TRANSIENT EFFECT OF AIRCRAFT PROPELLER BLADE BY USING COMPOSITES

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***Abstract*:** A propeller is a fan form which transmits power by turning rotational movement into an impeller. The pressure differential between the airfoil formed blade's surfaces in front and rear is created and the fluid is propelled behind the blade, for example air. The present analysis is directed to the examination of the function of the composite propeller and its terms, simulation and the simulation of the flow of the composite propeller of the aircraft. For study of ANSYS applications integrated aircraft propeller. The deformity, tension and pressure of the composite propeller blade must be calculated by static and dynamic analysis. Tiredness analysis to calculate the component's existence. The propeller blades that differ in no of blades are optimised for 2,3&5 blades and even E-glass material epoxy, aluminium alloy and carbon epoxy have been optimised. CATIA parametric machine simulation 3D. 3D.

Key words-*aircraft propeller; composite material; static; dynamic; fatigue.*

I. INTRODUCTION

An aeroplane is a machine that can travel with the assistance of air. The downward pull of the engines counters the gravity force by way of an either static boost or the dynamic raising of the airfoil or in some cases. Typical representations of aviation are aircraft, helicopters, airships (blimps included), gliders, criteria and hot air.

Aviation is considered the surrounding human activity. The science of aviation, including the design and production of aircraft, is named aeronautics. An on-board pilot flies crewed aircraft; however, autonomous aircraft may be flown by onboard computers remote or self-controlled. Aircraft may define various specifications, including type of boost, aircraft engine propulsion, service and so on. Propellers use one or two propellers to produce a forward drive (aircrews). The propeller is typically positioned before the power source in the tractor setup, although it may be placed in the push configuration behind it. Contra-rotating propeller and ducted fans provide variations of host style.

Several forms of propeller power plants were included. Damp engines or man-power were used in the early airships. The more handy combustion engine piston engine was used and still is used in many smaller aviations by virtually all of the fixed wings until World War II. Any versions are propeller-driven with turbine engines in the form of a turboprop or prophane. Human strength flight was made but it was not a realistic method of flying. Unmanned models and aircraft have used power sources such as diesel engines and rubber bands.

II. LITERATURE REVIEW

Y.S Rao and B.S.Reddy[1] have been found to be healthy in harmonic research in the event of addressing current. The vibration fault may also be modified in the case of the composite as the damping effect is greater. The aluminium metal was contrasted with S2 Glass/Epoxy utilising the Ansys software to allow harmonic tests. The average displacement of the composite is 0.08192, which is much less than the 0.1784 blade of the aluminium propeller.

For composite material considered separate layer knots, M.A.Khan et al[2] found a cross-laminary shear stress and demonstrated a strong bonds between layers. The Eigan Efficiency Analysis shows that composite composites have an 80.5% higher natural frequency than aluminium thrusters. They found that in their static analysis, the composites comprise of various layers.

V Ganesh et al. performed static and modal study of aluminium propellers and composite propellers[3]. It demonstrates the blade deflection in case of a com The finite element method was used by K.B.Yeo et al.[4] to render a comment on stress propagation around a propeller blade. Taking into consideration the hydrodynamic research conducted on the Wagenigen B Series 3 blade propeller and stainless steel. Stress with a growing speed of rotation is always increased and vital stress is passed after 3000 rpm, and the possibility of failure can occur.

E.A. E.A. A. De Barros and J.L.D.Dantas [5] suggested a formula for measuring hydrodynamic power and momentum using CFD simulation. Their prediction meaning is equal to the test findings. Their data indicate a wake coefficient of 0.36, while the findings of 0.22 are called experimental.

W.Y.San et al.[6] expected a number of CFD, FEM and BEM-based acoustic reaction for the submarine system by a propeller. Apply the continuity equation in the Optimized Integral Algorithm to achieve the special solution and point the normal CHIEF to the inner location. A global mesh refining device takes into consideration QUAD8 as a boundary factor defines the Field position. The upper maximum bound of 10-4 has been refined by errors. In the BEM sphere model, RIA requested an integral HIE approximation. 4381 Open water propeller trait tested by CFD compares and the experimental findings to the received performance. In order to obtain torque and thrust variation, CFD simulated a machine "Sub marine + propeller" The turbulent SST model was developed to observe the flow data at the boundary of the submarine.

