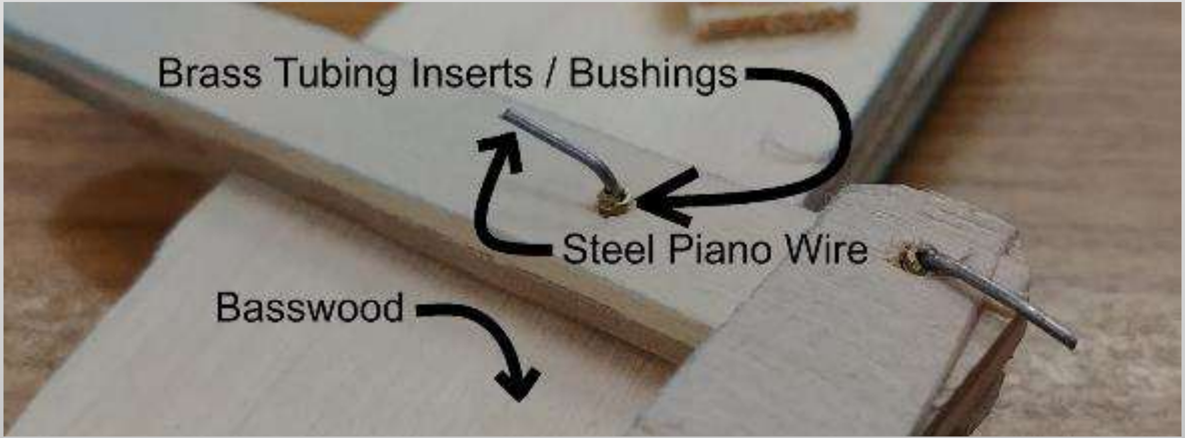
- The process of 3D printing was simple and cheap
- We used a website in order to create the model of the airfoil
- Used the printer in Evans to create a real life version of the rendered model of the airfoil

