REPORT NUMBER 301L-GTL-03-006

SAFETY COMPLIANCE TESTING FOR
FMVSS NO. 301L
FUEL SYSTEM INTEGRITY

TOYOTA MOTOR CORPORATION
2003 TOYOTA HIGHLANDER, MPV
NHTSA NO. C35103

GENERAL TESTING LABORATORIES, INC.
1623 LEEDSTOWN ROAD
COLONIAL BEACH, VIRGINIA 22443

JUNE 26, 2003
FINAL REPORT
PREPARED FOR

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF VEHICLE SAFETY COMPLIANCE
400 SEVENTH STREET, SW
ROOM 5111 (NVS-220)
WASHINGTON, D.C. 20590
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Prepared By: [Signature]
Approved By: [Signature]  
Approval Date: 06/26/03

FINAL REPORT ACCEPTANCE BY OVSC:

Accepted By: [Signature]  
Acceptance Date: 07/03
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<tr>
<td>Grant Farrand, Project Engineer</td>
<td>GTL-DOT-03-301L-006</td>
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<tr>
<td>Debbie Messick, Project Manager</td>
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<td>NVS-221</td>
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<td>June 04, 2003</td>
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16. Abstract

Compliance tests were conducted on the subject, 2003 Toyota Highlander MPV in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-301-02 for the determination of FMVSS 301 compliance. Test failures identified were as follows:

NONE

17. Key Words

Compliance Testing
Safety Engineering
FMVSS 301

18. Distribution Statement

Copies of this report are available from NHTSA NHTSA Technical Reference Div., Rm. 5108 (NPO-230) 400 7th St., S.W. Washington, DC 20590 Telephone No. (202) 366-4946

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20. Security Classif. (of this page) UNCLASSIFIED

Form DOT F 1700.7 (8-72)
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<tr>
<td>5.40 Vehicle in Rollover Fixture at 0°</td>
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SECTION 1
PURPOSE OF COMPLIANCE TEST

1.0 PURPOSE OF COMPLIANCE TEST

A 2003 Toyota Highlander MPV was subjected to Federal Motor Vehicle Safety Standard (FMVSS) No. 301 testing to determine if the vehicle was in compliance with the requirements of the standard. The purpose of this standard is to reduce deaths and injuries occurring from fires that result from fuel spillage during and after motor vehicle crashes, and resulting from ingestion of fuels during siphoning.

1.1 The test vehicle was a 2003 Toyota Highlander MPV. Nomenclature applicable to the test vehicle are:

A. Vehicle Identification Number: JTEGD21A530058515

B. NHTSA No.: C35103

C. Manufacturer: TOYOTA MOTOR CORPORATION

D. Manufacture Date: 01/03

1.2 TEST DATE

The test vehicle was subjected to FMVSS No. 301 testing on June 04, 2003.
SECTION 2

COMPLIANCE TEST RESULTS SUMMARY

2.0 TEST RESULTS

All tests were conducted in accordance with NHTSA, Office of Vehicle Safety Compliance (OVSC) Laboratory Procedure, TP-301-02 dated 8 November 1994 and General Testing Laboratories, Inc. (GTL) Test Procedure, TP-301-02, "Fuel System Integrity".

Based on the test performed, the 2003 Toyota Highlander MPV appears to meet the lateral impact requirements of FMVSS 301 testing.
3.0 TEST RESULTS

The following data sheets document the results of testing on the 2003 Toyota Highlander.
SUMMARY OF RESULTS

Vehicle's NHTSA No.: C35103 Test Model: HIGHLANDER

Test Date.: 06/04/03 Time: 16:16 Temperature 64 ° F

Vehicle Model Year, Make, Model and Body Style:
2003 TOYOTA HIGHLANDER MPV

Vehicle Test Weight: 3970 lbs.; Impact Velocity: 19.4 mph

Type of Front Occupant Restraint System Installed in Test Vehicle:

Driver's DSP: TYPE 2 BELT WITH FRONTAL AIR BAG IN STEERING WHEEL AND SRS AIR BAG IN OUTBOARD SIDE OF SEAT BACK.

