



TEST REPORT

**CRASHWORTHINESS TESTING
OF AEV TRAMAHAWK TYPE III AMBULANCE**

FOR

AMERICAN EMERGENCY VEHICLES

BY

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FINAL REPORT

PREPARED FOR

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1.0 INTRODUCTION

This report documents two inter-vehicular impact tests conducted for American Emergency Vehicles by General Testing Laboratories. Both tests were conducted using the same AEV Tramahawk Type III Ambulance.

2.0 PURPOSE

The primary purpose of this test program was to simulate typical accidents involving ambulances and to answer questions as to the performance of the following:

1. Determine how well the restraint systems would keep the “EMT CREW” in their seats.
2. The ability of the ambulance body structure and doors to withstand the impacts.
3. If the body mounts would break off or shear during impact.
4. The ability of the interior cabinetry and fixtures to withstand the impact.

3.0 RATIONALE

Based on real life experiences as an ambulance manufacturer, AEV chose to conduct testing with passenger cars striking the sides of the ambulance as being representative of the most common type of accident for this testing program. The test vehicles chosen were a Ford Contour and a Toyota Camry as typical passenger cars in use on the highways and streets.

The following two scenarios were chosen for testing.

TEST 1 (GTL052)

This scenario simulated an ambulance making a left hand turn and being struck by a car coming from the right (“blind”/passenger side) before completing the turn. This places the ambulance at an obtuse angle to the path of the striking vehicle at impact.

TEST 2 (GTL055)

This scenario simulated an ambulance going straight through an intersection and being struck on the driver's side by cross traffic coming from the left, thus creating a "T-Bone" or perpendicular impact.

A nominal speed of 42 MPH at impact was chosen for this testing. Although this is a higher speed than the 33 MPH that is used by the National Highway Traffic Safety Administration (NHTSA) for FMVSS 214 side impact protection testing, AEV believes it is more representative of typical estimated accident speeds.

4.0 TEST SETUP

GTL's crash test track runs from east to west. The test vehicle starts approximately 400 feet east of the impact point and is accelerated to the test speed traveling west along the monorail track.

In the first test the ambulance was positioned across the test track facing 37° east of north. It was positioned such that the Ford Contour would strike the right side impacting in an area that would include the right side patient compartment door and the battery compartment.

For the second test the ambulance was positioned across the test track facing south which is 90° to the direction of travel of the impacting vehicle. The ambulance was positioned such that impact would occur on the left side between the centerline of the rear wheels and the oxygen tank storage compartment.

In both tests the patient compartment of the ambulance had 50th percentile male Anthropomorphic Test Dummies (ATD's) at each of the four designated seating positions. Each of the "ATD's" was restrained with the Protek Restraint System. In addition a 95th percentile male ATD was secured to the patient cot. The impacting vehicles each had a 50th percentile male ATD in the driver seating position restrained by seat belts.

5.0 TEST DATES

The testing was conducted on July 23 and 24, 2009

**6.0 COMPONENT IDENTIFICATIONS**SEAT BELTS: INTERTEKBODY: MICKEY BODY #6165BODY MOUNT PUCKS: UPPER VIBRATION ISOLATOR, AEV PART #4240-3
LOWER VIBRATION ISOLATOR, AEV PART #4239-3**7.0 VEHICLE IDENTIFICATIONS**

TEST #	Make	Model	VIN	TEST WT.
GTL052 GTL055	AEV	TRAMAHAWK TYPE III	1FDXE45P25HA76708	11,570
GTL052	FORD	CONTOUR	3FALP6536WM108228	2957
GTL055	TOYOTA	CAMRY	4T1SK12E0RU475151	3168

8.0 RESULTS

Both tests were performed as described in the setup (Section 4.0) of this report. The data generated from the tests is presented in the following tables:

TABLE 1

TEST #	DATE & TIME	TEST SPEED	TEMPERATURE
GTL052	07/23/09 12:08 P.M.	42.1	87°
GTL055	07/24/09 12:43 P.M.	42.2	88°

TABLE 2

TEST #	AMBULANCE DEFORMATION		
	LOCATION	DISTANCE FROM GROUND	STATIC CRUSH
GTL052	RIGHT SIDE BATTERY COMPARTMENT	21 7/8"	4 1/4"
GTL055	LEFT SIDE STORAGE COMPARTMENT	23 3/4"	2 5/16"

In each test the ambulance moved in the general direction of travel of the impacting vehicle. The ambulance wheel positions were marked before and after impact for each test. Table 3 gives the distances the tires moved on the struck side of the ambulance as a result of impact. The column with the heading "TRAVEL" is the distance traveled parallel to the path of the impacting vehicle. The column with the heading "OVER" is the perpendicular distance to the left or right as indicated of the pre-impact position.

