JRC input to the discussion on “Hazardous environment” definition for thermal propagation test

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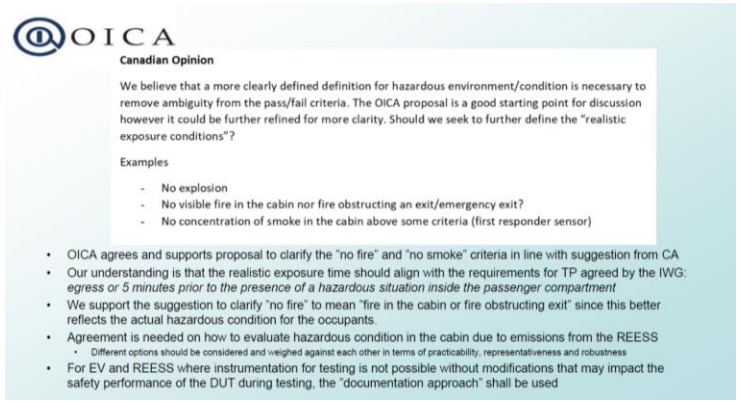
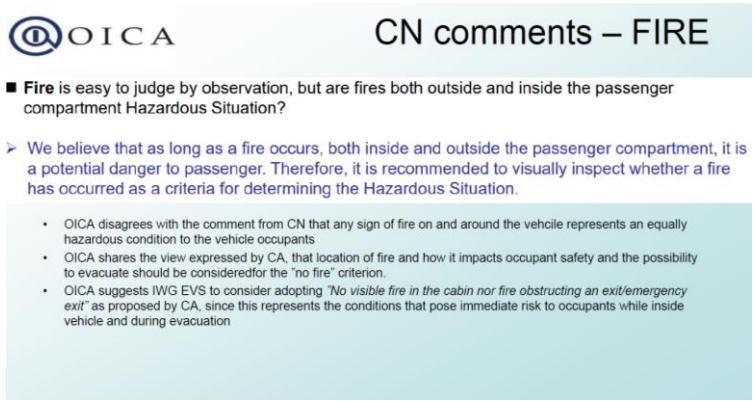
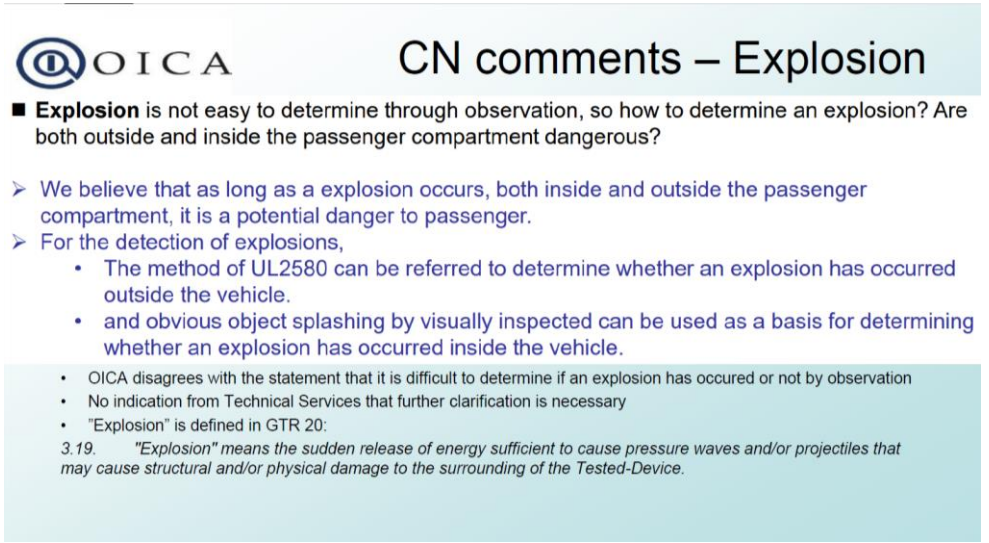
Fire





