

# Technology doping:

Swimsuits, bikes with motor engines, prosthetic legs, optimized jersey for better aerodynamism –

How do regulators deal with the new technology, knowing it enhances performances ?

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***« A new report from the Institute of Mechanical Engineers suggests that technological innovation is now an integral part of sport at the highest level (...) »***

S. BOSLEY, « London 2012 Olympics : How athletes use technology to win medals », website [www.theguardian.com](http://www.theguardian.com), July 4th, 2012.

# Summary

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# 1. Introduction

Athletes have always tried to improve their performance:

- by training;
- by playing on their diet;
- by managing their recovery time;
- but also (for some) by using drugs or substances that increase their physical capacities (steroids, EPO).

Today, this type of doping has become commonplace in the wake of scandals.

It tends to be replaced by a more insidious process, more visible but less shocking process: the use of high-tech equipment.

# 1. Introduction

The future already has an undeniable grasp on sports: every year, the latest high-tech breakthroughs are used to technologically improve and enhance sports equipments and materials... and having certainly not, of course, the aim of cheating!

With technological progress, the line between performance improvement and cheating is becoming even blur.

The governing authority of the concerned sport has to define when improvement ends, when cheating starts and more.

Welcome to the era of sports engineering... or rather, technologic doping!

## 2. What is technological doping?

- ⦿ "Traditional" doping is an illegal practice which consists in absorbing substances, doping products or relying on medical acts in order to increase physical and mental performances (articles 1 and 2 of the World Anti-Doping Code).
- ⦿ Technological doping is no longer about improving the athlete's performance but improving the performance of his equipment – usually a mechanical device - using hidden technological devices.



### 3. Technological doping, craftsmanship...

#### The spaghetti racket in tennis



- 1970's
- Vagueness surrounding tennis regulations
- Technically bold
- 1977: invention of the double-strung racket
- benefit provided: considerable spin to the ball and very difficult for the opponent to read the game
- Banned in 1977
- Player never accused of cheating

### 3. Technological doping, craftsmanship...

#### Jean Robic's lead canister



- 1950's
- Small gauge climber
- Too light to reach high speeds on descents
- Fake 9 kg lead water canister at the top of Tourmalet ascent
- Fall due to a change in its centre of gravity
- Got rid of his extra 9 kg by asking a spectator to hand over the object of the crime to his assistance car



### 3. ... towards sport engineering

#### Toyota Celica



- 1990's
- Modification of the turbo's air intake system
- Benefit provided: increase in engine power (limitation of engine power by the FIA to 300 horsepower)
- Attempted concealment
- Discovered by the commissioners during the Rally of Catalonia in 1995
- Exclusion of the Toyota team from the 1995 World Rally Championship.

### 3. ... towards sport engineering

#### Toyota Celica



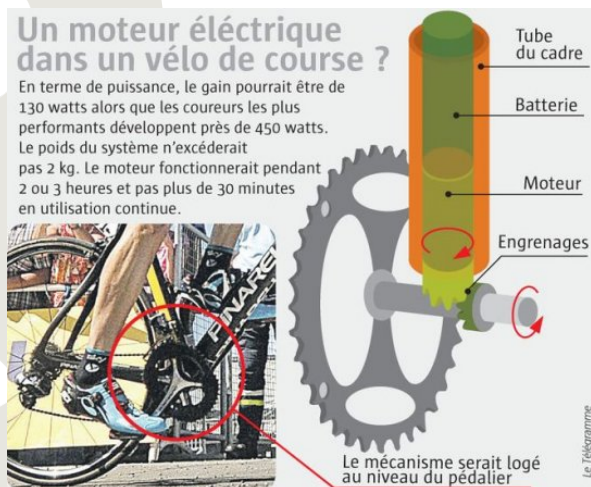
- The FIA technical commissaries had never seen this before.
- *"This is the most subtle and sophisticated subterfuge our technicians have ever encountered. It was very difficult to detect."* Max Mosley, President of the FIA

# 4. Enhanced detection and sanctions meant to be doped

*Femke Van den Driessche: the face of technological doping*



- Use of a motor engine in her bike during the 2016 Cyclo-cross World Espoir race



