

Your Ref: OD/ 600680  
Our Ref : CS/MSG 19012928/Pqf3

7<sup>th</sup> August 2019

**M/s MSIG Insurance Pte. Ltd.**  
16 Raffles Quay #24-01  
Hong Leong Building  
Singapore 048581  
(Motor Claims Department)

**TECHNICAL INVESTIGATION REPORT OF FIRE INCIDENT INVOLVING THE  
INSURED VEHICLE SDT 2012A ON 17<sup>th</sup> July 2019**

1. We refer to your letter dated 22<sup>nd</sup> July 2019 and the instructions therein.
2. Our analysis, comments and opinions with respect to the cause of fire to the insured vehicle SDT 2012A (herein referred to as "**Insured Vehicle**") are set out below.

**Inspection of the Insured Vehicle**

3. The Insured Vehicle was physically inspected on 24<sup>th</sup> July 2019 at the premises of NPH Auto Service located at Block 9005, Tampines St 93 #01-246/254 Singapore 528839.
4. A static inspection was carried out to the Insured Vehicle where the following general information was recorded:-

Vehicle Registration No.	: SDT 2012A
Make / Model	: Subaru Legacy 2.0l Sedan
Chassis No	: JF1BM5KC2AG004547
Year of Registration	: July 2010
Mileage	: N.A (wiring affected)

5. The Insured Vehicle was noted to have sustained fire damage that was confined to its front undercarriage portion. The interior compartment and rear portion was observed to be unaffected by the fire.
6. The fire had resulted in the body parts at the front undercarriage portion of the Insured Vehicle to be burnt. This had included its front undercarriage splash shield; Several parts inside the engine compartment were also observed to sustain heat damage. This includes the firewall insulator, timing cover, condenser, original wiring harness. See photos 1 – 7 below.



**Photo 1** shows the general view of the front portion of the Insured Vehicle at the time of our inspection. The fire damage to the Insured Vehicle was confined to its front undercarriage portion. Its undercarriage splash shield, engine compartment firewall insulator, timing cover and condenser and original harness are amongst the body parts that were found to have been affected as a result of the fire.



**Photo 2** shows the close up view of the front undercarriage portion of the Insured Vehicle at the time of our inspection. The fire damage to the Insured Vehicle was confined to its front undercarriage portion. Its front splash shield (circled) was amongst the body parts that were found to have been affected as a result of the fire.





**Photo 3** shows the general view of the front engine compartment portion of the Insured Vehicle at the time of our inspection. The fire damage to the Insured Vehicle was confined to its front undercarriage portion and. Its engine compartment firewall insulator (arrowed) was amongst the body parts that were found to have been affected as a result of the fire.



**Photo 4** shows the damage of heat nature to the timing case cover (arrowed) in the engine compartment portion of the Insured Vehicle at the time of our inspection. This was amongst the body parts that were found to have been affected as a result of the fire.



**Photo 5** shows the damage of heat nature to the condenser and original wiring harness in the engine compartment portion of the Insured Vehicle at the time of our inspection. This was amongst the body parts that were found to have been affected as a result of the fire



**Photo 6** shows the interior compartment of the Insured Vehicle, which was observed to be unaffected by the fire.





**Photo 7** shows the rear portion of the Insured Vehicle, which was observed to be unaffected by the fire.

7. At the time of inspection of the Insured Vehicle, we did not find any additionally fitted electronic and/or electrical component(s) on the Insured Vehicle. There also appears to be no modification(s) fitted on the Insured Vehicle.

#### **Investigation and Technical Analysis**

8. We managed to speak to Mr Thomas on 26 July 2019 where we were able to gather further information pertaining to the incident as well as information pertaining to the history of the Insured Vehicle.
9. From the Singapore Accident Statement, which was made by Mr Thomas Matthew (herein referred to as "**Mr Thomas**"), we note that the fire to the Insured Vehicle had started at a time when it was stationary at the traffic lights. Mr Thomas was first alerted of the fire by the driver of the vehicle next to him at the traffic lights.

