

'Stretching the rules': how racing design may drive the evolution of the technological and legal environment.

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Abstract

Andrea Dovizioso's victory in the opening race of the 2019 Moto GP season at Qatar has been subjected to appeal. Dovizioso raced in Qatar using the new aerodynamic components and he won a thrilling close race by a margin of only 0,023 seconds from Marc Màrquez; the top five finished within six tenths of a second. The new aero parts prompted four factories (Aprilia, Honda, KTM, and Suzuki) to lodge a protest with the FIM Stewards, claiming that the aerodynamic device attached to the swingarm was illegal. 'The Spoon' developed by Ducati Moto GP team led to significant technical improvement of the Ducati GP19 motorcycle and its legal debate, involving the FIM, had a huge media impact. According to Ducati the discussed component had a function of cooling the rear tire by directing airflow directly onto its surface. However, exploration into its exact effect had thrown up a number of theories to its main function, one being that it helped the bike in becoming more slippery through the air, improving its aerodynamics and therefore reducing drag. Drag reduction or tyre cooling? On 22nd March 2019, the Moto GP Court of Appeal ruled that Ducati's aero spoiler was legal.

La vittoria di Andrea Dovizioso nella gara inaugurale della stagione 2019 di Moto GP, in Qatar, è stata oggetto di contestazione. Dovizioso ha corso in Qatar utilizzando i nuovi componenti aerodinamici e ha vinto un'emozionante gara ravvicinata con un margine di soli 0,023 secondi da Marc Màrquez; i primi cinque classificati hanno chiuso entro sei decimi di secondo. I nuovi componenti aerodinamici hanno spinto quattro case costruttrici (Aprilia, Honda, KTM e Suzuki) a presentare una protesta ai commissari sportivi della FIM, sostenendo che il dispositivo aerodinamico montato sul forcellone fosse illegale. Il 'cucchiaio' sviluppato dal team Ducati Moto GP ha portato a un significativo miglioramento tecnico della moto Ducati GP19 e la disputa legale, che ha coinvolto la FIM, ha avuto un enorme impatto mediatico. Secondo Ducati, il componente in questione aveva la funzione di raffreddare lo pneumatico posteriore dirigendo il flusso d'aria direttamente sulla sua superficie. Tuttavia, lo studio del suo effetto esatto ha fatto emergere una serie di teorie sulla sua funzione principale, una delle quali è che rende la moto più fluida nell'impatto con l'aria, migliorando la sua aerodinamicità e quindi riducendo la resistenza aerodinamica. Riduzione della resistenza aerodinamica o raffreddamento degli pneumatici? Il 22 marzo 2019, la Corte d'Appello della Moto GP ha stabilito che lo spoiler aerodinamico della Ducati è legale.



Keywords: MotoGP; Sports law; Appeal.

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Introduction.

Nowadays, the evolution of law is increasingly guided by technological development.¹ In this perspective, the interdisciplinary collaboration between legal² and engineering experts becomes central. This collaboration serves not only to manage the problems that occur to the attention of the legislator, but also to anticipate them. In this sense, the world of automotive and motorcycle sports competitions represents a very interesting study soil. In fact, the technological solutions adopted in the context of these sports competitions have always permeated the market of cars and motorcycles for private use, increasing its safety.³ The mobility sector, as known, has been and is at the centre of the evolution of modern society and, consequently, of the legal framework.⁴ Jurists and engineers are now called to collaborate to define the legal framework of the mobility of the future, studying the best technological and legal solutions to protect the safety of drivers, passengers and in general of users of mobility services, bearing also in mind the need to design economically sustainable solutions.⁵ In this context, the case of study proposed in this article can represent a fruitful meeting soil between the legal and

¹ See L B Moses, 'Agents of change: how the law copes with technological change' (2011) 20(4) Griffith L. Rev., 764 ff.; see also A J Cockfield, 'Towards a law and technology theory' (2004) 30(3) in Man. LJ, 383 ff.; In the Italian perspective, see also E Al Mureden, 'Event data recorder e advanced driver assistance system': la 'spinta gentile' verso la mobilità del futuro (2022) 2 in Contr. impr., 390 ff; see also E Al Mureden, G Calabresi, 'Driverless car' e responsabilità civile (2020) suppl. Riv. dir. banc., 7 ff.; see also E Al Mureden, U Ruffolo, 'Autonomous vehicles e responsabilità nel nostro sistema ed in quello statunitense' (2019) 7 Giur. it., 1704 ff.; see also E Al Mureden, 'Autonomous cars e responsabilità civile tra disciplina vigente e prospettive de iure condendo' (2019) 3 Contr. impr., 895 ff..

² An overview on the legal perspective can be found in L Gatt, 'Legal anthropocentrism between nature ad technology: the new vulnerability of human beings' (2022) 1 EJPLT, 15 ff.; MC Gaeta, Liability rules and self-driving cars: the evolution of tort law in the light of new technologies (ESI, 2019); MC Gaeta, 'Automazione e responsabilità civile automobilistica' (2016) 5 Resp. civ. e prev., 1718 ff.; MC Gaeta, 'La protezione dei dati personali nell'Internet of Things: l'esempio dei veicoli autonomi' (2018) 1 Dir. inf. e informatica, 147 ff.; MC Gaeta, 'The regulation of certain aspects of autonomous driving in the Italian legal system' (2022) 1 EJPLT, 263 ff.; L Gatt, IA Caggiano, MC Gaeta, 'Italian Tort Law and Self-Driving Cars: State of the Art and Open Issues', in BH Oppermann e L Stender-Vorwachs (a cura di), *Autonomes Fahren. Technische Grundlagen, Rechtsprobleme, Rechtsfolgen* (C.H.Beck, 2020), 239 ff..

³ See E Candelo, *Marketing Innovations in the Automotive Industry. Meeting the Challenges of the Digital Age* (Springer, 2019).

