

impact

THOUGHT
LEADERSHIP
FROM



WINTER 2016/SPRING 2017 | ISSUE 02

MAKE OR BREAK
how can the handheld
sector balance consumer
demands with practicality?

TRACK RECORDS
how sport is helping drive
innovation in impact protection

THE BIG ISSUE

is 'military-grade
protection' tough
enough for
consumer tech?

WORD FROM THE TOP
industry leaders on how to
create an innovation culture



impact magazine

THOUGHT LEADERSHIP FROM D3O

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protection by delivering trusted, high
performance, quality shock absorbing
solutions to our partners.

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WELCOME

STUART SAWYER, CEO, 

Welcome to this second issue of *Impact* magazine, which offers a compelling insight into the past, present and future of impact protection and shock absorption technology.

Ten years ago D3O changed the world of protection when the US and Canadian ski teams adopted our high performance soft armor for the 2006 Olympic Winter Games in Torino. D3O developed a lightweight, low-profile, flexible and breathable protective solution that gave the skiers the protection they needed, without any compromise on flexibility and freedom of movement. D3O technology transformed the global protective wear market almost overnight, from 'big and bulky is best' to clever, patented, low-profile performance.

A decade on, D3O continues to lead the world in protection, delivering exciting and

diverse solutions to protect people and their things around the world. D3O is committed to its cause and delivers game-changing protective solutions for the consumer electronics sector, American footballers and the defense and workwear sectors operating in the harshest of environments.

Innovation is at the heart of our business and today remains central to the work being done by our chemists, designers, material technologists and engineers. That's why we believe D3O and our unique technologies keep growing and expanding into new markets and sectors – not only in terms of keeping soldiers and sportspeople better protected, but in driving greater business efficiencies, human productivity and athletic performance.

Our aim in this edition of *Impact* is twofold. Firstly, to show you how we at D3O are changing perceptions about protection, through our continued commitment to research and develop new materials and

innovative new product solutions. Secondly, to highlight some of the key issues around impact protection in the rapidly expanding consumer technology sector.

Many of the products we protect today in everyday life have their origins in work we did for the defense sector. These roots are often used in marketing narratives to imply a degree of ruggedness that can't always be justified by the methods of testing them. What does 'military-grade protection' actually mean? And how can consumers be confident in the choices they make when seeking to protect costly, fragile and increasingly miniaturized devices? How can we trust the claims being made on the packaging?

These are important questions we believe should be asked; our aim is to respond with business-changing answers.

I hope you find this issue of *Impact* an enjoyable and thought-provoking read.

NEED FOR SPEED

CRASHES ARE AN OCCUPATIONAL HAZARD IN MOTORSPORT. WORLD CHAMPION RACER SAM LOWES TALKS TO *IMPACT* ABOUT PERFORMING TO THE MAX WHILE STAYING SAFE

It's hard jumping off a bike at 150mph," says Britain's Moto2 contender Sam Lowes. He's describing an occasion at the Knockhill racing circuit in Scotland when his brakes failed and he was forced to make an emergency dismount.

"It's hard to jump off but I had to, otherwise... There was a wall coming. In our sport you get injured a lot but you get real injured if you hit stuff. Just don't hit anything."

It's a simple golden rule from a man who is no stranger to pain. When we meet, halfway through the 2016 Moto2 Championship, he reckons he's parted company with his bike 20 times already this season. I tell him that a Google search of 'Sam Lowes crash' returns 570,000 results.

"Hopefully some of them are duplicates," he laughs, but the truth is he has a history of cracks and breaks that reads like a glossary of the human skeleton.

Back: "I broke my vertebrae. They gave me injections a week after. Massive needle. I raced. Won."

Collar: "My collarbones are destroyed, both of them."

Fingers: "They're the most painful sometimes. I did my little finger last year in a few pieces and they just injected me and off you go."

Wrist: "I did my scaphoid a couple of years ago and I raced with that. I still can't bend it back. That was really painful 'cos every time I broke it, it pushed in and made me feel sick."

RITE OF PASSAGE

You get the picture. What is fascinating is the acceptance of these injuries as an occupational hazard.

The 25-year-old from Lincoln has been racing bikes since he was eight years old alongside his twin brother Alex, who currently races in the World Superbike Championship. He looks back on his first big spill – a broken collarbone sustained at the age of 14 – as if it were a rite of passage.

“Up to that point I’d never broken anything so it was like a milestone in my career. It was good. I’ve done the same one three times since – just to make sure I did it right.”

Gallows humor seems to be woven into the DNA of racers like Lowes. A compact 5’6”, self-assured and engaging company, with a ready wit and brimming enthusiasm for his sport, when Lowes says he doesn’t really think about crashing, let alone fear it, you believe him. That he can go into each race concentrating on winning, not on crashing, is down to having the right preparation and equipment.

He works on his fitness every day, with two hours of cardio and core work in the morning then, three days a week, a long run in the afternoon. In winter, when the race season closes down, his training intensifies. Stamina and strength are vital for bike racing, such are the forces pulling on you and the adrenaline

devouring your energy. Lowes’ heart rate never drops below 180bpm during a race.

“I’ve done lots of cycling, I’ve run half marathons, 10k races, and the thing that tires me out more than anything is racing my bike. It’s so physical.”

MAKING MARGINAL GAINS

There is no training for falling off a bike – “but I’ve done a lot of crash training in real time” – and, perhaps surprisingly, there is no team sports psychologist whispering positive messages in his ear.

Lowes did see a sports psychologist once, who advised him against having any superstitions as they can become a crutch that lets you down. It’s up to him to bring his courage to the track.

“When I’m on a race weekend, the goal is to win so I don’t really think about the safety side of it. But you need to have equipment around you that makes you not think about it. You just don’t need to have any questions like that in your head.”

Shoulders, elbows and knees are protected by D30 pads velcroed into his leathers. A D30 chest and back protector are strapped around his torso. It’s a lot of kit, so it has to be as light and pliant as possible.

“At the qualifying session, two-tenths of a second over a minute and 40 can separate first and fifth place – so you’re looking for every little advantage in every area. It’s a fine balance between being as protected as I can be and being able to ride the bike as well as I can. With this technology we can have everything we need. ▣

**A GOOGLE SEARCH OF
‘SAM LOWES CRASH’
RETURNS 570,000
RESULTS**



CAREER IN NUMBERS

2009-13
SUPERSPORT
WORLD CHAMPIONSHIP

2009 HONDA
COMPETED IN TWO ROUNDS

2010 HONDA
25TH

2011 HONDA
6TH

2012 HONDA
3RD

2013 YAMAHA
1ST

2014-16
MOTO2 GRAND PRIX

2014 SPEED UP
13TH

2015 SPEED UP *
4TH

2016 KALEX
5TH

2017-18
MOTOGP CHAMPIONSHIP

*** HOLDS MOTO2 LAP RECORD OF 1:51.514
AT MUGELLO, SET DURING 2015 ITALIAN
MOTORCYCLE GRAND PRIX**

"On the bike you're in a tucked position for a long time and if you've got something that's digging into you, it's a long time to be uncomfortable. This armor is great because it's soft and flexible. It molds to your body."

FOCUSED ON WINNING

Lowes comes across as a man with the mental freedom to pursue his goal of taking on the world's best in MotoGP next season. He has secured a ride for Aprilia over the next two seasons, which has the added thrill of pitting him against his childhood hero.

"Valentino Rossi. 1999 was his first year in the top class, when I was nine years old.

Now I've been to his ranch and I've trained with him and next year I'll race against him. That's a great feeling."

Lowes talks a lot about 'the feeling' of riding a bike fast. The thrills override the spills. So what is the biggest thrill of all?

