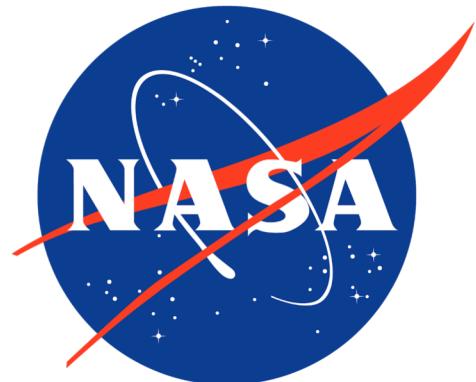


Rotor Organization for Sound Effect Hinderance and Increase in Power (ROSEHIP) Efficiency Project

Rosemary Williams

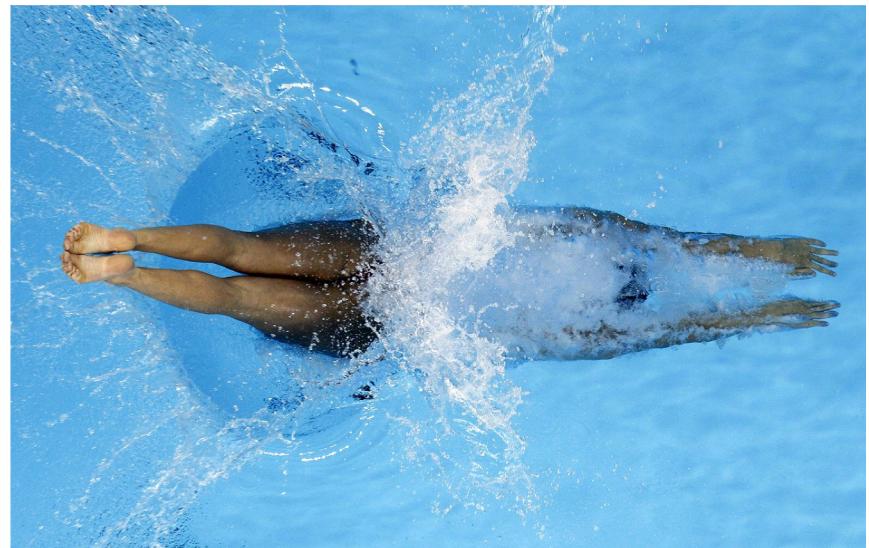
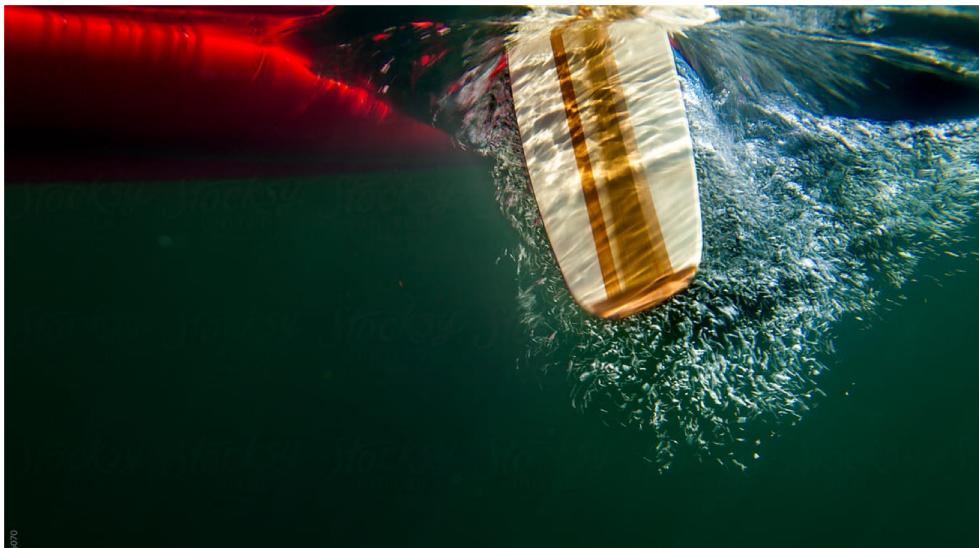


Objectives and Abstract

- Manipulate the location of rotor blades' trailed vortices to minimize sound in the x and z axes and maximize thrust.
- Minimize blade vortex interaction. What is blade vortex interaction?



