

## Technology In Sports To Enhance Players Performance

Technology is part of everyday life, and some of this technology has a place within a sport. For example, people use a global positioning system (GPS) in their car, or when hiking to monitor how far they have traveled or how long it will take to arrive at the destination. Similar technology can be used in sport to determine how far an athlete has run during a game or to quantify how straight someone paddled a kayak. This modern-day knowledge can provide new feedback to athletes and thus tell them something they didn't already know. Or at times this technology is merely telling them something that the coach has repeatedly said but that somehow didn't get through. How many times has a golf coach told a golfer, "You are lifting your head just as the club is making contact with the ball?" The golfer doesn't feel her head moving and for a number of reasons doesn't or can't make a correction to her technique. If the coach uses a video camera to record her swing and then plays the video back, the golfer can see the fault in the mechanics. More advanced technology can measure the amount of movement, like how far the head lifted, and with the use of force transducers and EMG (electromyography), can measure the timing of muscle sequences. This type of monitoring with technology can provide a new approach to coaching; therefore, in understanding sport mechanics, we need to understand and incorporate technology into the training sessions.

Colleges are hiring Director of Technology Services for Athletics related to all sports review <http://www.dartfish.com/data/document/document/1104.pdf> . This covers Advanced Human Performance: Development of new advanced materials, equipment, sensors, and analytic strategies that enable athletes to realize their full potential. Second optimizing the game plan including sports analytics, statistics, data mining, game theory. Third , Safety: Analysis of injury and risk, and design and development protective equipment along with associated new materials and sensor. Today everyone around the globe has been scurrying around basically making the training environment for the athlete high-tech," said David James, a sports engineer and senior lecturer at Sheffield Hallam University in England, which runs the Centre for Sports Engineering Research.

Fortune 500 companies like Apple hire over one hundred technology scouts that travel the globe evaluating new technology. A baseball team minor league system needs to evaluate and enhance the new talent to bring up to majors as fast as the development will allow. New technology can speed up the process of player development . A tech scout offers additional dimension to find new technology related to athlete performance. A player personal director / GM can plan 2016 new technology roadmaps to be tested & proven out. Jlyons Marketing ( JLM ) can provide demo ready slightly modified per specifications of teams requirements.

## Technology Used In Sports

OTHER SPORTS TECHNOLOGY  
US DEFENSE R & D  
OEMS  
MEDICAL DEVICES ( Start-Ups , Research Labs , Fortune 500 )  
RESEARCH LABS  
Human Performance Labs

Fortune 500 R & D annually is spent roughly \$300Billion a year related to healthcare and computes. The point to make is no R & D dollars needed to be spent for sports training tools.

The range covers enhance performance to injury prevention

- **Tracking Technology Revolutionizes Athlete Training**

<http://www.athleticbusiness.com/equipment/tracking-technology-revolutionizes-athlete-training.html>

- Injury Prevention technology example

[http://www.philly.com/philly/sports/phillies/20150715\\_Philis\\_need\\_to\\_take\\_healthy\\_look\\_at\\_injury-prevention\\_data.html?nlid=8580391](http://www.philly.com/philly/sports/phillies/20150715_Philis_need_to_take_healthy_look_at_injury-prevention_data.html?nlid=8580391)

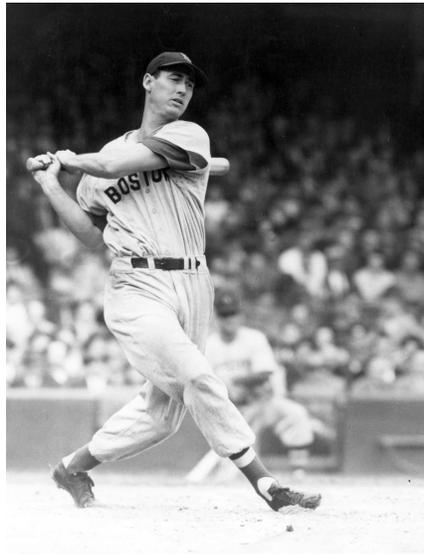
## Other Sports Examples

Top 10 Tech in Sports

[http://www.eetimes.com/document.asp?doc\\_id=1262759&page\\_number=4](http://www.eetimes.com/document.asp?doc_id=1262759&page_number=4)

