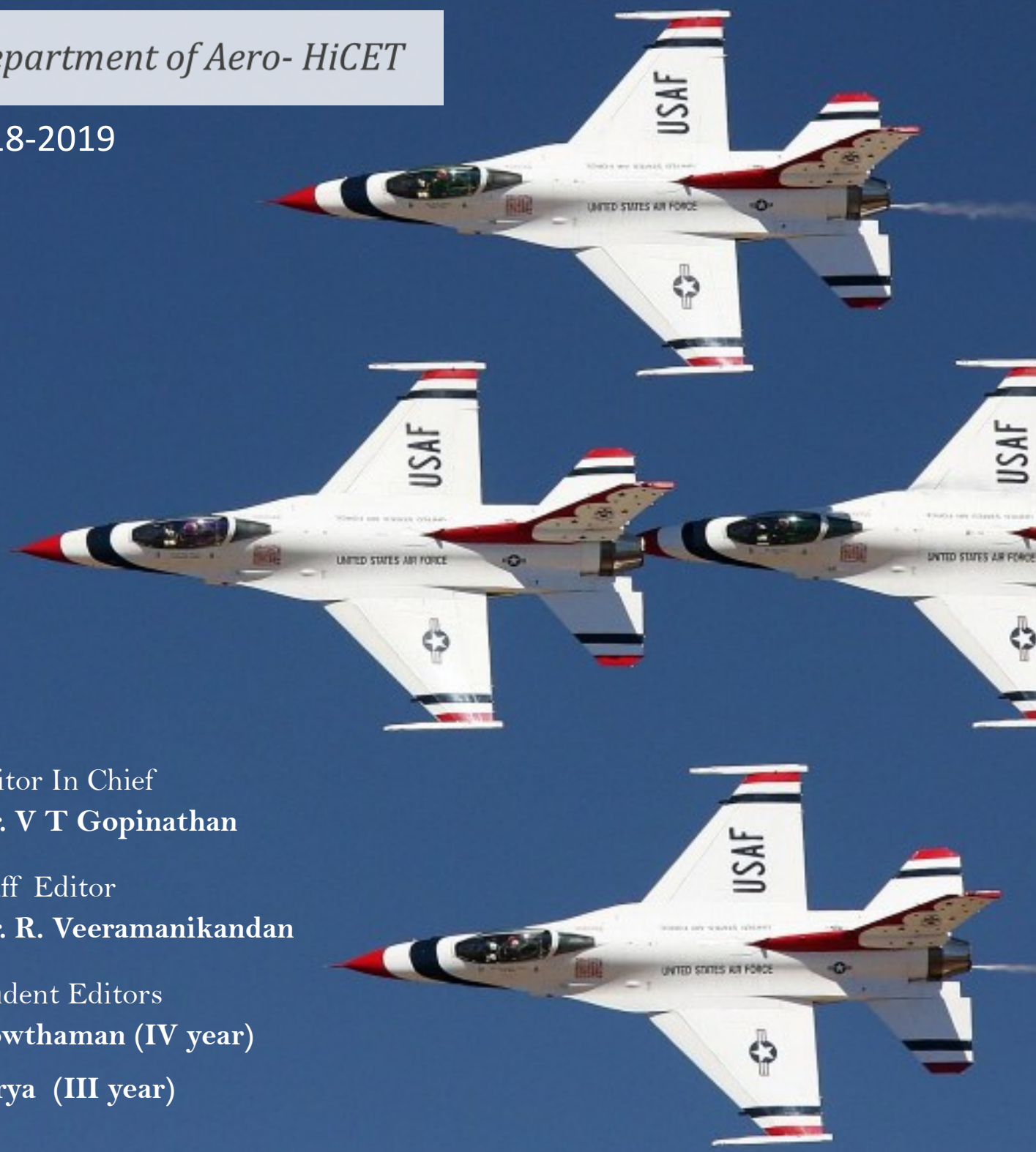
Aero Annum

Department of Aero- HiCET

2018-2019



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About the Institution

Hindusthan College of Engineering and Technology (HiCET) Coimbatore, established in the year 2000 by the great Industrialist and Philanthropist, Thiru.T.S.R.Khannaiyann of Hindusthan Educational Trust whose determination and dynamism made possible the realization of this institution of excellence. Surrounded with natures pristine beauty and an excellent infrastructure coupled with dedicated and experienced faculty has made the campus a much sought-after abode of learning. HiCET is one of the premier technological institutions inculcating quality and value based education through innovative teaching learning process for holistic development of the Students. The institution is recognized under Section 2(f) and 12B of University Grants Commission (UGC) and is an autonomous institution affiliated to Anna University , Chennai with permanent affiliation for most of the programmes, approved by the AICTE and the Government of India. Accredited by the National Assessment and Accreditation Council (NAAC) with 'A' grade, National Board of Accreditation (NBA).