10. According to Mr Thomas, at about 1945hrs on 17 July 2019, he was travelling from Woodlands Avenue 2 to Woodlands Ave 1. He stopped the Insured Vehicle at the traffic lights just before Esso petrol station located at Woodlands Ave 1 then after he was alerted by the driver of the vehicle on the left next to him that flames was seen emitting at the undercarriage area of the insured vehicle. Mr Thomas spotted Esso petrol station with a washing bay up ahead and right after the traffic lights turned green he hastily drove the vehicle into the washing station of the petrol station then came to stop, shutting his engine off and requested for assistance from the washing station's crew to render assistance
11. The petrol station's manager bought out 2 fire extinguishers to render assistance to extinguish the fire, subsequently the SCDF was activated by the petrol station's manager and arrived shortly the fire was extinguished fairly quickly. Mr Thomas was given a case number after his statement was taken by the police.
12. Mr Thomas subsequently made towing arrangements on the same day with his Insurance company (MSIG). The Insured Vehicle was towed to NPH Auto Service Pte. Ltd. where Mr Thomas made an insurance report the next day at 1255 hours.
13. 1 week prior to the fire incident, Mr Thomas informed that he smelt exhaust fumes from the interior cabin of the insured vehicle. And in the subsequent days made a trip to a workshop to have the Insured Vehicle checked. Upon arriving at the workshop, he was turn away because the workshop was packed and did not have a space for the Insured Vehicle to be checked thoroughly and he was asked to monitor the condition of the Insured Vehicle and return back 1 week later. It was in this 1 week monitoring period which the Insured Vehicle caught fire.
14. With regards to the history of the Insured Vehicle, we were able to gather from Mr Thomas that the Insured Vehicle was purchased pre-owned. He is the registered owner of the Insured Vehicle. Mr Thomas informed us that he is the sole driver of the Insured vehicle since 5 years ago and a major overhaul of the gearbox had been done on 16 January 2018 to the Insured Vehicle.



15. Pertaining to the maintenance aspect, Mr Thomas sends the Insured Vehicle for periodical servicing. He services the Insured Vehicle at Foo Brothers Auto Service. Located at Blk 9002 Tampines St.93, #01-42, Singapore 528836. The last servicing before the incident was done on 03 May 2019. We were able to obtain a receipt of the most recent servicing and repairs done to the Insured Vehicle. The last servicing package included the changing of engine and oil filter. The valve cover gasket was also replaced. See Invoice 1 & 2 below
16. Given the circumstance of incident described by Mr Thomas, the fire had occurred while the Insured Vehicle was being driven/engine in operation. Common causes of fire arising from a vehicle that is being driven and/or with its engine in operation include engine overheating, leakage of fluid onto hot surfaces or electrical nature.
17. Fire due to an overheated engine was unlikely as the Insured Vehicle was still able to be operated after flames were seen undercarriage of the Insured Vehicle. Mr Thomas was still able to drive the Insured Vehicle, bring it to a complete stop in the petrol kiosk car washing bay before alighting to check. In the event if the Insured Vehicle's engine had overheated, the mechanical parts inside the engine would first seize causing the engine to stall. Mr Thomas would have likely experienced engine stalling shortly rendering the Insured Vehicle undriveable.
18. Fire due to an electrical short circuit to the Insured Vehicle was unlikely as no burnt wirings was observed, except for a stretch of wiring harness that was slightly melted due to the heat and the characteristic of hot air rising from the burning area of the undercarriage portion of the Insured Vehicle.
19. Since engine overheating and electrical in nature were both unlikely the cause of fire, the most probable cause would then be the leakage of fluid, which was also what we had observed between the transmission oil sump and the exhaust piping that may cause a fire to be ignited on Insured Vehicle. The leaked fluid comes into contact with hot surfaces; such the heated exhaust pipe would possibly have been at a sufficient temperature that could result in leaked fluid to self-ignite and started burning the splash shield of the Insured Vehicle which had caused the fire at the undercarriage of the Insured Vehicle.



