
Motor Sports

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1 Introduction

Even as countries around the world face up to economic and environmental issues, activities are being pursued to ensure the continued future of motor sports.

Major regulatory changes in motor sports in 2012 included the introduction of different standard engine displacements for the motorcycle Road Racing World Championship Grand Prix. However, as car racing is on the verge of substantial changes to power plant regulations, no major changes to regulations occurred in 2012. However, steady progress was made in specific technical studies in anticipation of the future modifications.

In Japan, Suzuka Circuit celebrated the 50th anniversary of its construction as the country's first full-scale racing circuit in September 1962. Since then, Suzuka has survived the changes of the passing years, re-affirming the position of motorsports as a part of Japanese culture.

Through its historical development, motorsports in Japan have gained an individual quality somewhat different to that in Europe and the U.S. However, regulations and technology from Japan may well have a major influence on the future of global motorsports. The continuation of a sound approach based on the whole range of historical perspectives is the key to resolving issues common to all motor sports and further enhancing its sustainability.

2 Car Racing Trends (Table 1)

2.1. Trends in Japan

Car racing in Japan has somehow overcome the austerity measures adopted in the wake of the Great East Japan Earthquake in 2011. 2012 was a year that aimed to achieve recovery and new forms of evolution. Although there were no major changes to vehicle regulations, racing was invigorated by organizational and other changes behind the scenes, and various new activities were implemented.

2.1.1. Super GT (Fig. 1)

The racing distances of the second round (Fuji Speedway) and fifth round (Suzuka), which were shortened in 2009 to reduce participation costs, were returned to the original distances of 500 and 1,000 km, respectively, in 2012. Four official tests are now held each year, increasing the amount of vehicle and tire development testing in conjunction with the tire manufacturer tests.

In the GT300 class, participating cars must be based on production vehicles. Cars are now divided into two main categories: FIA GT3 cars and JAF-GT300 cars that are based on authorized or registered vehicles (other cars were limited to participants in the 2011 series that were allowed to continue racing in 2012). The regulations for performance adjustment of FIA GT3 cars have basically adopted world championship standards for each model rather than individual adjustments, which was previously the case. Since the standards for performance adjustments have been clarified and compliance made easier, the number of FIA GT3 cars has increased. At the opening race, of the 25 cars that reached the final race, 16 (8 models) were from the FIA GT3 category. To match the performance of the FIA GT3 cars, elements such as tire widths, ground clearances, aerodynamic devices, intake restrictor diameters were revised for the JAF-GT300 cars and restrictions were lifted on electronic chassis controls and paddle shifts.

In addition, hybrid vehicles, which have already been recognized in the regulations of the GT300 class, also participated. A Toyota Prius took part from the opening race and a Honda CR-Z took part from the fourth round. Both demonstrated a constant level of competitiveness.

The GT500 class also did not make major changes to regulations from the previous year. However, the intake restrictor was enlarged by two ranks to maintain the performance gap to the GT300 class.

2.1.2. Formula Nippon (Fig. 2)

Excluding the dual race format of the final round,

Table 1 Details and results of major car racing categories in 2012.