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An example training tools that be develop so players can see the ball like Ted Williams



Ted Williams was thought to have the greatest eyes in baseball. Ty Cobb once said, "Ted Williams sees more of the ball than any man alive - but he still demands a perfect pitch." When he entered the Navy in 1942, Williams' vision was found to be 20/10. "They used to write a lot of bull about my eyesight," Williams said. "How I could read license numbers on cars before another guy could see the license. . . . Or how I could read the label on a phonograph record while it was going around the turntable. 'What made it worse was when I took my physical with the Navy, they announced my eyesight was 20/10 and the intern said, 'This guy's got terrific eyesight.' 'Sure, I think I had good eyesight, maybe exceptional eyesight, but not superhuman eyesight. A lot of people have 20/10 vision. The reason I saw things was that I was so intense . . . it was discipline, not super eyesight.'" vision. The reason I saw things was that I was so intense . . . it was discipline, not super eyesight."

Nationals players praise special glasses that help strengthen vision

<http://www.washingtontimes.com/news/2012/jun/12/eyes-have-it-with-help-of-special-spectacles/?page=all>

## Training Tools for Sports :

- Baseball mount the device to the knob of their bat to replay their swing in three dimensions, and lets one view it from all angles, including a bird's eye top-down view. Included in the playback are visually highlighted areas to track bat plane and bat path.



Hawk-Eye is a complex computer system used officially in numerous sports such as [cricket](#), [tennis](#), [Gaelic football](#), [hurling](#) and [association football](#), [badminton](#), to visually track the trajectory of the [ball](#) and display a record of 4 statistically most likely path as a moving image

Video-Based Sports Analytics Solutions <http://www.news-sap.com/sap-panasonic-launch-joint-initiative-video-based-sports-analytics-solutions/>  
SAP and Panasonic Launch Joint Initiative for Video-Based

Smart Googles video goggles 1000 frames per second ( slow motion )  
<http://www.sporttechie.com/2014/03/13/three-ways-google-glass-could-be-utilized-by-the-nba/#more-18172>

Tampa Bay Rays recently installed a motion-capture system called KinaTrax designed to monitor their pitchers' mechanics. In addition to helping their coaches work with players on short-term fixes that improve performance, you can bet the Rays will be spending countless man hours crunching each game's data in search of patterns that might correlate with injuries.

## Training Tools For Sports

- Spin doctors' high-tech simulation helps skaters nail those jumps [Sports Analytics Solutions](http://articles.philly.com/2014-02-03/news/46927572_1_simulation-cameras-jumps) [http://articles.philly.com/2014-02-03/news/46927572\\_1\\_simulation-cameras-jumps](http://articles.philly.com/2014-02-03/news/46927572_1_simulation-cameras-jumps)
- How a Danish tech company is revolutionizing pitching data <http://www.si.com/more-sports/2011/04/12/fastballs-trackman>
- Image speed , motion capture etc Over the past few years, motion capture has gone to a "markerless" model, doing away with the silly suits and long setup previously needed to allow for capture and analysis. The next phase along those lines could be in using a suit like the [PrioVR](#), which captures far more data and does so in real time.



- Golf as an example has the most patents for hitting a ball techniques

## OEM 's

- Apparel from track suits to running shoes, new designs and re-engineered fabrics are aimed at making athletes faster. Compression garments are a big trend. Compression helps blood flow and keeps an area taut so there is less muscle pull and strain, said Mark Sunderland, a textile engineer at Philadelphia University and a performance-apparel expert. Textile can currently measure compressive force, tensile force and temperature.