⁴ See E Al Mureden, G Calabresi, *Driverless cars* (Bologna, 2021).

⁵ See E Al Mureden, 'Il futuro del 'law and economics' nel pensiero di Guido Calabresi' (2018) 3 Riv. dir. civ., 778 ff.; see also E Al Mureden, *Costo degli incidenti e responsabilità civile' quarant'anni dopo. Attualità e nuove prospettive dell'analisi economico-giuridica di Guido Calabresi* (ivi, 2015, 1026); see also E Al Mureden, 'Il pensiero di Guido Calabresi e il suo influsso sull'armonizzazione della responsabilità del produttore nell'Unione Europea [2015] in Not. Politeia, 102.

engineering knowledge, in the path that will lead to drawing the future of mobility.⁶

1. Case background.

If a student inquired about a course in sports law at a university or law school 25 years ago, that student may have encountered a blank stare. Fortunately, that is not the case today. The business of sports has become a multimillion-dollar industry with sports law leading the way. The topics of sports law run the gamut of legal and societal issues, dealing with many categories of law, including contracts, torts, intellectual property, labour relations, antitrust and agency law. The rise of interest in sports law mirrors the explosion of the interest in sports in society and the business of sports. Sports law looks at the major legal cases, statutes, and regulations that explore a variety of legal issues in sports law.

For what concerns the Moto GP world, which is the main topic of this paper, it could be said that the Race Direction is the observant nerve centre of the Moto GP.⁷

The Race Direction must manage the event (Moto GP race) and everything that comes with it, both for sports-related and non-sports related things. For example, if the race has a problem with the spectators, the Race Direction should solve the trouble.

A famous historical case is that of Indianapolis, in which the forecast announced that there was going to be a lightning storm on the track and according to American legislation, if necessary, the circuit had to be evacuated within certain times. All these decisions are made by the Race Direction.

Moreover, when the Spanish Grand Prix is held, there is always a member of the Guardia Civil, the National Police, present, or a member of the Mosso D'esquadra, regional police, in Catalonia, in case there are any problems with the spectators.

In Misano, the Race Direction decide when to let people onto the track. It's not a decision taken at that time, but completely the opposite: it is something that is decided on beforehand between the police chief and Race Direction.

On the international side, the Race Direction is made up of three people. For example, there are three of them that make decisions to raise the red flag.

In the past, there was a Race Director who would make all the decisions. This led to several problems because there were decisions made that people did not understand. So, it was decided to create a system in which there is a representative from each member group of the Championship.

IRTA has a representative, FIM has another one and Dorna has another representative. Together they make joint decisions. When a decision must be made, the IRTA representative will support teams more, the FIM representative

⁶ See M Wegener, 'The future of mobility in cities: Challenges for urban modelling' [2013] *Transport Policy*, see also J Zmud, L Ecola, P Phleps, J Feige, *The future of mobility: Scenarios for the United States in 2030* (RAND, 2013); see also S Shaheen, H Totte, A Stocker, *Future of mobility white paper* (in eScholarship, 2018).

⁷ Box Repsol, *Race Direction: the observant nerve centre of the MotoGP* [2016] in <https://www.boxrepsol.com/en/motogp-en/race-direction-the-observant-nerve-centre-of-the-motogp/>.

will support safety, and the Dorna representative opt for decisions that affect the show. The truth is that Dorna holds races. At Dorna there is the motto: '*Hold races, show them on TV, and then sell time for adverts but... You have to hold races*'.

During a GP, fans often read the TV news ticker that shows that an incident is being investigated. What is the protocol in these cases and what stages do these investigations go through?

Race Direction has always investigated what has needed to be investigated, but not that long ago, Race Direction spoke with press representatives and decided that it was better to announce it. A pre-analysis of the situation is done and if it is seen that a more in-depth analysis must be performed, that is when Race Direction makes it public. The situation is managed in this way so that everyone understands that Race Direction has seen the fact and is analysing what people saw on TV and what commentators continue to mention.

People must understand that sometimes it's difficult when a race is going on to work on analysing a specific moment of it. That's why sometimes the accident is analysed after the fact. On other occasions, if Race Direction feels that what has happened could affect the result of the race, it tries to do it during the race.

In a tense situation when Dorna members are deliberating what penalty the rider will receive, do they have a time limit to decide? If so, how long is it?

Of course, it depends on the penalty. If a rider gets a head start, Dorna has four laps to notify him. If two riders touch one another, which sometimes Dorna can't see and in the afternoon one of the riders calls the Race Direction and tells it that this has happened, Dorna looks into it. There have been cases when a rider was penalised a week after.

Dorna has always tried to have an ongoing dialogue with teams and riders. A decision is usually made because Dorna believes that it is the right one. However, Dorna tries to involve everyone affected by this decision. The process may be a little long, but it is a way to ensure that everyone is involved and that they agree with what Dorna is doing.

There are meetings every two or three GPs for the new technical or sport regulations. Every Friday, meetings are held with the riders and with the teams, almost one out of every two races. Anyway, later, Dorna keeps in touch constantly with teams: even if there is no definite structure, Dorna tries to talk about everything with everyone.

