



# NOTAM

## NOTICE TO AIR MANAGERS

*1 "Intellectuals are not born, but are made. I believe the aim of education is the knowledge not of facts but of values. I strongly believe in the capabilities of student's community and ensure everything best to reach them for their promising growth.*

**Mr. Ch. Malla Reddy.**



A thought beyond horizons of success committed for educational excellence.

"Wishing all the aeronautical Engineering students all the success in future endeavours".

**Dr.VSK REDDY, PRINCIPAL**

*Innovation is the ability to see changes as an opportunity – not a threat.*

We believe in giving the power of knowledge to all our students. MRCET has created a benchmark in the field of Aeronautics and provides a fertile ground for the flowering of the potentials.

**Dr.M.MURLI KRISHNA,  
DEAN, ACADEMIS**



**Taking off, Cruising High**

**JANUARY 2K19**

# Department of Aeronautical Engineering

Welcome to the new Academic Year! The department has a propelling the activities based on the most-recent academic year. Its areas for improvements have been catalyzing the department to achieve progressively. Like any other departments, the Aeronautical Department takes an active role in fulfilling its requirements for the Institutional Standards of the College. Gearing to become a well-rounded department, the department aligns all its activities to such operational standards and be adequately addressed. This Year of the ANE Newsletter serves as a reservoir of information throughout the academic year which can document all such activities. May I take this opportunity to invite everyone to become a contributor for the rest of the other issues of our NOTAM Newsletter!



HOD, ANE



- Student Chapter – Tier II events
- Faculty Development Program
- Engineer's Day
- CRT Training
- Catia Workshop
- Swami Vivekananda Birthday
- Aeromodelling Workshop
- Students Articles

## TWO DAY "FACULTY DEVELOPMENT PROGRAM"

**Program Name:** Advanced Computational Technologies in Aerospace Engineering

**Program Date:** 12<sup>th</sup> & 13<sup>th</sup> June 2018

**Resource Persons:** Shri Anup K Bandyopadhyay, Dr. Supradeepan, Dr. Pavan Kumar Penumakula, Dr. SanthanaKrishnan, Professor, Prof A.K.Rai.

**About The Program:** This program was arranged by Department of Aeronautical Engineering propelled with lots of efforts and under able guidance of Prof. V. Ravi to focus on current advance techniques useful for the present research aspirants aiming both the faculty and research scholars.

It started with the Inauguration ceremony graced by Dr. Murali Krishna Dean Academics, Dr. Supradeepan, Dr. Pavan, Prof V. Ravi HOD Aero faculty, PG Students and other dignitaries from other colleges.

The main agenda of the Faculty Development Program are

- ✓ **Roots of the Computational methods in fluid Dynamic analysis and structural analysis**
- ✓ **Advancements in Scramjet fuel injection**
- ✓ **Advancements in Composite structures**
- ✓ **New trends in Air transportation systems**
- ✓ **Simulation techniques as a teaching tool**

After each session there was an interaction with the participants and also few of them have got a chance to simulate the Concorde aircraft by using MATLAB Simulink and Control stick in session.



