

EDR-DSSAD-IWG-24

Data Survivability in EDR Step 2

Tokyo, April 10th 2024



Previous Meeting Recap (SG-EDR-39, February 26th 2024)

Introduction of EDR data retrieval cases for post-crash fires in EVs.

- ✓ KATRI's research revealed : EDR data could not be retrieved in three out of nine cases.
- ✓ Suggestion : Discuss the need for transmitting EDR data externally to ensure data survivability.

Case #	Date	Manufacturer	Model	EDR Data Survivability
1	2020-12-09	A	AA	X(car log)
2	2022-06-04	B	BB	O
3	2022-06-25	B	BB	O
4	2022-09-07	C	CC	X
5	2022-12-05	B	BB	O
6	2023-01-09	A	aa	X(car log)
7	2023-03-15	B	BB	O
8	2023-07-04	C	CC	O
9	2023-11-13	B	BB	O

Accident Cases : Ensuring data survivability		Accident Cases : NOT Ensuring data survivability	
<ul style="list-style-type: none"> ✓ (Summary) Fire after crashing into bumper near highway toll booth ✓ (Damage) Confirmed front center to passenger side intrusion into the engine compartment of the accident vehicle ✓ (Data Survivability) EDR data was retrieved. <ul style="list-style-type: none"> ✦ Undercarriage flooding occurs during extinguishing of accident vehicle ✦ EDR data records indicate that the speed at the Time 0 was 96kph 	<ul style="list-style-type: none"> ✓ (Summary) Fire after crashing into retaining wall on the side of the road ✓ (Damage) Deformation confirmed at the front of the vehicle up to the front of the high-voltage battery pack ✓ (Data Survivability) EDR data was retrieved. <ul style="list-style-type: none"> ✦ Undercarriage flooding occurs during extinguishing of accident vehicle ✦ EDR data records indicate that the speed at the Time 0 was 109kph 	<ul style="list-style-type: none"> ✓ (Summary) Fire after frontal collision with concrete barrier ✓ (Damage) Deformation confirmed at the front of the vehicle up to the front of the high-voltage battery pack ✓ (Data Survivability) Unable to retrieve EDR data <ul style="list-style-type: none"> ✦ ACU corrupted by thermal runaway 	<ul style="list-style-type: none"> ✓ (Summary) Fire after entering an underground car park and crashed into a wall ✓ (Damage) The vehicle burned, and the driver escaped, but one passenger died inside the cabin ✓ (Data Survivability) Unable to retrieve EDR data <ul style="list-style-type: none"> ✦ Both direct connection and EEPROM swapping failed ✦ Car log data(speed) available via OTA

* SG-EDR-39-09 EDR Data Survivability EV Post-Crash Fire Accident Cases in S. Korea.pdf

Requirements mentioned by IWG

- ✓ Comparing the unretrievable case to existing collision test requirements
- ✓ Crash severity and time to thermal runaway arrival on post-crash fire cases
- ✓ List of data elements used for post-crash fires investigation

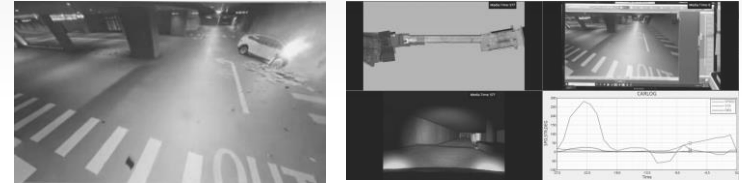


Follow-up on Last Session - I

◀ Comparing the unretrievable case to existing collision test requirements

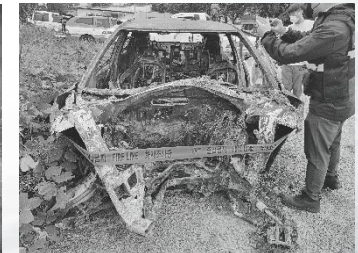
☑ Case #1

- Location : Apartment underground parking
- Impact speed : 94.4kph
- Crash type : Frontal collision(offset 25%)
- Comparison to collision test : UN R94(56kph, offset 40%)
 - Similarities : Collision type
 - Differences : Speed, offset rate, Material of barrier, etc
 - Severity in Case #1 exceeds the UN R94 test requirements due to the higher accident speed.



☑ Case #4

- Location : Overpass road
- Impact speed : Unknown
- Crash type : Frontal collision(w/ concrete median barrier)
- Comparison to collision test : none
 - The front center of the vehicle was damaged by a structure.
 - The vehicle's deformation suggests that the accident occurred at a high speed.



