

**Provisional Report**  
**8<sup>th</sup> Meeting of the Quiet Road Transport Vehicle Work Group**  
**18 thru 20 October 2011**  
**Baltimore, Maryland, USA**

**18 October- 10:00 a.m. to 5:30 p.m.**

1. Welcome and Opening remarks

➤ QRTV Chairman

Chairman welcomed participants and advised that the U.S. was selected at the 8th QRTV meeting in Osaka, Japan, for this 9th meeting in order to facilitate the participation of key NHTSA researcher and rulemaking personnel. The National Federation of the Blind (NFB) generously offered to host the meeting here at their national headquarters. The Chairman introduced Mr. John Pare, Executive Director for Strategic Initiatives for the NFB and an original participant in the QRTV work group.

➤ Host Organization:

Mr. Pare welcomed the group to the headquarters of the National Federation of the Blind (NFB) on behalf of its President, Dr. Marc Maurer, who was on travel. He provided a brief explanation of the NFB staff and facility and advised that Dr. Maurer would host a reception and dinner on Tuesday evening to welcome the group. Mr. Pare further informed the group that the NFB had planned a "White Cane Walk" for all interested parties on Wednesday at the close of business. The intent is to provide first-hand experience to sighted persons regarding the challenges faced by the blind and limited sight persons during their daily navigation in low and high vehicle traffic areas, without the benefit of sight. He concluded his remarks by wishing the group a successful meeting.

2. Introduction of Participants and Logistic Information:

See attach list of attendees.

3. Agenda

- a) Modifications / Additions: No modifications or changes
- b) Adoption: Adopted as presented

4. Minutes from 7<sup>th</sup> Meeting in Osaka, Japan
  - a) Modifications / Additions: No modifications or changes
  - b) Adoption: Adopted as presented
5. Report by GRB Chairman Christian Theis of September 2011 meeting
  - Chairman Theis reported that GRB expects the US to propose co-sponsoring of a GTR. In addition, WP29 / AC-3, at its July meeting, had orally directed the GRB to proceed with the development of a GTR in the anticipation of forthcoming required documentation from the U.S. delegation. The Chairman stated there is one open question: will the requirements to be worked out by the QRTV group result in technical requirements that are applicable to the operation of an alerting device that is "fitted" to a vehicle or will the GTR "mandate" the use of a system on designated vehicle classes? Chairman Theis stated that this question was also raised by the European Commission.
6. Introductory Comments:
  - The QRTV Chairman pointed out the tight timescale the U.S. legislation has imposed on the NHTSA to develop a regulation for the quiet cars. He expressed his concern about this timing since, in his opinion, it does not allow time to adequately explore the range of complex technical issues and operational options that deserve consideration to obtain a regulation that will not require revisions in the near term. He then reminded the group that in terms of typical 4 to 5 year regulation development time, the QRTV Work Group had already accomplished significant steps toward a future GTR. Having met approximately 21 days within the process under the UN ECE patronage it had:
    - developed a globally acceptable guidance document adopted by the UN as UNECE RE3, to assist governments and industry in their voluntary development of alerting devices and
    - obtained very substantial technical information from a broad spectrum of technical experts from around the world, ranging from psycho-acousticians' to automotive engineers, that have provided the basic foundation for a future comprehensive GTR for all quiet road transport vehicles. He stated that it is essential that a global regulation consider all relevant technical and administrative aspects from around the world.

Chairman also reminded the group that the QRTV work group is obligated to deliver its recommendations for the principal technical performance parameters of an alerting system GTR to the GRB at its February 2012 meeting. At that time the current QRTV Terms of Reference (TOR) will be fulfilled. The development of the GTR will be developed pursuant to new TOR and timelines.

Finally, the Chairman reminded the group that they would have the benefit of presentations and discussions with key NHTSA personnel at this meeting. He encouraged everyone to take full advantage of this opportunity and not be reluctant to question NHTSA on all aspects of their regulatory activity.

The Chairman concluded his remarks with the introduction of Mr. Ezana Wondimneh, NHTSA Office of International Policy and Mr. Thomas Healy, Attorney Advisor, NHTSA Office of Rulemaking

- U.S. National Highway Transportation Safety Administration (NHTSA): Introductory comments were given by Mr. Wondimneh who reiterated the U.S. commitment to co-sponsor the development of a GTR. He informed the group that NHTSA is in the process of preparing the documentation required by the 1998 Agreement. He also expressed the U.S. desire to have both Japan and the European Communities as co-sponsors of the GTR.

