OPTIMIZATION OF FANWING AIRCRAFT WITH IONOCRAFT

Abdul Rahman.A[1], Jenson Prakash.X[2]

[1]*M.E. CAD/CAM Engineering*

Department of Mechanical Excel College of Engineering and Technology, Namakkal (India)

[2]*Msc, Aerospace Technologies, Department of Aerospace Engineering the University of Nottingham*

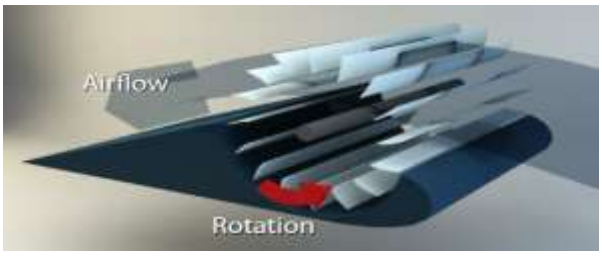
ABSTRACT

Fanwing has been affectionately described as flying lawnmowers. The similarity is because fanwing utilizes a tangential fan—that resembles a push-mower—mounted along their leading edge to artificially accelerate air rearwards over their upper camber. After a certain stage, the fan is capable of autorotation. In addition to providing lift, the fan generated a small thrust force as it accelerated air toward the trailing edge of the airfoil. The most striking result was that the fan inhibited stall at high angles of attack, increasing the maximum lift coefficient and reducing the minimum required airspeed for sustained flight by over 40%.

In our project titled OPTIMIZATION IN FANWING AIRCRAFT the modification of the FanWing concept intended for the use at higher speeds for manned flight. By adding ionocraft in the tail to tail surface of the aircraft. The lift, drag and hovering power are numerically calculated. The principle of operation, basic aerodynamic characteristics, and the features in untypical flight situation(autorotation) are described and explained.

I. INTRODUCTION

The FanWing uses a large bladed rotor lying on a horizontal axis with the front of the thick wing. This, connected to an engine, rotates, sucking in air and pushing it up and over the wing greatly increasing the lift and allowing the model he has built to carry twice its own bodyweight[1]. Thrust and lift of the vehicle, as well as steering direction, are controlled by small flaps in front of the fan which controls the angles in which the air hits the fan cages[4].

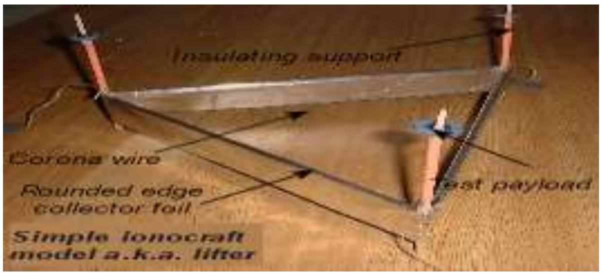


FanWing is a cyclogyro that pulls the maximal airflow through both the propulsion and lifting surfaces. A cylindrical radial turbine (resembling a cylinder mower) is embedded in the wing with its axis parallel to the wing and leaving about 2/3 of the diameter exposed above the top side of the wing's length just after the leading edge. This increases the velocity of the airflow across the wing's upper surface beyond that of the forward motion of the aircraft. Consequently the wing has lift at slow speeds where a normal wing would stall. Practical trials with various remote-controlled models have proven that the concept provides a vehicle capable of controlled flight[7]. There are however some significant differences compared to normal fixed-wing flying The throttle directly affects the pitch which means increased throttle can slow the plane down much in the same manner a helicopter flares, and if carelessly applied can force a complete mid-air stop. Glide-ratio in case of power-failure is rather low (about 1:3) but if the power-line is disengaged, the fan-wing is fully capable of doing an auto-rotational landing[5].

II. IONOCRAFT

2.1 Introduction

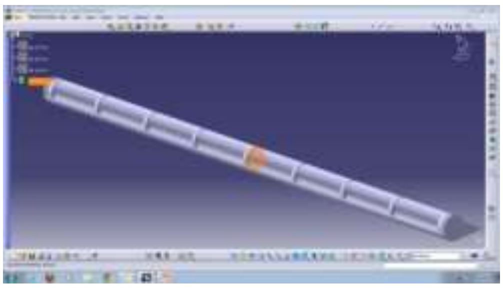
An ionocraft or ion-propelled aircraft, commonly known as a lifter or hexalifter, is an electro hydrodynamic (EHD) device (utilizing an electrical phenomenon known as the Biefeld–Brown effect) to produce thrust in the air, without requiring any combustion or moving parts.this is added in the tail to tail surface of aircraft .it is shown in the cad diagram of aircraft

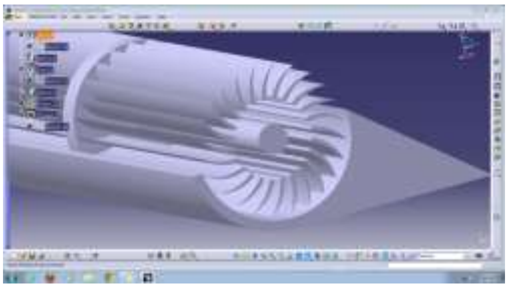


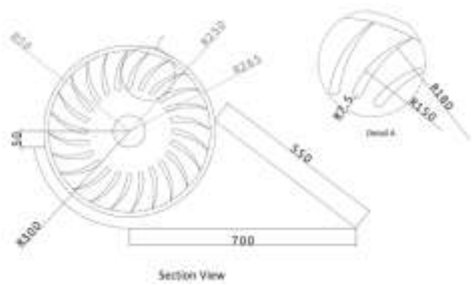
both circuit-based clients and packet-switching clients which provide a datagram service model. It can be used to carry many different kinds of traffic, including IP packets, as well as native ATM, SONET, and Ethernet frames.

