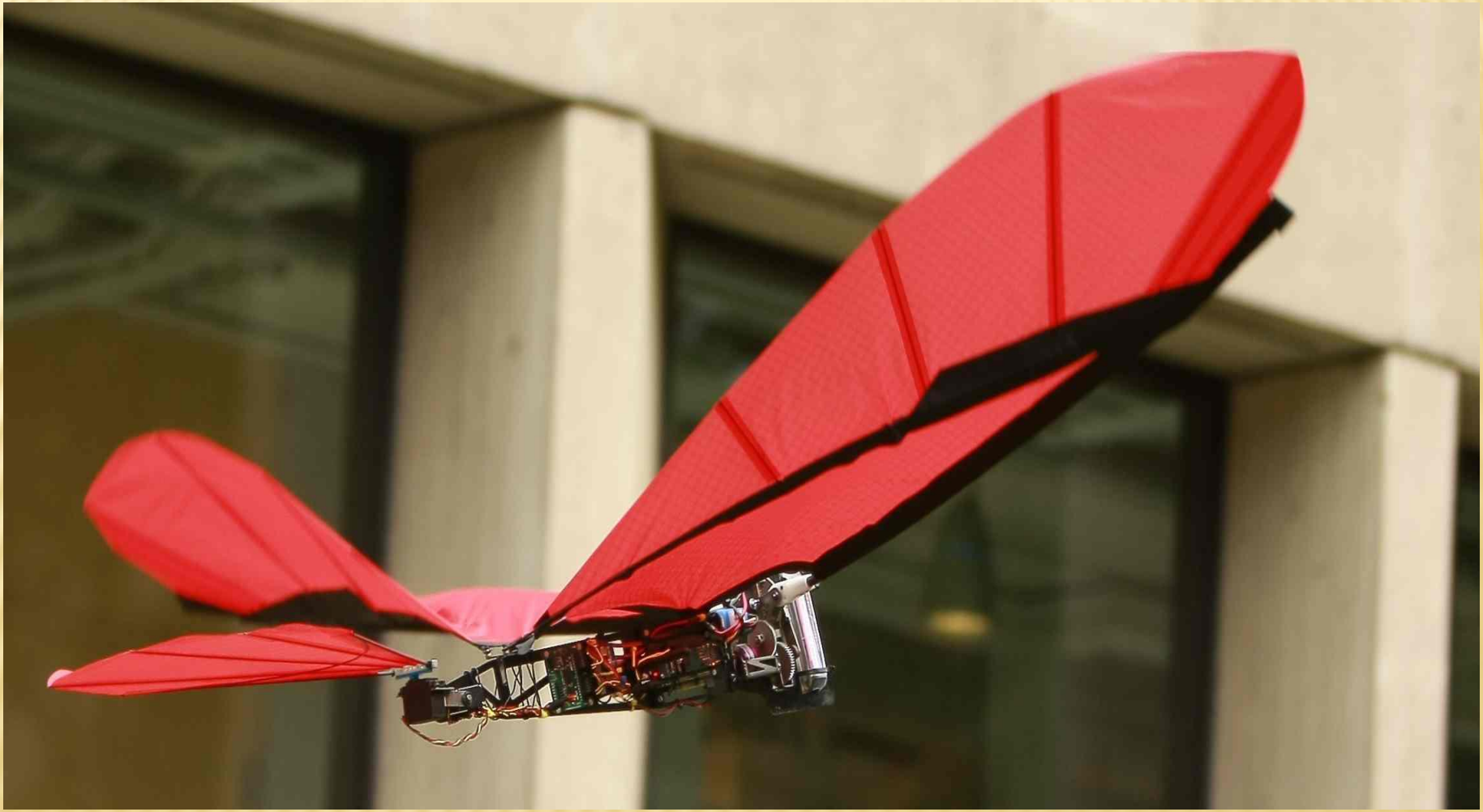
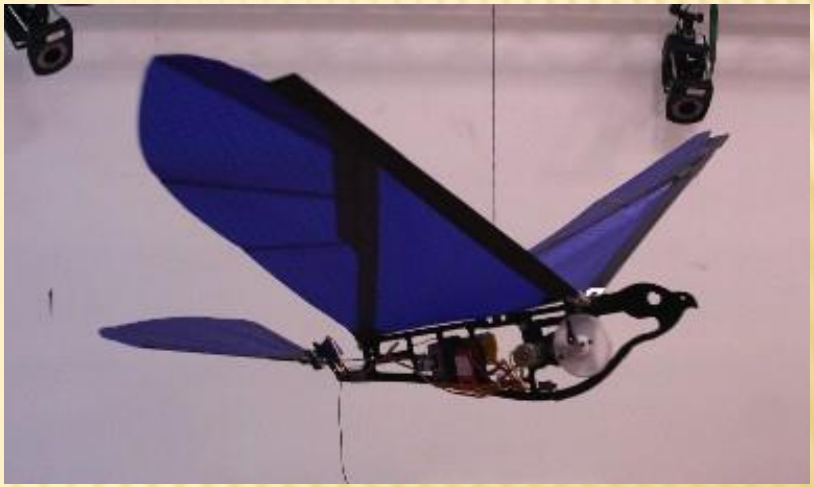