Mr. Wondimneh identified the other members of the NHTSA delegation who will attend the afternoon session as:

Ms. Gayle Dalymple (NHTSA / Team Leader),

Mr. James Maclsaac (NHTSA/VRTC/researcher),

Mr. Nat Beuse (NHTSA / Director Rulemaking),

Dr. Aaron Hastings (NHTSA/Volpe/researcher),

He stated they will provide an update on recent research activities, including just completed vehicle noise tests and will answer questions regarding the development of the U.S. regulation.

He further informed the group that the Honorable Christopher Bonanti, Associate Administrator for NHTSA Rulemaking is planning to attend the Tuesday afternoon session and Presidents reception and dinner.

## 7. Presentations:

- Status Report on Activities in Japan regarding the Guideline on Measures against Quietness Issues of HV, etc., presented by Mrs. Heather Konet (JASIC/Nissan-USA): Please see GRBIG-QRTV-8-2 - JASIC QRTV Presentation.pdf
- Nissan's Audible Vehicle Alerting System (AVAS), presented by Mrs. Heather Konet (JASIC/Nissan-USA); Please see 2nd section of GRBIG-QRTV-8-2 - JASIC QRTV.
- The presenter elaborated on the basis for Nissans selection of the audible frequency ranges stating:
  - peak frequencies between 2 kHz and 5 kHz were found to be effective for providing good detectability for sighted pedestrians,
  - peak frequency below 1 kHz found to provide good detectability for majority of sight impaired people. Research shows that approximately 70% of visually impaired persons (70 % - USA; 72% - Japan) are over 60 years of age and generally have difficulty detecting sounds higher than 2 kHz due to age related hearing loss.
  - frequency peaks at the shoulders (approximately 0.6 kHz and 2.5 kHz) of the 1 kHz peak will allow an overall lower sound pressure level while maintaining effectiveness and a quiet environment for driver and community.
- Nissan tests in major U.S. city (Detroit, Michigan) revealed the following 1kHz ambient noise peak:
  - at busy traffic intersection: approximately 77 dB(A) at vehicle start, 74 dB(A) moving and 65 dB(A) stopped.
  - at neighborhood near busy intersection: 58 dB(A) at vehicle start, 56 dB(A) moving and 54 dB(A) stopped.
- Nissan determined that the use of "twin peaks" (approximately 0.6 and 2.5 kHz) required time domain characteristics:
  - pitch shifts proportionally with vehicle speed

➤ Questions / Comments:

- QRTV Chairman congratulated Nissan and Mrs. Konet on a most informative presentation, particularly the innovative research that monitored the brain activity of human subjects when exposed to various sounds. He stated he believed this preliminary research provides a first-time "view" of the cognitive response of humans to various sounds through visual indications of activity within their brain.
- What was the ambient noise level during the measurements?

Answer: The ambient noise during the measurements was 45 dB(A)

➤ General Discussion:

- A key issue needing resolution is a defeat or manual on/off switch to be used in quiet areas, during prolonged vehicle operation at low speed and while vehicle is stationary at a stop sign or traffic I
- Chairman: proposed that an alternative to an on/off switch, the SPL might be automatically reduced to a lower level than is necessary during operation in high ambient noise environments, possibly below 55 dB (A).
- Robert Falk: 55 dB (A) can be perceived at a distance of 38m at ambient noise level of 45 dB (A).
- Henry Morgan (Brigade): However that may differ in case of walls or other reflecting objects.
- Dr. Schroeder (NFB/WBU): If people are given the choice to have a switch, they will take it, although it is not sure if they will use it. Experience shows that one is awoken at night by silent ICE vehicles coming home.

**12:00 p.m. Lunch on site**

**1:00 p.m.** Resume presentations and discussions of NHTSA work relevant to the development of the U.S. regulation under the Pedestrian Safety Act of 2010. Presenters will include the following NHTSA personal/organizations:

Mr. James MacIsaac (Volpe) and Dr. Aaron Hastings (Volpe)

- Presentation GRBIG-QRTV-8-3 --Oct GTR Meeting NHTSA-Volpe Phase 3 v5.pdf)