Dr. VSK Reddy, Principal Sir Addressing the FDP

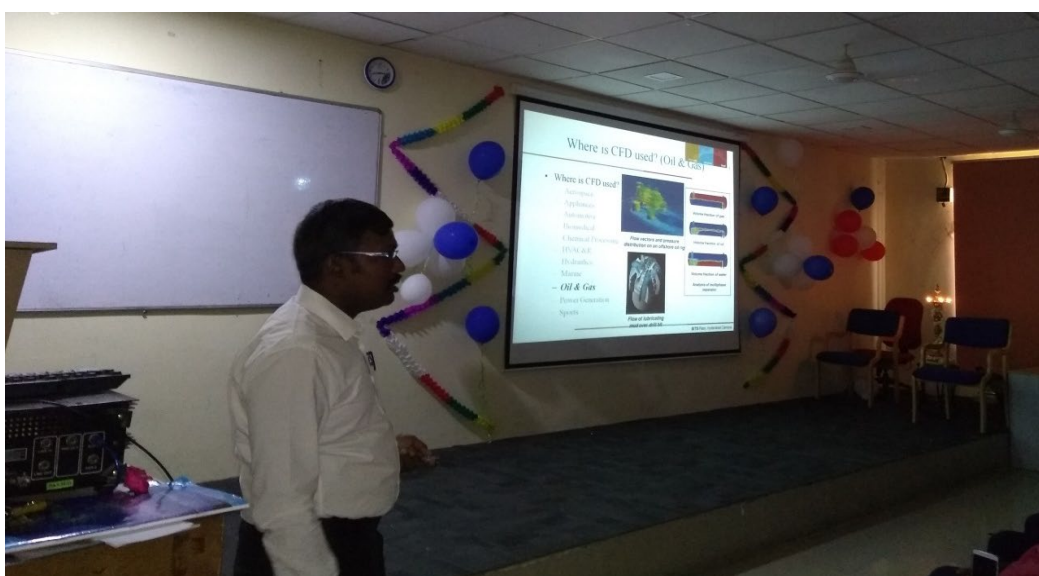




Dr. Murali Krishna, Dean Sir Distributing the Participation certificates



HOD Sir Giving the Memento to prof. A.K Rai



Dr. Supradeepan Giving the presentation



Prof Anup sir giving Certificates to participants



Participants

**Remarks:**

- This has helped the faculty to update their knowledge before going for a new semester with tons of zeal and enthusiasm by updating themselves.
- It helped PG students to choose a problem definition and the methods for doing their research work.
- Most of the Practical perspectives were discussed which are useful for the current teaching aids.





## Students Articles

Propelling forward No limits ...No dimension

# Learn in the Real World

Maintenance is a key role in the Aviation to sustain and build confidence in students and I Shashank Mahaseth from Aeronautical Engineering was a part of this experience and got an opportunity to carry out my internship at hangar of Buddha Air Pvt. Ltd. It operates domestic as well as international services within Nepal and India, serving major towns and cities in Nepal, linking Kathmandu with ten destinations, Varanasi of India and Paro, Bhutan. It is an international standard hangar, equipped with maintenance facility, certified as part 145 Aircraft Maintenance Organization from Civil Aviation Authority Nepal (CAAN). Since the hangar is located at TIA, it allows for safety inspections and audits to be performed in Nepal, rather than being flown abroad for maintenance. It also maintains aircrafts for national and international airlines.

The purpose of this internship is to get a practical aspect of the theoretical work studied at the University and to understand the maintenance operations carried out in the hangar.

During my internship period, a number of approaches and exposure methods were used which included: hands on, through reading relevant materials, and also questions and answer approaches.

I was assigned to different departments which include the administration, safety department, quality assurance department, technical department, operational department etc. I worked with Beech 1900D, ATR 42 and ATR72 aircrafts where I learnt different new things like wheel and brakes assembly, fuel nozzle and filter cleaning, non-destructive testing method etc. This has helped me to interact with different people which helped me acquire information and gain practical knowledge on the operation methodology of the aircraft maintenance hangar.

Job Opportunities: In the present scenario Airways is developing more in India therefore requirement of Aircraft technicians is drastically increasing day by day. Choosing this as profession can indulge students to be in a field of Aeronautical



Courtesy: Buddha Air Lines Hangar: ATR 42 Going under C-Check

Sometimes making your hands dirty lets you explore and learn new things around you.

Shashank Mahaseth

IV Year

Aeronautical Engineering

# Internship a Practical Perspective

A. Stephen (15N31A2104)

T. Manohar (15N31A2157)

B. Vaibhav (15N31A2107).

## Maintenance operations in aircraft hanger

We carried out the internship at Air India hanger Trivandrum, Kerala. It operates domestic services within India. Since the hangar is located at Trivandrum, it allows for safety inspections and audits to be performed in India, rather than being flown abroad for maintenance. It also maintains aircrafts for national and international airlines.

The purpose of this internship is to get a practical aspect of the theoretical work studied at the university and to understand the maintenance operations carried out in the hangar.

During our internship period a number of approaches and exposure methods were used which included: hands on, through reading relevant materials, and also questions and answer approaches.