Institute Vision

To become a premier institution by producing professionals with strong technical knowledge, innovative research skills and high ethical values.

Institute Mission

IM1:To provide academic excellence in technical education through novel teaching methods.

IM2:To empower students with creative skills and leadership qualities.

IM3: To produce dedicated professionals with social responsibility.

About the Department of Aeronautical Engineering

The Department of Aeronautical Engineering was established in the year 2005 and now headed by Mr.V.T.Gopinathan**.** The Department also inaugurated the Aeronautical Students' Engineering Association (ASEA) in March 2008. The Department is directed by a dedicated team of teaching and non-teaching staff with a wide range of experience, and it has well-equipped laboratories and good infrastructure to support the autonomous curricular needs. Until now, the department has been in the forefront of advancing aeronautical education and indigenous research in the field of aeronautics. The department has received numerous funds under different schemes for various projects. On the year 2018 the UAV lab and UAV club was established to invent and support the UAV sector. Signed MoU with Government ITI, Coimbatore to train students of Drone pilot trade.

Department Vision

To be a global player and prepare the students with knowledge, skills, and ethics for their successful deployment in Aeronautical engineering.

Department Mission

M1:To nurture the students technically based on current trends and opportunities in the global Aerospace industry.

M2:To develop the students as innovative engineers to address the contemporary issues in the aeronautical field.

M3:To inculcate professional and social responsibility based on an innate ethical value system.

Program Educational Objectives (PEOs)

PEO 1: Graduates shall exhibit their sound theoretical, and practical knowledge with skills for successful employment, advanced education, research, and entrepreneurial endeavors.

PEO 2: Graduates shall establish deep-rooted mastering abilities, professional ethics, and communication alongside business capabilities and initiatives through lifelong learning experiences.

PEO 3: Graduates shall become leaders and innovators by devising engineering solutions for social issues in care of modern society.

Program Specific Outcomes (PSOs)

The graduates will be able to:

PSO 1: Apply the knowledge of aerodynamics, structures, propulsion, avionics, and aircraft maintenance to give solutions for complex engineering problems.

PSO 2: Use progressive methodology and tools involving design, analyze, and experiment in aircraft design.

HoD's Message

The Department of Aeronautical Engineering, Hindusthan College of Engineering and Technology were established in the Year 2005 with a sanctioned intake of 60 students. The sanctioned intake increased to 120 from the academic year 2008-2009 onwards**.** The department endeavors to impart quality education in Aeronautical Engineering and to produce Engineers of excellence, and strive to be one of the best institutions in Aeronautical domain. We provide the best teaching faculty, high-tech labs and infrastructure. Our Students are securing ranks consistently at the University Level and the department has the excellent placement record every year. The graduated students are pursuing their higher studies at premier institutes in India and Abroad. Our Students have participated in various technical events at national and international level and won awards. I am sure in times to come many students from our department will make incredible mark nationally and internationally. We hold firm belief in our ability to succeed, practice human values, and show attitude of self-reliance, confidence and commitment. Students of our department will show a high level of professional competence in their respective areas. I wish my students all the best for all their endeavors.

HoD /AERO

Automated Drone Surveillance in Railways

R Saravanan AP –AERO

The usage of UAV (Unmanned Aerial Vehicles) – widely known as 'drones' – is being increasingly investigated in a variety of surveillance scenarios. Being an emerging technology, several challenges still need to be tackled in order to make drones suitable in real applications with strict performance, dependability and privacy requirements. In particular, the monitoring of transit infrastructures represents one critical domain in which drones could be of huge help to reduce costs and possibly increase the granularity of surveillance. Furthermore, drones pave the way to the implementation of smart-sensing functionalities expanding current capabilities in railway monitoring, to support automation, safety of operations, prognostics and even forensic analyses. In this paper we provide a survey of current drone technology and their possible applications to automated railway surveillance, taking into account technical issues and environmental constraints. A current experimentation with drone intelligent video will be addressed, highlighting some preliminary results and future perspectives.