- Apparel Technology in Sports is Optimizing Player Performance

<http://iq.intel.com/sartorial-sports-tech-powered-apparel-optimizes-player-performance>

[Wearables and company wellness programs go hand-in-hand](#)

Iron Mountain sees big drop in insurance costs with LiveWell program, aided by wearable devices.

- Broadcaster equipment that can be adapted for video analytics

Instant Replay from broadcaster that adapts to player development A ref cam system is a wearable, HD 1080i wireless camera system designed to capture the point-of-view (POV) of the referee during live broadcast productions of sporting events. The camera is small, with dimensions of 1.75 inches high by 1.125 inches wide by 3.5 inches long, and lightweight, weighing in at 3.77 ounces.

- Sensors

The application of modern sensor technology to the athlete's quest for improvement is just beginning. While some innovative fitness devices have come to market in the last few years, these represent just the tip of the iceberg in terms of how these sensors and embedded computing power will revolutionize the way that aspiring and even casual athletes approach their training and development.

<http://www.st.com/st-web->

[ui/static/active/en/resource/sales\\_and\\_marketing/presentation/product\\_presentation/MEMS\\_Summit\\_Matt\\_Apanius.pdf](#)

Hundreds of wireless sensor technologies from startups to Fortune 500 companies like Bosch Connected Devices and Solutions GmbH. Sensors communicate with data analytics video / software OEMS

Image sensors ( an example Toshiba & OmniVision ) JLM sold over \$100M in cell phones

OEM's -SENSORS

Researchers Use Sensor Technology to Improve Athletic Performance

<http://umaine.edu/news/blog/2011/03/25/researchers-use-sensor-technology-to-improve-athletic-performance/>

Sensory Training Technology Takes Hold in the NFL

<http://techland.time.com/2012/01/03/sensory-training-technology-takes-hold-in-the-nfl/>

Technology, however, provides us with many different kinds of sensors for specifically measuring these attributes. The key, however, is not what sensors you can throw into a package, but how you use the data from all of these sensors together to paint a detailed and realistic picture of the critical moments in sports. The table below looks at some of the more widely available sensors and how they may be applied to sports.

Sensor

Sports Applicability

Doppler

Object Speed

Accelerometer

Acceleration (limited inference of position, velocity)

Ultrasonic

Distance, (inference of velocity and acceleration)

Photo Detectors (IR, Light)

Position, proximity

Magnetic Sensors (Hall Effect, Reed, magnetomer)

Position, Cadence, speed, (inference of acceleration, position)

Temperature Sensors

Environmental factors, body temperature

Humidity Sensors

Environmental factors

CCD/CMOS

Position, proximity, (with significant processing, form and execution)

Sound

Device Interaction, activity inference

## OEM's

- Automotive

How Formula 1 Technology Innovations are Racing Us into the Future  
<http://iq.intel.com/how-formula-1-is-racing-us-into-the-future/>

- Virtual Reality [http://www.edn.com/electronics-products/other/4438099/Module-transforms-eyewear-into-smart-augmented-reality-devices?\\_mc=NLEDTEDN\\_productsandtools\\_20141229&cid=NLEDTEDN\\_productsandtools\\_20141229&elq=49c71205fd6e4d038d76bcdf46d046bf&elqCampaignId=209](http://www.edn.com/electronics-products/other/4438099/Module-transforms-eyewear-into-smart-augmented-reality-devices?_mc=NLEDTEDN_productsandtools_20141229&cid=NLEDTEDN_productsandtools_20141229&elq=49c71205fd6e4d038d76bcdf46d046bf&elqCampaignId=209)

- EYEWEAR / GOOGLES



Smart Googles video googles 1000 frames per second ( slow motion )  
<http://www.sporttechie.com/2014/03/13/three-ways-google-glass-could-be-utilized-by-the-nba/#more-18172>