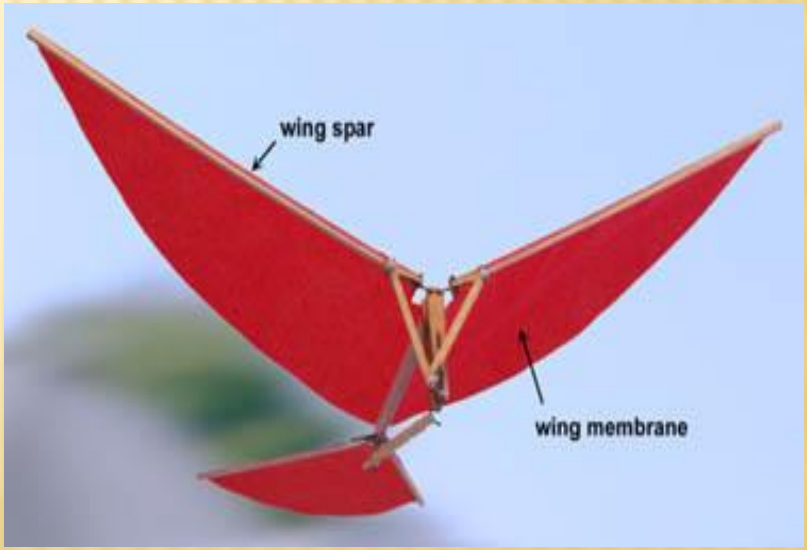
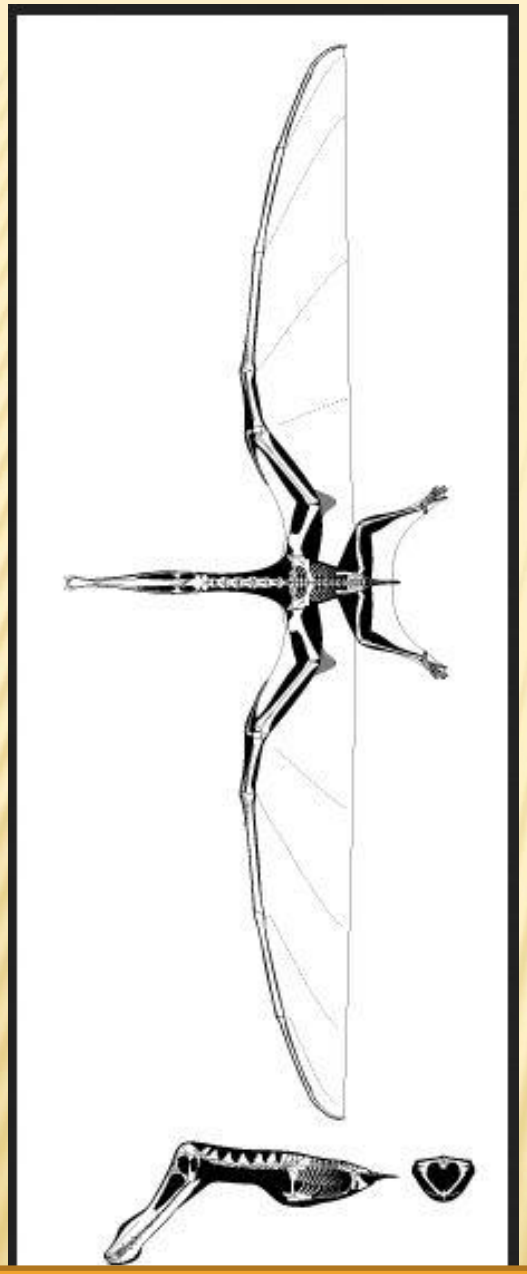
Powered Ornithopter