- Violation of article 1.3.010 of the UCI cycling regulations:  
« *The bicycle shall be propelled solely, through a chainset, by the legs (inferior muscular chain) moving in a circular movement, without electric or other assistance (...) »*

## 4. Enhanced detection and sanctions meant to be doped

An exemplary sanction for Mrs. Van den Driessche for technological doping

- 6 years suspension period

Sanction for "traditional" doping (use of a prohibited substance in competition)

- 4 years suspension period (art 10.2.1 of the World Anti-Doping Code 2015 with 2018 amendments, also contained in art. 10.2.1. of the UCI anti-doping regulations)

Evolution of the sanction for technological doping

- Suspension period of at least 6 months (art 12.1.013bis of the UCI regulations as last amended on February 2<sup>nd</sup>, 2017)
- UCI has intentionally taken a margin of discretion in the sanction to be imposed on cheaters who have resorted to technological fraud.

## 4. Enhanced detection and sanctions meant to be doped

*Fight against technological fraud by the UCI*

Consequence of Mrs. Van den Driessche's fraud:

- ⊙ Significant financial investments by the UCI
- ⊙ multiplication of controls

## 4. Enhanced detection and sanctions meant to be doped

*Fight against technological fraud by the UCI*



Since the 2018 edition of the Tour de France, the bicycles of the stage winners and randomly selected riders have been checked and pass the engine detector :

- ⦿ the bicycles are placed in an X-ray control cell
- ⦿ a truck parked near the finish line watches the race and performs a kind of video arbitration
- ⦿ use of thermal cameras



Deterrent system: no cases of doping have been recorded during the 2018 edition of the Tour de France.

## 4. Enhanced detection and sanctions meant to be doped

Criminal sanctions envisaged by France against any athletes who use or attempt to use *“mechanical or technologies aids that have the effect of improving their physical performance and distorting the results of the competitions in which he is involved”*.

Two amendments to the draft law on the ethics of sport making *“technological fraud a criminal offense”* proposed to the vote of the French General Assembly in January 2017.

Amendments rejected because of the penalties envisaged which raise problems with regard to the proportionality of offences and penalties (a principle which is in France of a constitutional nature).

Awaiting a report from the French government (Ministry of Sport) on the possible creation of *“a crime of mechanical and technological fraud in sport and on the extension of the powers of the French Anti-Doping Agency”*.



## 5. Technological doping, the consequence of the vagueness of written rules

- Athletes and their entourage (coaches, technical staff but also equipment manufacturers) have managed to dissociate formal cheating (violation of the provisions contained in the regulations) from what could be called the game with legality.
- *"The question is whether we can really talk about "mechanical doping" every time. I would say that it is rather the faculty of exploiting a regulation"*

Philippe Liotard, sociologist of sport at the University of Lyon-I



## 5. Technological doping, the consequence of the vagueness of written rules

### The “vortex” suit



- During the inaugural time trial of the 2017 Tour de France
- 4 Sky team riders put on suits, flanked by air ball bands on their arms and shoulders
- Objective: to improve their aerodynamics and therefore their time

## 5. Technological doping, the consequence of the vagueness of written rules

### The “vortex” suit

Accusation of cheating of the Sky team by Fred Grappe, the performance director of the FDJ team, who asserts that this so-called "vortex" suit would have for Sky riders made it possible, on a 14 kilometers race, to win 18 to 25 seconds.

According to article 1.3.033 of the UCI cycling regulations (Part 1 General organisation of cycling as a sport – version on October 22nd, 2018) :

*« It is forbidden to wear non-essential items of clothing or items designed to influence the performances of a rider such as reducing air resistance or modifying the body of the rider (compression, stretching, support). (...) Equipment (helmets, shoes, jerseys, shorts, etc.) worn by the rider may not be adapted to serve any other purpose apart from that of clothing or safety by the addition or incorporation of mechanical or electronic systems which are not approved as technical innovations under article 1.3.004. »*

## 5. Technological doping, the consequence of the vagueness of written rules

### The “vortex” suit

Nicolas Portal, Sky team sports director, denied any breach of the rules: *"We are not breaking the rules because the wormhole is not added to the jersey, it is integrated, which is different. »*

Alerted by the FDJ on these outfits at the limit of the regulations, the UCI commissioners preferred to send the ball back to the organization's management because of a legal uncertainty.

