Mark 1 original

$L = (1.225 kg/m^3)\, 4\pi^2 \cdot (52mm)^2 \cdot (\text{revs/sec})$

MOTOR:

15000 RPM = 250 revs/sec

* Gear ratio

183.5mm : 62.8mm 3:1

250 → 83.33 rev/sec

$L = \rho \cdot G \cdot V$ lbs/ft

Where,

ρ = air density = 1.225 kg/m³ = 0.002376892 slugs/ft³

G = Vortex strength

$2\pi \cdot b \cdot Vr \Rightarrow 2\pi \cdot (0.170604 ft) \cdot Vr$

b = 52mm = 0.170604 ft

Vr = rotational speed (ft/sec)

$Vr = 2\pi \cdot b \cdot s$

$2\pi \cdot (0.170604 ft)(83.33 revs/sec)$

Vr = 89.32804515 Ft/sec

$2\pi(0.170604)(89.32804515 ft/sec)$

G = 95.7539962

assuming V = Air flow direction of 1 ft/sec

$L = (0.002376892 slugs/ft^3)(95.7539962 ft^2/sec)(1 ft/sec)$

$\rho \cdot G \cdot V$

⇒ 0.227596946 lbs/ft ≈ 101 g/ft.

2 ft = 202 g < 229 g

Weight

wheel 11.2 g x4 = 44.8

Battery Box and motor w/wires 71.7 g

Nut

Pully x wheels = 9 g

Total = 229 g

styraphome w/metal parts + tape and paper = 103.5 g

styraphome = 2.2 g

tape + paper max 20 g

metal parts = 81.3 g

2/17/2022

Lift of a Rotating Cylinder

$$L = \rho \cdot G \cdot V \text{ (lbs/ft)}$$

where ρ = gas density (slugs/cu.ft.)

$G = 2\pi \cdot b \cdot V_r$ = Vortex strength (sq.ft./sec)

→ b = radius of cylinder (ft)

→ $V_r = 2\pi \cdot b \cdot s$

— s = spin (revs/sec)

$L = \rho \cdot (2\pi \cdot b(2\pi \cdot b \cdot s)) \cdot V$ → expanded

$L = \rho \cdot (4\pi^2 b^2 s) \cdot V$ → simplified w/o V_r + G.