

A DDDS for Structural Health Monitoring
and Critical Event Prediction

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STRUCTURAL HEALTH MONITORING



- ✱ Support design for safety and performance
 - worst case stimulus scenario (initial/boundary conditions and loads) for safety is often unknown at design time:
 - * nonlinear effects
 - * multidisciplinary effects
 - set of potential stimulus conditions is sometimes too large to allow case-by-case analysis
 - uncertainty quantification is still in its infancy

➔ *many deployed structural engineering systems are not flawless*

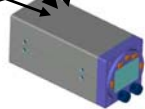




AND CRITICAL EVENT PREDICTION



On-board Sensing & Processing



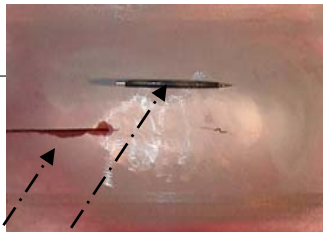
Pilot Display of Crisis



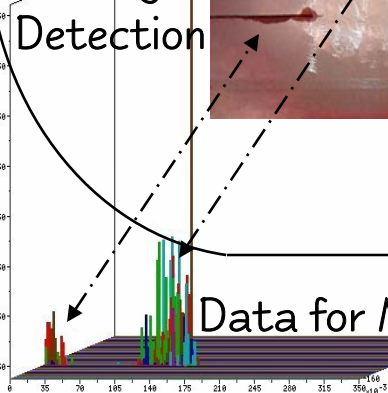
On-Demand Maintenance

On-line Prognosis & Processing

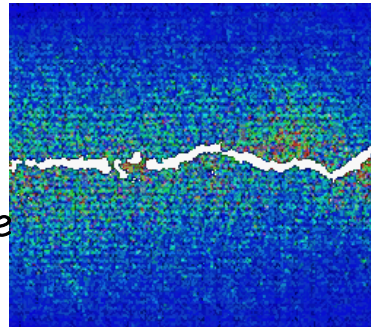
Damage Detection



Data for Model Update



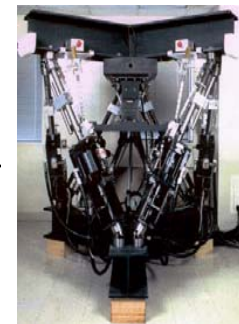
High-Performance Off-Line Prognosis by Modeling and Simulation



Detailed Report

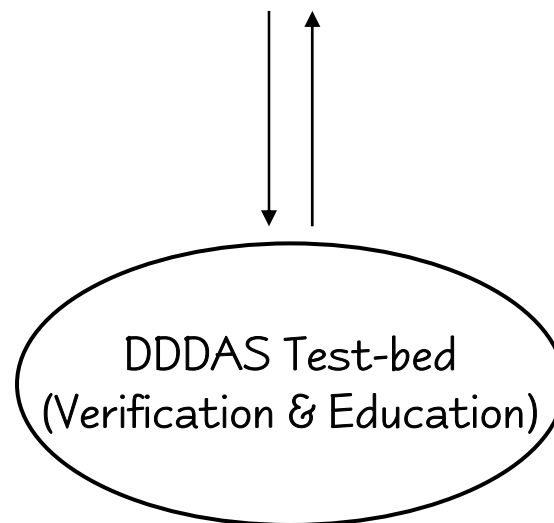
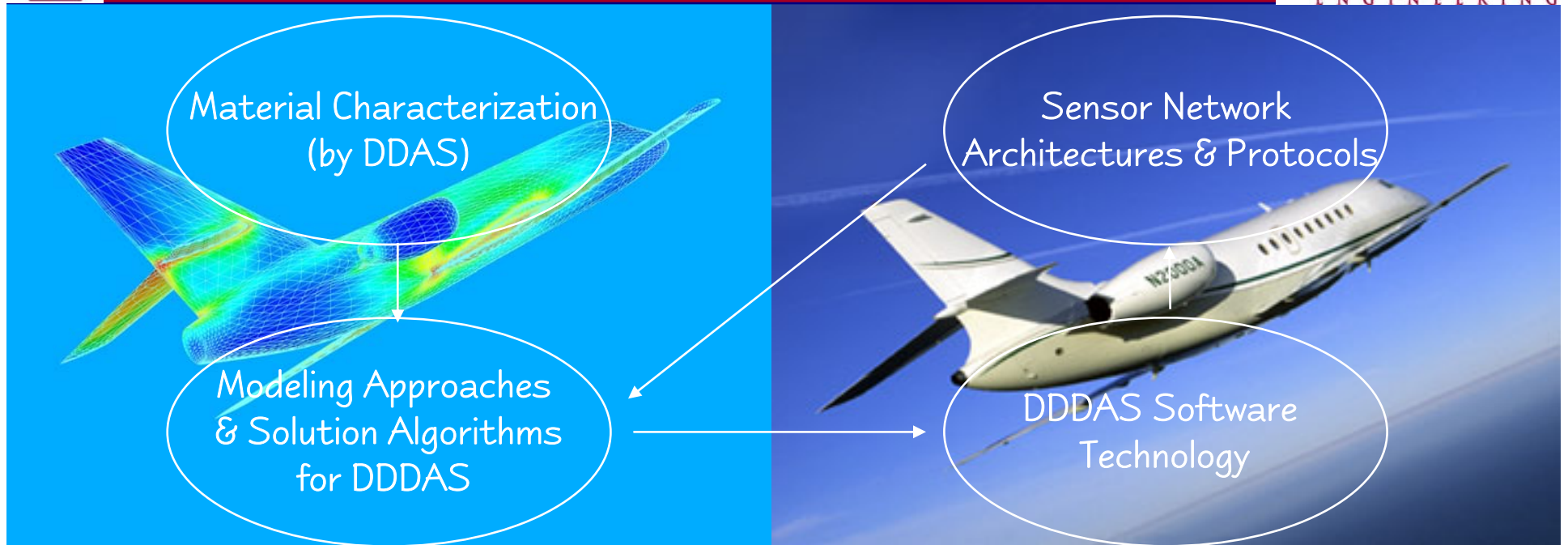


Material Characterization





DDDAS CONCEPT





ADDITIONAL ENABLED CAPABILITIES



- ✱ Platform management
 - operational life
 - service needs
 - damage assessment
 - overall battle readiness

- ✱ Crisis management
 - computer-aided decision tools
 - informed decision making process

- ✱ Real-time computing
 - hybrid numerical/data-driven domain decomposition
 - time-domain parallel processing