FIM President Vito Ippolito, in 2018, has given an interview in which he explains what has changed in terms of the disciplinary procedures since 2016.⁸

Following a process that began in 2016, the FIM Stewards are now responsible for disciplinary sanctions, while the Race Direction takes care of the management of the race. What is the reason for this decision? Vito Ippolito, FIM President, said: '*In the last years we were thinking how to improve the management of Moto GP during the races. In the past, race direction had all the responsibility; not only to manage the races, but also to penalise the riders. We were thinking it would be much better to separate these two functions because*

⁸ Moto GP official website (2018), *Race Direction and FIM Stewards: Vito Ippolito explains*, <https://www.motogp.com/en/news/2018/04/17/race-direction-and-fim-stewards-vito-ippolito-explains/255236>.

the race direction is very busy, there is a big responsibility, but the management of the race have to decide how to place the grid to show a red a flag to intervene in many delicate parts of the races, take decisions about whether the race is wet or dry and the judges are the FIM stewards. Now we separate these two functions because of the way you approach the race, the event is different because now you are a judge – a judge is different from a race director, for example (...) FIM Stewards are expert people. Their job is only to penalise. They have a lot of experience, of course, and I can add that after each race there is an analysis; a study of what happened during the race, about the behaviour of the riders or about any other kind of problem around the penalties. Then we have many stewards; more than twenty but for each championship, in this case Moto GP, we choose a small part of these stewards, one of them is permanent for each race and the others rotate but, in any case, there is a short choice of stewards for the Moto GP (...) The advantage of this new structure is that, because the Moto GP Race Direction is too busy, they haven't got enough time to manage the race at the same time and penalise, we were thinking that if we separate these two structures, we will have better results because at the end the justice that the stewards do and they can impose penalties during the event, which is extremely important. We must not only be fair but show that we're fair and for this reason we decided that we would separate this function. Then, since 2017, it is the FIM stewards that are responsible for all penalties during Moto GP'.

Several analyses on the present case of study have been carried-out by journalists and published as articles on magazines. However, nobody has performed a conjoint study between technical and law aspects, which is the purpose of this paper.

This paper has been structured coherently with its purpose: at first all the law elements that should be known to deeply understand the legal case are provided and then, the case study is analysed from a technical engineering point of view.

As a matter of fact, the paper deals with Moto GP rules and regulations and all the legal system laying behind it. A wider picture of the hierarchical structure for Moto GP legal cases is depicted and legal debates between two or more teams are discussed. In addition, providing an insight of the FIM Moto GP regulation, possible consequences for non-compliant teams are presented. Then the article provides a technical description of the case study of this report. To be a fluent reading also for a non-expert public, a description of the main engineering features of a general motorcycle swingarm is initially given. After, a deeper analysis of the Moto GP Ducati GP19 swingarm device is carried out and the legal debate about it is described. Eventually, the final judgement of the Court and the consequences for Ducati Moto GP team are discussed. Moving toward its conclusion, the paper provides general conclusions regarding the Ducati aero appeal. Afterwards, a new hypothetical scenario for future rules and regulations applied to counter similar cases is figured with the aim of assessing who will be liable for them in case of new class actions and which could be the legal consequences.

2. A look at Moto GP rules and regulations in 2019.

What follows is based on the '*Disciplinary and Arbitration Code*' of the FIM World Championship Grand Prix Regulations (amended as from 01/01/2021).⁹

The obligations incumbent upon the participants, officials and organisers are set out in the Regulations published by the FIM.

Proven violation or non-observance of these obligations will be subject to the penalties laid down in this chapter.

The bodies of the FIM, qualified to deal with race decisions, disciplinary and arbitration matters, are the Race Direction;¹⁰ the FIM Moto GP Stewards Panel;¹¹

⁹ FIM official website (2022), *FIM World Championship Grand Prix Regulations 2022*, in <https://www.fim-moto.com/en/documents>.

¹⁰ The Constitution of the Race Direction is in accordance with the requirements laid down by the Regulation. The Race Direction will comprise the following people: the FIM Representative; the DORNA Representative; the IRTA Representative (who is the Race Director). These persons can perform other functions during the event. The quorum for a meeting of the Race Direction is two persons. Each member has one vote. Decisions are based on a simple majority. The Race Direction will meet at any time required during the event. The duties of the Race Direction are: to take decisions as provided in the Regulations; to oversee operational matters to ensure the safe, efficient, and timely running of the event according to the FIM World Championship Grand Prix Regulations; to make changes in the conduct and/or format of a race and/or a practice session based on safety considerations, provided that such decision is absolutely necessary to resolve a situation not foreseen in the FIM World Championship Grand Prix Regulations. In such exceptional cases, such decision may prevail over specific provisions of the FIM World Championship Grand Prix Regulations. Provided that it is necessary to resolve a situation not foreseen in the Regulations, the Race Direction may issue pre-race instructions or clarifications and in specific cases even create pre-race regulations. However, such actions may only be taken within the limits set out by the FIM World Championship Grand Prix Regulations. The Race Direction has the authority to refer any case involving riders, teams' personnel, Officials and Promoters/Organisers, and all persons involved in any capacity whatsoever in the event or in the Championship, to the FIM MotoGP Stewards Panel for possible disciplinary for: any voluntary or involuntary action or deed accomplished by a rider or team member or any other person as mentioned above, contrary to the current Regulations or instructions given by an official of the meeting; any voluntary or involuntary action of Officials and Promoters/Organisers for having been unable to ensure the smooth and efficient running of the event or for serious breaches of the Regulations and Protocols covering the event organisation.

