Journal of Basic and Applied Engineering Research
Print ISSN: 2350-0077; Online ISSN: 2350-0255; Volume 1, Number 3; October, 2014 pp. 53-54

http://www.krishisanskriti.org/jbaer.html

Aircraft Design and Technology

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Abstract: This research paper incudes the work of designing an aircraft named as G-2S Cyclone whose purpose is to innovate a technology which provides testing facility for newly constructed prototypes and models which requires to be projected from a higher altitude [1].G-2S cyclone is designed such that which makes us enable to detach the mounted prototype or module in air with a higher potential energy to check its aerodynamic characteristics.

1. INTRODUCTION

During our research works we had observed the lack of efficient lift creation by single propeller configuration. We also observed that current bicopters designs compromise with their stability for acquiring maximum thrust.

In current Bicopter technologies high lift requirement needs bigger propeller system which increases their aerial contact area, causing more drag and various aerodynamic frictions. Presently, one of the most challenging concerns is to design more efficient and advanced propelling system with more advanced lifting abilities.

This study investigates need of more advanced design and technology, for more promising use of Bicopters. Our research emphasis on a new type of design called Bicopter "G-2S cyclone".

This technology will use more efficiently designed bipropellers for aircraft's vertical take-off and landing.

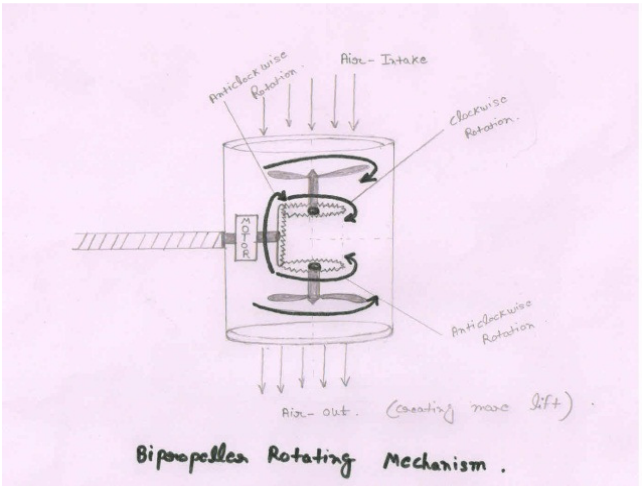
There is a need of more advanced coaxial contra rotating technology.

2. METHOD

2.1 Use of Bipropellers

The lift generation in G-2S cyclone is carried out by two dynamically stable propeller systems on each side of the aircraft, which is named as "Cyclone". These cyclones are connected to their respective wings on both the sides in such a way that the cyclones can rotate its axis by using a constrained helical gearing mechanism.

Contra-rotating propellers have been found to be between 6% to 16% more efficient than normal propellers [2]. Use of the contra rotating bipropeller configuration increases the suction rate of air through propellers resulting heavy lift generation and it also reduces the take-off time. In this technology, the Bipropeller systems (cyclones) can produce variable revolution speed by radio controlled techniques. We developed the following gear mechanism for coaxial rotation of the Bipropellers. The angled (helical) teeth engage more gradually than do spur gear teeth, causing them to run more smoothly and quietly [3].



Φιγυρε 1.Βιπροπελλερ Ροτατιον Γεαρ Μεχηανισμ

2.2 Prototype Wind Tunnel Test

- We analysed various effects on bipropeller motion in different wind tunnel conditions.
- We practically studied all possible aerodynamic components of thrust and lift generation.
- We had also performed few tests on lifting capabilities of our Bipropeller configuration.
- The air suction rate gets increased after introducing the lower contra rotating propeller.
- Additional air suction results comparatively greater thrust.

2.3 Lift -Thrust Transformation

We hypnotised several mechanisms which transform the lift configuration of the aircraft into the thrust configuration of

that aircraft by using same bipropeller systems. This mechanism is shown in figure. We can very well understand the feasibility of this lift-thrust transformation and its future scope in much advanced aircrafts. Our future aircrafts need efficient take –off and landing technique in critical landing conditions and spaces. And G-2S Cyclone is designed for the same. We had developed a gear mechanism for attaining lift-thrust transformation. There are two classes of this mechanism design based on the weight of prototype.

Table 1.Classification of G-2S Cyclone

Mechanism, use	Light Duty	Heavy Duty
Coaxial rotation mechanism.	Use of light material gear system.	Use of high strength gear system.
Lift-Thrust transformation.	Regulated radio controlled servo mechanism.	Constrained radio controlled crossed configuration spiral bevel gear.
Applications	Prototype testing, short range items delivery system etc.	Accidental aircraft carrier, machine gun mounting, reconnaissance, air to air missile launching, bomb dropping etc.

3. RESULT

3.1 Use of more efficient bipropellers increases the amount of lift and thrust generation. The air suction rate through the top propeller increases, by introducing the contra-rotating bottom propeller.

3.2 The rolling and pitching motions of the aircraft was achieved satisfactorily. But for higher applications some more material research is required.

3.3 Structural vibrations were detected during flight which is the result of unavailability of appropriate material because of insufficient financial funding.

3.4 All other structural problems encountered during flight were approximately eliminated.

3.5 Instant stability was not detected due to dislocation of centre of gravity of the aircraft during longitudinal and lateral motion.

3.6 Most of the expected aerodynamic motions were found to be feasible.

3.7 There is an increase in noise in the axial direction and comparatively less noise increment in tangential direction.

4. DISCUSSION

In this research, most of the practical findings support our theoretical flying hypothesis. Our mechanism of coaxial contra rotation using a single mechanical power source which minimises the weight of the G-2S Cyclone. But there is a necessity of further material research for optimizing the advancement in G-2S Cyclone's design and its higher applications. Heavy duty version of this aircraft needs funding guidance.

Air boosting effects of the contra rotating technology indicates scope of more "Multy Propeller Configurations" research. Lift –Thrust transformation requires further research to attain extra flight stability and reduction in aircrafts structural vibrations during this transformation. Calculative data about this technology can only be produced with the use of more efficient testing facilities and fund.

Our prototype wind tunnel tests demonstrate the designing feasibility in terms of aerodynamics, which suggests further advancement in the design of heavy duty version of this aircraft.

5. ACKNOWLEDGEMENT

This research was supported and facilitates by the Aeronautical department and Humanities department of B.B.D.N.I.T.M Lucknow. Special thanks to Ms. Ankita Srivastava (Research paper analysist)

Mr. R.K Sharma and Mr. C.C Gupta (Granting wind tunnel facility).

REFERENCE

[1] "^usyd.edu.au/AMME4111/2013 Thesis Documents/list of abstracts Sem 2, 2013 rev 9 Oct.pdf"

[2] "http://ftp.Clarkson.edu/.depts./mae/public_html /papers/vanderover.pdf"

[3] "Khurmi, R.S, Theory of Machines, S.CHAND"