ENGINEERING ANALYSIS CLOSING REPORT

SUBJECT: Alleged non-crash fire originating in the engine compartment that may be related to oil leakage from the front valve cover gasket.

INVESTIGATION: EA07-008

DATE OPENED: 12-Jun-2007 **DATE CLOSED:** 01-May-2008

SUBJECT VEHICLES: Model year (MY) 1999 through 2002 Buick Park Avenue, Regal, and Riviera; Oldsmobile LSS; and Pontiac Bonneville and Grand Prix vehicles that use the same or substantially similar transverse mounted "L67" supercharged version of the General Motors Corp. (GM) 3800 Series II V6 engine.

BASIS: The National Highway Traffic Safety Administration's (NHTSA) investigation of alleged non-crash related engine compartment fire in certain MY 1999-2002 Pontiac Grand Prix GTP subject vehicles began with Preliminary Evaluation PE07-006 on January 29, 2007. NHTSA's Office of Defects Investigation (ODI) sent a letter to the manufacturer on February 8, 2007, to request certain information about the twenty-one complaints ODI had received. ODI also requested certain information about other GM vehicles that use either the "L67" engine or the "L36" naturally aspirated version of the GM 3800 Series II V6 engine. As a result of information obtained during the Preliminary Evaluation, the range of vehicles under investigation was expanded to include all the subject vehicles (defined above) when the investigation was upgraded to an Engineering Analysis (EA07-008) on June 12, 2007.

DESCRIPTION OF COMPONENT OR VEHICLE SYSTEM: The subject vehicles are equipped with a gasoline-fueled internal combustion V6 engine mounted transversely in the front of the vehicle ahead of the passenger compartment. The "L67" engine is equipped with a belt-driven supercharger that is capable of forcing air into the engine intake manifold at above atmospheric pressures. The supercharger is largely responsible for the increased power output of the "L67" engine over the naturally aspirated "L36" engine that it's based on. The "L67" engine in the subject vehicles is mated to an automatic, planetary type gearbox that transmits power to the front wheels. See Figure 1 (below) for a pictorial description of an exemplar subject vehicle engine compartment.

There are some detail differences among those subject vehicles that utilize the "L67" engine. As pertains to this investigation, the primary differences between the W-platform vehicles and the other subject vehicles (see Vehicle Population below for platform data) pertain to the size of the engine compartment (the W-car is more compact due to smaller overall vehicle dimensions), tighter component packaging in the radiator cooling fan area (65mm from the front exhaust manifold to the radiator cooling fan vs. 110mm+), the presence of additional heat shielding on the exhaust manifold (in response to tighter component packaging), the use of a spark plug wire conduit, and an engine mount configuration that utilizes two lower mounts and two upper mounts as opposed to three lower mounts.

Although the "L67" engine was available in some other GM vehicles mounted in a longitudinal configuration, those vehicles were not subject to this investigation due to the numerous differences in component packaging and the absence of an apparent defect trend.

Figure 1: Exemplar Vehicle (yellow arrow shows subject fire area of origin)

VEHICLE POPULATION: The manufacturer provided Vehicle Identification Number (VIN) level detail for each of the subject vehicles, as defined by ODI, including the date of production, the date the warranty coverage period commenced, and the U.S. State where the vehicle was first sold. Table 1 provides a summary of the populations by platform, make, model, and model year for all subject vehicles sold in the United States.