- Test data very new (approximately 1 week ago) thus no conclusions have been drawn and the analysis is yet to be completed. The results were obtained using SAE J2889-1 and corrected according to SAE. Values taken from the quieter side. It could not be clarified if the sounds shifted with vehicle speed.
  - NHTSA has introduced the concept of "crossover speed" as that low speed where tire-road interaction and aerodynamic noise is not a significant contributor to the overall vehicle noise. The results from the crossover speed testing will be important for the determination of the performance test procedure.
  - Recognizability may mean two different things
    - realize that there is something
    - realize what that something is doing...standstill...accelerate...cruise...
  - A key requirement is that QRTV must be as recognizable as an ICE. Overall level of signal, frequency ranges, tonal components, amplitude and frequency modulation are beneath the parameters that need to be defined. In all about 100 GB of data has been gathered which now needs to be analyzed and transformed into legislation. NHTSA pointed out that it is the intend to give flexibility to OEMs. It shall not be prescriptive but shall be used as a toolbox to define AVASs.
- Questions/Comments;
- Mr. Healy offered that all NHTSA reports and other relevant information can be found in the new docket "NHTSA-2011-0148" that can be reached via the NHTSA website.
  - Questions were very limited due to the presentation of "raw" data. NHTSA stated they will make their analysis known when completed.
  - Mr. Beuse reiterated NHTSA's need to expedite their work in order to meet the U.S. Congress mandated timelines.
- Background of Specified Vehicle Speed for AVAS in Japanese Guideline, presented by Mr. Shirahashi (JASIC/Nissan)
- (Please see GRBIG-QRTV-8-4 - JASIC 20kph.pdf )
- The question had been previously raised by NHTSA regarding the basis for the Japanese selection of a "crossover" speed of 20 kph specified in the earlier Japanese Guidance Document.
  - Mr. Shirahashi stated that tests were carried out on typical Japanese asphalt pavement for four vehicles (2 ICE and 1 HV operating in electric mode).

- The tests demonstrated that at vehicle speeds above approximately 20 kph the four vehicles produced nearly the same sound level since tire noise is dominant.
  - At speeds below 20 kph there was an increasing difference in sound level with decreasing speed. The SPL of the HV in EV mode was found to be approximately 20 dB(A) lower than the ICE vehicles while stationary.
  - OICA pointed out that for OEMs it is more practical to have a sharp on/off criteria, e.g. a pitch-shifted sound up to 20 kph and a constant sound above 20 kph
- The Chairman thanked Nissan, NHTSA and JASIC for their participation and for the high quality of presented material and encouraged NHTSA to take into account the new psychoacoustic / human brain response to various sounds as elaborated by Nissan.

**19 October - 9:30 a.m. to 5:30 p.m.**

- Added Sounds for Quiet Vehicles- GRBIG-QRTV-8-5 -- 11 Oct 2011.pdf; presented by CLEPA/Brigade
- Questions/Comments
- OICA/ISO: The suitability of the proposed broadband sound was questioned because it may be annoying to citizens. Also people may assume a mechanical failure of the vehicle. Only tonal sound would be acceptable.  
  
Answer: CLEPA replied that sounds wouldn't be annoying in reality.
  - The important difference between the measured SPL and the subjective loudness was mentioned. This effect must also be taken into account.  
  
Answer: It was concluded that while broadband sound was necessary for the locatability of the noise source, tonal components are of the same importance. They do not only make the noise acceptable but also they can be pitch-shifted that provides information about vehicle speed and acceleration.

8. Continue development of the Draft Global Technical Regulation (GTR) (Attachment A). Receive inputs from experts as assigned at the Osaka meeting.
  - a) Revise Scope and Introduction language per Osaka discussions
    - No action taken
  - b) Applicability - Need to resolve applicability wording issue
    - Discussion on the definition of the qualification benchmark to require the fitment of AVAS.
    - Suggested wording: "The scope shall include all vehicles that are capable of running with electrical energy only."
    - A specific aspect is the emergent automatic start/stop system at traffic lights. For sighted people those vehicles may remain obvious as lights remain on during standstill, a signal that is not available to all pedestrians. One can't rely on the driver's full attention. More evidence is needed to confirm that adding sound to quiet vehicles will result in increased safety.
    - Germany must take into account the national goal of reducing traffic noise by 3 dB (A) until 2020. Reduced emissions from not running engines during standstill are an important contributor to this goal. Adding sound here would be counterproductive and therefore not acceptable.
    - It was suggested that GRB may not be the appropriate working party for this "safety" subject. WP29 might wish to split the work between GRB and GRSG. GRB Chairman to raise this issue at November WP.29 meeting.
  - c) Definitions - Need to provide clear definitions of vehicles subject to this GTR, environmental terms, vehicle operation, other terms used in GTR.
    - Vehicle subject to the GTR: See applicability above.
    - The question of "sound directivity" requirements was raised. OICA stated that directivity is difficult to measure in motion. It may vary with speed and therefore a pass by test is not adequate for its determination.
    - A controversial discussion about directivity and necessary microphone positions was carried out. No clear outcome could be defined.
    -

