

## A. STATEMENT OF TECHNICAL RATIONALE AND JUSTIFICATION

### 1. Introduction

Some existing motorcycle brake regulations have not kept pace with the advancement of modern technologies. With the improvement of disc brake systems and the recent introduction of new technologies such as anti-lock brake systems (ABS) and combined brake system (CBS), modern motorcycles can be equipped with very sophisticated and effective braking systems. In addition, the motorcycle manufacturing and testing certification industry has become a global industry, serving a global market.

Together, the Contracting Parties to the 1998 Agreement and the motorcycle industry, have determined that work should be undertaken to address the braking performance of motorcycles as a means of improving road safety in their countries. The development of a gtr on motorcycle brake systems is intended to reduce the injuries and fatalities associated with motorcycle accidents. GRRF believes that it is time to update current national standards with a harmonized regulation, based on the best practices within existing Contracting Party national regulations, while taking into account modern brake system technologies.

### 2. Background

During the 126<sup>th</sup> session of WP.29 in March 2002, AC.3, the Executive Committee for the 1998 Global Agreement, adopted the 1998 Global Agreement Program of Work, which included the development of a Global Technical Regulation (gtr) on Motorcycle Brake Systems. Subsequently, Canada offered to sponsor the gtr on motorcycle braking requirements at the 52<sup>nd</sup> session of GRRF, in September 2002. To proceed with the development of the gtr, AC.3 endorsed Canada's request to establish and chair an informal group on motorcycle brakes, at the 130<sup>th</sup> session of WP.29 in June 2003.

Following approval of WP-29, Canada initiated and chaired four meetings of the informal group. The meetings were open to all interested parties. Due to the time schedule and nature of the task, discussions on the content of the gtr and research necessary to develop the gtr began on October 25, 2002, prior to the establishment of an informal group. A total of six meetings on the topic of the development of a motorcycle brake were held, including two before the informal group was established, as noted below:

- October 25, 2002, in Montreal, Canada
- February 6, 2003, in Geneva, Switzerland
- July 16-17, 2003, in Pisa, Italy. 1<sup>st</sup> meeting by the informal group on Motorcycle Brake Systems
- April 26-28, 2004, in Brussels, Belgium. 2<sup>nd</sup> meeting by the informal group on Motorcycle Brake Systems
- November 08-10, 2004, in Montreal, Canada. 3<sup>rd</sup> meeting by the informal group on Motorcycle Brake Systems
- June 27-29, 2005, in Munich, Germany. 4<sup>th</sup> meeting by the informal group on Motorcycle Brake Systems

The meetings were open to all interested parties. The attendees for the informal group included representatives of:

- Canada
- United States of America
- Italy
- Japan (JASIC (Japan Automobile Standards Internationalization Center))
- India (by correspondence)
- IMMA (International Motorcycle Manufacturers Association)
- FEMA (Federation of European Motorcyclists' Associations)
- AMA (American Motorcyclist Association)
- JAMA (Japan Automobile Manufacturers Association, Inc.)

Early work on a motorcycle brake gtr was initiated by The International Motorcycle Manufacturer's Association (IMMA). They initiated a programme of work at the 46/GRRF with the intention to complete a proposal for a gtr for motorcycle brakes. In an effort to select the most stringent performance requirements for a gtr, IMMA conducted an analysis of the relative severity of three national motorcycle brake system regulations in which the UN/ECE Regulation No. 78, the United States Federal Motor Vehicle Safety Standard FMVSS 122 and the Japanese Safety Standard JSS 12-61 were compared. These reports, along with suggested requirements for a gtr, were presented at the 51/GRRF as informal document number 15, and at 53/GRRF as informal document number 26.

The United States, in a joint project with Canada, conducted a similar study comparing the severity of the same three national regulations. This report was made available at 55/GRRF. Despite using different methodologies, the results were very similar to that of the IMMA work. The results of this report were discussed at a 2<sup>nd</sup> informal group meeting, held in Brussels. A preliminary consensus was reached among all participants, in which the outline of the performance requirements for a gtr on motorcycle brake systems was reached.

The United States and Canada conducted a further performance evaluation study, in which selected motorcycles equipped with anti-lock brake systems were compared to like models without ABS. This report was presented at the 3<sup>rd</sup> informal group meeting in Montreal.

The studies completed by the United States, IMMA and work completed by JASIC, provided the basis for the development of the technical requirements of the gtr.