Follow-up on Last Session - II

Crash severity and time to thermal runaway arrival on post-crash fire cases

Case #	Date	Manufacturer	Model	EDR Data Survivability	Accident Speed [kph]	Obtaining Accident Video	Crash and Fire Interval Time (source)
1	2020-12-09	A	AA	X(car log)	94.4	O	Fire immediately (video)
2	2022-06-04	B	BB	O	96	X	Fire immediately (witness)
3	2022-06-25	B	BB	O	85	O	Temporary flame (video)
4	2022-09-07	C	CC	X	Unknown	X	Unknown
5	2022-12-05	B	BB	O	114	O	Fire immediately (video)
6	2023-01-09	A	aa	X(car log)		Not shareable	
7	2023-03-15	B	BB	O	13	X	Unknown
8	2023-07-04	C	CC	O	109	O	Fire immediately (video)
9	2023-11-13	B	BB	O	96	O	Fire immediately (video)

✓ Fire immediately by high-voltage battery damaged



✓ Temporary flame by combustible materials



✓ Direct damage to high-voltage battery



Follow-up on Last Session - III

◀ List of data elements for post-crash fires investigation

☑ (Reference) List of car-log data used in the Case #1 crash investigation

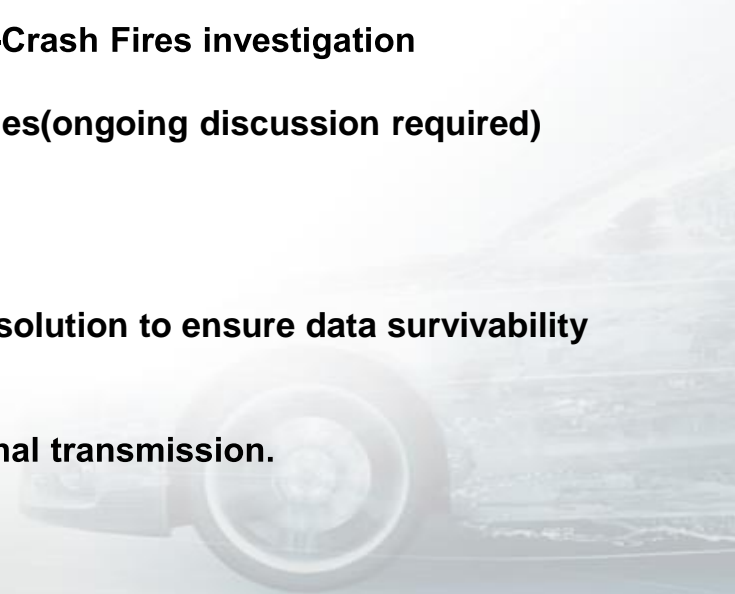
- Real time
- Vehicle speed
- Service brake, on/off
- Accelerator pedal
- Steering input

☑ (Proposal) Data elements to be transmitted externally for Post-Crash Fires investigation

- Some of the pre-crash data elements from the UN R160 01 series(ongoing discussion required)
- ADS mode (at -1.0 sec)

※ Based on the following assumptions :

- 1) External transmission of EDR data is the most promising solution to ensure data survivability for Post-Crash Fires in EVs.
- 2) The scope of the vehicle is ADS vehicles capable of external transmission.



Conclusion & Proposal

◀ Discussing measures to ensure data survivability for post-crash fires in EVs

☑ Reason to propose topic:

- S. Korea investigated post-crash fires in EVs and found that the EDRs stored in the vehicle could not be retrieved due to a thermal runaway caused by battery damage. The inability to retrieve EDR data can be considered a serious issue that threatens data survivability.
- EDRs record data valuable for effective crash investigations and for analysis of safety equipment performance. We need to ensure EDR survivability so that we can use it to prevent other incidents.

☑ Suggestion how to approach in IWG:

- Sharing of additional accident case studies held by IWG members and the CP's opinions on data survivability for post-crash fires in EVs
- Discussion for external transmission of EDR data
 - To reference a previous case, the externally transmitted data was used for accident investigation. External transmission of EDR data can be considered as one option for ensuring data survivability. In this case, scope would be a Vehicles capable of external data transmission(e.g. ADS vehicle).
- Discussion for a more appropriate solution
 - External transmission of data is not definitive as the only solution.
 - Discussion of more appropriate solutions should continue.



THANK YOU

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