



## STUDY OF AIRPLANE WINGLETS ON LIFT AND DRAG



Jon Barry  
Nicole Heacock  
12/12/08

## Motivation

- Observation of varying aircraft winglet geometry
- Improve flight performance
- Increase fuel efficiency



4/7/2010 STUDY OF AIRPLANE WINGLETS ON LIFT AND DRAG 2

## Geometry

- Major Boeing 747 dimensions determined
- Boeing 747 Airfoil proprietary, varying cross section
- Modeled in Pro/Engineer with protrusion blends

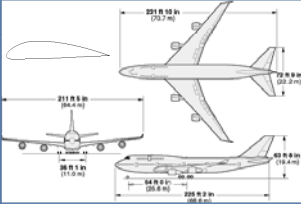



Image sources: www.aerospaceweb.org

4/7/2010 STUDY OF AIRPLANE WINGLETS ON LIFT AND DRAG 3

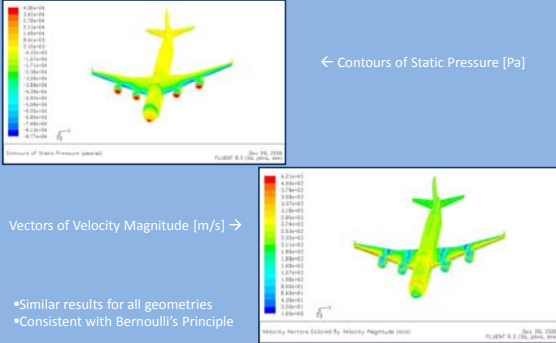
## Geometry Simplifications

- Modeled half aircraft
- Removed curves, airfoil from rear wings
- Removed ailerons, flapperons, rutter (part of original model)
- Solid Engines



4/7/2010 STUDY OF AIRPLANE WINGLETS ON LIFT AND DRAG 4

## Results – Pressure/Velocity



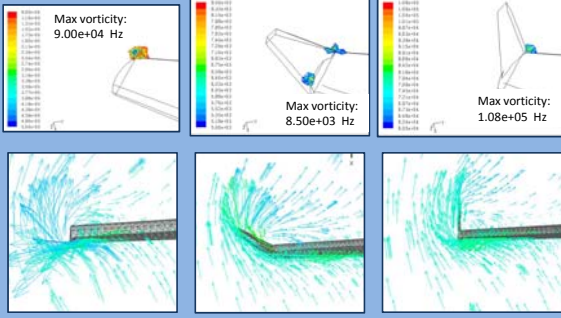
← Contours of Static Pressure [Pa]

Vectors of Velocity Magnitude [m/s] →

- Similar results for all geometries
- Consistent with Bernoulli's Principle

4/7/2010 STUDY OF AIRPLANE WINGLETS ON LIFT AND DRAG 8

## 10° AOA



Max vorticity: 9.00e+04 Hz

Max vorticity: 8.50e+03 Hz

Max vorticity: 1.08e+05 Hz

4/7/2010 STUDY OF AIRPLANE WINGLETS ON LIFT AND DRAG 12