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Your Ref: D21001017MFVS
Our Ref : CS4/FCI21004180/P

26th April 2021

M/s FIRST CAPITAL INSURANCE LTD
36 ROBINSON ROAD #16-01
CITY HOUSE
Singapore 068877
(Motor Claims Department)

TECHNICAL INVESTIGATION REPORT OF FIRE INCIDENT INVOLVING THE INSURED VEHICLE YN 5689K ON 23rd March 2021

1. We refer to your letter dated 31st March 2021 and the instructions therein.

2. Our analysis, comments and opinions with respect to the cause of fire to the insured vehicle YN 5689K (herein referred to as **"Insured Vehicle"**) are set out below.

Inspection of the Insured Vehicle

3. The Insured Vehicle was physically inspected on 5th April 2021 at the premises of Klenco (Singapore) Pte Ltd located at 18 Gul Crescent, Singapore 629527

4. A static inspection was carried out to the Insured Vehicle where the following general information was recorded:-

Vehicle Registration No.	: YN 5689K
Make / Model	: DULEVO, 5000 VELOCE EU5 A/T 2WD ROAD SWEEPER
Chassis No	: ZA9S5020E5AC38183
Year of Registration	: 26 July 2014
Mileage	: N.A (wiring affected)

5. The Insured Vehicle was observed to have sustained minor fire damage confined only to its engine compartment in the middle, the electrical wirings, engine block and components around the engine area was damaged as a result of the fire. The other parts of the Insured Vehicle was not affected by the fire See photos 1 – 8 below.

Photo 1 shows the front portion of the Insured Vehicle, which was observed to be unaffected by the fire.

Photo 2 shows the rear portion of the Insured Vehicle, which was observed to be unaffected by the fire.

Photo 3 shows the right body of the Insured Vehicle, which was observed to be unaffected by the fire.

Photo 4 shows the left body of the Insured Vehicle, which was observed to be unaffected by the fire.

Photo 5 shows the general view of the interior compartment of the Insured Vehicle at the time of our inspection was observed to be unaffected by the fire.

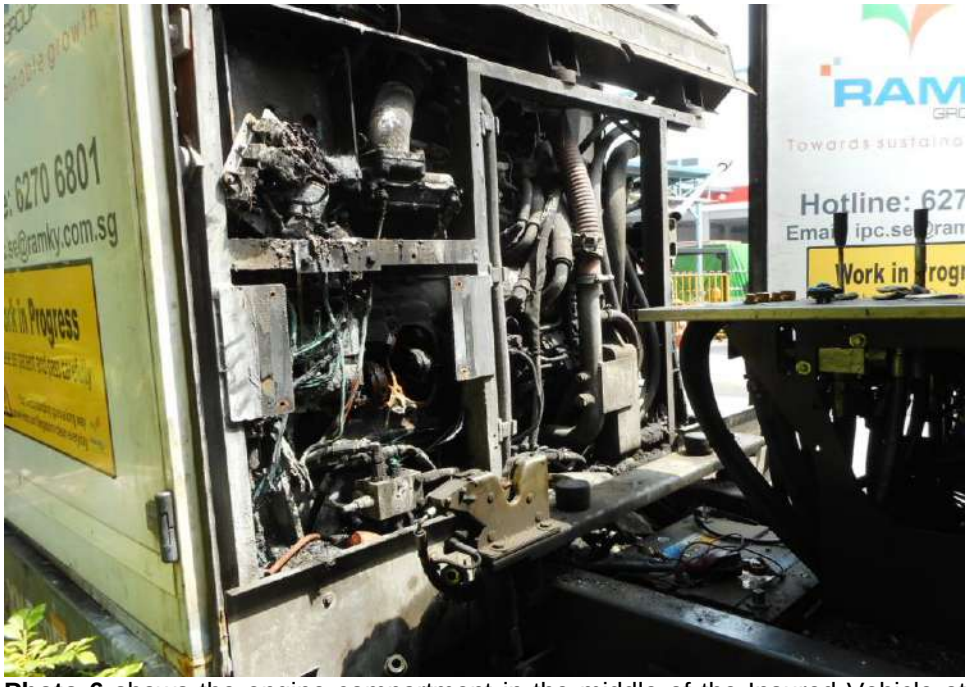

Photo 6 shows the engine compartment in the middle of the Insured Vehicle at the time of our inspection. The engine compartment of the Insured Vehicle was observed to be burnt. The electrical wirings, engine block and components around the engine area was damaged as a result of the fire.