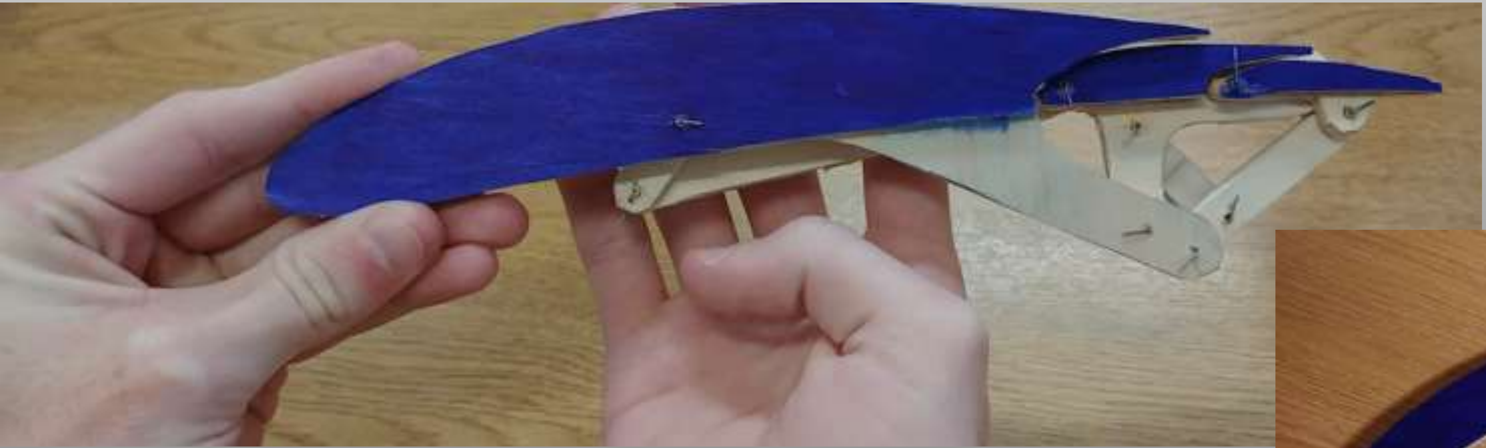


FLAPS

"The Flaperons"
Team 14

Jacob Smith
Abbigale Smith
Garret Ho
Nolan Burke


Brass Tubing Inserts / Bushings
Steel Piano Wire
Basswood

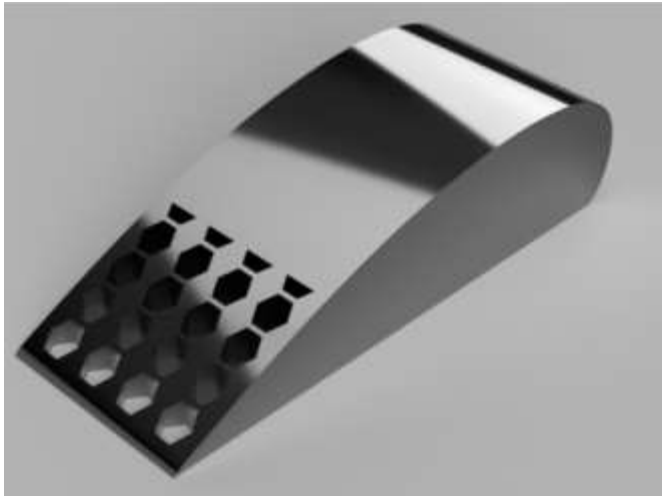


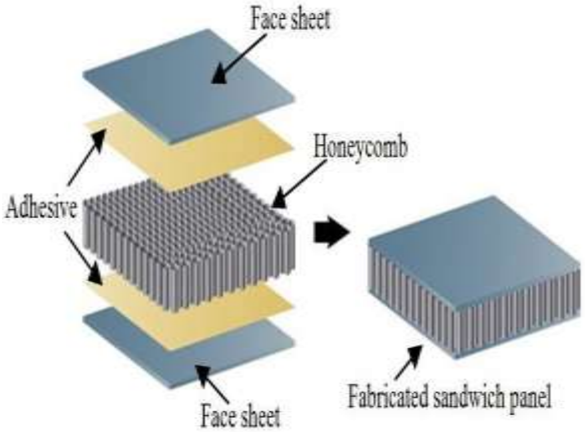
Lightweighting; Composite Materials

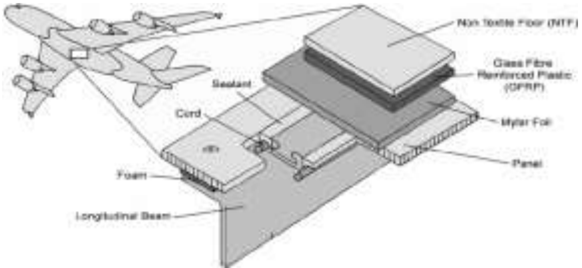
Michael Scarafile, Marlee Tache, Rebecca Palmer, Daniel Ellis

Composites

- Reduce weight
- Increase fuel efficiency
- Easy to handle, design, shape, and repair
- Functional components of planes i.e. wings, fuselage skins, engines, and landing gear

