



# In the comfort zone

**Aerospace parts and the machines that manufacture them are often of very high value. Simulation prior to machining guarantees security; VERICUT software is pre-eminent**

**C**GTech's VERICUT software simulates CNC machining in order to detect errors, potential collisions or areas of inefficiency. Unlike CAM systems, the code simulated by VERICUT is the actual post-processed code that is used on the machine tool. CAM systems employ pre-post processed information to support simulation.

VERICUT also understands the kinematics of machine tools and makes sure that the movements employed during simulation accurately represent those that will take place in practice. CAM systems do not faithfully reproduce individual machine behaviour.

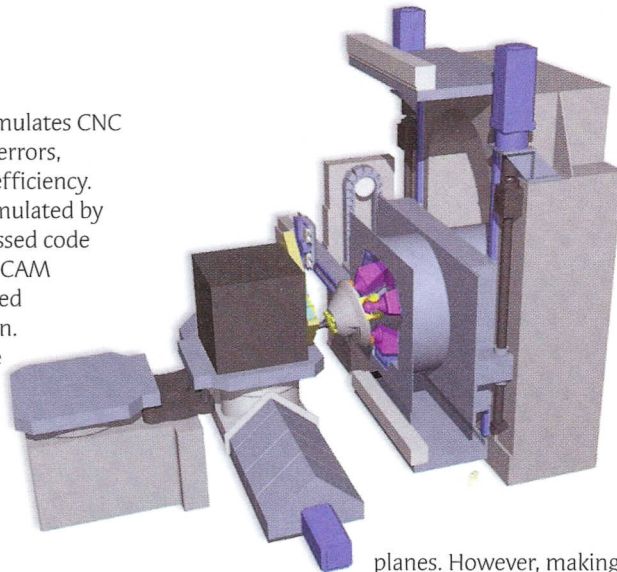
The software enables NC programmers to correct errors before the program is ever loaded on the machine, thereby eliminating manual prove-outs. VERICUT also optimises NC program cutting speeds for more efficient machining, including high speed machines.

But while the simulation of metalcutting processes are its roots, VERICUT is today also used to support other processes, such as water jet profiling, riveting/assembly, parallel kinematic machines, plus composites tape lay-up machinery (see later), as well as robots as CGTech's customers adopt these processes.

In the UK, the vast majority of aerospace OEMs, together with their supply chain partners, are VERICUT users.

High profile aerospace industry users in the UK include GKN Aerospace, Filton (previously Airbus) and GE Aviation. At GKN, high speed machining centres are equipped with elaborate motion control algorithms to ensure smooth acceleration/deceleration when contouring at feeds in excess of 20 m/min.

While these work well most of the time, GKN found them to be an inhibiting factor when trying to optimise the production of key components for the wing structures of Airbus



planes. However, making changes could have led to some very unpredictable results. So instead, GKN contacted tooling and software companies, with the outcome a successful project involving CGTech and Kennametal.

The subject was GKN's so-called Cell F, comprised of Mori Seiki SH-50 machining centres, and mainly used to cut aluminium A-Frames for the A330/340 Airbus. These come in 60 variations and are situated along the leading edge of the wings. There was no need to change the fundamental set-up, so the focus was on optimising feeds and speeds. VERICUT's OptiPath was used to override various control parameters, while Kennametal's tooling allowed efficient cutting at higher feeds and speeds.

