

Award-winning Support

New Product Introductions (NPIs) are essential for the growth of any company serving markets with high-tech products.



NPIs face a variety of commercial and technical challenges in that to deliver their features the products will almost certainly employ high performance electronics and, increasingly, require the latest assembly techniques. NPIs also face considerable logistical challenges, such as hitting both time- and volume-to-market targets.

In light of these challenges, if the manufacture of the new product is to be outsourced it is essential to select and engage with the CEM as soon as possible. Moreover, the discussions need to be as open and as transparent as if the CEM were the customer's own production department. Such collaboration produces amazing results.

The following case study recounts how Speedboard Assembly Services supported motion capture specialist **Vicon Motion Systems** leading up to and during the launch of a range of high-tech cameras.

Key points:

- Mutually beneficial solutions found to business/engagement concerns;
- Speedboard's four-phase NPI model was employed to the full;
- Vantage comprises three complex PCBs, two of which required specialist assembly techniques;
- Demand for Vantage far exceeded expectations and Speedboard coped with a last-minute 50% increase to already demanding launch quantities; and
- Vicon presented Speedboard with an Outstanding Customer Service Award.



Customer: Vicon

Vicon Motion Systems is an Oxford-headquartered developer of world-leading motion capture products and services. It sells to more than 70 countries and its markets fall broadly into three categories: Life Sciences (including sports performance, neuroscience and gait analysis); Engineering (including design visualisation and the tracking of fast-moving objects) and Entertainment (for example, Industrial Light & Magic [ILM] is a long-standing customer and Vicon's motion capture products have been used on films in The Transformers, Pirates of the Caribbean and Iron Man franchises).

Vicon's products are of extremely high quality and in addition to being ISO 9001 certified, Vicon is the only image capture company to have ISO 13485:2003, the quality management system for medical devices.

The company's UK headquarters are home to R&D, final product assembly and sales & marketing activities. Bar for a few low volume sub-assemblies all PCBAs are currently assembled in the UK by Speedboard.

Speedboard's relationship with Vicon dates back to 2011, when the company took over the manufacture of PCBAs for the Vicon Bonita range of cameras from an underperforming CEM.

The first year of the relationship saw some very erratic demand for the Bonita range and the traditional standalone order mechanism was stretched to breaking point. Speedboard therefore recommended the introduction of a Kanban system for the Bonita boards and that they be supplied in sets to Vicon for final assembly.



INTRODUCING

VICON VANTAGE

Vicon's new camera range, Vantage, combines high resolution with a high sample rate. The new camera is feature-rich and has several on-board sensors which improve the user experience by transitioning from the user needing to look for information to the system intelligently proffering it.

Three years in the making, Vantage was designed from the ground up, building on Vicon's thirty years of motion capture experience as well as embracing new technologies, such as a MEMS-based accelerometer for sensing movement. Vantage also works with Vicon Control, the company's first tablet application, which frees the user from being behind a PC and allows them to work much closer to the camera.

Vantage Point.

During the development of Vantage, Vicon Motion Systems had to make a number of key decisions. For example, in early 2014, the company needed to identify a partner for prototyping the camera's circuit boards. Then, later in the year, it became necessary to commence sourcing the long-lead time items that would be needed for final production, and thus incurring significant costs. At neither point though had the selection of a CEM for final production been made.

However, Speedboard enjoys open and transparent relationships with all of its customers, and was comfortable doing both the prototypes and ordering the long-lead time items; for which it was agreed that Speedboard would make the purchases.

An RFQ for volume production was issued in late 2014 and Speedboard, along with several other CEMs, pitched. It was a very comprehensive tendering process and Vicon graded all of the competing CEMs on a variety of factors, such as quality assurance, engineering change management and continuous improvement strategies, their Kanban implementations and their repair processes. Speedboard won, fair and square, on paper. However Vicon's board had some concerns.

Though Speedboard had won the pitch for the Vantage production work, and was doing an excellent job on the Bonita range, Vicon saw business risks associated with entrusting so much work to a single supplier, which put the company in something of a quandary.

“Did we want to potentially forego the level-of-service Speedboard had demonstrated with our Bonita range just for the sake of using another CEM for our new product range? We were therefore keen to explore ways forward.” – Imogen Moorhouse, CEO of Vicon Motion Systems.

Due to the complexity of the Vantage product, there were manufacturing challenges to address too. The product comprises three PCBAs, namely:

- A Processor Board (16 layers, circa 800 PTH vias and 6,500 blind / buried vias and 31 BGA devices);
- A Sensor Board (12 layers, nine BGAs and circa 800 PTH vias); and
- A Strobe Board (a metal-backed single layer substrate).

Of these, the Strobe Board, would be extremely difficult to manufacture using a traditional convection reflow line, as doing so would run the risk of damaging sensitive electronic components. Speedboard recommended the use of its Vapour Phase reflow oven (see box).

Also presenting a significant challenge was the assembly of the Sensor Boards. They are mixed technology PCBAs dominated by high-end, through-hole sensor devices with several hundred pins and a tight pitch. It was agreed that the Vantage Sensor Boards could not be hand soldered reliably and consistently, in accordance with IPC Class 3, and that another solution would be required.



