

## S&T Campaign: Sciences for Maneuver Platform Mechanics

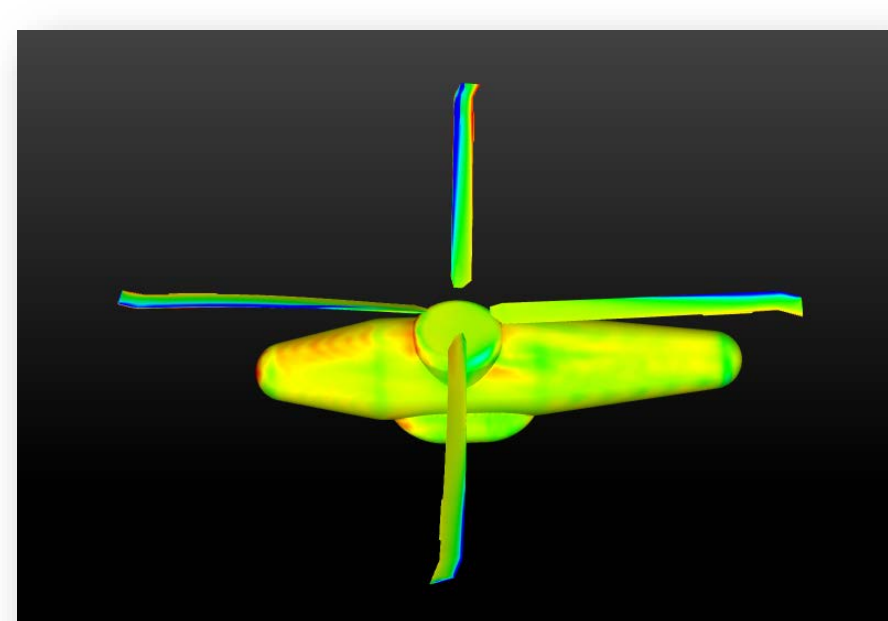
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## Research Objective

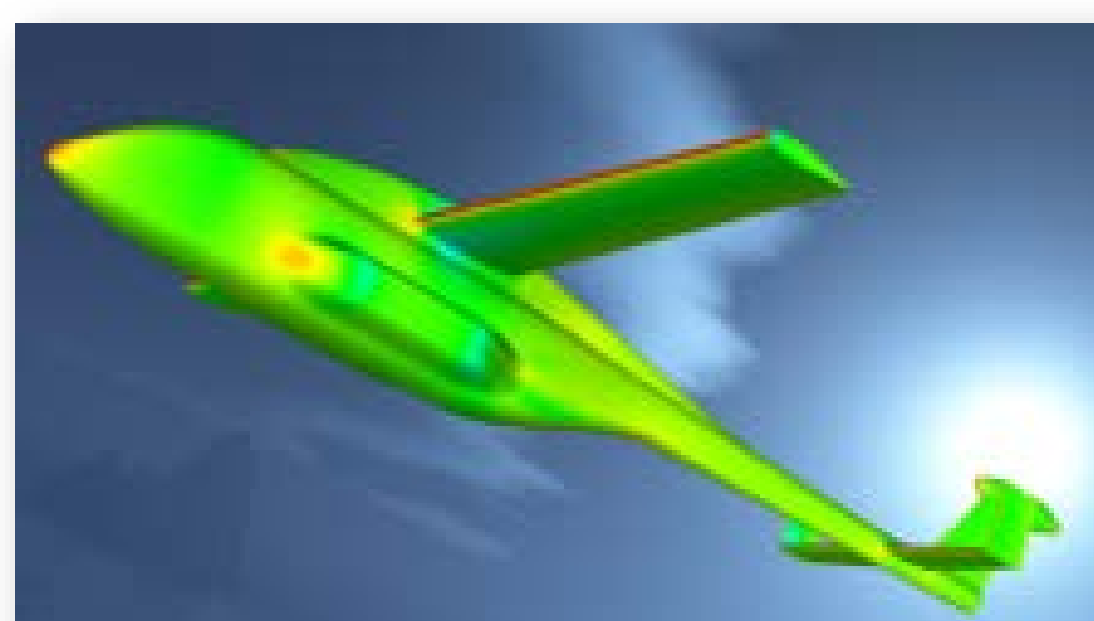
- Computational and experimental investigation of aeromechanics for rotorcraft and unmanned aerial systems
- Research to enable development of rotorcraft capable of high speeds and hover efficiency

