# LABTEC - 3D IN MOTION

***The market for the 3D controllers is set to profit from the boom in 3D CAD. Spacetec having recently merged with Labtec are now riding high on the crest of the 3D wave. With the newly formed company, Labtec 3D Motion Control Technology Group in place they are poised to make their impression on the world-wide market. CAD Dealer's Adam Ramli interviewed Joyce Ouellette, Senior VP of Sales and discussed how she feels the CAD channel will benefit from the Labtec proposition.***

**CAD *Dealer:*** *Has Spacetec's recent merger with Labtec altered your focus on the CAD market? How important is the CAD market to Labtec?*

**Joyce Ouellette:** The merger has not altered our focus on CAD at all. In fact, the CAD market is extremely important to Labtec. It is where a significant portion of the company's 3D motion control technology revenue comes from.

***CD:*** *Which products do you specifically target towards the CAD market?*

**JO:** The Spaceball 3003 FLX and Spaceball 4000 FLX are targeted to this segment. The Spaceball 4000 FLX is a replacement for the Spaceball 2003 FLX.

***CD:*** *How do Spacetec differentiate themselves from their competitors with their CAD products?*

**JO:** We regard ourselves as market leaders defining the standard for 3D input devices. Our development is ISV centric.. Our products are sold by leading workstation manufacturers world-wide (Compaq/DEC, Dell, HP, IBM, Intergraph). We ask prospective users to take the "Spaceball Challenge" - it just feels better! According to our analysis and independent analysis at customers, the Spaceball technology has better ergonomics, provides the user with more intuitive and more precise control of their 3D models and gives the user better functionality.

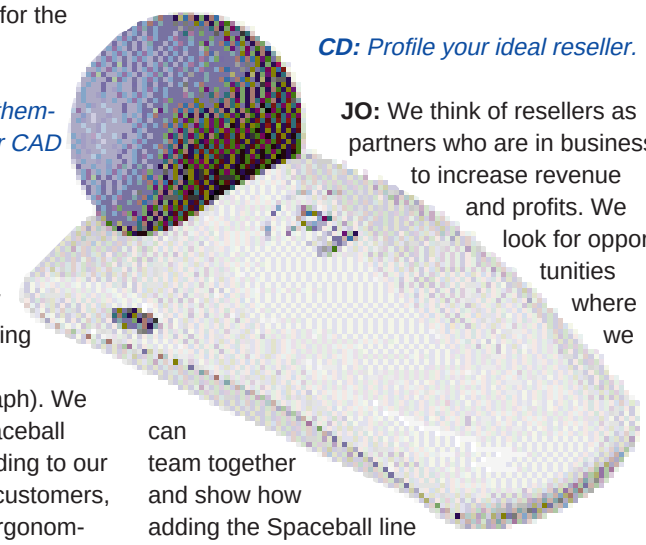
We pride ourselves on having developed the CAD market's demand for 3D motion controllers and we were the 1st 3D input devices ever supported and certified by the major 3D CAD application vendors. We take certification by the CAD ISV's very seriously and have devoted an entire infrastructure to supporting and serving the needs of our ISV partners to ensure to the customer quality support revision-to-revision.

***CD:*** *Your reseller proposition - what incentives do you propose in order to win over CAD resellers and encourage them to re-sell your products?*

**JO:** We maintain aggressive programs to drive sales & generate business. Our philosophy is not to take business from our channels - we will lead business to them! We will not sell direct to an end-user if a channel is available - this is a trict policy of our company. Service (marketing and sales support) is available to our resellers, regardless of where they actually purchased the Spaceball from - whether direct from us, from a distributor or direct from OEM. We also provide private web-site access with on-line sales tools, funding of co-marketing, training and sales help on site at the customer if required.

***CD:*** *Define the current structure of your world-wide distribution channel.*

**JO:** Our products are available world-wide through all the channels of distribution of our workstation partners (Compaq/DEC, HP, IBM and Intergraph). We have Master Distributors in N. America as well as "Preferred VAR" direct selling relationships in N. America. Regional VARs / Distributors (usually country-centric) are available in Europe and Southeast Asia. In Japan we have a Master Distributor



***CD:*** *Profile your ideal reseller.*

**JO:** We think of resellers as partners who are in business to increase revenue and profits. We look for opportunities where we can team together and show how adding the Spaceball line can significantly improve profit margins. Ideally our partners are CAD - centric and solutions driven. They believe in developing an "added-value proposition" to win and keep customers. Ideally they have a training department and curriculum.

Finally they must believe in the value of strong business partnerships with the ISV, the workstation provider and the ancillary vendors in the market to create a complete 3D solution for their customer.