## OEM's Software

Video analytics software ( pitching ) [http://sports.yahoo.com/news/sources--mlb-team-enlisting-potentially-revolutionary-technology-to-study-pitching-154837850.html?soc\\_src=mediacontentstory&soc\\_trk=ma](http://sports.yahoo.com/news/sources--mlb-team-enlisting-potentially-revolutionary-technology-to-study-pitching-154837850.html?soc_src=mediacontentstory&soc_trk=ma)

- Quantum Interface Launches Intuitive, Easy Navigation for Augmented Reality Based on Motion and Predictive Navigation
- Camera slow motion / instant replay HD cameras have built-in GPS elevation distance tracking , Bluetooth capability to control a camera remotely and lashed to helmets
- Optical motion capture analyze performance movements, features digital video graphics that can enhance visual feedback instantaneously in different ways. It permits the athlete and the provider to examine performance deficiencies in extensive visual detail,
- Biomechanics enable a whole body approach to real-time biomechanics measurement EMG, gait analysis, biofeedback and 2D/3D motion analysis.



## Human Performance Labs

Companies include

- GSK <http://www.gskhpl.com>,

- JNJ [Human Performance Institute Division of Wellness & Prevention](#),
- Nike
- Redbull
- Under Armour

All have multi-million dollar labs set up. Currently work with athletics related player performance.

## COMBINING WORLD CLASS SPORTS SCIENTISTS WITH CUTTING EDGE TECHNOLOGY



## MEDICAL OEMS

- Optometry <http://www.qmed.com/mpmn/medtechpulse/hacking-wearables-medical-device-applications> Hacking Wearables for Medical Device Applications



## OEM's Medical

NeuroTracker provides strength and conditioning training for the key cognitive skills that are most important to athletic performance: situational awareness,

focus and dynamic scene processing. Virtual reality programs like [Strivr](#) provide immersive environments that help athletes gain the mental reps they need to learn specific plays in specific situations. Both are important and complementary to each other. Just as athletes have rigorous physical strength and conditioning programs in addition to their live and virtual practice sessions, so too should they have rigorous cognitive training regimens, which is what NeuroTracker provides.

An important quality for any VR program is its ecological validity, i.e., how closely it approximates real-world situations. NeuroTracker is very ecologically valid because it's so simple. The pathways and trajectories that the virtual balls take are identical to what would occur with physical balls, if they could float around in a 3D cube. Although this is a simple exercise, it is unique in its ability to simultaneously solicit the neural systems for awareness, attention and information processing. By isolating these systems, overloading them and repeating over and over, the neural pathways connecting these systems become stronger and more efficient, a quality called neuroplasticity. As a result, the athletes become better at reading the scene on the field, anticipating what comes next, and executing in pressure-filled situations.

Immersive VR programs are highly context-specific, so getting them to approximate reality can be a very complex process. It's not clear how much of an investment the Stanford or Arkansas coaches had to make to get their initial QB simulations done, but getting simulations for the entire playbook for each offensive and defensive position sounds like a non-trivial exercise. Still, having the ability to practice virtually is a great advantage, and something that we can deliver now with NeuroTracker Tactical Awareness (NTTA) mode. This mode requires the player to make correct playbook decisions while NeuroTracking.

