



National Center for Advanced Manufacturing Supporting NASA Exploration Goals Through Advanced Technologies

The National Center for Advanced Manufacturing is a partnership between NASA, the state of Louisiana and the University of New Orleans. Founded in 1999, the center provides research and advanced manufacturing technology for use in aerospace and commercial markets.



An aerial view of the manufacturing plant which houses the National Center for Advanced Manufacturing at NASA's Michoud Assembly Facility in New Orleans, LA. (LMSSC-MO)

Through this partnership, new welding, fabrication and material evaluation techniques developed by NASA and its partners remain integral to development of the space shuttle and NASA's next-generation exploration and launch vehicles – keys to the Vision for Space Exploration and NASA's exploration goals to return humans to the moon and travel to Mars and destinations beyond.

The National Center for Advanced Manufacturing is located on the 832-acre NASA Michoud Assembly Facility in eastern New Orleans. Managed by NASA's Marshall Space Flight Center in Huntsville, Ala., Michoud has a long, successful history and proven expertise in the manufacture and assembly of large aerospace systems and structures supporting NASA programs and projects.



A space shuttle external tank is on the move at Michoud Assembly Facility in New Orleans. (NASA/MSFC)

Michoud's primary responsibility is the design, manufacture, assembly and test of the external tanks – the single largest element of the shuttle, 27.6 feet in diameter and standing as tall as a 15-story building – for NASA's Space Shuttle Program. The facility is involved in the integration of composite materials, which offer lighter weight and equivalent-or-greater strength than metals, into the external tank design. Michoud also is responsible for development of lightweight pressurized tanks for advanced satellite and commercial reusable launch vehicle systems, and other advanced manufacturing techniques applicable to the aerospace industry.

The National Center for Advanced Manufacturing is under contract to the Marshall Center for material and process development technology to support NASA's exploration mission goals.

Advanced Technology

The National Center for Advanced Manufacturing features and has demonstrated several areas of advanced manufacturing technology for use in aerospace structures.

Friction stir welding is a solid-state, metal-joining process producing high-strength, defect-free joints in metallic materials. The

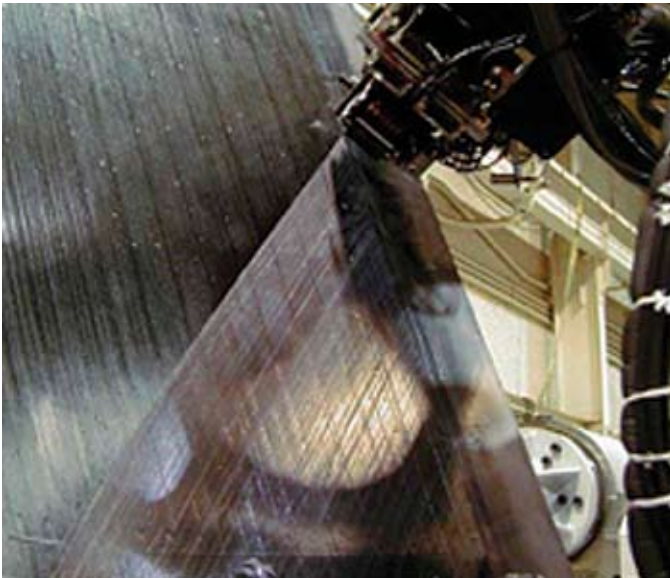
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process employs a pin tool with a low rotational speed and applied pressure that “mechanically stirs” two materials together to produce a uniform weld – a vital requirement of next-generation launch vehicles and hardware that must endure long-term space travel.



NCAM's Friction Stir Welding System produces a uniform weld as it joins the panels of an elliptical dome structure. (LMSSC-MO)

The center's Advanced Fiber Placement machine is used to manufacture large-scale, complex-shaped structures composed of composite materials. These materials, which offer lighter weight with equivalent-or-greater strength than metals, are increasingly used in airframes and other industrial products.



On the Advanced Fiber Placement Machine at the National Center for Advanced Manufacturing, courses are generally placed in orientations of 0°, +45°, -45° and 90° to build up plies, or layers, and maintain consistent properties in all direction on a material. (LMSSC-MO)

The 2nd Advanced Fiber Placement Machine is used for the manufacture of small- to medium-scale, complex-shaped structures composed of composite materials.

The Non-Destructive Evaluation System applies non-destructive evaluation techniques in the testing of composite materials by employing a twin 5-axis traveling column configuration and multiple inspection system capability. The system tests the strength, structural integrity and reliability of a component or material for use in the space environment.



NCAM's Non-Destructive Evaluation System measures 24 feet in diameter and is 12 feet high and 10 feet wide. (LMSSC-MO)

The Gantry Machining Center is a 5-axis, high-speed system that can machine complex components using multi-axis capability. This technology is capable of machining both composite and metal materials using a 24,000-revolutions-per-minute, 60-horsepower cutting spindle.



An engineer prepares composite material for machining on the Gantry Machining Center, which measures 23 feet in diameter and is 11 feet high and five feet wide. (LMSSC-MO)

The autoclave located at the center is capable of withstanding high temperatures and pressures. It applies heat and pressure in a controlled environment, providing the conditions needed to manufacture many of today's space-age composite materials. The 10-by-20-foot autoclave cures parts made from the fiber placement machine and other composite manufacturing processes.



The Autoclave at NCAM sits open as engineers prepare to cure a stack of components made from the center's composite manufacturing processes. (LMSSC-MO)

Research

Research at the National Center for Advanced Manufacturing focuses on advanced aerospace materials with an initial focus on the applicability of composite and metallic materials to advanced manufacturing technologies.

The following are some examples of research projects conducted by the College of Engineering at the University of New Orleans, which leads a consortium of seven universities where research is conducted. Abstracts are available for each.

- Cryogenic Microcracks Growth in Polymer Composites
- Non-Destructive Evaluation Techniques for Applications in Composites Manufacturing
- Space Launch Initiative/Friction Welding Risk Reduction Program

Education

The National Center for Advanced Manufacturing works with universities, industry and government to increase the levels of education and application in the area of composites manufacturing and technologies.

The center includes two on-site classrooms, providing students an interactive environment with engineers, scientists and researchers for engineering courses taught by the National Center for Advanced Manufacturing. Its educational program includes curriculum leading to a master's degree in engineering with an emphasis on composites.



One of two on-site classrooms at the National Center for Advanced Manufacturing. (NCAM)

The center also has the capability for state-of-the-art videoconferencing, allowing classes and seminars to be broadcast over the Web to individual computers interactively.

Faculty members associated with the National Center for Advanced Manufacturing conduct research in advanced materials processing technologies.

As part of the University of New Orleans' College of Engineering, the National Center for Advanced Manufacturing also offers advanced educational courses and distance learning to senior and graduate students and members of the aerospace industry in an effort to grow the minds of tomorrow's scientists, researchers and manufacturers.



NCAM's video conference system allows classes to be broadcast to NASA, various universities and industries. (NCAM)

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