OptiPath reads the NC tool path file and divides motion into a number of smaller segments. Since VERICUT mathematically subtracts the material cut away from the model, the software always knows the depth/width/angle of cut, and the amount of material removed. Where necessary, based on the amount of material removed in each segment, OptiPath assigns the best feed rate for each cutting condition encountered. It then outputs a new tool path, identical to the

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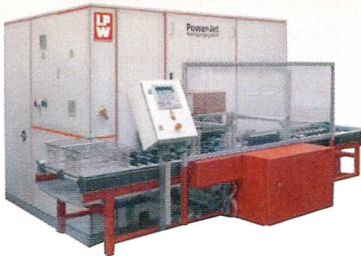
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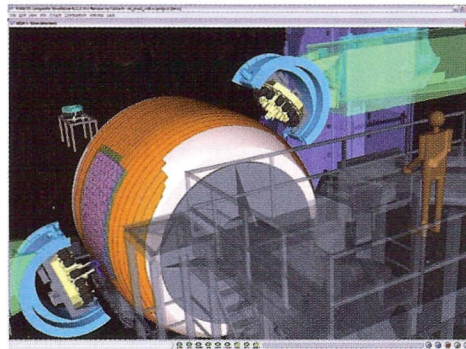


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**SURFACE ALLIANCE**



original, but with improved feed rates.

"CGTech got involved helping us to get the best out of our NC programs and changing the mindset at Filton," says Matt Godfrey, EIT team leader. "We swapped tools for ones with longer flute lengths and took greater depths of cut – and got better finishes. We didn't have to change the part programs whatsoever. OptiPath took care of feed rates for us – we just capped the programs at 7 m/min feed rate to stop thin cuts ramping up to 16 m/min. This would have given us unacceptable surface finishes. The original program was set up to cut at around 1 m/min. We now have improved accuracy and better tool utilisation."

Filton experimented with two optimisation methods: 'Constant Volume' and 'Constant Chip' thickness. Operators found the constant volume method was more suited to the A-Frames. Using this method, run time was cut by 25 per cent and throughput was increased by 15 per cent – the largest savings on roughing. A specialist team was subsequently assembled to roll the benefits seen with this first installation across a number of other cells at Filton.

With the increasing use of composites in large civil aircraft and military projects, VERICUT also now takes in the simulation of tape laying machines.

Launched late last year, the VERICUT Composite Applications Suite (picture, above) offers machine-independent off-line

programming and simulation software for automated composite tape and fibre-placement CNC machines. It comprises two separate applications: VERICUT Composite Programming (VCP) and VERICUT Composite Simulation (VCS).

VCP reads CAD surfaces and ply boundary information, and adds material to fill the plies according to user-specified manufacturing standards and requirements. Lay-up paths are linked together to form specific lay-up sequences and output as NC programs for the automated lay-up machine.

VCS reads CAD models and NC programs, either from VCP or other composite lay-up path-generation applications, and simulates the sequence of NC programs on a virtual machine. Material is applied to the lay-up form via NC program instructions in a 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.

CGTech's composites product development was kicked off in 2004 after it was contacted by Boeing (a CGTech customer since 1989) to develop a program for Automatic Fibre Placement (AFP) machine simulation for 787 fabrication. This project progressed in 2005 to include the development of a programming solution for AFP machines.

In 2006, Electroimpact was selected to supply American company Spirit Aerosystems with a multiple machine AFP lay-up cell for the Boeing 787 fuselage section 41. For nearly three years, Electroimpact has been in a non-exclusive co-operation with CGTech to develop AFP programming and simulation software. Following more than two years' testing and development, Spirit Aerosystems will use the software to program the new Electroimpact AFP machines being installed. The software will be updated and maintained by CGTech. □

### VERICUT 6.2 enhancements

The latest release of VERICUT boasts numerous enhancements. For a full and comprehensive list visit: [www.cgtech.com/usa/cgtech-to-show-vericut-62-at-westec](http://www.cgtech.com/usa/cgtech-to-show-vericut-62-at-westec). VERICUT runs standalone, but can also be integrated with

all leading CAM systems. Interfaces to Siemens NX, Dassault Systemes Catia V5, PTC, MasterCAM, EdgeCAM and GibbsCAM are offered. In addition the following companies offer interfaces to VERICUT – Delcam for PowerMILL, Open Mind for hyperMILL, and Missler's for TopCAM.