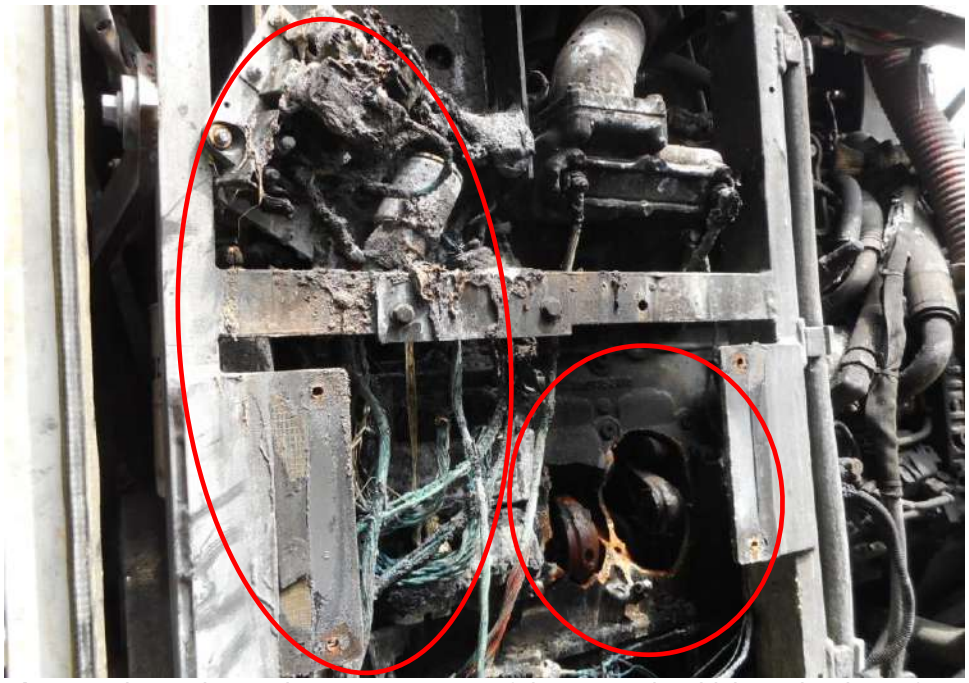

Photo 7 shows the engine compartment of the Insured Vehicle at the time of our inspection. The Insured Vehicle was observed to have sustained fire damage to its electrical wirings and components (red circled) and engine block (yellow circle) was damaged as a result of the fire.

Photo 8 shows the engine compartment of the Insured Vehicle at the time of our inspection. The Insured Vehicle was observed to have sustained fire damage to its engine radiator component (circled) was damaged as a result of the fire.

6. At the time of inspection, we did not find any unusual remains which could have suggested that there was possible modification(s) on the Insured Vehicle.

Investigation and Technical Analysis

7. Based on the circumstances for this particular case, the fire appears to have originated from the engine area of the Insured Vehicle, somewhere around the middle portion. This can be determined basing on the area where the extent of fire damage was most severe, the circumstances of the fires' origin at the material time of incident and also the high heat intensity burn marks (whitish burn marks) that were found on the exterior surface close to the engine portion.

8. These whitish burn marks are a result of exposure to prolong heat intensity. Rust would normally start to develop around these areas soon after a fire as the prolonged exposure to high heat intensity usually causes the bare steel/metal material of the body parts to be exposed to natural environmental condition. The rust that had developed on the front bonnet and centre portion, in the immediate vicinity of where these whitish burn marks were found, would also support our findings of where the fire had affected the Insured Vehicle. See photo 9- 10 below.

Photo 9 shows the close up view of the engine of the Insured Vehicle at the time of our inspection. The burn pattern of the various components which were observed to be partly melted and burn from the high heat intensity and exposure of bare copper wirings (circled) indicates that the fire had originated from the wirings of the engine portion of the Insured Vehicle.

