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Design and Analysis of Reduction of Induced Drag by using Ring-Wing Configuration

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***Abstract*:- This research is proposed to focus especially on the reduction of parasite and induced drag which is approximately 1/2 or 1/3rd of the total drag. By reducing the drag, reduced fuel consumption, increased operational range &endurance, higher achievable speed can be obtained. This paper summarizes about the method of reducing induced and parasite drag by using RING-WING configuration. For many years people were focused on reduction of total drag. This paper particularly focused on decreasing the induced drag and parasite drag. By drag reduction, lift and thrust can be increased effectively than compared to total drag. This is obtained by making the wing configuration as ring-wing and it is analyzed aerodynamically by CFD analysis and it is compared with experimental analysis which has to be done on subsonic wind tunnel.**

Keywords:* Ring-wing; Induced Drag; Lift; CFD; Subsonic speed & wake.

INTRODUCTION

This research is mainly focused on resolving induced drag produced on an aircraft when lift is produced. There are lot of methods to reduce induced drag of that some are using wing lets, tip sails, vortex diffuser, tip fence at the wing tips. but one of the most effective method was making a non-planar wing and in this paper I'm going to implement one of the type of non-planar wings to reduce the induced drag problem in a much more considerable manner than the other methods, and finally comparing with the other basic wing shapes to get a good result of flow analysis to visualize the wake reduction by ring wing than other types.

INDUCED DRAG

The induced drag is one of the parasite drags that occur when the airplane produces lift while take off or maneuvering. To reduce the induced drag the aspect ratio of the wings should be infinite, but practically it is not possible. The induced drag is also called as wake drag; the wake is due to the flow of air over the wings. At the top and bottom the flow gets converging and diverging over the wing due the production of pressure difference i.e. lift. To put an end to wake I'm planning to use a non-planar wing of ring shape or annular shape wing around the fuselage center**.**

RING WING OR ANNULAR WING

The ring wing looks like a ring shape when it is looks from the aircraft nose side. Due to the ring shape the wing does not have any open end to produce large wake but there is very negligible amount of wake will be produced at the time of lift when consider with other wing shapes.

FLOW ANALYSIS

I have analyzed two different basic wing shapes that are commonly used in commercial type aircrafts with compare to a ring wing configuration .The results will be at below that visualizes clearly that wake was reduced more than that types.

