

Insurance Institute for Highway Safety Crashworthiness Evaluation

Crash Test Report 2000 Toyota Avalon (CF00012)

Vehicle identification number: 4T1BF28B7YU042528
Body style: Midsize 4-door sedan
Engine/transmission: Transverse 3.0-liter V6, 4-speed automatic,
front-wheel drive

Standard crashworthiness features:

- Driver and right front passenger front airbags
- Driver and right front passenger seat-mounted side airbags
- Dual-locking shoulder belts (front outboard and all rear seating positions)
- Shoulder belt upper anchorage height adjusters (front outboard seating positions only)
- Seat belt crash tensioners (pyrotechnic, front outboard seating positions only)
- Seat belt force-limiting mechanisms (front outboard seating positions only)
- Center rear lap/shoulder belt
- Right front and all rear shoulder belt retractors are convertible from emergency to automatic locking for ease of child restraint use
- Rear seat head restraints (all seating positions)

Other standard safety features:

- Four-wheel antilock brakes
- Daytime running lamps

Vehicle specifications (provided by manufacturer):

- Wheelbase: 272 cm
- Overall length: 488 cm
- Overall width: 182 cm
- Curb weight: 1,550 kg

Vehicle specifications (measured):

- Front bumper to firewall: 118 cm
- Curb weight: 1,573 kg
- Test weight: 1,677 kg (58% front, 42% rear)
- Overall width: 182 cm

Nominal test parameters:

40.0 mi/h (64.4 km/h), 40% overlap, deformable barrier face with slotted bumper

Crash test date:

March 23, 2000

Figure 1
Preocrash and Postcrash Side Views — 2000 Toyota Avalon



Summary

A 2000 Toyota Avalon was crash tested on March 23, 2000 into a fixed deformable barrier at 40.0 mi/h (64.3 km/h) and a 41 percent overlap on the driver side. A Hybrid III 50th percentile male dummy was positioned in the driver seat with the lap/shoulder belt fastened.

Measures of intrusion taken after the crash indicated the lower instrument panel in front of the dummy moved rearward 2-3 cm. Resultant intrusion in the driver footwell measured 7 cm at the footrest and 13-15 cm at other places on the toepan. All doors remained closed during the crash. After the crash, the driver door required manipulation with tools to open, but the other three doors opened with ease.

The driver dummy was restrained by a three-point lap/shoulder belt and an airbag. During the crash, the belt crash tensioner activated and retracted 2 cm of shoulder belt webbing. A total of at least 9 cm of webbing, including the tensioner-retracted length, spooled off the retractor, with the force-limiting mechanism alone contributing about 9 cm. The airbag contacted the dummy's face during deployment. After rebounding from the airbag, the dummy's head contacted the upper B-pillar trim (which had come loose during the crash), head restraint, and then the roof side rail and grab handle. After the crash, the upper end of the steering column had moved upward 6 cm and rearward 4 cm.

None of the injury measures exceeded the published threshold values. The peak resultant head acceleration from the roof side rail contact was 13 g.

Test Conditions

This vehicle had been tested previously in the Institute's Low-Speed Crash Test Program and subjected to an impact on the front corner of the passenger side at 5 mi/h (8 km/h) into a 30 degree angle barrier and a rear impact at 5 mi/h (8 km/h) into a flat barrier. All structural damage on the front was repaired prior to this test (see Appendix, Low-Speed Crash Test Damage Repair Estimate).

This test was conducted according to the procedures specified in the IIHS Offset Barrier Crash Test Protocol (Version VII). The Hybrid III dummy positioned in the driver seat was equipped with instrumented lower legs that included feet modified to include two accelerometers and to have a 45 degree dorsiflexion range with soft stops at all extremes of foot-ankle motion. All dummy seating parameters were set according to the procedures specified for Federal Motor Vehicle Safety Standard 208 compliance testing (49 *CFR* Part 571.208 § 11). The dummy's left foot was placed on the footrest.

Seat back, shoulder belt upper anchorage, and steering column adjustments were set according to the manufacturer's specifications for government crash testing. Other adjustments were set according to the procedure specified for Federal Motor Vehicle Safety Standard 208 compliance testing (49 *CFR* Part 571.208 § 7 and 8). After final positioning of the dummy, measurements from various parts of the dummy to a number of vehicle interior points were made. These measurements and the seat back, shoulder belt upper anchorage, and steering column adjustments are described in the Appendix, Dummy Clearance Measurements.

Vehicle acceleration measurements were made by a triaxial arrangement of accelerometers mounted on the vehicle's longitudinal centerline and 57 cm behind its center of gravity (170 cm behind the front axle). The vehicle speed recorded just prior to impact was 40.0 mi/h (64.3 km/h), and the actual overlap was 41 percent.

Structural Performance

All doors remained closed during the crash. The driver door aperture shortened 5 cm, as measured at the lower edge of the window. After the crash, the driver door required manipulation with tools to open, but other three doors opened with ease.

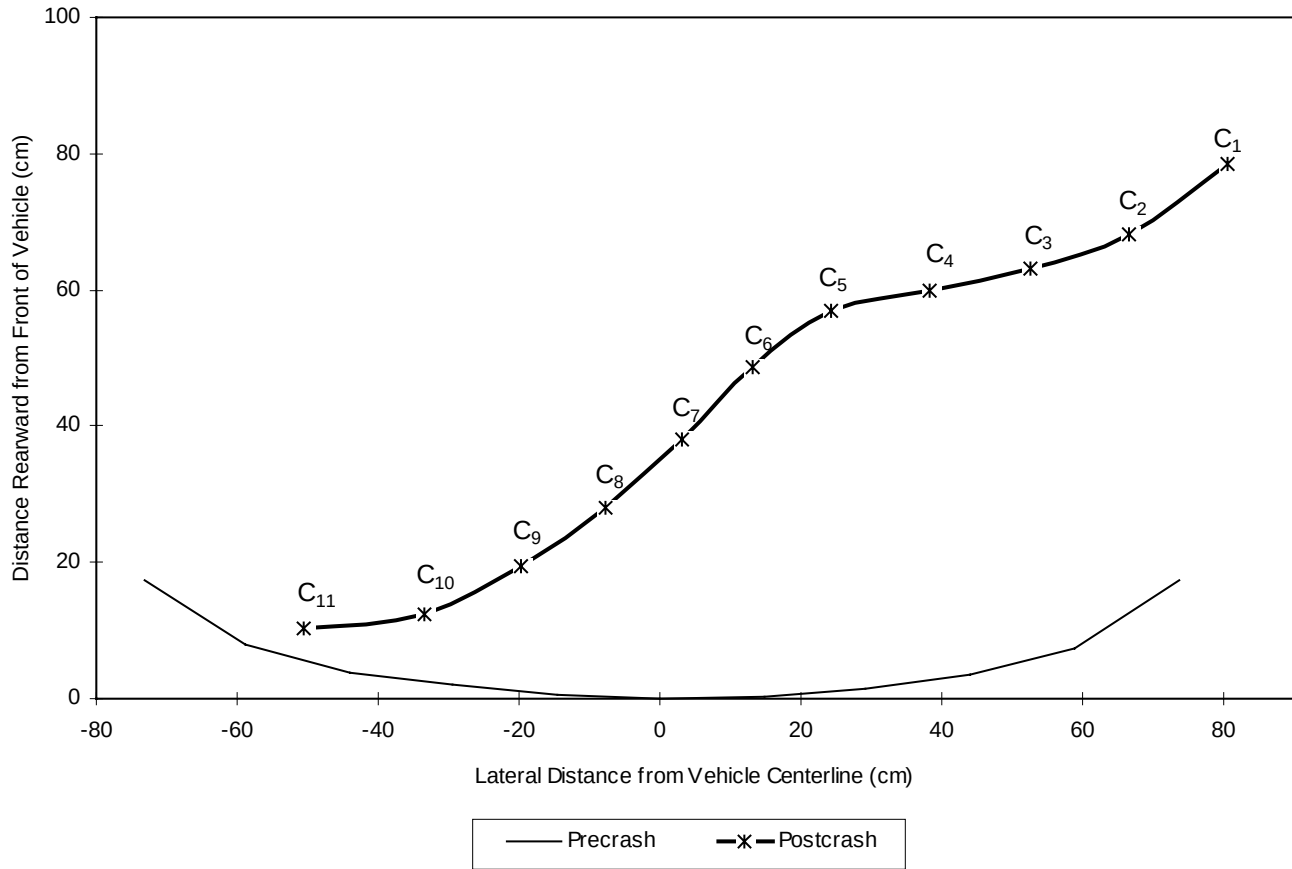
No fuel system leaks were observed after the crash. In addition, no fuel system leaks were observed when the vehicle was rotated onto its right side to allow postcrash photography.