- QRTV Chairman: for the pedestrian this performance requirement may be of higher importance. The ability to know the location and distance of a vehicle approaching could be more important than knowing exactly what it does once it is at the location of the pedestrian. Therefore not only speed during the test must be fixed, also the distance from which onwards a vehicles is detectable must be determined.
  - NFB: locatibility means the capability of determining vehicle distance, moving direction, speed and the fact if it is turning. In the view of SAE, the formerly defined attributes for pitch-shifting, frequency modulation etc. would, as a package, give sufficient information to fulfill all those requirements.
- Pitch Shift Procedure (GRBIG-QRTV-8-7 - Oct 2011) presented by Mr. Moore (ISO/SAE)
- Pitch shifting is not a technical unit, but a musical one. In the context of AVAS it is to be seen as an increase of frequency relative to vehicle speed.
- d) General Requirements - Need to define alerting system requirements with regard to pedestrian safety and environmental masking.
- No action taken on this
- e) Alerting Signal Characteristics - Need to specify acoustic signal form, time related functions and other key acoustic parameters.
- The Chairman summarized that the criteria of sound must be defined, taking into account the so far elaborated findings. OICA volunteered to draft for the next meeting a wording that enables the technical definition to be included in the legal text. The following aspects will be covered: pitch shifting, modulation, volume shifting, frequency range.
  - OICA/ISO/SAE and CLEPA agreed to work on this issue and present their recommendations at the 9th QRTV meeting in December. They suggested that key acoustic signal characteristic be established in a matrix that contains all aspects.
- f) Performance Requirements - Need to specify acoustic performance in terms of sound pressure level, directionality, locatibility, operation on-time, and other key performance requirements of alerting system
- See paragraph e) above.

- In another approach, Germany proposed to look at typical ICE noise emissions an 2 m distance, being approximately 53-55 dB(A) @ 10kph and 65 dB(A) @ 65 50 kph (ISO362) respectively. Derived from those figures, the requirements for quiet vehicles can be fixed on the same levels.
  - NHTSA pointed out that they are only tasked to developed regulation under safety aspects so that they have no mandate to evaluate maximum values.
  - Germany stated that legislation without maximum sound level would not be acceptable. An upper limit could be derived arithmetically from the average pass-by noise level @ 50 kph (ISO362).
- g) Test Conditions - Need to specify environmental test environments that are not defined in the ISO quiet vehicle test procedure such as use of test subjects, vehicle selection, etc.
- No action taken
- h) Test Procedures - Need to incorporate by reference the ISO quiet vehicle test procedure to establish baseline vehicle sound levels (with regard to vehicle operation, alerting system operation, environmental conditions, acoustic influences, other).
- Mr. Moore (ISO/SAE) suggested this was possible and would check with the SAE organization regarding copyrights.
- i) Conformance Test Procedure - Need to define test procedure that will be used by government authorities to determine compliance with GTR
- No action taken
- j) Alignment of Technical Terms - Need to review definitions, performance requirements, testing protocols and other key technical requirements with those established by signatories to the 1958 and 1998 Agreements.
- No action taken
- k) Other considerations (See Attachment B)
- No action taken

**6:00 p.m. NFB President hosted reception and dinner for QRTV participants at the NFB headquarters.**

**20 October - 9:30 a.m. to 5:30 p.m.**

9. Continuation of GTR development discussions
10. Discussion and assignment of key GTR requirements
  - a) Economic / cost analysis
  - b) Public benefit analysis
  - c) Environmental impact analysis
  - d) Other considerations
    - No action taken
11. Recap of special presentations to the QRTV Chairman at Inter-Noise 2011, Osaka.
  - presentation *GRBIG-QRTV-8-6 - 2011.10\_QRTV8th-yamauchi.pdf*
12. Date and place of 9th and 10th(?) QRTV meetings.
  - 'The next meeting (9<sup>th</sup>) will be in Bonn, Germany at the facility of the German BMVBS (Department of Transport), starting on Monday, Dec 5 in the early afternoon and ending on Wednesday Dec 7 in the late afternoon.
  - No decision is made on a possible 10<sup>th</sup> meeting.
13. Required February 2012 report/recommendations to the GRB
  - To be addressed at the 9th meeting in Bonn.
14. Review and discussion of recent publications, both pro and con, regarding the need for alerting devices on quiet vehicles
  - No action taken
15. Other business
  - Dr. Schroeder (NFB/WBU) provided the group with basic instruction in the use of a white cane. Following instruction, the group was issued eye masks and canes. The participants were divided into groups of three or four persons and assigned to a blind guide who assisted in their exit of the building. Further instructions were provide by the guides before beginning a walk in areas of differing background noise and traffic flow and supervised their walk with continuing instruction. Following the walk the

group reconvened (all participants were accounted for and no bruises or broken bones were reported) to discuss their experience. There was little doubt that all participants had benefitted from this experience.

- The Group expressed their appreciation to the NFB staff for a well organized demonstration, for their assistance throughout the meeting and for the excellent meeting accommodations (see below).

## 16. Adjourn