Active rotor technologies



Flight mechanics of rotorcraft configurations

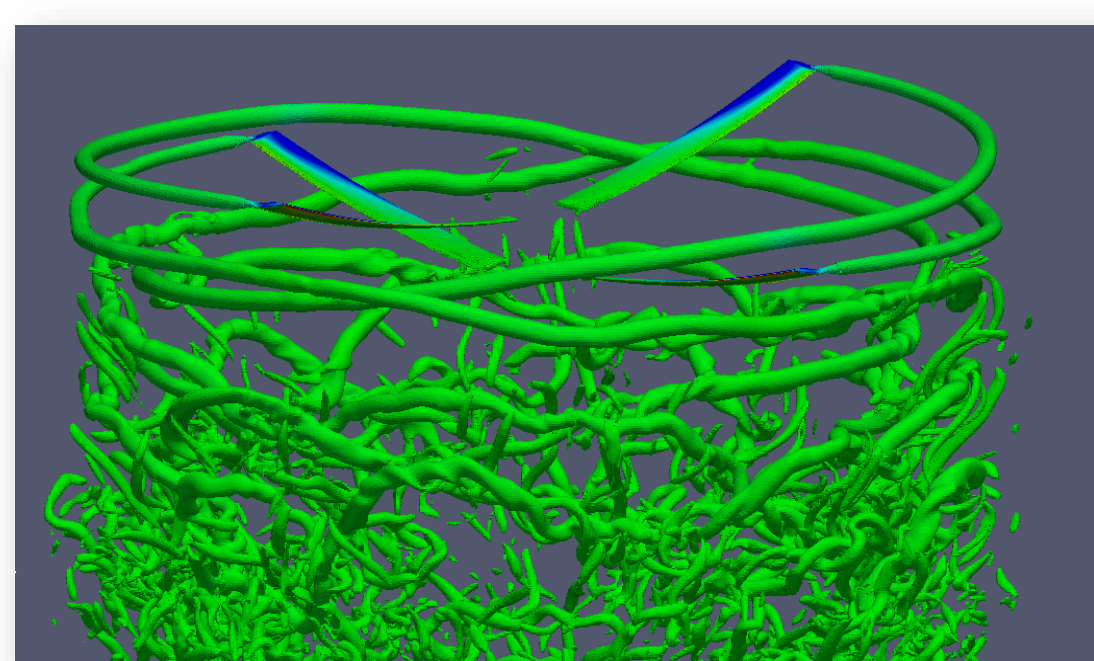
Platform drag reduction



Aeromechanics of rotor systems



Computational and experimental research on VTOL systems and subsystems



## Challenges

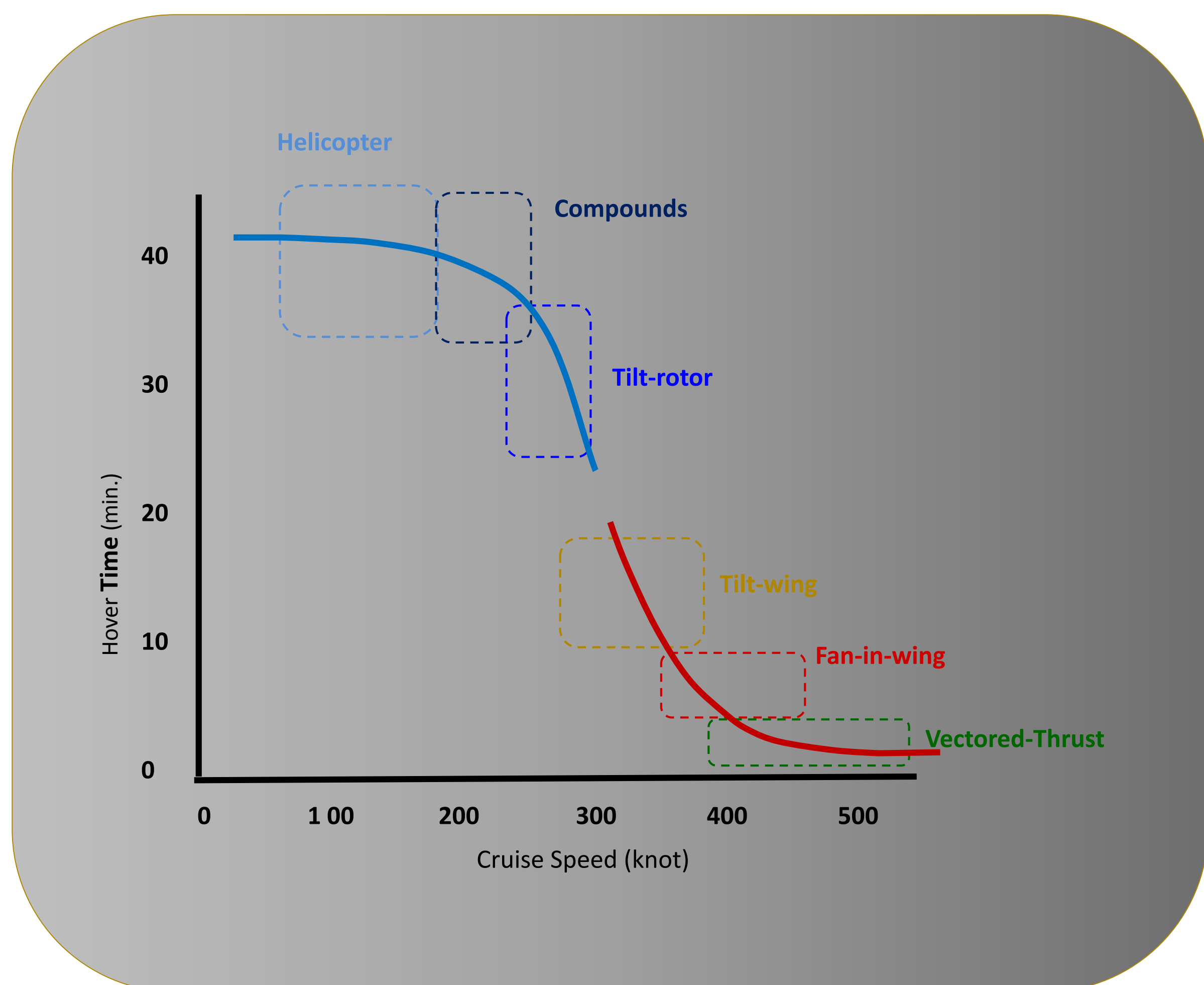
- Vertical Take-Off and Landing (VTOL) designs so far have been unable to increase top speed without unacceptable compromises in range, efficiency, and useful payload
- Reconfigurable vehicle platform is needed to minimize performance trade-off penalties in different flight regimes

## ARL Facilities and Capabilities Available to Support Collaborative Research

- Access to High Performance Computing resources along with several modeling and simulations tools
- Rotorcraft aeromechanics comprehensive analysis packages (CAMRAD-II and RCAS)
- Rotorcraft CFD/CSD simulation packages (Helios)
- Ducted rotor test stand for simultaneous measurement of duct and rotor forces
- Personnel with over 100 years of combined research experience in rotorcraft aeromechanics, design and analysis
- Computational tools and low-speed wind tunnel aerodynamics research on micro-autonomous systems
- Transonic dynamics tunnel for Mach-scaled wind tunnel tests
- Multidisciplinary design optimization for rotorcraft concepts
- Rotorcraft flight simulators for virtual flight demonstrations of aeromechanics technologies
- Facility for flight experimentation of small unmanned aerial vehicles (UAVs)

## Complementary Expertise/Facilities/Capabilities Sought in Collaboration

- Coaxial rotor test stand for experiments on rotor in hovering flights
- Wind tunnel for rotorcraft scaled experimental research with a test section area greater than 50 sq. ft. and capable of speeds greater than a 0.2 Mach number
- Anechoic chamber for rotor aero-acoustics experiments
- Capability for active flow control experiments using plasma
- Expertise in active shape morphing for structures
- Expertise and capability in shape memory alloys for morphing rotor concepts
- Water towing tank for aerodynamics research



Current hover time and cruise speed capabilities of various rotorcraft configurations