

## **Motor Vehicle Fire Research Institute Awarded Contracts**

**Title:** Testing of Automotive Fuel Tanks

**Contractor:** Southwest Research Institute

**Duration:** September 6, 2002 – March 6, 2003

**Purpose:**

The purpose of this program is to conduct comparison evaluations of existing fuel tanks not older than four years (conditioned tanks) and new virgin original equipment manufacturer (OEM) production tanks. The conditioned tanks will be from vehicles that have been operated in a hot climate. The virgin tanks will be from the same tank manufacturer as the conditioned tanks and *not* from an after market supplier. The suggested fuel tanks will evaluate three different tank design shapes. The three tank design shapes are as follows: 1) a tank with a long and narrow shape mounted inside the frame rail; 2) a tank with a flat shape mounted to an underbody near the rear seat area; and 3) a tank designed to mount behind the rear axle. In addition to the comparison testing, SwRI will coordinate a Counter Measure Consortium. The purpose of this consortium is to bring automobile manufacturers, fuel tank suppliers and tank shield manufacturers together in an effort to develop a fuel system with suitable fire resistant properties. Outlined below are five tasks related to this contract.

The project has been divided into five Tasks with associated Deliverables. In addition to the task output, a report will be generated for each task.

- **Task 1 – Fire Evaluation of Conditioned and Virgin Plastic Tanks**

SwRI will purchase three salvage vehicles for testing the tanks selected (conditioned tanks) and three OEM production tanks (virgin tanks). One conditioned and one virgin tank, per model, will be tested with the fuel delivery modules intact. The fuel tank assembly will be configured to meet the venting requirements of the ECE R34 Standard. The fire test procedure will be conducted in general accordance to European Standard ECE R34 Annex 5 Section Fire Resistance. Once the standard exposure time is reached, the test will continue until the tank fails. Temperature measurements will be measured at two points within the tank and four points outside the tank. Digital photographs will document each test setup and post-test results. Two video cameras with digital timers will record each test. Following this series of testing, an additional series of repeatability tests will be conducted. The tank with the shortest time to failure will be selected for testing. An additional two conditioned and two virgin tanks will be purchased and tested.

- **Task 2 – Fire Evaluation of Metal Fuel Tank**

SwRI will purchase one metal tank for testing and comparison to the plastic tanks in Task 1. The same test procedure will be carried out. Due to potential safety concerns this test may be terminated at any time and may not necessarily take the tank to failure.

- **Task 3 – Impact Resistance**

ECE R34 Annex 5 Section 1 “Impact Resistance,” evaluates the fuel tank’s ability to resist puncture. The test is conducted with the tank at –40°C and the tank is impacted with a pyramid shaped 15-kg pendulum mass with the edges being rounded to a radius of 3 mm. The energy of the pendulum at the moment of impact shall be delivered to not less than 30 Nm. The impacts shall be made on points of the tank regarded as vulnerable when installed in a vehicle. SwRI will purchase three conditioned tanks and three virgin tanks based on the models selected in Task 1. Digital photographs will document the test.

- **Task 4 – Drop Test**

To test the durability of the fuel tanks, drop tests per 49 CFR §393.67 will be performed. The tank will be filled with a quantity of water having a weight equal to the weight of the maximum fuel load of the tank. The tank will be dropped 30 feet onto an unyielding surface so that it lands squarely on one corner. Leak rates that occur immediately after the drop test will be recorded. Drop tests will be performed on three conditioned tanks and three virgin tanks based on the models selected in Task 1.

- **Task 5 – Counter Measure Consortium**

The purpose of this consortium is to bring automotive industry suppliers together to evaluate new materials designed to protect a plastic fuel tank when exposed to fire. Automobile manufacturers, fuel tank suppliers, and fuel tank shield manufacturers will participate in the evaluations. This consortium will serve to stimulate dialog between all parties to further advance the development of technologies for mitigating fires associated with plastic fuel tanks. SwRI will serve as the facilitator for the consortium.