

# ManTech Improves Affordability of F-35 Canopies

## The Challenge:

The largest component of the F-35 Lightning II canopy is a continuous shell of thermoformed acrylic. Textures imparted to the exterior and interior surfaces of the shell during forming must be removed using labor-intensive hand-held vibratory sanding equipment. The work is tedious, the risk of inadvertent damage to the shell from the procedure is considerable, and the process represents a significant portion of the labor effort.



## ManTech Response:

- A Navy ManTech project adapted an automated precision sanding system, developed under an Air Force Small Business Innovation Research program with Aerobotix, Inc., for use on acrylic transparencies
- Both subscale and full-scale demonstration were required as some optical problems only show up over larger or more curved surfaces
- With precise position and force feedback in the sanding head, the robot was 'trained' to duplicate the hand sanding results to include sanding with various grits to improve adhesion and coating durability
- Testing conducted to ensure that the process does not impart polishing stresses in the acrylic surfaces
- Solution uses a modern industrial robot with a vibratory polishing head that is able to sand with heavier grits and polish with fine rouge-type materials to provide clean optical surfaces

## ManTech Response (cont):

- Navy ManTech Investment of \$1.1M

## Impact:

- Demonstrated low-cost method of automated transparency clean-up that meets the requirements of the F-35 program and is safe for operator use
- Reduced process variability
- Appreciably reduced the amount of touch labor to produce a single transparency
- Reduced manual direct labor in the initial transparency forming process
- Technology applicable to F-18 canopies and implemented on F-35 in FY16

**Total Estimated Cost Savings of nearly \$170M**

## PARTICIPANTS

Office of Naval Research (ONR) Navy ManTech, Composites Manufacturing Technology Center, GKN Aerospace Transparency Systems, Aerobotix, Inc., NAVAIR, F-35 Joint Program Office