

Report Documentation Page

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14. ABSTRACT Lockheed Martin Aeronautics Company (LMAC), Fort Worth, TX, is experiencing issues when drilling advanced aluminum composite stacked skin material for the F-35 Joint Strike fighter (JSF). The current tooling (drill) requires slower feed rates than desired due to the necessity of drilling through air gaps between the composite and aluminum stacks. LMAC demands are increasing for the drilling of the aluminum composite stacked material used in the forward fuselage, and wing assemblies on the F-35 JSF aircraft. Therefore, LMAC called upon the National Center for Defense Manufacturing and Machining (NCDMM) to lead a collaborative effort to research various drill geometries in order to find a more efficient solution for drilling these components to the specifications required by LMAC.					
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F-35 Aluminum Composite Stack Drilling

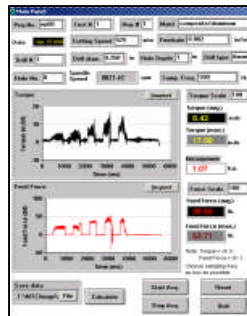
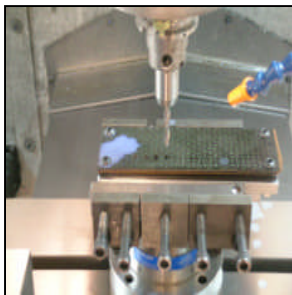
NCDMM Project No. 04004205

PROBLEM / OBJECTIVE

Lockheed Martin Aeronautics Company (LMAC), Fort Worth, TX, is experiencing issues when drilling advanced aluminum composite stacked skin material for the F-35 Joint Strike Fighter (JSF). The current tooling (drill) requires slower feed rates than desired due to the necessity of drilling through air gaps between the composite and aluminum stacks. Chip evacuation during the drilling operation is also an issue; chips can get trapped within the air gap between the two material stacks and erode the composite material on the exit side of the hole. The current tooling also creates higher drilling forces than desired by LMAC.

LMAC demands are increasing for the drilling of the aluminum composite stacked material used in the forward fuselage, and wing assemblies on the F-35 JSF aircraft. Therefore, LMAC called upon the National Center for Defense Manufacturing and Machining (NCDMM) to lead a collaborative effort to research various drill geometries in order to find a more efficient solution for drilling these components to the specifications required by LMAC.

Dynamometer Testing & Results



cutting forces associated with them. Once the drill geometries and drill forces were evaluated, the drilled holes were measured and the data recorded to LMAC's specifications.

The results of this effort identified key elements necessary in the development of an advanced cutting tool solution.

With the assistance of NCDMM's Alliance Partners, the NCDMM and LMAC were able to combine key technologies, and jointly developed an optimum drill geometry that will eventually replace the current drill being used at the LMAC facility.

Implementation and Technology Transfer

The following process and tool recommendations were made to LMAC:

- Verification of the process to be implemented in the future at LMAC
- New feed rate tailored towards the development of an advanced cutting tool

Expected Benefits

Lockheed Martin can expect the following benefits from the new drill geometry:

- Increased productivity
- Less chips trapped within the air gap between the two materials
- Better hole quality

LMAC is expected to manufacture a total of 2,723 F-35 JSF aircraft, over the life of the program.

TIME LINE / MILESTONE

Start Date..... February 05
Recommendations Made January 06

ACCOMPLISHMENTS / PAYOFF

Process Improvement

The NCDMM initiated the development of a solution by having test coupons, supplied by LMAC, machined and assembled with a .015" air gap between the two material stacks to LMAC's specifications.

A team decision between NCDMM and LMAC was made on what drills would then be tested. Testing began by evaluating various drill geometries and the

PROJECT FUNDING

NCDMM Effort \$70K

PARTICIPANTS

Kennametal Inc
Lockheed Martin Aeronautics Co., Fort Worth, TX
Precorp Inc.
Westmoreland Mechanical Testing & Research Inc.

For additional information concerning this project, contact the NCDMM at www.ncdmm.org