***CD:*** *What is your current policy concerning reseller recruitment?*

**JO:** Normally we recruit via ISV reseller conferences and major CAD trade shows. Many reseller leads are referrals right from the customer.

***CD:*** *Does Spacetec have OEM programs?*

**JO:** We have four different programs as follows:

**1.** Standard OEM - deliver existing product in customcolors, logos, custom packaging and labelling as specified by the OEM.

**2.** Custom OEM - we will build product to specification, including custom industrial design (their design or ours)

**3.** Component OEM - we can supply the OEM with both the Spaceball PowerSensor (ball) and Electronics for their own custom manufacturing

**4.** Licensing - license technology for custom manufacture by the OEM.

***CD:*** *It seems that 3D motion controllers need to be 'pushed' through the market as initially end users struggle to see the benefits when previously they've worked with a $15 mouse. What is Labtec doing to educate the end user?*

**JO:** We are clearly still in a market development phase. The good news, is that with LogiCAD3D joining in, there are now two players focused on developing the demand for this product.

The key is working many areas simultaneously for example, leveraging the programs and strategies of our business partners (workstation vendors, ISVs, distributors and resellers). Secondly,
we support our channels and partners by driving demand at the end-user level with aggressive approaches to moving the customer from the mouse to the Spaceball. Once in an end-user account, it is not difficult to prove the value of the Spaceball technology - within a week or two of use, the benefits become obvious.

***CD:*** *The future, how do you see the 3D motion control market developing?*

**JO:** The 3D market is still very much in it's infancy, most particularly for the mainstream corporate and home user. The 3D hardware exists today, however 3D applications for corporate and home use are just beginning to emerge. Within the next 2 years 3D use will explode! For example, according to John Peddie Associates, there are currently over 90 million users with access to the web, of which there are currently 18 million frequent 3D users. John Peddie expects the number of
frequent 3D users to be over 50 million in 2001!

Anyone that uses 3D, whether at home or work, will have the need for intuitive and more robust 3D interactivity than today's mouse and keyboard are able to provide. Labtec intends to be at the forefront of the market as it emerges. Labtec is committed to continuing the research and development activities started by Spacetec to deliver future generations of Spaceball 3D motion control technology in products that are viable for the emerging 3D market - from an ergonomic and functionality standpoint, and at the right price-point for mass market acceptance.

# Technology overview of the Spaceball

The Spaceball consists of a hollow ball that "floats" on six leaf springs. As the ball is pushed and/or twisted the springs deflect, resisting the motion. The deflection of the springs is sensed using infrared LEDs and detectors. The analog detector signals are digitized and used to calculate the push and twist information as a 3D force vector and a 3D torque vector. The main elements of a Spaceball can be broken down into the PowerSensor, the Eclipse and a microcontroller.
The PowerSensor is the physical ball sensor. The Eclipse is a proprietary IC that interfaces directly to the opto-electronic sensors inside the PowerSensor. A microcontroller interfaces with the Eclipse with just two digital signals. It processes the data from the Eclipse and sends the result to the host computer.

## Construction

Construction of the PowerSensor begins with three leaf springs that interlock (Figure 1 left).

Two Hemi-cubes assemble over these leaf springs and screw together to firmly mount the leaf springs (Figure 1 middle).
Ball Tip and Optical Mask details are molded onto the leaf springs (Figure 1 right).

An Origami PCB (Figure 2 left), containing the LEDs and detectors, folds around the Hemi-cube subassembly to form the Sensor subassembly (Figure 2 middle).

The Sensor subassembly is fitted into an Inner Ball Lower Hemisphere with the wires threaded through the stem portion (Figure 2 right).

An Inner Ball Upper Hemisphere is fitted over the top and locked in place using a C-spring around the equator to complete the Inner Ball subassembly (Figure 3).

Two Outer Ball hemispheres are glued over the Inner Ball subassembly. The Outer Ball hemispheres have protrusions that form a slot for fitting over the corresponding Ball Tip .

Four Flexure Caps with the same slot details are glued into place completing the PowerSensor assembly (Figure 4).

A rubber ball is stretched over the PowerSensor to provide a good grip and aesthetics.

## Operation

As the ball is pushed and/or twisted the six leaf springs deflect, resisting the motion. The LED and detector are positioned so only half of the light passes the mask when the spring is undeflected .
Deflecting the spring in one direction blocks more light off, deflecting it in the other lets more light through.

The detector generates a current proportional to the amount of light. The Eclipse measures this current converting it to a high resolution digital value.

## Beneficial Characteristics

The Spaceball design provides a spatial force/torque sensor that has the same resolution and feel in all directions.

