I-CAR ADVANTAGE Online™
December 26, 2006
Technical Information For The Collision Industry

FORD CROWN VICTORIA FIRE SUPPRESSION SYSTEM

A fire suppression system is designed to help reduce the risk of fire in high-speed rear impacts. Since the 2005 model year, the Ford Crown Victoria Police Interceptor (police car) has had an optional fire suppression system (see Figure 1). Fire suppression systems were initially developed and tested for use in military and aerospace applications. The system on the Crown Victoria is a first for the automotive industry, and so far the only factory-installed system available. The fire suppression system was developed for these vehicles because police vehicles are more likely to be involved in high-speed/high energy rear collisions than other vehicles. Also, police vehicles are frequently parked along highways during traffic stops.

There are other vehicles that have been adapted for different uses that we see on the highway everyday. Consider the vans modified for handicap access, the cab and chassis trucks that allow a company to customize the vehicle for their business needs, and Cadillacs adapted for use as limousines. What makes the fire suppression system an interesting subject for the collision industry, is that there are some safety risks associated with the system when doing repairs similar to working near airbag modules.

OPERATION

The fire suppression system is designed to sense a high-speed, high-energy rear impact and discharge the fire suppressant material underneath the vehicle and onto the fuel tank, slowing the spread of a fire, or potentially extinguishing a fire. The system is not deployed immediately, but when the vehicle comes to a stop, or at six seconds, whichever occurs first. Development testing showed that the best time for deploying the fire suppressant is near the point of rest, which may be more than 60 m (200 ft) away from the point of impact. The system can also be discharged manually with a button on the front headliner. The ignition must be in the RUN position for the manual button to operate.

The actual discharging operation uses a hybrid (nitrogen and CO_2) gas generator, similar to what is used to deploy an airbag. Also similar to an airbag operation, the system uses two impact sensors. In order to determine the most appropriate time to deploy the foam, the system also measures post-impact vehicle movement.

The system cannot be retrofitted to pre-2005 police vehicles. The frame had to be modified to support additional weight at the mounting locations. Also, the electronics monitoring and deploying the system had to be integrated throughout the vehicle.

MAIN PARTS

Main system parts include the fire suppression module, fire suppressors, fire suppressor manifolds, a manual activation switch, and a system indicator lamp on the instrument panel (see Figure 2).

The fire suppression module, or electronic control module, is mounted under the rear seat cushion. This is the computer for the system and contains the impact sensors. It also receives information from the anti-lock brake module to help sense how far the wheels have slowed and when the

Figure 1 – The fire suppressant system is optional on 2005 and newer Ford Crown Victoria Police Interceptors.

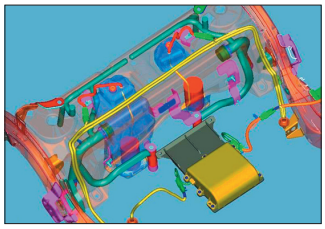

Figure 2 – This shows most of the system parts in relation to the fuel tank.

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vehicle is coming to a rest. This information is used to signal the suppressors to deploy. The fire suppression module also monitors the system for faults. A large capacitor in the module provides backup system power in case vehicle electrical power is lost.

The fire suppressors contain the fire suppressant material. These are two stainless steel containers and gas generators mounted above the rear axle on the number four crossmember.

Mounted on the fire suppressors are the fire suppression manifolds. The manifolds contain the nozzles that spread the fire suppressant material. There are two manifold assemblies with nozzles pointed toward the ground and an additional manifold mounted higher which sprays fire suppressant material up and into the body (see Figure 3).

The manual activation switch is located on the headliner between the sun visors and is covered by a clear plastic door (see Figures 4 and 5).

The indicator lamp on the instrument panel normally turns on for about six seconds when the ignition is cycled ON and then goes out. Again similar to an airbag system, a lamp that stays lit or starts flashing is an indication that there is something wrong with the system.

SAFETY WARNINGS

The similarities to airbag systems continue with the safety warnings and precautions.

Before doing any service around a vehicle equipped with a fire suppression system, disconnect the negative battery cable and wait at least one minute for the backup power supply to deplete its energy. There is also a dedicated system fuse that should be removed before servicing the system. This procedure should be followed before lifting the vehicle, working around the fuel tank or rear axle, or replacing any of the system parts. It is further recommended to not reconnect the battery if there is someone underneath the vehicle. Electrical connectors on the fire suppressors should not be probed. Also, memory saver devices should not be used on a vehicle equipped with a fire suppression system.

Though water-based and not hazardous, the fire suppressant material may cause mild irritation if it contacts skin. Technicians are told to wash with soap and water as soon as possible. For this same reason, chemical-resistant gloves and goggles are recommended during clean-up if the system has been deployed.

The system does not always deploy, depending on the severity of the rear collision, so first responders should use similar precautions as when working around airbags.

SERVICE PROCEDURES

After deployment of the system, the main system parts must be replaced. There are no repairs of any of the parts or recharging of the suppressor material. Replacement parts include the fire suppression module, the fire suppressors, and the fire suppressor manifolds. The manual switch only has to be replaced if the clear plastic cover on the switch is damaged.

Similar to a passive restraint control module, the orientation of the fire suppression module is critical for correct system operation. If the rear floor pan is damaged in a collision, the mounting bracket for the module must be inspected. If the bracket is damaged, a new fire suppression module must be installed whether or not the system has deployed. The floor pan area must be restored to its original condition before installing the replacement module.

When deactivating the system, the Ford procedure calls for turning all vehicle accessories off, the ignition to OFF, and removing the dedicated system fuse. To make sure the proper fuse has been removed, the ignition is turned to ON and the dash lamp is monitored for at least 30 seconds. If the correct fuse was removed, the dash lamp remains lit steadily, without flashing. The ignition is turned OFF again. If battery voltage is required for diagnostics, the battery is left connected with the fuse out. If battery power is not required, the battery is disconnected.

There is a Ford-specific scan tool identified in the service information, but an "equivalent diagnostic tool" is an option for reading diagnostic trouble codes. A breakout box is also required equipment for diagnosis, which must be done with

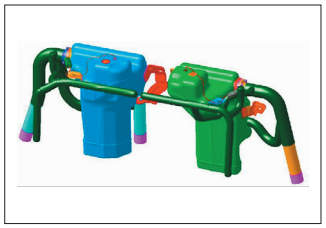

Figure 3 – The "N" icon in the Ford manual indicates that the fastener must be replaced with a new fastener.

Figure 4 and 5 – These are body support mount bolts with adhesive that are used on the Ford F-150. These bolts must be replaced if loosened or removed.

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the fire suppression module attached to the vehicle. Ford service information includes trouble code identification charts and symptom charts.

The fire suppressant foam is water-based, and not hazardous to the environment, so cleanup can be done by flushing the underbody with water, or soap and water. If the decision is to use an automatic car wash facility to wash the underbody, there is a note in the service information to secure the fire suppression manifold nozzles in the up position, or the nozzles might come in contact with the washer parts in the car wash.

CONCLUSION

Since the 2005 model year, a fire suppression system has been optional equipment on Ford Crown Victoria Police Interceptors. If one of these vehicles comes into your facility, be sure to follow the safety precautions and special service information for inspecting and replacing the parts on these systems. Many of the safety measures are similar to the precautions taken when working near an undeployed passive restraint system.

All figures courtesy of Ford Motor Company.

For comments or suggestions on the Advantage Online, please contact I-CAR Senior Instructional Designer Bob Jansen at bob.jansen@i-car.com.