Figure 2 shows the overhead view of the crash deformation. Figure 3 illustrates the precrash and postcrash contour measures of the front bumper cover profile and the resulting permanent crush. Figure 4 shows the precrash and postcrash views from below. Figure 5 illustrates the deformation of the side rails, door sills, and engine cradle, which are visible in Figure 4.

Figure 2
Overhead View of Crash Deformation — 2000 Toyota Avalon



Figure 3
Front Bumper Cover Crush Contour — 2000 Toyota Avalon



	C ₁	C ₂	C ₃	C ₄	C ₅	C ₆	C ₇	C ₈	C ₉	C ₁₀	C ₁₁
Postcrash Contour (cm)	78	68	63	60	57	49	38	28	19	12	10
Precrash Contour (cm)	17	7	4	1	0	0	1	2	4	8	17
Resulting Crush (cm)	61	61	59	59	57	49	37	26	15	4	-7

The bumper cover was torn almost completely off the vehicle during the crash. The postcrash contour represents the best attempt to fit the cover back onto the vehicle. The length of the reference line was 147 cm precrash and 131 cm postcrash.

Figure 4
Precrash and Postcrash Views from Below — 2000 Toyota Avalon

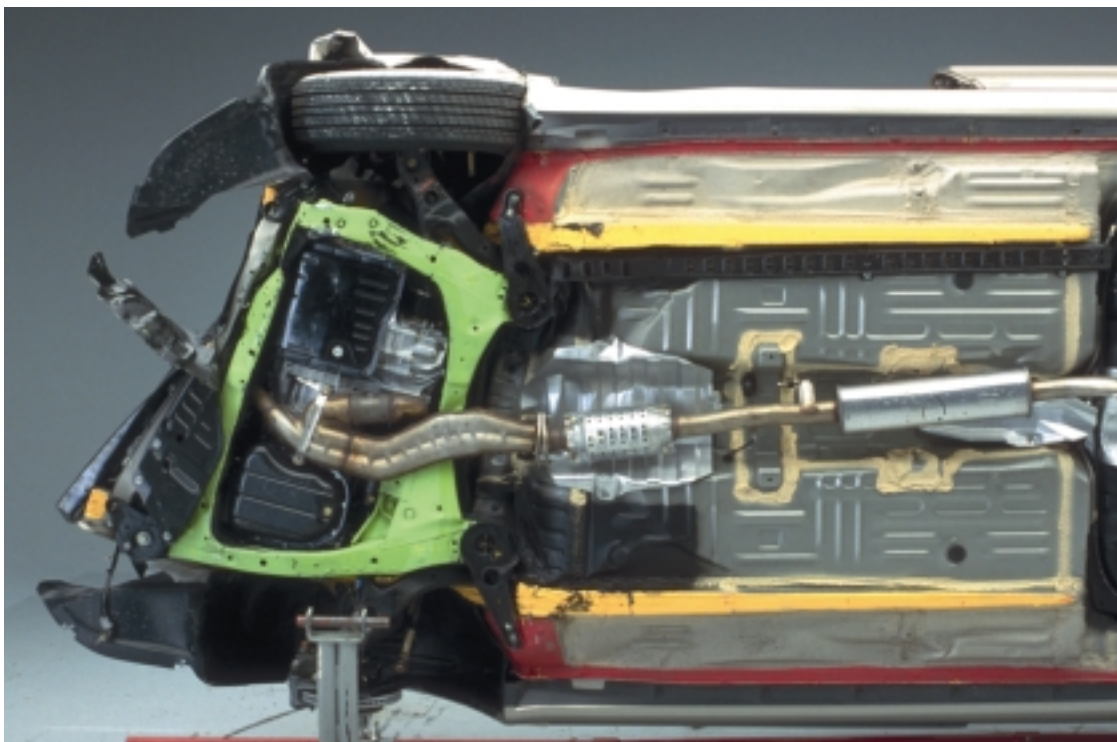
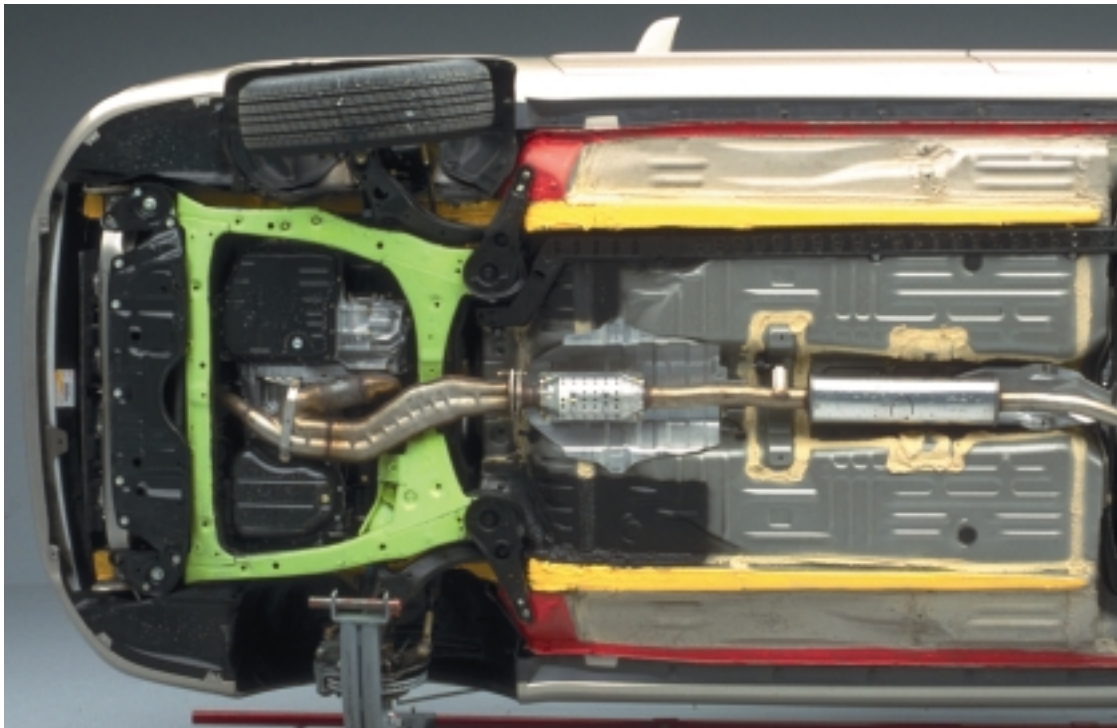
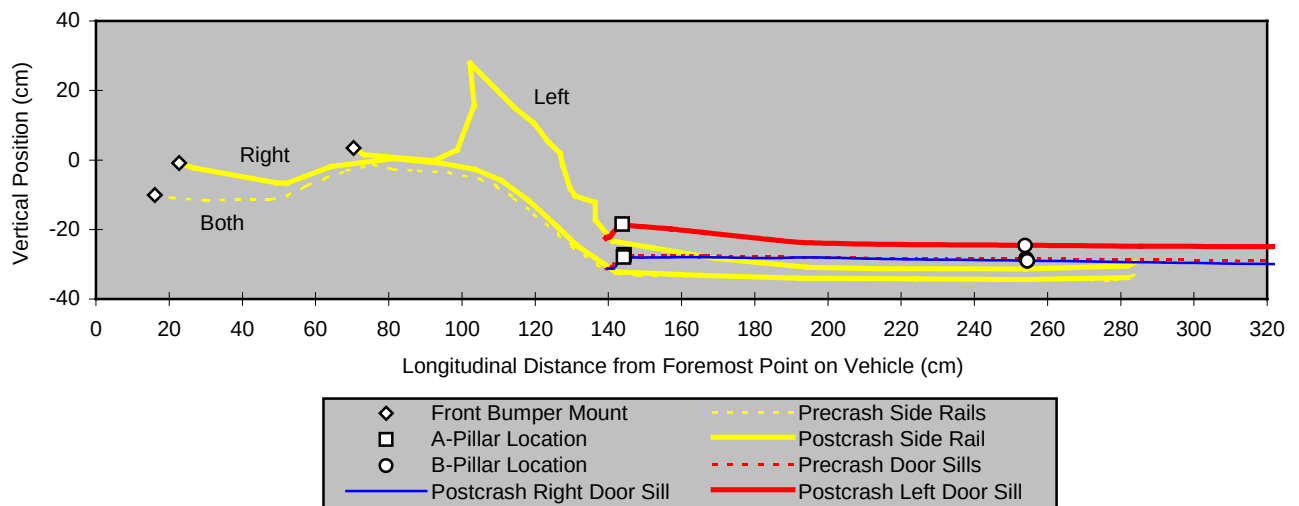
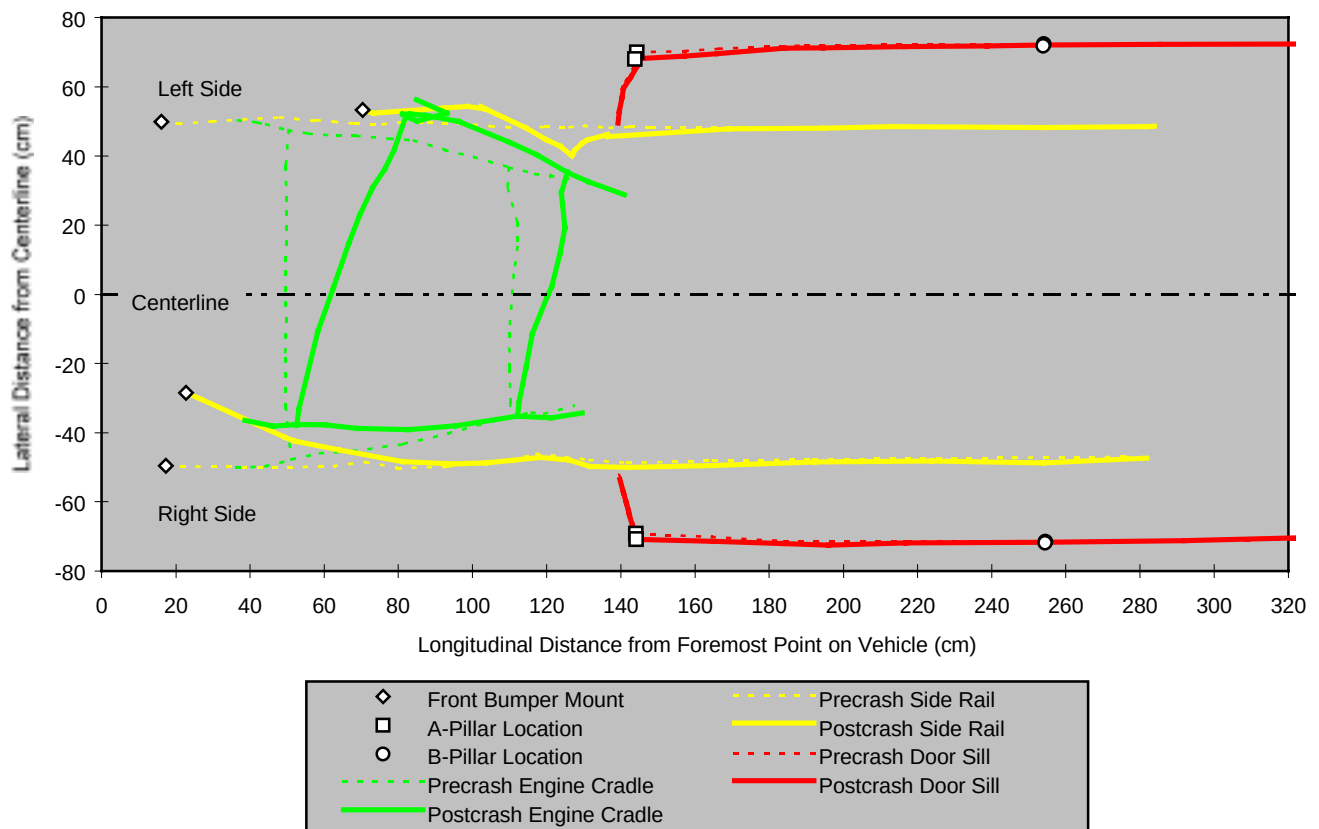