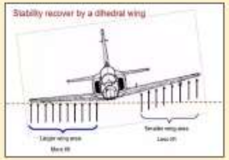


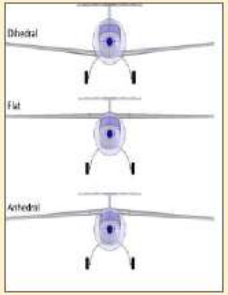


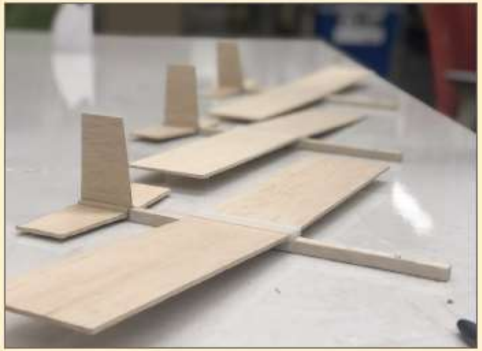


Stable Nature of Dihedral Wings

Team 3
Just PLANE Awesome:
Melanie Rivera, Zachary Gross, Huy Tran

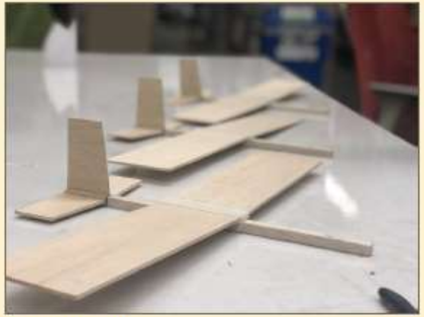




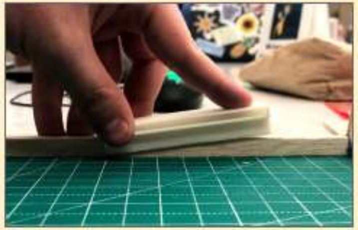


Glider Build Progression

Attaching Tail/Wings



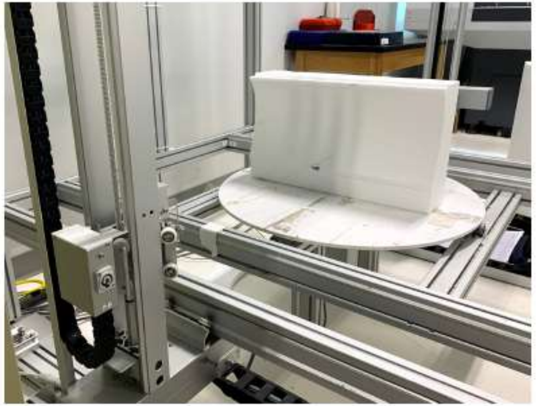
Final Product

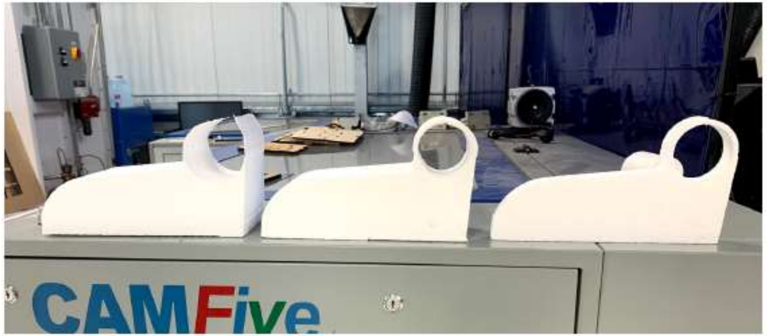


Adding Mount

Presentation Day

VERTICAL TAKE-OFF and LANDING JETS



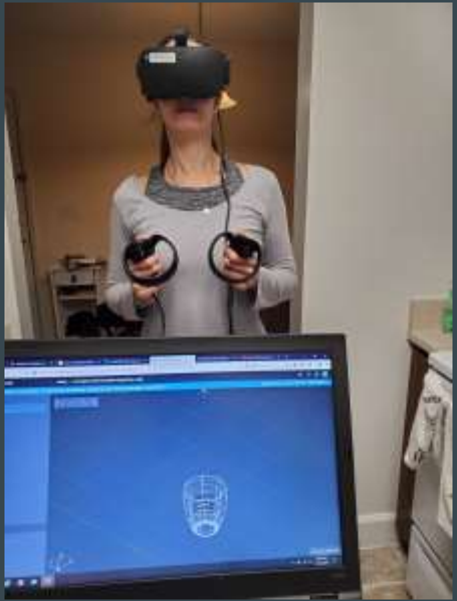


Icarus I

Death star crew
Teams teaching Aerospace
Group 16

Anderson Goncalves Youpeng Xu Joshua Calautti Patrick Leamy

Our project



Illustrates the basics of a turbojet engine using a VR oculus rift

User is able to interact with CAD model through Oculus

Team 9 - “Team Tandem”

Skye Swarat, Sam Lovelace, Caleb Webb, Graham Shea

Team AirSub

Submersible Aircraft

A vehicle capable of moving in air and underwater.

•••

Major challenge:

A propeller capable of efficiently providing thrust in both environments.

