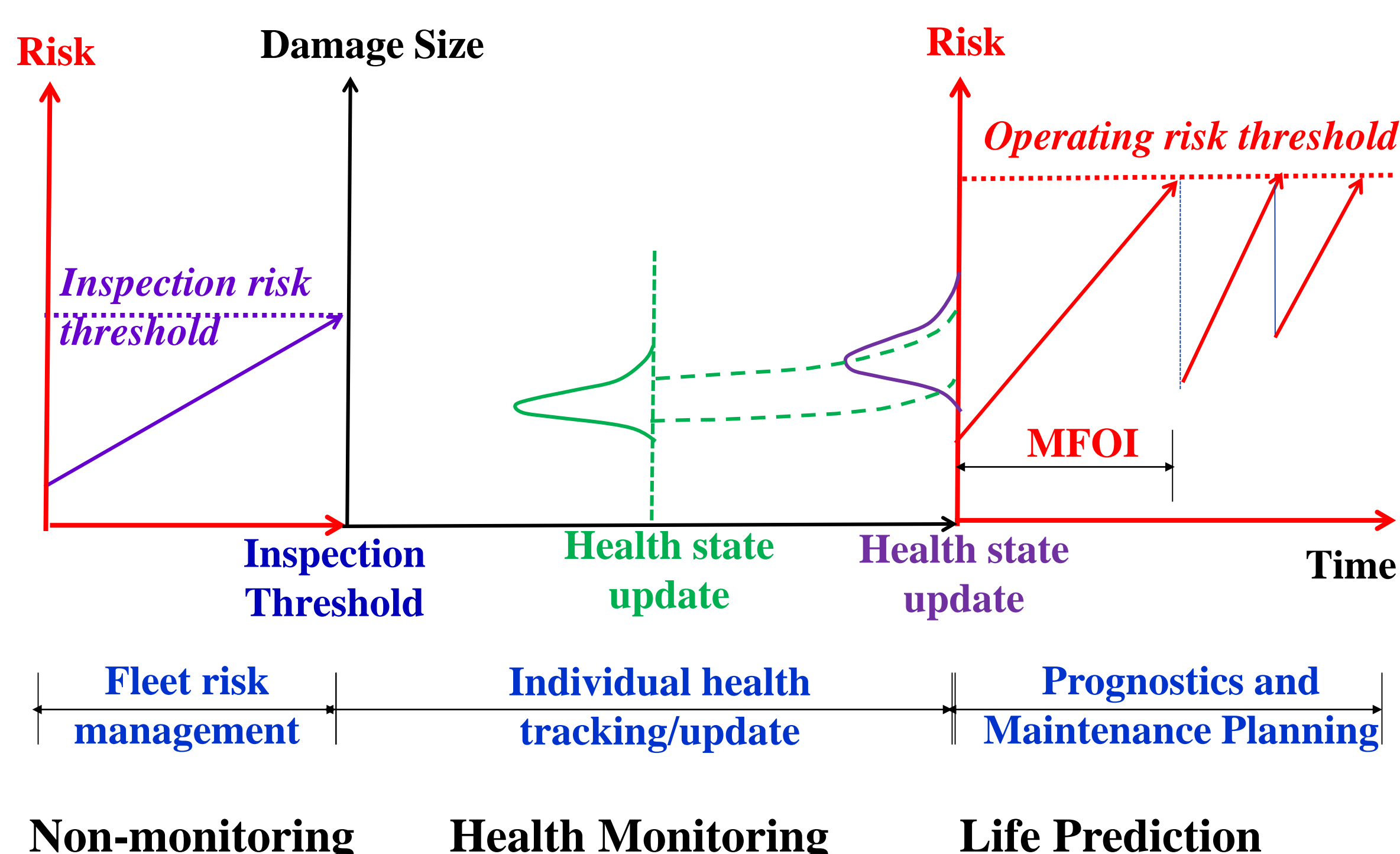


S&T Campaign: Sciences for Maneuver Logistics & Sustainability

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Research Objective

Develop a cradle to grave fatigue design and risk assessment/management with health monitoring for next generation rotorcraft structural and mechanical components using a probabilistic and damage tolerance-based framework



ARL Facilities and Capabilities Available to Support Collaborative Research

- Four 22-kip servohydraulic load frames with 6" stroke, and 1–30 gpm servovalve capacity
- One 5.5-kip, 1000 Hz load frame with 1" stroke
- Fixture
 - Hydraulic grips for specimen thickness 0" – 0.75"
 - Compression platens
 - ASTM D695: End-loaded compression
 - ASTM D5379: V-notch shear
 - ASTM D6484: Open hole compression
- 16 –channel, low frequency, ultrasonic conditioning unit
- Frequency range: 20KHz to 2.3 MHz
- Used to detect cracks and crack locations in structural components, and fiber breaks and delaminations in composites