Right Passenger's DSP: TYPE 2 BELT WITH FRONTAL AIR BAG IN DASH AND SRS AIR BAG IN OUTBOARD SIDE OF SEAT BACK

Stoddard solvent spillage from Vehicle's Fuel System: None

REMARKS: THE DRIVER SIDE SRS AIR BAG IN SEAT BACK DEPLOYED.

RECORDED BY: [Signature] DATE: 06/04/03

APPROVED BY: [Signature]
DATA SHEET 1
TEST VEHICLE SPECIFICATIONS

TEST VEHICLE INFORMATION:

NHTSA No.: C35103
Year/Make/Model/Body Style: 2003 TOYOTA HIGHLANDER MPV
Engine Data: 2.4 LITER INLINE
Transmission Data: 3 SPEED AUTOMATIC PLUS OVERDRIVE
Final Drive Data: FRONT WHEEL DRIVE
Major Options: ALLOY WHEELS, QUICK ORDER PACKAGE
Date Received: 03/12/03  Odometer Reading: 107 miles

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured By: TOYOTA MOTOR CORPORATION
Date of Manufacture: 01/03
VIN: JTEGD21A530058515

GVWR: 2260 kg (4985 lbs.); GAWR Front: 1300 kg (2865 lbs.) GAWR Rear: 1240 kg (2735 lbs.)

DATA FROM VEHICLE'S TIRE PLACARD:

Location of Placard on Vehicle: DRIVER'S "B" PILLAR
Tire Pressure With Maximum Capacity Vehicle Load —
Front: 30 psi; Rear: 30 psi
Recommended Tire Size: P225/70R16
Recommended Cold Tire Pressure: Front = 210 kPa (30 psi) Rear = 210 kPa (30 psi)
Size of Tires on Test Vehicle: P225/70R16
Type of Spare Tire: FULL SIZE

Vehicle Capacity Data —

Type of Front Seat(s): BUCKET
Number of Occupants: Front = 2; Mid = ; Rear = 3; Total = 5

A. VEHICLE CAPACITY WEIGHT (VCW) = 925 lbs.
B. Number of Occupants x 150 lbs. = 750 lbs.
RATED CARGO AND LUGGAGE WEIGHT (RCLW) = A - B = 175 lbs.

RECORDED BY: 
DATE: 06/04/03
APPROVED BY: 
D. W. 
DATE: 
APPROVED BY:
DATA SHEET 2
PRE-TEST DATA

WEIGHT OF TEST VEHICLE:

A. As Received At Laboratory (Maximum Fluids) —

Right Front = 449.9 kg (992 lbs.) Right Rear = 334.3 kg (737 lbs.)
Left Front = 454.9 kg (1003 lbs.) Left Rear = 341.5 kg (753 lbs.)
TOTAL FRONT = 904.9 kg (1995 lbs.) TOTAL REAR = 675.8 kg (1490 lbs.)
% of TOTAL = 57 % % of TOTAL = 43 %
TOTAL DELIVERED WEIGHT = 1580.8 kg (3485 lbs.)

B. Calculation of Target Test Weight —

1. Total Delivered Weight = 1580.8 kg (3485 lbs.)
2. Rated Cargo & Lugg. Weight (RCLW) = 79.4 kg (175 lbs.)
3. Weight of 2 Dummies (164 lbs. each) = 148.8 kg (328 lbs.)
TARGET TEST WEIGHT = 1 + 2 + 3 = 1808.9 kg (3988 lbs.)

C. Vehicle, Dummies and 79.40 kg (175 lbs.) of Cargo Weight —

Right Front = 493.0 kg (1087 lbs) Right Rear = 407.3 kg (898 lbs)
Left Front = 487.1 kg (1074 lbs) Left Rear = 413.2 kg (911 lbs)
TOTAL FRONT = 980.2 kg (2161 lbs) TOTAL REAR = 829.5 kg (1809 lbs)
% of TOTAL = 54 % % of TOTAL = 46 %
TOTAL TEST WEIGHT = 1800.7 kg (3970 lbs)

Weight of Ballast secured in cargo area = 95.25 kg (210 lbs)
Type of Ballast: SALT BAGS
Method of Securing Ballast: REAR SEAT BELTS
Vehicle Components Removed for Weight Reduction:
NONE
DATA SHEET 2
PRE-TEST DATA CONTINUED