Electrically conductive polymeric composite for lightning strike protection of aircraft

Ms. Jayameena (IV AERO)

A still increasing use of polymeric composites in manufacturing of aircraft structures contributes to the decreasing of overall mass of vehicles, which leads to decreasing of fuel consumption and reduction of emissions to the environment, and simultaneously retaining or even increasing their mechanical properties. The use of polymeric composites, besides their numerous advantages, has a drawback: the polymers used in aircraft industry are electrically insulating, which causes that such structures are compliant to the lightning strikes and derivative effects like extremal heating in the area of plasma channel, which leads to the thermal decomposition of a polymeric matrix and pyrolytic processes in this area and surrounding and ablation of the reinforcement; generation of an acoustic shock waves, which influence mechanically on the stroked composite structure, etc. Therefore, the appropriate lightning strike protection (LSP) solutions are necessary to prevent or at least lower the damaging of aircraft composite structures during the lightning strike.

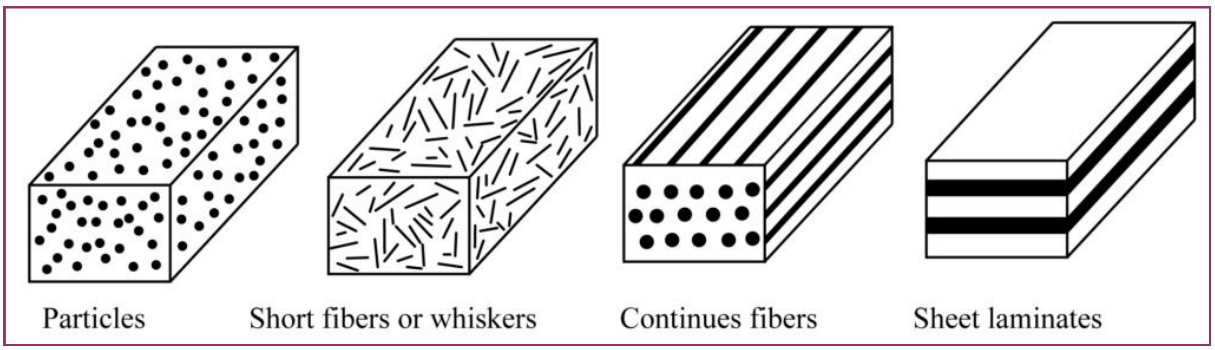
Current LSP solutions used in commercial aircraft composite structures are based on impregnation of meshes or foils made of highly conducting metals and alloys. Such solutions reveal significant decrease of damaged area after the lightning strike, which is justified by numerous theoretical and experimental studies, however, they cause increasing of mass of structural elements and significantly complicate the manufacturing process. It should be mentioned that the solutions based on impregnation of metallic meshes and foils allow for decreasing the damage extent, but do not eliminate the problem. Thus, the new solutions that allow increasing resistance to atmospheric discharges and simplify the manufacturing process are highly desired.

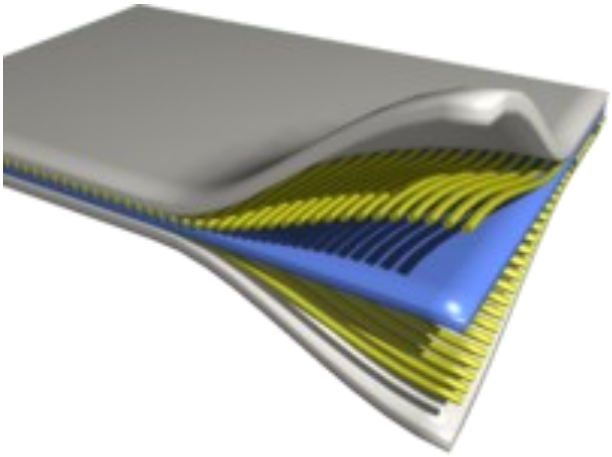
Several attempts in LSP solutions have been made during last decades. These solutions cover using metallized sprays and coatings, metallization of reinforcing fibers and dispersion of micro- and nanoscale conducting particles. However, in the case of using metallized sprays and coating the content of metallic particles is quite high, while the LSP effectiveness is low, therefore such solution found an application primarily in electromagnetic shielding of aircraft [1]. Covering of the reinforcement by metallic layers or dispersing metallic particles in the polymeric matrix of a composite increases the mass of a structure, since the content of particles should be high (in order to form critical percolation cluster). Moreover, the problems with adhesion between metallic particles and polymer may appear.