¹¹ The Constitution of the FIM Moto GP Stewards Panel is in accordance with the requirements laid down by the same Regulation. There will be a panel comprised of three persons holders of an FIM GP Super-licence; Two FIM Stewards will be nominated by the FIM, the third one will be nominated by IRTA, who will be a permanent member and the Chairman. Each FIM Steward may be a permanent appointment, or appointed by rota, and approved by the Permanent Bureau. These people can perform other functions during the event. The quorum for a meeting of the FIM Moto GP Stewards Panel is two people. Each member has one vote. Decisions are based on a simple majority. In the case of a tie, the Chairman will exercise a casting vote. The FIM Stewards have no executive role in the running of the events, except for the imposition of penalties and the adjudication of protests as per Art. The FIM Moto GP Stewards Panel will meet at any time required during the event. The FIM Moto GP Stewards Panel is responsible for: taking decisions as provided in the Regulations; imposing penalties for any infringements of the Regulations; adjudicating on any protest relating to infringements of the Regulations. All decisions of the FIM Moto GP Stewards Panel must be communicated in writing to the Race Direction and all affected parties. The FIM Moto GP Stewards Panel has the authority to penalize riders, teams' personnel, officials, promoters/organizers and all the persons involved in any capacity whatsoever in an event or in the Championship for: infringements of the Regulations; any voluntary or involuntary action or deed accomplished by a person or a group of persons during a meeting, contrary to the current Regulations or instructions given by an official of the meeting; any corrupt or fraudulent act, or any action prejudicial to the interests of the meetings or of the sport, carried out by a person or a group of persons occurring during an event. The FIM Moto GP Stewards Panel is competent to adjudicate upon a protest relating to infringements of the Regulations. Penalties that may be pronounced by the FIM Moto GP Stewards Panel: a warning; a fine; a change of position; long lap penalty(ies); a ride through; a time penalty; a grid penalty; a disqualification; a withdrawal of Championship points; a suspension. Furthermore, the FIM Moto GP Stewards Panel can refer the case to the Moto GP Court of Appeal in order to impose a higher penalty than the FIM Moto GP Stewards Panel is empowered to do.

the FIM Appeal Stewards;¹² the International Judicial Panel;¹³ the Moto GP Court of Appeal.¹⁴

For all the appeals to the Moto GP Court of Appeal, the FIM is entitled to assert its interests or to explain its position by means of a prosecution address. The Executive Board shall appoint in each case, the person who will represent the FIM. The intervention of the FIM is optional and is left to the appreciation of the Executive Board. As a party, the FIM enjoys the same rights and obligations as the other parties. The FIM may be present in person at a hearing or may present its claims in writing.

In case of a behaviour of an exceptional gravity, the President of the FIM, the FIM Executive Board may refer the case to the FIM CDI which will hear such a case according to the procedures and time limits laid down by the General FIM Disciplinary and Arbitration Code.

A protest is an action taken by any legal entity or any individual, rider, team, manufacturer, official etc. against another legal entity or any individual, rider, team, manufacturer, official etc.

After an immediate hearing, the FIM Moto GP Stewards Panel must make a decision on any protest presented. The protest has to be judged according to the provisions of the Regulations.

The decision of the FIM Moto GP Stewards Panel of determination of penalty is immediate.

An appeal is an action taken by any legal entity or any individual, rider, team, manufacturer, official etc. affected by a penalty or decision issued by the FIM disciplinary authorities (whether arising from a protest or otherwise).

It is interesting also to note that in the procedure before all the Disciplinary and Arbitration Bodies there shall be the unquestionable right of any person or body charged with any offence under the Regulations to defend themselves,

¹² The FIM Appeal Stewards will consist of one FIM Steward with FIM Sporting Steward Superlicense, who will be the chairman of the FIM Appeal Stewards and exercise a casting vote if necessary. This Steward will be nominated by the FIM and approved by the Permanent Bureau; one FMNR Steward with FIM Sporting Steward License, nominated by the FMNR and approved by the FIM. The FIM Appeal Stewards will hear any appeals against decisions taken by the FIM Moto GP Stewards Panel. The FIM Appeal Stewards may confirm or overturn a decision of the FIM Moto GP Stewards panel or impose a different penalty. The FIM Appeal Stewards may refer the case to the Moto GP Court of Appeal if it appears impossible to deal with the case for any valid reason. Such a decision will be justified in writing by the FIM Appeal Stewards.

¹³ The International Judicial Panel (CJI) is composed of qualified persons from which the member of the Moto GP Court of Appeal is nominated. The International Judicial Panel shall consist of members nominated by FMNs. Each FMN may nominate one or several members having the nationality of that FMN. The appointments shall be confirmed by the General Assembly for 4-year periods. In order to qualify for appointment to the International Judicial Panel, a candidate must be in possession of a diploma in Law studies of university level. He must be able to express himself in at least one of the official languages of the FIM. He cannot however be an officer or a license holder of the FIM.

¹⁴ The FIM Legal Director in collaboration with the Director of the CJI will appoint, each time, the judge(s) who will constitute the Moto GP Court of Appeal. The name of the judge(s) appointed must be communicated to all interested parties in the case, who have the right to make a duly documented objection to the composition of the Court, the day after having received the information. If the Permanent Bureau considers that a reasonable objection is made, they must appoint the necessary replacements. Otherwise, they reject the objection and fix the date for the hearing. The court may request the opinion of an expert or summon a witness who it considers useful. The Moto GP Court of Appeal will hear any appeals against decisions taken by the FIM Appeal Stewards. The Moto GP Court of Appeal adjudicates upon request of the Race Direction, the FIM Moto GP Stewards Panel, or the FIM Appeal Stewards. The President of the FIM, the Executive Board or the Management Council may, within 4 days after an Event, refer to the Moto GP Court of Appeal matters of violation or infringement of the FIM regulations not concerning sporting or technical regulations.

either in person or by proxy. Any party convened before a disciplinary or arbitration body has the right to be represented by one defence counsel of its own choice and at its own expense. Adequate notice of this intention must be given in order that this may also be notified to all other parties in the case. Failure to do so may result in the disciplinary or arbitration body upholding an objection to such representation. If any of the parties duly convened do not appear, judgment can be rendered by default.

The disciplinary or arbitration bodies may decide that the hearing take place by means of a telephone conference call or through any other means of communication using a telephone or electronic device. Such a method of conducting a hearing shall only take place with the consent of all parties involved.

The hearing shall be public unless the disciplinary or arbitration body itself decides otherwise in exceptional circumstances. The hearing shall be conducted in one of the official languages of the FIM. Should one of the parties wish to use another language, it shall provide the necessary interpreters at its own costs. The appellant must be present or duly represented, failing which, the protest will not be admissible, and the costs shall be borne by the appellant.