VICON

Initial investigations identified Selective Soldering as a viable solution, though research and trials would be needed before any commitments made. Because Speedboard was involved in the NPI discussions very early on, the CEM had time to research Selective Soldering thoroughly. However, there were business concerns - this time Speedboard's, as investing over a hundred thousand pounds in advanced manufacturing kit is not something any CEM would do for just a prototyping project. Speedboard was comfortable voicing its business concerns.

“There was the potential of a great project ahead and, with solutions found to the technical challenges, it only remained to address certain business issues. Like Vicon, we were keen to explore ways forward.” – Nick Fairhead,

Sales and Marketing Director of Speedboard Assembly Services.

Vicon's concerns were addressed by introducing enhanced (and tested) disaster recovery plans against a number of different scenarios, such as the failure of any given piece of production or test equipment. Also, Speedboard's Kanban model was developed to include Consignment Stock, in that the CEM would be responsible for maintaining levels of manufactured and tested board sets on Vicon's premises. The stock remains the property of Speedboard until Vicon draws it for use.

Moorhouse comments: “We have the enormous comfort of seeing the stock on our site, ready for use, plus the peace of mind that there's stock on site with Speedboard too - in their Kanban system.”

Fairhead adds: “Consignment Stock was recognised as a way of enhancing disaster recovery plans - in place in both Windsor and Oxford, to ensure that Vicon will always be able to meet its delivery commitments.”

Regarding Speedboard's investment in a Selective Soldering line, needed for the Sensor Board, having won the RFQ on paper and with Vicon's concerns addressed (and acknowledged as being so), the CEM ordered the equipment, which was in place and operational by March 2015.

Speedboard sourced components against a pre-released Bill of Materials at the very earliest opportunity in order to minimise prototype lead times. As some of the components were trial parts, Vicon agreed to cover the costs of any parts that would be not make the final design. Several iterations of each board were made, which enabled Vicon and Speedboard - working as a single team - to hone the design (i.e. experiment with different board layouts including bare board construction) and fine-tune the manufacturing processes to achieve the optimum quality and cost balance.

“The level of support provided during the NPI was incredible. Our engineers spent a great deal of time in Windsor, almost as if Speedboard was our own shop floor. We could not have asked for more.” – Imogen Moorhouse, CEO of Vicon

Motion Systems.

The bottom half of the page features a dark blue background with abstract geometric shapes in lighter blue and white. On the left, there is a partial view of a Vicon logo with the letters 'ON' visible. The text 'VICON NANTAGE' is prominently displayed in white, bold, sans-serif font. The background also includes a close-up image of a blue metal grating or mesh structure on the right side.

VICON NANTAGE

CASE STUDY: VICON

The designs for the Vantage range of cameras were signed off and production began in earnest for a June 2015 launch, at which point another problem – albeit a good one to have – was encountered.

Moorhouse explains: “Demand for Vantage was considerably higher than expected, and we had to revise our launch quantity, which was high anyway, by about 50%. Again, Speedboard pulled out all the stops, pulling in stock, running additional batches and introducing shift and weekend work to get the boards built and through test.”

In conclusion, the on-time launch of Vantage – in sufficient launch quantities – was attributable to the level of collaboration between Vicon and Speedboard, and an engagement that closely followed all four phases of Speedboard’s bespoke NPI model. Early and open discussions, in particular, meant all concerns were aired and solutions found at the appropriate stages of the NPI, almost as if Speedboard were Vicon’s own shop floor.

The metal-backed Strobe Board (below) for the Vicon Vantage is manufactured using the Vapour Phase reflow soldering technique. It involves lowering the PCB into the vapour of boiling Galden, which is an environmentally friendly liquid with a boiling point only slightly higher than that of solder. Because the Galden vapour physically cannot be hotter than the liquid’s boiling point there is no danger of ‘over-cooking’ any of the board’s heat sensitive components.

Below, the Sensor Board of a Vantage camera is run through Speedboard’s Selective Soldering line, an ERSA Versaflo 345 in-line system installed in March 2015. The soldering technique has much in common with wave soldering - in terms of fluxing, pre-heating and soldering stages - but components are soldered on a pin-by-pin basis and without disturbing pre-placed neighbouring components.





About Speedboard Assembly Services

Established in 1983, Speedboard is a UK-based Contract Electronics Manufacturer (CEM), serving customers in a variety of high-tech sectors, including Industrial, Defence, Medical, Communications and Security. The company offers a broad range of manufacturing services, ranging from traditional build-to-print through to full lifecycle; including packaging, delivery to end customer, repairs and after sales support.

Speedboard also offers a bespoke four-phase model to support customers seeking fast turnaround prototypes and New Product Introductions (NPIs). It extends beyond a typical build-to-print scenario and includes an early review of the Bill of Materials (BOM), the securing of long lead-time items and considerable Design for Manufacture (DFM) and Design for Test (DFT) guidance.

The CEM has five Surface Mount Technology (SMT) lines which, between them, comprise 15 Siemens SiPlace machines. Speedboard also has a selective soldering line and a vapour-phase oven, thus enabling the company to tackle increasingly complex Printed Circuit Board Assemblies (PCBAs - such as double-sided, mixed technology boards) and boards with areas of widely varying thermal mass. Test capabilities include Automatic Optical Inspection (AOI), X-ray, Ball Grid Array (BGA) Scope, Boundary-scan, In-Circuit Test (ICT – both flying probe and bed-of-nails), Functional Test and Soak Testing.

Speedboard offers Kanban stock holding and operates a Quality Management System which is BSI-certified as being compliant with ISO 9001:2008.



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