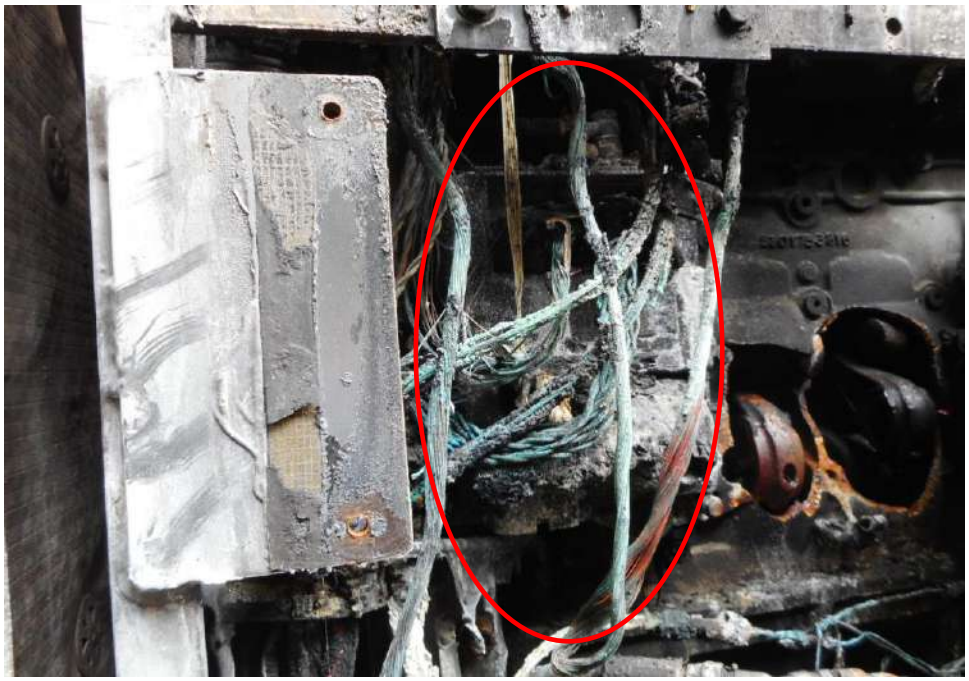

Photo 10 shows the close up view of the engine of the Insured Vehicle at the time of our inspection. The burn pattern of the various components which were observed to be partly melted and burn from the high heat intensity and exposure of bare copper wirings (circled) indicates that the fire had originated from the wirings of the engine portion of the Insured Vehicle.

9. Upon closer examination of the engine compartment portion Insured Vehicle which was where the fire had likely started, we had found traces of greenish residue on the main wiring's harnesses leading from the batteries to the electrical components of the Insured Vehicle. The wirings were original wirings fitted from the manufacturer. The presence of greenish residue indicates internal heating of copper wires, a sign of an electrical short circuit occurring. The greenish residue is normally left behind from the oxidation as a result of chemical reaction involving the copper wires. This physical evidence would then appear to suggest that the cause of fire to the Insured Vehicle could have possibly been due to electrical in nature. See photos 11 and 13 below.