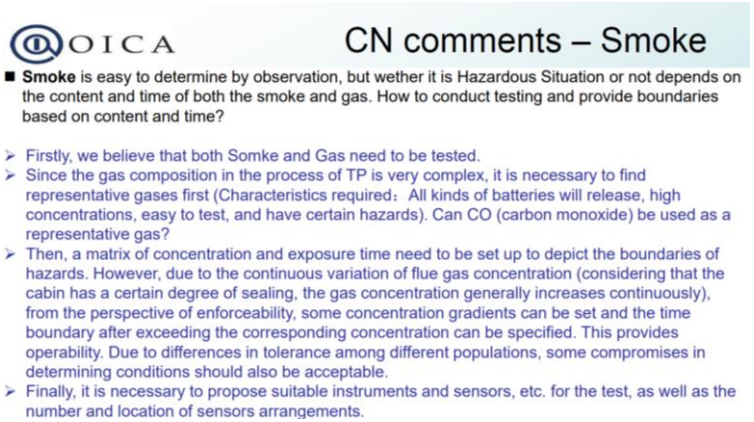
- Both fire inside the cabin and outside the vehicle are dangerous and can be considered hazardous environment
- Fire spread (speed and direction) is dependent on many environmental factors (aerodynamic conditions, wind speed and direction, materials present in the vehicle, REESS design, etc.)
- Fire can (quickly) lead to an explosion
- Visual observation can be considered as an adequate verification method for fire
- Present text of the GTR EVS Phase 1 adopts “no fire” as a pass/fail criterion for many tests, JRC do not see the need to change this criterion.
- GTR EVS Phase 1 text defines fire in paragraph 3.22: "*Fire" means the emission of flames from a Tested-Device. Sparks and arcing shall not be considered as flames.”*

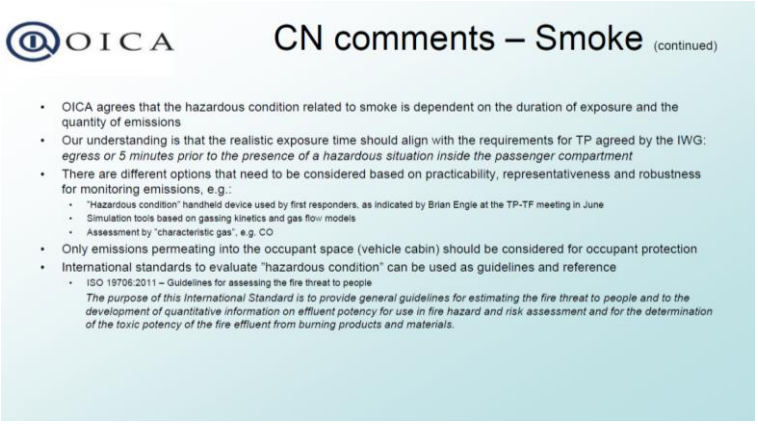
Explosion



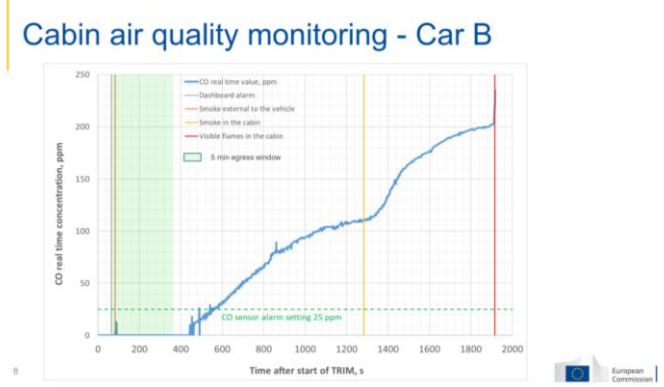
- Explosion both inside the cabin and outside the vehicle are dangerous and can be considered hazardous environment
- Visual observation can be considered an adequate verification method
- Present text of the GTR EVS Phase 1 adopts “no explosion” as a pass/fail criterion for many tests, JRC do not see the need to change this criterion.

Smoke





- Smoke was adopted in Phase 1 of the GTR EVS as an indication of hazardous environment created by emissions from the REESS undergoing TP.
- It is well-documented that emissions of gases often precede emission of smoke (see e.g. EVS25-E2TG-0400).



- In the emissions from REESS in TP <u>many</u> toxic, flammable and corrosive gases are observed (EVS24-E1TP-0401, EVS26-E2TG-0300), <u>all</u> of them can have an adverse effect of human health.

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Smoke (continued)