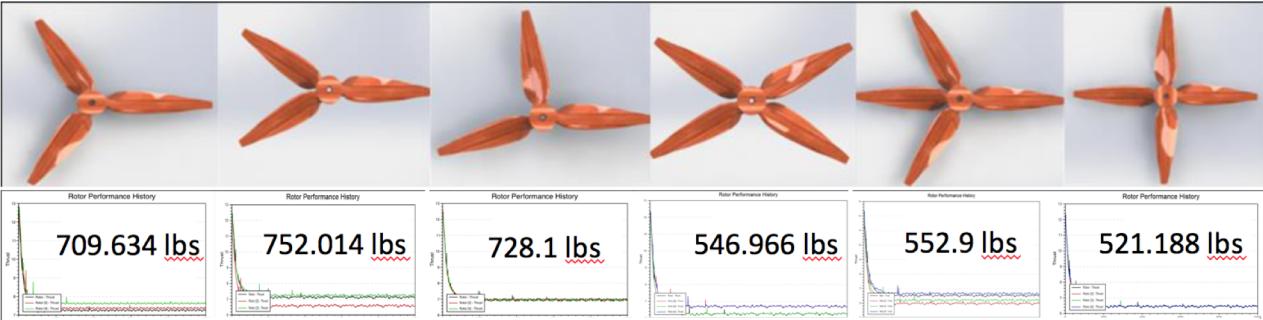
Blade Vortex Interaction



Methods & Thrust

SOLIDWORKS

SukraHelitek



Configuration	Mean thrust (lbs)	Min thrust (lbs)	Max thrust (lbs)	Total mean (lbs)
21	709.634	685.0	1232.1	2128.902
31	752.014	726.21	1247.2	2256.042
22	728.1	702.9	1218.1	2184.300
3	546.966	529.32	944.4	2187.864
111	552.9	535.4	944.22	2211.600
4	521.188	503.82	942.62	2084.752



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Maintaining Solidity

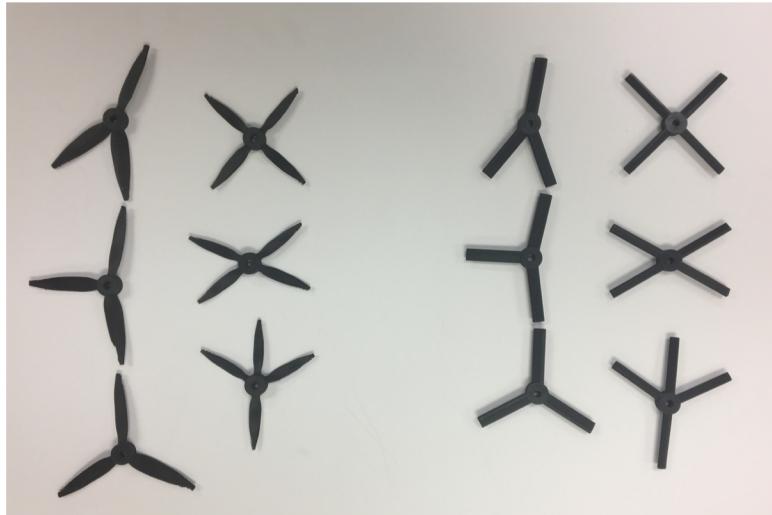


Figure 4: High solidity rotor



Figure 5: Low solidity rotor [4]

