PARK COLLEGE OF ENGINEERING AND TECHNOLOGY
(Approved by AICTE, Accredited by National Board of Accreditation and NAAC, Affiliated to Anna University)
NH 544, Avinashi Road, Kaniyur, Coimbatore – 641 659. Ph: 0421 2911200, 2910100
Email : info@park.ac.in Web : www.pcet.ac.in

DEPARTMENT OF AERONAUTICAL ENGINEERING

IV YEAR / VIII SEMESTER – A&B

STUDENT NAME LIST - BATCH (2018 – 2022)

SNO	REGISTER NO	STUDENT NAME	YEAR	PROJECT WORK	MINI PROJECT	INTERNSHIP	FIELD WORK
1	712218101001	ABILASH R	IV	✓	-	-	-
2	712218101003	ADHAVAN M	IV	✓	-	-	-
3	712218101004	AHMED SHATHIK ARSHAT N	IV	✓	-	-	-
4	712218101005	AJITHRA M	IV	✓	-	-	-
5	712218101006	AKILA SRI M	IV	✓	-	-	-
6	712218101009	ARUN K	IV	✓	-	-	-
7	712218101010	ARUN KUMAR S	IV	✓	-	-	-
8	712218101011	AUGUSTINE JOSEPH W C	IV	✓	-	-	-
9	712218101012	BALAJI N	IV	✓	-	-	-
10	712218101013	BALAKRISHNAN M	IV	✓	-	-	-
11	712218101014	BALAMURUGAN L	IV	✓	-	-	-
12	712218101017	BHARATHAN R	IV	✓	-	-	-
13	712218101018	BHARATHI M	IV	✓	-	-	-
14	712218101019	BRINDHA K	IV	✓	-	-	-
15	712218101020	DAPRIN PRABU N	IV	✓	-	-	-
16	712218101021	DHARANESH P	IV	✓	-	-	-
17	712218101022	DHARANI THARAN S	IV	✓	-	-	-
18	712218101023	DHARMARAJAN M	IV	✓	-	-	-
19	712218101025	GANESH B	IV	✓	-	-	-
20	712218101027	GOKUL S	IV	✓	-	-	-
21	712218101028	GOKUL SHARMA R	IV	✓	-	-	-

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

22	712218101030	GURUVIGNESH P	IV	✓	-	-	-
23	712218101032	HARSHAVARDHAN S K	IV	✓	-	-	-
24	712218101033	IDHAYA PRIYA G	IV	✓	-	-	-
25	712218101034	ILAVARASAN T	IV	✓	-	-	-
26	712218101035	JAHNAVI G	IV	✓	-	-	-
27	**712218101037**	**JAI VIGNESH M**	IV	✓	-	-	-
28	**712218101038**	**JAI VISHWESH M**	IV	✓	-	-	-
29	712218101039	JANSIRANI S	IV	✓	-	-	-
30	712218101040	JAYARAM U	IV	✓	-	-	-
31	712218101045	KARTHIKEYAN K	IV	✓	-	-	-
32	712218101046	KAVIYARASAN G	IV	✓	-	-	-
33	712218101047	KEERTHIVASAN B	IV	✓	-	-	-
34	712218101048	KISHORE R	IV	✓	-	-	-
35	712218101049	LEAYANDER PAYAS M	IV	✓	-	-	-
36	712218101051	MADHUMATHI M V	IV	✓	-	-	-
37	712218101052	MANJUNATHAN D	IV	✓	-	-	-
38	712218101053	MITHUN S	IV	✓	-	-	-
39	712218101055	MUNIRAJ S	IV	✓	-	-	-
40	712218101056	NIRMALRAJ U	IV	✓	-	-	-
41	712218101058	POOJA S	IV	✓	-	-	-
42	712218101060	PRAVEEN S	IV	✓	-	-	-
43	712218101061	PREAMRAJAN P	IV	✓	-	-	-
44	712218101062	PRIYA M	IV	✓	-	-	-
45	712218101063	RAGAVANDER S	IV	✓	-	-	-
46	712218101064	RAGURAM J	IV	✓	-	-	-
47	712218101065	RAJESH N	IV	✓	-	-	-
48	712218101066	RENGARASU C	IV	✓	-	-	-
49	712218101067	RUTHRA RAJ V	IV	✓	-	-	-
50	712218101068	SANGEETHA P	IV	✓	-	-	-
51	712218101069	SARANRAJ V	IV	✓	-	-	-
52	712218101070	SIVAGANESH P	IV	✓	-	-	-

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

53	712218101071	SRIDHAR M	IV	✓	-	-	-
54	712218101073	SRI RAGURAM M	IV	✓	-	-	-
55	712218101074	SUDHAKAR S	IV	✓	-	-	-
56	712218101075	SUGA DHEV R S	IV	✓	-	-	-
57	712218101077	SURENDAR T	IV	✓	-	-	-
58	712218101080	THIRUVENGADAM R	IV	✓	-	-	-
59	712218101081	UMA SIVA SANKAR P	IV	✓	-	-	-
60	712218101082	VARSHINI T	IV	✓	-	-	-
61	712218101083	VASANTHAKUMAR C	IV	✓	-	-	-
62	712218101084	VASANTHAKUMAR S	IV	✓	-	-	-
63	**712218101085**	**VEERARAJ D**	IV	✓	-	-	-
64	712218101086	VENGATESH M	IV	✓	-	-	-
65	712218101087	VINOTH S	IV	✓	-	-	-
66	712218101088	VISHNU DHARSAN T	IV	✓	-	-	-
67	712218101089	VISHNUVARADHAN P	IV	✓	-	-	-
68	712218101090	VIVEEN S	IV	✓	-	-	-
69	712218101091	YUKABHARATHI K	IV	✓	-	-	-
70	712218101301	ARIKARAN V	IV	✓	-	-	-
71	712218101501	SOORYA E	IV	✓	-	-	-
72	712218101502	SUNIL KUMAR S	IV	✓	-	-	-
73	712218101504	VINOTH S	IV	✓	-	-	-

Coimbatore 641659.

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

PARK COLLEGE OF ENGINEERING AND TECHNOLOGY
(Approved by AICTE, Accredited by National Board of Accreditation and NAAC, Affiliated to Anna University)
NH 544, Avinashi Road, Kaniyur, Coimbatore – 641 659. Ph: 0421 2911200, 2910100
Email : info@park.ac.in Web : www.pcet.ac.in

BATCH	Roll No	REG.NO.	NAME OF THE STUDENTS	PROJECT TITLE	INTERNAL GUIDE
1	11	712218101011	AUGUSTINE JOSEPH.W.C	COMPARITIVE STUDY OF FLOW SIMULATION OF RECIRCULATION ZONE OF A V-GUTTER	G.SRIRAM
	19	712218101019	BRINDHA.K		
	27	712218101027	GOKUL.S		
	58	712218101058	POOJA.S		
2	17	712218101017	BHARATHAN.R	INVESTIGATIONS OF ALUMINIUM METAL MATRIX COMPOSITES	S.GOVINDARAJ
	68	712218101068	SANGEETHA.P		
	84	712218101083	VASANTHAKUMAR.C		
	86	712218101086	VENGATESH.M		
3	22	712218101022	DHARANI THARAN.S	STUDY OF MECHANICAL BEHAVIOUR OF ALUMINIUM BASALT HYBRID COMPOSITES	S.J.ELPHEJ CHURCHIL
	25	712218101025	GANESH.B		
	35	712218101035	JAHNAVI.G		
	91	712218101091	YUKABHARATHI K		
4	14	712218101014	BALAMURUGAN.L	EFFECT OF HEXAGONAL SHAPED DIMPLES ON AERODYNAMIC PERFORMANCES OF WING	G.SRIRAM
	30	712218101030	GURUVIGNESH.P		
	32	712218101032	HARSHAVARDHAN.S.K		
	49	712218101049	LEAYANDER PAYAS.M		
5	52	712218101052	MANJUNATHAN.D	ANALYSIS AND OPTIMIZATION OF AIRFOIL TO REDUCE THE AERODYNAMICS EFFECTS OF ICING	S.GOVINDARAJ
	73	712218101073	SRI RAGURAM.M		
	77	712218101077	SURENDER.T		
	80	712218101080	THIRUVENGADAM		
6	01	712218101001	ABILASH.R	STUDY OF FACTORS AFFECTING HYDROGEN COMBUSTOR DESIGN	G.SRIRAM
	06	712218101006	AKILA SRI.M		
	08	712218101009	ARUN.K		
	21	712218101021	DHARANESH.P		
7	12	712218101012	BALAJI.N	COMPARITIVE ANALYSIS OF SHARKLET AND SPLIT SCIMITAR WINGLET CONFIGURATION	SUDHAKAR.S
	60	712218101060	PRAVEEN.S		
	87	712218101087	VINOTH.S		
	92	712218101301	ARIKARAN.V		
8	39	712218101039	JANSIRANI.S	DESIGIN OF HEXACOPTER FLYING HOVER BOARD WITH INVERTED PENDULUM STABILIZATION	SUDHAKAR.S
	51	712218101051	MADHUMATHI M.V		
	56	712218101056	NIRMALRAJ.U		
	65	712218101065	RAJESH N		
9	53	712218101053	MITHUN.S	AGRICULTURAL PADDY SHOOTING DRONE ASSISTED TECHNOLOGY FOR SOFT SOIL PADDY FIELD	SUDHAKAR.S
	66	712218101066	RENGARASU.C		
	67	712218101067	RUTHRA RAJ.V		
	74	712218101074	SUDHAKAR.S		
10	10	712218101010	ARUN KUMAR.S	ANALYSIS AND OPTIMIZATION OF AIRCRAFT WING USING COMPOSITE MATERILAS	K.SABARISH
	28	712218101028	GOKUL SHARMA.R		
	46	712218101046	KAVIYARASAN.G		
	48	712218101048	KISHORE.R		