"Winning. I get a lot more from the feeling of the result than from the actual riding. Riding's fantastic, I love it, but the extra emotion comes from achievement.

"The motivation now is different because, much as it's fun or a hobby, it's my job and I'm under a lot of pressure; there's a lot of people banking on me to do well."

Forty years after Barry Sheene's last

World Championship triumph, Britain is still waiting for its next winner of the top prize in Grand Prix bike racing. Sam Lowes would be a fitting heir.

"TWO-TENTHS OF A SECOND OVER A MINUTE AND 40 CAN SEPARATE FIRST AND FIFTH PLACE - SO YOU'RE LOOKING FOR EVERY LITTLE ADVANTAGE IN EVERY AREA"



PHILLIP ISLAND, AUSTRALIA



MUGELLO, ITALY



SILVERSTONE, UK

QUICKFIRE Q&A

Favorite circuit? Phillip Island, Australia. For the setting. It's a great location.

Favorite event? Silverstone. My home race. It's incredible. The home crowd gives you that little bit more.

Most grueling circuit? Mugello, Italy. It's really fast and all the corners are really flowing so there's no rest. What tires you out is braking and change of direction because you don't really breathe.

Pre-race meal? Pasta and chicken. But plain, really plain, 'cos you're nervous as well so if you eat anything too rich you'll be sick.

Antidote to bike racing? Golf. On my bike it's me against the track and golf is similar. You're testing yourself against something.



Visit d3o.com to see how D3O works with its motorcycle partners to develop high-performance impact protection products

D3O® - A DECADE AND MORE OF SPORTING INNOVATION

LOW-PROFILE D3O PROTECTION USED BY US AND CANADIAN SKI TEAMS IN SPYDER RACE SUITS AT WINTER OLYMPIC GAMES

MOVE INTO ACTION SPORTS WITH PROTECTION FOR MOUNTAIN BIKING, SKATEBOARDING AND BMX

PARTNERSHIP WITH HEAD TENNIS TO INCORPORATE D3O IN RACKETS

BODY PROTECTION FOR DOWNHILL MOUNTAIN BIKE BRANDS INCLUDING SCOTT, RACE FACE, 661 AND BLUEGRASS

PARTNERSHIP WITH SCHUTT SPORTS TO DEVELOP HELMET LINERS FOR FOOTBALL AND BASEBALL

2006

2007

2009

2010

2012

HEAD FIRST

ADVANCES IN HELMET TECHNOLOGY ARE PLAYING THEIR PART IN MAKING FOOTBALL SAFER

Every impact sport carries risk. For players and spectators alike, it's part of the thrill. However, football and rugby union have both been accused of failing properly to address the risk of traumatic brain injury (TBI) as a result of undiagnosed concussions caused by player collisions. In addition, baseball and cricket have been compelled to address head safety after a number of blunt force trauma incidents – one of which proved tragically fatal.

Research has shown that repeated concussions and head impacts increase the possibility of TBI. No sport has come under greater scrutiny for its response to this risk than football, with a headline-grabbing survey by Bloomberg Politics in 2014 revealing that 50 per cent of Americans would not allow their children to play youth football.

The story of how the brains of many former football players showed evidence of neurodegenerative disease even made it to Hollywood: Will Smith's 2016 film 'Concussion' raised yet more concerns about the potential hazards of an activity where high-speed collisions between huge, powerful athletes are the norm.

In response, equipment manufacturers are playing a key role in increasing safety by investing in technology to help minimize the impact of the sport's characteristic big hits. Football authorities have scrutinized how the game is played and are supporting further research into brain trauma and helmet design. Player safety is 'our number one priority', says NFL commissioner Roger Goodell.

STEPS TO GREATER SAFETY

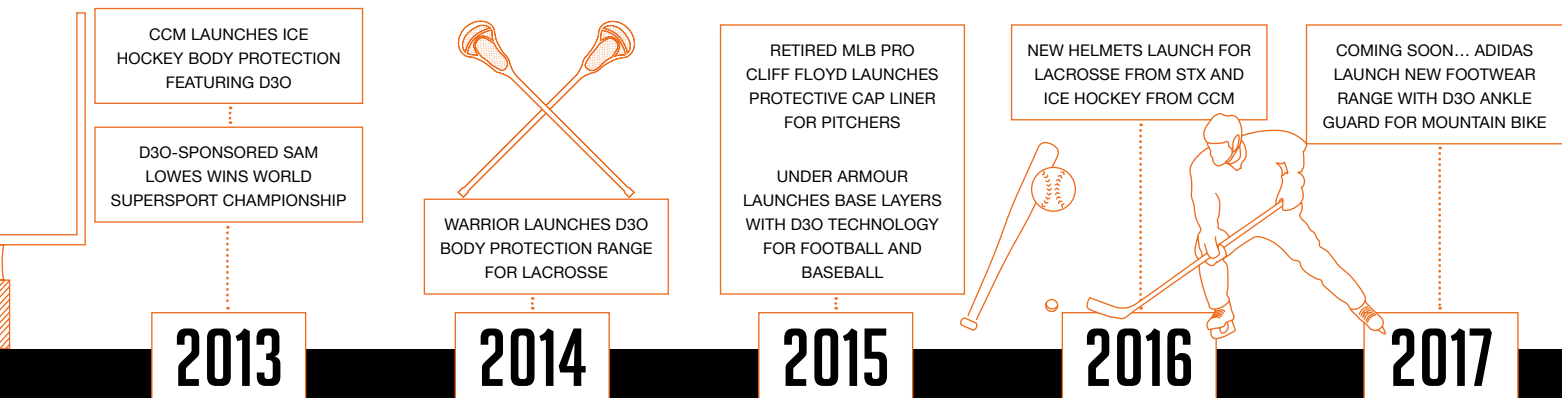
The NFL is now one of the largest funders of brain research, supporting numerous projects including a global initiative launched in early 2016 by the International Concussion and Head Injury Research Foundation to study the long-term effects of concussion in impact sports players.

Thirty-nine rule changes with player safety in mind have been introduced into the NFL over the last five years. New concussion protocols include independent observers telling officials to stop a game if a player shows signs of disorientation.

Also, tackling techniques inspired by rugby union are increasingly finding favor. Instead of using the head as the first point of contact, tackling with the shoulder is proving safer – and, according to some coaches, more effective.

Yet rugby union is certainly not immune from issues around head injuries. Concussions account for 17 per cent of all rugby lay-offs while England international Alex Corbisiero has stated that suffering concussion is 'inevitable'. The sport is unhelmeted, and claims by soft headguard manufacturers that their products can reduce impacts transferred to the brain have been rigorously challenged. ▀

EQUIPMENT MANUFACTURERS ARE INCREASING SAFETY IN FOOTBALL BY INVESTING IN TECHNOLOGY TO HELP MINIMIZE THE IMPACT OF THE SPORT'S CHARACTERISTIC BIG HITS



HEAD FIRST



An alternative approach is a smart mouthguard that measures the location and level of each hit taken by an athlete. The Vector MouthGuard by i1 Biometrics wirelessly transmits data to team personnel on the sidelines, creating a real-time assessment of an athlete's exposure to impacts. According to i1 Biometrics President Jesse Harper, a former football player, 'I'm interested in how we preserve the game, allow young men to play the game, but make it safer'.

LEARNING FROM TACTICAL RESPONSE

Evidence of TBI among soldiers is well documented and there is increasing collaboration in studies exploring the prevention and reduction in severity of TBI among athletes and military personnel. In 2013, GE and the NFL teamed up to accelerate concussion research, diagnosis and treatment by launching the Head Health Initiative – a five-year project to improve the safety of athletes, members of the military and society overall.