Category	Outline of races	Outline of vehicles	Participating Japanese manufacturers	2012 champions		Remarks		
				Drivers	Manufacturers			
World championships	F1	20 rounds on circuits (Shanghai, Monaco, Brazil, South Korea, Suzuka, Abu Dhabi, etc.)	Dedicated race cars (formula) 2.4-liter V8 NA engines	—	Sebastian Vettel (third consecutive year)	Red Bull Racing (team)		
	Rally	WRC class	13 rounds on general roads (Sweden, Jordan, Greece, UK, etc.)	4WD cars based on commercially available vehicles Maximum 1.6-liter direct-injection turbocharged engines	—	Sebastian Loeb (ninth consecutive year)	Citroen (team)	
		PWRC class	8 rounds on general roads (Monaco, Portugal, Finland, France, etc.)	4WD cars based on commercially available vehicles Maximum 2.0-liter direct-injection turbocharged engines	Mitsubishi Subaru	Benito Guerra	/	
		SWRC class	8 rounds on general roads (Mexico, Jordan, Finland, France, etc.)	4WD cars based on commercially available vehicles Maximum 2.0-liter direct-injection NA engines	—	Craig Breen	/	
	WEC	8 rounds on circuits (Sebring, Spa, Circuit de la Sarthe in Le Mans, Fuji, Bahrain, Shanghai, etc.)	Dedicated race cars (open/closed body) LMP1: Maximum 3.4-liter NA, maximum 2.0-liter turbocharged, or maximum 3.7-liter turbo-diesel engines LMP2: Cars based on commercially available vehicles, maximum 5.0-liter NA or maximum 2.3-liter turbocharged engines	Toyota Nissan Honda	Benoît Tréluyer André Lotterer Marcel Fässler	Audi		
	Touring cars	24 rounds at 12 venues (circuits: Italy, Morocco, Germany, Japan (Okayama), Macao, etc.)	2WD cars based on commercially available vehicles, maximum 1.6-liter direct-injection turbocharged gasoline engines	Honda	Robert Huff	Chevrolet		
FIA GT1	9 rounds on circuits (Nogaro, Zolder, Navarra, Slovakia Ring, etc.)	Front-engine rear-wheel drive (FR) or mid-engined cars based on commercially available vehicles, 5 to 7-liter NA engines	Nissan	Marc Basseng Markus Winkelhock	All-Inkl.com Münnich Motorsport			
International series	Super GT	GT500 class	FR cars based on commercially available vehicles, 3.4-liter V8 NA engines Uniform vehicle body depth and width, wheelbase, and overhangs	Toyota Nissan Honda	Ronnie Quintarelli Masataka Yanagida	/	Special JAF Grand Prix are also held	
		GT300 class	Cars based on commercially available vehicles. Engine conversion, displacement, turbocharging, and drive wheels are not regulated, or FIA GT3 homologated vehicle	Toyota Nissan Honda Subaru	Kyosuke Mineo Naoki Yokomizo	/		
	DTM	11 rounds on circuits (Hockenheim, Nurburgring, Brands Hatch etc.)	FR cars based on commercially available vehicles, 4.0-liter V8 NA engines	—	Bruno Spengler	/		
	IRL	15 rounds on ovals and circuits (Indianapolis, San Paulo, Long Beach, etc.)	Dedicated race cars (formula) 2.2-liter V6 direct-injection turbocharged engines Blended fuel consisting of 85% ethanol and 15% gasoline	Honda	Ryan Hunter-Reay	/		
	IRC (rally)	13 rounds on general roads (Italy, Spain, Cyprus, Corsica, etc.)	4WD or 2WD cars based on commercially available vehicles Maximum 2.0-liter turbocharged or NA engines	Subaru Mitsubishi Honda	Andreas Mikkelson (second consecutive year)	Skoda		

Table 1 Details and results of major car racing categories in 2012 (continued).

Category	Outline of races	Outline of vehicles	Participating Japanese manufacturers	2012 champions		Remarks
				Drivers	Manufacturers	
Japanese championships Rally	Formula Nippon	7 rounds on circuits (Suzuka, Motegi, Fuji, etc.)	Dedicated race cars (formula) 3.4-liter V8 NA engines	Toyota Honda	Kazuki Nakajima	Special JAF Grand Prix are also held
	F3	15 rounds at 7 venues on circuits (Fuji, Okayama, etc.)	Dedicated race cars (formula) Maximum 2.0-liter inline 4-cylinder NA engines based on commercially available units	Toyota Nissan Honda	Ryo Hirakawa	
	Class 4	9 rounds on general roads (Hokkaido, Chubu, Kyushu, etc.)	4WD or 2WD cars based on commercially available vehicles, engine displacement: more than 3.0-liters (turbo coefficient: 1.7)	Subaru Mitsubishi	Norihiko Katsuta (third consecutive year) Sayaka Adachi	
	Class 3			Toyota, Honda Daihatsu	Tomoyuki Shinkai Masahiko Shimazu	
	Class 2			Toyota Mazda	Tomoyuki Amano Yukiko Inoue	
Class 1	Daihatsu Nissan			Takatoshi Yamaguchi Makiko Yamada		
Other	Dakar Rally	Held in Argentina and Chile Total distance: 8,600 km Start/finish: near Buenos Aires	Cars based on commercially available vehicles, dedicated race car, dedicated race trucks NA gasoline or turbo-diesel engines	Mitsubishi Toyota Auto Body Hino Nissan Subaru	Stéphane Peterhansel Jean-Paul Cottret	BMW/Mini



Fig. 1 Super GT: Nissan GT-R⁽²⁾



Fig. 2 Formula Nippon: Team Dandelion Racing⁽³⁾

Formula Nippon races became all the same length of 250 km. Although obligatory tire changes and refueling were abolished, the fuel tank volume was adjusted so that cars cannot run a full race without at least one pit stop as a measure to encourage exciting racing.