We were assigned to different departments which include the administration, safety department, quality assurance department, technical department, operational department and so on. We were also assigned to workshop where we learnt different new things like wheel and brakes assembly, non-destructive testing method etc. This has helped us to interact with different people which helped us acquire information and gain practical knowledge on the operation methodology of the aircraft maintenance hangar.

In conclusion, this was an opportunity to develop and enhance skills and competencies in our career field which we actually achieved.





# Aero-Emulation

Every year a two –day Workshop on “Aeromodelling” is conducted by the department of Aeronautical Engineering to establish the basic concepts of Flight and put them into practical use through the making of a working models. Aeromodelling is the activity involving flight design, development and flying of small Remote Controlled Aircrafts. It is a very interesting way to learn, apply and understand science and engineering principles. The most realistic form of Aeromodelling in its main purpose is to replicate full scale aircraft designs.

## Day 1-

The spectrum of the event began with a Demo Presentation on the major components of an aircraft and the basic principles of flight. The lecture based on the presentation was delivered by trained RC Aircraft Expert Mr.Vinod Nayak who also happens to be the Alumni of our college. He enlightened us about the Workshop’s major aim and the procedure of how to construct the RC Model. Next the students began with the construction of the model according to the Dimensions prescribed. The first day ended with the completion of making the basic aircraft frame.

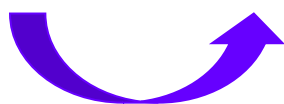




## Day 2-

Day 2 focused on inner technical aspects which could furnish the aircraft to fly properly. All the electrical components were fitted inside the aircraft body whose parts were glued initially. The elevation and maneuverability of the flight was taken care of through attachment of rods, etc. finally the motor along with the propeller was installed at the fore end of the aircraft which made ready for flight. The radio transmitter controlled aircraft was then put into launch manually and set into flight.

# A Learning Curve is Essential for Growth



**B.Bhargavi**  
**R. Pavan**  
 II Year AeronauticalEngg

## Outside the Box –Competition excels



- **Boeing National Aero-modeling Competition 2019**

National level Aeromodelling competition in India is conducted with the joint conjunction of IIT Bombay, IIT Delhi, IIT Kanpur, IIT Kharagpur and IIT Madras as a part of the tech-fest of IITs every year. The competition is launched with the vision to provide the real time experience in RC Aircraft modeling and piloting.

We as a team were fortunate enough to participate in the south zonal of this event which was held on 5<sup>th</sup>-6<sup>th</sup> of Jan 2019 at IIT Madras, Chennai. This tournament was the part of the IITM's tech-fest "Shaastra".

**Competition Description:**

This event is classified into 2 parts. The first part is based on the plane design on the basis of the constraints provided by the panel members. The rules and regulations were exclusively put forth for the beginners. Initially the plane's design was their major concern but from past few years they started giving importance to the flying skills, as a result the basic flying expertise like level flight, hovering, maneuvering played the primary role in the qualifying round. The second part of the event was to test the flight controlling skills of the pilot on the basis of dropping the object in the specified region. The safety measure was also taken care by inserting the kill switch mechanism to avoid any harm to the viewers. All together the entire event gave the practical exposure in flying and designing.



**Team members**

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Manvith Reddy (17N31A2132)

[ Aeronautical 2<sup>nd</sup> year]

- Boeing Aeromodelling Competition (IITM)





# RESEARCH EXPOSURE

## SEVERE PLASTIC DEFORMATION

Severe Plastic Deformation (SPD) can simply be defined as a metal forming process in which very large plastic strain is being introduced in the bulk material in order to produce an ultra-fine grain structure. SPD methods are mainly to produce a very high strength structure with light weight with environmental harmony. Many conventional method such as rolling, forging and extrusion can impose a plastic strain of about 2. When these methods are carried out to impose the higher plastic strain, the dimensions of the material such as diameter and thickness becomes very thin such that the material can no longer be used as structural part. However, SPD methods not only impose higher plastic strain at relatively low temperature (usually less than  $0.4 T_m$ ) but also guarantees that the overall dimensions of the material is not significantly changing. The material processed with SPD are safe, reliable , light weight and are of high strength which in turn is demand of many industries. Another feature of SPD is that retained shape is due to the use of special tool geometries which prevent free flow of material and thereby produce a significant hydrostatic pressure. Achieving high strains and introducing high densities of lattice defects which are important for exceptional grain refinement is due to the presence of this hydrostatic pressure.