Figure 5
Structural Deformation, Views from Below and Side — 2000 Toyota Avalon



Various measures of intrusion were made after the crash. These residual measures of intrusion typically are less than the maximum deformation that occurs during the crash. The coordinate reference system for these measures is described in the IIHS Offset Barrier Crash Test Protocol (Version VII). The measures of deformation shown in Table 1 have been adjusted to better reflect the displacement of the various target locations relative to the driver, based on the locations of the four driver seat-attachment bolts. The average displacement of the seat-attachment bolts relative to the reference system also is shown in Table 1.

Table 1 Residual Measurements of Intrusion Relative to Driver Seat — 2000 Toyota Avalon				
Selected Locations*	Longitudinal	Lateral	Vertical	Resultant
Steering column (cm)	-4	1	6	7
Left lower instrument panel (cm)	-3	0	4	5
Right lower instrument panel (cm)	-2	1	4	4
Brake pedal (cm)	-10	-1	6	11
Left toepan (cm)	-10	-2	7	13
Center toepan (cm)	-13	-3	7	15
Right toepan (cm)	-11	-1	9	14
Footrest (cm)	-4	-1	6	7
Average displacement of the four seat-attachment bolts relative to reference system (cm)	-1	1	-2	n/a

* All measurements taken on driver side. From the driver's position, positive is forward, left, and up.

Restraint System Performance

Airbags

Driver: The uninflated driver airbag is approximately 66 cm in diameter, and the excursion of its center when inflated is limited by two tethers. The airbag is vented by two holes located at positions corresponding to 11 and 1 o'clock on the forward-facing surface of the airbag. Analysis of the high-speed film taken from camera positions B and E indicated the airbag deployed at 40 ms into the crash and appeared to be fully inflated at 68 ms. The seat-mounted side airbag did not deploy during the crash.

Passenger: The passenger airbag, mounted on the top of the lower of two tiers of the instrument panel, deployed at an angle and is untethered. The cylinder-shaped airbag is vented by two holes located at the lateral ends. The airbag did not contribute to windshield damage during deployment. The seat-mounted side airbag did not deploy during the crash.

Seat Belts

This vehicle is equipped with dual-locking lap/shoulder belts with sliding latch plates at all seating positions (except the center front position if equipped with a split bench seat) and adjustable upper anchorage points, pyrotechnic crash tensioners, and mechanical force-limiting mechanisms at the driver and right front seating positions. The center front position (if present) has only a lap belt. The front inboard lower anchorage points for the driver and right front belts are attached to and move with the seats. The front outboard lower anchorage points are bolted to sills at the base of the B-pillars. During the crash, 2 cm of webbing was pulled by the belt crash tensioner into the retractor through the D-ring, as determined by film analysis of the movement of a tape strip on the belt webbing near the dummy's shoulder. Postcrash investigation of the force-limiting torsion bar within the retractor spool indicated it was twisted about 187 degrees from its precrash orientation. This measure, combined with the estimated diameter of the retractor spool and stowed webbing (53 mm), suggested the force limiter contributed about 9 cm of webbing to the total amount (including the tensioner-retracted length) pulled through the D-ring. A pull-string mounted between the webbing and the B-pillar trim adjacent to the D-ring could not be used as an indicator of the amount of webbing pulled through the D-ring because the B-pillar trim was dislodged during the crash. However, plastic transferred from the D-ring onto the belt webbing indicated that 6 cm of webbing was pulled through the D-ring, about the same as the net amount of 7 cm (9 cm minus 2 cm) noted above.

Seat

Postcrash examination of the driver seat rails indicated no discernible movement of the seat in its tracks during the crash. Deformation of the floor under the driver seat caused the seat to tip slightly outboard and pitch slightly forward.

Steering Column

The upper end of the steering column moved upward 6 cm and rearward 4 cm relative to the driver seat.

Dummy Kinematics

Head, Neck, and Torso

Analysis of the high-speed film taken from camera position E indicated the deploying airbag contacted the dummy's face at 54 ms into the crash and then receded by 58 ms. The dummy's face began to load the airbag at 72 ms (4 ms after the airbag became fully inflated). Paint transferred from the dummy's face indicated the nose contacted the airbag 1 cm directly to the right of its center. As the head moved into the airbag, it moved downward and tilted to the left. On rebound from the airbag, the head moved upward, and the left upper rear part of the head contacted the upper B-pillar trim (which had come loose earlier in the crash) at 217 ms. The head continued upward and rearward, pushing the B-pillar trim rearward as the neck began to

extend rearward. The center rear of the head contacted the head restraint upper outboard quadrant at 248 ms; as the neck continued to extend, the left upper front and top right parts of the head contacted the grab handle and roof rail, respectively, just ahead of the B-pillar at 270 ms. Table 2 provides the timing of these events.