Despite no fundamentally major changes to the regulations, modifications may now be made to brake calipers and rear view mirrors. The regulations had previously only permitted standardized parts.

2.1.3. Formula 3 (F3)

The All-Japan Formula Three Championship scrapped the class classification that had existed until 2011 (C: Champion class and N: National class) and re-introduced a uniform single class from 2012. However, vehicles classified as N class cars up to 2011 are allowed to participate under virtually the same regulations as before and the organizing committee has authorized a ranking based on points awarded specifically to drivers using these regulations.



Fig. 3 Japanese Rally Championship:
Subaru Impreza WRX STI Spec C⁽⁴⁾

2. 1. 4. Japanese Rally Championship (Fig. 3)

The Japanese Rally Championship includes the Rally Hokkaido, which is also Japan's entry in the FIA Asia-Pacific Rally Championship race. In 2012, a rally was held again in Kanto and a round was added in the Kinki region. The champions in each class were not decided until the final round and the championship attracted large numbers of spectators from all over Japan.

Class 4 is the highest category in the championship and most cars are either the Subaru Impreza WRX or Mitsubishi Lancer Evolution, which have four-wheel drive (4WD) and 2-liter turbocharged engines. A new entrant in Class 3 was the Toyota 86, which is the first rear-wheel drive vehicle for some time. The number of new cars is increasing in both class 2 and 1, generating great interest from fans.

2. 1. 5. Other

Bad news in 2012 included a fatal accident during the fifth round of the Super Taikyu endurance series. After the causes were analyzed, various measures were recommended to each relevant organization. These included the compulsory wearing of head and neck support (HANS) devices⁽¹⁾, which had already been adopted in the relevant categories, changes to the flag system used for race control, and so on. However, simply improving the direct race-related elements of motor sports, such as the vehicles, safety equipment, track and medical facilities, and the like, is not sufficient to enhance safety. Every effort must also be made to improve background elements such as the handling of races and operations.

2. 2. Trends outside Japan

Motor sports outside Japan remains badly affected by the global economic downturn. For this reason, various activities were planned in all categories of racing under the three keywords of safety, the environment, and cost reduction to ensure the future of the sport.

These plans are due to come into force from 2014 and beyond. Therefore, although there were no major changes to regulations in 2012, some modifications were introduced this year.

2. 2. 1. FIA Formula One World Championship (F1)

In 2014, F1 will make a major change and switch to 1.6-liter V6 turbocharged engines. Consequently, 2012 saw the introduction of no particularly significant changes in the regulations.

Affecting the external appearance of the cars, a driver impact protection measure was introduced that restricted the height of the front nose to 550 mm from the reference plane. However, since the maximum height of the front end of the monocoque remained 625 mm, the new regulation resulted in most cars featuring a step of 75 mm in the nose. Although this step had little effect on aerodynamics, it made the cars look somewhat awkward and unbecoming to F1 as the pinnacle of formula racing.

In terms of aerodynamic performance, some teams in 2011 gained an aerodynamic effect by directing exhaust gases onto the rear diffuser. This was restricted by regulating the position of the exhaust pipes.

2012 also saw the addition of a three-day mid-season test in addition to regular pre-season testing.

2. 2. 2. FIA World Rally Championship (WRC)

The World Rally Car is intended to be driven at the top rank of rallying. To reduce costs, the regulations for the World Rally Car are derived from the ones for S2000 cars, with the introduction of more environmentally friendly downsized 1.6-liter direct injection turbocharged engines and various kit components such as the gearbox and aerodynamic parts. Manufacturers are also obligated to sell to privateer teams.

2. 2. 3. FIA Super 2000 World Rally Championship (S-WRC)

Previously, the vehicles used the S2000 regulations introduced in 2006 as a cost reduction measure. However, since then, costs gradually increased and the S2000 concept was revised. The scope of modifications was limited and the cars were obligated to use 1.6-liter direct-injection turbocharged engines based on commercially available units. This new R5 rules category was established and put into force to further reduce costs. However, manufacturers will only start supplying cars in 2013. It was also announced that applications for homologation of new S2000 vehicles would close in September 2013, to help popularize adoption of the R5 rules.