In recent years , SPD was developed as a new method of manufacturing bulk specimen having ultrafine grained structure(UFG). This has been the subject of research and intensive investigation from the past two decades due to its unique physical and mechanical properties inherent in various UFG materials.

There are various SPD methods available such as multiple forging, high-pressure torsion (HPT), accumulative roll bonding(ARB), equal-channel angular pressing (ECAP) , twist extrusion (TE), cyclic extrusion and compression (CEC), repetitive corrugation and straightening (RCS) and various developed and modified processes. ECAP, HPT and ARB are the methods which produces metal having very small average grain size of less than  $1\mu m$  with mostly high-angle misoriented grain boundaries. Among all these available methods, ECAP process is a promising and interesting method.

### APPLICATION

The properties of the metals processed by SPD display high strength, ductility and fatigue characteristics. UFG metals are used as a structural material due to their properties. Bolts are manufactured with titanium alloys processed from ECAP. Long carbon steel bars, of over several kilometres, with ultra-fine grains are manufactured by

a warm continuous calibre rolling and cooling process, from which micro bolts are manufactured. Initially, the application of SPD are likely to be in niche market producing low volume specialty products (e.g. sputtering targets). The next step will be medium volume markets with the emphasis put on product's performance rather than price (medical implants, defence applications, aerospace components, sports equipment). Eventually, the mass production of components may be undertaken by the automotive and aerospace industries.

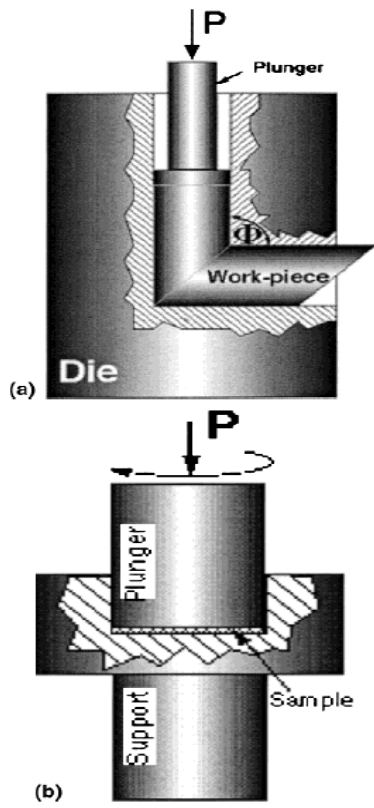


Figure :Schematics of SPD techniques: (a) ECAP and (b) HPT

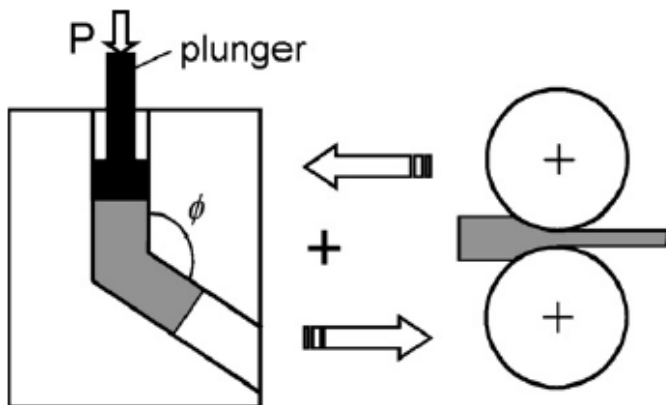


Figure: Principle of the combined process of ECAP process and cold rolling.