Table 2 Restraint System Performance and Dummy Kinematics — 2000 Toyota Avalon	
Event	Time (ms)
Deployment of airbag	40
Airbag contacts face during deployment	54
Airbag fully inflated	68
Face begins to load airbag	72
Left rear of head contacts loose B-pillar trim	217
Top of head contacts roof rail and grab handle	270

Figure 6
Dummy and Vehicle Interior, Postcrash — 2000 Toyota Avalon



Legs and Feet

Left leg and foot: Paint transferred from the dummy's left knee indicated the knee contacted the knee bolster and the instrument panel to the left of the steering column, 4 cm directly above the left instrument panel intrusion reference point. The knee also contacted the lower left corner of the steering column trim. Paint transferred from the dummy's left shin indicated the shin contacted the bolster below and to the left of the knee impact location on the bolster. The left foot was found in neutral dorsiflexion and somewhat inverted, with the lateral sole of the forefoot on the inboard edge of the footrest and the sole at the heel almost flat on the floormat/carpeting on the floorpan.

Right leg and foot: Paint transferred from the dummy's right knee indicated the knee contacted and dislodged the small plastic trim panel around the instrument-panel-mounted ignition switch. The knee also contacted both the top of the knee bolster just below the ignition switch and the lower right corner of the steering column trim. Paint transferred from the dummy's right shin indicated the shin contacted the bolster directly below the knee impact location on the bolster. The right foot was found somewhat dorsiflexed and slightly inverted, with the back of the foot pressed against a downward buckle on the floormat/carpeting on the floorpan. The sole at the heel was pressed against the intruded toepan, and the lateral sole at the forefoot was resting on the fully depressed accelerator pedal.

Dummy Injury Measures

Head

The maximum vector resultant head accelerations were recorded and the HICs were calculated during an interval that corresponds with the dummy's head excursion into the airbag. The peak resultant head acceleration from contact with the roof side rail and grab handle was 13 g at 275 ms. Table 3 provides a summary of the maximum head injury measurements recorded during the crash.

Table 3 Head Injury Measurements — 2000 Toyota Avalon			
Measure	Published Tolerance Threshold	Result	Time (ms)
Vector resultant acceleration (g)	80	61	99
Vector resultant acceleration — 3 ms clip (g)	80	60	98-101
Head Injury Criterion (HIC)	1000	604	85-121
Head Injury Criterion — 15 ms interval (HIC-15)*	700	377	93-108

* Canadian Motor Vehicle Safety Regulations (Standard 208) allow the resultant head acceleration to exceed 80 g in airbag-equipped vehicles if HIC-15 is less than 700 (Transport Canada, 1998).

Neck

Table 4 provides a summary of the maximum neck injury measurements recorded during the crash. None of the recorded neck force measures exceeded the magnitude-duration injury criteria (Figures A-13 to A-16).

Table 4 Neck Injury Measurements — 2000 Toyota Avalon			
Measure	Published Tolerance Threshold	Result	Time (ms)
A-P shear force (kN)	±3.1	-0.6	168
Axial compression force (kN)	4.0	1.5	258
Axial tension force (kN)	3.3	1.8	109
Flexion bending moment (Nm)	310	51	166
Extension bending moment (Nm)	122	43	118

Chest

Table 5 provides a summary of the maximum chest injury measurements recorded during the crash.

Table 5 Chest Injury Measurements — 2000 Toyota Avalon			
Measure	Published Tolerance Threshold	Result	Time (ms)
Vector resultant spine acceleration — 3 ms clip (g)	60	55	110-113
Rib compression (mm)	-50	-35	108
Sternum deflection rate (m/s)	-8.2	-0.8	104

Legs and Feet

Table 6 provides a summary of the maximum leg and foot injury measurements recorded during the crash.

Table 6 Leg and Foot Injury Measurements – 2000 Toyota Avalon					
Measure	Published Tolerance Threshold	Left		Right	
		Result	Time (ms)	Result	Time (ms)
Femur axial force (kN)	-9.1*	-3.5	81	-2.1	100
Tibia-femur displacement (mm)	-15	-3	75	-4	80
Upper Tibia					
L-M moment (Nm)	±225	61	106	-51	84
A-P moment (Nm)	±225	-74	86	-67	60
Vector resultant moment (Nm)	225	74	86	71	60
Index	1.00	0.37	86	0.37	60
Lower Tibia					
L-M moment (Nm)	±225**	-53	82	-49	82
A-P moment (Nm)	±225**	74	106	29	140
Vector resultant moment (Nm)	225**	74	106	50	82
Axial force (kN)	-8.0**	-1.7	44	-3.0	80
Index	1.00	0.36	106	0.30	82
Foot					
A-P acceleration (g)	±150	-64	76	-67	81
I-S acceleration (g)	±150	-53	76	-43	81
Vector resultant acceleration (g)	150	81	76	77	81

* This critical value is for instantaneous loading. Femur loads are compared with magnitude-duration injury criteria in Figures A-24 and A-37.

** These published thresholds are for fractures of the tibia. Ankle and foot injuries have been associated with bending moments as low as 50-100 Nm, and heel fractures have been associated with axial forces as low as -6.0 kN.

References

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Appendix

Low-Speed Crash Test Damage Repair Estimate

Dummy Clearance Measurements

Graph Index — index to graphs of time plots of dummy and vehicle data

Manufacturer's window sticker

Low-Speed Crash Test Damage Repair Estimate

2000 Toyota Avalon Midsize Four-Door Sedan: 5 mi/h Front into Angle Barrier

Test Number: LA00007

VIN: 4T1BF28B7YU042528

Mileage: 73

Features: Driver and passenger front airbags, driver and front passenger side impact airbags, four-wheel antilock brakes, air conditioning, automatic transmission, heated power mirrors, keyless entry system, power door locks, power windows, power driver and passenger seats, heated back glass, tilt steering wheel, cruise control, front fog lamps, moonroof, two-stage paint.

Description	Part		Labor	
	Mfg. No	Price	Operation	Hours
Bumper reinforcement, front	52131AC060	\$141.68	Replace*	0.9
Frame sidemember extension, right front	5703333020	34.35	Replace*	2.6
Support, bumper cover, upper front	52029AC030	39.15	Replace*	0.5
Support bracket, bumper cover, right front	52115AC020	11.20	Replace*	
Bumper absorber, front	52611AC030	50.93	Replace	
Bumper absorber insert, right front	52117AC010	11.00		
Unibody, right front			Set up*	1.0
Frame sidemember end, right front			Pull/align*	0.5
Frame sidemember end, right front			Repair*	1.0
Frame sidemember end, right front			Refinish	0.3
Fender, right front			Align*	0.3
Airbag sensor, right front	8917339195	97.18	Replace*	0.2
Headlamps			Aim	0.5
Paint and materials		5.40		
Total Parts		\$390.89		
Total Labor		265.20		7.8
Grand Total		\$656.09		

* This item was repaired or replaced as indicated before the 40 mi/h frontal offset test.

Dummy Clearance Measurements

Test Number: CF00012
Vehicle Make/Model: Toyota Avalon
Vehicle Model Year: 2000
Seat Type: Electrically adjusted bucket seat (fore/aft, height, and seat back angle)

Manufacturer's Specifications

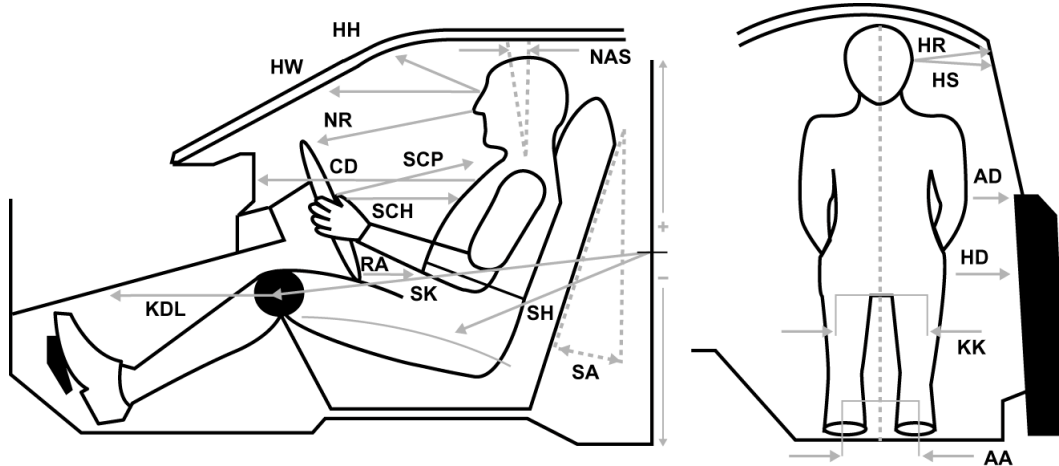
Seat Back Information: Reclined 6° rearward from the most upright position
Upper Belt Anchorage: Set to midpoint of 5 positions
Steering Column Adjustment: Set to midpoint of 5 tilt positions

Location	Code	Measure	Location	Code	Measure
Head to header	HH	375	Neck angle, torso 90	NAT90	21.3°
Head to windshield	HW	633	Neck angle, seated	NAS	5.6°
Nose to rim	NR	449	Torso angle (NAT90 - NAS)	TA	15.7°
Chest to dash	CD	727	Striker to knee**	SK	592
Rim to abdomen	RA	216	Striker to knee angle**	SKA	-9.4°
Knee to dash, left	KDL	193	Striker to H-point, horizontal	SHH	198
Knee to dash, right	KDR	205	Striker to H-point, vertical	SHV	-180
Steering wheel to chest, horizontal	SCH	324	Ankle to ankle	AA	325
Steering wheel to chest, perpendicular	SCP	419	Knee to knee	KK	350
Steering wheel to chest, reference	SCR	411	Arm to door	AD	120
Hub to chest, minimum	HCM	262	H-point to door	HD	140
Pelvic angle	PA	23.4°	Head to A-pillar	HA	560
Seat back angle*	SA	6.4°	Head to roof	HR	245
			Head to side window	HS	275

All distance measurements are in millimeters (mm).