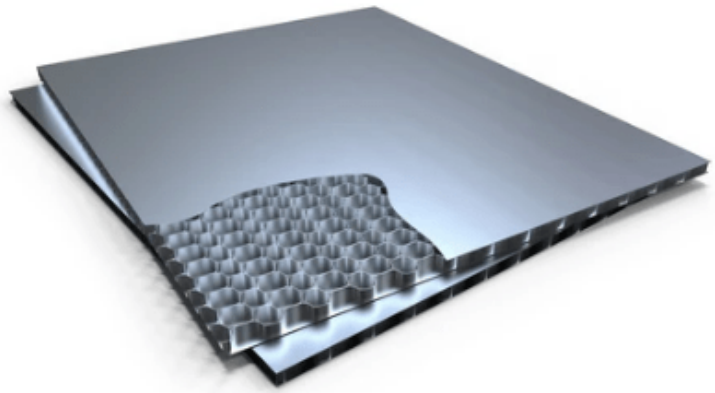
The last group of above-presented solutions is based on dispersion of carbon nanostructures (CNS) in the dielectric matrix, which is an effective alternative to the impregnated metallic meshes, i.e. CNS increase significantly the electrical conductivity of a resulting material, however, such solutions are still too expensive to apply them into industrial manufacturing of structural elements of aircraft.

Another solutions which may solve the above-mentioned problems is a possibility of using the intrinsically conducting polymers (ICPs) as a conducting filler of composites. Their application allows increasing electrical conductivity significantly, while the mass of the resulting composite structure remains similar. Several studies on using ICPs as conductive fillers for LSP applications have been performed to date. Jeon proposed composite made of polycarbonate (PC) and polyaniline (PANI), Jia investigated composites of epoxy resin and PANI-dodecylbenzenesulphonic acid, similar composites were studied by the authors of in terms of their electrical properties. A special attention should be paid to the studies of Yokozeki and his team, where the authors described synthesis, mechanical and electrical properties as well as lightning damage resistance of CFRP composites with a matrix of PANI/epoxy composite with various dopants. As the previous and on-going research studies ICP-based composites show, this solution seems to be a promising direction for LSP applications, and the doped PANI seems to be the mostly studied conductive filler in such composites.

The following study presents recent attempts of the group of authors on modeling, simulating, and then synthesis and characterization of PANI/epoxy composites which can be considered as a matrix of CFRP aircraft composites with increasing resistance to the lightning strike damaging. In this study the authors reported the concept of the developed material formulated basing on the results of numerical simulations, description of synthesis process as well as determination of fundamental physicochemical, mechanical, thermal and electrical properties of the developed material. The final studies cover high-voltage tests and characterization of damage sites caused by high-voltage electrical discharges.







Concept of electrically conducting polymeric composite

Among the wide range of ICPs, only several can be applied commercially, i.e. polypyrrole (PPy), poly(3,4-ethylenedioxythiophene) (PTh) and PANI. Exhibiting high conductivities together with chemical and electrochemical stabilities makes them advantageous materials to be used in surface and coatings technology [21]. They could be also considered as a filler of a matrix of composite with LSP properties.

For the synthesis of polyaniline (PANI), aniline (Acros, purity 99.8%), sulfuric acid (Acros, concentration 96%, purity 99%), ammonium persulfate (POCH, purity 99.9%), methanol (POCH, purity 99.9%), ammonia (POCH, concentration 25%, purity 99.9%) and 10-camphor sulfonic acid (TCI, purity >98%) were used as received. The epoxy resin was made from commercially available epoxide Epidian 6 (Ciech, MW <700 g/mol) and amine hardener IDA (Ciech) with the volume content of PANI from 20% to 70%.

Preliminary numerical simulations of a thermal response of the developed conducting composite during the lightning strike were performed in order to evaluate the influence of a presence of the PANI particles in the composite on resulting damage sites. The problem was defined as a transient heat transfer one with a source of heating resulting from a lightning. The calculations were performed for the 30% vol. content of PANI

Conclusions

In the following paper the results of theoretical and experimental studies focused on development of the new all-polymeric material with a possibility of conducting electrical current dedicated for matrices of aircraft composite structures were presented. Preliminary computations allow for evaluation of a content of the selected conducting polymer, polyaniline, in the resulting mixture of conducting and dielectric polymers in order to reach the compromise between conductivity and integrity.