- Ayush Jain






wing spar
wing membrane

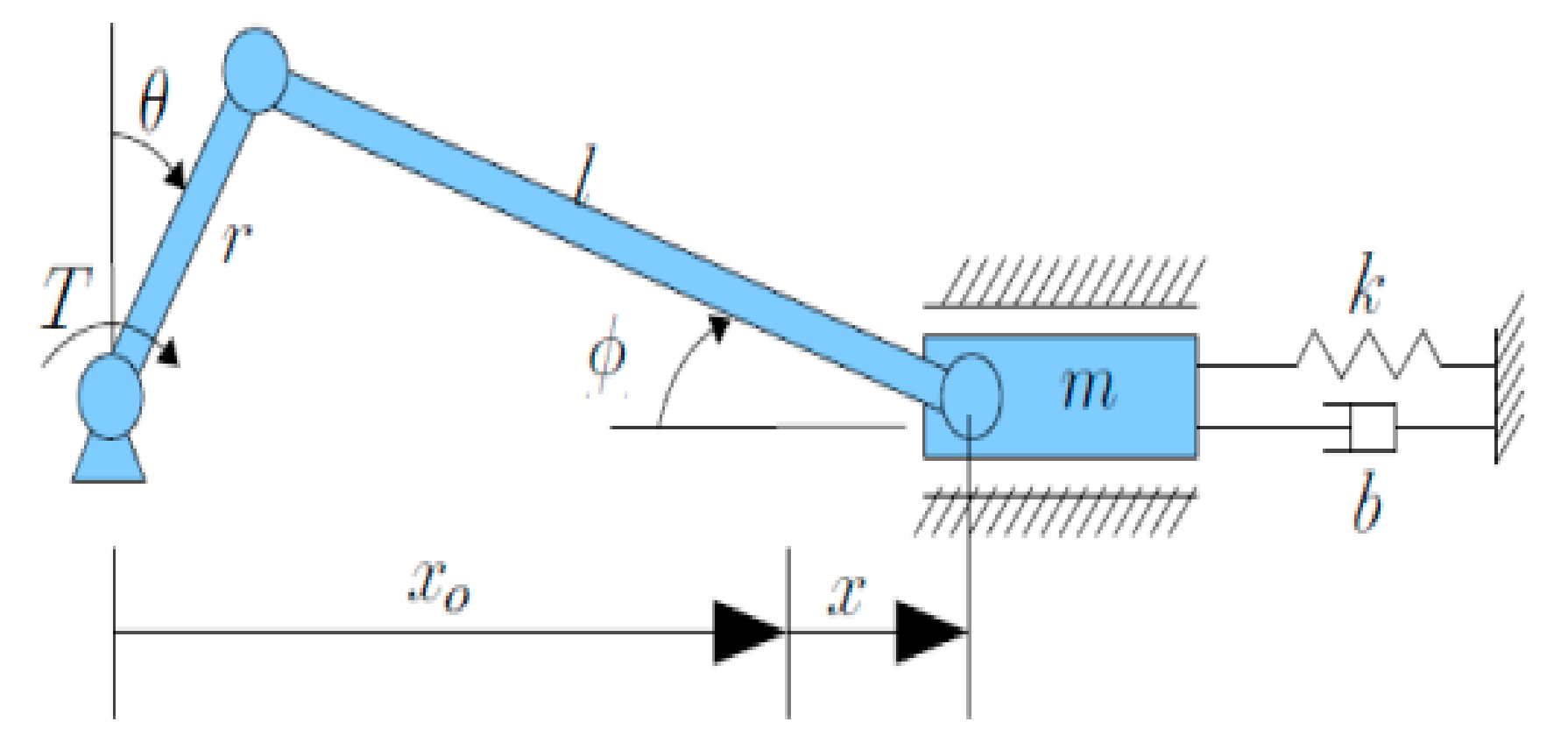


Pterosaur Replica