TEST VEHICLE ATTITUDE:

As Delivered —

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<thead>
<tr>
<th>Position</th>
<th>Measurement</th>
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<tbody>
<tr>
<td>Right Front</td>
<td>800 mm (31.5 inches)</td>
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<tr>
<td>Left Front</td>
<td>800 mm (31.5 inches)</td>
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<tr>
<td>Right Rear</td>
<td>820 mm (32.3 inches)</td>
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<tr>
<td>Left Rear</td>
<td>815 mm (32.1 inches)</td>
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</tbody>
</table>

As Tested —

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<thead>
<tr>
<th>Position</th>
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<td>788 mm (31.0 inches)</td>
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<tr>
<td>Left Front</td>
<td>790 mm (31.1 inches)</td>
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<tr>
<td>Right Rear</td>
<td>788 mm (31.0 inches)</td>
</tr>
<tr>
<td>Left Rear</td>
<td>794 mm (31.2 inches)</td>
</tr>
</tbody>
</table>

Vehicle's Wheelbase = 2715 mm (106.9 inches)

FUEL SYSTEM DATA:

Fuel System Capacity Listed in Owner's Manual = 75.0 liters (19.8 gallons)
Usable Capacity Figure Furnished By COTR = 75.0 liters (19.8 gallons)

Test Volume Range (91 to 94% of Usable Capacity) — 92.5%

58.1 liters (15.0 gallons) TO 70.4 liters (18.6 gallons)

ACTUAL TEST VOLUME = 69.3 liters (18.3 gallons) (with entire fuel system filled)

Test Fluid Type: Stoddard solvent
Test Fluid Specific Gravity: .7583
Test Fluid Kinematic Viscosity: 1.7 centistokes at 77° F
Test Fluid Color: BLUE ("red" is preferred)
Type of Vehicle Fuel Pump: ELECTRIC
Electric Fuel Pump Operation with Ignition Switch ON and Engine OFF — NO

Details of Fuel System: HIGH PRESSURE ELECTRIC FUEL PUMP SUPPLYING FUEL INJECTORS WITH LOW PRESSURE RETURN LINE TO FUEL TANK.

REMARKS:

RECORDED BY: [Signature] DATE: 06/04/03
APPROVED BY: [Signature]
DATA SHEET 3
POST IMPACT DATA

TYPE OF TEST: 301L
TEST DATE: 06/04/03; TIME: 16:16; TEMP.: 64 °F
VEH. NHTSA NO.: C35103; VIN: JTEGD21A530058515

REQUIRED IMPACT VELOCITY RANGE: 18.9 to 19.9 mph

ACTUAL IMPACT VELOCITY: (speed traps located within 5 feet of impact plane)

Trap No. 1 = 19.4 mph
Trap No. 2 = 19.4 mph
Average Impact Speed = 19.4 mph

REMARKS:

RECORDED BY: [Signature]  DATE: 06/04/03
APPROVED BY: [Signature]
DATA SHEET 4
SUMMARY OF FMVSS 301 DATA

TEST VEHICLE NHTSA NO.: C35103 ; TEST DATE: 06/04/03

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 2003 TOYOTA HIGHLANDER

TYPE OF IMPACT: 301

STODDARD SOLVENT SPILLAGE MEASUREMENT:

A. From impact until vehicle motion ceases —
   Actual = 0 oz.  Maximum Allowable = 1 ounce

B. For 5 minute period after vehicle motion ceases —
   Actual = 0 oz.  Maximum Allowable = 5 ounces

C. For next 25 minutes —
   Actual = 0 oz.  Maximum Allowable = 1 oz./minute

D. Provide Spillage Details: NONE

REMARKS:

RECORDED BY: [Signature]  DATE: 06/04/03
APPROVED BY: [Signature]
DATA SHEET 5
STATIC ROLLOVER TEST DATA:

A. Test Phase = 0° to 90°

Determination of Stoddard Solvent Collection Time Period:

1. Rollover Fixture 90° Rotation Time = 1 minute, 35 seconds

(Specified Range is 1 to 3 minutes)

