



# Simulating more than ever



VERICUT is the leading CAD/CAM-independent NC program simulation tool. Latest developments have seen its composite tape and fibre placement capabilities strengthened, while a new development supports drilling and riveting machinery

**C**GTech's VERICUT Composite Applications are being used by leading aero component manufacturers to program and simulate automated fibre placement machines.

The latest version 7.1 of the software for composite applications, VERICUT Composite Programming (VCP) and VERICUT Composite Simulation (VCS), offers a number of key enhancements.

Delivering independent off-line programming and simulation for automated composite tape and fibre-placement CNC machines, the new VCP and VCS software suite provides significant benefits for companies producing composite components.

"Being independent of the CAD/CAM/PLM design software systems, such as Catia or Siemens NX, and also independent of the builder of the automated fibre placement machines, such as MAG, MTorres and Electro-Impact, provides a significant advantage," say CGTech managing

director John Reed.

"When software is separate from the machine and applied in a variety of applications, the software and underlying technology expands," he explains. "Thanks to extensive feedback from users, together with industry partners, both VCP and VCS have seen significant enhancements since the last release. For example, VCP now has enhanced processing capabilities, significantly reducing the time required to make changes to one or more plies. VCS has been enhanced with several new measurement tools and the ability to simulate ultrasonic knife cutting."

## READING THE SITUATION

VCP reads CAD surfaces and ply boundary information and creates fibre-placement paths to fill the plies, according to user-specified manufacturing standards and requirements. Layup paths are linked together to form specific layup

sequences and are output as NC programs for the automated fibre placement machine.

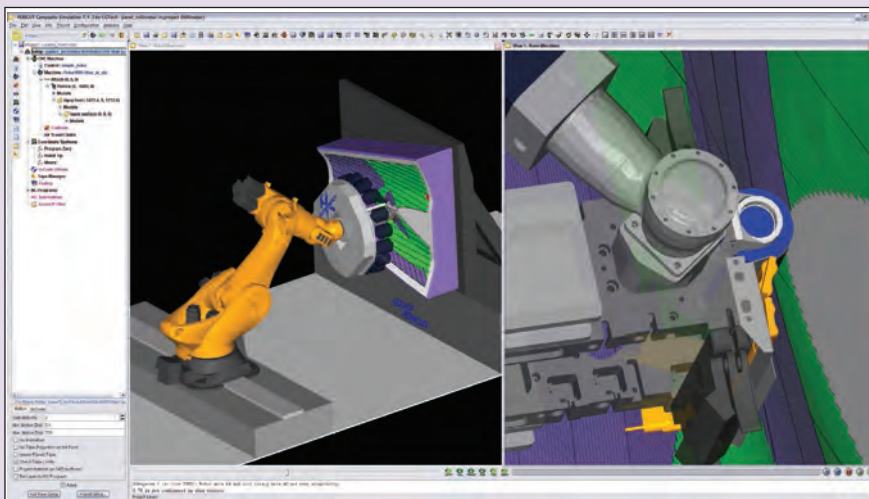
VCS reads the CAD models of the layup tool and fixtures, and simulates the layup sequence directly from NC program files, either from VCP or from other composite layup path-generation programming applications.

Tow material is applied to the layup form via NC program instructions in VERICUT's virtual CNC simulation environment. The simulated material applied to the form can be measured and inspected to ensure the NC program follows manufacturing standards and requirements. A report showing simulation results and statistical information can be automatically created.

"Material additive processes, such as fibre placement, are developing rapidly to match the demand from the aerospace industry for components with improved strength-to-weight ratios. At CGTech, we are fortunate enough to have the software development engineers to keep our products ahead of this technology-led curve, and the application experience in the field to understand what the industry needs," Mr Reed underlines.

CGTech has also recently revealed VERICUT Drilling & Fastening (VDAF) program, new software for simulating and programming auto-drilling and fastening machines.

