



U.S. ARMY  
**RDEC**

Aeromechanics for Rotorcraft and  
Unmanned Aerial Systems



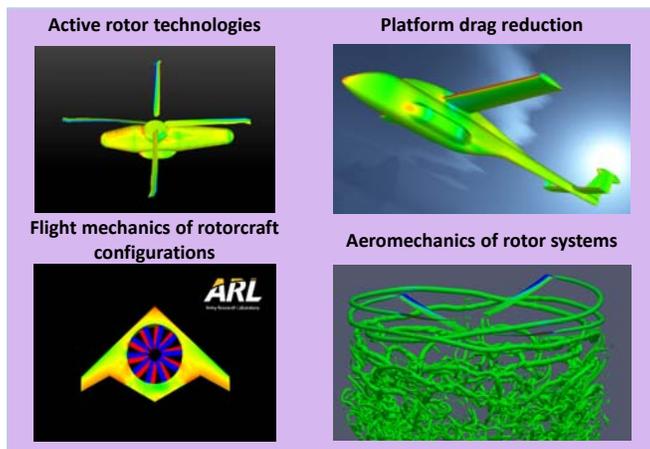
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## S&T Campaign: Sciences for Maneuver Platform Mechanics

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### Research Objective

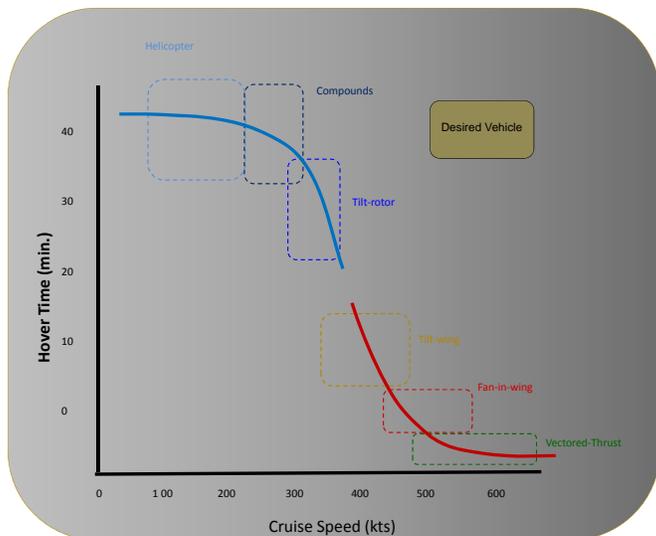
- Computational and experimental investigation of aeromechanics for rotorcraft and unmanned aerial systems
- Research to enable development of rotorcraft capable of high speeds and hover efficiency



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



Current hover time and cruise speed capabilities of various rotorcraft configurations

### 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