Auto  
Consultants  
Pte Ltd

Company Registration No. 199607198R

51 UBI AVE 1, #01-25 PAYA UBI INDUSTRIAL PARK, SINGAPORE 408933 TEL : (065) 62563561 FAX : (065) 67414108



116 8032 Tampines St 11, #01-42, Tampines Ind. Park A, Singapore 486466

**Foo Brothers Auto Service**  
**符氏兄弟车辆维修服务**  
Tel. 6784 0549 Hp. 9884 0688

Business Reg. No. 888162/CLM

**CASH  
INVOICE**

No. 34034

ITEM NO.	DESCRIPTION	QTY	AMOUNT (S\$)
1	Engine Oil	✓	\$ 110.25
2	Gear Oil		
3	Auto Transmission Fluid		
4	Oil Filter	✓	\$ 12.00
5	Air Filter		
6	Air-con Filter		
7	Spark Plugs		
8	Wiper Blades		
9	Battery	1 set	\$ 115.00
10	Bulbs	1 set	\$ 98.00
11	Wheel Alignment		
12	Brake Fluid		
13	Brake Pads (Front/Rear)		
14	Brake Shoes		
15	Brake Pump		
16	Brake Master Pump		
17	Fan Belt / Fan Motor		
18	Timing Belt		
19	Timing Belt Tensioner		
20	Timing Gear		
21	Timing Bearing		
22	Water Pump		
23	Thermostat		
24	Coolant		
25	Radiator		
26	Starter		
27	Alternator		
28	Clutch Pressure Plate		
29	Clutch Disc		
30	Clutch Bearing		
31	Labour Charge		
<b>PAID</b>			
To replace timing system, flush & replace coolant and labour charge			
Total (S\$)			4907.25

Agreed by:

C.S.N.P.

Total (S\$)

4907.25

Customer's Signature

for FOO BROTHERS AUTO SERVICE

ORIGINAL TO BE KEPT BY CUSTOMER AND MADE AVAILABLE TO EQUALLY AVAILABLE TO SERVICE. QUANTITY TO BE KEPT FOR REFERENCE ONLY. NO RETURN.

NO GOODS TO BE RETURNED TO THE SERVICE. IF FOR BROTHERS AUTO SERVICE, LK, SINGAPORE, S. 116111

Invoice 1 shows the major overhaul done on the Insured Vehicle at Foo Brother Auto Service. On 16 January 2018 (red arrows) which had included the Overhauling of gearbox, the flushing and replacement of the Auto Transmission Fluid (ATF).





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**Foo Brothers Auto Service**  
付氏兄弟车辆维修服务  
Tel. 6784 0549 Hp. 9664 0688  
Bik 9002 Tampines 50-23, #01-42, Tampines Ind. Park A, Singapore 378558 Business Reg. No. 366165/00-C

**CASH INVOICE**  
No. 35909

Bill To: 257 2012 H Vehicle Make: Subaru Forester Date: 3/05/19

ITEM NO.	DESCRIPTION	项目	QTY	AMOUNT (\$)
1	Engine Oil	引擎油	✓	\$ 110.25
2	Gear Oil	齿轮油		
3	Auto Transmission Fluid	自动变速箱油		
4	Oil Filter	机油滤清器	✓	\$ 12.00
5	Air Filter	空气过滤器		
6	Air-con Filter	空调过滤器		
7	Spark Plug	火花塞		
8	Wiper Blades	雨刮器		
9	Battery	电池		
10	Bulbs <u>Tyre rotation</u>	灯泡	✓	\$ 15.00
11	Wheel Alignment	四轮定位		
12	Brake Fluid	刹车油		
13	Brake Pads (Front / Rear)	刹车片 (前/后)		
14	Brake Shoes	制动蹄		
15	Brake Pump	制动泵		
16	Brake Master Pump	制动主泵		
17	Fan Belt / Fan Motor	风扇皮带/风扇电机		
18	Timing Belt	正时皮带		
19	Timing Belt Tensioner	正时皮带张紧器		
20	Timing Gear	正时齿轮		
21	Timing Bearing	正时轴承		
22	Water Pump	水泵		
23	Thermostat	恒温器		
24	Coolant	冷却液		
25	Radiator	散热器		
26	Starter	起动机		
27	Alternator	发电机		
28	Clutch Pressure Plate	离合器压盘		
29	Clutch Disc	离合器片		
30	Clutch Bearing <u>Valve Cover Gasket (L/R) 2 sets</u>	离合器轴承	✓	\$ 320.00
31	Labour Charge	修车费		
Total (\$\$)				457.25