DRAWING ON LEARNINGS FROM THE DEFENSE INDUSTRY, A HELMET LINER DEVIZED BY D3O IN PARTNERSHIP WITH SCHUTT REDUCES THE RISK OF BRAIN TRAUMA FROM AN IMPACT WITHOUT INCREASING BULK

SOLUTIONS IN SMART TECHNOLOGY

As well as straight-on impacts, rugby and football both face the issue of rotational hits that cause the head and neck to twist. Thinking around football helmet technology has moved from simply stuffing in more padding, which makes it harder for players to move their heads.

A helmet liner devised by D3O in partnership with Schutt, for example, uses the product's unique shock-absorbing properties to provide more effective energy dispersion. Drawing on learnings from helmet development for the defense industry, this model reduces the risk of brain trauma from an impact without increasing bulk.

Meanwhile, law enforcement agencies are themselves benefiting from research into the hazards faced by tactical response teams. 3M's Ultra Light Weight Ballistic & Bump Helmet deploys a D3O helmet pad system that has been tested for blunt impact protection against the leading protocol for enhanced combat helmets.

PITCHING INTO DANGER

Baseball and cricket are sports where there is no risk of being hammered by a 220-pound linebacker. Instead, damage is caused by a hard ball weighing less than six ounces but travelling at speeds of up to 100 miles per hour.

Baseball catchers have worn protective helmets since the late 19th century and batters since the 1930s. Pitchers, however, have tended to downplay the risk of a line drive to the head due to its rarity. Yet more than a dozen Major League Baseball pitchers have been struck since 2012, prompting efforts to develop effective protection that avoids violating the sport's strict rules and traditions.

The temple is a pitcher's greatest vulnerability, due to their follow-through position placing the side of the head in line of fire. A direct impact to the temple at just 30mph could be a killer. Spark Innovations' Ball Cap Liner incorporates D3O technology, offers full protection to the temple, stays secure during an impact and is invisible beneath regulation headgear.

PLAYING WITH CONFIDENCE

Cricket batsmen first donned helmets in the 1970s and they have been mandatory in hard-ball junior cricket since 2000 – since when the number of serious head injuries has fallen. Most incidents have involved the ball passing through the grille protecting the face. Yet the tragic death of Australian international Phillip Hughes in 2014 showed that even sophisticated modern equipment can still have vulnerabilities.

Hughes was struck on the back of his neck, triggering a brain haemorrhage. Manufacturers have since developed an attachable neck protector while helmet design continues to evolve in the quest for even greater safety.

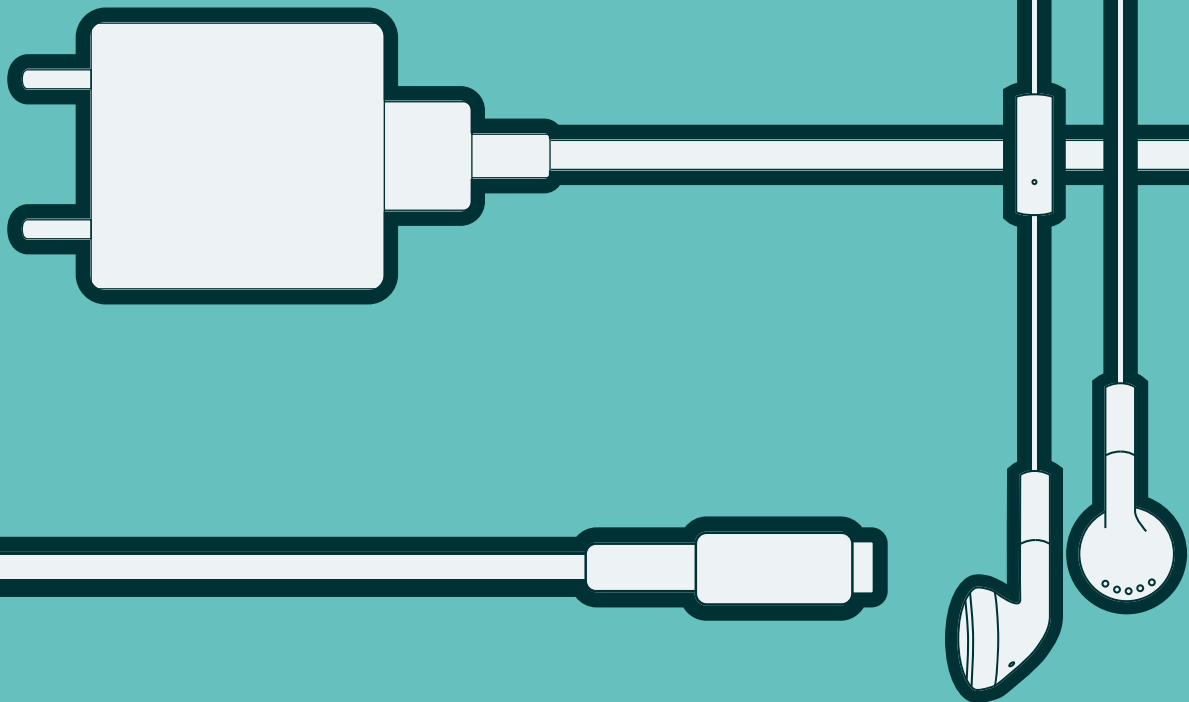
Very few players or administrators want to see their sport become sanitised, and freak accidents are inevitable. Yet TBI is far too serious an issue to be left to chance. It's heartening that the NFL has reported a 36 per cent drop in overall concussions since 2012, with the most damaging helmet-to-helmet or shoulder-to-helmet hits down by around half. A combination of awareness, education and technology are clearly making an impact in football – and this time it's a positive one.

the big issue

impact protection standards for consumer tech

many products claim 'military-grade protection' – what does this actually mean? And just because it's tough enough for the military, does it follow that it's tough enough for the consumer?

A special report by david phelan



There's no shortage of products on store shelves that claim to offer military-grade protection. This sounds impressive, but what does it mean? Are the standards that lead to these claims accurately pursued? And just because it's tough enough for the military, does it follow that it's tough enough for the consumer?

Military specifications are available for products ranging from potato peelers to pens to ashtrays. A mil-spec potato peeler may seem superfluous but for other items, such as a rope that will hold you securely when you're rock-climbing or a case to protect valuable technology like your mobile phone, it's a standard worth knowing about.

In the case of mobile phone protection, the standard in question is MIL-STD 810G. This is one of a series of US military testing standards that have become accepted in a number of other industries as methods for objectively deciding whether a device can withstand certain conditions.

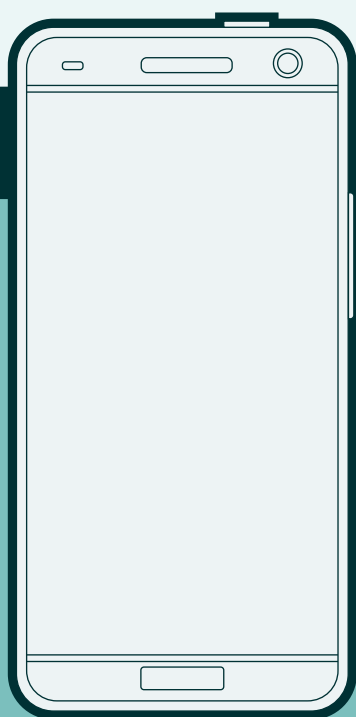
The tests in MIL-STD 810G are not limited to impact protection. They also cover temperature extremes, altitude, humidity, water immersion, drops, shocks, dust and so on. One test, Method 516.6, is specifically a drop/shock test – especially important for handheld devices.