Philippe Marien, chairman of the commissioners, said: *"The Regulation says that no external additions are required. There, it was integrated into the suit (...) So there's nothing I can do"*

## 5. Technological doping, the consequence of the vagueness of written rules

### The “vortex” suit

The Sky team had protected itself and its riders against any risk of disqualification or suspension (article 12.1.013bis of the UCI cycling regulations) by using the provisions of article 1.3.004 of the UCI cycling regulations which requires UCI approval in order to be able to use "technological innovations" in events.

## 5. Technological doping, the consequence of the vagueness of written rules

What remedies for the FDJ?

1. If the Sky had not obtained UCI approval, and
2. If the riders had worn the "vortex" suit during the inaugural time trial, and
3. If, in the end ,the riders had not been sanctioned by the UCI commissioners' panel.

In such circumstances, the FDJ could have referred the matter to the Disciplinary Commission (article 1.3.005 of the UCI cycling regulations).

An appeal may be lodged with CAS against the decisions of the UCI Disciplinary Commission (article 12.2.022 of the UCI cycling regulations).

## 5. Technological doping, the consequence of the vagueness of written rules

### The “vortex” suit

The controversy surrounding “vortex” suits will no longer present itself on the context of the 2019 edition of the Tour de France.

On October 2<sup>nd</sup>, 2018, the UCI amended article 1.3.033 of its regulations relating to the general provisions concerning the clothing equipment of riders.

## 5. Technological doping, the consequence of the vagueness of written rules

### The “vortex” suit

This change to the regulations will enter into force as of March 4th, 2019, and provides that:

*« Items of clothing may not modify the morphology of the rider and any non-essential element or device, of which the purpose is not exclusively that of clothing or protection, is forbidden.*

*Modifications to the surface roughness of clothing are authorised but may only be the result of threading, weaving or assembling of the fabric. Surface roughness modifications shall be limited to a profile difference of 1mm at most.*

*The measure of surface roughness modification shall be made without pressure or traction on the clothing.*

*All clothing must maintain the original texture of the textile and may not be adapted in a manner to integrate form constraints. (...) »*

## 5. Technological doping, the consequence of the vagueness of written rules

Should the Sky's aerodynamic suit be seen as a new threat to the meritocratic purity of the racing bike?

Since their invention at the end of the 19th century, cycling competitions have always been marked by the race for technical innovation, more or less in line with the rules set by the sports authorities on an ad hoc basis.



## 5. Technological doping, the consequence of the vagueness of written rules

### The recumbent bike by father and son Mochet



- 1933: 7 international records were broken
- 1934 : banishment by the UCI of this type of cycle from official competitions

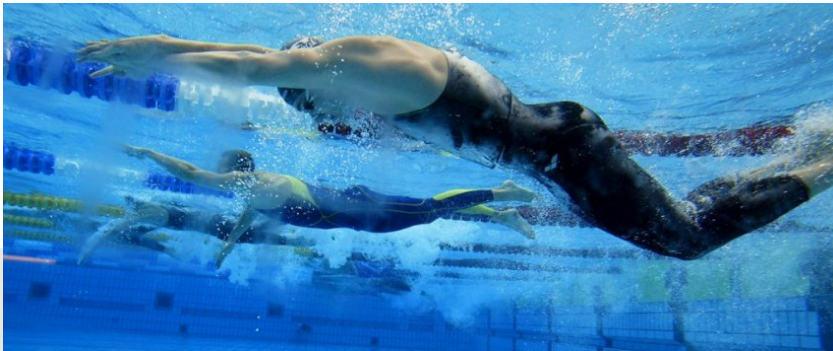
### Greg LeMond's triathlete handlebar



- beat Laurent Fignon in the final time trial of the 1989 Tour
- eventually adopted when it was contested by the UCI itself

## 6. Technological doping and the disruption of equality

### The "Jacked" swimming



- 2000's
- Consequence: a series of records broken
- According to Institute of Biomedical Research and Sport Epidemiology researchers: gain of 1 to 2% on the stopwatch thanks to these swimming suits

## 6. Technological doping and the disruption of equality

Would newly crowned, confronted in bathing suits with those they dethroned, have they had the last word ?

