ScMvr-20

Advanced Rotorcraft Aeromechanics Research

S&T Campaign: Sciences for Maneuver
Platform Mechanics

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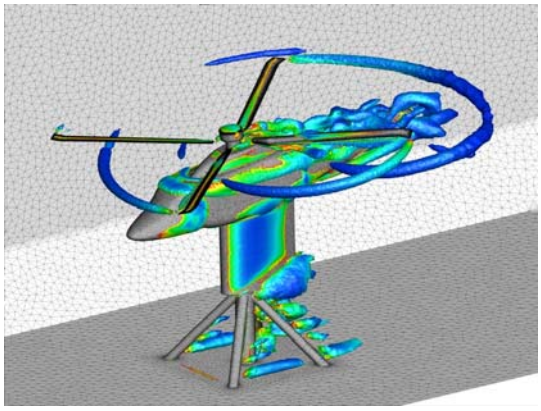
Research Objective

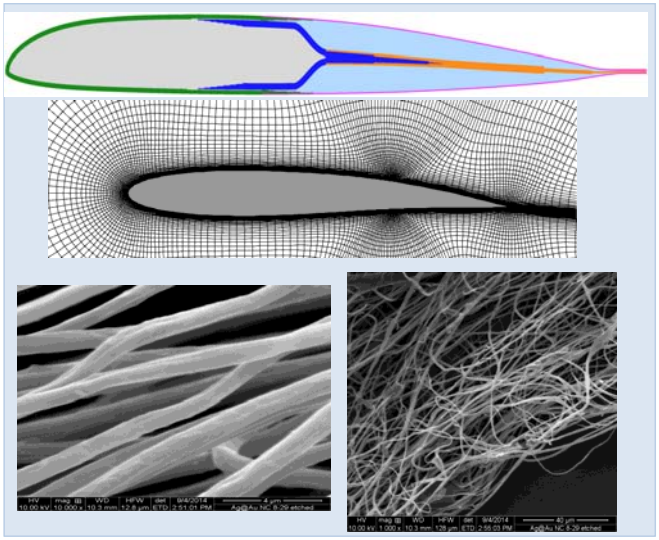
- Exploratory research to enable rotorcraft capabilities that are beyond the current state of the art
- New morphing structures based on approaches for swashplateless control and hybrid nanocomposite structures as a new approach to passively enhance aeromechanical stability



Experimental and analytical research of active twist rotor

Challenges

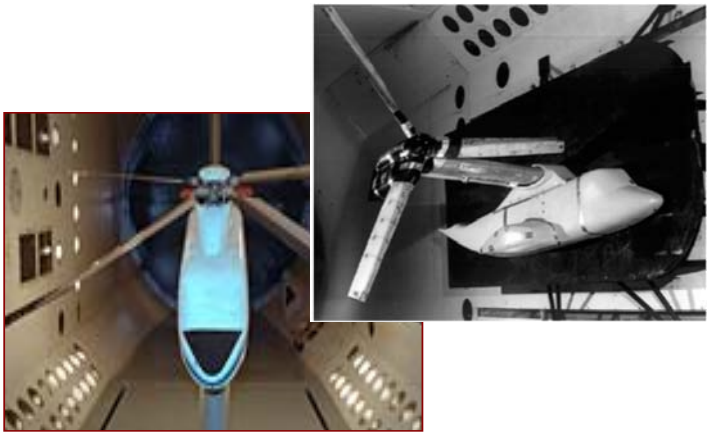
- Viable approach for swashplateless helicopters has yet to be developed
- Vulnerabilities and performance of morphing trailing edge flap concept has yet to be demonstrated.
- Interfacial load transfer and energy dissipation mechanisms in nanocomposite are not fully understood



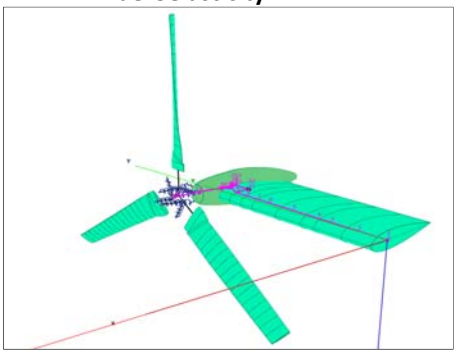
Morphing structure and adaptive hybrid nanocomposite research

ARL Facilities and Capabilities Available to Support Collaborative Research

- Transonic Dynamics Tunnel at NASA Langley is uniquely suited to testing future Army rotorcraft configurations
- Specialized wind tunnel facility exists for conducting aeromechanical stability and rotorcraft aeroelasticity studies
- Air or R-134a heavy gas may be used as test medium
- ARL has a field element at NASA Langley to leverage unique facility for rotorcraft aeromechanics studies



Experimental edgewise rotor and tiltrotor aeroelasticity



Analytical rotor aeroelasticity

Complementary Expertise/Facilities/ Capabilities Sought in Collaboration

- Advancements in morphing structures
- Fabrication of hybrid nanocomposite structures (i.e., conventional fiber reinforcement with carbon nanotube matrix inclusions)
- Passive approaches for aeromechanical stability enhancement

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