$$\frac{3cr}{\pi r^2} = \frac{4lr}{\pi r^2}$$
$$3/4c = l$$

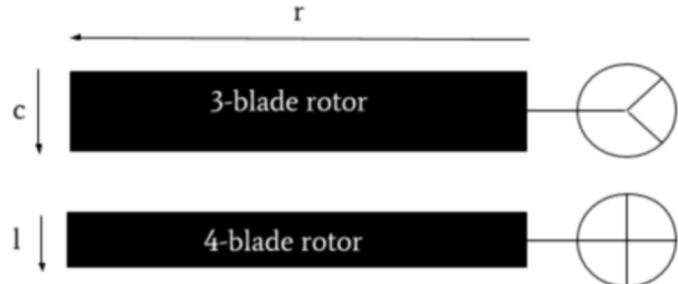
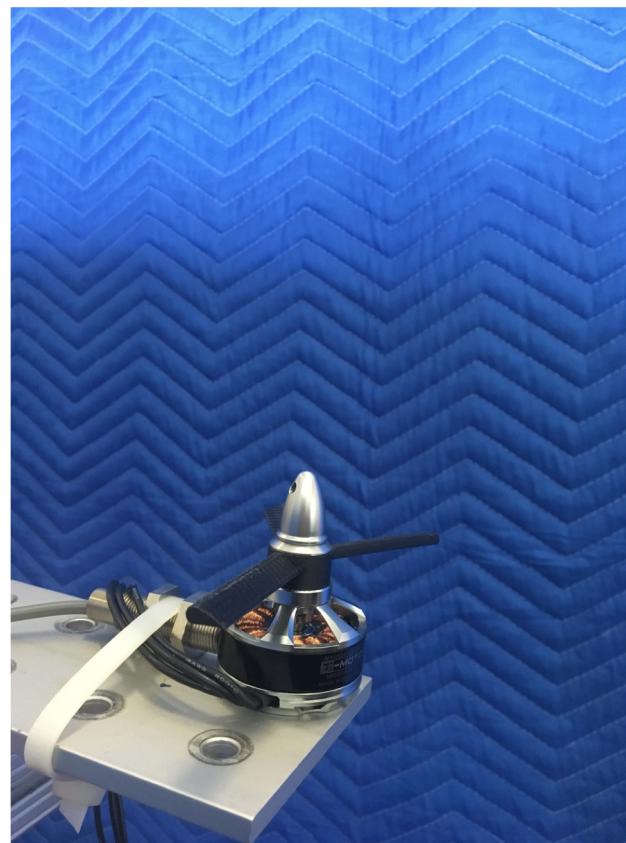
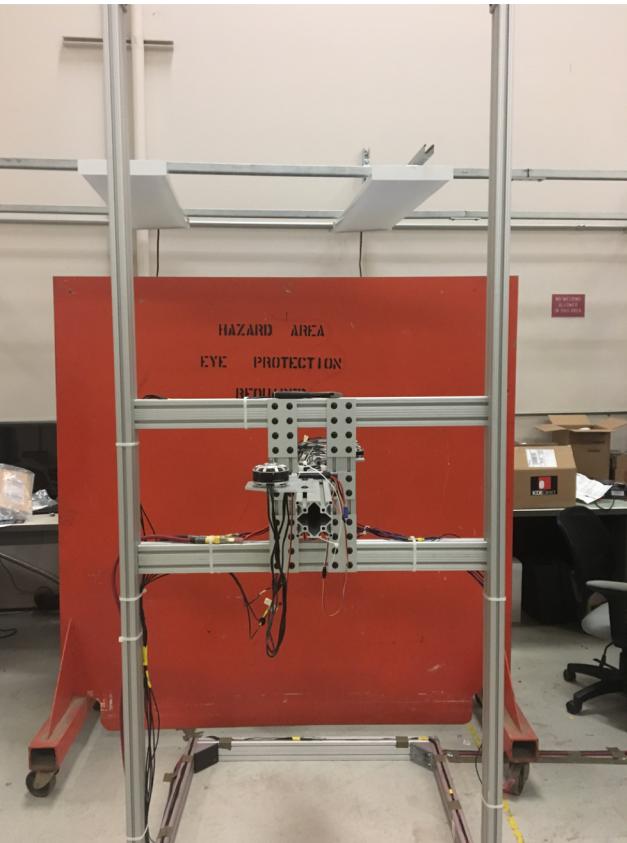
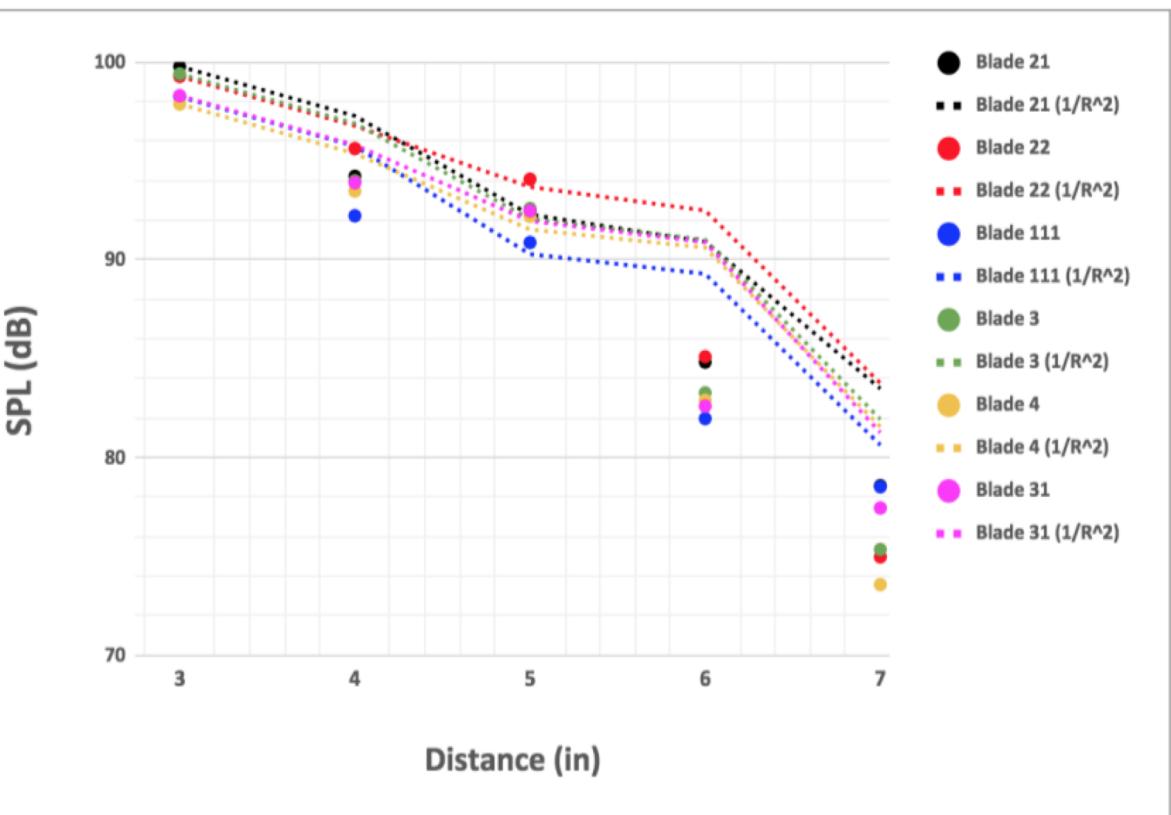