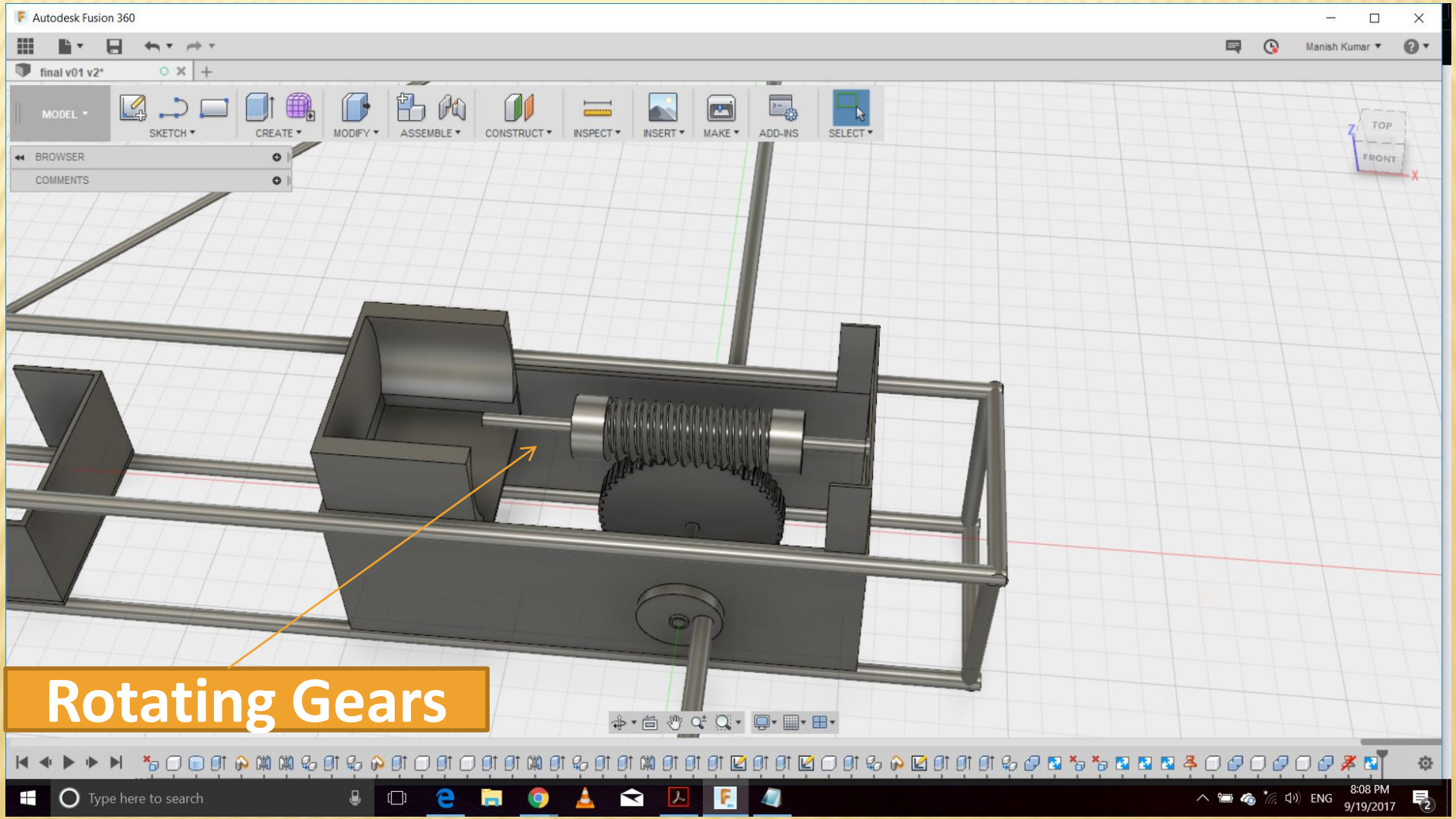
The Main Motivation for the design of an artificial bird (ornithopter).