Park College of Engineering & Technology Coimbatore 641659. Kaniyur

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

11	64	712218101064	RAGURAM.J	DIGITAL RUNWAY SYSTEMS	S.GOVINDARAJ
	75	712218101075	SUGADHEVR.S		
	83	712218101084	VASANTHAKUMAR.S		
	90	712218101090	VIVEEN.S		

12	13	712218101013	BALAKRISHNAN.M	ENVIRONMENTAL EFFECT OF HYBRID COMPOSITE MATERIALS	S.JELPHEJ CHURCHIL
	47	712218101047	KEERTHI VASAN		
	70	712218101070	SIVAGANESH .P		
	88	712218101088	VISHNU DHARSAN.T		

13	18	712218101018	BHARATHI.M	STUDY AND ANALYSIS OF FLUTTER VIBRATION IN AIRCRAFT WING	K.SABARISH
	33	712218101033	IDHAYA PRIYA.G		
	55	712218101055	MUNIRAJ.S		
	81	712218101081	UMA SIVA SANKAR.P		

14	03	712218101003	ADHAVAN.M	AIRCRAFT JET ENGINE PERFORMANCE ENHANCEMENT BY OPTIMIZATION COMPRESSOR DESIGN	S.GOVINDARAJ
	20	712218101020	DAPRIN PRABU.N		
	23	712218101023	DHARAMARAJAN.M		
	40	712218101040	JAYARAM U		

15	05	712218101005	AJITHRA.M	CFD ANALYSIS ON A DIFFERENT ADVANCED ROCKET NOZZZLES	S.J.ELPHEJ CHURCHIL
	34	712218101034	ILAVARASAN.T		
	45	712218101045	KARTHIKEYAN K		

16	61	712218101061	PREMRRAJAN.P	STUDY OF FLUIDIC THRUST VECTORING IN DUAL THROAT NOZZLE	S.J.ELPHEJ CHURCHIL
	62	712218101062	PRIYA.M		
	63	712218101063	RAGAVENDER.S		
	71	712218101071	SRIDHAR.M		

17	93	712218101501	SOORYA E	COMPUTATIONAL STUDY ON AEROFOIL SELECTION FOR SHORTER WINGSPAN	K.SABARISH
	94	712218101502	SUNIL KUMAR S		
	96	712218101504	VINOTH S		
	69	712218101069	SARANRAJ V		

18	04	712218101004	AHMED SHATIK ARSATH N	COMPARATIVE STUDY OF ANCIENT RUKMA VIMANA AND NASA'S DRAGON	S.J.ELPHEJ CHURCHIL
	82	712218101082	VARSHNI T		
	89	712218101089	VISHNU VARDHAN P		

19	37	712218101037	JAI VIGNESH M	ABSENT	ABSENT
	38	712218101038	JAI VISHWESH M		
	85	712218101085	VEERARAJ D		

Park College of Engineering & Technology Coimbatore 641659.

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

Project work

Batch 1

REDUCTION OF AERODYNAMIC DRAG BY USING VORTEX GENERATOR IN AUTOMOBILE

A PROJECT REPORT

Submitted by

S. AKHIL KARTHIKRAJ	**712214101003**
C. DHARMALINGAM	**712214101011**
M. MEIYAZHAGAN	**712214101031**
A. L. VAIRAVAN	**712214101708**

in partial fulfilment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

AERONAUTICAL ENGINEERING

PARK COLLEGE OF ENGINEERING AND TECHNOLOGY

COIMBATORE-641659

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ANNA UNIVERSITY: CHENNAI 600025

BONAFIDE CERTIFICATE

Certified that this project report **"REDUCTION OF AERODYNAMIC DRAG BY USING VORTEX GENERATOR IN AUTOMOBILE"** is the bonafide work of **S. AKHIL KARTHIKRAJ, C. DHARMALINGAM, M. MEIYAZHAGAN, A. L. VAIRAVAN** who carried out the project under my supervision.

SIGNATURE

Dr. A .P .HARAN, Ph.D.,

HEAD OF THE DEPARTMENT

Aeronautical Engineering,
Park College of Engineering
and Technology, Kaniyur,
Coimbatore. Pin- 641 659.

SIGNATURE

Mr. S. GOVINDARAJ, M.E.,

SUPERVISOR

ASSISTANT PROFESSOR

Aeronautical Engineering,
Park College of Engineering
and Technology, Kaniyur,
Coimbatore. Pin- 641 659.

Submitted for the University project viva-voce held on --12-04-2018-

INTERNAL EXAMINER

EXTERNAL EXAMINER

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ABSTRACT

Any physical body being propelled through the air has drag associated with it. Reduction of drag force is an essential process in vehicle aerodynamics for improving the vehicle driving performance and reducing the fuel consumption. A vortex generator is an aerodynamic surface, consisting of a small vane or bump that creates a vortex. Vortex generators delays flow separation by "re-energizing the boundary layer". Vortex generators can be used as remedy for the flow separation problem. The drag coefficient of passenger car body will have a value between 0.2 and 0.5. For cubic object it is greater than 1.0 and for the aerodynamic design bullets it is less than 0.1. It has been shown that 40% of the drag force is concentrated at the rear of the geometry. The aim of this project is to delay the flow separation on the downstream side of the car on account of increasing adverse pressure gradient. By using vortex generators at the right location, boundary layers at the back end can be energized there by delaying the flow separation. This paper presents the positive effect of vortex generators in the flow field and the mechanism by which the drag reduction is achieved. The design of the car is done by CATIA software and the analysis is performed using ANSYS Software.

10.1.1 OPTIMIZED COEFFICIENT OF DRAG RESULT

Forces

Zone	Forces (n) Pressure	Viscous
car wall	(183.37457 97.337706 -113.80291)	(0.27476379 7.7284416 0.86480151)
net	(183.37457 97.337706 -113.80291)	(0.27476379 7.7284416 0.86480151)

Forces - Direction Vector (0 1 0)

Zone	Forces (n) Pressure	Viscous	Total	Coefficients Pressure	Viscous	Total
car wall	97.337706	7.7284416	105.06615	0.29623467	0.023520509	0.31975518
net	97.337706	7.7284416	105.06615	0.29623467	0.023520509	0.31975518

Figure 10.4 Force vector optimized value

10.2 CONCLUSION

From the analysis it was observed that, there is a huge reduction in the drag coefficient because of the vortex generator

10.3 OPEN ISSUES AND FUTURE TRENDS

Using drag coefficients as the measure of the state of the art in vehicle aerodynamics, further progress appears to be possible. Today, well tuned cars have coefficients of about 0.30. However lower values are possible, and have already been realized with production cars. Whether or not they are feasible for any particular car is more a question of consistency with the vehicles design concept than it is of aerodynamic capability.

Drag will be of even greater importance for some of the specially vehicles likely to be on the market in the future. The greatest problem of electric vehicles limited driving range is directly impacted by drag. Drag coefficients less than 0.20 are feasible, and electrics and provide the incentive for achieving them However, the development process will be of increased difficulty because

Batch 2

REDUCTION OF INDUCED DRAG USING WINGLETS

A PROJECT REPORT

Submitted by

HARIHARAN V	712214101019
MONISHA M	712214101035
SHANY MG	712214101057
SRIDEVI R	712214101060

In partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

AERONAUTICAL ENGINEERING

PARK COLLEGE OF ENGINEERING AND TECHNOLOGY

COIMBATORE-641659

ANNA UNIVERSITY: CHENNAI 600025

APRIL 2018

Park College of Engineering & Technology Kaniyur Coimbatore 641659.

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ANNA UNIVERSITY: CHENNAI 600025

BONAFIDE CERTIFICATE

Certified that this project report **"REDUCTION OF INDUCED DRAG USING WINGLETS"** is the bonafide work of

HARIHARAN V	**712214101019**
MONISHA M	**712214101035**
SHANY MG	**712214101057**
SRIDEVI R	**712214101060**

Who carried out the project work under my supervision.

SIGNATURE
Head of the Department,
Dr.A.PAHARAN Ph.D.
Park College of Engineering & Technology,
(Dean of Mechanical science)
Aeronautical Engineering
Park College of Engineering & Tech
Kaniyur, Coimbatore -641659.

SIGNATURE
Mr. MOSES RAJA KUMAR. M.E.,
Supervisor, Assistant Professor
Aeronautical Engineering
Park College of Engineering & Tech
Kaniyur, Coimbatore -641659.

Submitted for the University project viva-voce held on --12.11.2018---

INTERNAL EXAMINER **EXTERNAL EXAMINER**

Park College of Engineering & Technology Coimbatore 641659.

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ABSTRACT

This project deals with the reduction of induced drag by using winglets. Winglets being a small structure plays an important role in reducing induced drag. The turbulant flow is mainly encountered on wingtips. The strength of the vortex can be reduced by increasing the span of wing. But it has certain limitations and it will raise the parasite drag on an aircraft. Have a tendency to cause wing flutter. So, the better way to reduce the induced drag by using winglets. The winglet converts some of the wasted energy in the wingtip vortex to an apparent thrust. They also improve the lift to drag ratio. The computational analysis for the aerodynamic characteristics of tapered wing without winglet and with blended, slotted and dual feather winglet. The tapered wing with NACA series 64215 has been used to construct the whole structure. Wing and winglets are designed in CATIA and analysed by using ANSYS software.

CHAPTER 7

CONCLUSION

This project is based on analysis of performance characteristics of induced drag in wing model with and without winglet. The wing model of NACA 64215 aerofoil was designed and analysed in ANSYS fluent software without winglet. This result was tabulated for various angle of attack at sea level. For wing model the maximum C_L value is 0.6737 it is obtained at 8 degree angle of attack. Further to reduce the induced drag three types of winglets was designed and analysed with wing. This result was tabulated for various angle of attack for same conditions. This project was analysed for velocity 280 m/s at sea level condition. For slotted and blended winglet the maximum C_L value is obtained at 8 degree angle of attack and for the dual feather winglet the maximum C_L value is obtained at 9 degree angle of attack .C_L and C_D values of wing was compared with winglets. In this we have proved that dual feather winglet is more efficient up to 52.1 %. When compared with those three winglets, dual feather winglet has the maximum C_L value with minimum C_D.

