



ManTech/SBIR Effort Drills Into Time and cost of JSF Production

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WRIGHT-PATTERSON AIR FORCE BASE, OH -- Thanks to Air Force Research Laboratory's Manufacturing Technology and Small Business Innovation Research--enabled results, technology supporting affordable, high-rate, and ergonomically sound production practices is transitioning to the Joint Strike Fighter program. The new technology comprises three F-35 Inlet Duct Robotic Drilling cells. The ManTech-influenced, SBIR-produced fully automated cells--which can drill left, right, and aft composite inlet ducts and aluminum frames--are undergoing integration into Northrop Grumman Corporation's new integrated assembly line for producing the aircraft's center fuselage. NGC's newly procured assets will be installed and operational in 2010, offering full-rate production for the F-35 by 2014.

The IDRD cells meet the JSF program's fundamental requirements of affordability and high-rate production, enhancing both manufacturing process repeatability and product quality as related to F-35 inlet ducts. In eliminating difficult manual drilling processes that require excessive tooling and time-consuming, ergonomically unsound labor, they use less hard tooling (and thus, floor space) and meanwhile reduce the span of effort from about 50 hours to around 12 hours per duct. In terms of their cost-effective utility, the cells translate to a potential cost avoidance of approximately \$40 million for the JSF program, with a return on investment of 5.3 years. As an added benefit, the precision closed-loop metrology developed as the cells' key enabling technology has merit for robotic positioning applications needed by military and industry users alike.



An Inlet Duct Robotic Drilling cell at work (AFRL image)

The IDRD cells represent an upgrade from robotic drilling methods that rely on specialized end-effectors and positional software routines. While providing acceptable drilling accuracy for fourth-generation tactical fighter aircraft, these methods are insufficient for fifth-generation fighters such as the F-35. These aircraft--which require higher positional-hole-drilling accuracy and inside-to-outside duct drilling techniques--demand an innovative robot guidance architecture that differs from traditional robot or computer numerically controlled drilling applications.

The transitioning IDRD cells--which provide such a solution--culminate ManTech efforts initiated in 2006, ongoing through 2007 (with SBIR awards to various contractors), progressing to Manufacturing Readiness Level (MRL)-7 in January 2009, and achieving (to date) MRL-8 maturity. ManTech and the F-35 Joint Program Office have consequently started two SBIR Phase III spin-off efforts for creating an articulated-arm robotic drilling cell. The combined results of the original IDRD program and the spin-offs will yield appreciable savings in labor time and per-aircraft costs. In addition, the technology has significant potential for use in future aerospace applications.

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