

# Use of an “Active Wing” to Test the Viability of Controlling Incipient Separation of an Airflow Over a Surface

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The separation of airflow from a surface, whether it is a wing or something else, is a major problem in engineering as a whole and more specifically, aeronautical engineering. This disruption of the airflow causes the system involved to lose efficiency and in aerospace terms can compromise the stability of an aircraft in flight in certain situations. The purpose of this experiment is to find a possible way to reattach a separated airflow using the introduction of a minimal amount of energy for the desired effect. For this validation, a Plexiglas wind tunnel was built with a backstep (see below pictures), which was modified with a ramp and an actuated flap to represent various angles of separation. Small computer speakers were mounted at the apex of the ramp and were used to inject momentum into the airflow and reattaching it in certain cases. In most aeronautical applications, a finite energy source will be used, say generators off the jet engines of an airliner that must support a lot of other equipment. Because of this, a main component of the project was to use measurements of energy spectra, pressure signatures, and intuition to intelligently determine the correct placement of the speakers. This allowed us to use less energy to produce better results than if a large amount of energy was introduced into the flow in the wrong place at the wrong frequency, and at the wrong degree of separation.

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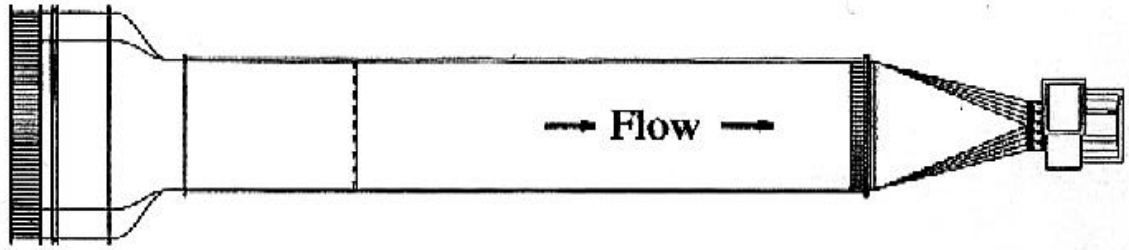


Figure #1: The Tunnel

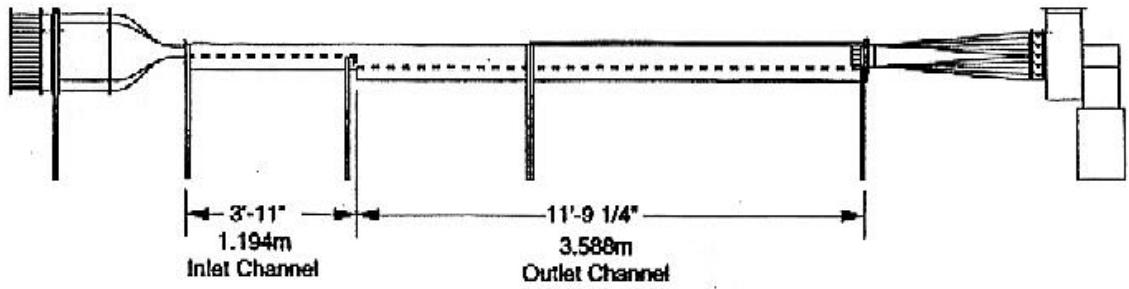


Figure #2: The Backstep, Ramp, and Flap