Batch 3

WEIGHT OPTIMIZATION OF FUSALAGE STIFFENED PANEL THROUGH STRESS ANALYSIS

A PROJECT REPORT

Submitted by

SHOBHIYA T	(712214101058)
SUBASH CHANDRA BOSE S	(712214101064)
SUNDAR RAJAN S	(712214101065)
SWATHI R	(712214101711)

In Partial Fulfillment for the award of degree
Of
BACHELOR OF ENGINEERING

IN

AERONAUTICAL ENGINEERING

PARK COLLEGE OF ENGINEERING AND TECHNOLOGY
COIMBATORE – 641659

ANNA UNIVERSITY: CHENNAI 600 025
APRIL 2018
PROJECT WORK CARRIED OUT AT

Bangalore Aircraft Industries Pvt. Ltd.

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ANNA UNIVERSITY: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project, **"OPTIMIZATION OF FUSELAGE STIFFENED PANEL THROUGH STRESS ANALYSIS"** is the bonafide work of

SHOBHIYA T	**(712214101058)**
SUBASH CHANDRA BOSE S	**(712214101064)**
SUNDARRAJAN S	**(712214101065)**
SWATHY R	**(712214101711)**

We carried out the project work under my supervision.

Signature
Dr.A.P.Haran
Head of the Department,
Aeronautical Engineering,
Park College of Engineering & Tekhnology,
Kaniyur, Coimbatore - 641 659.

Aeronautical Engineering,
Park College Of Engineering And
Technology,
Kaniyur, Coimbatore.
Pin- 641 659.

Signature
Dr.A.P.Haran
Head of the Department,
Aeronautical Engineering,
Park College of Engineering & Tekhnology,
Kaniyur, Coimbatore - 641 659.

Aeronautical Engineering,
Park College Of Engineering And
Technology,
Kaniyur, Coimbatore.
Pin- 641 659.

SUBMITTED FOR ANNA UNIVERSITY PROJECT EXAMINATION HELD ON 12.04.2018

INTERNAL EXAMINER **EXTERNAL EXAMINER**

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ABSTRACT

Aircraft is a flying machine. It is a complex engineering structures. The safety of the structure and the weight of the structure are the two important aspects to be kept in mind while designing the aircraft structure. It is a challenge in front of the aircraft structural designer to bring out a safest structure with minimum weight.

Fuselage and wing are the major primary structural components of the airframe. Fuselage is a cylindrical structure which houses passenger seats and cargo at the rear end. Normally fuselage is a built-up structure with structural members along longitudinal and circumferential directions. The skin used for the structure is a thin member with orthogonal stiffening.

The stiffening members have to intersect at 90degree to each other. Therefore a provision is made to pass the longitudinal stiffeners through the bulkheads which are in the circumferential direction. These mouse-hole cutouts in the bulkheads will act as stress raisers due to hoop tension in the bulkheads.

The current project deals with the stress analysis of the fuselage frame along with the skin. When the aircraft is flying above 8000ft altitude the internal pressurization is applied to create a sea level atmospheric pressure inside the fuselage cabin. This internal pressurization is considered to be one of the critical load cases during the design and development of the aircraft.

Stress analysis of the fuselage skin with and without stiffening members will be carried out to capture the global response of the fuselage under pressurization. A skin panel with fuselage frame and stringers representing the critical region of the bulkhead will be considered for the local analysis to capture the high stress location. The hoop stress developed during the pressurization at the bulkhead mouse-hole region will be carried out on this panel to obtain the optimum weight for the stiffened panel.

A stiffened panel will be fabricated using aircraft standard aluminum alloy material.

Park College of Engineering & Technology Coimbatore 641659.

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

CHAPTER -8

CONCLUSION

Thus in the present work we had optimized the stiffened panel by changing the dimensions of the structures in stiffened panel such as bulkhead, stringers, thickness of the plate dimensions by maintaining all dimensions at 2mm in first iteration and the stress is calculated at Y component and then the thickness of the plate is reduced to 1.8mm and the second iteration is done and the stress is calculated in the same component the result varies more. So the third iteration is done by reducing he bulkhead dimension with 1.8mm and the thickness is as same as second iteration the result is calculated in the same component and the result variation is minimum and hence in fourth iteration we change the stringers dimension to 1.8mm and all dimensions are now maintained as 1.8mm and the result is calculated in the same Y component and now the stress remains constant. Thus by optimizing either by increasing or decreasing the dimension, our aim is to maintain the stress constant throughout the structure and to avoid failure and hence the stress is maintained constant throughout the structure.

Park College of Engineering & Technology Coimbatore 641659. Kaniyur

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

Batch 4

DESIGN AND ANALYSIS OF WIND TURBINE FOR COMMERCIAL PURPOSE

A PROJECT REPORT

Submitted by

E.GOKULNATH	**712214101016**
K.SANJAY KRISHNAN	**712214101054**
R.VIJAYANAND	**712214101066**
N.YUVARAJAN	**712214101067**

In partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

AERONAUTICAL ENGINEERING

PARK COLLEGE OF ENGINEERING AND TECHNOLOGY

COIMBATORE-641659

ANNA UNIVERSITY::CHENNAI 600025

APRIL 2018

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ANNA UNIVERSITY: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report, **"DESIGN AND ANALYSIS OF WIND TURBINE FOR COMMERCIAL PURPOSE"** is the bonafide work of **E.GOKULNATH, K.SANJAY KRISHNAN, R.VIJAYANAND, N.YUVARAJAN** who carried out the project work under my supervision.

Signature

Dr. A.P.Haran,

Dean (Mechanical Sciences)

Aeronautical Engineering,
Park College of Engineering and Technology,
Kaniyur, Coimbatore.
Pin- 641 659.

11/4/18

Signature

Mr. D. Lokesharun M.E.,

Assistant Professor,

Aeronautical Engineering,
Park College of Engineering and Technology,
Kaniyur, Coimbatore.
Pin- 641 659.

This Project Report is submitted for the Viva-Voce Examination held on 12.04.2018

INTERNAL EXAMINER

EXTERNAL EXAMINER

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ABSTRACT

This project deals with the design and analysis of a small horizontal axis wind turbine which is designed to produce the electrical energy of 2.5kW. The fixed 2.5kW electrical energy is calculated based on the usage of household appliances where the average consumption per day. This type of the wind turbines are designed for the roof top application. For the design of wind turbine blade, the NACA63415 series profile has been chosen because the profile generates a maximum amount of lift around the wind turbine blades and gives a good aerodynamic performances. Finally, the total aerodynamic performances of the wind turbine are calculated based on operating conditions of various levels of rpm with different velocities.

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

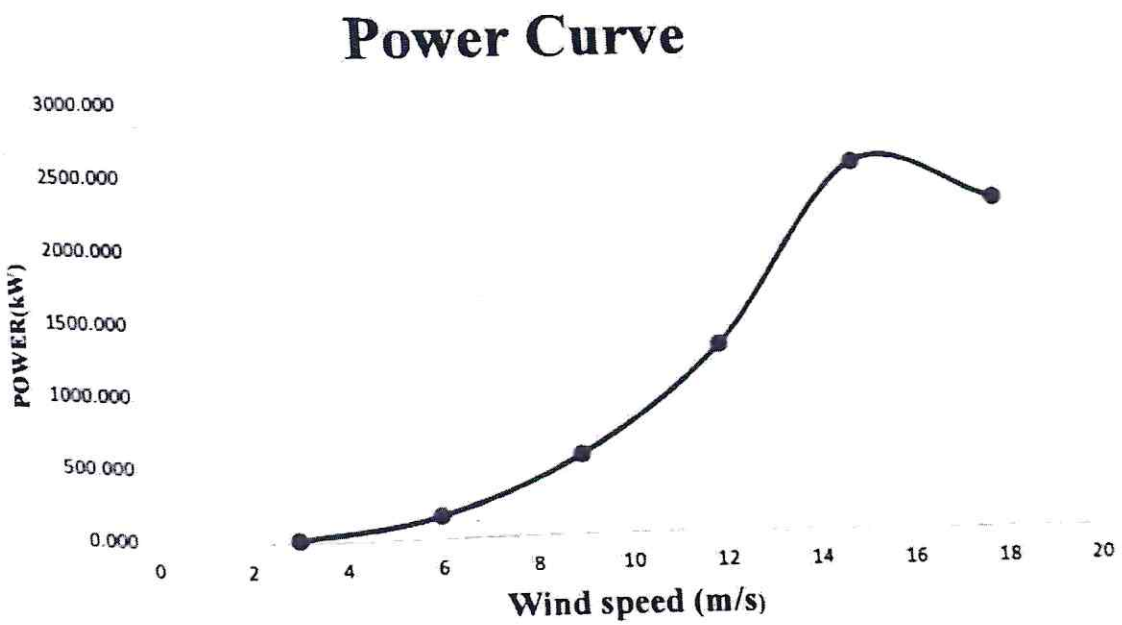
6.2 Result:-

The 2.5kw small horizontal axis wind turbine is analyzed successfully at different level of RPMs with in the different velocities.

In this project we are analyzed the mechanical power generated by the wind turbine design. And that result will be represented by the graphical term. This result will be compared successfully by DIXON BOOK, both the result are same.