Figure 6: Variable diagram for calculating solidity

X-Axis testing



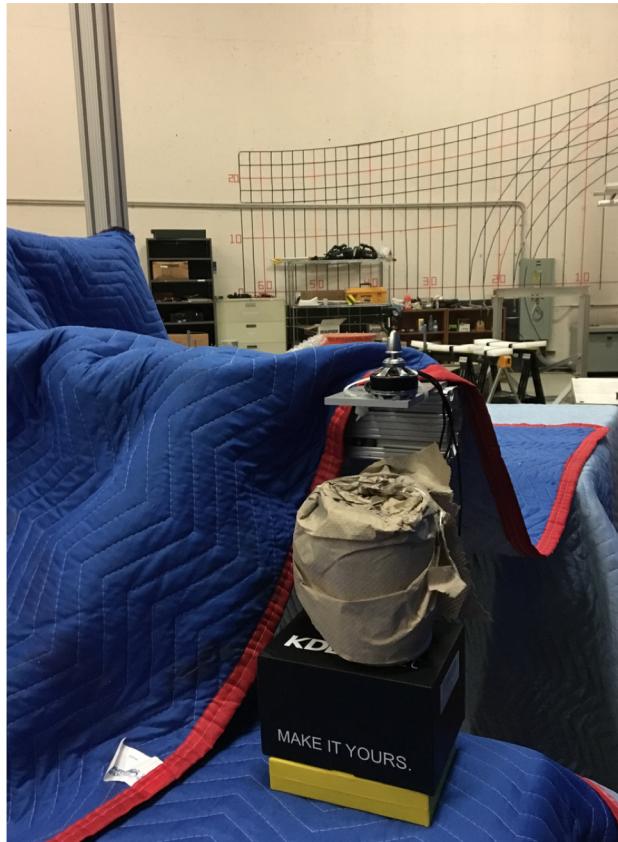
Results: x-axis



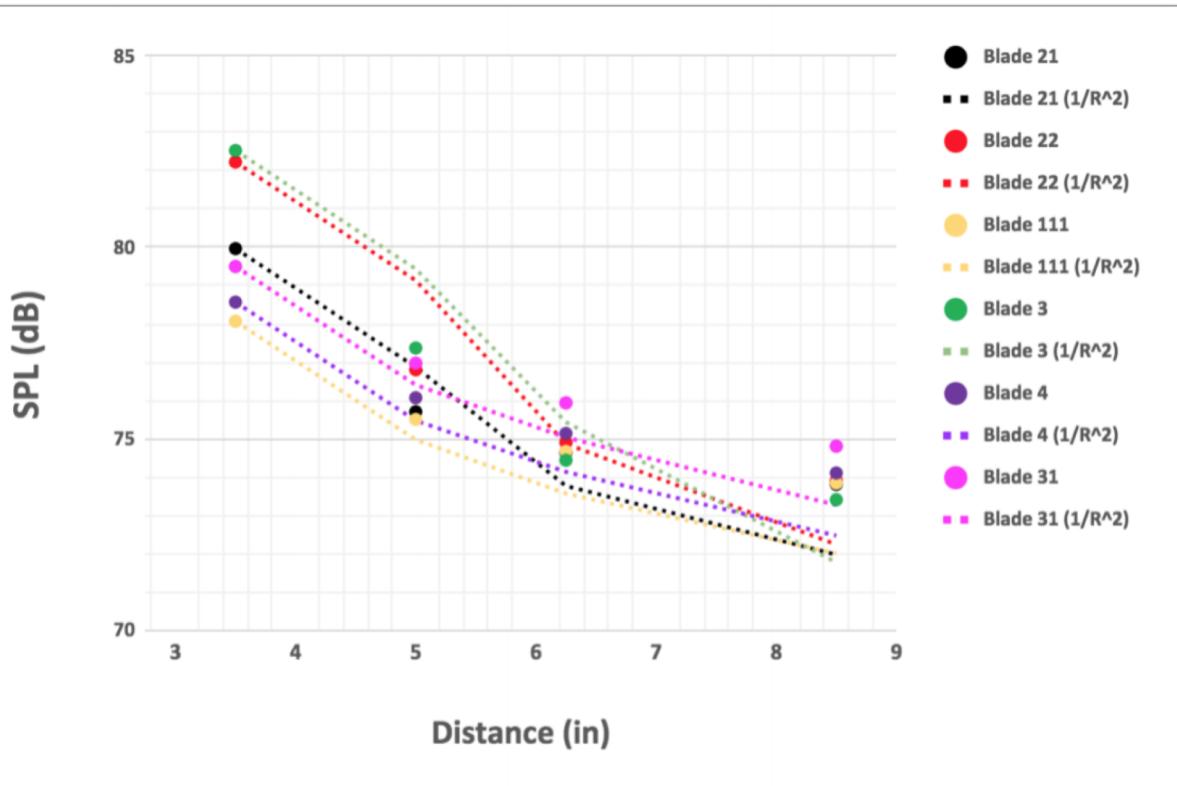
Distance (in) and Mean (dB)	21 (dB)	22 (dB)	111 (dB)	3 (dB)	4 (dB)	31 (dB)	Motor (dB)
3	99.8	99.5	98.5	99.2	98.3	98.5	89.4
	99.8	99.3	98.5	101.4	98.0	98.2	87.9
	99.7	99.1	98.0	98.8	97.9	98.2	88.9
	99.8	99.2	98.0	98.2	97.3	98.3	88.9
Mean	99.775	99.275	98.250	99.400	97.875	98.300	88.775
4	93.8	95.3	92.4	93.4	93.4	94.0	79.0
	94.1	95.8	92.2	94.0	93.6	94.2	79.2
	94.5	95.6	91.6	94.2	93.3	93.7	78.7
	94.5	95.8	92.7	94.4	93.6	93.7	79.0
Mean	94.225	95.625	92.225	94.000	93.475	93.900	78.975
5	92.9	93.6	90.9	93.2	92.4	92.3	79.7
	92.4	94.4	91.1	92.4	92.2	92.5	79.6
	92.4	94.2	90.7	92.0	92.1	92.6	79.4
	92.3	94.1	90.8	92.8	92.1	92.5	79.1
Mean	92.500	94.075	90.875	92.600	92.200	92.475	79.450
6	84.6	84.5	81.7	82.9	82.2	80.9	78.1
	85.5	85.4	81.4	82.6	83.0	83.2	78.6
	85.1	84.0	82.0	82.8	83.8	83.2	78.7
	84.1	86.5	82.8	84.8	82.6	83.1	78.6