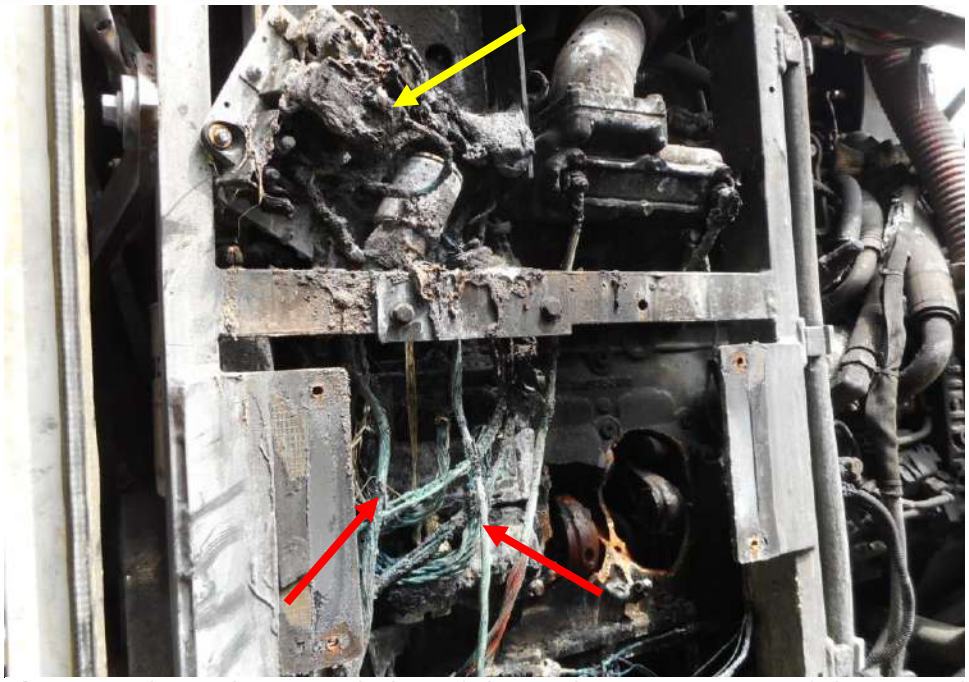

Photo 11 shows the general view of the engine compartment of the Insured Vehicle at the time of our inspection. The fire damage to the Insured Vehicle has affected its engine compartment. Its wirings from the batteries (red arrow), electrical components (yellow arrow) and various original wiring harnesses was amongst the parts in the compartment that were found to have been affected as a result of the fire.

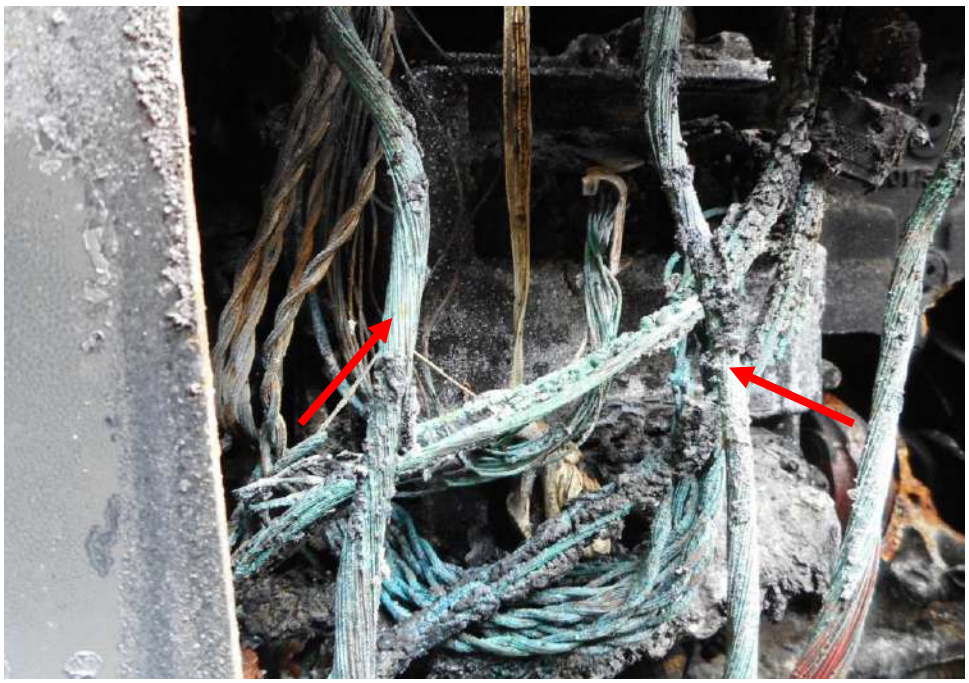

Photo 12 shows a close up view of the original wiring harness from the batteries (arrowed) was observed with greenish residue on the surface. The presence of greenish residue indicates internal heating of copper wires, a sign of an electrical short circuit occurring. The greenish residue is normally left behind from oxidation as a result of chemical reaction involving the copper wires.

Photo 13 shows close up view of the original wiring harness from the batteries (red arrow) to the electrical components (yellow arrow) was observed with greenish residue on the surface. The presence of greenish residue indicates internal heating of copper wires, a sign of an electrical short circuit occurring. The greenish residue is normally left behind from oxidation as a result of chemical reaction involving the copper wires.

10. From the Singapore Accident Statement, which was made by Mr Rosli Bin Yusoff (herein referred to as **"Mr Rosli"**); we note that the fire to the Insured Vehicle started at a time when the engine stalled in the midst of travelling on the road. Mr Rosli was first alerted of the fire when the Insured Vehicle stalled during driving.

11. We managed to speak to Mr Rosli on 11th November 2020 where we were able to gather further information pertaining to the incident as well as information pertaining to the history of the Insured Vehicle.