Whether permanently fixing with cured adhesives, semi-permanently fixing with rivets or simply bolting various parts together, the assembly of structural aircraft parts always requires accurate drilling and fastening. To ensure this accuracy and process security,



**Complex composite machinery can be simulated accurately via CGTech's VCS software**

CGTech presented the first European preview of its new product for programming and simulation of the automated drilling and fastening machines used for airframe assembly at the recent Paris Airshow.

Also called 'layer drilling' or 'riveting' machines, these machines are used to assemble large aero-structures and it is clearly essential to avoid programming errors and collisions at such a late stage in the aircraft manufacturing process.

### DRILLING AND FASTENING

Based on the industry-leading VERICUT software, the VDAF system allows the user to program drilling and fastener assembly operations employing the same NC program code that will be run on the machine. Simulation is independent from programming, and VDAF can simulate NC programs from any programming system for any CNC-automated drilling and fastening machine in a virtual machine tool environment. It provides simulation to check for a variety of potentially disastrous error conditions.

Such situations include drilled hole or fastener in wrong position, missed hole or fastener, wrong hole size or fastener at incorrect position, hole not drilled through the stack, hole double-drilled or double-filled, wrong fastener for material stack, collision with structure, collision with tooling or collision with added fasteners.

The base simulation software is used to visualise and simulate drilling and fastening from NC program code. VDAF simulation is a universal software application, capable of simulating multiple CNC auto-drilling or auto-fastening machines.

A single license can simulate multiple different machines using a VERICUT Machine Configuration (VMC) for each machine. Every VDAF implementation requires at least one VMC.

VDAF simulates machine motion directly from NC program files to check for collisions and other potential process problems. VDAF simulation also checks specific auto-driller/fastener actions, such as: proper drilling and fastening through the stack; appropriate tool selection for specified hole or fastener parameters; properly inserted fastener

for given hole and stack call-out; and collisions with inserted fasteners.

The assembly to be programmed within VDAF contains an individual part model for each element of the CAD assembly, located in its proper assembled position. Each part's material is identified, as well as the clamp surface and any fixturing. VDAF's fastener locations are created from the CAD model's fastener locations and attributes, as read by the custom-tailored fastener reader utility.

These locations contain the attributes of a fastener and its location in the assembly. The set of fasteners and their attributes define the drill and fastener cycles to be used.

One or more reference locations may be selected, typically at Drilled at Assembly (DA) holes or temporary fastener locations. These selections invoke machine reference operations, but, typically, do not affect nominal locations in the NC program. Hole or fastener locations are grouped by local and global reference locations. Designating and activating reference holes create commands in the NC program to align the operation to the physical part.

Fasteners and operations are displayed in a tree dialog. The tree layout allows the user to group fasteners under tree branches, and order and re-order them as needed. The user interface clearly identifies the fasteners that have been processed and those that have not. Fastener information can also be

displayed in different ways to meet other user requirements. For example, fasteners may be displayed by type, diameter, length etc.

A Tool Library organises the drills and countersinks to be used in a simulation session. A Fastener Library contains models of specific fasteners that can be inserted by NC program commands.

### DEFINING THE ENVIRONMENT

VERICUT Machine Configuration (VMC) reads the auto-drilling/fastening NC program for a specific machine. It contains the definition of all drilling, fastening, utility cycles, and functions used in the NC program.

It then emulates the CNC logic necessary to accomplish a simulation of the NC program on the specific machine, including simulated fastener insertion. Simulated fastener insertion requires CAD models of the various fasteners that will be used in the assembly process (stored and organised in the Fastener Library).

The post-processor formats the auto-drilling/fastening paths created in VERICUT for a specific machine. The post-processor contains the definition of all drilling, fastening, utility cycles, and functions used in the NC program. Like all VERICUT software, the new module interfaces to leading CAD/CAM/PLM systems and is independent of the assembly machine manufacturer. □

**CGTech's new drilling and fastening program – avoiding costly errors**