Once the Judge(s) has opened the proceedings, he will invite the parties involved to state their respective cases without the witnesses being present. After statements of the parties concerned, the disciplinary or arbitration body shall hear the various witnesses and experts to complete the evidence. The parties involved in the case shall have the right to question all witnesses and experts on their evidence. Any member of the disciplinary or arbitration body may, at any time during the hearing and with the Judge's approval, question any of the parties involved, the witnesses and experts.

Each party is responsible for the convening and appearance of its own witnesses, as well as their expenses unless decided otherwise by the Court. The disciplinary or arbitration body has no authority to oblige the witnesses to swear on oath; therefore, testimony shall be given freely. The witnesses may only testify to the facts they know and shall not be allowed to express an opinion, unless the disciplinary or arbitration body should regard them as experts on a particular subject and should ask them to do so.

After having made their statements, the witnesses may not leave the Courtroom and shall not be allowed to speak to any other witness who has still to give evidence. The Court may summon experts.

Decisions of all disciplinary or arbitration bodies will be reached in camera by a simple majority of votes. All members will have equal voting rights which must be exercised when a decision is required. Abstention is not permitted. Each member of the disciplinary or arbitration body binds himself to keep all deliberations secret. The disciplinary or arbitration body imposing a penalty or adjudicating a protest or an appeal must have its findings published and quote the names of all parties concerned. The persons or bodies quoted in these statements have no right of action against the FIM nor against any person having published the statement.

Furthermore, final decisions will be published in the Media Centre and in the FIM Magazine unless the Court itself decides otherwise.

As a consequence of the agreement of reciprocity concluded on April 30th,

1949 between the 4 organisations controlling motorised sports internationally (i.e. in addition to the FIM, the Fédération Internationale de l'Automobile, FIA, the Fédération Aéronautique Internationale, FAI, and the Union Internationale Motonautique, UIM), penalties of suspension or exclusion may also be applied to one or another of the sports represented by the above organisations, upon request of the FIM.

3. Case study: Moto GP Ducati GP19 swingarm device in 2019.

A swingarm (*fig. 1*), or swinging arm (UK), originally known as a swing fork or pivoted fork, is a single- or double-sided mechanical device which attaches the rear wheel of a motorcycle to its frame, allowing it to pivot vertically. It's the main component of the rear suspension of most modern motorbikes, it holds the rear axle firmly, while pivoting to absorb bumps and suspension loads induced by the rider, acceleration, and braking.¹⁵



Figure 1: Traditional motorbike swingarm
(Picture courtesy of: <https://www.cycleworld.com/sport-rider/2003-yamaha-yzf-r6/>)

The main goal to achieve when finding the optimal design of a Moto GP swingarm is to obtain a final lightweight component, but which can withstand all the external fluctuating loads without showing a plastic deformation.

Luigi Dall'Igna (Technical Crew Chief of Ducati Moto GP) got a genial idea, which costed him the appellative of 'the wizard': why not exploiting the ground effect also in Moto GP?

He developed his technical concept and, for the first time, some aerodynamic appendages have been seen on a motorcycle swingarm. These appendages, visibly made with 3D technology, leave many doubts about their real function: do they serve to promote downforce and give more grip to the rear tire, or simply to cool the tread? Or both effects? For sure, a fin positioned

¹⁵ Giacomo Guidotti (Crew Chief of Hector Barbera in 2013) said: 'The swingarm is a part of the chassis and it works everywhen during the action of a motorbike. It's really important in launch starts because it needs to be enough rigid to support the load of the engine, which in first gear is very huge. It comes into play also in braking manoeuvre because it should be enough stiff and stable to support all the stresses concentrated in this so short deceleration time. In addition, it's very important also in mid-corner areas because it should be able to absorb and damp all the vibrations coming from asphalt disturbances and bumps'.

on the swingarm can generate an effect tending to keep the bike attached to the asphalt, particularly useful during acceleration.¹⁶



Figure 2: Ducati GP19 Swingarm Attachment device
(Picture courtesy of: <https://www.corsedimoto.com/motomondiale/motogp/motogp-la-tecnica-lo-spoiler-ducatti-quante-polemiche/>)



Figure 3: Ducati GP19 Swingarm Attachment device, zoomed view
(Picture courtesy of: <https://www.motogp.com/en/news/2019/07/30/technology-trends-through-2019/301476>)

The philosophy of Ducati Racing Team was to make a larger use of the aerodynamic downforce to improve the performance of the motorcycle controlling the centre of gravity of the bike and the lack of wheelbase. Ducati's controversial will born due to wing elements mounted on the swingarm of Ducati Moto GP racing motorbike GP19. As it can be seen from *fig. 2* and *fig. 3*, there are three elements that look like to be designed by a road racing car designer to produce downforce.

Taking a deeper look to the whole design of the swingarm and of these wing elements (*fig. 4*), it can be easily seen that these three elements split and the gaps between the elements have the function of flow air.

¹⁶ Corse di moto la nostra passione (2019), *Spy MotoGP: La Ducati ad 'effetto suolo'*, in <https://www.corsedimoto.com/motomondiale/spy-motogp-la-ducatti-e-ad-effetto-suolo/>.



Figure 3: Ducati GP19 Swingarm Attachment device, 3 split elements

The lowest element, which is the shallowest one, would feed the central element and the central element would feed the steepest element, in order to prevent the wing stall or the aerodynamic package stall.

Ducati claimed that this device was designed to cool the rear tyre, but they could easily reach this goal by using scoops or by mounting NACA ducts at the side of the swingarm, just to push air to the tyre and to the top of the wheel. Apparently, it doesn't quite make sense for them to cool the rear tyre in this way, because if this system was designed only on purpose to do that, the tyre in the lowest point (just behind the 3 elements) immediately reaches the ground and it will have no time to cool.