			Model Year				
Platform	**Make**	**Model**	**1999**	**2000**	**2001**	**2002**	**Total**
C	Buick	Park Avenue / Ultra	15,048	9,091	5,744	3,872	33,755
G	Buick	Riviera	2,103				2,103
H	Oldsmobile	LSS	39				39
	Pontiac	Bonneville GXP	2,420	12,423	6,500	5,321	26,664
W	Buick	Regal GS	18,250	13,041	7,523	5,664	44,478
	Pontiac	Gran Prix GTP	20,922	24,509	12,028	13,248	70,707
	Subtotal W-Cars		39,172	37,550	19,551	18,912	115,185
Total Production			58,782	59,064	31,795	28,105	177,746

Table 1: Subject Vehicle Population

THE ALLEGED DEFECT: The alleged defect is any non-crash fire originating in the engine compartment that may be related to oil leakage from the front valve cover gasket. Initially, ODI considered all non-crash related engine compartment fires to determine what defect trend(s), if any, might exist. After gathering and analyzing additional information, it became apparent that the strongest fire trend was ignition key-off events first discovered approximately 5 to 15 minutes after the vehicle had been driven and then parked. A pattern began to emerge that indicated many fires originated in the center portion of the engine compartment near the exhaust manifold for the front cylinder bank (cylinders 1-3-5).

Within this central area of the engine compartment two possible fire paths, upper and lower, were examined to assist with root cause determination. The lower path focused on the transmission oil cooler lines and transmission fluid. The upper path examined substances that included gasoline, electrical components, and engine oil. Study of available ignition sources in the area of origin identified sources of electrical arc, hot surface ignition, and/or a high resistive electrical circuit. Examination of field performance data, component design changes, and component and vehicle testing supported the determination by GM that a defect exists in certain subject vehicles that relates to motor vehicle safety.

FAILURE MECHANISM: Engine oil may escape past the valve cover gasket on the front cylinder bank (cylinders 1-3-5) and deposit onto hot exhaust system components. Under certain conditions, it is possible for this oil to ignite a small pilot flame, which may spread to the adjacent plastic spark plug wire channel, the spark plug wires themselves, the plastic engine cover, and other under hood components. Reports indicate this most often occurs on higher-mileage vehicles shortly after the vehicle has been driven and then parked. Typically, the fire was discovered within 5 to 15 minutes after the vehicle was parked. During this time window, under hood temperatures may become elevated. Such elevated temperatures combined with a lack of airflow through the engine compartment may permit a small pilot flame to propagate and ignite other fuel sources.

VALVE COVER GASKET PERFORMANCE: According to GM, the subject vehicles all use the same or substantially similar valve cover gasket, and all subject vehicles may experience elevated risk of valve cover gasket leakage, as evidenced by valve cover gasket warranty claim rates. However, not all subject vehicles have an elevated fire incident rate. This may be explained, in part, by the many detail differences in component packaging between the W-platform subject vehicles and the other subject vehicles. In response to elevated valve cover gasket warranty claim rates in the subject vehicles, the gasket design was changed in approximately May 2003 to improve sealing characteristics.

The “L67” valve cover gasket warranty claim rate is significantly higher than the “L36” valve cover gasket warranty claim rate for the same period. Although the “L67” valve cover gasket material is identical to that used on the “L36” engine, there are differences in mating surface geometry and other operating characteristics that have an effect on gasket performance. Corresponding to this difference in valve cover gasket performance, the fire incident rate on certain W-platform subject vehicles equipped with the “L67” engine is significantly higher than on peer vehicles equipped with the “L36” engine.

FREQUENCY OF THE ALLEGED DEFECT: Table 2 provides a count of alleged non-crash fire originating in the engine compartment that may be related to oil leakage from the front valve cover gasket in the subject vehicles. Table 3 shows the count of subject fire incidents by platform, make, model, and model year. Table 4 shows the subject fire incident rate.

