

In 1951, the prop-driven DC-3 is the workhorse of the aviation industry. The first passenger airliners with pressurized cabins are introduced. The first fighter jets are still being refined while helicopters seem exotic. Computers are about as rare as a blue moon and weigh almost as much.

In that era, aviation is a high tech leader, and ACE Clearwater Enterprises is already an important supplier to the leading aerospace companies of the time. More than 50 years later, ACE Clearwater is still producing customized components for leading aerospace vendors such as Boeing and Lockheed Martin. The company's expertise in working and welding aluminum, steel, and titanium has resulted in an ongoing stream of metal skins, ducts and components for commercial aircraft and more exotic "birds" such as the new Joint Strike Fighter.

The company also produces components for large power generation turbines for key industry players such as GE, so it requires deep design and production skills in order to meet the needs of large manufacturers and government contractors.



The company's broad metal forming capabilities include hydroforming, drop hammer and press, thin metal welding, annealing ovens, CNC horizontal mills and lathes, hot press forming of titanium, stamping and tube bending.

Because of ACE's history of manufacturing excellence and responsive delivery, the company has often been very busy. "The demands on our engineering and production resources have been increasing and we needed to continue to improve turnaround and productivity," says Steve Farentinos, engineering manager at ACE Clearwater. "So we began to evaluate new CAD/CAM software that could help."

Complex Surfaces Require A New Solution

While exhaust manifolds and exterior skins for high-performance aircraft are a highly valued and visible part of ACE's production, Farentinos also notes that the heavily contoured ducting surfaces in a turbine generator system can be equally challenging.

"These are high-pressure flows in constantly running systems, so the components have to be rugged and reliable. At the same time, these are complex and precise surfaces that require a sophisticated CAD system. After careful review of the alternatives, we chose ZW3D software because we can quickly develop these kinds of surfaces."

Previously, ACE used Inventor and Mechanical Desktop, but those programs didn't handle the machining, so ACE also relied on NCL and SurfCAM. Under ACE's previous workflow, surface models received from customers would be moved through IGES to Mechanical Desktop then through IGES again to SurfCAM. Changes made to tooling went through IGES again to Mechanical Desktop. "This is a common kludge in so many organizations," says Farentinos. "A lot of time is wasted, and as surfaces get more complicated, the entire process gets longer. Our new approach using ZW3D is simpler and more effective because it's all integrated under ZW3D."

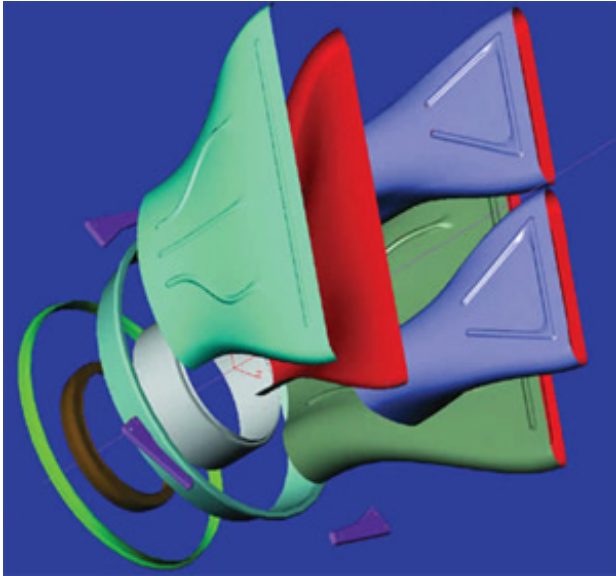
The ZW3D software adopted by ACE provides a complete range of CAD through CAM tools, so their engineers can handle the entire design through manufacturing process within one system. This saves time and improves quality by eliminating data import and export problems and by enabling a single engineer to easily transition between design and manufacturing functions. "ZW3D is also great because it helps us with our own drawings as well as imported customer drawings,"

Farentinos adds.