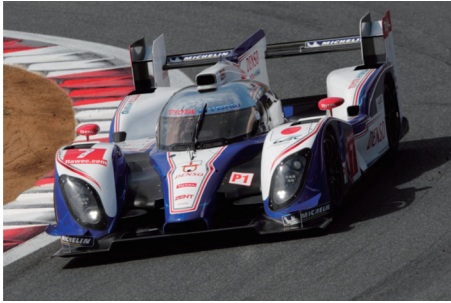


Fig. 4 WEC: Toyota TS030 Hybrid⁽⁵⁾

2. 2. 4. Intercontinental Rally Challenge (IRC)

The IRC was a FIA-sanctioned series that was particularly popular in Europe, using the S2000 regulations for the top cars. However, the series finished in 2012 and the IRC was merged with the FIA European Rally Championship (ERC) from 2013.

2. 2. 5. FIA World Endurance Championship (WEC) (Fig. 4)

The WEC was originally the Le Mans Series, named after the most famous endurance event, the 24 Hours of Le Mans organized by the French Automobile Club de l'Ouest (ACO). In 2012, this series was reborn as an FIA-sanctioned championship.

The two categories of vehicles are Le Mans Prototypes, which are dedicated racing cars, and GT Endurance cars, which are based on commercially available models. There are two further categories of Le Mans Prototypes: LMP1 cars that are installed with dedicated racing engines, and LMP2 cars that use engines based on commercially available units. The highest category, therefore, is LMP1, and these cars use 3.4-liter naturally aspirated (NA) or 2-liter turbocharged gasoline engines, or 3.7-liter turbo-diesel engines. The intake restrictor is adjusted to a maximum power of 540 PS. LMP1 cars are also permitted to use full-scale hybrid systems. In terms of the total permitted assistance per lap, the high-capacity systems in WEC are allowed to produce approximately 5 MJ/lap, more than ten times the 0.4 MJ permitted by the F1 kinetic energy recovery system (KERS). This is a key technical point in vehicle development. The LMP2 category uses 5-liter NA or 3.2-liter gasoline turbocharged engines that are based on commercially available units. Power is restricted to approximately 450 PS.

2. 2. 6. FIA GT Championship

Due to increasing costs that reduced the number of participating cars, the top GT1 class has been replaced

by the lower cost GT3 class. This features more cars and has attracted great interest in fans.

The FIA has also started examining technical regulations for a new GT championship that will ensure both exciting racing and lower costs, with 2016 set as the target introduction date.

2. 2. 7. FIA World Touring Car Championship (WTCC)

The WTCC only allows the use of 1.6-liter direct injection turbocharged gasoline engines that were adopted in 2011. As a result, the participating vehicles have come to use a uniform configuration.

Since the number of participating manufacturers has fallen each year, the FIA has started to examine new technical regulations with a planned introduction date of 2015 to provide more appealing touring car racing.

3 Motorcycle Racing Trends (Table 2) —

In 2012, the world of motorcycle motorsports is in the middle of revolutionary changes in each category to ensure a stable future for the sport.

This section mainly focuses on trends in the Road Racing World Championship Grand Prix as an example.

The highest class in this championship is MotoGP (Fig. 5). Engine displacement was increased from 800 to 1,000 cc. This change was made to allow the use of engines based on commercially available units to vitalize participation in the sport. Therefore, the displacement regulations were adjusted in accordance with mass production super sports bikes.

Despite the higher displacement, the fuel tank capacity of prototype bikes was kept at 21 liters. However, each manufacturer managed to clear the severe fuel efficiency requirements while still boosting performance. Top racing speeds reached 340 km/h, depending on the course layout. In motorcycle races, lap times are strongly affected by cornering speeds. Therefore, improving maximum speed does not have a direct correlation with faster lap times. However, average race times in 2012 were roughly 22 seconds shorter than 2011 due to improved acceleration stability.

There are 12 prototype bikes in MotoGP. Bikes with engines based on commercially available units can seek Claiming Rule Team (CRT) status. There are 9 CRT bikes that combine engines manufactured by Honda, Kawasaki, BMW, and Aprilia with bodies from each constructor. CRT bikes compete with prototype bikes

Table 2 Details and results of major motorcycle racing categories in 2012.

