Vertical Lift Performance, Reliability, and Survivability Research Center

S&T Campaigns: Analysis & Assessment Sciences for Maneuver

Rick Grote
(410) 278-6294
ricky.l.grote.civ@mail.mil

Elias Rigas
(410) 278-8809
elias.j.rigas.civ@mail.mil

Dy Le
(410) 278-9829
dy.d.le.civ@mail.mil

Research Objective

- Provide opportunities for Government, Industry (large & small) and Academia to collaboratively develop solutions that enhance performance, reliability, and survivability for both Military and Civilian vertical lift aircraft operations.
- Develop test and analysis capabilities to assess complex rotorcraft designs with multifunctional capabilities of next-generation vertical lift airframe structures, which also exhibit “fatigue-Free” characteristics.
- Develop innovative complex analysis tools required to address new mission requirements, increased performance levels, and multifunctional structure gaps.

Source: Bell Helicopter

Joint Multi-Role Rotorcraft Technology Demonstrators

Source: Sikorsky-Boeing

ARL Facilities and Capabilities Available to Support Collaborative Research

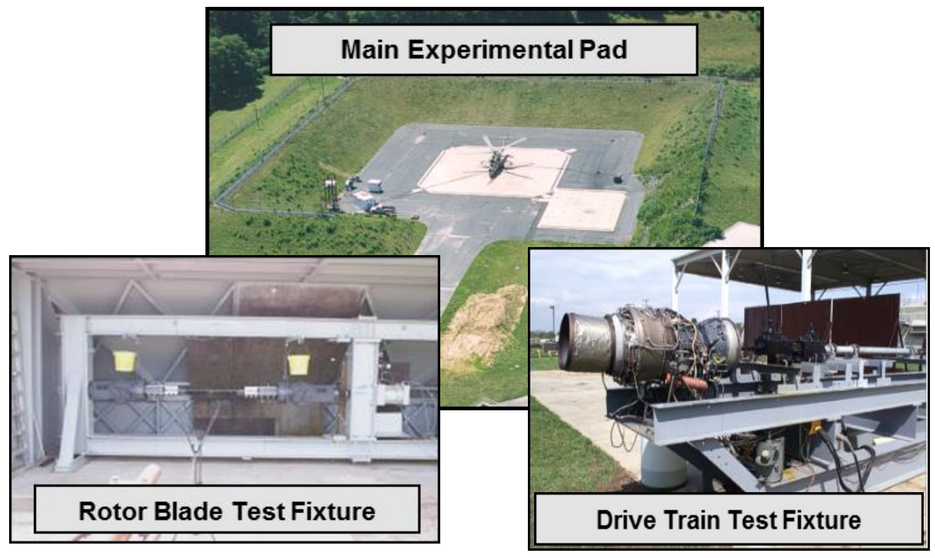
- Extensive ballistic experimentation facilities.
- Unique system, subsystem and component level test fixtures; Rotor Blade Rig, Static Drive Shaft Rig, Dynamic Drive Train Rig, specialize Fuel Fire and Spill Containment .
- Operational helicopters available for testing.
- Unique Reliability and State Awareness Testbed facility
- Software development capability to integrate new models into existing analysis tools.
- Material prototyping capabilities
- Aerodynamic modeling, reliability, and aircraft fatigue research expertise through ARL’s Sciences for Maneuver.

Complementary Expertise/ Facilities/ Capabilities Sought in Collaboration

- Academic and industry partners to develop research center concept and priorities
- Composite material penetration physics.
- Physical properties of complex materials and structures including fatigue, material damage precursors, embedded sensors, self-healing materials, and multiscale modeling.
- Structural fatigue and probabilistic remaining useful life prediction computation and methods.
- Interactive tradespace analysis across performance, life cycle costs, and “ilities”.

Challenges

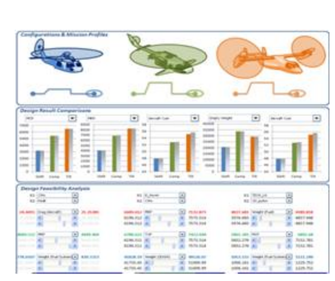
- Insufficient ballistic tolerance of flight critical components. Explore ballistic damage mechanisms and residual performance capabilities.



- Lack of innovative tools and technologies to (1) advance materials properties to enable multi-functionalities, (2) capture damage indication prior to onset of physical degradation, (3) enable micro-to-macro real-time multiscale modeling, (4) determine platform risk-informed capability, and (5) reconfigure flight controls to accommodate damage and mission requirements.

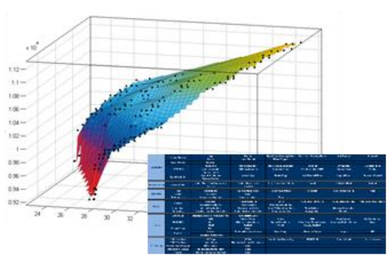
Reliability State Awareness Testbed Facility (RSAT)

- Insufficient tradespace analysis capability to conceptualize, analyze, tradeoff, and select complex technologies. Need algorithms for linking design decisions, requirements, life cycle cost, performance, environment, reliability, manufacturability, and vulnerability to ballistic, cyber and EW threats.



Interactive user value elicitation

Immersive technology trade-offs and exploration



Deep tradespace exploration

Virtual and physical experimentation