PAID

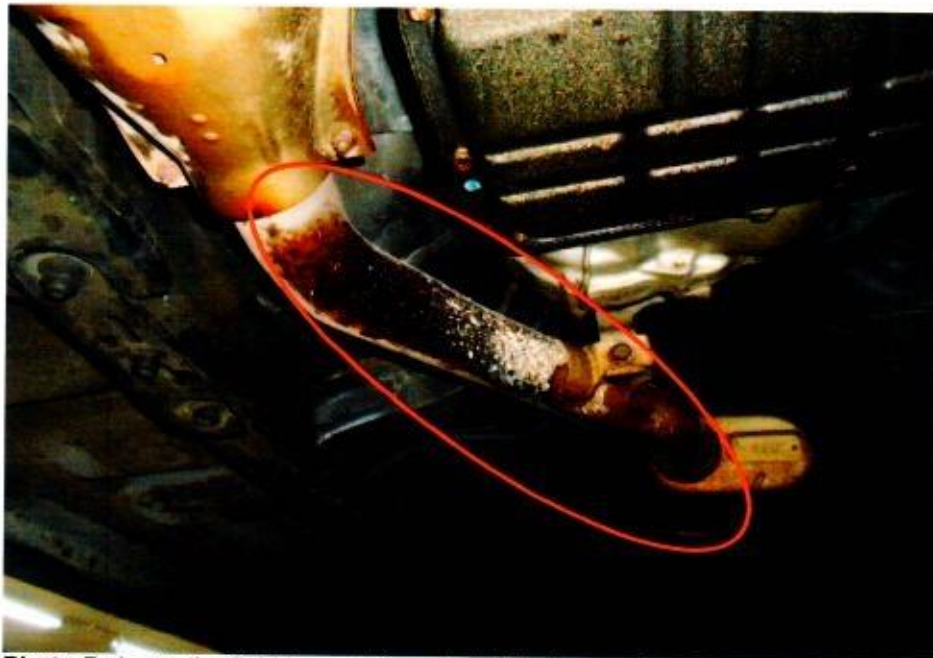
Agreed by: \_\_\_\_\_ F.R.O.E. \_\_\_\_\_ Total (\$\$) 457.25

Customer's Signature \_\_\_\_\_ for FOO BROTHERS AUTO SERVICE

DISCOUNTS COULD BE CROSSED AND MADE AVAILABLE TO FOO BROTHERS AUTO SERVICE. RETURNABLE DATE 30/04/2019. ALL WORKS DONE BY FOO BROTHERS AUTO SERVICE. ALL WORKS DONE BY FOO BROTHERS AUTO SERVICE. ALL WORKS DONE BY FOO BROTHERS AUTO SERVICE.

Invoice 2 shows the latest servicing package done on the Insured Vehicle at Foo Brothers Auto Service. On 03 May 2019 which had included the changing of engine and oil filter (circled). The valve cover gasket was also replaced (red arrowed).