However, the new component hadn't to introduce any kind of instability in the motorcycle in all the dynamic manoeuvres.



Figure 4: Ducati GP19 braking manoeuvre, right-side lateral view

(Picture courtesy of: https://www.infomotori.com/motorsport/motogp-2019-gp-di-gran-bretagna-acuto-di-marquez-nelle-libere-di-silverstone-poi-vinales-dovizioso-quarto-rossi-17esimo_301599/foto-11/)

Starting with the braking phase, when the motorcycle is breaking into a corner (*fig. 5*), the swingarm drops and it exposes much the wing elements.

In addition, Ducati had mounted on the bike also front brake discs spats to improve the air flow towards these 3 wing elements (*fig. 6*). Actually, on Danilo Petrucci's Ducati GP19, another deflector has been added on the front wheel which probably has the purpose of channelling the air flow that goes to the radiator and back, and therefore to the fin of the movable arm. Obviously, during braking manoeuvre, also this component is producing downforce. A

further analysis of the front brake discs spats will be carried out while studying the acceleration phase.



Figure 5: Ducati GP19 braking manoeuvre, left-side lateral view

(Picture courtesy of: <https://it.motorsport.com/motogp/news/la-corte-dappello-da-ragione-a-ducatti-vittoria-confermata-e-spoiler-legale/4358989/#gal-4358989-m0-andrea-dovizioso-ducatti-team-43241470>)

During mid corner phase (*fig. 7*), the downforce would push the bike to slide more, against the centripetal force. Ducati engineers cleverly designed this 'spoon' so that during cornering it sort of tuck in, not producing too much downforce when the bike is leaning.



Figure 6: Ducati GP19 mid corner

(Picture courtesy of: <https://www.cnnindonesia.com/olahraga/20190811190857-156-420333/hasil-motogp-austria-dovizioso-menang-dramatis-atas-marquez>)

During acceleration phase (*fig. 8*), the wing elements are slightly tucked inside and not sticking out to scoop more air, since the rear suspension is compressed. Effectively, it can be said that this wing element, the front brake discs spats (*fig. 9*) that complement it and the achieved air flow are designed for manoeuvres such as high speed breaking and entering into a corner so that the structural swingarm would have some downforce on it. It will drop and it will keep the rear wheel on the ground, reducing the possibility to have a 'stoppie' of the motorbike, maintaining lateral grip and making the bike swing. Under heavy breaking, the bike would be swinging side by side and become unstable. Having this innovative rear wing element, the bike would neutralize the negativity of the front wings: the motorcycle brakes and this system makes

the rear suspension drop down intaking an air flow which provides downforce for the rear.



Figure 7: Ducati GP19 acceleration manoeuvre

(Picture courtesy of: <https://www.gpone.com/it/2019/05/30/motogp/dovizioso-stoner-lorenzo-ducatti-cerca-il-poker-al-mugello.html>)



Figure 8: Ducati GP19 front brake discs spats: on the left the optimized air flow could be seen
(Picture courtesy of: Sky Sport)



Figure 9: Ducati GP19 ground effect
(Picture courtesy of: Sky Sport)

Summing up, the global effect generated by the air flows is clearly displayed in fig. 10.

In a press conference, Luigi Dall'Igna said: *'Of course, we are still a long way far from the ground effect of a Formula 1'*.

In the past, in the motorcycles, some 'splits' had been seen fixed on the lower part of the fairings of some Aprilia GP125s. Who was the technical director in Aprilia at that time? The same Luigi Dall'Igna who is now the wizard of Ducati secrets.¹⁷

This is the first time in which a manufacturer was really working on the flow of air that passes under a motorcycle: the imagination of the Italian engineer has no limits.

Andrea Dovizioso's victory in the opening race of the 2019 Moto GP season in Qatar had been subject to appeal. Dovizioso raced in Qatar using the aerodynamic components previously debuted by factory Ducati teammate Danilo Petrucci at the Qatar test and used by Petrucci and Pramac Ducati's Jack Miller during practice at the Qatar Moto GP round. After Dovizioso won a thrilling, close race by a margin of 0,023 seconds from Marc MÀrquez the top five finishing with six tenths of a second, but the race was the first time Dovizioso had used the new aero parts.

Following the Moto GP Race of the Qatar Grand Prix, four factories – Aprilia, Honda, KTM, and Suzuki – filed a protest with the FIM Moto GP Stewards Panel, meaningfully the body of first instance competent to adjudicate upon a protest related to infringements of the FIM World Championship Grand Prix Regulations.

The protest concerned the aerodynamic device in mention, mounted on the rear swingarm of Ducati motorcycles driven by Andrea Dovizioso (using this device for the first time in this race), Danilo Petrucci and Jack Miller.

The FIM Moto GP Stewards Panel rejected the claim, considering that the aerodynamic device used did not contravene the regulations.

So, after conferring with the Technical Director Danny Aldridge, the FIM Stewards rejected the protest by the four factories, on the grounds that the aerodynamic devices used did not contravene the regulations.

Anyway, the four factories then immediately lodged a protest, which they had prepared previously. According to Manuel Pecino, writing in the Spanish daily Mundo Deportivo, the parties involved had signaled in advance that they would be protesting Ducati's use of the devices, if they were used in the race.

Therefore, the protestants, within the time limit of 30 minutes set forth in the Regulations, lodged an appeal with the FIM Appeal Stewards, the body of second instance competent to hear any appeal against decisions taken by the FIM Moto GP Stewards Panel.

FIM Appeal Stewards, considering impossible to deal with the case (absent any further detail), referred the case to the Moto GP Court of Appeal.

The appeal went forward to the Moto GP Court of Appeals, which met in Geneva, where they considered the case. A judgment is expected to take a couple of weeks and may not be ready before the next round of Moto GP at Termas de Rio Hondo in Argentina.