III. INTRODUCTION TO CAD

A. Computer-aided design (CAD)

Computer-aided design (CAD) Is it feasible to create, modify, analyses, or optimize structure utilizing Computer Systems (or Workstations)? CAD programmer is used to enhance the effectiveness of the manufacturer, maximize design quality, promote collaboration of documents and generate output data. CAD production is still usable as electronic files for printing, machining or other manufacturing processes. The word CADD is sometimes used (for Computer Assisted Design and Drafting).

It is classified as electronic design automation or EDA in computer device architecture. It is called mechanical design automation (MDA) or mechanical design computerized drawing (CAD). This includes skilled drawing using computer software. This method is called computer design automation.

INTRODUCTION TO CATIA

CATIA is an acronym for immersive three-dimensional applications. This is one of the leading 3D applications used by aviation, engineering and consumer products firms in various industries.

CATIA is a multiplatform 3D technology suite for Dassault Systèmes that incorporates both CAD, CAM and CAE. Dassault is a French air science giant, 3D modelling technology, 3D virtual mackups and software for controlling the product life cycle (PLM). CATIA is a good simulation platform, integrating 2D technologies with 3D parametric features and addressing any steps in design-to-production. In addition to the development of solid models and assemblies, CATIA often provides orthographic, portion, auxiliary, isometric or informative 2D drawing views. In the drawing views, both model sizes and reference sizes can be created. The two-way associative property of CATIA guarantees that the improvements made to the templates are expressed in the drawing views and vice versa.

Both general functionality

Crew: None

Capacity: 68 kg (150 lb) payload

Length: 5.85 m (19 ft 2 in)

Wingspan: 8.54 m (28 ft 0 in)

Height: 1.25 m (4 ft 1 in)

Gross weight: 500 kg (1,100 lb)

Airfoil: NACA 64 A 008

Power plant: 1 × Limbach L 550, 40 kW (47 hp)

Performance

Maximum speed: 8000rpm

Endurance: 18 hours

Service ceiling: 6,100 m (20,000 ft)

Design specifications:

S.NO	Parameters
1	2bladed propeller
2	Radius of hub=50mm
3	Radius of Propeller=500mm
4	Power=40kw
5	Rpm=8000

3D models of aircraft propeller

Aircraft propeller with (a) 2 blades (b) 3 blades (c) 5 blades

IV INTRODUCTION TO FEA

Study of finite elements is typically approximate a tool for addressing such functional and scientific questions. It is primarily used for problems in a mathematical format that is not exactly solved. It is not an analysis but a computational procedure. This form of approach is important as empirical approaches cannot cope with the true, complex engineering problems. For eg, the strength of materials or the statistical principle of elasticity may be used to evaluate the stresses and strains in a bending beam, but it is not so effective to know what happens during corners of part of a car suspension structure. ANSYS Mechanical is a method for the study of finite elements, including linear, nonlinear and dynamic research. This computer simulation product offers infinite modules for the actions of models and supports material models and equation solvers for a broad variety of mechanical design problems. ANSYS Mechanical also covers thermal analysis and coupling mechanics capacities, including acoustics, piezoelectric, thermal-structural and thermal-electric analysis.

Material properties

Material	***Density (kg/m3)***	***Young's modulus (Pa)***	***Poisson's ratio***
Aluminum alloy 7475	4620	9.6E+10	0.36
Carbon epoxy	1800	4.5E+10	0.35
S2-glass epoxy	2770	7.1E+10	0.33