2. FMVSS 301 Position Hold Time = 5 minutes, 0 seconds

3. TOTAL = 6 minutes, 35 seconds

4. NEXT WHOLE MINUTE INTERVAL = 7 minutes

Actual Test Vehicle Stoddard Solvent Spillage:

1. First 5 minutes from onset of rotation = 0 oz.
   (5 oz. allowed)

2. 6th minute = 0 oz.
   (1 oz. allowed)

3. 7th minute = 0 oz.
   (1 oz. allowed)

4. 8th minute (if required) = N/A oz. (1 oz. allowed)

Provide Details of Stoddard Solvent Spillage Locations — NONE

________________________________________________________

________________________________________________________
B. Test Phase = 90° to 180°

Determination of Stoddard Solvent Collection Time Period:

1. Rollover Fixture 90°
   Rotation Time = __ minutes, __ seconds
   (Specified Range is 1 to 3 minutes)

2. FMVSS 301 Position Hold
   Time = 5 minutes, 0 seconds

3. TOTAL = __ minutes, __ seconds

4. NEXT WHOLE MINUTE INTERVAL = __ minutes

Actual Test Vehicle Stoddard Solvent Spillage:

1. First 5 minutes from onset of rotation = ___ oz.
   (5 oz. allowed)

2. 6th minute = ___ oz.
   (1 oz. allowed)

3. 7th minute = ___ oz.
   (1 oz. allowed)

4. 8th minute (if required) = N/A oz. (1 oz. allowed)

Provide Details of Stoddard Solvent Spillage Locations — NONE
C. Test Phase = 180° to 270°

Determination of Stoddard Solvent Collection Time Period:

1. Rollover Fixture 90°
   Rotation Time = 1 minute, 28 seconds

   (Specified Range is 1 to 3 minutes)

2. FMVSS 301 Position Hold
   Time = 5 minutes, 0 seconds

3. TOTAL = 6 minutes, 28 seconds

4. NEXT WHOLE MINUTE
   INTERVAL = 7 minutes

Actual Test Vehicle Stoddard Solvent Spillage:

1. First 5 minutes from onset of rotation = 0 oz.
   (5 oz. allowed)

2. 6th minute = 0 oz.
   (1 oz. allowed)

3. 7th minute = 0 oz.
   (1 oz. allowed)

4. 8th minute (if required) = N/A oz. (1 oz. allowed)

Provide Details of Stoddard Solvent Spillage Locations — NONE
D. Test Phase = 270° to 360°

Determination of Stoddard Solvent Collection Time Period:

1. Rollover Fixture 90°
   Rotation Time = _1_ minutes, _45_ seconds
   (Specified Range is 1 to 3 minutes)

2. FMVSS 301 Position Hold
   Time = 5 minutes, 0 seconds

3. TOTAL = _6_ minutes, _45_ seconds

4. NEXT WHOLE MINUTE INTERVAL = _7_ minutes

Actual Test Vehicle Stoddard Solvent Spillage:

1. First 5 minutes from onset of rotation = _0_ oz.
   (5 oz. allowed)

2. 6th minute = _0_ oz.
   (1 oz. allowed)

3. 7th minute = _0_ oz.
   (1 oz. allowed)

4. 8th minute (if required) = N/A oz. (1 oz. allowed)

Provide Details of Stoddard Solvent Spillage Locations — NONE
DATA SHEET 6
CAMERA LOCATION

VEHICLE NHTSA NO.: C35103
TEST DATE: 06/03/03

NO STEEL GRATING ALLOWED OVER PHOTO PIT

CAMERA 1 - REAR SIDE VIEW OF VEHICLE DURING CRASH
CAMERA 2 - FRONT SIDE VIEW OF VEHICLE DURING CRASH
CAMERA 3 - OVERHEAD VIEW OF ENTIRE IMPACT
CAMERA 4 - UNDERBODY VIEW OF FUEL TANK LOCATED IN PIT
### SECTION 4
INSTRUMENTATION AND EQUIPMENT LIST

**TABLE 1 - INSTRUMENTATION & EQUIPMENT LIST**

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<td>04/04</td>
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<td>GTL ST2</td>
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SECTION 5

