

Transportation Safety Technologies, Incorporated

Ford CVPI Trunk Pack Evaluation Progress Report #1, 7-14-03

This will serve as the first and preliminary reporting of three crash tests that were conducted on July 10 and 11, 2003 at KARCO Engineering on retrofitted 1998+ Ford Crown Victoria Police Interceptor (CVPI) for the purpose of aiding in the evaluation of the Ford "trunk pack." Work is in progress on the post test documentation, inspection and analysis of the test results. The crash tests include:

Test 1: 75.99 mph, rear left side 50% offset, impact by Taurus with police cargo and no trunk pack. This test is conducted to confirm the development of a reasonably foreseeable trunk loading configuration that punctures the non-trunk pack equipped CVPI fuel tank.

Test 2: 77.64 mph, rear left side 50% offset, impact by Taurus with trunk pack and no police trunk cargo. Trunk is ballasted similar to Ford's August 19, 2002 testing (four – sand bags, totaling 200 lbs, at rear of trunk). This test is conducted to evaluate if the trunk pack alone changes the risk of burn injury compared to the Ford test conducted on August 19, 2002.

Test 3: 74.22 mph, rear left side 50% offset, impact by Taurus with police cargo loaded identical to test 1 in the Ford trunk pack. This test is conducted to determine if the puncture producing trunk loading configuration is prevented from puncturing the fuel tank by the Ford trunk pack. Further, the test will evaluate performance of the fuel tank, vis-à-vis the trunk pack, as it influences the risk of burn injury.

The CVPI fuel tanks were filled to 95% of usable capacity with stoddard solvent. Ballasting of each test vehicle was similar to Ford's August 19, 2002 test. The tests were controlled by measuring the impact velocity of the Taurus, documenting the pretest condition of the vehicles with measurements and photographs, recording by electronic instrumentation the vehicle accelerations and CVPI fuel tank pressure and filming the crash with high speed and real time video cameras.

For the tests with police trunk equipment a trunk loading protocol was developed and documented to ensure consistent and reproducible loading of the trunk. Because the Ford trunk pack does restrict loading of the CVPI trunk, minor differences between the trunk loading with and without the trunk pack

were necessary. Trunk loading differences with police trunk equipment were allowed that were judged to make no difference in the trunk equipments potential for puncturing the fuel tank or causing damage to the vehicle including the fuel tank. For the test with the trunk pack and trunk ballast only, because the Ford trunk pack restricts loading of the CVPI trunk, ballast is added that duplicates as closely as possible the volume and position of ballast used in the Ford August 19, 2002 test.

Post test documentation included best efforts in collection and measurement of any post crash induced leakage from the fuel tank. Each CVPI fuel tank has been drained with residual contents volume measured. The total loss of stoddard solvent for the third test is subject to minor downward revision pending confirmation that all residual liquid has been drained from the vehicle. Photographs and measurements of the vehicle and test site were made.

Final reports from KARCO are not yet available. Work is in progress and will at least include the following: Each vehicle will be mapped. Each CVPI fuel tank will be removed, inspected, photographed and documented as necessary. Vehicles will be stored for a period of at least 6 months.

Preliminary observations of the tests include:

Test 1: The fuel tank has been removed, but analysis is not complete. As a result of this test there were 5 perforations of the front wall of the trunk and 4 perforations to the rear of the fuel tank by trunk contents. The fuel tank also sustained damage to the vent control valve on top of the fuel tank. Leakage of the fuel tank contents was noted pouring from the vehicle in its post test rest position and a trail of spilled stoddard solvent was noted on the ground along the path of the vehicle movement to its post crash point of rest. Leakage occurred from the trunk content induced perforation of the fuel tank and the broken vent control valve. Fuel tank leakage resulted in a total loss of 17.14 gallons of stoddard solvent. The leakage rate was severe. Due to the high rate that the solvent was leaking and leakage from several locations, accurate solvent collection was determined to be impossible.

Test 2: The fuel tank is not removed from the vehicle and analysis is not complete, however initial inspection of the vehicle revealed a fuel tank tear estimated as at least one inch wide by at least two to three feet long adjacent to the fuel tank's top seam weld as viewed from the passenger side to drivers side. Leakage of the fuel tank contents was noted running from the vehicle in its post test rest position and a trail of spilled stoddard solvent was noted on the ground along the path of the vehicle movement to its post crash point of rest. Fuel tank leakage resulted in a total loss of 7.61 gallons (974 fluid ounces) of stoddard solvent. Leakage flowed from several areas under the vehicle and all locations of

leakage were not possible to measure. The total leakage from this test was substantially in excess (23 times greater) of the reported leakage in Ford's August 19, 2002 test in which a retrofitted 1998+ CVPI without a trunk pack was tested under similar conditions. The Ford's August 19, 2002 test was described to leak 40 fluid ounces of stoddard solvent.

Test 3: The fuel tank is not removed from the vehicle and analysis is not complete. Further, only a preliminary inspection of this vehicle has been completed. Leakage of the fuel tank contents was noted running from the vehicle in its post test rest position and a trail of spilled stoddard solvent was noted on the ground along the path of the vehicle movement to its post crash point of rest. Leakage from the vehicle was principally flowing to the ground through the trunk indicating a possible puncture to the back of the fuel tank. Fuel tank leakage resulted in a preliminary total loss of 17.46 gallons of stoddard solvent. The total loss of stoddard solvent for this test is subject to minor downward revision pending confirmation that all residual liquid has been drained from the vehicle. Leakage flowed from several areas under the vehicle and all points of leakage were not possible to simultaneously measure. An unknown amount of stoddard solvent was lost during the first minute after impact. Leakage rate of stoddard solvent for the most severe leak was at least 158.1 fluid ounces per minute (1.24 gallons per minute). Several attempts were made to determine a flow rate from a second leakage location, but leakage was severe enough to twice overflow KARCO's solvent collection equipment. At 5 minutes and 30 seconds after impact a flow rate of approximately 57.5 fluid ounces per minute was determined from the second leak location.

Overall, my initial review and analysis has not revealed any indication of punctures to the front of the fuel tank on these retrofitted vehicles.