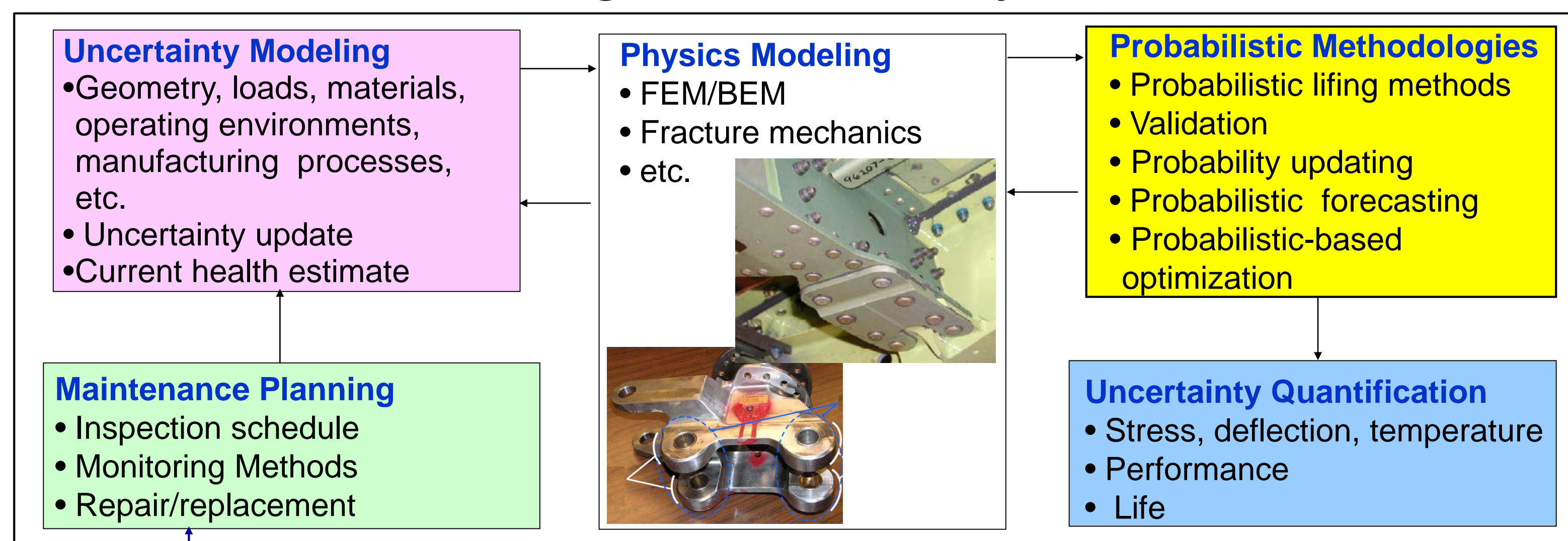
Challenges

- Uncertainty quantification for probabilistic analysis
- Sensor technology development for high sensitivity to component damage
- Deep learning based on big data from heterogeneous sensing
- Development of functional relationships among damage states and damage features
- Probabilistic lifing development for various damage stages

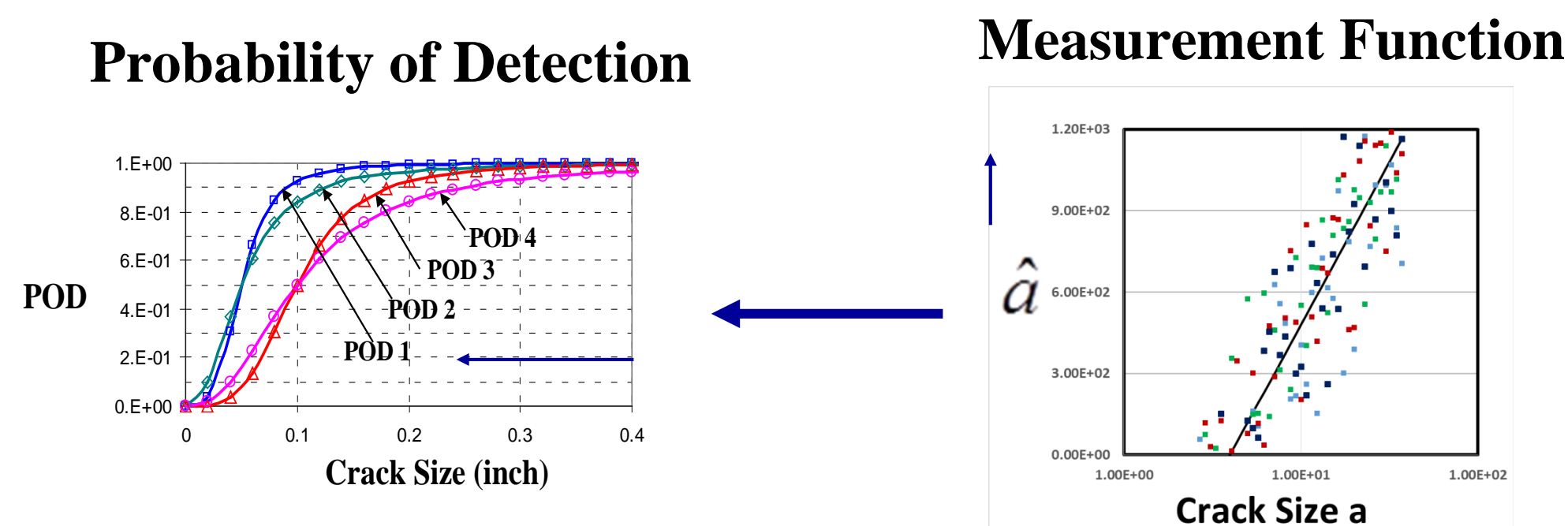
Complementary Expertise/Facilities/Capabilities Sought in Collaboration

- Expertise in lifing methods for structural and mechanical components
- Expertise in health monitoring system development and data analysis
- Modeling and simulation for damage progression and failure prediction
- Expertise in probabilistic life estimation

Probabilistic Damage Tolerance Analysis with Maintenance



Data Collection and Analysis



Structural Health Monitoring Test