## MEDICAL -Injury Prevention

## MEASURING FATIGUE Technology

- Muscle Sound software for Ultrasound <http://www.sporttechie.com/2014/04/01/how-musclesound-technology-is-providing-new-ways-to-measure-athlete-performance/>
- Rutgers women's soccer team uses technology to improve program and lower injury rates [http://www.nj.com/rutgers/index.ssf/2013/10/rutgers\\_womens\\_soccer\\_team\\_uses\\_technology\\_to\\_improve\\_program\\_and\\_lower\\_injury\\_rates\\_1.html](http://www.nj.com/rutgers/index.ssf/2013/10/rutgers_womens_soccer_team_uses_technology_to_improve_program_and_lower_injury_rates_1.html)
- Tech-savvy Pirates testing a new secret weapon this spring <http://triblive.com/sports/pirates/5784994-74/pirates-martin-calories#ixzz2xZJny2M1> Tech-savvy Pirates testing a new secret
- Eccentric Hamstring Strength and Hamstring Injury Risk in Australian Footballers. <http://journals.lww.com/acsm-msse/pages/articleviewer.aspx?year=9000&issue=00000&article=97945&type=abstract>
- Zepp revolutionizing fitness tracking by measuring four muscles (biceps, triceps, abs, and quads) device might give them their Holy Grail in measuring fatigue. Aim to detect fatigue directly, it could be possible to use on a pitcher after he comes off the mound each inning, with an athletic trainer checking his arm in just seconds to obtain a real-time measure of muscle fatigue



**MedTec**  
Medizintechnik GmbH

**MBST**  
Kernspin

- Founded in 1998
- Own Research and Development
- International activities
- Top-Innovator 2014
- Own production, Made in Germany
- Owner-managed



**TOP 100**  
Top-Innovator  
2014

**MedTec**  
Medizintechnik  
GmbH



- MBST treatment with MBST® resulted in measurable improvement of mobility, coupled with distinct relief from, and in some cases even the total reduction of pain in the diseased body part [www.mbst.de](http://www.mbst.de)

## MEDICAL -Injury Prevention

- Air Products Cryotherapy with KrioSystems technology with special chambers used primary in basketball
- CVAC Systems Inc. says athletes who use the CVAC process report greater endurance and more energy. The pod's popularity got a boost recently when Serbian tennis player Novak Djokovic reportedly used the device. A study of athletes at the University of Hawaii in 2009 found that the process significantly improved their blood's oxygen-carrying capacity. CVAC officials won't reveal which Olympic athletes use the chambers or the price tag of the equipment. Athletes usually rent time on the pods at sports facilities. "We found athletes don't like to let their competitors in on what they're doing," said Mary Steinman, the company's director of marketing
- Head Injuries in Sports: Wearable Sensors and Tech Changing Game Head Injuries in Sports <http://iq.intel.com/sports-using-technology-detect-prevent-athlete-head-injuries/>



## US Defense R & D Dollars

- DARPA is funding the development of a soft, fabric-based exoskeleton Wyss Institute, Harvard Biodesign Lab Inspired Engineering is taking the lead on the biologically inspired smartsuit with the aim of reducing injuries and fatigue, while improving mission performance. The Army's new "smartsuit"
  - Special Forces technology used for target practice  
: <http://www.wired.com/2012/05/socom-neurotracker>
  - Portable Unit Metabolic Analysis (PUMA) NASA Glenn Research Center  
Detects hypoxia to ensure health and safety of astronauts, pilots, divers, and athletes

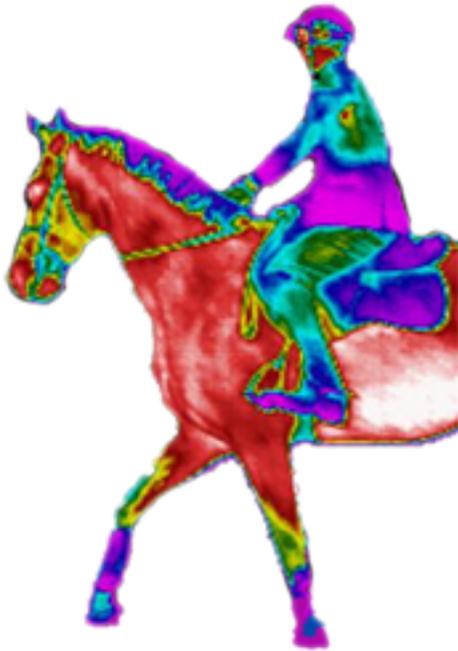
- Centr Camera, NeoLab Offer New-Look Machine Vision develop a 360-degree machine vision technology that can identify certain objects -- such as people



