

Programming progress

Andrew Allcock reviews CAM related investment and benefits at a satellite maker, a medical appliance maker and a vacuum moulding company

Launching a satellite into space requires sophisticated and innovative technology – as does the design to manufacturing process preceding it. Surrey Satellite Technology Ltd (SSTL) is the first professional organisation to offer small, low-cost satellites within rapid time scales, using advanced terrestrial technology. The company's Sevenoaks-based Optical Payload Group is using EdgeCAM's software solution to machine electro-optical instruments for space applications.

The range of instruments developed by the Optical group includes multispectral and hyperspectral imagers for environmental, commercial and military applications; environmental ozone monitors; infrared fire and hotspot detection imagers; space debris monitoring cameras; and satellite-to-satellite broadband optical communication instruments.

"All of our manufacturing is bespoke and before we had our own four-man workshop operation at Sevenoaks, this was subbed out," explains manufacturing manager Geoff Cooper. "The bread-and-butter work is still often placed with third party sub-contractors, but specialist optics projects are handled in-house."

The group manufactures to order for a broad customer base, which includes the European Space Agency, commercial companies and governments of countries that are keen to join the space race. SSTL designed, built and delivered the first European Galileo satellite, GIOVE-A, launched in December 2005 and



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vigorously pursues its vision of providing customers with affordable, frequent and rapid access to space.

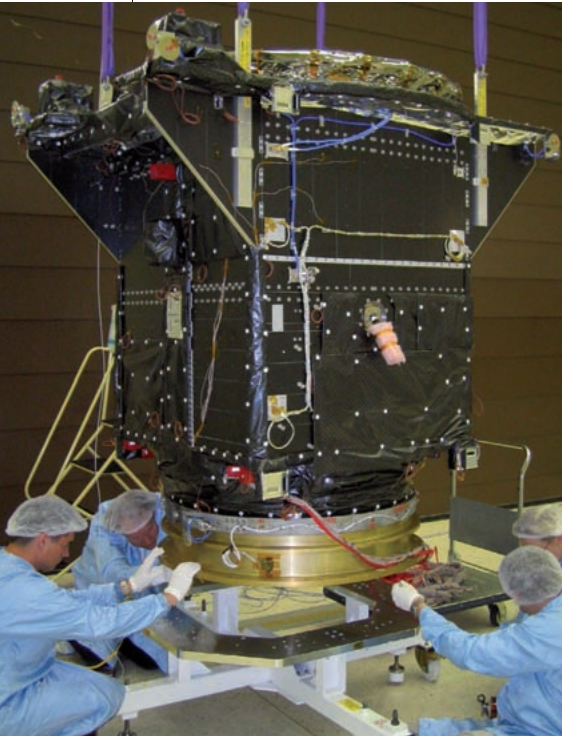
EdgeCAM is used in the manufacture of structures for mounting the optics and for avionics modules – basically, metal boxes that house the electronics – machined in one piece from a billet or as 'honeycomb' panels. Two thin skins bonded together with a honeycomb core form a light but rigid structure that can be used for solar panels and other parts of the satellite platform.

"A 3D design is generated within SolidEdge or SolidWorks and imported

directly into EdgeCAM," says Mr Cooper. "The platform is a combination of heritage units and new designs. Inevitably there are changes during programming; but EdgeCAM flexibility makes updating machine code to the latest release easy."

BOXES TO ORDER

Metal enclosures are designed to the customer's specification to accommodate the optical modules. Each job is quite different, often involving numerous angles, with pockets cut out of the metal wherever possible to reduce weight – a vital consideration with aerospace



SSTL offers small, low-cost satellites

applications. A wide range of standard and exotic materials is used – from stainless steels to aircraft grade aluminium and titanium – each with its particular machining requirements.

“We had been using a competitor system for some time but it didn’t quite give us all the technology we were looking for,” explains Bob Pearce, programmer/operator on NC milling machines at SSTL. “After demonstrations and discussions with EdgeCAM, we decided its advanced system would meet all our criteria the most efficiently.”

Pearce and his team get involved at the design stage to ensure the synergy is right between drawing and model. With confirmation that the product can be manufactured to meet all the customer’s specification, Pearce takes the model into EdgeCAM to generate the program.

