UAS Modeling and Simulations

Computational Fluid Dynamics (CFD) Lab, Department of Mechanical and Energy Engineering

- **High-Fidelity Simulations of UAS Aerodynamic and Acoustic Signature**
  - Modeling the complex flow physics around a flying UAS using two In-house CFD solvers
  - Predicting the generated noise at far-field
- **Development of Physics-Based Reduced Order Models**
  - Integrated CFD and machine learning methods for fast predictions during UAS design steps to optimize the platform
  - Improve in-flight control mechanism using reduced order model
- **Development of Numerical Techniques for Modeling Extremely Morphing UAS platforms**
  - Modeling new design UASs such as bird-inspired UAS using an innovative immersed boundary method
  - Modeling smart UAS with adjustable rotor and wing shapes based on the flight condition
- **UAS Uncertainty Quantification and Risk Analysis**
  - Non- intrusive methods including Monte Carlo (MC) without and with metamodel and polynomial chaos (PC) to study the environmental condition uncertainty
  - Developing hybrid uncertainty quantification techniques (intrusive and non-intrusive approaches) for multi physics problems
- **UAS Collisions with Flying Objects**
  - Modeling flying objects and their interactions with quadcopters using CFD coupled with Discrete Element Method