Integrated Capabilities Save Time

The initial phase of bringing ZW3D online has been completed and now ACE is integrating ZW3D with one of their five-axis water jet cutting machines. ACE is also tapping ZW3D's ability to work with computerized measurement machines to inspect tooling and ACE has been writing ZW3D macros to generate CMM code and evaluate CMM data.

The idea is to use a single CAD file to manufacture, inspect and report inspection results for a particular part. The ultimate goal is to eliminate as much file translation as possible and to minimize the number of 2D engineering drawings. Since both manufacturing and inspection data are coming from the same file, in many cases there's no need for dimensioned drawings.



“Unlike most systems, ZW3D was built from the ground up to be completely integrated, so it can handle the entire process or just small parts. It's flexible. In an operation like ours, the integrated functions save a lot of time and improve our efficiency. We also didn't have to purchase a lot of add-on products, which is the case with most CAD/CAM software,” says Farentinos.

One example of ZW3D's efficiency was seen in a recent file received from a customer using MasterCAM as a design tool. As received by ACE, the file had a large number of overlapping edges and unconnected vertices. Using ZW3D's powerful native healing function (which “sews up” these disconnects), ACE was able to significantly reduce what would have consumed an enormous amount of time. Likewise, some of ACE's biggest customers

such as Honeywell and General Electric use Pro/E and Unigraphics, so ACE relies on ZW3D's translators to easily handle those files.

Exceptional Ease of Use

ACE tool design engineer Javier Tenorio spends most of his time designing tooling for complex formed aerospace ducting systems. With all of the software and hardware at Tenorio's disposal, today's sophisticated components can seem easier to produce than some of the legacy aerospace parts still in use.

“I've received paper drawings from 1942. Obviously the engineering was sound because those aircraft are still flying, but it's always an extra challenge to work from paper,” says Tenorio.

Before ACE Clearwater adopted ZW3D software, Tenorio used the previous ACE combination of Mechanical Desktop and SurfCAM. Tenorio had received formal training in Mechanical Desktop but it still took some time to become proficient in that program. During the transition to ZW3D, what immediately impressed Tenorio was the friendly interface. “ZW3D is almost self explanatory. It seems to have all the right tools and they're easy to find and use. In just a few days, even without formal training, I began producing parts.”

Tenorio has also used SolidWorks and Pro/E and notes that ACE was originally looking at replacing Mechanical Desktop with CATIA, Unigraphics or Pro/E. “When I was first introduced to ZW3D, I thought it would be up in cost like Pro/E or CATIA. Instead, it's priced like SolidWorks, but it has sophisticated capabilities similar to CATIA. It's turned out to be an incredible value.”

According to Tenorio, beyond ease of use, one of the key differences between ZW3D, Mechanical Desktop and SurfCAM is ZW3D's sophisticated surfacing capabilities. He says that he can now

easily create the complex surfaces essential for the components the company produces. By his estimate, he can build surfaces two to three times faster with ZW3D than with SurfCAM.

Tenorio also notes that ZW3D is a vital part of ACE Clearwater's CMM operations. Unlike other CAD/CAM systems, ZW3D has built-in reverse engineering tools that make it easy to import point cloud data from a CMM. At ACE, this capability helps create machineable geometry in projects that don't have existing parts or CAD files. Just as important, ZW3D can be used with the CMM machines to precisely inspect and verify the conformity of completed parts against the CAD model.

In the course of Tenorio's day, he might be working on weld and drill fixtures, creating parts to be shaped on the company's two five-axis water jet machines, or helping a colleague with parts for ACE's many drop hammers and hydroforming presses.

Between ZW3D's unusually strong IGES import capabilities and healing function, Tenorio can save several hours on each project. Multiplied many times over the course of the year, these capabilities significantly boost Tenorio's productivity.

"ZW3D has been a great addition to our company and we expect it to contribute even more to improving our workflow and furthering our competitive advantage as we apply its many other capabilities," concludes Farentinos.