Aircraft Propeller Noise Reduction Using Owl Feather Inspired Notching

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Uniquely shaped leading and trailing edges of owl primary wing feathers allow owls to fly silently. Aircraft propeller blades can potentially be modified with this design to reduce noise. My previous project focused on adding fibrous material to blades and notching the edges. It was found that notching and adding material to the trailing edge could reduce noise; but added material destroyed thrust generation. This year's study focused on depth and position of propeller notching. It was hypothesized that by altering the aircraft propeller blade using owl feather inspired notching, aircraft propeller noise will be reduced while maintaining thrust. Six propeller blades were tested, each in unmodified and modified condition. A sound meter, tachometer, and ultrasonic wind meter were used to measure sound (dB), rate of rotation (RPM), and wind speed (MPH) from the blades driven by a battery powered motor on a test stand. Propeller modifications included shallow versus deep notching along the leading, trailing, or both edges. Results showed that all of these modifications were capable of reducing the amount of propeller noise at equivalent rates of rotation and generated wind speed (i.e., thrust). Deep notching along trailing edges produced the maximum noise reduction of greater than 7%; this performance was not consistent over the test range. The best overall average noise reduction was nearly 4% from a propeller modified by deep notching along the leading edge. In conclusion, propeller blades with the owl feather inspired notching reduce propeller noise while producing thrust, supporting the hypothesis.

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