What exactly is involved? The test indicates 26 drops from a height of 1.2 metres onto two-inch thick plywood over concrete. Though not as severe a drop as when a consumer's mobile phone slips from their grasp and crashes onto the street, it's still a challenge.

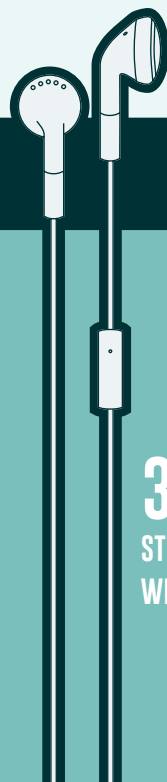
The test specifies that the case (with the device inside) is dropped separately onto each face, edge and corner, and is checked visually after each drop. But is this still an example of buyer beware? After all, there is some room for manoeuvre here. For a start, up to five different samples may be used in the course of the testing, meaning that each might be dropped as few as five or six times.

This is not to say the mil-spec standard is intrinsically wrong; it rightly has its advocates. However, the point at issue is that it was created with a set of requirements that were designed to suit military needs first rather than modern, everyday consumer devices.

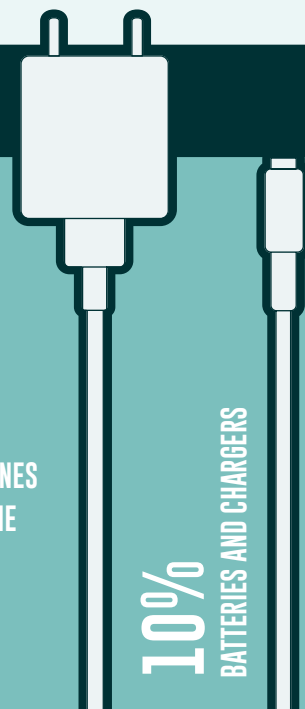
Furthermore, companies are permitted to conduct their own tests. This means comparisons between claims are hard to make and it's up to the companies how they analyse the results. Without independent testing being a requirement – and it's not – there's a need to take on trust that the smartphone case maker really has performed the tests it says it has, and with precision. After all, testing labs are expensive to set up and maintain while putting a logo on a website or carton isn't.



36%
SMARTPHONE
CASES



34%
STEREO HEADPHONES
WITH MICROPHONE



10%
BATTERIES AND CHARGERS

understanding standards

Could a military-grade standard sticker on a phone case be misleading? Does it encourage a consumer to entrust their smartphone to a case which may not live up to its claims?

David Buzzelli, Market Development Leader for the Americas at DuPont, believes there are a number of factors to consider: “The military is well known for setting rigorous standards to protect troops and the equipment that they use in the field. Sometimes, the innovation and product design that goes into meeting those specs can trickle down into the consumer segment and can bring great value. Much like how innovations in the Formula One space eventually make their way into mainstream automobiles.”

And it’s not just the military that benefits, says Buzzelli. “In the last few years we have seen growth in the consumer side of our business as manufacturers try to bring newer high-performing innovations to market.

“There are many instances where Kevlar adds tremendous value to consumer products. A few examples would be Kevlar fiber used in protective motorcycle pants or for improved durability in high-performance athletic apparel and equipment.”

Where does Buzzelli see the future heading as technology becomes smaller, more lightweight and more fragile? “While best known for bullet-resistant vests and helmets, DuPont Kevlar has a proven track record of bringing lightweight strength and durability to many different applications. As the trend towards slim, sleek, smart electronics continues, Kevlar allows designers and manufacturers options to develop even lighter, stronger and safer solutions to help protect your device while retaining the slim profile many desire.”

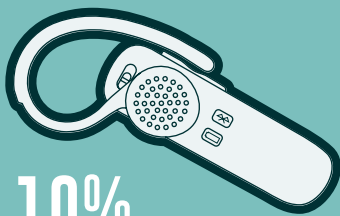
On military specs, Buzzelli concludes: “It is important to understand standards and how they apply (or not). Some questions to consider: does the military standard referenced apply to the intended use of this consumer product? Who is the manufacturer? Are they credible? Have they actually tested the product

against the military spec or simply claim that it will meet the spec?”

As there’s no organisation to insist on compliance or to validate tests, it’s up to customers to find out exactly what tests each manufacturer does, before they buy. In reality, this rarely happens. ▣

“Does the military standard referenced apply to the intended use of this consumer product? Who is the manufacturer? Are they credible? Have they actually tested the product against the military spec or simply claim that it will meet the spec?”

SMARTPHONE ACCESSORY MARKET BREAKDOWN (RETREVO, ABI RESEARCH, STATISTIC BRAIN, 2016)



10%
CELL HEADSETS
AND HANDS FREE



7%
SCREEN
PROTECTION

Independent validation

Some manufacturers do ensure that independent organisations are brought in to confirm what's been tested, and state that a case has been approved by a certified testing laboratory.

Additionally, while a visual assessment after a drop is useful, it may not be enough. A mobile phone case may prevent the handset from suffering a single scratch but a quick look won't reveal if there's any internal damage, for instance to the antenna, the microphone, speaker and so on. If it looks fine but then behaves differently, it's a sign there has been damage that wasn't cosmetically apparent.

The Cranfield Impact Centre (CIC) is a UK test facility with state-of-the-art laboratories offering a range of test rigs for both static and dynamic testing. Tests can be carried out for certification or research purposes, with CIC being a Fédération Internationale de l'Automobile (FIA) approved test house for motorsport tests.

Dr Jim Watson, Engineering Manager at CIC, points out: "The most important consideration is that you need an independent test house to say that your product has met the most relevant

standards properly. If you're doing your own tests, building your own rig and so on, there's room for interpretation. Whereas an independent test body can say what they've witnessed and made sure all the tests were performed correctly.

"Here, we perform tests on Formula One cars – certification body the FIA would simply not accept tests performed at F1 factories. Another play on words is if a label says something is 'equal to' a certain standard. Without an independent test body, it doesn't mean that much."

CIC already conducts impact tests on phone cases, recently comparing how market-leading cases fared in a drop of one metre, with deceleration measured using accelerometers. This showed how much the case compressed on impact and which cases offered better impact protection.

Nevertheless, there's no question of communicating a level of protection. Duane Cabbage, Product and Brand Manager for Australian case and screen armor brand EFM, says: "The military standard is industry recognized, so it plays a part in our overall messaging when featuring performance and standards. It has gained credibility through many US brands utilizing this spec as a key USP, and with EFM D3O Case

A armor we need to compete at the same level or above. Consumers want accurate information and we back this up in all our communications to market."

The mil-spec standard was created with a set of requirements that were designed to suit military needs first rather than modern consumer devices

Phil Mulholland, Chief Marketing Officer for STRAX, whose brands include GEAR4, also thinks the standard is something consumers are familiar with: "The industry has put 'military standard' onto packaging and it's become a basic requirement to have in the protection space." However, he feels the extraordinary pace of change in the consumer tech sector means the military standard could be improved upon: "It's interesting because the military standard was written in the Sixties and the latest update was in 2008."