Ergonomic requirements are very well satisfied by this design. There are no special directions, the user can grab the ball from their most comfortable angle. The ball displaces proportionally to the applied push and twist.

The device is very robust since a heavy impact is taken by the outer ball hitting the inner ball, keeping the impact away from the accurate joints and springs. The small frictional characteristics of the joints naturally damp any vibrations.

The non-contact digital optical sensing is frictionless, highly accurate, highly reliable, low power and very linear. The Eclipse IC provides a high resolution, low power and high reliability as the circuitry is simplified and fewer interconnects are needed.

Figure 1

Figure 2

Figure 3

Figure 4

# History of the Spaceball

**1983** - John Hilton, current VP and Chief Technology Officer of Labtec's 3D Motion Control Technology Group (formerly Spacetec IMC Corporation), set's out to develop a "3D force sensing joystick" for CAD while studying for an advanced degree (Master of Engineering) at the University of Sydney, Australia and prototypes in late 1983, his first design (known as the external design) of the Spaceball.

**1984** - Whilst employed full-time at Techway Limited and completing his studies on a part time basis, Mr. Hilton develops his second prototype design, the "internal design".

**December, 1985** - Mr. Hilton applies for a patent in Australia for a 6D controller using 6 optical sensors in a ball-type design. This original patent remains the basis for all Spaceball products. To-date there are 17 patents issued world-wide.

**1986** - Spatial Systems Pty. Ltd formed to commercialize Hilton's inventions.

**1987** - Evans & Sutherland places pre-production order for first commercial Spaceball, the model 1003, to be built in Australia by Spatial Systems Pty Ltd.

**1988** - Mr. Hilton moves to Massachusetts and forms Spatial Systems, Inc., a wholly-owned subsidiary of Spatial Systems Pty Ltd. Starts the formal marketing and selling of the Spaceball 1003 - Spatial Systems enters into OEM arrangements for the 1003 with E&S, SGI, Intergraph and Stardent Comp.

**April, 1991** - Mr. Hilton, and key members of Spatial Systems Inc., form Spaceball Technologies, Inc., a Massachusetts corporation, and acquire all rights to technology and Patents from Spatial Systems.

**June, 1991** - Spaceball Technologies Inc. (STI) introduce the Spaceball model 2003 and aggressively enter into alliances with the leading CAD/CAM, CAE ISVs.

**1993** - IBM signs world-wide OEM agreement with STI for manufacture of custom Spaceball model 2003.

**1994** - HP signs world-wide OEM agreement with STI for manufacture of custom Spaceball model 2003.

**1994** - STI introduce Spaceball SpaceController addressing PC CAD market needs, winning 2 prestigious industrial design awards (in N. America and Germany).

**1995** - STI introduce, for market research purposes only, the Spaceball Avenger - the first PC 3D game controller using the Spaceball PowerSensor technology.

**1995** - STI develops new Spaceball PowerSensor technology and moves to custom IC (ASIC) - the Eclipse to drive and manage the LEDs and photodioides to 10-bit accuracy.

**1995** - STI changes name to Spacetec IMC Corporation (SIMC) - "IMC" is an acronym for Interactive Motion Control.

**December, 1995** - SIMC completes Initial Public Offering (IPO), raising $14,000,000 on NASDAQ.

**1996** - SIMC introduces the Spaceball 3003 for high and mid-range CAD markets.

**1996** - SIMC introduces the SpaceOrb 360 3D game controller for the PC games market, winning numerous product review awards world-wide.

**1997** - SIMC introduces new Spaceball PowerSensor FLX technology into the Spaceball 2003 FLX and Spaceball 3003 FLX product lines, significantly improving precision of movement, comfort and reliability.

**1997** - SIMC enters into world-wide OEM agreement with Compaq

**February 17, 1999** - SIMC merges with Labtec, Inc., the supplier of PC audio input and output peripherals, and name changes to Labtec, Inc. The new entity now combined has greater commercial, engineering, marketing and financial resources to strengthen Labtec's overall position in the PC and workstation peripherals market. Operations of SIMC are fully consolidated with Labtec at its headquarters in Vancouver WA, and European HQ in London. SIMC's sales operations operate as Labtec, Inc. 3D Motion Control Technology Group and remain in the US and Europe.

**March 15, 1999** - Labtec's 3D Motion Control Technology Group introduces the new Spaceball 4000 FLX - which they claim as the only 3D motion controller designed for, tested to, and passing ergonomic standards to minimize wrist and arm stress, and the only 3D motion controller ergonomically optimized for the widest range of users world-wide (wrist position, all hand sizes, and left- or right- hand positions).