A full report of the work of the Informal group, its deliberations and conclusions is provided in the informal group's Technical Report, [which was presented at the 58/GRRF as an informal document]. The Technical Report includes a summary of the technical justification for the performance requirements for each of the testing requirements.

This final report and appended gtr technical requirements are in response to Article 6 of the 1998 Agreement Concerning the Establishment of Global Technical Regulations for Wheeled Vehicles, Equipment and Parts Which Can be Fitted and/or Used on Wheeled Vehicles, known as the 1998 Global Agreement. This final report has been prepared after a thoughtful review by GRRF of the proposal submitted by Canada.

### 3. Existing Regulations, Directives, and International Voluntary Standards

While there were no regulations contained in the Compendium of Candidates, the following regulations and standards were reviewed and used as the basis for the development of the gtr:

UN/ECE Regulation 78 – Uniform provisions concerning the approval of vehicles of category L vehicles with regard to braking.

U.S. Code of Federal Regulations (CFR) Title 49: Transportation; Part 571.122: Motorcycle brake systems.

Canada Motor Vehicle Safety Regulation No. 122 – Motorcycle brake systems.

EU Directive 93/14/EEC, braking for category L vehicles (in effect, the same as ECE Regulation 78)

Japan Safety Standard J12-61

Australian Design Rule 33/00 – Brake systems for motorcycles and mopeds.

ISO 8710:1995, Motorcycles – Brakes and braking devices - tests and measurement methods

ISO 12364:2001, Two-wheeled motorcycles - Antilock braking systems (ABS) - tests and measurement methods

ISO 8709:1995, Mopeds – Brakes and braking devices - tests and measurement methods

ISO 12366:2001, Two-wheeled mopeds - Antilock braking systems (ABS) - tests and measurement methods

Most of these regulations and standards have been in existence for many years and the methods of measurement sometimes vary significantly. The technical experts were familiar with these requirements and held detailed discussions over them in their working sessions.

### 4. Discussion of Issues Addressed by the gtr

The gtr was developed so that it would be:

- representative of world-wide on-road motorcycle operation,
- able to provide the highest possible level of efficiency in controlling motorcycle braking;
- representative of state-of-the-art testing and measurement technology; and,
- applicable in practice to existing and foreseeable future braking technologies.

The informal group reviewed each of the listed regulations and standards and compared the requirements in each during the development of the gtr. These regulations and standards, in conjunction with the research and analysis, were used to develop a draft table of regulatory requirements. This draft table of requirements was continually updated as the technical issues were raised, discussed and resolved. At the 57/GRRF in February of 2005, this table was presented and the draft technical requirements discussed. The informal group used the feedback from the GRRF presentation to complete the final requirements for the gtr. The table of regulatory requirements was used to develop the text of the gtr, with the final text proposal being presented at the [58/GRRF in September 2005], and is presented below, in Part B of this document.

Where national regulations or standards address the same subject, e.g. dry stop or heat fade performance requirements, the informal group reviewed comparative data on the relative severity of the requirements from the research and studies and included the most severe options. In many cases, individual members of the informal group were tasked with completing additional testing to confirm or refine the testing and performance requirements. Qualitative issues, such as which wet brake test to include, were discussed on the basis of the original rationales and the appropriateness of the tests to modern conditions and technologies.

In each of these steps, specific technical issues were raised, discussed, and resolved. The technical report describes this information. Additionally, other issues addressed in this gtr are identified below:

(a) Applicability

The Informal group followed the agreed terms of reference and has prepared a gtr for all Category 3 vehicles, (mopeds, motorcycles and three-wheelers).

(b) Definitions

The definitions used in this gtr were aligned with those of the Common definitions of vehicle categories, masses and dimensions (S.R.1). In addition, specific technical definitions were developed to align with the current definitions used by each of the contracting parties.

(c) Performance Requirements

The gtr contains performance requirements which are more stringent than the individual requirements of each of the Contracting Parties. This was accomplished by choosing the most stringent requirements of each of the Contracting Parties. The gtr includes the specific tests as noted:

1. dry stop tests:
  - with each brake control operated separately, in the laden condition
  - with all braking systems activated simultaneously, in the unladen condition
2. a high speed test
3. a heat fade test
4. a wet brake test
5. an ABS test

(d) General Requirements

General requirements, such as labelling and parking brake requirements, were aligned with the most severe requirements in the current Contracting Party regulations.