That was the year the iPhone 3G was released, and at the time most people were using phones that were anything but smart. ▶

MOST COMMON WAYS PEOPLE BREAK THEIR PHONE (KRC RESEARCH, 2015)



50%
HAD THEIR PHONE FALL
OUT OF THEIR HANDS



32%
HAD THEIR PHONE FALL
OUT OF THEIR POCKET

30%
HAD THEIR PHONE FALL OUT
OF THEIR LAP WHEN STANDING



X26
THE NUMBER OF
TIMES A DEVICE IS
DROPPED FOR TESTING

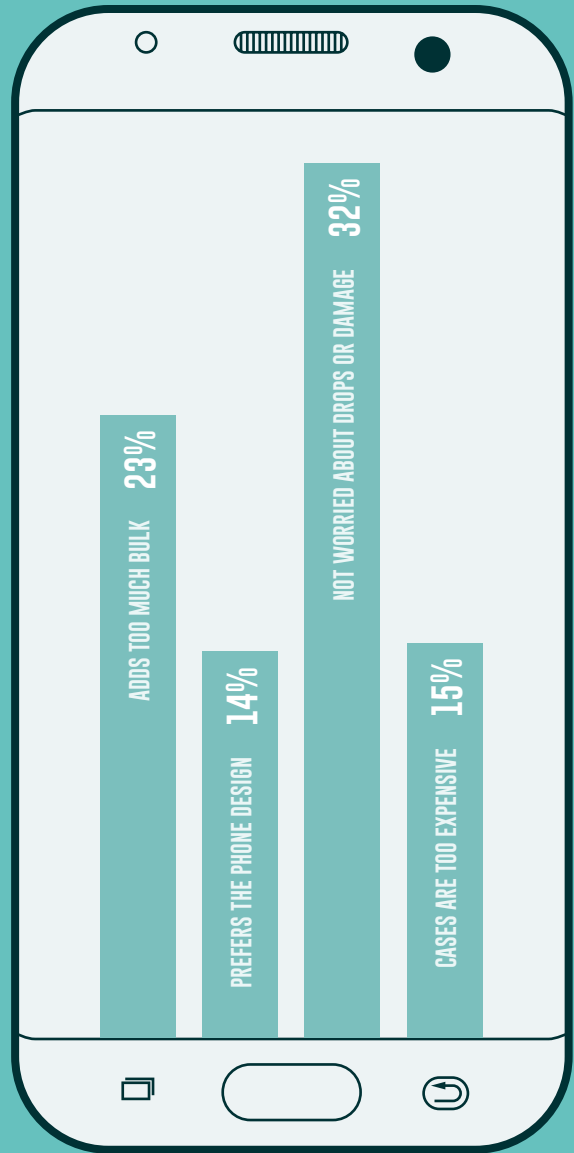
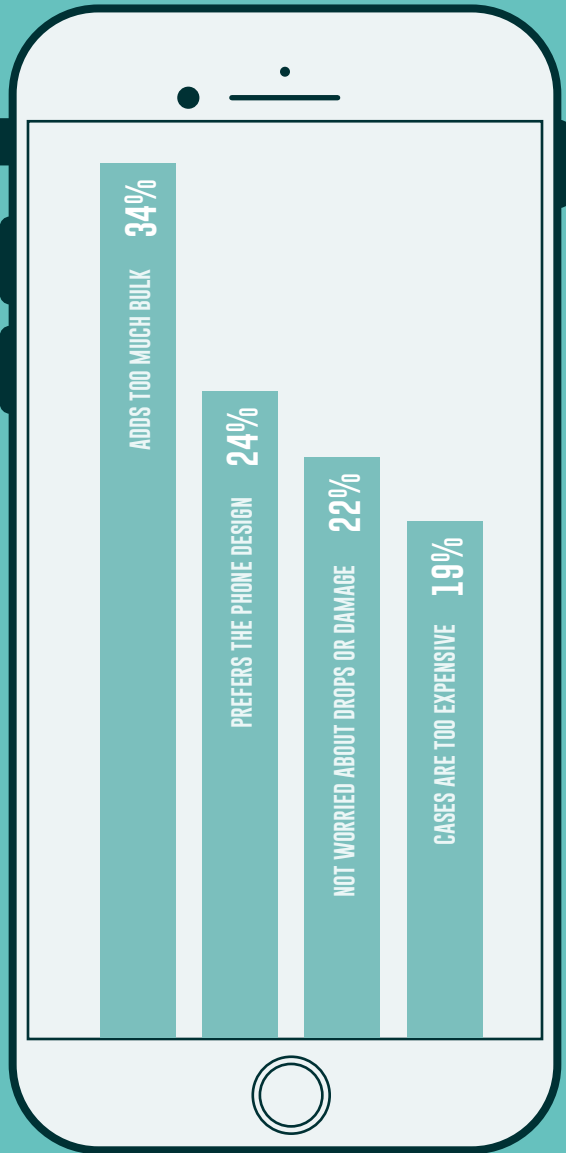
12 ON EACH OF ITS **SIX** FACES,
EDGES AND **8** CORNERS



EACH DROP IS ONTO
2 INCHES OF PLYWOOD
OVER CONCRETE

THE HEIGHT AT WHICH
A DEVICE IS DROPPED
4 FEET

MIL-STD 8106 516.6 SHOCK TESTING SPECIFICATION



REASONS FOR NOT USING A SMARTPHONE CASE

NPD GROUP SMARTPHONE CASE SEGMENTATION STUDY, 2013

False sense of security

Some analysts feel the military spec has become a de facto stamp of approval, even though it's not a standard test. Mulholland again: "It was designed basically to refer to what happens when you drop something in an army truck. Would the bit of electronic radio equipment inside, or whatever, be protected?"

"As a brand, we point out that we exceed the standard because we go beyond the required drop height, we go up to three metres. But for many consumers the thing that jumps out are the words 'military standard approved'."

Phones now have much more computer power that needs protecting. Does that create its own problems? "That's why we signed up with D3O," Mulholland adds, "because it's all about dispersing energy on impact and to make sure that even a slim case can protect more delicate screens and components inside."

Mulholland stresses that the military standard is there as a badge but instead GEAR4 focuses more on the fact that D3O has surpassed requirements in other industries: "From sports to motorbikes, to the Ministry of Defence, to helmet liners for football and defense, these have much more stringent requirements and are standardized so there is an independent component to the testing. If it'll protect your body in motorbike leathers at 100mph, it's going to protect your phone dropping from the top of your car."

Since the standard wasn't designed for consumer use, is it therefore less appropriate for customers? "I wouldn't mind if it was standard among all brands and was

independently tested or had been updated to signify it can protect more advanced electronics. I think it's quite a dated badge."

"if it'll protect your body in motorbike leathers at 100mph, it's going to protect your phone dropping from the top of your car"

Getting the message across is its own challenge, since a customer in a shop will typically spend just three or four seconds reading box information, including what protection is on offer. This means manufacturers must be clear and concise in their communications.

creating an open standard

What does the future hold when many phones now are waterproof or have some degree of shock protection or strong screens from Gorilla Glass, for instance?

"A phone is still an increasingly more expensive piece of kit," says Mulholland. "Even if it's scratch-resistant, consumers still want to protect it to keep it looking like new. If you've bought a thin phone, you don't want it bulked up again so the protection needs to be thin. The other trend is towards colour, and making cases more design-oriented."

A further challenge with the latest models is that they have curved-edged screens. In this situation, manufacturers need to find a way to protect these edge-to-edge screens without covering them. Solutions include adding protection with a front cover in a wallet-style case.

GEAR4 has its own ideas about where the standard should be heading. It is in initial discussions with NPL, the National Physics Laboratory based in Teddington, near London.

"We want to see if there's a process towards having an open standard that can become a more relevant measure of what you're buying in terms of protection," explains Mulholland. "A British standard, devised with an independent authority, would mean the end user has a clear idea of what they're buying. Manufacturers could go to a test lab to have their products independently verified."