Velocity(m/s)	Angular Velocity(rad/sec)	rpm	torque	power(mech)
3	14.28571429	137	1.091871	15.59815714
6	28.57142857	273	6.970573	199.1592286
9	42.85714286	410	13.43324	575.7104143
12	57.14285714	546	24.06234	1374.990857
15	71.42857143	683	35.52212	2537.294429

Table: 3 Results of mechanical power with in varies velocities



Graph result: 2 Power Curve

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

Batch 5

DEVELOPMENT OF AN AUTONOMOUS QUADCOPTER WITH AUTOMATIC FORCE LANDING SYSTEM

A PROJECT REPORT

Submitted by

HARIPRASAD S	**712214101020**
PRINSULA J	**712214101047**
JYOTHEES C	**712214101501**

in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

in

AERONAUTICAL ENGINEERING

PARK COLLEGE OF ENGINEERING AND TECHNOLOGY

KANIYUR, COIMBATORE- 641 659.

ANNA UNIVERSITY: CHENNAI 600 025

APRIL 2018

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ANNA UNIVERSITY: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that the project report **"DEVELOPMENT OF AN AUTONOMOUS QUADRCOPTER WITH AUTOMATIC FORCE LANDING SYSTEM"** is the bonafide work of **"HARIPRASAD S, PRINSULA J, and JYOTHEES C"** who carried out the project work under my supervision.

SIGNATURE

Dr. A. P. HARAN

HEAD OF THE DEPARTMENT

Dean of Mechanical Science,

Department of Aeronautical Engineering,

Park College of Engineering and Tech,

Kaniyur,

Coimbatore-641 659.

SIGNATURE

Mr. S. SUDHAKAR

SUPERVISOR

ASST PROFESSOR,

Department of Aeronautical Engg,

Park College of Engg, and Tech,

Kaniyur,

Coimbatore-641 659.

Submitted for the viva-voice examination held on 12.04.2018.

INTERNAL EXAMINER

EXTERNAL EXAMINER

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ABSTRACT

Unmanned Aerial Vehicles are becoming more reliable and easier to use with a great potential for surveillance and exploration purpose. So in our project we have introduced the automatic force landing system in the quad copter.

The autonomous nature of the quad copter is achieved by using the Ardupilot mega (APM) this is done by feeding the required C++ programs to the APM board. The automatic force landing is done by using mission planner software. All the signals are processed by the APM and the output from the APM is used to control the quad copter propellers. Communication is done by using wireless networks and its related technologies such as Wi-Fi and Bluetooth communication mediums in android phone.

CHAPTER 9
CONCLUSION

Technological advancements and utilization of available sources paved way for various innovations and achievements. The aim of our project is to develop an autonomous quadcopter along with providing a proper failsafe to make the process trendier, innovative and most importantly safe for use. Through various sources and thorough studies obtained from C++ programing language and APM (Ardu Pilot Mega) board and mission planner software, it is made sure that the quad can be operated automatically through various internet protocols. Our approach is made through Wi Fi based modules which permits the operation of UAVs in a desirable manner. We finally believe that the autonomous nature of the quadcopter offers much promise for a wind variety of UAV mission applications

Batch 6

STRUCTURAL ANALYSIS OF COMPOSITE LATTICE CONICAL SHELL AS SATELLITE CARRIER ADAPTOR

A PROJECT REPORT

Submitted by

G.ARAVIND	712214101004
A.NAVINKUMAR	712214101038
S.RAVI	712214101706
A.UDHAYA KUMAR	712214101710

in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

AERONAUTICAL ENGINEERING

PARK COLLEGE OF ENGINEERING AND TECHNOLOGY

COIMBATORE-641659

ANNA UNIVERSITY: CHENNAI 600025

APRIL 2018

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technolog
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ANNA UNIVERSITY: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report **"STRUCTURAL ANALYSIS OF COMPOSITE LATTICE CONICAL AS SATELLITE CARRIER ADAPTOR"** is the bonafide work of **"ARAVIND G, NAVIN KUMAR A, RAVI S, and UDHAYA KUMAR A"** who carried out of the project work under my supervision.

SIGNATURE	**SIGNATURE**
Dr.A.P.THARAN, Ph.D.,	**Mr.D.MUNIRAJ, M.E.,**
HEAD OF THE DEPARTMENT,	**ASSITANT PROFESSOR,**
Aeronautical Engineering,	Aeronautical Engineering,
Park College of Engineering and Technology,	Park College of Engineering and Technology,
Kaniyur , Coimbatore-641 659.	Kaniyur, Coimbatore-641 659.

Submitted for project viva-voice held on..12.04.2018.....

INTERNL EXAMINER **EXTERNAL EXAMINER**

Dr.D.LAKSHMANAN,ME., Ph.D
PRINCIPAL
Park College of Engineering & Technolo
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ABSTRACT

Composite lattice structure is the structural concept which consists of helical and hoop ribs intersecting each other in a regular pattern. This Structure seems very suitable for launcher structures because of its light-weight nature. In this project, mechanical behavior of the satellite carrier adapter composed of composite lattice shell is investigated. First , geometric parameters of the composite lattice shell are optimized. Then, the various cross sections of helical ribs are drawn out by using CATIA Software. Finally, analysis is carried out based on the finite element modeling of a conical lattice shell specimen using ANSYS software. The various composite materials are compared by their strength to weight ratio, to choose the high load withstanding composite materials. And finally, the various cross sections (rectangle, circle, c-inward, and I-section) of helical ribs are designed and analyzed to identify the better cross section.

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

CHAPTER 7

CONCLUSION

From the analysis, it was observed that the Epoxy carbon UD 395 Gpa prepreg gives high specific strength compare to other composite materials.

Rectangle conical shell gives high strength to weight ratio compare to other section.

For this best model ,buckling factor is 18068, buckling deformation is 1.3952mm,buckling stress is 74.338Mpa and the specific strength is 48.2714 Nm/kg.

Park College of Engineering & Technology Coimbatore 641659. Kaniyur

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

Batch 7

STRUCTURAL DESIGN AND FABRICATION OF CUBESAT

A PROJECT REPORT

Submitted by

M. AASIBA NISRIN	712214101001
S. MADHUBALA	712214101028
K. MOHAMED MANAZ	712214101034
R. NIVETHA	712214101039

in partial fulfilment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

AERONAUTICAL ENGINEERING

PARK COLLEGE OF ENGINEERING AND TECHNOLOGY

COIMBATORE-641659

ANNA UNIVERSITY: CHENNAI 600025

APRIL 2018

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kalliyur, Coimbatore - 641659.

ANNA UNIVERSITY: CHENNAI 600025

BONAFIDE CERTIFICATE

Certified that this project report **"STRUCTURAL DESIGN AND FABRICATION OF CUBESAT"** is the bonafide work of **AASIBA NISRIN M. MADHUBALA S. MOHAMED MANAZ K. NIVETHA R** Who carried out the project under my supervision.

SIGNATURE

Dr. A .P .HARAN. Ph.D.,

HEAD OF THE DEPARTMENT

Aeronautical Engineering,
Park College of Engineering
and Technology, Kaniyur,
Coimbatore. Pin- 641 659.

SIGNATURE

Mr. S. SUDHAKAR,
M.E., M.I.E., M.Ae.S.I.

SUPERVISOR

ASSISTANT PROFESSOR

Aeronautical Engineering,
Park College of Engineering
and Technology, Kaniyur,
Coimbatore. Pin- 641 659.

Submitted for the University project viva-voce held on 12/04/2018.

INTERNAL EXAMINER

EXTERNAL EXAMINER

Park College of Engineering & Technology
Coimbatore
641659.
Kaniyur

Dr.D.LAKSHMANAN,ME., Ph
PRINCIPAL
Park College of Engineering & Techno
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ABSTRACT

The design and analysis of 3U cubesat structure based upon the International Standards for Cubesats as approved by NASA for exploration at Lower Earth Orbits is carried out in this project. The cubesat structural design will include selection of materials based on its parameters, calculations for thickness and dimensions of the structure both theoretically and using software on Finite Element Simulations for nodal analysis. The database of various modules in COTS are collected for varying mass and power budgets. These mass budgets of modules are subjected in calculations to determine the thickness of rails to be provided. This includes the shear force and bending moment calculations and the rails are also to be considered for buckling load limits.

The load calculations and stress calculations also include maximum von-mises stress values. Based on these calculations, the structural design and material used for structure is concluded. The complete structure design is subjected to various vibrational and shock testing to withstand the space environmental effects. The concept of implementing creative stack design that can be modified as per the customer requirements is the main objectives of the project. The finalized structural design can be fabricated and used for real time launch of cubesats.

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

CHAPTER-11

JUSTIFICATION AND SUMMARY

11.1 RESULTS

As Rails and Stack design being primary structure of the Cubesat design, we had to define its dimensions which varies with different material properties. So, by considering the rail dimensions as X, Y, t (X- Length, Y- Breadth, t- Thickness), we did trial and error method to predict X, Y, t for the chosen materials. Since, we know the properties of materials under consideration, design is done using CATIA V5 by varying X, Y, t with respect to material, structural Properties and they are analyzed using ANSYS by application of Static structural load (Stress level- 20g). The result proved Titanium having considerably the very least deformation but as it has least Strength to weight ratio the material is not advisable for use over a complete structure. Yet AA2019 material has better physical properties, it fails under thermal heat ablation. Thus, we have come with a conclusion of using AA-7075 with its dimensional values X-8.5, Y-8.5, t-1.5 which is quite compatible and suitable under all operating conditions. The design of the rails structure proves easy for accommodation of modules and the stacks are found to fasten the modules with good support. The design has paved way for space management of modules in cubesat and the moto of the project has been achieved successfully.

Batch 8

STRUCTURAL ANALYSIS OF COMPOSITE WIND TURBINE BLADE USING FINITE ELEMENT MODEL

A PROJECT REPORT

Submitted by

BALAMURUGAN V	712214101007
KARTHI C	712214101023
PRABHAKARAN K	712214101042
PRADEEP R	712214101043

In partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

AERONAUTICAL ENGINEERING

PARK COLLEGE OF ENGINEERING AND TECHNOLOGY

COIMBATORE-641659

ANNA UNIVERSITY: CHENNAI 600025

APRIL 2018

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ANNA UNIVERSITY: CHENNAI 600025

BONAFIDE CERTIFICATE

Certified that this project report **"STRUCTURAL ANALYSIS OF COMPOSITE WIND TURBINE BLADE USING FINITE ELEMENT MODEL"** is the bonafide work of

BALAMURUGAN V	**712214101007**
KARTHI C	**712214101023**
PRABHAKARAN K	**712214101042**
PRADEEP R	**712214101043**

Who carried out the project work under my supervision.

