Integrated Vehicle Health Management and Wireless Applications
Boeing Research & Technology
Presentation Abstract
February 23, 2009

The Boeing Research & Technology's (BR&T) role at The Boeing Company is to facilitate the development and transition of emerging technologies into Boeing products to provide a competitive advantage. Boeing aerospace products include spacecraft and commercial and military aircraft as well as logistics and maintenance support for these platforms. To address our customer's need for value both in the platform performance and life cycle cost, BR&T has created a Health Management Engineering Environment (HMEE) to foster and transition health management technology from industry, academia and government technology base to Boeing Products. The HMEE consists of a:

- Program Analysis and Modeling Environment,
- Development Environment and an
- Operations Environment.

The Program Analysis and Modeling Environment provides the processes and tools to perform performance/cost driver analysis, root cause analysis, solution formulation, and cost/benefit trade studies including fleet simulation modeling. The Development Environment provides the design processes and synthesis tools required to develop solutions. The Operations Environment provides the processes and tools to integrate, test and mature the hardware and software elements of the health management solution. Major elements of the HMEE are an open software reference architecture, access to hardware laboratories to characterize degraded components/ subsystems, a data repository to store and access laboratory and field data, and hardware and software to support end to end technology demonstrations. It will support progressive levels of integration and demonstration from a single technology on a PC to the integration of this technology into a complete Integrated Vehicle Health Management (IVHM) system with hardware in the loop as needed to provide vehicle data and address integration into vehicle avionics or a ground support system. Significant elements of the HMEE are in place with additional expansion and integration ongoing. The Boeing Phantom Works IVHM team is acquiring hardware, tools and algorithms from a number of suppliers to create a pool of resources for system level, end to end demonstrations of IVHM applications and development tools.

A major focus of this laboratory is to investigate technology to access the platform data needed to implement diagnostics or prognostics. Current avionics architectures are designed to control the platform and support redundancy management. The support of ground maintenance is limited to the downloading of Built In Test (BIT) indications. Advanced diagnostics and prognostics applications frequently require higher bandwidth data and additional sensors such as accelerometers. Utilization of the higher bandwidth data requires either downloading this data or onboard processing to reduce the communication bandwidth. Either approach requires implementing additional processing, storage and/or communications hardware on the platform. Wireless technology offers a means to circumvent some of the barriers (e.g., cost, weight, power) associated with processing. BR&T is investigating the augmentation avionics systems with wireless capability as a means to implement IVHM.