

Improving Wingsuit Performance

(Proposed Research)

College of Aviation -- College of Engineering

Introduction

Wingsuit flying is the newest skydiving discipline. Wingsuits have flying surfaces attached to the arms and legs of a skydiver that enable the skydiver to fly large horizontal distances with a very slow descent rate. Despite the amazing advances in this new sport, Team Eagle Wingsuit believes that the design and construction of wingsuits is suboptimal due to the type of materials used to make wingsuits, the type of airfoils used and the configuration of current wingsuits. Team Eagle Wingsuit believes that by methodical scientific investigation the performance of a wingsuit can be measured and we can discover techniques that can be used to greatly improve the performance of wingsuits.

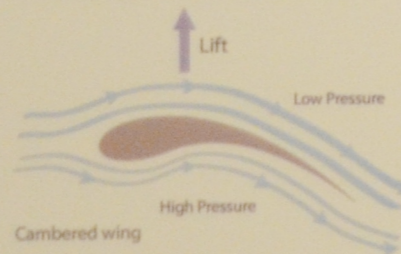
Hypotheses:

H₁: The textured fabric materials of which wingsuits are made act like a contaminated airfoil or like frost on a wing – reducing lift.

Close up of wingsuit fabric texture



H₂: The airfoils used on current wingsuits are not well selected and are not the best airfoils to use on wingsuits.



H₃: Ram air inflated airfoils can become deformed due to the pressures of flight and this reduces lift and reliability. Methods of stabilizing the airfoil of wingsuits are needed.

Deformed wingsuit wing in flight



Methods

Team Eagle Wingsuit plans to use the 44"x 32" wind tunnel in the Tracy Doryland Wind Tunnel Laboratory to perform a series of scientific measurements testing each of our hypotheses.

Design and Fabrication of a Wind Tunnel Balance:

The first challenge of this research is to build a balance to measure the aerodynamic forces generated by ram-air airfoils in the wind tunnel. Because of the instability of the ram-air inflated airfoils and likelihood of them flapping, most wind tunnel balances are too fragile and a robust balance and associated measuring equipment must be designed and fabricated.



Test of Various Wingsuit Materials: Using a well documented and well behaved airfoil, the change in lift and drag characteristics will be measured when the airfoil is clad with different wingsuit construction materials to test hypothesis 1.

Test of Various Ram-Air Airfoil Shapes: A series of ram-air inflated airfoils fabricated of the best performing materials will be tested. The airfoils now commonly used in wingsuit construction and other more advanced airfoils will be tested and their performance compared to test Hypothesis 2.

Stabilization of Ram-Air Airfoil Shapes: Current ram-air inflated airfoils are unsupported and are often deformed by inflight forces, this reduces lift and performance. A variety of methods of stabilization of ram-air inflated airfoils will be designed, fabricated, and tested in the wind tunnel to test Hypothesis 3.

Team Eagle Wingsuit

Joshua Warren

Caity Mello

Glenn Borland

Joseph Ballas

Christopher Reed

Spencer Douglas

Professor Timothy Sestak

Follow-On Research

The results of this research will lead to information that can be used to design a better performing wingsuit. Current information on wingsuit design indicates that rigorous scientific principles have not been used to develop optimal wingsuit configurations.

These preliminary studies will provide information that can be used to design a high performance wingsuit. This will be attempted with the cooperation of a wingsuit manufacturer. The Team goal would be to design and wind tunnel test a full sized prototype wingsuit incorporating the features found by this research to produce the best wingsuit performance.

Research Value

Beyond improving the performance and safety of the sport of skydiving and wingsuit flying, there are potential military applications of technologies that would significantly improve wingsuit flight performance. This information will be used to develop future high performance wingsuits.



Team Eagle Wingsuit at ERAU Wind Tunnel