SIGNATURE
Dr. A.P.HARAN
(Dean of Mechanical science),
Aeronautical Engineering
Park College of Engineering & Tech
Kaniyur, Coimbatore -641659.

11/4/18
SIGNATURE
Mr. MUNIRAJ D.,
Supervisor, Assistant Professor
Aeronautical Engineering
Park College of Engineering & Tech
Kaniyur, Coimbatore -641659.

Submitted for the University project viva-voce held on 12/04/18

INTERNAL EXAMINER

EXTERNAL EXAMINER

Park College of Engineering & Technology Coimbatore-641659.

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

Abstract-This paper is concerned with the structural optimization of horizontal axis composite wind turbine blade. Structural Analysis has been performed to achieve minimum weight and maximum strength in order to fulfill the requirement of efficient power production. The finite element modelling of the blade is performed through ANSYS software with various meshes created on each structural part considering shell type for all surface geometries. The rigidity of the blade was evaluated in terms of three distinct components: Flapwise, Edgewise,and Torsional rigidity based on the optimized layup schedule .The Extreme Wind loading condition is imposed on the pressure side of the blade and is analyzed as a cantilever setup.The dynamic analysis performed in order to obtain the natural frequencies andcorresponding mode shapes focusing the first five in and out-of-planebending and the torsional modes of the blade. The results obtained from static and dynamic analysis of the composite wind turbine blade indicates that the blade will not fail for the extreme wind loading condition.

Keywords- composite, rigidity, static and dynamic analysis, mode shapes.

Park College of Engineering & Technology
Coimbatore
641659.

Dr.D.LAKSHMANAN,ME., Ph.
PRINCIPAL
Park College of Engineering & Techno
Avinashi Road,
Kaniyur, Coimbatore - 641659.

CHAPTER 7

CONCLUSION

- The deflection for the severe loading condition is in the acceptable range from the assembly point of view also, since the distance between the tower and the rotational plane is far above the displacement value.

- From the static behavior it is observed that the mass of the blade is only 0.7kg. The flexural rigidities of blade are rigid enough to sustain the bending and torsional loads which meets the objective of light weight and high strength wind turbine blade.

- The maximum stress occurs at the root section of the blade, which is well below the ultimate stress of the glass fiber. The stress variation is smooth and it decreases along the length of the blade.

- The finite element analysis result is correlated with the deflection test and the dynamic behavior is compared with the simple prismatic beam hand calculation.

Batch 9

ESTIMATION OF DRAG OVER A SHIP BY USING 3D MULTIPHASE WAVY FLOW MODEL

A PROJECT REPORT

Submitted by

BHUVANESWARI K	712214101009
CHARISHMA C	712214101010
GOWTHAM M	712214101017
GOWTHAM R	712214101018

In partial fulfillment for the award of the degree

Of

BACHELOR OF ENGINEERING

IN

AERONAUTICAL ENGINEERING

PART COLLEGE OF ENGINEERING AND TECHNOLOGY

COIMBATORE 641 659

ANNA UNIVERSITY: CHENNAI 600 625

APRIL 2018

ANNA UNIVERSITY: CHENNAI 600 625

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

BONAFIDE CERTIFICATE

Certified that this project report "**ESTIMATION OF DRAG OVER A SHIP BY USING 3D MULTIPHASE WAVY FLOW**" is the bonafide work of

BHUVANESWARI K

CHARISHMA C

GOWTHAM M

GOWTHAM R

Who carried out the project work under my supervision.

SIGNATURE	**SIGNATURE**
Dr. A.P HARAN,	**Mr. D. LOKESHARUN,**
HEAD OF THE DEPARTMENT,	**SUPERVISOR,**
Aeronautical Engineering,	Aeronautical Engineering,
Park College of	Park College of
Engineering & Technology	Engineering & Technology
Kaniyur, Coimbatore,	Kaniyur, Coimbatore,
PIN-641 659.	PIN-641 659.

Submitted for Anna University Project Examination held on 12-04-18

INTERNAL EXAMINER **EXTERNAL EXAMINER**

Dr.D.LAKSHMANAN, ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ABSTRACT

This project represents the estimation of drag over a ship by using 3D multiphase wavy flow model. The behavior of wave over ship and the drag over ship is calculated by using Transition k-kl-Omega Model. The ship model is designed using CATIA v5 and analyzed in CFD Fluent using multiphase approach. Multiphase is defined as the simultaneous flow of material with different phases (or) materials with different chemical properties but in same state of phases. In the flow analysis vof model and realizable Transition k-kl-Omega equation are used to find out the wave effects over the ship hull. Simultaneously this experiment aims in finding out the coefficient of drag, coefficient of pressure and skin friction coefficient over the ship model.

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

CHAPTER-5

RESULT AND CONCLUSION

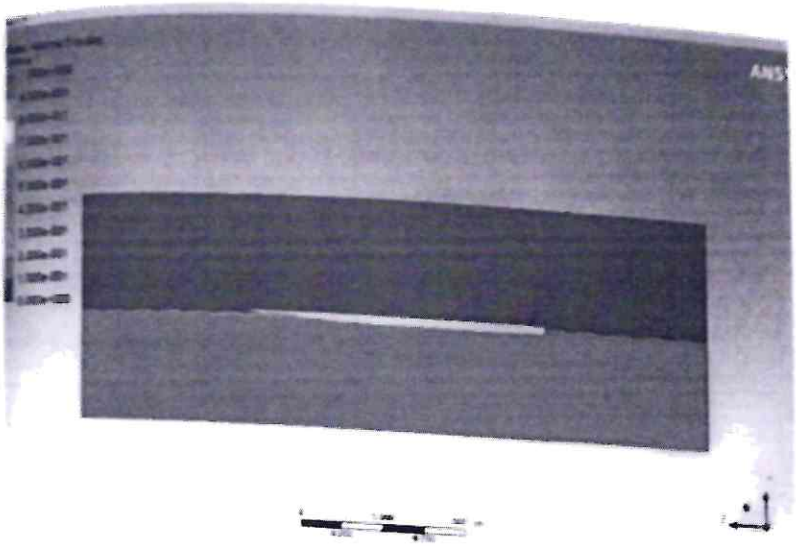


Fig.22 wave formation

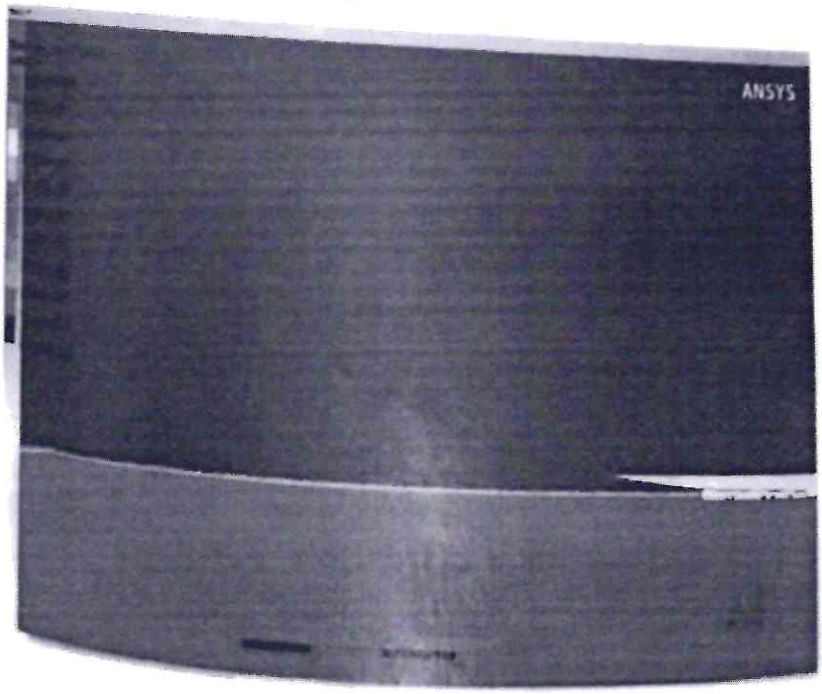


Fig.23 contour diagram in 2D

Batch 10

DESIGN OF LIQUID ROCKET ENGINE FOR BALLISTIC MISSILES AND ROCKETS

A PROJECT REPORT

Submitted by

IRFAN ALI	**(712214101021)**
G.PRIYANGA	**(712214101048)**
S.SAHAYA SELVA SOWMIYA	**(712214101052)**
R.SUBASH	**(712214101063)**

in partial fulfilment for the award of the degree

Of

BACHELOR OF ENGINEERING

IN

AERONAUTICAL ENGINEERING

PARK COLLEGE OF ENGINEERING AND TECHNOLOGY

ANNA UNIVERSITY : CHENNAI 600 025

APRIL 2018

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ANNA UNIVERSITY: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report "**DESIGN OF LIQUID ROCKET ENGINE FOR BALLASTIC MISSILE AND ROCKETS**" is the bonafide Work of "**IRFAN ALI, G.PRIYANGA, S.SAHAYA SELVA SOWMIYA, R.SUBASH**" who carried out the Project work under my supervision.

SIGNATURE
DR.A.P.HARAN, Ph.D
HEAD OF THE DEPARTMENT
Department of Aeronautical engineering,
Park College of Engineering and Technology,
Coimbatore-641 659.