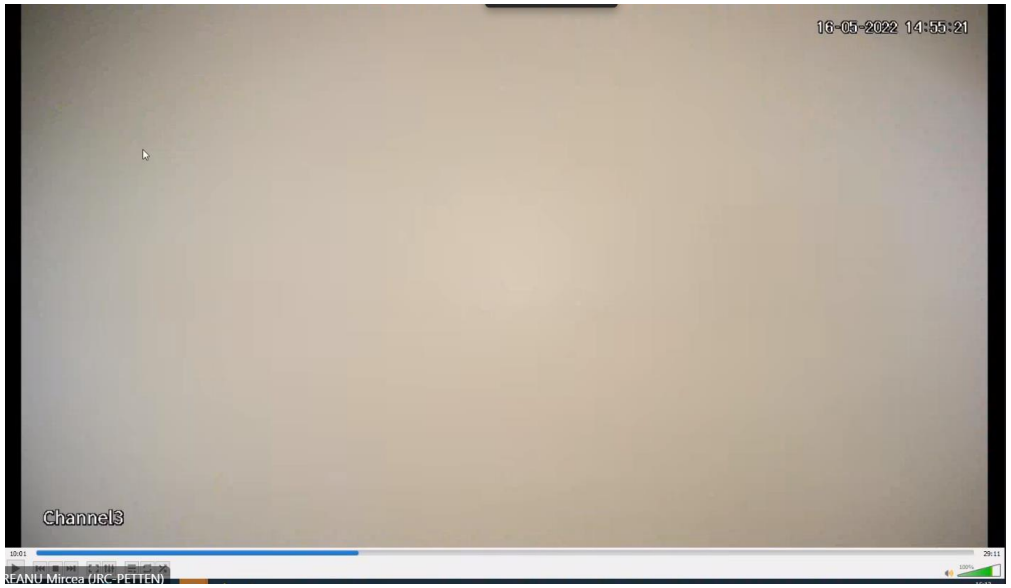
- Why is CO proposed as most representative gas if there can be gases emitted with higher toxicity, e.g. formaldehyde, acrolein, phenol, etc. (EVS24-E1TP-0401, EVS26-E2TG-0300)?
- The choice of AEGL-2 (PAC-2) level of accidental exposure as an appropriate threshold is highly questionable because "…*the general population… could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape"* following an exposure to chemicals at this level.
- Having performed an extensive research, JRC came to a conclusion that at present there is no sufficiently simple and inexpensive, specific (non-cross-sensitive), robust and off-the-shelf method available to quantitatively evaluate a concentration of a given "representative" gas in a complex gas mixture*.

* see for example S. Hildebrand, F. Ferrario, N. Lebedeva, *Comparative overview of methods for detection of airborne electrolyte components released from Li-ion batteries*, submitted to Energy Technology.

Smoke (continued)

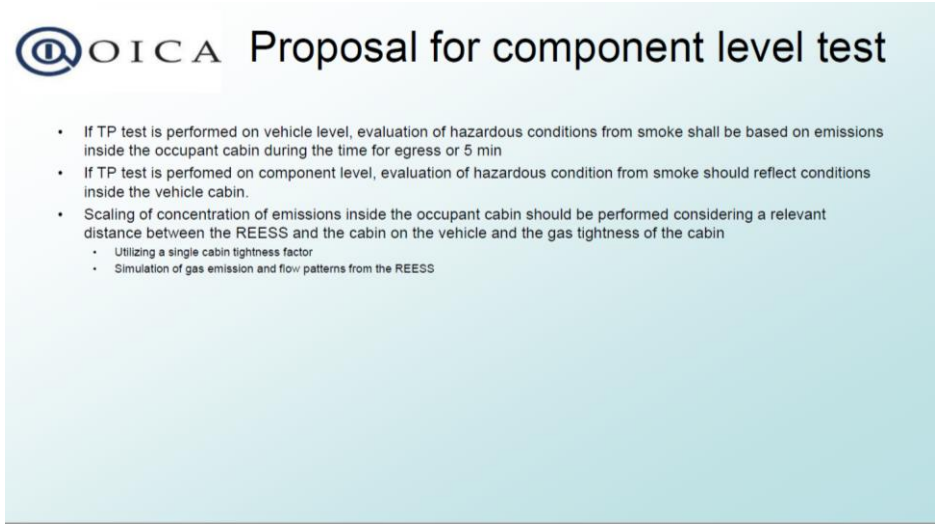
Smoke detectors:

- In our experience smoke detectors, used for domestic purposes, signal the presence of smoke slower than both gas sensors and visual inspection.
- In the JRC experiment described in EVS24-E1TP-0300, smoke detector alarm was given 1 min 50 s after the visual observation of the smoke in the cabin, at that moment the cabin is full of smoke (see picture below).



- JRC propose to keep visual observation of smoke in the cabin as a reasonable indicator of a hazardous environment created by emissions from a REESS undergoing TP.
- With more research results becoming available in the near future, this requirement can be further refined in Phase 3.

Smoke (continued)



- Scaling approach to evaluate hazardous conditions, proposed by OICA, is not clear and no data has been presented so far to support this.

- JRC is in favour of a TP test at a vehicle level, where direct evaluation of hazardous environment for a well-defined period of time can easily and unambiguously be performed.

Thank you

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