12. According to Mr Rosli, on 8th April 2021. Mr Rosli informed us that he works as a road sweeper operator and was operating the Insured Vehicle along Upp East Coast Road at about 0155 hours. Mr Rosli was in the midst of driving the Insured Vehicle when the engine stop warning light illuminated up on the dashboard of the Insured Vehicle. He informed us that when the warning light illuminated up it means that there is a low pressure in the engine which in turn means that the engine oil in the engine is of a insufficient level and he should shut off the engine and inform his company to arrange for a tow truck as the warning light means that there is insufficient fluid in the engine of the Insured Vehicle.

13. However, he mentioned that his office is located at Bedok North Street 5 which is about a 20 minute drive from where he is and he subsequently drove the Insured Vehicle to back to his office with engine warning light illuminated on.

14. Upon arriving at the road junction just outside his office, Mr Rosli mentioned that the Insured Vehicle engine stalled and that he proceeds to restart the engine and he cranked the engine for about 2 times but the engine was still not started. He then exited the Insured Vehicle.

15. Upon exiting the Insured Vehicle, he mentioned that there was smoke smell and he saw smoke emitting out from the engine area which was located in the middle of the Insured Vehicle. He opened the door of the engine compartment and saw flames emitting out, subsequently he when into the cabin of the Insured Vehicle and put out a fire extinguisher to put out the fire at the engine compartment.

16. He mentioned to us that when he in the midst of fighting the fire, a by passer had called for SCDF assistance and his colleagues in a vehicle at the material time drove pass him and they also saw the Insured Vehicle on fire, stopped and render assistance by retrieving the water hose in their vehicle to help put on the fire on the Insured Vehicle. SCDF officers arrived shortly and had Mr Rosli's statement was taken down.

17. Mr Rosli subsequently contacted his company and they arrange with their insurance company and made towing arrangements. The tow truck arrived and had the Insured Vehicle towed to the authorised workshop, Klenco (S) Pte Ltd. Mr Rosli made an insurance report on 8th April 2021 at 1100 hours.

18. Mr Rosli mentioned that he had not experienced any mechanical or electrical/electronic problems with the Insured Vehicle till the day of the incident. However, He only mentioned that the engine warning lights were display throughout the period Insured Vehicle was driven prior to the fire.

19. With regards to the history of the Insured Vehicle, we were able to gather from Mr Rosli's company that the Insured Vehicle was purchased new 6 years 7 months ago and Mr Rosli is the registered driver of the Insured Vehicle. Mr Rosli informed us that he is the sharing driver of the Insured vehicle since the day he started working with the company prior to the fire incident.

Incident Scene Photographs

20. During the course of our investigations, we were able to obtain coloured photographs showing the Insured Vehicle at the incident after the fire was extinguished and SCDF personnel was on the scene. These were provided to us by Mr Rosli.

21. Our examination of these photographs revealed that the fire had started from the front of the Insured Vehicle. The photographs had also showed the Insured Vehicle on fire and similar extent of damage and burn pattern to the Insured Vehicle as per what we had observed during our physical inspection of the Insured Vehicle. Apart from the aforesaid; there was no further notable information that could be gathered from these photographs. See photos 14 and 15 below which were provided to us by Mr Rosli.

Photo 14 shows the burned Insured Vehicle at the road junction after the fire was put out. In general, the information that could be gathered from this photograph had corresponded to the events that were related to us by Mr Rosli, location when the fire broke out.

Photo 15 shows the SCDF officer on scene after the fire was put out on the Insured Vehicle. In general, the information that could be gathered from this photograph had corresponded to the events that were related to us by Mr Rosli, location when the fire broke out.

22. Given the circumstances of the incident as reported, the possibility of the cause of fire to the Insured Vehicle being due to engine overheating would seem unlikely as Mr Rosli had mentioned to us that the Insured Vehicle had stalled but did not caught fire immediately upon stalling or when it was driven, prior to the fire incident.

23. The possibility of the fire being due to external factors (foreign material(s) stuck on hot surfaces, arson and sabotage amongst others) would also seem unlikely. As the location where the Insured Vehicle caught fire was also observed to be not at a secluded location.

24. The possibility of the fire being due to electrical in nature would then seem more likely given that engine overheating and external factors would both seem unlikely. The fire being due to electrical nature is also supported by the condition of the several stretches of original wirings from the batteries to its electrical components which was burnt internally to its bare copper state on the Insured Vehicle which was a sign of short circuit that which was earlier discussed in paragraph 9 above.