## Thermography Technology

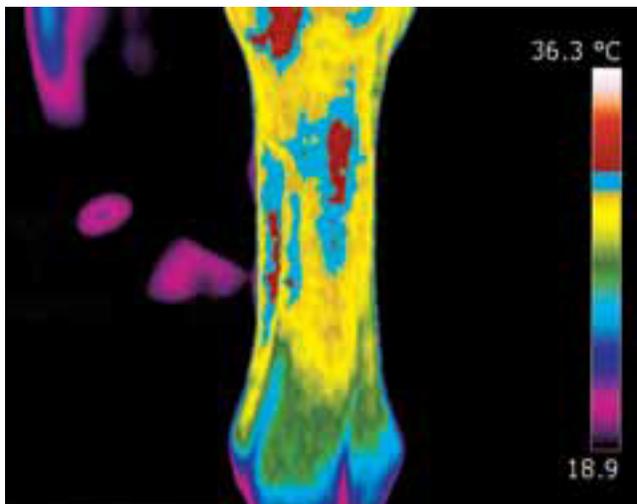
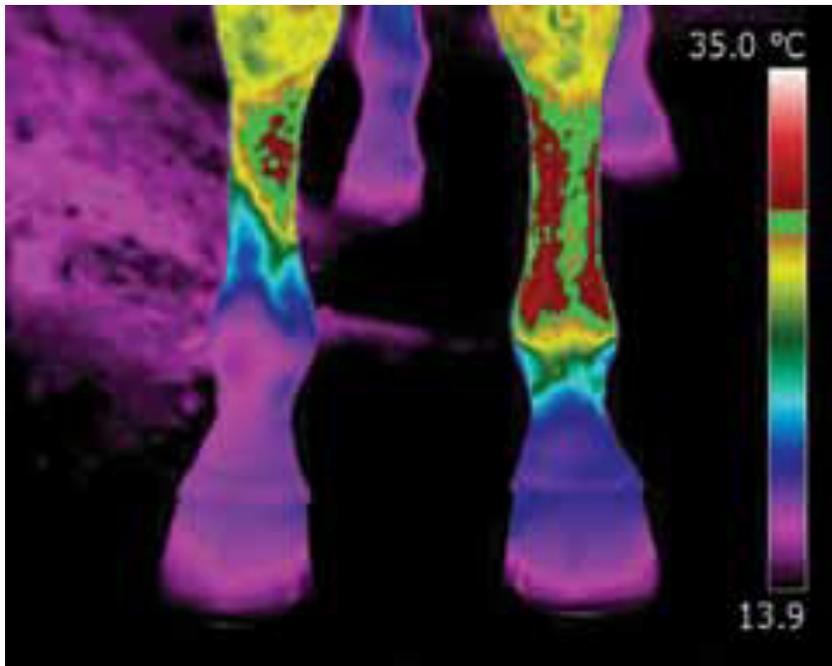
<http://www.flir.com/thermography/Americas/us/view/?id=44238>

**Before Thermography, Veterinarians could only locate problems using traditional methods such as observation and palpation. Now, using advanced EquineIR™ thermography, abnormalities present stressed tissues even before damage occurs. This methodology has been developed and refined over the past twenty-five years and has been proven to be an effective imaging technique for the following:**



- Hoof Balancing
- Inflammation
- General Diagnostics & Preventive Medicine
- Pre-Event Imaging
- Saddle Fit
- Muscle/Nerve Injury

A horse's saddle should fit correctly and have even bearing on the horse's back. A thermal review of the horse and the saddle can show when pressure points are unevenly distributed, therefore causing discomfort to the horse and the rider.