	ODI	Manufacturer	Total
Complaints:	69	83	138
Fires:	69	83	138
Injury Incidents:	1	2	3
# Injuries:	1	2	3
Fatality Incidents:	0	0	0
# Fatalities:	0	0	0

Table 2: Subject Fire Incidents Related To Valve Cover Gasket Leakage

Subject Fire Incident Count

Platform	Make	Model	Model Year				Total
			1999	2000	2001	2002	
C	Buick	Park Avenue / Ultra	0	0	0	0	0
G	Buick	Riviera	0				0
H	Oldsmobile	LSS	0				0
	Pontiac	Bonneville GXP	0	2	0	0	2
W	Buick	Regal GS	12	7	3	1	23
	Pontiac	Grand Prix GTP	38	50	16	9	113
	Subtotal W-Cars		50	57	19	10	136
Total			50	59	19	10	138

Table 3: Subject Fire Incidents by Platform, Make, Model, and Model Year

Subject Fire Incident Rate / 100,000 Vehicles Produced

Platform	Make	Model	Model Year				Total
			1999	2000	2001	2002	
C	Buick	Park Avenue / Ultra	0.0	0.0	0.0	0.0	0.0
G	Buick	Riviera	0.0				0.0
H	Oldsmobile	LSS	0.0				0.0
H	Pontiac	Bonneville GXP	0.0	16.1	0.0	0.0	7.5
W	Buick	Regal GS	65.8	53.7	39.9	17.7	51.7
	Pontiac	Grand Prix GTP	181.6	204.0	133.0	67.9	159.8
	Subtotal W-Cars		127.6	151.8	97.2	52.9	118.1
Total			120.2	118.1	72.9	41.3	97.3

Table 4: Subject Fire Incident Rate by Platform, Make, Model, and Model Year

To date, ODI is aware of 138 non-duplicative fire incidents related to the alleged defect in the subject vehicles. In evaluating this issue, ODI used the following criteria to determine which fire incidents were most likely related to the alleged defect: the fire origin and cause was determined and was conclusively linked to oil leakage from valve cover gasket; the alleged engine compartment fire was discovered shortly after the vehicle was parked (approximately 5 to 15 minutes); and any alleged engine compartment fire where the origin was determined to be in the vicinity of front valve cover gasket and exhaust manifold but the cause was undetermined. ODI did not include any alleged engine compartment fire incidents discovered while the vehicle was in motion if the origin/cause was undetermined or any other fire incident with known origin/ cause unrelated to the alleged defect.

Of the 138 subject fire incidents, 8 are alleged to have occurred while the vehicle was parked inside a structure such as a garage or carport, and in 6 cases the fire damage spread to the adjacent structure (all involving W-platform subject vehicles). The three reported injury incidents all involved Pontiac Grand Prix GTP subject vehicles. Complainants alleged smoke inhalation, minor contusions and muscle strain as a result of escaping from the burning vehicle to safety, and in one case a hydraulic hood support strut became a projectile and pierced through the leg of a responding firefighter.

SAFETY RECALL: By letter dated March 12, 2008, General Motors Corp. (GM) has notified the agency that it will conduct a safety recall (identified by NHTSA Recall Number 08V-118) to address a defect in approximately 207,542 model year (MY) 1997-2003 Buick Regal GS and Pontiac Grand Prix GTP vehicles originally equipped with the "L67" supercharged version of GM's 3800 Series II V6 engine.

To correct the safety defect, GM will install an improved design front valve cover gasket and spark plug wire retainer. The new front valve cover gasket has a higher initial sealing pressure and improved compression set characteristics for greater longevity. This remedy is available free of charge for all recalled vehicles. Until sufficient parts become available to repair all of the affected vehicles, GM strongly recommends that owners observe the following important precautions: (1) they strongly recommend that owners do not park their vehicle in a garage, carport, or other structure; (2) if owners notice a burning odor, they should have their dealer inspect the vehicle - the dealer will inspect the vehicle without charge; and (3) use premium fuel (91 octane or higher) in the vehicle as recommended in the vehicle's owner manual.

REASON FOR CLOSING: The action taken by GM is sufficient to resolve the issues raised by this investigation. The subject fire incident rate on the C-, G-, and H-platform subject vehicles is low. However, the agency will continue to monitor this issue and reserves the right to take further action if warranted by the circumstances. Accordingly, this investigation is closed.

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