How relevant are the world records?



While the sport has become more professional, the selection has progressed, and athletes are training more, the means used to improve the equipment have also contributed to the champions' achievements.

## 6. Technological doping and the disruption of equality

Why did swimming suits raise a wave of protest, when the adoption of an innovative pavement on the Bird's Nest Athletics track in Beijing did not provoke any debate ?

Because all competitors benefit from this technology, while in swimming, only a few could afford the famous suit.

Beyond the intrusion of technology into sport, it is the spectre of cheating, or at least the feeling that equity is no longer respected, that explains the controversies.

## 6. Technological doping and the disruption of equality

Identical debates have taken place in the practice of table tennis.



Since the late 1980s, to avoid cheating and to balance matches, rackets, their size, material (including glue) and faces have been regulated.

A regulatory framework for equipment would safeguard sporting equity.

If this framework can prove to be a brake on technological evolution, it can also be a safeguard against the drift of science.

## 7. From the « improved » athlete...

### Prosthetic legs

Leg prostheses allow their bearers to run faster until they became "increased" athletes.

Oscar Pistorius' carbon fibre prostheses, the "Flex-Foot Cheetah", gave him a clear advantage over his able-bodied competitors.

What is the boundary between repair and increase ?

With his artificial legs, was Pistorius finally a sprinter like the others, or rather a super-athlete ?



## 7. From the « improved » athlete...

### Prosthetic legs



#### Advantage of prosthetics:

- prevent muscle damage to Achilles tendons and calves
- allow you to accelerate at the end of the stroke.

#### Disadvantage of prosthetics:

- at the beginning of the race and during turns, they do not have the same flexibility as the natural human ankle (Bryce Dyer, prosthetic engineer at the British University of Bournemouth)
- Technological advances should soon erase any similar discrepancies between human and mechanical limbs (Hugh Herr, biomechanical engineer at MIT)

## 7. ...to trans-humanisation and the creation of new sports

From increasing to transhumanism (increasing our physical capacities through technology, in order to become “superhumans”), there is obviously only step to take.

One only has to look at the case of Tiger Woods, who had eye surgery to improve his (normal) vision.



One day, in order to be equal, will all runners use prostheses, as if they were some kind of vehicle ?

Will all golfers have surgery to get more than 10 out of 10 in each eye ?



## 7. ...to trans-humanisation and the creation of new sports

According to Mr. Hugh Herr, performance-enhancing technologies will advance to a point at which they will not only extend human limits:

*“For each one there will be a new sport — power running, and power swimming, and power climbing.”*

*“Just like the invention of the bicycle led to the sport of cycling. What we’ll see is the emergence of all kinds of new sports.”*

Transhumanists, even imagine new sports categories: one category “100% human“, another “50% modified“, or one dedicated to all those using prostheses.



## 8. Conclusion: the future of sports competitions still to be defined

A real technological arms race has just begun in sport and only a few privileged people will be able to benefit from it (the richest).

- For some, technological overkill would no longer necessarily be in the air: the use of technology would eliminate the notion of effort, which is inseparable from the definition of an athlete.
- For others, if the continuous progression of world records makes people dream, it is because it gives the spectacle of a constantly growing human species that nothing can stop it, and technology, as the means of acting of the world and pushing the limits imposed by biology, would then be perfectly legitimate.



## 8. Conclusion: the future of sports competitions still to be defined

In any case, rules seem urgent to restrict the advantage of those who will be the first to use sports improvement technologies.

In the immediate future, it seems obvious that we should ask ourselves what kind of sport we want to watch:

- ⊙ Do we want to see athletes train hard and give all they have in order to naturally push their limits ?
- OR
- ⊙ Would we rather see, through a battle of engineers and wallets, a competition between (almost) dehumanized athletes ?

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