* Indicated value is from vertical, as measured on head restraint post.

** These measurements were made in a vertical plane containing the striker and parallel to the driver door sill.

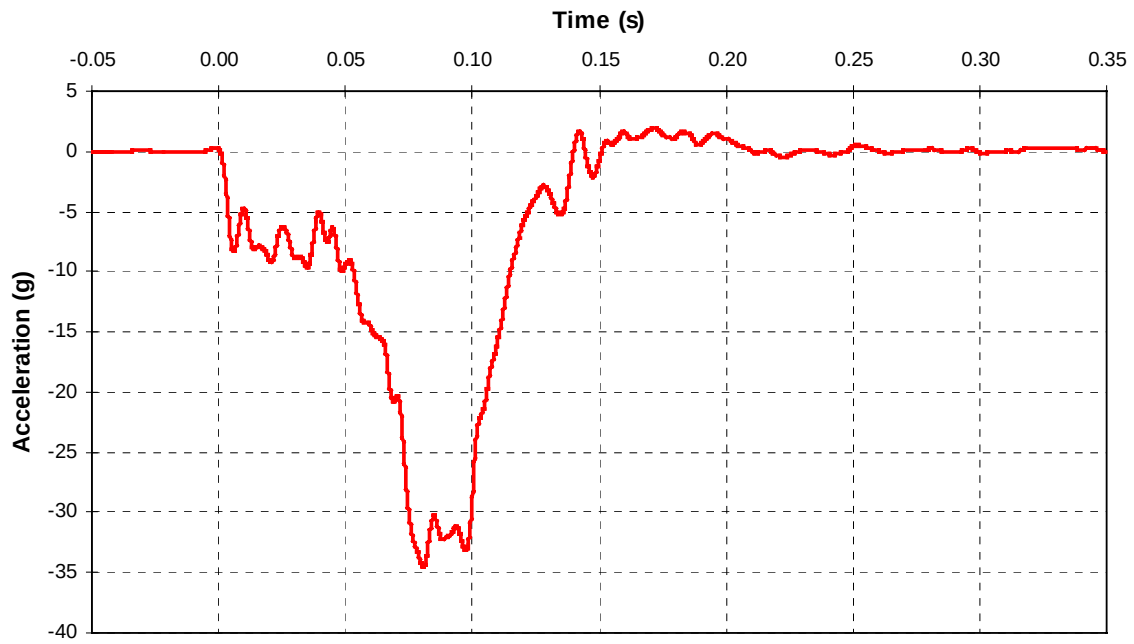


Graph Index

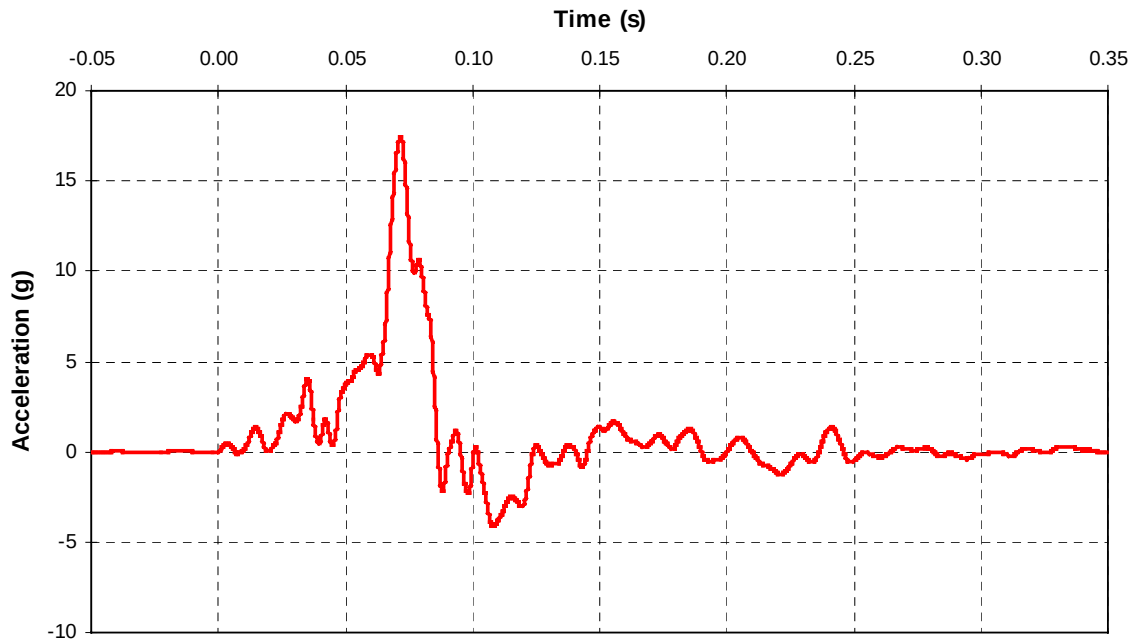
A-1	Vehicle longitudinal acceleration (X)
A-2	Vehicle lateral acceleration (Y)
A-3	Vehicle vertical acceleration (Z)
A-4	Vehicle vector resultant acceleration
A-5	Integration of vehicle longitudinal acceleration (X)
A-6	Head A-P acceleration (X)
A-7	Head L-M acceleration (Y)
A-8	Head I-S acceleration (Z)
A-9	Head vector resultant acceleration
A-10	Neck A-P force (X)
A-11	Neck axial force
A-12	Neck occipital A-P bending moment
A-13	Neck tension — force by duration analysis
A-14	Neck compression — force by duration analysis
A-15	Neck shear (positive) — force by duration analysis
A-16	Neck shear (negative) — force by duration analysis
A-17	Chest compression
A-18	Chest A-P acceleration (X)
A-19	Chest lateral acceleration (Y)
A-20	Chest I-S acceleration (Z)
A-21	Chest vector resultant acceleration
A-22	Sternum deflection rate
A-23	Left femur axial force
A-24	Left femur — force by duration analysis
A-25	Left tibia-femur displacement
A-26	Left upper tibia L-M bending moment
A-27	Left upper tibia A-P bending moment
A-28	Left upper tibia vector resultant bending moment
A-29	Left lower tibia L-M bending moment
A-30	Left lower tibia A-P bending moment
A-31	Left lower tibia vector resultant bending moment
A-32	Left lower tibia axial force
A-33	Left foot vector resultant acceleration
A-34	Left foot A-P acceleration
A-35	Left foot I-S acceleration
A-36	Right femur axial force
A-37	Right femur — force by duration analysis
A-38	Right tibia-femur displacement
A-39	Right upper tibia L-M bending moment
A-40	Right upper tibia A-P bending moment
A-41	Right upper tibia vector resultant bending moment
A-42	Right lower tibia L-M bending moment
A-43	Right lower tibia A-P bending moment
A-44	Right lower tibia vector resultant bending moment
A-45	Right lower tibia axial force
A-46	Right foot vector resultant acceleration