SIGNATURE
DR.A.P.HARAN, Ph.D
SUPERVISOR
Department of Aeronautical engineering,
Park College of Engineering and Technology,
Coimbatore-641 659,

Submitted for Anna university project examination held on- 18-04-2018

INTERNAL EXAMINER

EXTERNAL EXAMINER

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ABSTRACT

Liquid rocket engines or LREs are one of the more popular rocket propulsion systems in use today. A cryogenic rocket engine that uses a cryogenic fuel or oxidiser that is, its fuel or oxidiser (or both) are gases liquefied and stored at very low temperature. Notably, these engines were one of the main factors of the ultimate success in reaching the moon by Saturn V rocket.

Ballistic missiles are long range accelerated flight applications and hence a very high specific impulse (Isp) is required for reaching the target sooner.

This project provides an overview of the design of liquid rocket engine for multi-purposes which can be used in ballistic missiles and rocket for space exploration. The main components of the liquid rocket engine, briefly described here, are the thrust chamber assembly, nozzle and turbo-pump. Hence, to model the engine, non hazardous propellant of liquid oxygen/liquid methane of high specific Impulse (Isp) is preferred.

A quasi one dimensional analysis is used to design the thrust chamber and nozzle of the liquid rocket engine. This analysis gave the mass fraction fuel, $\dot{m}_f =$ 1.085 kg/s and oxidiser, $\dot{m}_o$=3.005 kg/s. The flow rate of propellant is $\dot{m}$=4.09 kg/s. The combustion chamber is designed at temperature 3000K and pressure 10.38 bar at the throttle area $7.85*10^{-3}$ m^2 .

In order to verify the final pressure and temperature achieved in thrust chamber, a NASA based software CHEMICAL EQUILIBRIAM APPLICATION (CEA) and an analysis and simulation software called ANSYS is used.

CHAPTER.7

RESULTS AND CONCLUSION

The chemical reaction of methane with oxygen in gaseous form gave a thermal energy yield of $\dot{Q}$=69998.174 kJ in the combustion chamber for a propellant mass flow rate, $\dot{m}$=4.09374 kg/s. The chamber temperature of propellant was estimated as 3000 K for the design combustion volume. The pressure rise in the chamber due to combustion temperature was, P=1038673.2 N/m^2=10.3867 bar in the controlled volume of the combustion chamber, V= 12.24554*$10^{-3} m^3$

C_p and γ are the functions of temperature and hence for the adiabatic temperature of 3000 K in the combustion chamber, C_p worked out to be 6.33409 kJ/kg-K

The thrust F achieved by the rocket engine at sea level was 10.502 kN

The exit velocity of the exhaust gas was obtained from the equation

$$v_e = M_e\sqrt{\gamma R T_e} = \sqrt{\frac{2\gamma R}{\gamma - 1} T_0 (1 - (\frac{P_e}{P_0})^{\frac{\gamma-1}{\gamma}})} = 2567.665 \text{ m/s}$$

The Mach number at the exit velocity was calculated, as M= 2.1715.

At the oxidiser fuel ratio, O/F=2.77, the possible specific impulse was 299 seconds at sea level at the chamber pressure of 68 bar. Hence for a chamber pressure of 10.386 bar the specific impulse achieved by the rocket engine was 261.73 second at sea level which was quite good and cooperatively better. A NASA based software called CHEMICAL EQUILIBRIUM EQUATION (CEA) was used for the estimation of adiabatic chamber and the result was within 10% of one-D estimation.

Batch -11

DEVELOPMENT OF LOW COST EMERGENCY LOCATOR TRANSMITTER FOR QUADCOPTER

A PROJECT REPORT

Submitted by

R.MIDHUN	712214101033
D.SASIKUMAR	712214101701
P.KASINATHADURAI	712214101702
B.M.CHINNASAMY	712214101705

in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

AERONAUTICAL ENGINEERING

PARK COLLEGE OF ENGINEERING AND TECHNOLOGY

COIMBATORE-641659

ANNA UNIVERSITY: CHENNAI 600025

APRIL 2018

ANNA UNIVERSITY: CHENNAI 600025

BONAFIDE CERTIFICATE

Certified that this project report **"DEVELOPMENT OF LOW COST EMERGENCY LOCATOR TRANSMITTER FOR QUADCOPTER"** is the bonafide work of **"MIDHUN R, SASIKUMAR D, KASINATHADURAI P, CHINNASAMY B M"** Who carried out the project work under my supervision.

SIGNATURE

Dr. A .P .HARAN, Ph.D.,

HEAD OF THE DEPARTMENT

Aeronautical Engineering,
Park College of Engineering
and Technology, Kaniyur,
Coimbatore. Pin- 641 659.

SIGNATURE

Mr. S. SUDHAKAR,
M.E., M.I.E., M.Ae.S.I,

SUPERVISOR
ASSISTANT PROFESSOR

Aeronautical Engineering,
Park College of Engineering
and Technology, Kaniyur,
Coimbatore. Pin- 641 659.

Submitted for the University project viva-voce held on -12/04/2018-

INTERNAL EXAMINER

EXTERNAL EXAMINER

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ABSTRACT

This project describes on detecting & locating of unmanned aerial vehicle (Quadcopter) at emergency condition without using manpower When a Quadcopter is met accident automatically will send a location to owner through global system for mobile communication (GSM) .GSM is used to send and collect data from a base station. The global positioning system (GPS) is helping us to find a location of Quadcopter. GPS and GSM module are interfaced to microcontroller. This module includes piezo electric sensor and temperature sensor. Piezo electric sensor is used to determine the vibration, when they crashed eventually temperature sensor is used to detect the temperature variation, when they fired. Mentioned components are interfaced together with Arduino.

This project proposing an additional feature to know a status of unmanned aerial vehicle at anytime and anywhere by sender through short message service without emergency condition. The output can be achieved by using Arduino software. This will be much simpler and low cost technique compared to others.

KEYWORDS: GSM, GPS, ELT, SENSOR & ARDUINO.

CONCLUSION

Being safe and secure of Quadcopter is the demand of the day. The proposed project provides viewing the location of Quadcopter in terms of latitude and longitude which can further being tracked by using Google maps. The system helps us to finding a Quadcopter in case of Emergency. Now the owner will be free and no more stress about Quadcopter.

Batch-12

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

MATCHING OF COMPRESSOR AND TURBINE IN GAS TURBINE ENGINE PURPOSE

A PROJECT REPORT

Submitted by

R.DYSON	**712214101014**
S.PACKYA LAKSHMI	**712214101040**
A.RAVISHANKER	**712214101050**
J SRINIVASAN	**712214101062**

In partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

AERONAUTICAL ENGINEERING

PARK COLLEGE OF ENGINEERING AND TECHNOLOGY

COIMBATORE-641659

ANNA UNIVERSITY::CHENNAI 600025

APRIL 2018

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

BONAFIDE CERTIFICATE

Certified that this project report, **"MATCHING OF COMPRESSOR AND TURBINE IN GAS TURBINE ENGINE"** is the bonafide work of **R.DYSON** who carried out the project work under my supervision.

Signature

Dr. A.P.Haran,

Dean (Mechanical Sciences),

Aeronautical Engineering,

Park College Of Engineering And Technology,

Kaniyur, Coimbatore.

641659,

Signature

Mr. NAVANEETH B.S.,

Assistant Professor,

Aeronautical Engineering,

Park College Of Engineering And Technology,

Kaniyur, Coimbatore.

641659

The project report is submitted for the viva-voce held on 12/4/18

INTERNAL EXAMINER

EXTERNAL EXAMINER

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ABSTRACT

For proper working of an engine, there should be continuity in mass flow, and compatibility in the speed (in rpm) between the compressor, turbine and the nozzle. Without these compatibility, the engine fails. Moreover, the pressure ratios, mass flow and the rpm should be as specified for continuous working i.e. to go above self idling condition and work below limited loading condition. Surge line is also to be taken care of. This matching also consists of designing, sizing, manipulation of operating characteristics. For our purposes , we just take care of manipulation of operating characteristics and that too of compressor and turbine only. There should be also a power matching i.e turbine should be able to provide the power required by the compressor. Also, pressure increase across the compressor and the combustion chamber should match the drop between the combustion chamber and the turbine. Hence our aim is to match the components by developing the graphical representation of:

1. Development of compressor and turbine performance maps.
2. Development of matching maps.
3. Development of operating lines.
4. Development of surge lines.

7 CONCLUSION

A graphical method is presented for matching the components and determining the operating characteristics of a turbojet engine. For simplicity the techniques, and relations used are for a single spool engine .The method would be applicable, however, to matching the components within any given spool of a multi spool engine. The subject matching the spools and developing the operating lines for each spool of engine was for each spool of multi spool engine was considered beyond the scope of this report.

Batch 13

EXPERIMENTAL ANALYSIS ON CARBON AND GLASS FIBER SANDWICH PANELS USED IN ADVANCED LIGHT HELICOPTER (ALH)

PROJECT REPORT

Submitted by

ABDUL AL MAAJID S	**(712214101002)**
KIRUBESH B	**(712214101027)**
MERGIN BM	**(712214101032)**
SAMUEL ANTONY J	**(712214101053)**

in Partial Fulfillment for the award of degree

of

BACHELOR OF ENGINEERING

in

AERONAUTICAL ENGINEERING

PARK COLLEGE OF ENGINEERING AND TECHNOLOGY

COIMBATORE – 641659

ANNA UNIVERSITY :: CHENNAI 600 025

APRIL 2018

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ANNA UNIVERSITY : CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this Project Report " **EXPERIMENTAL ANALYSIS ON CARBON FIBER AND GLASS FIBER SANDWICH PANEL IN ADVANCED LIGHT HELICOPTER** " is the bona fide work of the Candidate named " **ABDUL AL MAAJID S (712214101002)** " who carried out the Project Work under my Supervision.

SIGNATURE
INTERNAL GUIDE
Dr. DHANAN JI,
Head of the Department,
Dean of Mechanical Sciences ,
Aeronautical Engineering ,
Park College of Engineering and Technology ,
Avinashi Road(NH-47), Kaniyur ,
Coimbatore 641659 .
Tamilnadu .