*In a routine thermography checkup (left) Sandie discovered a severe injury. There is an obvious difference in the thermal pattern between the left and right front leg. On the right is the injured leg in close-up. There is a very clear hot spot indicating some kind of injury in the tendon.*

## Thermal-imaging cameras to be tested during World Series broadcasts



*Associated Press file photo* World Series moments - such as Edgar Renteria's home run in 2010 for the San Francisco Giants - could be visually enhanced by new technology to be tested during this year's games. Fox wants "to look at bat-on-ball type contact and when the ball hits the side of the bat ... They're the sort of clients that we love to work for and, you know, that support us 100 percent."

Unlike the Board of Control for Cricket in India.

It has blown hot and cold — well, mostly cold — about the use of technology in umpiring. It agreed to use Hot Spot for its ill-fated tour of England this summer, when the English whitewashed the test series 4-0 to wrest away the Indians' crown as the world's No. 1 side.

Some disputed calls involving Hot Spot — "We probably did miss a couple, where the player did hit it and it didn't show up on Hot Spot," Brennan said — in that series subsequently led to a U-turn from the BCCI. In September, its president called Hot Spot "insufficient" and said the BCCI no longer wants umpiring technology, called the Decision Review System or DRS in cricket, at least not in its present form.

## Thermography Technology in Sports

### Analyse Motion Shoe Fitting for Runners in five seconds

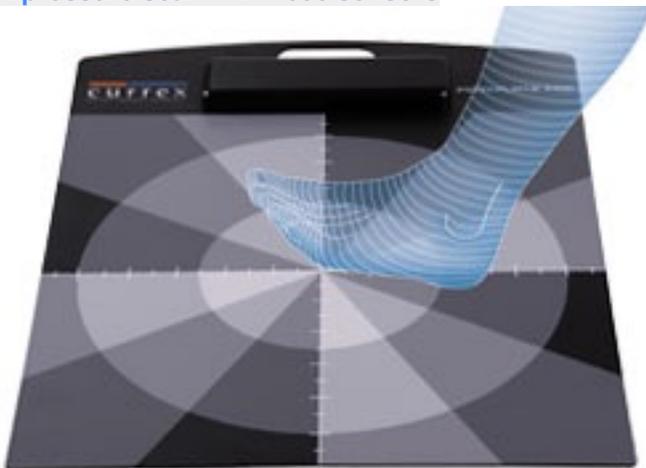
<http://www.currex.de/en/> currex creates solutions to analyse and optimise human motion.

Foot type and shoes size measurement



FOOTDISC - Thermography foot scan: Quick and maintenance-free

Foot pressure scan with 4096 sensors



Footplate - Dynamic foot pressure measurement and postural analysis

## Thermography Technology In Sports

Motorsports industry — testing brakes, engine components, exhaust systems, tires, cooling systems, even seat warmers. Infiniti Red Bull Racing team with unique insights into the thermal characteristics of their cars' components and operations. Managing car temperatures effectively will be a key aspect of ensuring reliability, a factor which is expected to play a significant role in determining the outcome of this season. Commenting on the collaboration, Christian Horner, Team Principal of Infiniti Red Bull Racing, said "This year sees the most fundamental changes to Formula One in well over a decade. The team which is most efficient in gathering the relevant data, learning effectively and adapting accordingly will be the one which triumphs in this season of transition.

## J Lyons Marketing As Tech Scout For A Sport Team

You should keep in mind that:

- JLM as a technology marketing company is a specialist for finding advance technologies
- JLM does business development globally with leading research institutions (over 30) target 20 most innovative countries
- JLM has 29+ years working with start-ups and spin-off companies with CTO's to validate new technology. Review over 3,000 companies a year.
- JLM is in the "door" with hundreds of CTO's related to new technology roadmaps. The relationship typically is on an on going bases
- JLM commercializes Fortune 500 non core technology to add revenue, typically start at \$100M
- **JLM has relationships from both sides the companies with enabling technology and ones that have the "demand"**
- JLM has set up over 200 beta sites and have design in over \$1 Billion of new technology.
- A technology scout for baseball team is very low risk and major upside.

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