A-47 Right foot A-P acceleration
A-48 Right foot I-S acceleration

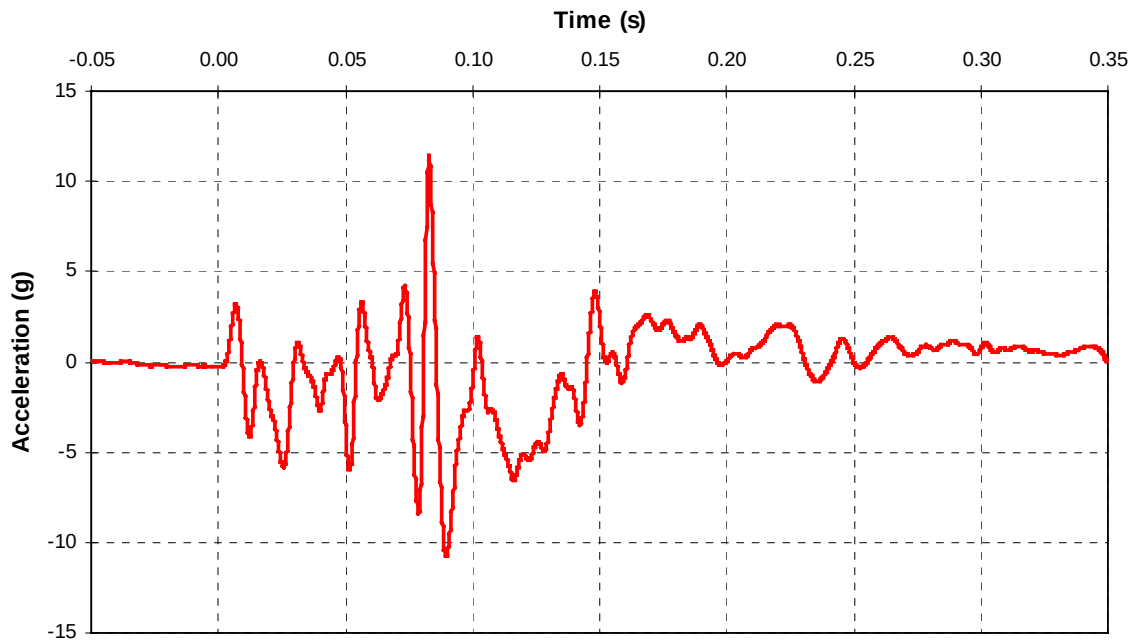
A- 1 CF00012 2000 Toyota Avalon Vehicle Longitudinal Acceleration



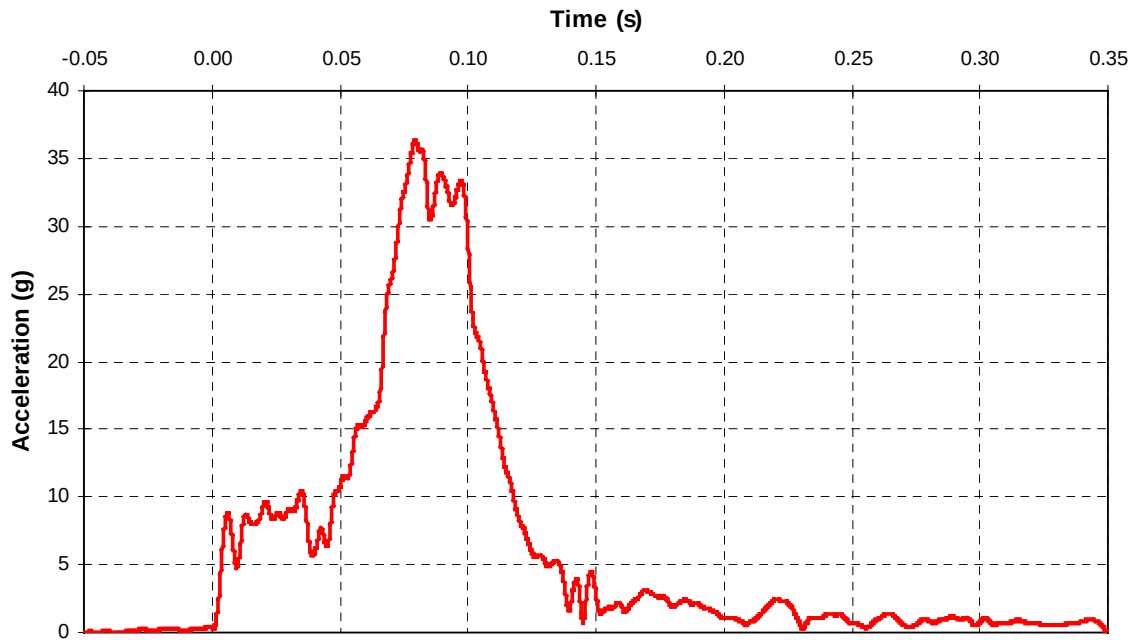
A- 2 CF00012 2000 Toyota Avalon Vehicle Lateral Acceleration



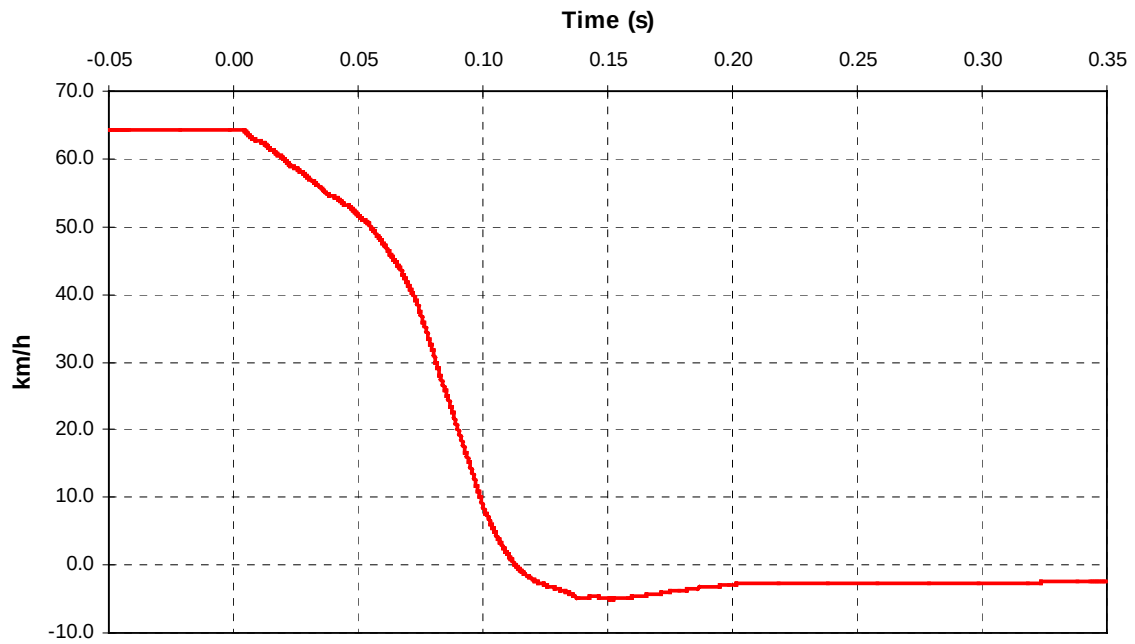
A- 3 CF00012 2000 Toyota Avalon Vehicle Vertical Acceleration



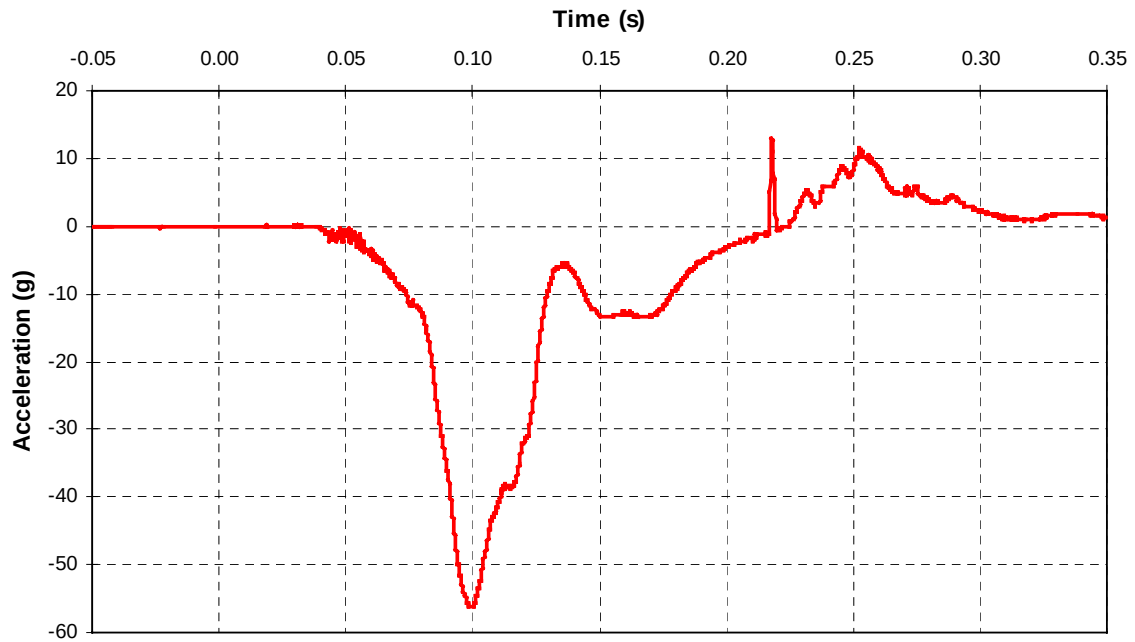
A- 4 CF00012 2000 Toyota Avalon Vehicle Vector Resultant Acceleration