Category		Outline of races	Outline of vehicles	Participating Japanese motorcycle manufacturers	2012 champions		
					Riders	Manufacturers	
World championships	Road races	MotoGP	Competition for position by racing around a circuit (approximately 110 km). Races are held in different countries and the total of points awarded at each race determines the annual standings. MotoGP is the highest class.	Dedicated bikes for MotoGP with 4-stroke maximum 1,000 cc engines	Honda Yamaha	Jorge Lorenzo	Yamaha
		Moto2	Competition for position by racing around a circuit (approximately 110 km). Races are held in different countries and the total of points awarded at each race determines the annual standings. MotoGP is the highest class.	Dedicated bikes combining a 4-stroke 600 cc commercially available engine and bodies developed by each constructor	Honda (engine supplier)	Marc Márquez	Suter
		Moto3		Commercially available or dedicated racing bikes with a 4-stroke 250 cc engine	Honda	Sandro Cortese	KTM
	Superbikes	Same competition style as road racing, but uses a two-heat system of two races in each round.	Bikes with a commercially available maximum 1,000 cc engine (2-cylinder bikes are permitted a maximum displacement of 1,200 cc.)	Honda Suzuki Kawasaki	Max Biaggi	Aprilia	
	Endurance	Road races in which teams compete for position with two or three riders alternating stints on a single bike over an extended period of time (8 or 24 hours).	Bikes with a commercially available maximum 1,000 cc engine (2-cylinder bikes are permitted a maximum displacement of 1,200 cc.)	Honda Yamaha Suzuki Kawasaki	Vincent Philippe Anthony Delhalle Fabien Foret Yukio Kagayama Takuya Tsuda	Suzuki	
	Motocross	MX1	Competition for position on a motocross (unpaved dirt or sand) track that lasts for 35 minutes + 2 laps (or 30 minutes +2 laps for MX3) (two-heat system). Races are held in different countries and the total of points over a year determines the standings.	Dedicated motocross bikes with a maximum 4-stroke 450 cc or 2-stroke 250 cc engine	Honda Yamaha Suzuki Kawasaki	Antonio Cairoli	KTM
		MX2		Dedicated motocross bikes with a maximum 4-stroke 250 cc or 2-stroke 125 cc engine		Jeffrey Herlings	KTM
		MX3		Dedicated motocross bikes with a maximum 4-stroke 650 cc or 2-stroke 500 cc engine		Matthias Walkner	KTM
	Trials	Competition to complete set courses within a time limit without touching the ground with the feet.	Dedicated trials bikes (no displacement restrictions)	Honda	Toni Bou	Montesa Honda	
	Japanese championships	Road races (JSB1000)	Competition for position by racing around a circuit. Races are held at different circuits and the total of points over a year determines the standings.	Bikes with a commercially available maximum 1,000 cc engine (2-cylinder bikes are permitted a maximum displacement of 1,200 cc.)	Honda Yamaha Suzuki Kawasaki	Katsuyuki Nakasuga	Yamaha
IA1 (motocross)		Highest class of the All Japan Motocross Championship. Competition for position on a motocross track lasting for roughly 30 minutes. Races are held at different tracks and the total of points over a year determines the standings.	Dedicated motocross bikes. The IA1 class features dedicated motocross bikes with a maximum 4-stroke 450 cc or 2-stroke 250 cc engine.	Honda Yamaha Suzuki Kawasaki	Akira Narita	Honda	
IA super (trials)		Competition to complete set courses within a time limit without touching the ground with the feet. Highest class of the All Japan Trial Championship.	Dedicated trials bikes (no displacement restrictions)	Honda Yamaha	Kenichi Kuroyama	Yamaha	

in the same series and the top-ranked CRT bikes managed to split the prototypes in the final year-end rank-

ings. By creating differences in the regulations related to fuel tank volume, engine number restrictions, and the



Fig. 5 MotoGP: Yamaha YZR-M1⁽⁶⁾

like, MotoGP found an optimum performance balance between both types of bikes, reduced costs, and helped to vitalize the racing.

In the future, MotoGP intends to introduce a compulsory common ECU from 2014 to simultaneously boost the performance of CRT bikes and curb excessive electronic controls on prototype bikes. Although software development will be permitted for prototype bikes, hardware will be restricted. CRT bikes have been permitted to use this ECU from 2013 and there are hopes for even greater improvements in performance. In this way, the leading class of motorcycle racing is attempting to enhance the sport as a spectacle while vitalizing participation and reducing costs. Future trends will be monitored carefully.