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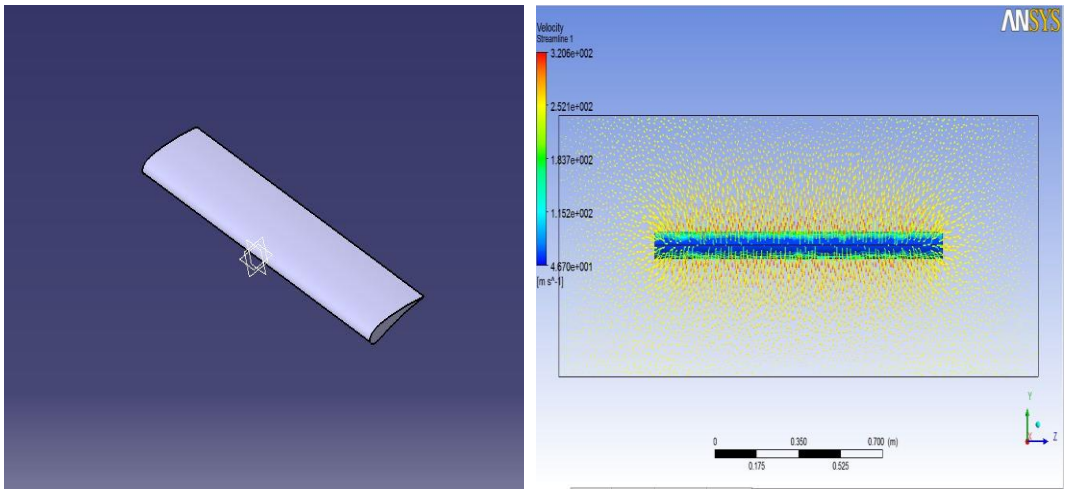
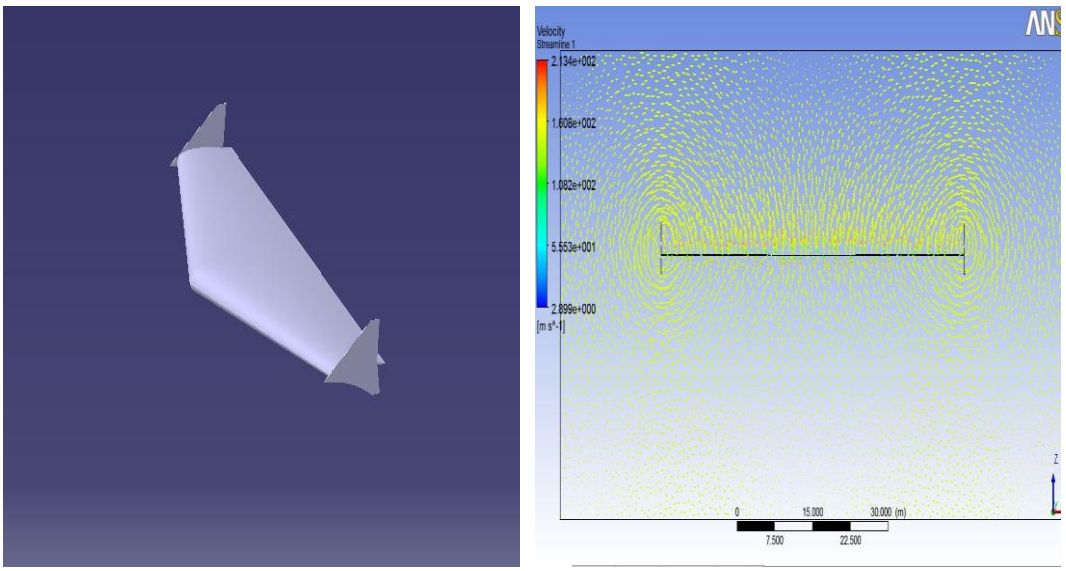
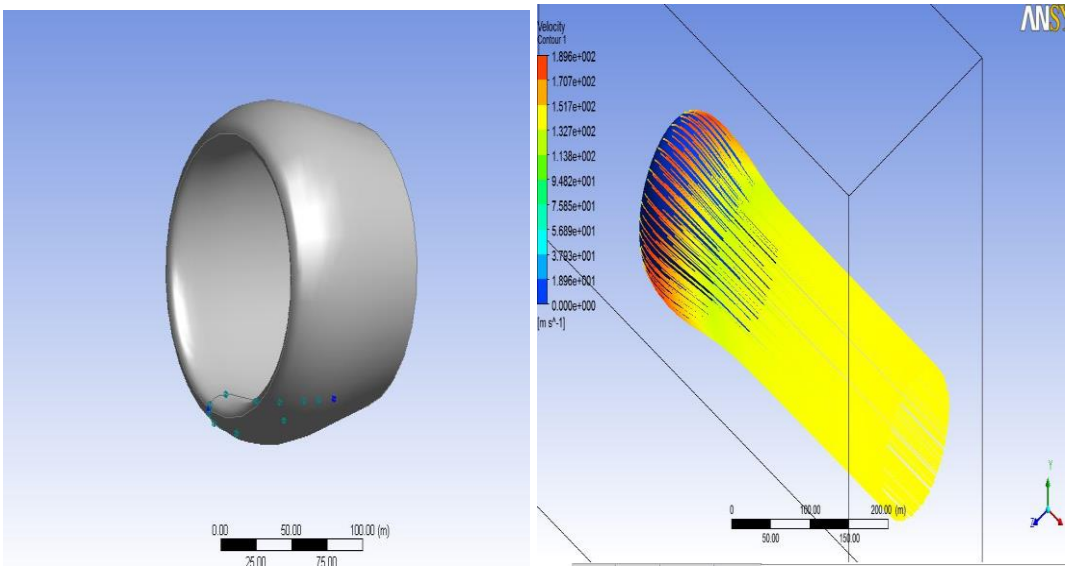
STRAIGHT WING WITHOUT WINGLET



SWEEP WING WITH WINGLET



RING OR ANNULAR WING



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ADVANTAGES

- The ring wing is bending into ring shape so it possesses less occupying space.
- Due to the ring shape of the airfoil the flow will be moves inside the ring like C-D nozzle so the flow velocity is maximum.
- Due to the above effect there is a production of moment, but the moment of the wing can be adjusted by adjusting the stabilizer or canard or both the parts of an aircraft.
- Due to this shape of wing the glide ratio is 3 times of other equivalent commercial aircrafts.

CONCLUSIONS

From the results it has been clearly visible that the ring has more advantages than the other methods

REFERENCES

1. Highly Non-planar Lifting Systems. Ilan Kroo, Stanford University John McMasters, Boeing Commercial Airplane Group and Stephen C. Smith, NASA Ames Research Center.
2. Induced-Drag Minimization of Non-planar Geometries Based on the Euler Equations, Jason E. Hicken! And David W. Zingg. University of Toronto, Toronto, Ontario M3H 5T6, Canada. DOI: 10.2514/1.J050379
3. Non-planar Wing Concepts for Increased Aircraft Efficiency. Ilan Kroo Stanford University, U.S.A.
4. Experimental Investigation of Annular Wing Aerodynamics. Lance W. Traub Journal of Aircraft (Impact Factor: 0.63). 01/2009; 46(3):988-996. DOI: 10.2514/1.39822