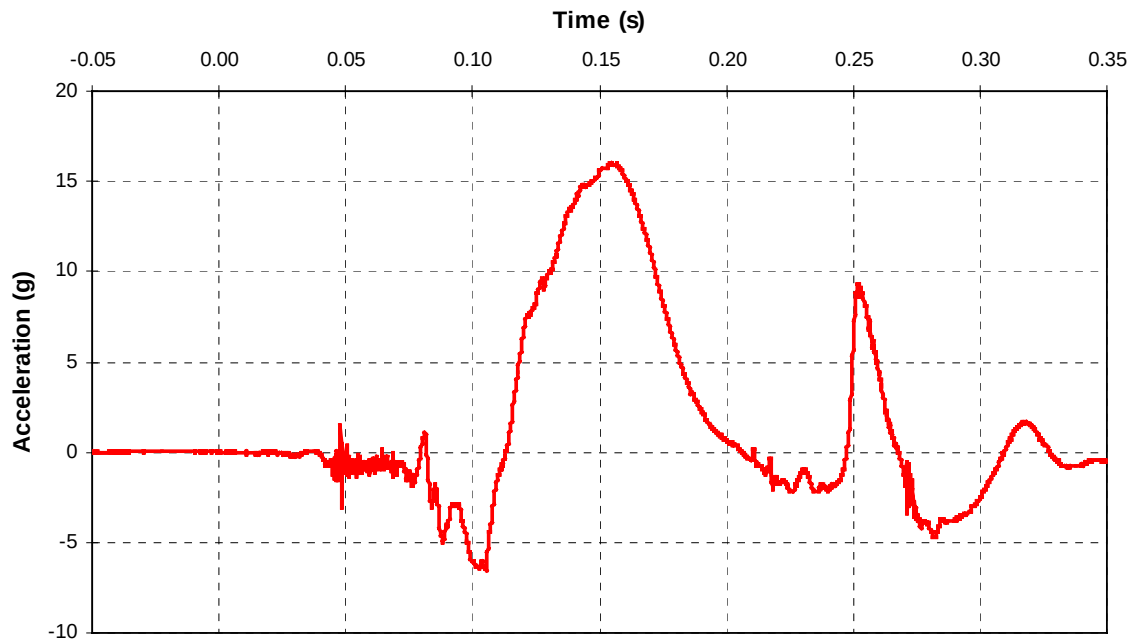
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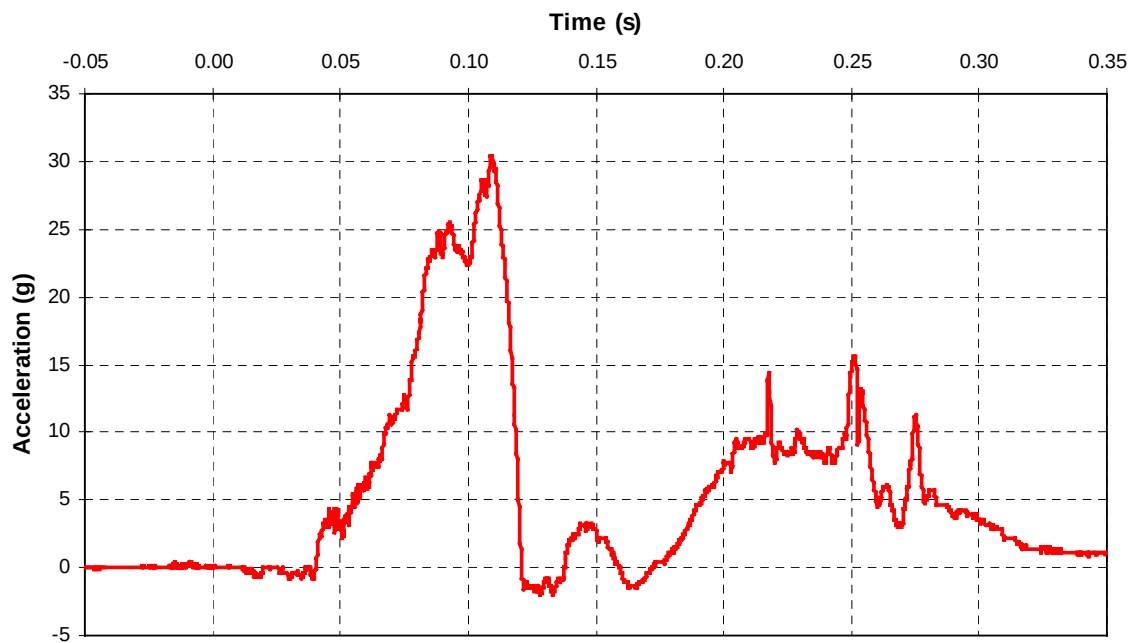
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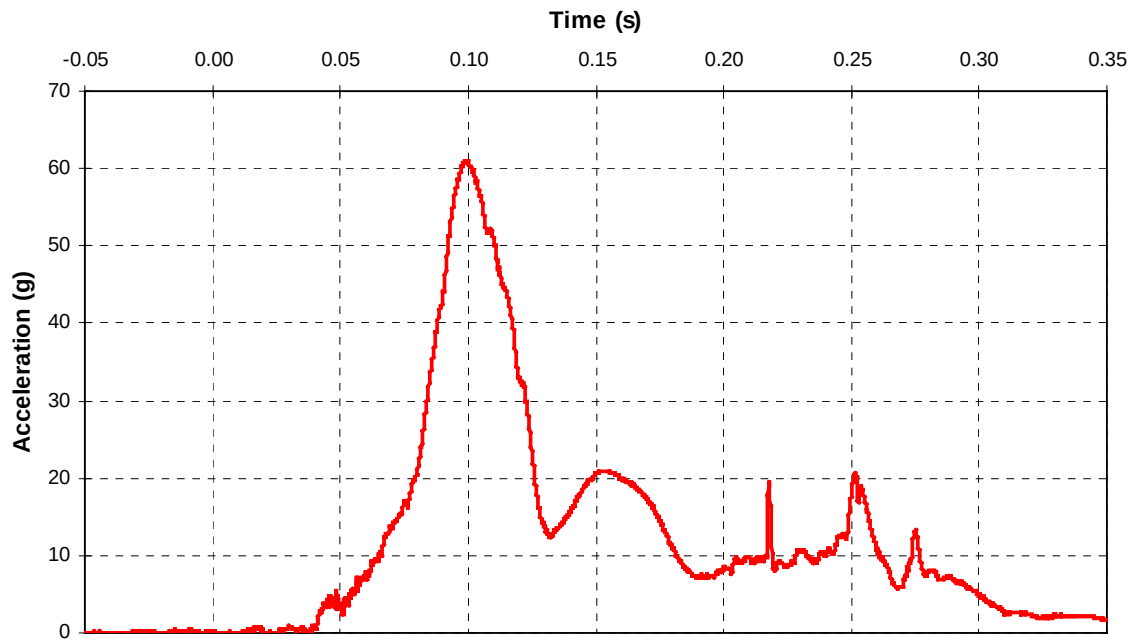
A- 7 CF00012 2000 Toyota Avalon Head L-M Acceleration