A. Static analysis:

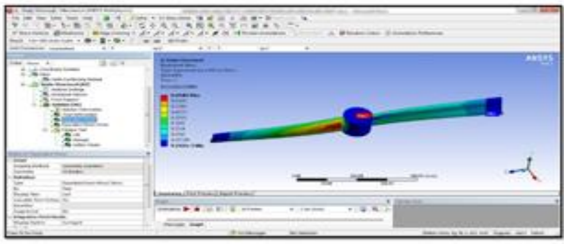

Fig: 4.1 Stress of carbon epoxy at 2blades

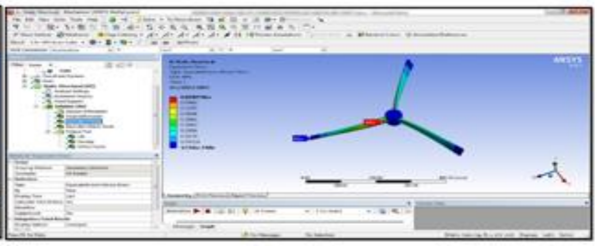

Fig: 4.2 Stress of carbon epoxy at 3blades

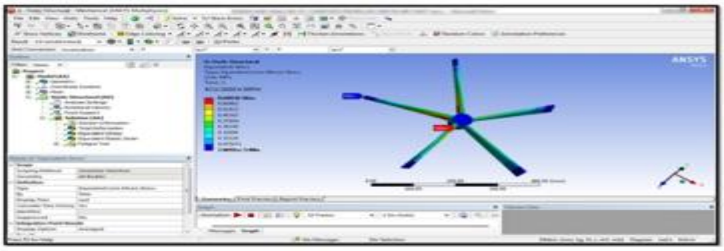

Fig: 4.3 Stress of carbon epoxy at 5blades

Table 4.1 Static analysis table

Models	Materials	Deformation (mm)	Stress (MPa)	Strain	Safety factor
2 blades	**Carbon epoxy**	0.01627	0.69402	1.5483e-5	1.242
	e-glass epoxy	0.015777	1.0668	1.5082 e-5	0.80803
	Aluminum alloy	0.01937	1.7827	1.8645 e-5	0.48354
3 blades	**Carbon epoxy**	0.015668	0.68469	1.7559 e-5	1.259
	e-glass epoxy	0.015336	1.0533	1.6663 e-5	0.81836
	Aluminum alloy	0.018814	1.7577	2.1404 e-5	0.4904
5 blades	**Carbon epoxy**	0.015132	0.68041	1.518 e-5	1.2669
	E-glass epoxy	0.014832	1.0429	1.4744 e-5	0.82657
	Aluminum alloy	0.018156	1.7501	1.8307 e-5	0.49255

Table 4.2 Dynamic analysis results table

Models	Materials	Time (sec)	Deformation (mm)	Stress (MPa)	Strain
2 blades	**Carbon epoxy**	**10**	**0.021785**	**2.0105**	**2.1028e-5**
		20	**0.024417**	**2.2542**	**2.3576 e-5**
	e-glass epoxy	**10**	**0.017756**	**1.2033**	**1.7012 e-5**
		20	**0.019905**	**1.3494**	**1.9076 e-5**
	Aluminum alloy	**10**	**0.018148**	**0.7828**	**1.7464 e-5**
		20	**0.020345**	**0.87722**	**1.9884 e-5**
3 blades	**Carbon epoxy**	**10**	**0.017632**	**0.77215**	**1.9823 e-5**
		20	**0.019767**	**0.86585**	**2.2232 e-5**
	e-glass epoxy	**10**	**0.01726**	**1.879**	**1.8512 e-5**
		20	**0.019349**	**1.332**	**2.1097 e-5**
	Aluminum alloy	**10**	**0.02116**	**1.9819**	**2.4166 e-5**
		20	**0.02372**	**2.2224**	**2.7102 e-5**
5 blades	**Carbon epoxy**	**10**	**0.01827**	**0.7707**	**1.7192 e-5**
		20	**0.020482**	**0.86423**	**1.9279 e-5**

	e-glass epoxy	**10**	**0.017916**	**1.1837**	**1.6713 e-5**
		20	**0.020086**	**1.3273**	**1.8742 e-5**
	Aluminum alloy	**10**	**0.021905**	**1.982**	**2.0728 e-5**
		20	**0.024555**	**2.2225**	**2.3243 e-5**

V. CONCLUSION

The present analysis is directed to the examination of the function of the composite propeller and its terms, simulation and the simulation of the flow of the composite propeller of the aircraft. For study of ANSYS applications reinforced aircraft propeller.
The deformity, tension and pressure of the composite propeller blade must be calculated by static and dynamic analysis. Tiredness analysis to calculate the component's existence.
The propeller blades with the no of 2,3&5 blades were strengthened and even the E-glass Epoxy content, Aluminum 7475 and Carbon Epoxy were optimised. CATIA parametric machine simulation 3D. 3D.

When the effects of the static study are observed, the 5-blade propeller is less stressful compare to 2 blades and 3 blades, and the less stressful components are contrasted to S2 glass epoxy and aluminium alloys.

Through studying the fatigue study, 5-blade propellers are safer than two blades and 3blades, and the fewer carbon-epoxy content is the safety component relative to aluminium and S2-glass epoxy. By analysing the effects of the complex study, 5-blade propellers equate 2 blades and 3-blades, while the less stressing composite is carbon-epoxy than 2-glass-epoxy and aluminium alloy. So the 5 blades and carbon epoxy content of a hot aircraft propeller may be inferred.

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