The Moto2 class has finished its third season under regulations in which teams combine a single engine type (a 600 cc commercially available Honda engine) with a chassis manufactured by each contractor. There is very little difference in performance between each bike and several bikes vie for the top position in each race. Moto2 is a compelling and popular race series.

The smallest displacement class in the Road Racing World Championship Grand Prix is Moto3, which has adopted 4-stroke 250 cc engines in 2012 instead of 2-stroke 125 cc engines. This class features both dedicated manufacturer-produced bikes and bikes using manufacturer-supplied engines. Various innovations have been implemented to reduce costs. The sales price of an engine has been limited to 12,000 euros and manufacturers are obligated to supply engines to up to 15 riders. Engine speeds are limited to 14,000 rpm and the development of electronic controls has been restricted by the use of a common engine control unit. Close to 35 bikes entered the series from 2012, which was the first year of the new regulations. It is hoped that this class will develop even further in the future,



Fig. 6 Suzuka 8 Hours Endurance Road Race: Honda CBR1000RR⁽⁷⁾

The leading races using production bikes are the Superbike World Championship, the FIM World Endurance Championship (Fig. 6), and superbike championships held in each country around the world. Measures are being implemented to vitalize these different championships by facilitating mutual participation in different races through the unification of regulations as far as possible. Again, future trends will be monitored carefully.

4 Motorsport Tire Trends

One particularly noticeable tire-related development in car and bike racing in recent years is the trend to adopt single manufacturers. F1, the leading car racing series, used Bridgestone tires from 2007 to 2010 before switching to Pirelli in 2011 as a single tire supplier for all teams. In Japan, F3 and Formula Nippon are among the series that use single manufacturers. The Superbike World Championship has used Pirelli tires since 2004 and MotoGP has used Bridgestones since 2009. This demonstrates how the top categories in each series have moved to introduce single tire manufacturers.

In contrast, Super GT in Japan is one example that encourages competition in tire development between multiple brands. In 2012, four brands were competing fiercely in the GT500 class: Michelin, Yokohama, Dunlop, and Bridgestone. However, this is a very unusual case in the world of motorsports. The following section describes tire trends in 2012 using Super GT and MotoGP as examples of the different approaches to tire suppliers in car and motorcycle racing, respectively.

Super GT is regarded as the fastest GT car race series in the world, resulting in severe tire loads and extremely strict specification requirements. In the Super GT regulations, the upper limits for the dimensions of both front and rear tires are an outside circumference of 28 inches and a width of 14 inches. Each manufacturer is working to design tires that maximize performance within these

restrictions. Since tire performance margins increase in accordance with greater air volumes, regulations that permit the use of same size tires at the front and rear are one factor allowing high cornering performance. However, in 2012, it was decided to adopt the same regulations that was introduced by the Deutsche Tourenwagen Masters (DTM: German Touring Car Masters) series in 2014. These restrict maximum front tire dimensions to an outside circumference equivalent to 27 inches and a width equivalent to 14 inches. This regulatory change is a major challenge to tire manufacturers in terms of obtaining the same cornering performance with smaller tires. In the future, vehicle developments and efforts by manufacturers to match tires to these developments will be of great interest, as well as tire performance.

In contrast, current MotoGP bikes are not using 100% of the incredible power of the engines. Unlike cars, bikes do not generate downforce. It is virtually physically impossible to support power in excess of 200 PS through a force of approximately 1 G and a ground contact area equivalent to the size of about one-and-a-half business cards. Consequently, manufacturers are focusing on the development of control systems from the standpoint of how to effectively transfer the power of the bike to the ground. This technology is currently making great strides. As the technology improves, tire requirements

are changing from the conventional demand for absolute grip force to ways of facilitating control of the bike by the rider in terms of maneuverability and stability.

As described above, the introduction of CRT bikes was one major change in MotoGP in 2012. This has also led to changes in the tire supply situation. In 2012, the first year of this change, tire manufacturers supplied the same specification tires as other MotoGP bikes for CRT bikes. However, due to the differences in acceleration, tire temperatures did not increase as much, meaning that the CRT bikes could not make the most of the hard-specification tires. Consequently, CRT bikes will be supplied with a slightly softer compound tire from 2013.

As a result, these developments demonstrate that all tire manufacturers are continuing to develop tires with the maximum performance while adapting to changes in the regulations, regardless of the existence of competition between different companies in the same series.

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