5. Regulatory Impact and Economic Effectiveness

Many global motorcycle brake regulations have not kept pace with the advancement of modern technologies. With the improvement of disc brake systems and the recent introduction of new technologies such as anti-lock brake systems (ABS) and combined brake system (CBS), modern motorcycles can be equipped with very sophisticated and effective braking systems.

Statistics compiled to date indicate that improved motorcycle brake systems would be beneficial in reducing motorcycle accidents. Fatal motorcycle accidents have been on the rise in North America since 1997. Of particular concern is the rise in motorcycle accident fatalities for the 40 year old and above age group, by 8.2% in Canada from 1994 to 2000, and 24.7% in the United States from 1994 to 1999. In addition, statistics from the United States of America for the period of 1991 to 1999 inclusively indicate that about 13 per cent of the yearly average of 1,055 fatal single vehicle motorcycle crashes were related to braking manoeuvres. A request for additional motorcycle traffic accident data was made at the 52<sup>nd</sup> GRRF, to all nations, in an effort to prepare for the cost effectiveness study for the purposes of the gtr. No responses were received following this request.

The informal group reviewed the benefits of developing a gtr. The group concluded that there are many benefits to the consumer, Contracting Parties and for manufacturers. The following highlights some of the significant benefits raised during the discussions:

- The gtr includes technical requirements to access both recent technologies, such as Combined Brake Systems (CBS) and Anti-Lock Brakes (ABS). Most regulatory requirements of the Contracting Parties do not include such current requirements.
- A gtr enables motorcycle manufacturers to test their models to just one regulation/series of tests to sell globally. Currently, tests have to be carried out to many different regulations eg. FMVSS 122 in the USA, ECE Regulation 78 in Europe, SS 12-61 in Japan, ADR in Australia, CMVSS 122 in Canada etc.
- Carrying out just one set of tests to a gtr is particularly beneficial to new manufacturers and manufacturers from the emerging nations. Apart from the benefits outlined in above, their test department needs only to become familiar with the gtr.
- It has been many years since current regulations were reviewed for their relevance. In order to compare current regulations, members of the informal gtr group (NHTSA, Transport Canada, and IMMA) carried out many vehicle tests and analysis that effectively checked out their suitability, with modifications being incorporated as required.

- The informal group gave many individuals and organisations the opportunity to come together to directly influence and participate in the development and content of the gtr. This has in fact been the case where a broad cross section of motorcycle manufacturers, authorities of several countries, and the motorcycle riders group have all participated.
- The gtr combines the better and more stringent procedures from current USA, ECE, and Japan regulations. This will result in an enhanced gtr that will benefit all motorcycle users in terms of brake performance, brake durability, and potential safety.
- Motorcycles sold in the USA will benefit from the following:
  - a wet brake test that simulates in service conditions by spraying water onto the disc.
  - a more stringent dry brake test
  - a more stringent heat fade test
  - a more stringent high speed test
  - an additional test to evaluate ABS performance.
- Motorcycles sold in Europe will benefit from the following:
  - a specified burnishing procedure for government conformity testing
  - an additional test from 100 km/h with both brakes applied
  - a more stringent high speed test
  - additional general requirements eg. warning lamp specification, brake system inspection
  - a specified test sequence
- Motorcycles sold in Japan will benefit from the following:
  - a specified burnishing procedure for government conformity testing
  - an additional test from 100km/h with both brakes applied
  - additional general requirements eg. warning lamp specification, brake system inspection
  - a specified test sequence

In addition, the text of the gtr will provide clear, straightforward instructions on test procedures and requirements that should be easy to follow for the tester. Additional documentation on interpretation (which is used currently) should not be necessary. This will provide a benefit to all Contracting Parties, manufacturers and testing facilities.

Motorcycles are vehicles, which are prepared for the world market. To the extent that manufacturers are preparing substantially different models in order to meet different braking regulations, testing costs and other production values are increased. It would be more economically efficient to have manufacturers using the same test procedure and meeting the same performance requirements worldwide. This will be achieved by this gtr and thus reduce the amount of resources utilized to test motorcycles. These savings will accrue not only to the manufacturer, but also more importantly, to the consumer as well.

In summary, as the gtr has been prepared on the basis of the most severe current requirements, there will be an increase in safety in all countries; since no one country has a

monopoly of the most severe requirement for the common test procedures. In addition, the gtr provides testing requirements applicable to new technologies such as ABS and CBS that will benefit all road users.