20. During our inspection of the Insured Vehicle, we observed that the undercarriage splash shield of the Insured Vehicle was burned and melted as a result of the fire, which had exposed the undercarriage components of the Insured Vehicle.
21. We observed Automatic Transmission Fluid around the surface of the fluid pan and the securing screws of the Insured Vehicle, the cause of the leakage would be from the gaps in between the gasket of the fluid pan. We also observed burned stained marks on the exhaust piping which is location right beside the fluid pan.
22. The presence of fluid burned marks on the exhaust pipe, would suggest that the fluid contacted onto the surface of the heated exhaust piping than had left a stain after burning. It is a sign of Automatic Transmission Fluid leakage on the heated exhaust and this physical evidence would then appear to suggest that the cause of fire to the Insured Vehicle could have possibly been due to leakage of fluids onto heated surface and the fire spread around the undercarriage of the Insured Vehicle by the burning of the undercarriage splash board which is made of a combustible material. Whitish burn marks were also observed on the exhaust piping, this was caused by high heat intensity from the fire. See photos 7 & 8 below.



**Photo 7** shows the fluid burn stain and whitish burn marks on the exhaust pipe of the Insured Vehicle (circled). Such marks are a result of burned fluid and exposure to prolonged heat intensity, which may indicate where the fire had started.





Photo 8 shows the fluid burn marks on the exhaust pipe at the undercarriage portion of the Insured Vehicle. This is the immediate vicinity where the fire to the Insured Vehicle had likely started. The transmission fluid residue can be seen on the screws of the transmission fluid sump (yellow arrow), the presence of fluid burn marks on the exhaust pipe was a sign of transmission fluid leakage onto the heated exhaust (red arrows) and this physical evidence would then appear to suggest that the cause of fire to the Insured Vehicle could have possibly been due to leakage of transmission fluids from the gasket of the fluid pan onto heated exhaust pipe surface.

23. Our checks with both local and international bodies and associations had revealed that at the time of writing this report, there was a manufacturer recall between 23 September 2016 – 06 September 2018 for the front wiper bottom cover, two relay switch insufficient contact, Takata Supplementary Restraint System (SRS) no rupture or inflator and cracked capacitor of Electronic parking brake (EPB). However 3 out of 5 recalls not rectified are, recall number 1, 2 and 5. Given that the cause of fire was due to fluid leak, the manufacturer recall between 23 September 2016 – 06 September whether rectified or not, it did not cause or contributed to the fire. See search result from LTA below.

## Enquiry on Vehicle Recall - Vehicle Specific

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

### Vehicle Owner Particulars

Owner ID Type:	Singapore NRIC	←
Owner ID:	922J	←

### Vehicle Details

Vehicle Registration number:	SDT2012A
Make:	SUBARU
Vehicle Model:	LEGACY SEDAN 2.0i AWD CVT ABS AIRBAGS
Engine No.:	EJ20D972782
Chassis No.:	JF1BM5KC2AG004547

### Recall Details

1	Recall No.:	R2018100599
	Manufacturer Recall Date:	06 Sep 2018 ←
	Estimated Completion Year of Recall:	2020
	Brief Description (As Provided by Motor Dealer):	Due to inappropriate manufacturing process, some vehicles may be equipped with the cracked capacitor and/or the magnet ring which has insufficient strength. One of the capacitors on the inner circuit board and the magnet ring of the sensor, located in the control unit of electronic parking brake (EPB), may fracture during vehicle usage. ←
	Date Rectified:	- ←
	For more details, contact MOTOR IMAGE ENTERPRISES PTE LTD	
	Hotline Information:	SUBARU SERVICE CENTRE TOA PAYOH BRANCH at 67038101 SUBARU SERVICE CENTRE LENG KEE BRANCH at 67038163




Recall 1 shows the recall details of the Insured Vehicle, this recall package consist of the replacements of components for the Electronic Parking Brake (EPB) of the Insured Vehicle. This components have not been replace, however there is no relation to the cause of the fire. (arrowed).



