INDUSTRY/ACADEMIC PARTNERS







SEONICS



- Explosion effects on structures NRB, New delhi, NSTL, Visakhapatnam, NPOL, Cochin
- **Projectile impact** CVRDE, DRDO, Chennai
- Mine blast effects CVRDE, DRDO, Chennai
- Materials for blast / impact mitigation CVRDE / NSTL , DRDO
- LS-DYNA Software Livermore Software Technology Corporation (LSTC). KAIZENAT Technologies Private Limited(KTPL)
- **Sensors** Structural Solutions Private Limited, PCB Piezotronics.
- Development of bird strike test facility M/s SEONICS, Bangalore
- **Development of polyurea coatings** M/s Saichem Coatings Private Ltd, Chennai.



Saichem Coatings Str

FACULTY



Dr. K. Ramajeyathilagam, Senior Prof, Group Lead Specialization: Impact, Blast, Crash and Shock

Mr. Stanley Samlal Asst. Prof Specialization: Bird Strike, Impact



Mr. C. Suresh Asst. Prof Specialization: Underwater explosion, Water entry shock

Contact Us: Structural Impact and Crash Simulation Centre (SIMCRASH) School of Aeronautical Sciences Hindustan Institute of Technology and Science, OMR, Padur, Chennai India – 603103.



STRUCTURAL IMPACT AND CRASH SIMULATION CENTRE







STRUCTURAL IMPACT & CRASH SIMULATION CENTRE



FOCUS IMPACT & CRASH

ESTABLISHED: JANUARY, 2017



Structural Impact and Crash Simulation Centre was established on 12th January 2017 at the Hindustan Institute of Technology and Science (HITS) to promote educational and research activities in the field of structural impact and crash analysis. The centre bridges the gap between the industries, research institutes and the University with a distinct capability to harness the intellectual energy of academia to solve the real time problems faced by the industry and the defence forces

RESEARCH AND INNOVATION IN THE FIELD OF STRUCTURAL **IMPACT, CRASH, SHOCK AND EXPLOSION** CONSULTANT FOR DEFENCE AND INDUSTRIAL APPLICATION LEARNING CENTRE FOR TRAINING ON STRUCTURAL IMPACT AND CRASH SIMULATION PROBLEMS

RESEARCH INTERESTS



IMPACT





BIRD STRIKE



WATER ENTRY SHOCK

ADVISORY BOARD



Dr. C.P Ramanarayanan Director General (Aero),DRDO



Dr. M.A Muthu Manickam Jt.Director CVRDE





Dr. P.V.S Ganesh Kumar Group Director NSTL



OBJECTIVES

***** To carry out Interdisciplinary research in the areas

of structural impact, crash, blast, shock etc.

- * To design structures for high velocity impact and shock loads
- * To train manpower in the area of Shock and Vibration through Ph.D. programmes



* To undertake Sponsored research projects and Consultancy work in the areas of bird strike, underwater explosion, project impact, mine blast, water entry shock, traumatic brain injury etc.



TRAUMATIC BRAIN INJURY (TBI)

UNDERWATER EXPLOTION

MINE BLAST



Dr. Rajeev Jain , Sc 'G' Group Director, GTRE



Dr. Uma Maheswar G.E. India



Prof. S. K Battacharya IIT(M)

> Evaluation of Numerical Bird Material Model Parameters Through the Dynamic Test of Bird Projectile

- Dr. K. Ramajeyathilagam & Mr. Stanley Samlal Funding Agency: GTRE (DRDO)

A CARS project from GTRE, Bangalore, DRDO to measure the temporal pressure variation on a rigid plate during bird strike and simulate the same numerically using homogenous bird models with suitable bird density and material model parameters of the bird and correlate the numerically predicted temporal pressure variation with experiments and fine-tune the numerical model using suitable material parameter of the bird.



Coupled Fluid-Structure Interaction Studies due to Underwater **Explosion Around Submerged Composite Pressure Hull**

> - Dr. K. Ramajeyathilagam & Mr. C. Suresh Funding Agency: NRB (DRDO)

A multi lab (NSTL, NPOL) research project from Naval Research Board (NRB), DRDO to study the fluid-structure interaction effects due to underwater explosion on the composite pressure hull of submersible and also establish the modelling techniques for explosive, water medium and structure.Conduct shock experiments on submerged cylinders at NSTL shock tank for various shock factors and measure the structural damage and establish the failure sequence for composite cylindrical shells. Numerically model the shock problem for the composite sonar dome (NPOL) and composite propeller (NSTL) and establish the failure sequence and validate with shock experiments on air- backed and water backed panels.



ONGOING PROJECTS

> Simulation of Traumatic Brain Injury (TBI)

An in-house R&D project from HITS to study the brain injury effects due to blast loads on a human brain model numerically using finite element method and relate the shock pressure levels to various brain failures in the temporal, parietal, frontal and occipital lobes of the brain.



> Structural integrity and crew safety enhancement of crew cabin of battle tank to mine blast loading using advanced composites

An R & D project to study the feasibility of using composites and poly urea coating aimed at increasing the structural integrity and crew safety of the crew cabin of battle tank to mine blast loading and projectile impact. The project envisages carrying out detailed analytical and numerical study for structural strength to projectile impact and for strategic locations as per STANAG 4569 mine blast loading and establish optimum design parameters in terms of composites, poly urea coatings. The study also includes the testing of one set of modified design for projectile impact and mine blast loading.



- Dr. K. Ramajeyathilagam & Mr. Stanley Samlal Funding Agency: HITS

- Dr. K. Ramajeyathilagam & Mr. Stanley Samlal Funding Agency: CVRDE (DRDO)



MAJOR FACILITIES

The centre has established a simulation laboratory for impact and crash equipped with multi core LS-DYNA Software to serve the research needs of the students and faculty of the university.



Compressed Air Gas Gun - designed to generate very high velocities.



Drop weight Impact Tester – used for low velocity impact studies



It is also planned to establish fuselage drop test facility with data acquisition systems to augment the above facilities.

ABOUT SIMCRASH

Structural Impact and Crash Simulation Centre (SIMCRASH) is a multidisciplinary research centre dedicated for solving real world structural impact and crash problems through the application of modelling and simulation techniques and to develop new approaches in material modelling for structural impact crash problems. The response of structures and materials subjected to dynamic loading has been a subject of interest for aeronautical, automotive, military, civil and mechanical engineering. Understanding the behaviour of structures to structural impact loads such as Bird strike on gas turbines, aircraft wing leading edge, aircraft fuselage canopy, hail ice impact on aircraft, projectile/ missile impact and air blast loading on aircraft are challenging issues for the aircraft designers for both civil as well as military applications. In other engineering applications underwater explosion loading on submarines / ships, vehicular impact, underground mine blast, collision of vehicles / trains, metal forming are some of the structural impact problems. Traumatic Brain Injury (TBI) is one of the high velocity impact that affect the mankind very seriously. This centre aims at bridging the gap between the academia and the Indian industries in this field.



Dr. O.R Nandagopan, Director, Naval Science and Technological Laboratory (NSTL), DRDO delivered a lecture on "Simulation of Underwater Explosion"