K. DHANDAPANI / Chief Manager / Hawk Final Assembly
SIGNATURE
PROJECT SUPERVISOR
Mr . DHANDAPANI K ,
Chief Manager ,
Hawk Final Assembly Shop,
Hindustan Aeronautics Ltd ,
Aircraft Division ,
Post Bag No : 1788 ,
Bangalore Complex–560017
Karnataka .

This Project Report is submitted for the Viva-Voce Examination held on
12.4.16

INTERNAL EXAMINER

EXTERNAL EXAMINER

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ABSTRACT

HELICOPTER DESIGN BUREAU

Our Project Thesis is based on Sandwich panels Usage in Helicopter . Generally large number of Helicopter body parts are modeled with metals . and due to this the Weight of the Helicopter mostly affects the performance . To Overcome this problem , we have used the Sandwich panel made of **Carbon – Fiber** and **Glass – Fiber** to reduce the weight and increase the strength to weight ratio . since the Sandwich panels are of low stiffnes but the outer skin ie.. Carbon fiber is extensively of high stiffness and the Composites constitutes around **50** to **80 %** of the airframe by weight .

The Objective of this project is to understand the Mechanical behaviour , significance of damage growth , maximum loading capacity and core failure mechanisms of Sandwich structures done with glass – fiber and Carbon – fiber facesheets fabricated by hand lay up technique as a function of Core Thickness .

As a part of Modernisation and new Technology adaptation , the honeycomb structures in Metals and Non – metals and Advanced Composites using Carbon , Kevlar and Glass – Fiber were introduced for several aircraft and Helicopter Programmes such as Cheetah and Chetak Helicopters , Jaguar Fighter Aircraft , Light combat aircraft**(Tejas)** and Advanced Light Helicopter **(ALH)** .The successful flying of Advanced Light Helicopter (ALH) has provided tremendous impetus to Composite Technology in the Country .

CHAPTER – 13

CONCLUSION

In this thesis , the mechanical properties of composite sandwich structures fabricated with **(0-45-90-45-90-90-45)** deg with carbon facesheet based nomex core were evaluated . The individual behavior of Honeycomb core material and carbon fiber facesheet were also determined by performing ASTM tests on these materials .

In Summary , the Core thickness increment has been found important for flatwise behavior of Composite sandwich structures . From the Thesis , the Carbon Fiber has proven its strength to weight ratio rather than any other materials .

CRITERIA	ALUMINIUM 5251 H24	SANDWICH PANEL
Bending stiffness	5146 . 6 N/m^2	5224.3 N/m^2
Shear stiffness	$1045 * 10^3$ N/mm^2	$1141 * 10^3$ N/mm^2
Deflection	43 mm	30mm
Facing stress	115.8 Mpa	93.80 Mpa
Core shear	0.042 Mpa	0.053 Mpa
Core stress	0.06 Mpa	0.033 Mpa
Panel Buckling	14413 N	6560 N
Shear Crimping	2.79 MN	1 MN
Skin Wrinkling	1244 Mpa	1816 Mpa
Intra cell Buckling	854 Mpa	301 Mpa
Local Compression	0.003 Mpa	0.006 Mpa

(Table - 25) – Comparisonal results between two different specimens

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

Batch 14

DESIGN AND NUMERICAL STUDY OF AXIAL FLOW PUMP WITH REDUCED CAVITATION

A PROJECT REPORT

Submitted by

V.ASHWINI BHARATHI	**712214101005**
D.BALA CHANDAR	**712214101006**
R.B.GOKUL KRISHNAN	**712214101015**
V.S.SARUNDAS	**712214101055**

In partial fulfilment for the award of the degree

Of

BACHELOR OF ENGINEERING

IN

AERONAUTICAL ENGINEERING

PARK COLLEGE OF ENGINEERING AND TECHNOLOGY

COIMBATORE-641659

ANNA UNIVERSITY: CHENNAI 600025

APRIL 2018

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ANNA UNIVERSITY: CHENNAI 600025

BONAFIDE CERTIFICATE

Certified that this project report, **"DESIGN AND NUMERICAL STUDY OF AXIAL FLOW PUMP WITH REDUCED CAVITATION"** is the bonafide work of **V.ASHWINI BHARATHI (712214101005), D.BALA CHANDAR (712214101006), R.B.GOKUL KRISHNAN (712214101015), V.S.SARUNDAS (712214101055)** who carried out the project work under my supervision

Signature
Dr. A.P.HARAN,
Head of the department,
Aeronautical Engineering,
Park College Of Engineering And Technology,
Kaniyur, Coimbatore.
Pin- 641 659.

Signature
Mr. R. MOSES RAJA KUMAR,
Assistant Professor,
Aeronautical Engineering,
Park College Of Engineering And Technology,
Kaniyur, Coimbatore.
Pin- 641 659.

Submitted for the viva-voice examination held on 12-04-2018

INTERNAL EXAMINER

EXTERNAL EXAMINER

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ABSTRACT

An axial flow pump uses impeller with vanes that direct flow parallel to the motion of operation. It operates at low head and high flow rate. Since cordier diagram speaks of discharge, head, and specific diameter, the relation for same at constant speed and head can be calculated. The blade geometry is found by iteration that is trial and error method. Theoretical calculations are made to check the efficiency of the pump and to verify whether the pump can achieve the desired head for the designed impeller blade profile. The blade tip clearance may lead to a kind of cavitation. In this study the cavitation was numerically investigated in an axial flow pump, for a constant speed, head and fixed flow rates. Due to which, the cavitation occurs in loading edge as well as in the blade tip. The design of an axial pump was carried out in CATIAV5 and analysis was done in ANSYS (CFX).

CHAPTER 6

SUMMARY AND CONCLUSIONS

6.1 Summary:

Design and analysis of the axial flow pump has been carried out. For the required specification of head, mass flow rate and rpm an axial flow pump is designed. Theoretical calculation are done to obtain the values of the design parameters of the pump and the design was analyzed using CFD. Results found satisfactory.

6.2 Future improvements:

The present design and analysis of the axial flow pump is the preliminary one. The following improvements can be done to the present design of the pump. The hub, diffuser and casing can be designed to achieve a better head.

The cavitation performance of axial flow pump with inlet guide vane at steady flow rates has been studied using computational fluid dynamics (CFD) method. Compared with the experimental data, the simulation results are credible. The cavitation performance can be improved by adjusting the different flow rates and also with varying inlet pressure.

Batch 15

FLUID STRUCTURE INTERACTION IN FUEL TANK SLOSHING

A PROJECT REPORT

Submitted by

KARTHICK MENA V	**712214101025**
PREVIN R	**712214101046**
SIVA M	**712214101059**
VIGNESH G	**712214101301**

In partial fulfillment for the award of the

degree of

BACHELOR OF ENGINEERING

IN
AERONAUTICAL ENGINEERING

PARK COLLEGE OF ENGINEERING AND TECHNOLOGY

COIMBATORE-641659

ANNA UNIVERSITY::CHENNAI 600025

APRIL 2018

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ANNA UNIVERSITY: CHENNAI 600025

BONAFIDE CERTIFICATE

Certified that this project report **"FLUID STRUCTURE INTERACTION IN FUEL TANK SLOSHING"** is the bonafide work of

KARTHICK MENA V	**712214101025**
PREVIN R	**712214101046**
SIVA M	**712214101059**
VIGNESH G	**712214101301**

Who carried out the project work under my supervision.

SIGNATURE	SIGNATURE 11/4.18
Dr. A.P.HARAN	**Mr. MUNIRAJ D.,**
(Dean of Mechanical science),	**Supervisor, Assistant Professor**
Aeronautical Engineering	Aeronautical Engineering
Park College of Engineering & Tech	Park College of Engineering & Tech
Kaniyur, Coimbatore -641659.	Kaniyur, Coimbatore -641659.

Submitted for the University project viva-voce held on 12.4.2018

INTERNAL EXAMINER **EXTERNAL EXAMINER**

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ABSTRACT

This paper presents the free surface behaviour of liquid in a partially filled automotive fuel tank under uniformly accelerated motion. The liquid in the fuel tank is subjected to violent sloshing during sudden acceleration or stopping of the vehicle which will produce structural vibration and noise in the passenger compartment. To reduce this sloshing, baffles are used inside the tank. The objective of this work is to study the influence of vertical baffles and fill levels on free surface elevation of liquid in a partially filled fuel tank. The simulation of liquid free surface behaviour under uniform acceleration is done using ANSYS FLUENT software. A numerical model is developed based on Volume of Fluid (VOF) technique to track the free surface motion of liquid. From the numerical analysis, amplitude of free surface elevation and slope of free surface are predicted. A 2-D rectangular tank of 0.5m*0.5m and 3-D rectangular tank is considered for than study and the simulation is carried out for 1 sec. The free surface profiles obtained from the simulations are compared with the analytical results.

Keywords: Liquid sloshing, volume of fluid, similitude relations, free surface elevation

8. CONCLUSION AND FUTURE WORK:

8.1 CONCLUSION:

1. From the result, it was observed that, the insertion of baffles reduces the effect of sloshing.
2. The vertical baffle dampens the sloshing effect. As the number of baffles increases the slosh height can be reduced but the weight of tank increases.
3. The slosh height can be effectively reduced by placing horizontal baffles exactly on the interface of liquid & air.
4. The indented function of the horizontal baffles reduces when it placed inside the interface of liquid & air
5. When comparing the baffles with hole and without hole, the weight reduces and fuel capacity increases in the later case. In addition the variation in slosh height is negligible when comparing those two cases.
6. From the fluid and structure point of view, the porous baffle kept at horizontal position exactly on the interface is declared as the best model.
7. The analytical 2D & 3D solution is correlated with the theoretical solution and is found that the percentage error is 6.7 %.