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2	Recall No:	R2018030511
	Manufacturer Recall Date:	30 Jan 2018 
	Estimated Completion Year of Recall:	2018
	Brief Description (As Provided by Motor Dealer):	If the relay-switch is turned on with insufficient contact point pressure caused by less over-travel stroke of the contact point, contact point bounding will occur. This damages and wears off the surface of the contact points which increases the occurrence of arc-discharges, resulting in the contact points melting. 
	Date Rectified:	- 
	For more details, contact MOTOR IMAGE ENTERPRISES PTE LTD	
	Hotline Information:	SUBARU SERVICE CENTRE (TOA PAYOH) at 67038101/ 67038102 SUBARU SERVICE CENTRE (LENG KEE) at 67038163

Recall 2 shows the recall details of the Insured Vehicle, this recall package consist of the replacements of relay components for the engine of the Insured Vehicle. This components have not been replace, however there is no relation to the cause of the fire. (arrowed).

3	Recall No:	R2016110313
	Manufacturer Recall Date:	07 Oct 2016 
	Estimated Completion Year of Recall:	2017
	Brief Description (As Provided by Motor Dealer):	The contact point bouncing occurs when relay switch turned on, with insufficient contact point pressure cause by less over-travel stroke of the contact point. When arc discharge occurs, surface of contact point is damaged, wears and make contact point pressure even less, letting arc discharge to occurs more, resulting in melting of the relay contact point. 
	Date Rectified:	05 Jan 2017 
	For more details, contact MOTOR IMAGE ENTERPRISES PTE LTD	
	Hotline Information:	SUBARU SERVICE CENTRE TOA PAYOH BRANCH at 67038101/8102 SUBARU SERVICE CENTRE TOA LENG KEE BRANCH at 67038163

Recall 3 shows the recall details of the Insured Vehicle, this recall package consist of the replacements of relay components for the engine of the Insured Vehicle. This components has been replace, however there is no relation to the cause of the fire. (arrowed).

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4	Recall No.:	R2016110309
	Manufacturer Recall Date:	23 Sep 2016 ←
	Estimated Completion Year of Recall:	2017
	Brief Description (As Provided by Motor Dealer):	During the manufacturing process of the front wiper bottom cover at the suppliers, mis-manufactured parts might be used or foreign material might get into the cover. Due to these manufacturing issues, interference between relay joint and worm wheel may occur. ←
	Date Rectified:	05 Jan 2017 ←
	For more details, contact MOTOR IMAGE ENTERPRISES PTE LTD	
	Hotline Information:	SUBARU SERVICE CENTRE TOA PAYOH BRANCH at 67038101/67038102 SUBARU SERVICE CENTRE LENG KEE BRANCH at 67038163

**Recall 4** shows the recall details of the Insured Vehicle, this recall package consist of the replacements of front wiper bottom cover components for the engine of the Insured Vehicle. This components has been replace, however there is no relation to the cause of the fire. (arrowed).

5	Recall No.:	R2017020358
	Manufacturer Recall Date:	14 Jan 2017 ←
	Estimated Completion Year of Recall:	2018
	Brief Description (As Provided by Motor Dealer):	No rupture of inflator is confirmed either on a field or on a testing conducted by TAKATA, third-party as for affected vehicles. Neither data nor consequence of technical analysis inferring specific risk is indicated by third-party organization as for affected vehicles. TAKATA has complied with the expansion of recall for the purpose of preventing future risks and offering security and safety to society. ←
	Date Rectified:	- ←
	For more details, contact MOTOR IMAGE ENTERPRISES PTE LTD	
	Hotline Information:	ECIA TAN at 67038079 TEE LEE TING at 67038110



Please do not use your browser's Back or Forward buttons as this may result in information loss.

**Recall 5** shows the recall details of the Insured Vehicle, this recall package consist of the replacements of Supplementary Restraint System (SRS) airbag components for the engine of the Insured Vehicle. This components has not been replace, however there is no relation to the cause of the fire. (arrowed).



**Conclusion**

24. 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 leakage of fluid which contacted on to hot surface that caused the self-ignition of fire. For this particular case, the fire had originated from the undercarriage area between the Automatic transmission fluid sump and the exhaust piping, somewhere around the undercarriage middle portion of the Insured Vehicle.
25. 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.
26. There were 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.
27. Our investigations had also revealed that at the time of writing this report, there is 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)*

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