The results of the Qatar round of MotoGP staid unless they were overturned by the Court of Appeal, although if they were overturned, and Ducati's aero

¹⁷ Corse di moto la nostra passione, *Spy MotoGP: La Ducati ad 'effetto suolo'?* [2019] <https://www.corsedimoto.com/motomondiale/spy-motogp-la-ducati-e-ad-effetto-suolo/>

devices ruled illegal, Ducati was certain to appeal to the Court of Arbitration for Sport (CAS). If the Court of Appeal upholds the ruling of the FIM Stewards, then that would settle the matter once and for all. No right of further appeal exists in that case.

Speaking on Sunday night, Ducati Corse Sporting Director Paolo Ciabatti explained why Ducati believed the aero devices are legal: *'It should be clear to everyone, because all manufacturers received a document from Danny Aldridge on the 2nd of March, which was guidelines for aerodynamics in general, mainly due to the bodywork. But it had a specific article related to that, saying that you can use such parts under certain limits: it has to be attached to the swingarm, it has to move with the swingarm, it has to be used for cooling, protecting from water, protecting the rear wheel from debris. We use it for cooling'*

This directly contradicted Danilo Petrucci, who told on Friday, *'We saw on television that it was for cooling down the rear tire, but it is not like this. But I can't tell you what it is for, because Gigi will get angry'*. Ciabatti said that Ducati had not wanted anyone to know that the purpose of the aero device was cooling, for the same reason they don't tell anyone about what any of the rest of the bike does. *'We didn't like to say this, because we don't like to tell people what we are doing'*, Ducati's Sporting Director said. *'But that's the main purpose. Its purpose is not to create an aerodynamic force to the ground, which is what they say. And ours is not for that'*. The biggest question, of course, is whether it is legal or not. Speaking to Danny Aldridge on Friday, he said that the parts did not contravene the regulations.

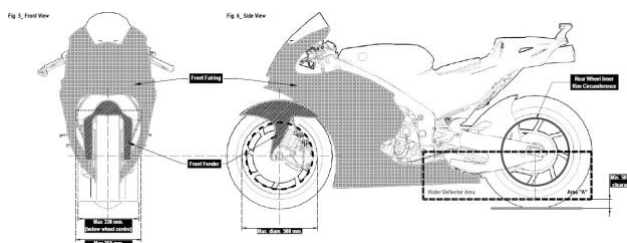


Figure 10: Aero Body of a Moto GP motorcycle, FIM World Championship Grand Prix Regulation (page 258)

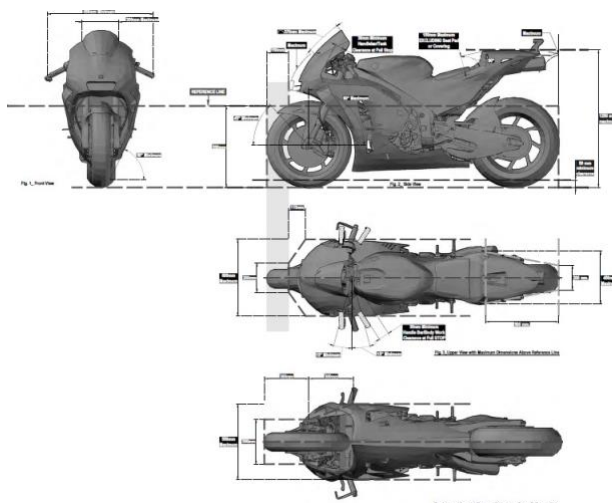


Figure 11: Fairings of a Moto GP motorcycle, FIM World Championship Grand Prix Regulation (page 259)

The Moto GP regulation on aerodynamics does not cover devices attached to the swingarm, or to the bottom of the front wheel, where the carbon covers are located.

Here is what the relevant part of the rules said: *'The Moto GP Aero Body is defined as the portion of the motorcycle bodywork that is directly impacted by the airflow while the motorcycle is moving forward, and is not in the wake (i.e. aerodynamic 'shadow') of the rider's body or any other motorcycle body parts. Therefore, the Aero Body consists of the two separate components Front Fairing and Front Fender (Mudguard).'*

To make the rules clear, the rule book also has pictures (*fig. 11* and *fig. 12*).

If someone compared these pictures with the Ducati aero-device photos, they could clearly see that Ducati have looked at the diagram and seen where the loophole was. They applied the covers to the bottom of the front wheel and attached a spoiler to the bottom of the swingarm.

The Court of Appeal sat in Mies, Switzerland, the offices of the FIM, and heard submissions from Ducati, and from the other four factories. Ducati had Fabiano Sterlacchini present alongside Gigi Dall'Igna, while Suzuki and Aprilia had brought Filippo Petrucci, a Ferrari engineer who had worked with Michael Schumacher in F1 previously, to help present their objections. The case revolved around the function of the spoiler fitted to the bottom of the Ducati's swingarm. Ducati claim that it helps to cool the rear tire. The other four factories, Aprilia foremost among them, point to the fact that the spoiler has three horizontal vanes, which must, they claim, create some kind of downforce. However, as these parts were not attached to what the rules called the Aero Body (the fairing and front fender), Ducati were free to attach and remove them as they see fit. This was why they do not fall under the ban on detachable aerodynamic parts, as set out in the rules. Actually, the MotoGP Court of Appeal¹⁸ had ruled that Ducati's aero spoiler, attached to the bottom of the swing arm of the three Desmosedici GP19s and used in the opening Moto GP race at Qatar, was legal. The decision of the Court means that the race result stands, and that Ducati can continue to use the spoiler going forward.