Before pressing the button to start machining, the simulation mode in EdgeCAM ensures the entire NC program is correct. The solid model can also be

used for inspection purposes once the item has been made, as it will have all the relevant dimensions and co-ordinates.

“Any erroneous cut will show up on the simulation which can be overlaid onto the solid model,” says Mr Pearce. “This facility enables us to see where the clamping is and ensure collision avoidance – eliminating idle time both for machine and operator.”

The manufacturing team at SSTL finds EdgeCAM very user friendly. “There is usually more than one way to do a job and the system gives you the choice of using feature or milling cycles,” notes Mr Pearce. “Not only that, it is intelligent and intuitive – with Windows drag-and-drop and the ability to change dimensions accordingly.

TOOL LIBRARY

“The tool library function has proved invaluable for our manufacturing processes. If the tool isn’t there it can be created to handle certain forms and sizes. The system works this out automatically, provided the operator has entered the correct information to start with.”

A further key advantage with the EdgeCAM package is the support and training provided, enabling SSTL to get the very best from its investment. The company makes use of the EdgeCAM website ‘submit suggestion/post question’ facility, obtaining help from other users.

“Being able to have any problems solved remotely is fantastic. It’s not efficient to have the machine standing idle when it should be machining parts, so if we do need to know the best way to tackle a particular job, not having to wait for an engineer to turn up is a big plus for us,” says Mr Pearce

“Faster and more efficient, EdgeCAM has made an enormous difference to our manufacturing processes. In terms of ROI, we are seeing 60-70 per cent savings on what it would cost to have multi-off orders handled by sub-contractors.”

For US company Oscor, rapid introduction of its minute medical components depends heavily on Delcam’s

CAD/CAM software, which it uses to manufacture mould tools for the moulded parts. “We do a lot of R&D and constantly come up with new products,” says Ed Smith, chief of manufacturing engineering. “We often must be able to go from prototype to production in a matter of days. One of the ways we are able to do this is to produce all our tooling in-house. This gives us control over the development and helps us achieve very fast turnaround on every tool.”

Oscor Inc, headquartered in Florida, designs, develops, manufactures and markets a range of highly specialised lead systems for pacemakers and a variety of other medical applications. Most are high volume, high accuracy components. According to Mr Smith: “Higher volume parts are in the range of 100,000 parts per month. Typical tolerances are 0.0002 in.”

Oscor’s machine shop includes high speed CNC vertical mills and a Roku Roku turning centre served by a robotic loading system. “We have a total of four high speed milling machines, two Mori Seiki machines for metalcutting and two others for graphite electrodes,” Mr Smith says. “All can run at 20,000 rpm. The CNC mills use very small cutters, down to a 0.005 in diameter ball milling cutter for the electrodes.” The company also runs six Star sliding-head machines.

Mr Smith introduced Delcam CAD/CAM software into Oscor. “We now use PowerShape and PowerMill for our mills and PartMaker for our sliding-head machines. Our Mitsubishi wire EDMs are run by Partmaker Wire. I’ve always liked Delcam because it is not a limited



Oscor uses multiple Delcam software packages

product, it has a lot of flexibility for the user built into it," he comments.

With PowerShape, Oscor can analyse its mould models for duplicated or missing surfaces, interactively inspect draft angles, and see hard-to-mould areas for the tiny leads. "Ninety per cent of the parts we make can be created with solid modelling but, for the other 10 per cent, we found that the surface modelling flexibility of PowerShape has been very helpful," Mr Smith reports.

"PowerMill even lets us write our own software code to automate our work," he adds. "We first create a Visual Basic program and link it back into PowerMill. For example, this ability has allowed us to

responsive to our customers."

Back in the UK, Vacuum forming specialist Big Bear Plastic Products, Droitwich, supplies a diverse range of markets from leisure to aerospace.

The company is able to offer consultancy and design services along with manufacture and supply, assisting customers from concept to components, including, tooling and material selection – not forgetting the incorporation of customer specific supply chain needs.