PHOTOGRAPHS
2003 TOYOTA HIGHLANDER
NHTSA NO. C35103
FMVSS NO. 301L

FIGURE 5.12
UNDERBODY VIEW OF FUEL FILL HOSE
AT TANK PRE-TEST
FIGURE 5.17
UNDERBODIES VIEW OF FUEL LINES TO ENGINE PRE-TEST
MFD BY TOYOTA MOTOR CORPORATION
DATE 01/03

GVWR: 4895KG (10805LB)
GAWR: FRT 16X5.5X10 (6355LB) 16X6.5X10 (10805LB) WITH 225/70R15 TIRES
PR 17X7.5X10 (10805LB) 17X8.5X10 (10805LB) WITH 225/60R17 TIRES
PR 17X9.5X10 (10805LB) 17X10.5X10 (10805LB) WITH 225/50R17 TIRES

THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR
VEHICLE SAFETY AND THEFT PREVENTION STANDARDS IN EFFECT
ON THE DATE OF MANUFACTURE SHOWN ABOVE

TFLJ21A530055515 PHV
ASUZL-DWPMKA
D/TG 1009E014
A/WM -D2A-
U241E
MADE IN JAPAN
10 972

2003 TOYOTA HIGHLANDER
NHTSA NO. C35163
FMVSS NO. 301L

FIGURE 5.19
VEHICLE CERTIFICATION LABEL
### Tire-Loading Information

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<td>COCLOAD 1 FR 1 AXLE 1 TOTAL</td>
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<td>Tires Size</td>
<td>8.00 R16 6PR</td>
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<tr>
<td>Front Tire Pressure</td>
<td>30</td>
</tr>
<tr>
<td>Rear Tire Pressure</td>
<td>30</td>
</tr>
<tr>
<td>Body Weight</td>
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<tr>
<td>Manufacturer's Notes</td>
<td>Additional Information in Owner's Manual</td>
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2003 TOYOTA HIGHLANDER
NHTSA NO. C33163
PMVSS NO. 301L

FIGURE 5.24
RIGHT SIDE VIEW OF VEHICLE POST TEST
2003 TOYOTA HIGHLANDER
NHTSA NO. C36103
FMVSS NO. 301L.

FIGURE 5.29
RIGHT VIEW OF VEHICLE-BARRIER POST TEST
2003 TOYOTA HIGHLANDER
NHTSA NO. C35103
FMVSS NO. 301.

FIGURE 5.34
UNDERBODY VIEW OF FUEL FILL HOLE
IN CENTER POST TEST.
2003 TOYOTA HIGHLANDER
NHTSA NO. C35103
FMVSS No. 301E.

FIGURE 5.35
UNDERBODY VIEW OF FUEL FILL HOSE AT FILL POST TEST.
FIGURE 5.38
UNDERBODY VIEW OF FUEL LINES TO ENGINE POST TEST
SECTION 6
BARRIER INFORMATION
NOTES:
1. Face Plate 0.50 in. (19mm) thick cold rolled steel
2. All Inner Reinforcements 4.0 x 2.0 x 0.19 in. (102 x 51 x 5mm) Steel Tubing
3. Impact Surface above shown without .75 x 48 x 96 in. Plywood Face attached
<table>
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<th>LETTER</th>
<th>INCHES</th>
<th>MILLIMETERS</th>
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<tr>
<td>A</td>
<td>20.5&quot;</td>
<td>521*</td>
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<tr>
<td>B</td>
<td>60.0</td>
<td>1524</td>
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<tr>
<td>C</td>
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<td>D</td>
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<td>E</td>
<td>78.0</td>
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TEST SET-UP OF COMMON CARRIAGE WITH 60" x 78" FLAT FACE IMPACT SURFACE INSTALLED:

LEFT FRONT WEIGHT  1081
RIGHT FRONT WEIGHT  1079
LEFT REAR WEIGHT  882
RIGHT REAR WEIGHT  873
TOTAL WEIGHT  3915

* EXCLUDING 3/4" PLYWOOD FACE

DIMENSIONS FOR GTL 60" x 78" FLAT FACE IMPACT SURFACE