¹⁸ The Moto GP Court of Appeal consists of three FIM judges, chosen from the governing body's international commission of judges; it must pronounce a decision within 4 weeks after the brief of appeal is received. Both the appellant/s and the respondent/s are by right parties of the proceeding, they must be represented by one defense counsel of their own choice and at their own expense. The appellant/s must be present, or duly represented, otherwise the protest will not be admissible, and the costs of the proceeding shall be borne by the appellant/s. The intervention of the FIM is, instead, optional and the decision left to the appreciation of its executive board. The hearing is public unless the Court decides otherwise in exceptional circumstances (it could be indeed the case of the proceeding in mention) and is conducted in one of the official languages of the FIM. The hearing is basically divided into two parts. Firstly, the parties involved are invited to state their respective cases, the witnesses being absent. Following, the Court hears the various witnesses and experts to complete the evidence. The parties as well as the Court have the right to question all witnesses and experts on their evidence. Once completed the evidence and after the hearing, in any case within the mentioned 4-weeks term after the brief of appeal is received, the Court decides in camera by a simple majority of votes of its three members; all members have equal voting rights and abstention is not permitted. The judgement has to be notified in writing, by registered letter with acknowledgement of receipt or by electronic mail, to all the parties concerned. From this time and date of receipt of the decision, the time limit of 5 days runs to lodge the appeal before the Court of Arbitration for Sports ('CAS') which is the body of third instance entitled to judge any appeal, according to the Regulations, against the decisions of the Moto GP Court of Appeal.

The MotoGP Court of Appeal's complete decision consisted in ruling that: the appeals filed by Team Aprilia, Team Suzuki, Team Honda and Team KTM are admissible; the provisional race results are confirmed and are declared as final; the request to declare the Device illegal and ban its use in future races is rejected. No appeal against this decision had been lodged before the Court of Arbitration of Sport (CAS) in Lausanne Switzerland.

4. Notes on the case final outcome.

The Moto GP Court of Appel had basically to decide whether the Ducati swingarm device was a tyre cooler, for which the use was approved by the FIM, or an aerodynamic device; in this second case, the device would not be permitted by the guidelines (and not the Regulations) which were provided to all the teams on 2nd of March by Technical Director Danny Aldridge.¹⁹

In the second scenario, the three riders subject to the proceeding could be disqualified and lose the points scored in the Qatar GP. Perhaps, the Moto GP Court of Appel could even decide in a 'Solomonic' way stating, for instance, that the devices would be banned from the next races. However, it wasn't so! In this contest, what it is noteworthy that the three appointed members of the Moto GP Court of Appel are not technicians; therefore, presumably, they could have little knowledge about the aerodynamic principles and devices. In order to avoid similar cases in the future, where the race final standing is decided in the following weeks in a courtroom rather than at the track, the FIM should find a way to deal with the anodyne situations inevitably inherent to technical regulations, given the highly competitive environment the FIM World Championship is. In this regard a good example could be provided by Formula 1 system currently in place, by means of which the borderline technological innovations – adopted by the teams and not expressly banned and/or contrary to the letter of the regulations in force – are allowed to be used for the remainder of the ongoing season; being it understood that, at the end of the season, where required, these borderline technological innovations will be double checked by the competent subjects in order to decide whether to allow their use in the next season or to ban them by mean of specific integration to the regulations.

Conclusions.

The case of study that we examined has as its object (although within a sports regulation) the assessment of compliance of an innovative component,

¹⁹ See Asphalt Rubber, *Analyzing the Ducati Aero Appeal: The Process, The Future, Where the MSMA Goes from Here* [2019] in <https://www.asphaltandrubber.com/motogp/ducati-aero-appeal-analysis-motomatters/>; see also Motomatters.com (2019), *MotoGP Court Of Appeal Rules Ducati's Swing Arm Aero Spoiler Legal, Confirms Dovizioso As Qatar Race Winner*, in https://motomatters.com/news/2019/03/26/motogp_court_of_appeal_rules_ducati_s.html; see also Bike sport news, *MotoGP Argentina: Ducati swingarm device is 'Yamaha copy'* [2015] in <https://www.bikesportnews.com/news/news-detail/motogp-argentina-ducati-swingarm-device-is-yamaha-copy>.

the result of the most advanced technological development. It is a theme that is acquiring increasing interest also in the field of law. The paradigmatic example is perhaps the evolution of the product liability regulation.²⁰ In this context, we have witnessed a significant evolution of the criteria based on which the judge makes his own judgment on the product's compliance-safety. Originally, in fact, this judgment was made to the light of general criteria, the result of daily experience: the judge verified if the product was conceived and created in accordance with the 'state of art', 'to perfection', or 'in a workmanlike manner', according to a criterion of judgment widely marked by the impressions of the average man. Technological evolution has upset these settings. The modern discipline on the manufacturer's liability and product safety is flourishing widely on technical standards, that is, on technical disciplines that integrate the content of the law and assist the judge in the assessment of compliance-defectiveness.²¹ In this context, the need for ever greater collaborations between lawyers and engineers is evident. In fact, technological development is achieved in increasingly accelerated times and now involves (in decisive terms) the new technologies of the digital world, generating new legal problems for which legal experts are called to give new answers.²² In this perspective, analyzing cases of study such as the one proposed in this article is of extreme utility, because it allows us to verify the method of evaluating the technical-regulatory problems that the vertiginous innovation of the technology also proposes to the highest levels of the sports competition, with obvious reflections on the future of our mobility system.

²⁰ See P Machnikowski, *European Product Liability. An Analysis of the State of the Art in the Era of New Technologies* (Intersentia, 2016); B Cappiello, *AI-systems and non-contractual liability. A European private international law analysis* (Giuffrè, 2022).

²¹ See J L Contreras, *The Cambridge Handbook of Technical Standardization Law. Further Intersections of Public and Private Law* (Cambridge, 2019).

²² See *The European Law Institute Draft of a Revised Product Liability Directive*, in <https://www.europeanlawinstitute.eu>.