The priorities are certainly different in the consumer world compared to the arena in which the standard originated. Not just the contrast between a phone surviving a drop in a military truck and slipping from the grasp of a supermarket shopper, but the phone itself. The device that a consumer carries every day is now vastly more sophisticated than when the standard was last revised.

Sitting alongside the military-grade impact protection standard, we need a new standard for modern-day consumer technology – one that recognizes that a contemporary smartphone is a rapidly evolving, high-performance computer and that it deserves something relevant and specific.

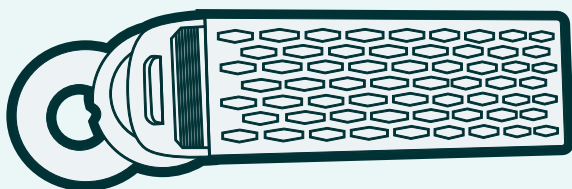
David Phelan is a specialist consumer technology journalist

Good enough for them...

Many technologies we take for granted have military origins

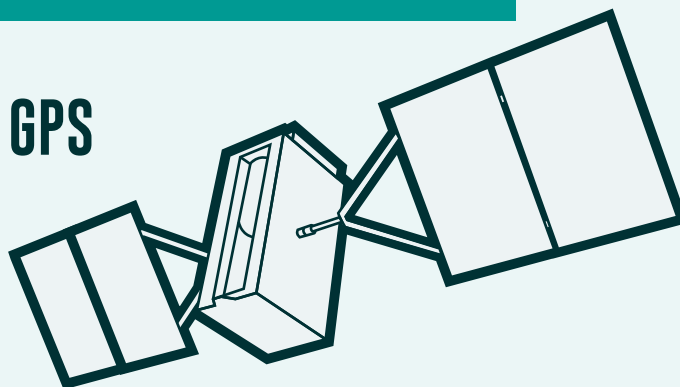
The internet was created as a way for military bases to talk to each other in a network that couldn't be knocked over. Here are four more pieces of tech for which we can thank the military.

Jawbone



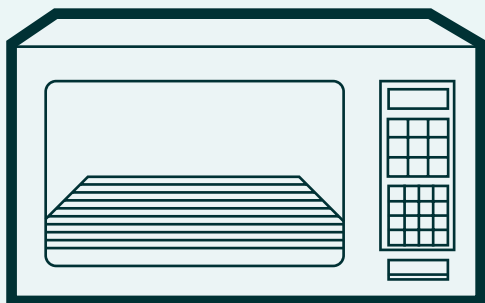
Californian company Jawbone now makes fitness bands but the company started out with Bluetooth headsets. These had noise-cancelling capabilities built in which were developed over years of research for the Defense Advanced Research Projects Agency. The tech even had a suitably warlike name: Noise Assassin.

GPS



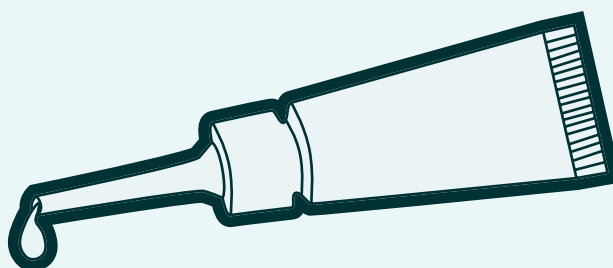
The satnav in most smartphones and many cars uses the Global Positioning System which the US Department of Defense developed. It was a child of the Cold War but has been a gift to everyone since.

Microwave



Radar technology developed during the Second World War led an American engineer, Percy Spencer, to realise its potential as a cooking device when a candy bar in his pocket melted as he worked on the radar. The first commercially available oven was called the Radarange.

super glue



In 1942 a chemist working for Eastman Kodak was looking for materials for the US Army that worked with clear plastic gunsights. The new substance was deemed unusable because it stuck to everything. As anyone who has ever used it will know.

MAKE OR BREAK?

HOW CAN THE HANDHELD SECTOR MEET CONSUMER DEMAND FOR INNOVATION WITHOUT MAKING DEVICES INHERENTLY MORE FRAGILE? IMPACT PROTECTION EXPERTS DISCUSS HOW TO STRIKE A DELICATE BALANCE



DUANE CABBAGE

EFM PRODUCT AND BRAND MANAGER
FORCE TECHNOLOGY INTERNATIONAL

Impact: How do trends in handheld devices influence your approach to protecting them?

DC: The evolution of the handset screen has had a big effect on product development. Devices are getting bigger, based on consumer demand for larger screen sizes, but also now have 'curved edge' finishes. This greater surface area for direct contact provides a number of challenges when designing fashionable, protective case ranges – chief of which is how to maximize overall protection in the most minimal profile possible. The shift to smartphones that are largely glass has driven the most significant upsurge in the mobile lifestyle case market, and this is set to continue for many years.

PM: The form of new phones is a key driving factor – and slimmness is a critical trend. Having slimmer and slimmer models is very appealing from a design perspective but 'bar of soap' shapes, rounded sides and curved glass make beautiful forms that are inherently difficult to hold. Numerous consumers have mentioned how 'slippy' phones are now – and some phones even bend! End users also want the benefit of a slimmer case to complement the slimmer phones and the need to develop a slim protective solution is a trend in our industry. D3O is a great enabler to create such solutions in mobile cases.

Impact: How can the industry strike a balance between these consumer demands and the greater risk of fragility in devices?

DC: The incorporation of market leading technologies and materials is the answer. When EFM was born, the desire to partner with D3O was powered by the ability to utilize the latest injection moulded D3O smart material, fused with existing thermoplastic polyurethane (TPU) case materials. We did this with the intention of constructing a 'slim but tough' case armor product for the market. The evolution of D3O materials naturally excites us and we will continue to collaborate with the D3O team on material uses and combinations that could be the next game changer for device protection.

PM: Smart materials are critical here: Gorilla Glass, Sapphire coatings and of course D3O. Graphene will be a really interesting development further down the road as it becomes more commercially viable. We see the trend for slim, light products continuing to grow for some time yet, fueled by new battery technologies and power-efficient Organic Light-Emitting Diode (OLED) screens becoming available.



PHIL MULHOLLAND

CHIEF MARKETING OFFICER
STRAX

Impact: Do consumers understand why it's so important to invest in appropriate protection for their devices?

DC: We firmly believe that given the increasing costs of smartphones, consumers are more conscious than ever of the need to protect their device. The precision and design cues of all leading handset manufacturers have led consumers to become increasingly attached to their smartphone. This attachment is seeing the mobile phone become the most 'personal device' someone can own, and this ultimately drives the consumer to personalize and protect as they would any cherished possession. The goal with EFM is tapping into these personal elements while delivering the most protective case on the market.

PM: As so many people drop their phones, they recognise the value of good protection for a device, not least to protect its resale value. Our relationship with our phone is changing constantly – leave a room without it and you feel lost! As a communications device, a research tool, an entertainment system and holder of memories and reminders, we are becoming ever more dependent and emotionally attached to our phones.

HELPING HANDS

The hand is one of the most complex pieces of engineering in the human body.

Our fingers contain some of the densest areas of nerve endings. They are even more sensitive than our eyes.

Forty per cent of the hand's capabilities are vested in the thumb. It is controlled by nine individual muscles which are themselves controlled by all three major hand nerves.

There are six separate terms just to describe directions of movement of the joint at the base of the thumb.