8.2 FUTURE WORK:

1. The experimental setup for the FSI can be mode and the solution may be compared with the analytical solution.
2. The effect of analysis acceleration, jerk, may be examined for the present model.
3. An elastic material called crater can be used as baffles and the effect may be studied.

Batch 16

DESIGN AND ANLYSIS OF IMPELLER BLADE OF CENTRIFUGAL PUMP

A PROJECT REPORT

Submitted by

DIBAKARAN K	712214101012
NAVEEN KUMAR P	712214101037
SRINIVAS T	712214101061

in partial fulfilment for the award of degree

Of

BACHELOR OF ENGINEERING

IN

AERONAUTICAL ENGINEERING,

PARK COLLEGE OF ENGINEERING AND TECHNOLOGY,

COIMBATORE,

ANNA UNIVERSITY: CHENNAI 600 025

APRIL 2018

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ANNA UNIVERSITY: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certificate that this project report "**DESIGN AND ANLYSIS OF IMPELLER BLADE OF CENTRIFUGAL PUMP**" is the bonafide work of

DIBAKARAN K

NAVEEN KUMAR P

SRINIVAS T

who carried the project work under my supervision.

SIGNATURE

Dr.A.P.HARAN, Ph.D.,

DEAN OF MECHANICAL SCIENCE,

Department of
Aeronautical Engineering,
Park college of engineering
and technology,
Kaniyur,Coimbatore,
PIN-641659

SIGNATURE

Mr. S.GOVINDARAJ, ME.,

ASST. PROFESSOR,

Department of
Aeronautical Engineering,
park college of engineering
and technology,
Kaniyur,Coimbatore,
PIN-641659

Submitted for Anna University project Examination held on 12.04.2018

INTERNAL EXAMINER

EXTERNAL EXAMINER

Dr.D.LAKSHMANAN,ME., Ph.D.,
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ABSTRACT

Pump is a machine which converts the mechanical energy into hydraulic energy and has a vital role in the domestic and industrial area. This project deals with the application and structural analysis of a centrifugal pump impeller. In this analysis the impeller outlet diameter, the blade angle and the blade numbers are the most critical parameters which affect the performance of impeller. The impeller is modelled using CAD software and analysed using ANSYS package. When there a disc of the liquid can be lifted to a high level. Impeller design for the head (H) discharge (Q) and speed (N) will be calculated. Impeller vane profile was generated by circular arc method in CATIA. Velocity and Pressure distribution were analysed for impeller of the centrifugal pump.

KEYWORDS: Performance,Efficiency,Distribution,Velocity,Pressure

CHAPTER 7

CONCLUSION

CONCLUSION

This paper thus presents description of various blade design methods and the calculations required, on the basis of which designers can design a blade mean line joining the inlet and outlet diameters of the pump impeller. Further modeling of pump impeller with these methods and CFD analysis can be carried out to obtain the performance curve for comparing the efficiency and head obtained with different blade design method at various discharge conditions.

Batch 17

EVALUTION OF AERODYNAMIC CHARACTERISTICS OF 2D AEROFOIL FOR DIFFERENT NACA SERIES

A PROJECT REPORT

Submitted by

MANIKANDA RAJA.J	**712214101029**
NAVIN JOHN BRITTO.S	**712214101036**
RAGAVAN.J	**712214101049**
KAMESH MAHADEVAN.S	**712214101703**

in partial fulfilment for the award of the degree

Of

BACHELOR OF ENGINEERING

IN

AERONAUTICAL ENGINEERING

PARK COLLEGE OF ENGINEERING AND TECHNOLOGY

COIMBATORE-641659

ANNA UNIVERSITY: CHENNAI 600025

APRIL 2018

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ANNA UNIVERSITY: CHENNAI 600025

BONAFIDE CERTIFICATE

Certified that this project report **"EVALUTION OF AERODYNAMIC CHARACTERISTICS OF 2D AEROFOIL FOR DIFFERENT NACA SERIES"** is the bonafide work of **MANIKANDA RAJA.J, NAVEEN JOHN BRITTO.S, RAGAVAN.J, KAMESH MAHADEVAN.S** Who carried out the project under my supervision.

SIGNATURE	**SIGNATURE**
DR.A.PETHARAN, Ph.D.,	**Mrs.D.Rohini, M.E**
(HEAD OF THE DEPARTMENT)	**(SUPERVISOR)**
Aeronautical Engineering	Aeronautical Engineering
Park College Of Engineering and	Park College Of Engineering and
Technology, Kaniyur, Coimbatore.	Technology, Kaniyur, Coimbatore.
Pincode-641659.	Pincode-641659.

Submitted for the viva voice held on 12-04-18

INTERNAL EXAMINER **EXTERNAL EXAMINER**

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ABSTRACT

In this project work, the process of modelling and simulation of an aerofoil section NACA series (like 4&5 digit) has been done on ANSYS(FLUENT) using computational fluid dynamics (CFD). While performing the analysis, pre-processing and post processing sections evaluation of the performance of each airfoil has been done. An effort has been made to do a detailed study of airflow over the aerofoil cross section to find the pressure and velocity distributions around it.

The pre-processing method including the creation and type of the tetrahedral mesh in ANSYS and the 2D volume grid generation is described. As a result, coefficient of lift and drag for the section is also calculated. Airfoil is the most important part of any airplane structure whether it may be commercial planes or fighter planes or helicopters.

The airfoils decide if the lift force is sufficient to balance the weight of the aircraft and how much drag is generated on the aircraft. An attempt has been made to plot the lift and drag coefficient variation with different angles of attack.

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

8.8 CONCLUSION:

The values of cl and cd are found for various aerofoils of NACA 4 and 5 digit series. These values are compared with each other and the best of these series are chosen based on these values and other aerodynamic characteristics.

REFERENCE:

1. S.Kandwal, Dr. S.Singh, "Computational Fluid Dynamics Study of Fluid Flow and Aerodynamic Forces on an Airfoil", IJERT, Vol.1 Issue 7.September-2012.

2. Aerodynamic investigation of flow parameter over NACA 4415 Aerofoil by computational fluid dynamics published by Pankaj garg.

3. Design of NACA 2412 and its Analysis at Different Angle of Attacks. Reynolds Numbers, and a wind tunnel test published by Er.Shivam Saxena.

4. A Review on Aerodynamic Behaviour of Airfoil When surface modified Test is published by Amit Kumar Saraf, Dr.Mahendra Pratap Singh.

5. Pressure Distribution & Aerodynamic characteristics of NACA Aerofoils using Computational panel method for 2D Lifting flow published by Vasishta Bhargava , Ch Koteshwara Rao , Y.D.Dwivedi.

6. Computational Fluid Dynamics: The Basics With Applications, McGram Hill,(1995)

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

Batch 18

CFD ANALYSIS OF WINDTURBINE BLADE WITH WINGLET CONCEPT

A PROJECT REPORT

Submitted by

KALEESWARAN P.T	712214101022
KARTHICK R	712214101024
KARUPAIYA S	712214101026
MANOVA SELVARAJ J	712214101030

In partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

AERONAUTICAL ENGINEERING

PARK COLLEGE OF ENGINEERING AND TECHNOLOGY

COIMBATORE-641659

ANNA UNIVERSITY::CHENNAI 600025

APRIL 2018

ANNA UNIVERSITY: CHENNAI 600025

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

BONAFIDE CERTIFICATE

Certified that this project report, **"CFD ANALYSIS OF WINDTURBINE BLADE WITH WINGLET CONCEPT"** is the bonafide work of

KALEESWARAN P.T

KARTHICK R

KARUPAIYA S

MANOVA SELVARAJ J

Who carried out the project work under my supervision.

Signature	Signature
Dr. A.P.Haran,	**Mr. D. Lokesharun M.E.,**
Head of the department	**Assistant Professor,**
Aeronautical Engineering,	Aeronautical Engineering,
Park College Of Engineering And Technology,	Park College Of Engineering And Technology,
Kaniyur, Coimbatore.	Kaniyur, Coimbatore.
Pin- 641 659.	Pin- 641 659.

Submitted for the project viva-voice examination held on 12.04.2018

INTERNAL EXAMINER

EXTERNAL EXAMINER

Dr.D.LAKSHMANAN,ME., Ph.D.
PRINCIPAL
Park College of Engineering & Technology
Avinashi Road,
Kaniyur, Coimbatore - 641659.

ABSTRACT

Wind turbine technology is one of the rapid growth sectors of renewable energy all over the world. As a core component of a wind turbine, it is a common view that the design and manufacturing of rotor blades represent about 20% of the total investment of the wind turbine. Moreover, the performance of a wind turbine is highly dependent on the design of the rotor. Winglets are wing tip devices commonly used in the aeronautical industry to reduce drag on airplanes. However, some investigations have shown that these winglets can be used in wind turbine blades in order to maximize the power produced using wind resources. This type of application in rotating machinery is a fairly recent subject and some research has been performed by scientists at the RISO National Laboratory in Denmark, a country for which wind power provides almost 20% of the electricity production. The project will involve the modeling of wind turbine blade with the winglet at the tip of the rotor blade.

Step to be done in this project:

- Study the best possible aero foil combination for the turbine blade.
- Design of blades with attached winglets in CATIA V5 software.
- CFD simulation of wind turbine blade with turbulence model using ANSYS software.

Once all the computational modeling and design is finished, the performance of rotor blade and winglet will be found out.

CHAPTER 6

RESULT AND DISCUSSION

The 2kW Horizontal axis wind turbine is designed using CATIA and analyzed using ANSYS FLUENT Software. The performance parameters are compared between the without and with winglet configuration, the value of torque and power from the result of simulation is noted in the following data.

Configuration	Velocity (m/s)	Angular Velocity(rad/sec)	Rpm	Torque (rad / Sec)	Power(Watt)
Without Winglet	9	29	277	62.89	1823.81
With Winglet				68.49	1997.81

By comparing the results for both configuration, the winglet configuration produces the excess power of 8 percentage from the conventional design.