MxD 15-05-03	Category: ECO, Quoting Process, Recurring Manufacturing, PO to 1st Article
Title:	Lower Life Cycle Costs, Improve Design & Performance Robustness through the Digital Thread
Completion Date:	2018-05-08
Project Team:	Rolls-Royce, Boeing, Deere and Company, Georgia Tech, Sentient Science, Pennsylvania State University (PSU)
Coordinator Contact:	Suryavamshi Murthy suryavamshi.n.murthy@rolls-royce.com
For Additional Information:	If you are a member of MxD (formerly DMDII), go to https://portal.dmdii.org/. If you are not a member of MxD, contact Tyler Vizek (Tyler.Vizek@mxdusa.org).

Problem:

Current tools and methods used in the design of products and systems have very limited capacity to support automated knowledge sharing for decision making in life-cycle considerations. The deficiency is particularly acute at the product subsystem/system level. Therefore, there is a need for solutions enabling digital integration of the wide array of stakeholders across the value chain, including suppliers, and tracking the part/ system variability impact on product life-cycle cost and performance. The data produced by existing information systems, such as computer aided design (CAD) and design for manufacturability (DFM) systems, are already in electronic format. But all the information required to make a decision may not be available, may lack consistency, and may not be expressed in a general format.

Summary:

To address this deficiency, we have developed and demonstrated an advanced pervasive systems architecture that would enable new technologies and models to be integrated within an original equipment manufacturer's (OEM's) product life-cycle feedback loop. This would enable information and data integration across system and seamless feedback architecture through digital thread within an information technology (IT) structure accounting for proper intellectual property (IP) protection, export controls, and facilitation of optimization of lifing, performance, and cost. A high fidelity network system simulating the individual life-cycle stage (such as design, manufacturing, test, operations, etc) along with data and a knowledge converter module is wrapped into a system framework that has been exercised as required to enable optimization. The individual models incorporate process and data information relevant to the specific attribute/life-cycle stage. The data output from this simulation system is then converted into actionable knowledge to make decisions to improve design, manufacture, inspection, and assembly and to optimize the various interdependent "-ility" topics (e.g., system reliability, affordability) under consideration.

The team consists of four levels of suppliers—Airframe OEM (The Boeing Company), Major Non-Aerospace Conglomerate (John Deere), Engine OEM (Rolls-Royce, program lead), and SME for Life Predictions of Gearbox Components (Sentient Science). The team also includes Academia Members (Georgia Institute of Technology and The Pennsylvania State University). The performance period was 18 months, with major milestones achieved in 12 months. The high level deliverables from this program are the following: Generic Base Framework, Technical Demonstration, and Transition Plan.