WHAT'S THE CONNECTION BETWEEN GOALKEEPING, MOTORCYCLE RIDING AND HEAVY INDUSTRY? ALL PLACE THE HANDS AT RISK. THE DESIGN OF PROTECTIVE GLOVES FOR ONE ACTIVITY IS INSPIRING INNOVATION IN OTHERS

RAIDEN ARAKIS GLOVE

Activity: All terrain motorcycle

Vulnerabilities: Abrasions, impact

Solutions:

- Leather palm triples pavement abrasion resistance compared to lightweight off-road glove
- Pre-curved D3O® knuckle insert provides impact protection and ensures perfect fit



MECHANIX M-PACT GLOVES

Activity: Automotive and construction industries

Vulnerabilities: Blunt force trauma, impact, abrasions, cuts, hand tool vibration, pinching, slippage

Solutions:

- Impact guard and molded thermoplastic rubber knuckle guard absorb blunt force trauma to hand and fingers
- Internal fingertip construction reinforces index finger and thumb
- Dual-layer internal fingertip construction reinforces high wear areas and improves abrasion and cut resistance
- Embossed and textured fingertip pattern enhances grip
- High-impact D30® palm padding reduces shock and vibration from hand tools

SELLS GOALKEEPER GLOVES

Activity: Soccer

Vulnerabilities: Impact, finger hyperextension, loss of flexibility, additional weight

Solutions:

- Lightweight D30® shock absorption protects hands when punching or shot stopping without adding weight in the backhand
- Padding in punch zone provides rebound effect to help increase distance
- Lightweight, flexible spines protect fingers from hyperextension

CRUDE HANDS SMARTSKIN IMPACT GLOVE

Activity: Oil and gas industry

Vulnerabilities: Abrasions, cuts, impact, slippage, loss of dexterity

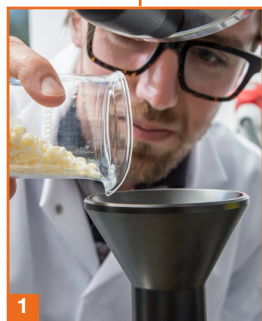
Solutions:

- D30® Impact protection for knuckles, wrist and fingers
- Slim profile ensures dexterity without reducing fingertip protection
- Waterproof, oil-resistant and breathable outer material
- Non-slip grip



D30 design and develop components tailored for their target markets as well as devising bespoke solutions for partners. Find out more at d3o.com

TAKING ADVANCED TECH FROM LAB TO MARKETPLACE



(1) Richard Holman, Material Development Leader for D3O Thermoplastics and Elastomers, trials a new formulation. **(2)** A piece of motorcycle armor withstands a hammering in the impact rig. **(3)** Accurate measurements help to show how materials and products are responding to testing. **(4)** Senior Testing Engineer Aileen McFarlane tests the tear-strength of a new formulation in the tensometer. **(5)** Moto2 racer Sam Lowes gives his appraisal of the new armor to Principal Product Designer Adam Turvey. **Main image:** Inside the Material Development Lab.

IMPACT MEETS THE D30 TECHNOLOGY TEAMS RESPONSIBLE FOR TURNING INNOVATIVE IDEAS INTO REALITY

We're two floors below the spacious, open-plan office where ideas are fermented and shared on computer screens. Here, down in the bowels of D30 HQ, lie the laboratories in which materials are formulated, molded into prototypes and vigorously tested.

This is the playground of the research and development teams: a sequence of exciting high-tech labs equipped with state of the art impact test rigs, tensometers, computerized numerical control (CNC) tool making machines, polyurethane (PU) processors, ovens, fridges and washing machines. D30® products have to go through a rigorous set of tests before they're passed fit for production.

D30 receives over 50 enquiries each week with ideas for new applications for its impact protection technologies. The Technology team, made up of material scientists, product developers and testing engineers, then go to work to bring these opportunities to life. The material scientists carefully tune D30's unique polymer blends to achieve specific properties to the final application. Is it required to meet or exceed an industry standard, temperature stability, abrasion resistance, flexibility?

The dedicated Material Development Lab enables the chemists to develop new material formulations in-house as well as optimize and refine specific properties within D30's portfolio of existing patented and proprietary technologies to ensure it's fit for purpose.

Each material development is carefully analyzed, characterized and tested in the Test Lab, which is regulated to a consistent 23 degrees C and 55 per cent humidity. If a material is being developed

for use in extreme temperatures, such as on Arctic oil rigs or desert military wear, a conditioning unit will chill or heat it as required before testing.

Most testing is for impact resistance. The impact rig drops a weight onto the material being tested and takes measurements of force and deceleration.

The weights can take many forms to replicate real-life impacts, such as a kerb stone hitting a motorcycle back protector or a head in a crash helmet.

A tensometer is used to stretch and compress materials to test their durability under stress. Products designed for wearing, such as protective base layers and gloves, are run through extensive machine washing and drying trials to ensure continued performance after use.

The Product Design and Development team use D30® materials to create custom and stock impact protection products with enhanced shock absorption properties.

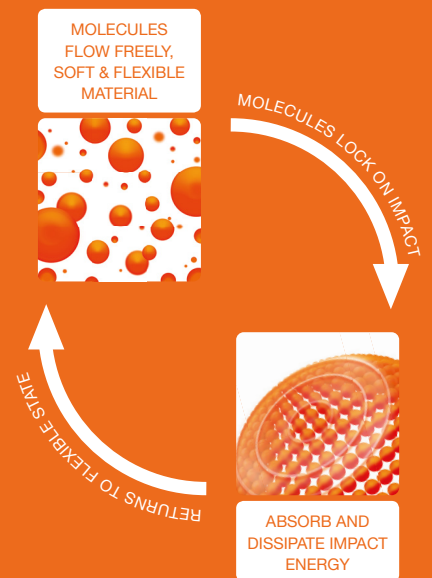
A design process that begins in 2D progresses through a 3D CAD stage and then to the CNC room for rapid-prototyping. Tools are cut and technicians pour in D30® materials in their liquid form, which react and set to form the protector.

The rapid-prototyping facilities enable the Product Development team to trial different geometries, thicknesses and densities to achieve optimum comfort, flexibility and impact protection properties specific to the final application.

At each stage during the development process, the team experiments with different designs and material formulations. All of which are extensively tested, evaluated and optimized ahead of wearer trials and, ultimately, mass production.

HOW D30 WORKS

- D30 uses unique patented and proprietary technologies to make rate-sensitive, soft, flexible materials with high shock absorbing properties that are used in impact protection products.
- Based on non-Newtonian principles, in its raw form the material's molecules flow freely, allowing it to be soft and flexible; on impact, the molecules lock together to dissipate impact energy and reduce transmitted force.
- British engineer Richard Palmer first discovered the material in 1999, isolating it at the University of Hertfordshire – in room D30, hence the name.
- D30® was first used by the US and Canadian ski teams in their Spyder race suits at the 2006 Winter Olympic Games.
- D30's products capture the benefits of rate-sensitive, non-Newtonian fluid behavior into different polymer structures that can be engineered to create soft, flexible impact protection for a wide range of applications.



Find out how D30 can provide an impact protection solution for your market at [d3o.com](https://www.d3o.com)

HOW TO CREATE AN INNOVATION CULTURE

INNOVATION SHOULD EMBRACE BOTH REVOLUTION AND EVOLUTION, SAYS NICK BERESFORD, CO-FOUNDER AND CEO OF ENERTOR



What does innovation mean for you?

Real breakthrough innovation is a product that people didn't know they needed or wanted – an iPad, a Dyson bladeless fan or a microwave.

But some of the best innovation is re-shaping an existing idea. Taking a product and doing it better creates enormous value for everyone. Take Starbucks: 20 years ago, coffee was served in polystyrene or poor quality china and sold for 80p a cup. Starbucks turned coffee on its head and made it an experience. People felt better about paying £4 for a coffee than they did 80p, even though the basic ingredients are the same.