Mean	84.825	85.100	81.975	83.275	82.900	82.600	78.500
7	79.0	74.6	80.5	76.7	73.1	78.7	77.6
	78.5	75.3	78.5	75.4	73.9	78.0	75.8
	78.5	74.9	78.1	75.0	73.7	76.6	78.5
	78.3	75.1	77.0	74.3	73.6	76.5	76.6
Mean	78.575	74.975	78.525	75.350	73.575	77.450	77.125

Rotor class	21	22	111	3	4	31
Average (dB)	89.980	89.810	88.370	88.925	88.005	88.945

Z-Axis Testing



Results: z-axis



Rotor class	21	22	111	3	4	31	Motor
Average (dB)	76.0250	76.9583	75.5167	76.9333	75.9667	76.8000	74.9250

Analysis & Applications



Acknowledgements



References and Citations

https://www.google.com/search?q=blade+vortex+interaction&safe=strict&rlz=1C5CHFA_enUS724US724&source=lnms&tbm=isch&sa=X&ved=0ahUKEwiswLXU5rveAhUvJTQIHT8yABIQ_AUIEvgB&biw=1280&bih=616#imgdii=Jb6R7aBuzyDbzM:&imarc=OoiwbIULCweI6M

https://www.google.com/search?q=drones&safe=strict&rlz=1C5CHFA_enUS724US724&source=lnms&tbm=isch&sa=X&ved=0ahUKEwiw04-losHeAhXWHDQIhbYCyMQ_AUIFSqD&biw=1280&bih=576&dpr=2#imarc=Xfv2_IJoal_tA1M

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