Albatross wing model

Concept of resonance type flapping mechanism



CAD - Design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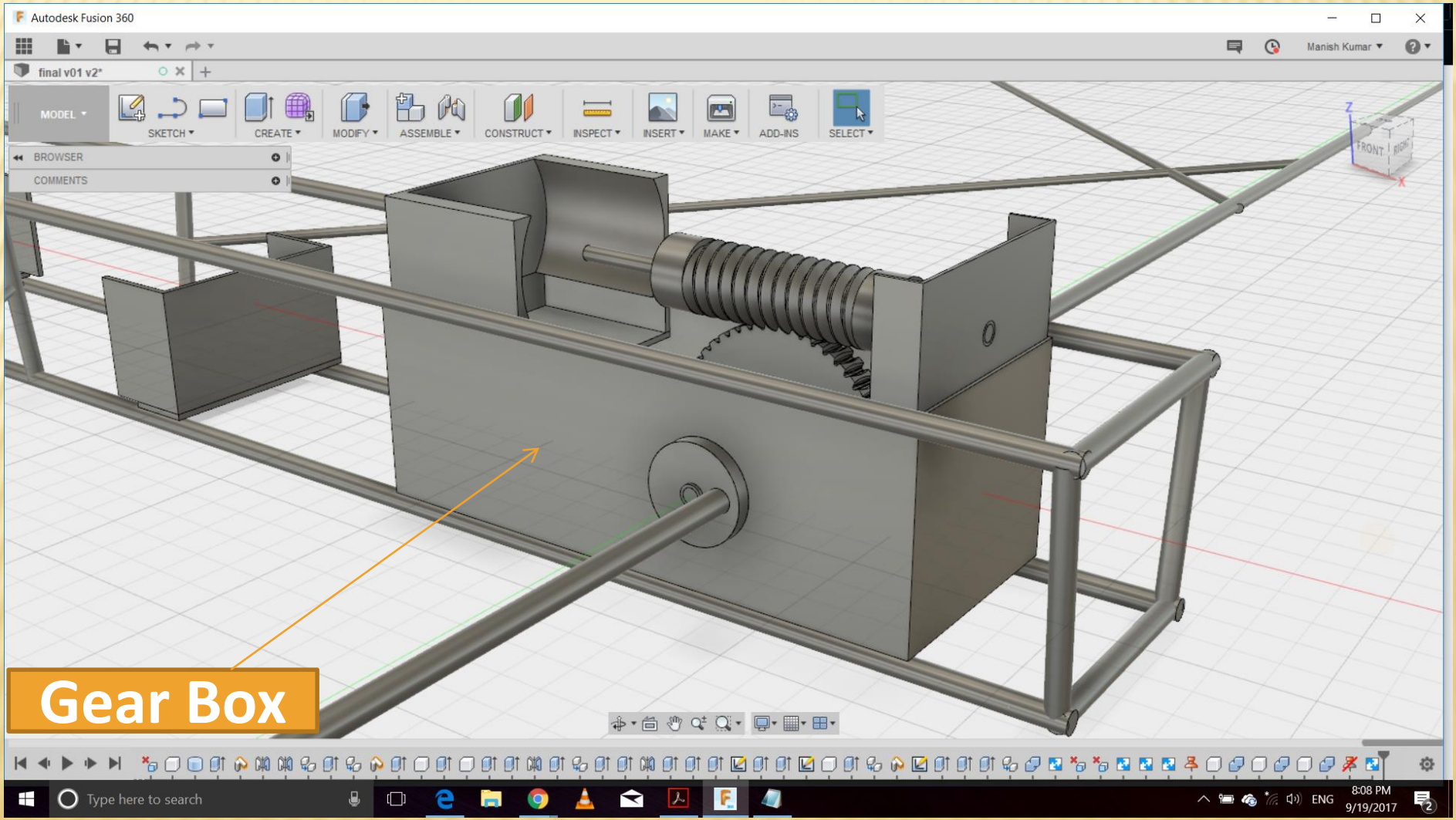
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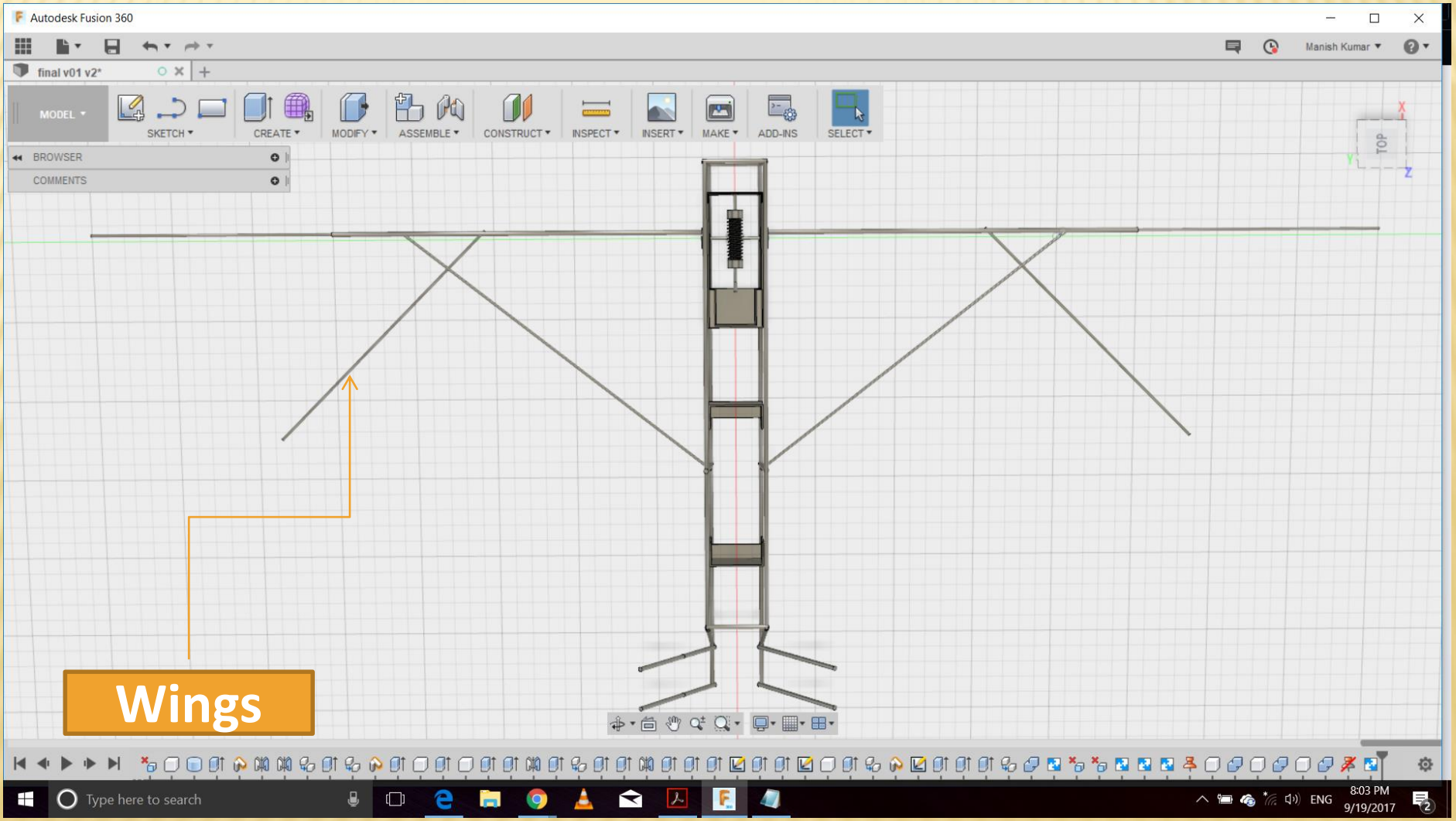
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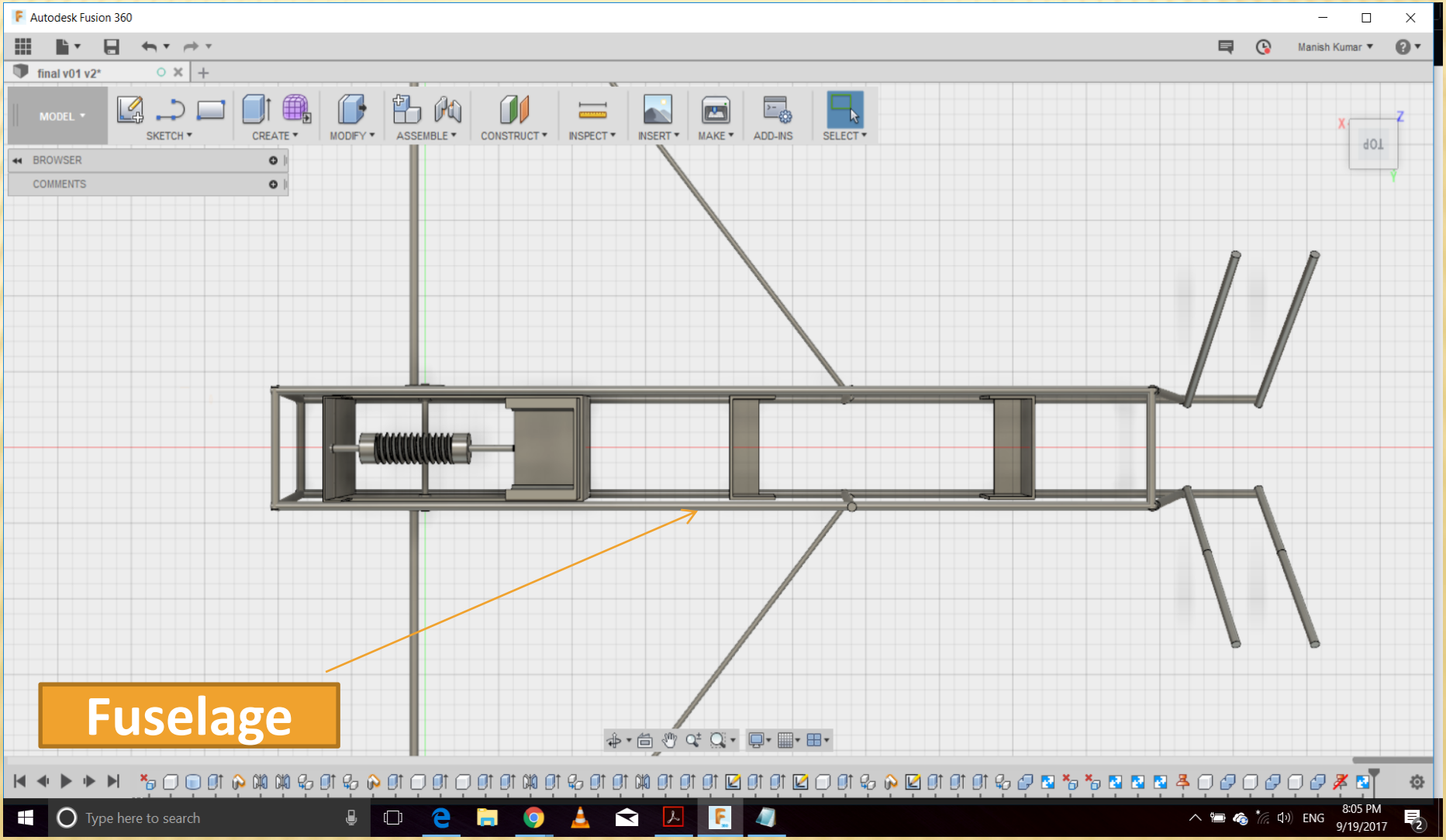
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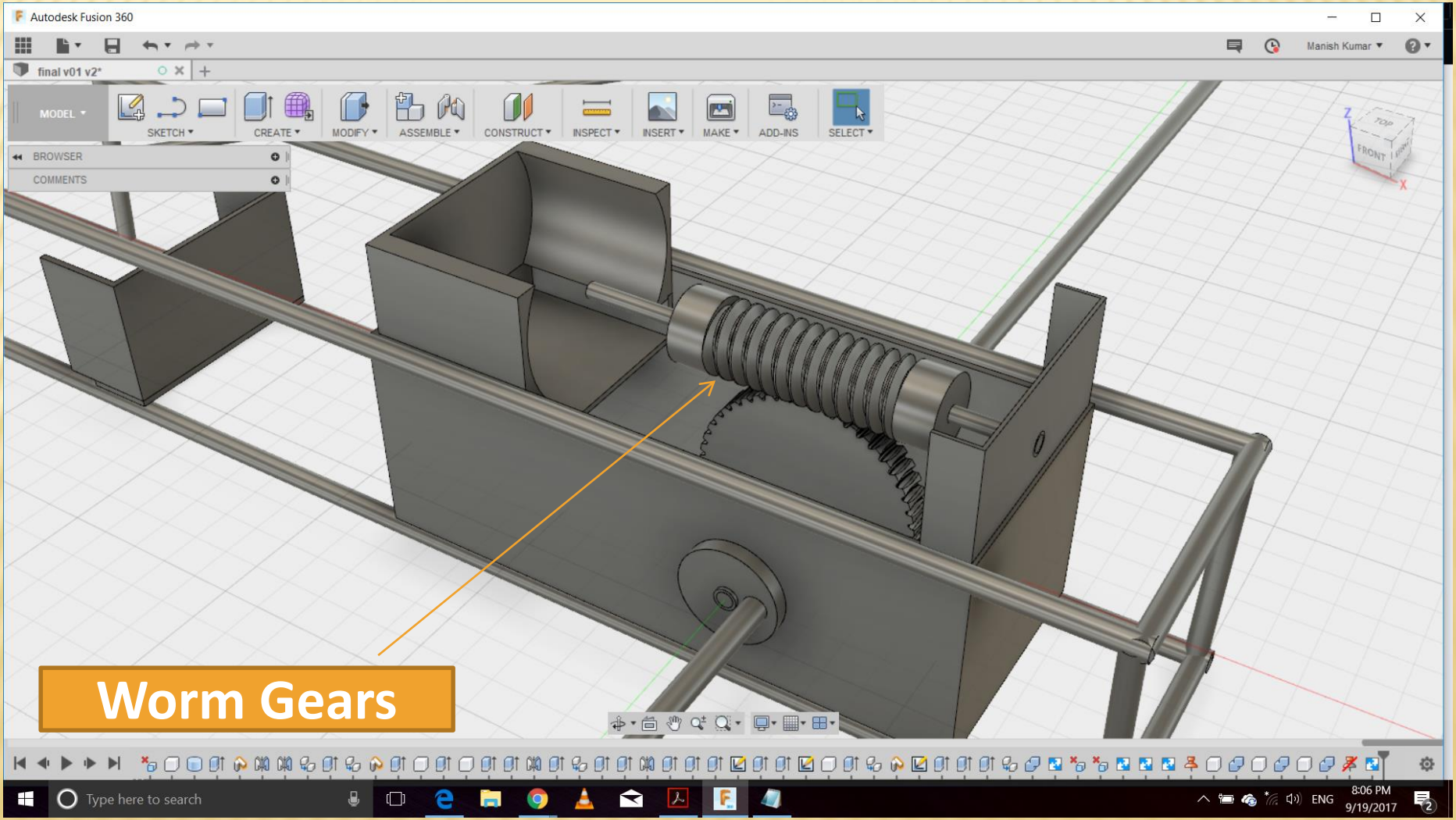