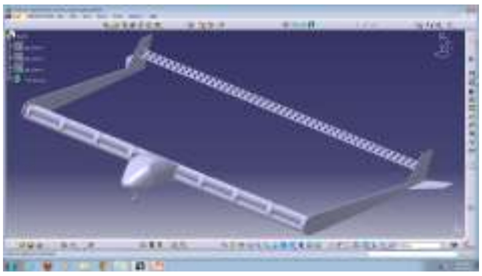
III. MODELLING

Fanwing aircraft modeled by CATIA

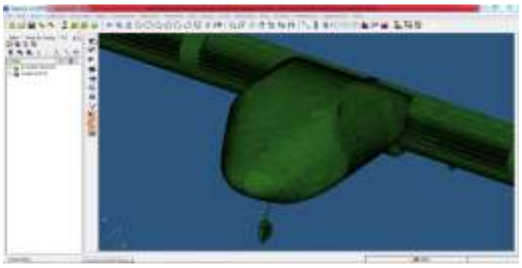


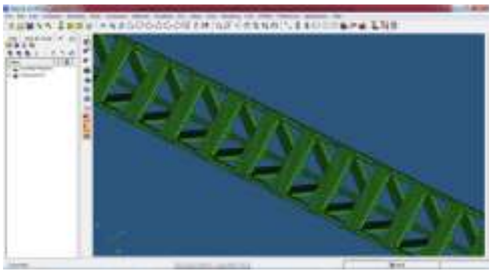






IV. MESHING OF FANWING AIRCRAFT

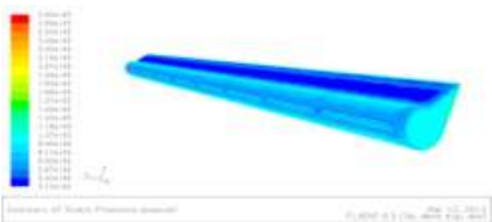




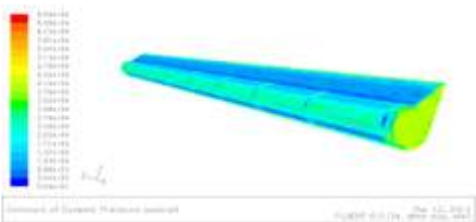
V. RESULTS

Results have been found for optimized with twisted and non twisted blade in thw combination of ionocraft which is located in the tail to tail surface of aircraft. The results are mach number and Lift and Drag are follows

Mach number



Static pressure



Dynamic Pressure

Comparison of values such as Lift(Fanwing lift+ ionocraft lift produced on tail surface) and Dynamic Pressure for untwisted and twisted aircraft

Parameters	Wing with Normal Blade	Wing with Twisted Blade	Theoretical values
Dynamic Pressure	30.8kPa	41.3kPa	37.5kPa
Lift	678.98kN	907.77kN	824.67kN

VI. CONCLUSION

This project highlights the need for implementing Fanwing Aircraft technology where the Lift is increased by adding ionocraft in the tail end of aircraft and also the modification of twisted blade give surplus amount of lift to enhance airworthy operation

REFERENCES

[1] G.Manoj Kumar, B.T.P.Madhav T.V.Rama Krishna, MSG.Prasad, “Design and Analysis of Narrow Inserted T – Shaped and Fan-Wing Shaped Slot Patch Antenna” ISSN: 2249-9954 Vol.2 , Issue 2 April 2012

[2] Tahir bisic, Adam Blanchard, Grant Bovee, Tom Claiborne”Stow Final”, Vol.6, No.5 (2013), pp.81-96

[3] Cengiz Camci and Ali Akturk “DOUBLE DUCTED FAN (DDF),” The Pennsylvania State University, September 3, 2010

[4] Foshag W.F., Boehler G. D.,“Review and Preliminary Evaluation of Lifting Horizontal-Axis Rotating-Wing Systems (HARWAS)”, Aerophysics Co., Washington

[5] Kentfield J.A.C., “Drag reduction and improved fuel consumption of aircraft employing outboard horizontal stabilizers”, AIAA Paper 2005-0811

[6] Seyfang G.R.,“Aerodynamics and applications of the OHS configuration”, Royal Aeronautical Society Conference on the Aerodynamics of NovelConfigurations

[7] Duddempudi D., Yao Y.,Edmondson D., Yao J., Curley A.,"Computational study of flow over generic fanwing airfoil",Aircraft Engineering and AerospaceTechnology, 2007 Vol. 79, Iss: 3, p.238–244

[8] Askari S., Shojaeefard M.H.,“Shape optimization of the airfoil comprising across flowfan”,Aircraft Engineering andAerospace Technology,2009 Vol. 81, Iss 5, pp407 – 415

[9] Chiang A. L., China N., Jie L., Xuhui, “Research on the Wing Composition of FanWing Flight”, ARIC Aeronautical Science and Technology 2009

[10] Seyfang G.R“Recent Developments of the FanWing aircraft” CEAS2011 Conference, Venice, Italy