

**Statement of Principles on the Design of High-Priority Warning Signals for In-Vehicle
Intelligent Transport Systems**

Preliminary OICA Comments to documents ITS-17-03 and ITS-18-04

GENERAL REMARKS:

This statement of principles, even though it is still rather unclear and unverifiable, is aimed at providing a basis for the further analysis of the design decisions required of vehicle system designers; it is also aimed at giving broad indications of the preferred responses.

An over-riding concern of any further work to guide or standardise key aspects of ITS systems should be not to stifle or be an obstacle to innovation and technical development. At this point in time, OICA does not believe that standardizing system warnings would lead to better field performance, or increased driver acceptance.

The statement of principles is intended to provide guidance to "designers and evaluators of ADAS or ITS devices that deliver high-priority warning signals". OICA feels strongly that there is no "one right way" to design an effective crash warning.

The Statement of Principles is not, and should not be viewed as, a set of design rules.

At this stage, taking into account the existence of various industry commitments and guidelines and the absence of any known safety problem with the current warning designs, OICA fails to understand the practical implications of these latest documents.

In addition, OICA also has doubts as to the exact scope of this paper which is concentrated on "high priority" warnings without actually clearly defining what the terminology "high priority" covers; as an example, OICA has doubts that back-up warning systems are to be considered as crucial for road safety.

SUMMARY OF THE STATEMENT OF PRINCIPLES:

The document contains 8 basic principles, for which further explanation and examples of good and bad practice are provided. These are:

- 1 High-priority warning should be noticeable in the driving environment.
- 2 High-priority warnings should be distinguishable from other messages.
- 3 High-priority warning should provide spatial cues to the hazard location.
- 4 High-priority warning should inform the driver of proximity of the hazard.
- 5 High-priority warnings should elicit timely responses or decisions.
- 6 Multiple warnings should be prioritized.
- 7 False / nuisance warnings rate should be low.
- 8 System status and degraded performance of high-priority warnings should be displayed.

SPECIFIC COMMENTS:

Principle 3.1: "Warnings should be noticeable in the driving environment"

"To make high-priority warnings more noticeable, they should be:

- Displayed in a least two modalities.
- Redundant - Visual warnings should be used to supplement, or be redundant with, auditory or haptic warnings"

COMMENT: This may be acceptable as a general guide, but there may be exceptions where this is either impracticable or even inappropriate. It should not be allowed to become a hard and fast rule. A discriminating warning return, specific to the function and well chosen, may in many cases be sufficient.

Furthermore and even more important, it is worth noting that SAE J2808, cited in this paper, states with regard to the combination of auditory and haptic warnings that:

*The combination caused participants to react slower (in one study).

*A second study concluded that participants might have felt overloaded by a combination

- "Location/ size – According to the research results, warnings located within 15 degrees of the drivers expected line of sight can increase noticeability for the driver.

COMMENT: No explanation or justification is given for the "15 degree rule". In many cases, it will be difficult to comply with this "rule of thumb", especially in combination with the other considerations mentioned. The 15° recommendation is very restrictive compared to the current existing HMI guidelines which indicate an angle of 30 degrees, and would impose that the warning be inside the instrument panel or high up in the Multi Function Display. The 30° angle, unanimously recommended in the existing HMI guidelines, avoid an overload of information in the display of the instrument panel.

- "Brightness - Visual warnings should have a luminance that can be detected by the driver. According to the research results, It has been found that a luminance of approximately twice of the immediate background is more noticeable under most driving conditions."

COMMENT: No explanation or justification is given for this luminance recommendation, which might be a necessary specification in some cases, but not always sufficient or even possible in others. This principle is totally unsuitable with new technologies of instrument panels functioning as a computer display, whereby the driver can adjust for example the colour, can choose his luminance, etc. It is therefore not possible to ensure a luminance twice of the immediate background when the driver has chosen the maximum luminance. A performance-orientated guideline relating to the prominence and conspicuity of the warning within its general surroundings would be more appropriate.

- "Activation - visual warnings should start ... According to the research results, flashing at a rate around 4hz can be effective in attracting the driver's attention to the signal."

COMMENT: No explanation or justification is given for this flashing frequency recommendation. OICA believes that this value around 4 Hz is too restrictive and possibly incompatible with new technologies. Moreover, in order to determine the appropriateness of a flashing warning, it is important to know the type of information to be passed on: a pictogram or a message.

- "Colour – high priority warnings should be desirable to be mostly red as their primary colour"

COMMENT: This may be appropriate for symbols, but for text warnings, red may not be the most conspicuous colour or the easiest to read.

- Auditory warnings: "Intensity - warning signals should be enough noticeable for the driver to the signals, but should not cause startle effect..."

COMMENT: Sound pressure level alone may not be the right, nor the only parameter to use. The whole spectrum (pitch, tone, general nature of the auditory warning) has to be taken into account (certain persons become less sensitive to certain frequencies at a certain age).

Principle 3.2: " High-priority warnings should be distinguishable from other messages in the vehicle"

"They should be ... immediately recognizable to allow a timely and appropriate driver response."

COMMENT: Recognition takes a finite time so "immediately recognizable" is not realistic. Warnings should be easily and quickly recognizable.

In some cases it may not be necessary for the driver to recognize the exact nature of the hazard, as long as enough information is communicated to prompt the necessary response, such as emergency braking or a steering manoeuvre.

There is generally a priority ranking between different warnings, but there may be situations whereby it is not so obvious to give simultaneously different warnings when the priority is the same. The quoted examples are misleading because in these cases it is indeed quite possible to give simultaneous warnings for equal priority situations.

Principle 3.6: "Multiple warnings should be prioritized"

COMMENT: The recommendations and explanations contained herein are generally acceptable, even though the example of the low fuel warning is probably not the most relevant tone to illustrate the case in question.

One has however to point out that prioritization cannot apply to "lower priority warnings" which are legally required, for instance safety belt reminders, unless specific regulations requiring these to operate are revised to allow prioritization.

Prioritization should not necessarily mean only delaying or suppressing a lower priority warning. Presentation of warnings could be designed to ensure that the most important warnings are the most noticeable and that lower priority warnings do not detract from their conspicuity or distract the driver away from them.

Principle 3.8: System status and degraded performance of high-priority warnings should be displayed

"To the greatest possible extent, the driver should be informed whenever the system is malfunctioning or is performing outside of its operating conditions (non-functioning)."

COMMENT:

Information to the driver every time the system is performing outside of its operating conditions cannot be provided in all cases. As an example, LDW may become non functional below a certain speed. Systematically providing information to the driver may therefore become a nuisance.