25. Our checks with both local and international bodies and associations had also revealed that at the time of writing this report, there is a manufacturer recall of similar make and model vehicle to the Insured Vehicle that may possibly be related to fire being originated from the engine compartment of the Insured Vehicle. See search result from LTA below.

Vehicle Recall Details

* ONLY INFORMATION ON VEHICLE RECALLS SUBMITTED FROM 9 APRIL 2007 IS AVAILABLE

Owner ID Type	*Owner ID*
Company	**246G**
Vehicle No. **YN5689K** ←	*Make/Model* **DULEVO/ 5000 VELOCE EU5 A/T 2WD ROAD SWEEPER** ←

Engine No.:
1176284

Chassis No.:
ZA9S5020E5AC38183

Recall Details:
No Recall Detail records ←

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Others

26. Having investigated and technically analysed the damages of burnt nature to the Insured Vehicle, we are of the view that the cause of fire to the Insured Vehicle was of electrical nature. For this particular case, the engine block and the components inside the engine block in the engine compartment of the Insured Vehicle was damaged as well.

27. Given that the Insured Vehicle's, engine stop warning light illuminated up on the dashboard of the Insured Vehicle due to the low level of engine oil pressure with in turn means that that is insufficient engine oil the in engine. The amount of engine oil in the engine would have decreased due to a leakage of engine oil from the engine, as per the circumstance of incident Statement of the driver of the Insured Vehicle. As a result of the leakage, the engine oil became insufficient for lubricating and heat removal purposes during the continued driving of the Insured Vehicle, ultimately affecting the mechanical parts inside the engine, as per the stalling of the engine and the failed attempt to jumpstart the Insured Vehicle as described by the driver.

28. From our understanding, the components in the engine block like the pistons and the crankshaft to be damaged in this particular case was highly due to insufficient engine oil for lubrication and heat removal purposes in the engine. And in this case these components had seized up and were not able to be moved in any other way and that explains why the engine could not be started up when cranked.

29. As the components in engine was seized when the Insured Vehicle had stalled in the first place and the cranking motion conducted by the driver to get the engine starter to run the engine had overloaded the jumpstarting electrical systems of the Insured Vehicle and cause the electric wires to heat up and break off its insulation cover thus causing the wires to touch each other and therefore causing a short circuit that results in a this fire. See photos 16 and 17 below.

Photo 16 shows the close up view of the engine block on the Insured Vehicle at the time of our inspection. The Insured Vehicle was observed to have sustained damaged to its engine block and piston connecting rod (circled) due to insufficient engine oil for lubrication and heat removal purposes in the engine that resulted in the sudden seizure of the running components in the engine causing them to break.

Photo 17 shows the close up view of the engine block n the Insured Vehicle at the time of our inspection. The Insured Vehicle was observed to have sustained damaged to piston connecting rod (red circled) due to insufficient engine oil for lubrication and heat removal purposes in the engine that resulted in the sudden seizure of the running components in the engine causing them to break.

Conclusion

30. Having investigated and technically analysed the damages of burnt nature to the Insured Vehicle, we are of the view that the cause of fire to the Insured Vehicle was of electrical nature. For this particular case, the fire had originated from the wiring harnesses of the batteries leading to its electrical components in the engine compartment of the Insured Vehicle.

31. We are in view that the damage to the components in the engine block is highly due to insufficient engine oil for lubrication and heat removal purposes in the engine. And in this case these components had seized up and were not able to be moved in any other way and not caused by the fire.

32. We did not find any evidence which had suggested that the cause of fire to the Insured Vehicle was due to poor maintenance and/or recurring electrical problem.

33. There was no modification(s) or additional electronic and/or electrical component(s) fitted on the Insured Vehicle at the time of our inspection of the Insured Vehicle.

34. Our investigations had also revealed that at the time of writing this report, there was no manufacturer recall to similar make and model vehicle as the Insured Vehicle that may possibly be related to this incident.

Sherwin Beh
Technical Investigator

Ang Bryan Tani
AMSOE, AMIRTE, AFF SAE, M.MATAI, AFF.Inst.AEA
Senior Technical Investigator
Technical Investigation & Reconstructionist (SAE-A)