Blake P, Edem K, Jossie D, Mitchell G

The ThunderBirds

Aidan O’Connor, Alexander Lockhart, Steven Citowitz, William Mahony

Demonstrating Newton's 3rd Law

With a potato cannon…

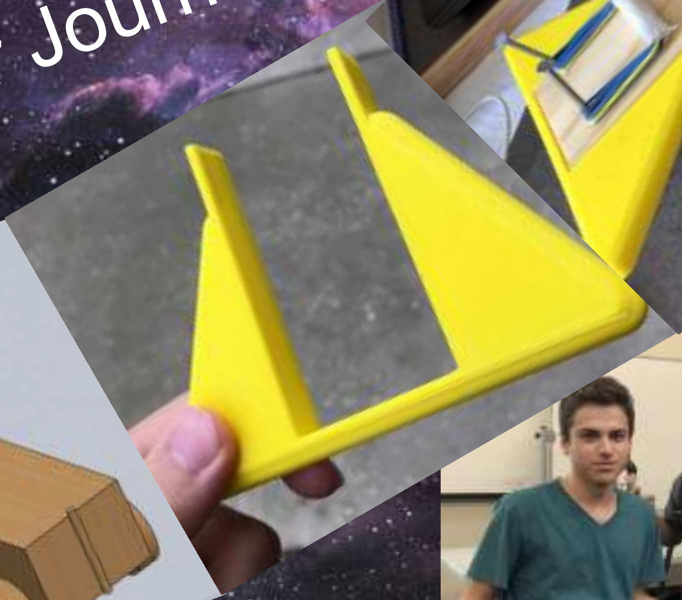


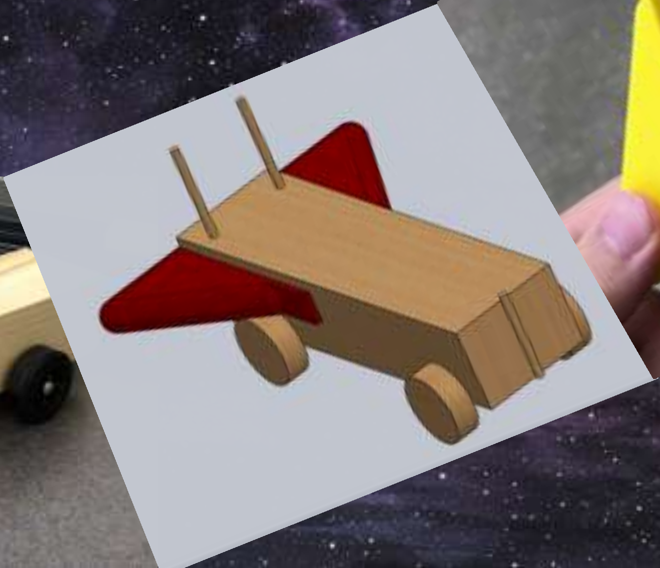




Mind
Over
Momentum
Team 22

Our Journey!





Misc. Clips of our Journey
https://www.youtube.com/watch?v=7rgZKG2z5-Q

Rubber Band Physics

$PE = KE$

$\frac{1}{2}kx^2 = \frac{1}{2}mv^2$

$\sqrt{\frac{k}{m}x^2} = V$

$\uparrow X, \uparrow V$

As stretched distance increases, the velocity of the quarter increases.

k = spring constant

x = stretch distance

m = mass

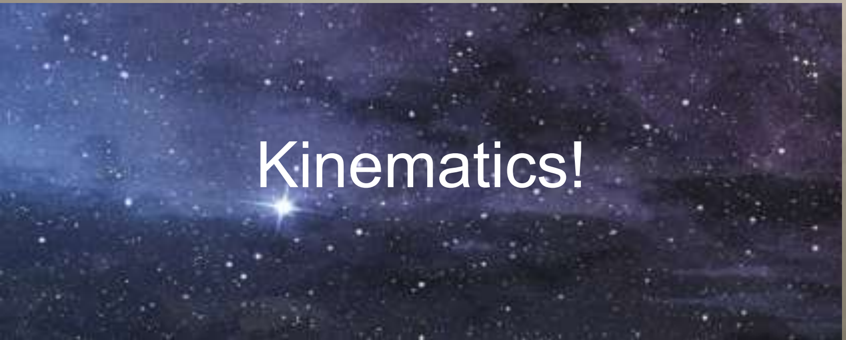
V = velocity

Car Physics

$0 = m\Delta V + \Delta m V_e$

$\uparrow |V_e|, \uparrow \Delta V$

As the exhaust velocity increases, the change in velocity of the car increases.



$$\Sigma F = \lim_{\Delta t \to 0} \frac{P_2 - P_1}{\Delta t} = \lim_{\Delta t \to 0} \frac{\Delta P}{\Delta t} = 0$$

$$0 = m(V + \Delta V) + \Delta m V_e - (m + \Delta m)V$$

$$= mV + m\Delta V + \Delta m V_e - mV - \Delta m V$$

$$= m\Delta V + \Delta m(V - v_e) - \Delta m V$$

$$= m\Delta V + \Delta m V + \Delta m V_e - \Delta m V$$

$$0 = m\Delta V + \Delta m V_e$$

Discretized version of rocket equation. Describes our car.

$$m\Delta V = -\Delta m V_e$$

$$m\frac{dV}{dt} = -V_e\frac{dm}{dt}$$

$$\int \frac{dV}{dt} = -V_e \int \frac{1}{m}\frac{dm}{dt}$$

$$V\Big|_{V_i}^{V_f} = -V_e \ln(m)\Big|_{m_i}^{m_f}$$

$$\Delta V = -V_e(\ln(m_f) - \ln(m_i))$$

$$\Delta V = V_e \ln\left(\frac{m_i}{m_f}\right)$$

Ideal Rocket Equation

$V_e = V + v_e$

$P_2 = m(V + \Delta V) + \Delta m V_e$

$P_1 = (m + \Delta m)V$

P = momentum

F = force

m = mass

V = initial velocity

V_e = exhaust velocity

v_e = exhaust velocity (relative to rocket)

t = time


BOOM. DONE.
FOXHD