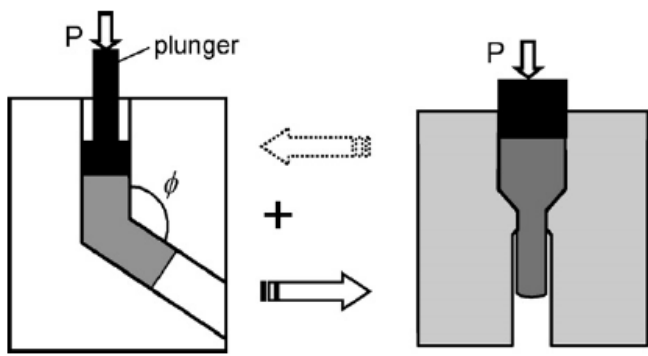


Figure: Principle of the combined process of ECAP process and conventional extrusion.

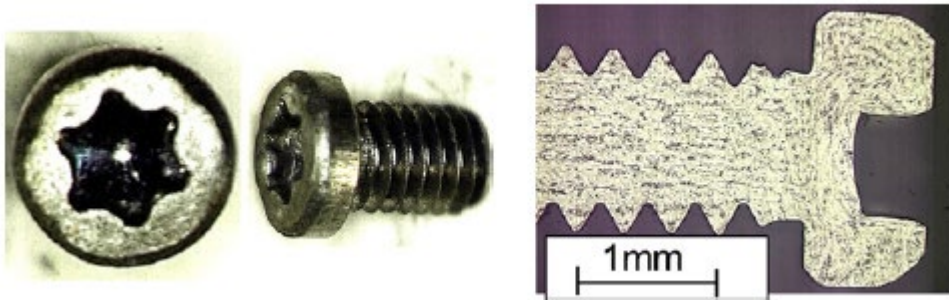


Figure: Overview and cross-section of micro bolts manufactured UFG Carbon steel processed by cold ECAP

## Cultivating young Aspirants

**Abhishek Patel**  
**Suraj Singhneeka**  
**Akhil**



# Discussion on Effect of axial spacing in multi stage low pressure compressor

Gas turbine engines are used in many aero and naval applications, where they are valued for their high power-to-weight ratio resulting high acceleration and ability to get underway quickly. When cost of fuel is less important than power and available space the gas turbine has no equal. The turbine's lack of noise and space saving design make them ideal for use on large cruise ships where they can be placed in tight spaces far from passenger cabins.

At first total engine cycle analysis is carried out as per the engine requirements. The engine cycle analysis will provide the specifications for compressor design. Initially 1-D (mean line) and 2-D (Stream Line Curvature) analysis is carried out which will generate the data for the blade design. Blade profiles are generated using in house codes (GTRE), 3-D model is generated, meshing is carried out using Ansys TURBOGRID, and 3-D flow analysis is carried out using Ansys CFX 16.0.

The objective of this project is to design and analysis of a multi stage Low Pressure Compressor (LPC) Fan Blisk. Gas Turbine Engine compressors provide the compression part of the engine's thermodynamic cycle. They are used to increase the pressure of incoming air to the combustor.

1-D flow analysis of LPC Blisk, blade profile generation and the 3-D analysis of the design using Ansys CFX are done. For a Multi stage analysis, stage efficiency calculation, surge margin calculation, generating compressor characteristics curve for 4mm, 6mm and 8mm and estimation of pressure loss.

Conclusion:

1. A literature study was carried out to design and analyse a multi stage low pressure axial flow compressor (LPC) for missile application and study the effect of axial spacing between the stages on the aero performance.
2. Based on design parameters like pressure ratio, mass flow rate, efficiency, a preliminary 1-D and 2-D calculations were carried out and parameters required for blade profile generation were estimated.
3. Grid sensitivity analysis was performed in Ansys Turbogrid 16.0 and obtained that Case\_2 is suitable for analysis.
4. CFD analysis was carried out in Ansys CFX 16.0 at design as well as off design speeds for a given inlet conditions and obtained performance characteristics like pressure ratio and efficiency with respect to mass flow for three different axial spacing configuration
5. Analysis shows that the massflow at 4 mm axial spacing is higher by 1.2% compare to 6mm and 8mm spacing, this is because of the lower spacing, the losses between the stage is less.
6. It is also observed that, efficiency is higher by 1.8% and surge margin is higher by 2.8% with 4mm spacing compare to 6 mm and 8mm.

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Internship, GTRE, DRDO