Is this the philosophy behind Enertor?

Most shoe insoles and aftermarket insoles are made with very poor material offering little support or protection for the foot. However, there are better products out there that can help you stay injury free, are more comfortable and can even help you perform better.

Enertor powered by D3O is a combination of an amazing 'super material' and world-leading design based on almost 20 years' working with elite athletes, the British Army and professional sports teams. For us, this is the Starbucks of insoles. Once people see the benefits they will not want to go back to the 80p equivalent.

Is innovation art or science?

Both. I believe the best innovation comes from design theory. A mixture of good left and right brain thinking. When we did shopper studies with young A+ shoppers in China it was clear that an innovation for them had to offer brilliant design but also cutting-edge technology.

Should entrepreneurs always seek to disrupt a market?

No, there are plenty of great entrepreneurs not disrupting a market but just doing something better. Disruption is very rewarding when it works but it's not a necessity. Uber is a great example of disruption but equally Addison Lee a few years earlier made the London minicab business a little bit better and built a tremendous business.

Personally, I am more interested in disrupting a market and that is what we are trying to do with Enertor. We fundamentally believe we can help people stay injury free and perform better, helping them to break their limits – which is a big repositioning of the category today.

What do you think about on a long train journey?

Ideas to transform the business. The beautiful thing about being an entrepreneur is you can come up with an idea and decide to execute it straight away. For me this is very exciting.

enertor.com

IMPACT ASKED D3O CEO STUART SAWYER FOR HIS FIVE KEY PRINCIPLES TO FOSTER CREATIVITY AND DEVELOP IDEAS



- 1. Innovation is a culture, not a process or a silo.** It needs investment, in time, space and resources. It should be part of the fabric of any business that has desires to lead or change a market.
- 2. The spark of an idea can come from literally anywhere.** It may be feedback from a large customer, a suggestion from a supplier or even a social media comment.
- 3. Innovation only happens in an environment where it's OK to dream and, just as importantly, OK to fail.** Allowing failure to happen is a key part of true innovation because it means you've gone beyond the boundaries. If it takes nine failures to get one great product, that's a result.
- 4. Ask the hard questions first.** Then, if you fail, you will fail fast. If the answer to a fundamental question is unclear, take time to figure it out. Don't spend time solving a less important question just because someone knows how to.
- 5. Always challenge the process.** If you can't test an idea until very late in the design process, it may end up being considered too risky to progress. But if you do press on with the production of a functional prototype (sometimes with only a belief to rely on), you'll have some answers and, ultimately, a less risky project and, quite possibly, find a cheaper, faster way to make it.

THE POWER OF 9



“LIMITS ARE SOMETHING THAT SPORTSMEN AND WOMEN FACE EVERY DAY, BOTH PHYSICALLY AND MENTALLY, AND TO BE SUCCESSFUL YOU HAVE TO BREAK THOSE LIMITS. BEING ABLE TO TRAIN HARDER AND PERFORM BETTER ENABLES EVERYONE TO BREAK THEIR LIMITS.”

USAIN BOLT

THE 100M WORLD RECORD IS ONE OF SPORT'S MOST ICONIC MARKS. TIM GLYNNE-JONES ASKS: IS DIPPING UNDER NINE SECONDS JUST FANTASY?

Ever since Jim Hines, Ronnie Ray Smith and Charles Greene all broke the ten-second barrier on the same night in Sacramento in 1968, one question has nagged away at the world's fastest men: could you do it in nine?

Sports fans love a milestone but there is something about the nine-second 100m question that stirs uneasy feelings. Ask the experts and their first response is a unanimous “no”, followed by a sheepish “well, maybe”. The tantalizing possibility remains.

We put the question to Dr Sam Allen, Lecturer in Biomechanics at Loughborough University; Nick Beresford, CEO of Enertor, whose insoles are worn by Usain Bolt; and Toby Glyn, D30's Product Manager – Footwear. All three felt restrained from saying a definitive 'no' by the recognition that human performance, knowledge and technology are always advancing.

They instinctively feel that the advances of the last 100 years have plateaued, so that lopping over half a second off Bolt's 9.58 seems like a very distant dream.

“I'd be surprised if you could make substantial improvements to the techniques that people have developed for sprinting,” says Dr Allen.

“Athletes want their spikes as light and stiff as possible so there's no loss of power. You couldn't make sprint spikes any stiffer,” says Glyn.

“I think that record will stand for a while,” says Beresford.

But then he adds, “Eventually a super-athlete will come along, a bit like Wayde van Niekerk who broke

Michael Johnson's 400m record at the Rio Olympics.”

So how can Bolt be improved upon? His start is the obvious weakness, although Dr Allen points out that “when he broke his world record, his start was by no means poor. His split time after 10m was the second fastest of all time”.

Second, eh? Still room for improvement, then.

“I think you've got a fundamental trade-off between being tall and accelerating,” Dr Allen explains.

Short of finding a new breed of awesomely super-fast athletes in an as yet undiscovered corner of the planet, Beresford sees the biggest opportunity for improvement coming from training.

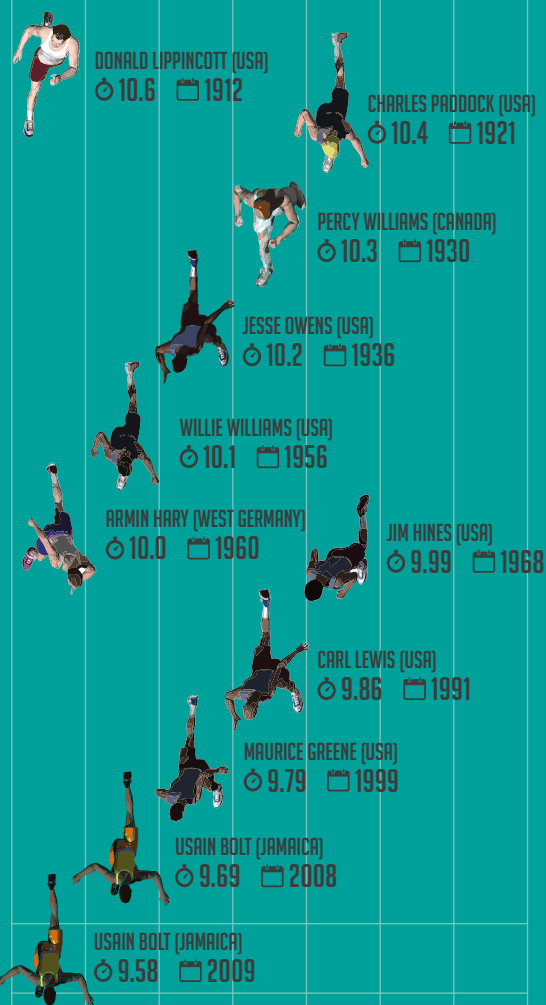
“The technology is good but there's still more to go,” he says, explaining that the injury prevention benefits designed into modern equipment are enabling athletes to spend more time perfecting their performance.

“Our insoles incorporate D30® to reduce shock on impact by 44 per cent and provide a 36 per cent energy return at take-off. Something else we're looking at is advanced muscle measurement. The technology is so much better now that you can weave it into a pair of shorts or a top and it can give predictive analysis that will help from both an injury point of view and a performance perspective.”

All this knowledge will undoubtedly bring the 100m world record down, but whether it ever reaches the nine-second mark... It seems unlikely, although all three experts agree on one thing: never say never.

THE FAST MEN

Even with the advent of artificial tracks in the 1960s and constant developments in technique, training and equipment, the 100m world record has only been lowered by one second in more than a century.





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