TABLE 3

TEST #	TIRE POSITION AFTER IMPACT			
	FRONT		REAR	
	Travel	Over	Travel	Over
GTL052	65"	Left 58"	118"	Left 42"
GTL055	36"	Right 43"	115"	Right 29"



The high speed photography was reviewed and the ambulance was inspected after testing. The observed performance assessments are as follows:

1. The restraint systems held the ATD's in their seats. There was no head contact with anything other than the head rests. There were no excessive excursions of the ATD's in their seats regardless of which way they were facing.

2. The ambulance body structure remained intact after the impacts. There was localized bending of the exterior body panels and supports in the areas of impact. There was no intrusion into the patient compartment.

All personnel and compartment doors operated as they should, post test, except for the battery compartment and left side lower storage compartment as noted below.

The battery compartment was bent in and the latch was destroyed. The left side lower storage compartment doors were bent in. The storage compartment floor and framing was distorted.

There was some minor separation and bending along the joint between the floor and wall behind the hinge side of the patient compartment door.

3. The body mount pucks did not shear as a result of the impacts. Visual inspection of the body in the area of the mounts showed no evidence of damage.

4. All interior cabinetry and fixtures remained in place and un-damaged.



9.0 TEST EQUIPMENT LIST

EQUIPMENT	MANUFACTURER	MODEL/ SERIAL NO.
COUNTER/TIMER	SYSTRON DONNER	19 353-10
COUNTER/TIMER	SYSTRON DONNER	19 353- 11
ABORT SPEED TRAP	GTL	ST1
FINAL SPEED TRAP	GTL	ST2
SCALES	INTERCOMP	199744
TIRE PRESSURE GAUGE	WEKSLER	0-100
STEEL SCALES	STARRETT	C416R
STEEL TAPE	STANLEY	GF2
LEVEL	STANLEY	42-449
SCALES	FAIRBANKS	N/A

10.0 PHOTOGRAPHIC COVERAGE

16 mm high speed photography, real time, and high speed video were used to document the testing. External overhead and side views as well as onboard views of the interior of the ambulance patient area have been provided under separate cover.

The following pre and post test still photographs were used to document the testing.

	Page
Test #052 – Pre-Test Setup	10 & 11
Test #052 – Post Test	12, 13, 14, & 15
Test #055 – Pre-Test Setup	16 & 17
Test #055 – Post Test	18, 19, 20 & 21



GTL TEST #052 - PRE-TEST



GTL TEST #052 – PRE-TEST SETUP



GTL TEST #052 – PRE-TEST SETUP



GTL TEST #052 – POST TEST



GTL TEST #052 – POST TEST



GTL TEST #052 – POST TEST



GTL TEST #052 – POST TEST



RIGHT SIDE IMPACT SHOWING MEASUREMENT OF MAXIMUM CRUSH (TEST #052)



RIGHT SIDE IMPACT SHOWING MEASUREMENT OF MAXIMUM CRUSH (TEST #052)



OVERALL VIEW OF RIGHT SIDE SHOWING DAMAGE TO PERSONNEL DOOR AND BATTERY COMPARTMENT (TEST 052)



VIEW SHOWING DAMAGE INSIDE PERSONNEL DOOR (TEST 052)



GTL TEST #055 – PRE-TEST



GTL TEST #055 – PRE-TEST SETUP



GTL TEST #055 – PRE-TEST SETUP



GTL TEST #055 – PRE-TEST SETUP



GTL TEST #055 – POST TEST



GTL TEST #055 – POST TEST



GTL TEST #055 – POST TEST



GTL TEST #055 – POST TEST



VIEW SHOWING DAMAGE TO INTERIOR OF LEFT SIDE STORAGE COMPARTMENT (TEST 055)



LEFT SIDE IMPACT SHOWING MEASUREMENT OF MAXIMUM CRUSH (TEST #055)



LEFT SIDE IMPACT SHOWING MEASUREMENT OF MAXIMUM CRUSH (TEST #055)



OVERALL VIEW OF LEFT SIDE DAMAGE (TEST #055)