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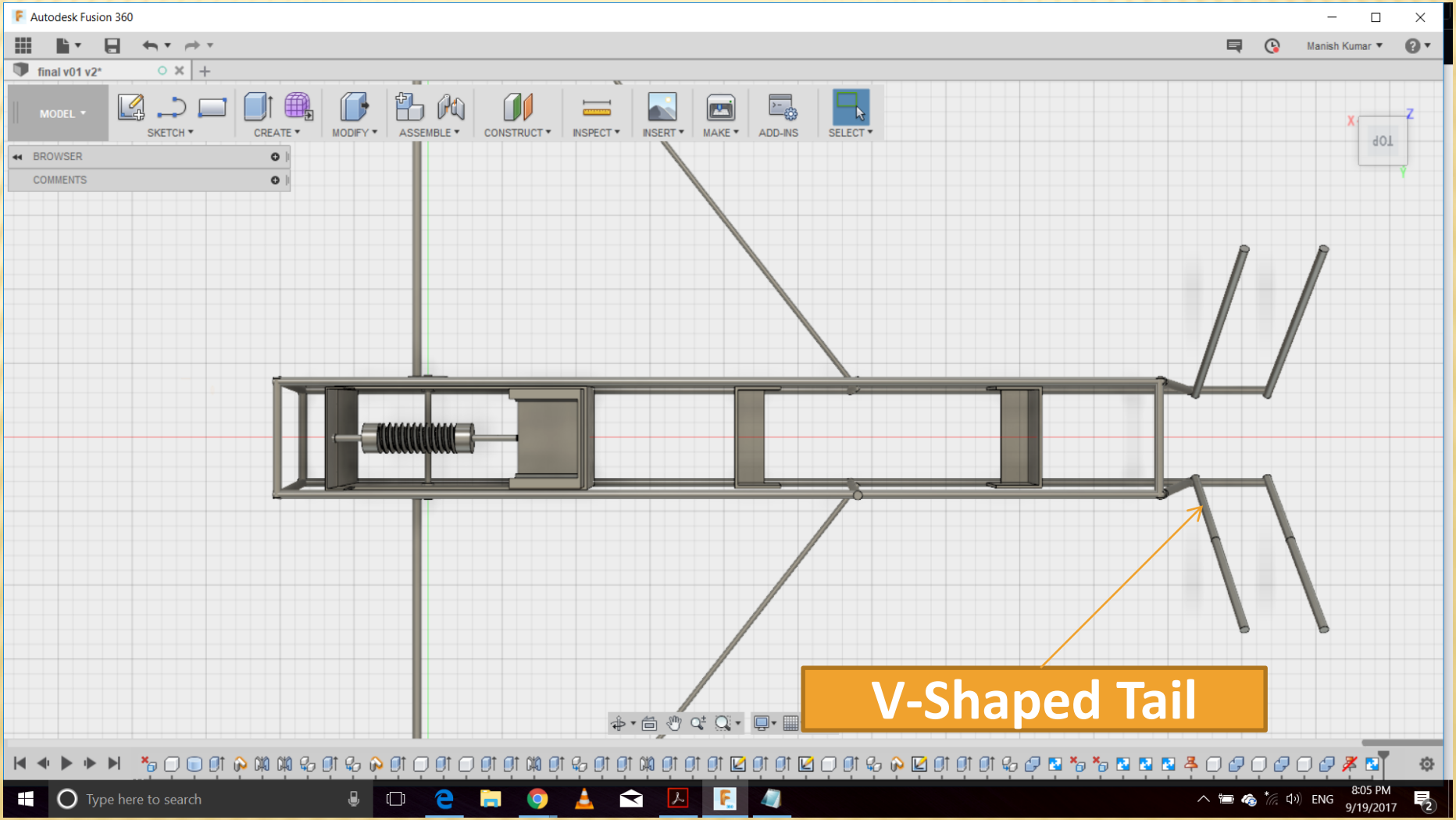
CAD - Design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Lifting Line Theory

Principle

The lifting-line theory applies the concept of circulation and the Kutta–Joukowski theorem,

$$L(y) = \rho V \Gamma(y)$$

Γ--> is the circulation over the entire wing (m^2/s)

AR --> is the aspect ratio

a_{oo} --> is the free stream angle of attack (rad)

V_{oo} --> is the free stream velocity (m/s)

In fluid dynamics, circulation is the line integral around a closed curve of the velocity field.

$$\Gamma = \int V.dl$$

Upstroke and downstroke - When a bird moves its wings downwards so that no air can pass through it is called downstroke. When the wings are widely open so that the bird can get the maximum lift is called upstroke.

>>> According to Rayner's model

Upstroke --> drag + lift

Downstroke --> thrust

>>> According to Lighthill

Upstroke lift is allowed, but that a span difference between upstroke and downstroke produces the net thrust.

Materials

- Worm Gears
- Carbon Rods (Different Thickness)
- Mylar Sheets
- 1350kv brushless motor
- LIPO Battery
- ESC
- Transmitter and Receiver


Thank You!