Company growth allied to a project to reduce lead times led Big Bear to invest in a CAM system to support and integrate with its current CAD solution – SolidWorks from Cadtek which enables it

this as source data at every opportunity," says Dan Patrick, project engineer. Big Bear Plastic Products installed two seats of SolidCam which integrate with its SolidWorks CAD systems.

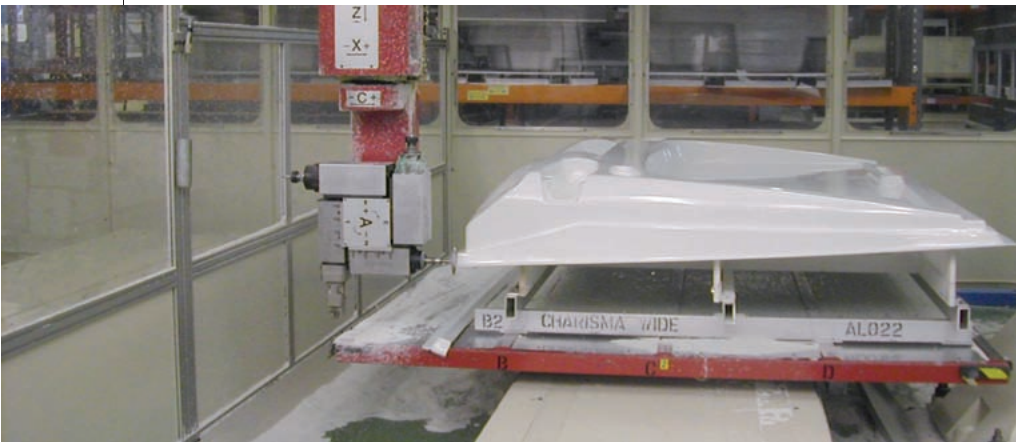
Operating from inside SolidWorks, SolidCam works directly with the model data, enabling the engineers at Big Bear to quickly add the 5-axis trimming paths once the datum and orientation of the part have been established. Mr Patrick adds: "It isn't uncommon for new components to come in families, so we start by programming the most complex one that contains the most features. We can then simply suppress some of the operations to get the trimming paths for the remaining simpler components." Once the toolpath has been prepared, SolidCam verifies it, showing the tool, the holder and the machine tool, picking up any collisions in its graphical simulator and ensuring that the machine operates safely and reliably.

PROGRAMMING TIME HALVED

The programming workload at Big Bear Plastic Products increased rapidly during 2007, so as its engineers were becoming familiar with the software, programmers from SolidCam helped by creating some of the toolpaths. "Assistance from SolidCam helped us to overcome the initial backlog of work," explains Mr Patrick. "Now more familiar with it, we regularly produce new trimming programs in less than half the time it would have previously taken."

Programming 'off line' in SolidCam has also raised the efficiency of the physical trimming equipment. Parts programmed manually on the machine resulted in downtime, as trimming could not continue at the same time. While parts are programmed in SolidCam, the machine can run without interruption.

Within Big Bear Plastic Products, more and more parts go through the SolidCam route, eliminating the possibility of error and enabling the company to offer project turnaround times that would previously have been very difficult to achieve. □



Big Bear Plastic Products is using SolidCAM and SolidWorks CAD to produce trimming toolpaths

automate the robotic handling of electrodes and tell the machine how many, and what kind of electrodes we want it to produce. Little things like that save a lot of time."

Another strong point is PowerMill's range of high speed machining techniques that help to assure rapid delivery of high quality mould tools and components for Oscor. According to Mr Smith, that ability is a big reason customers come to his company. "We can do these micro-moulds faster than most shops could ever hope to," he claims. "Our speciality is the quick prototype-to-production work in the 30,000 parts per month range and that is where the Delcam software really helps us to be

to accept and manipulate solid models imported directly from its customers.

As component tolerances reduce, the pace of new tooling release increases and the need to link the validity of mould tooling, trim tooling and cutter path geometry increases, the use of an integrated CAD/CAM system gained importance. Being able to use customer-generated model files to produce both tooling and cutter programs has significantly improved project lead times.

"It may still be necessary to manually program some components on line at the [trimming] machine which may not have valid model files, but with most new projects the model file is the heart of the project so it would be wrong not to use