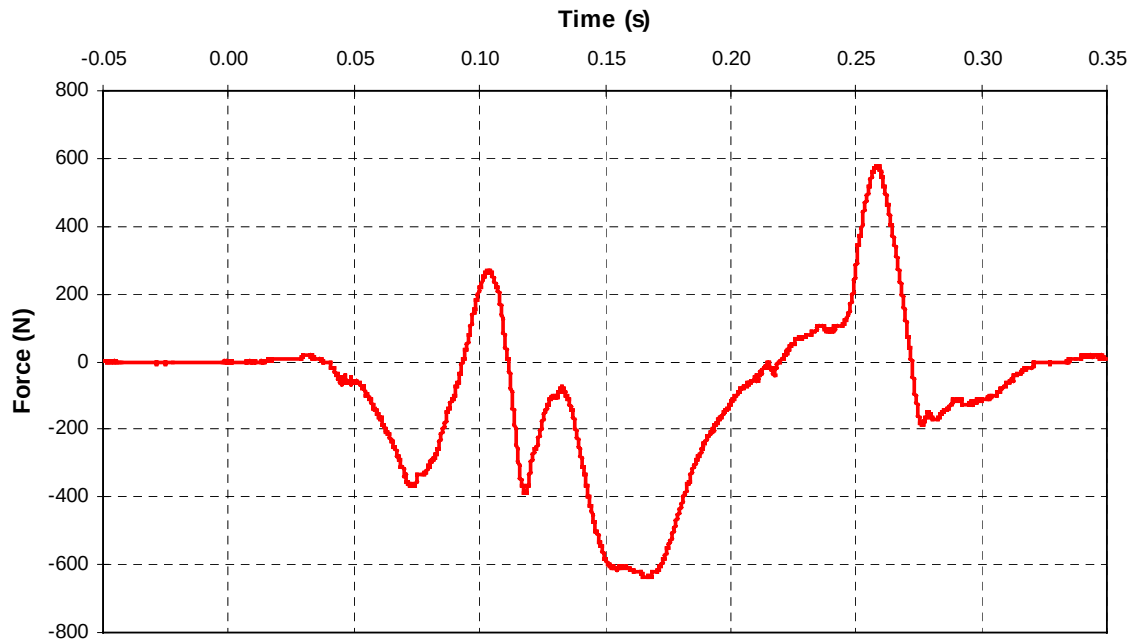
A- 8 CF00012 2000 Toyota Avalon Head I-S Acceleration



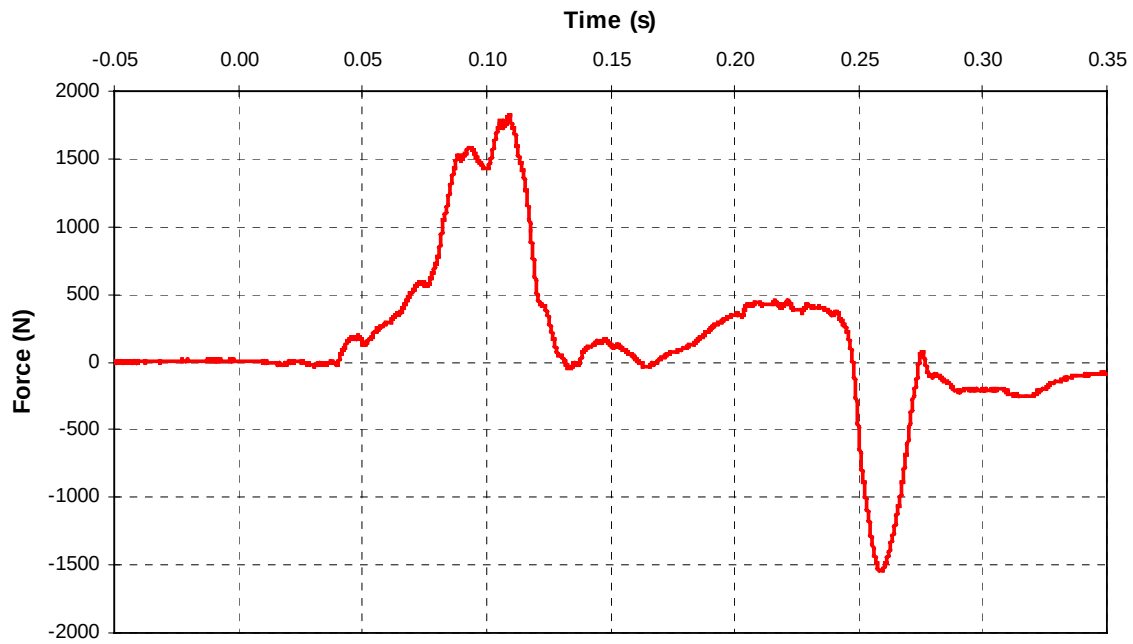
A- 9 CF00012 2000 Toyota Avalon Head Vector Resultant Acceleration



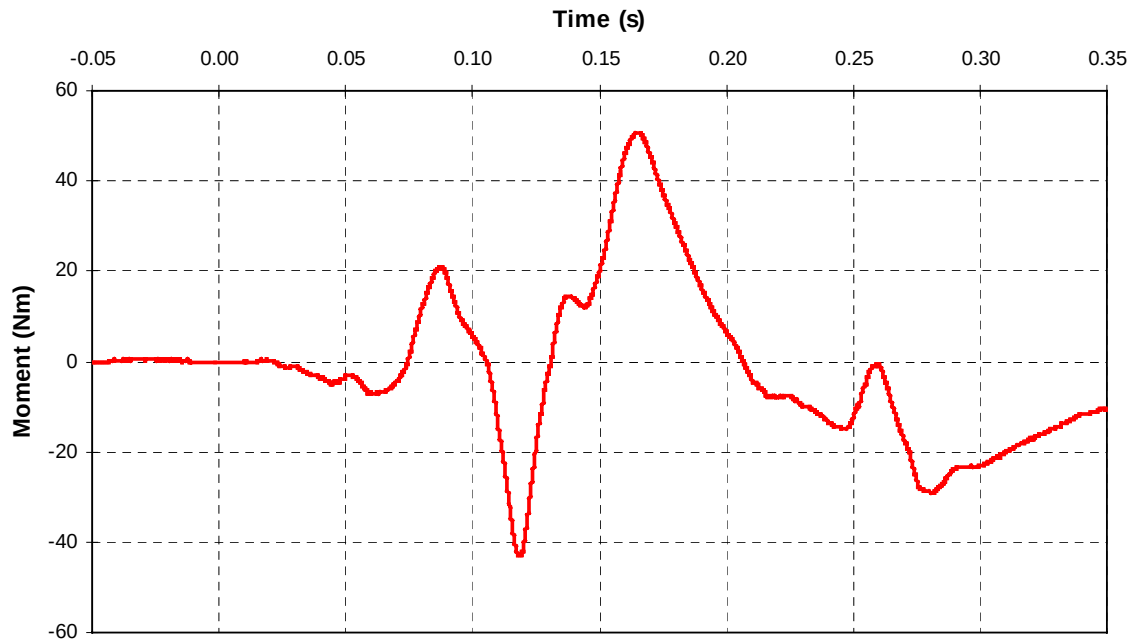
A- 10 CF00012 2000 Toyota Avalon Neck A-P Shear Force



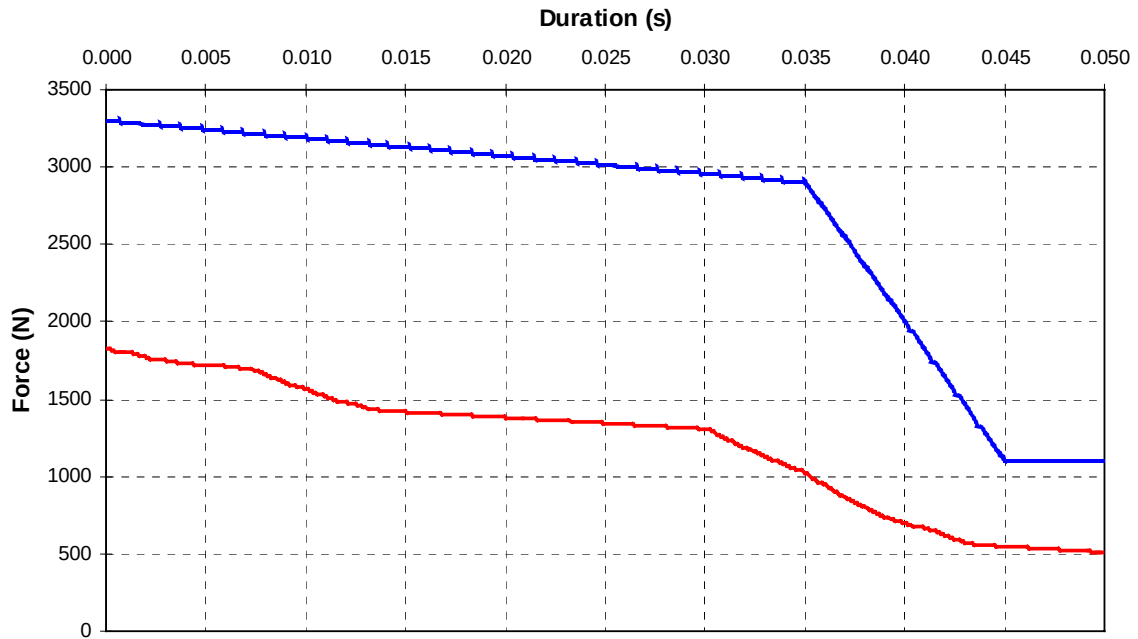
A- 11 CF00012 2000 Toyota Avalon Neck Axial Force



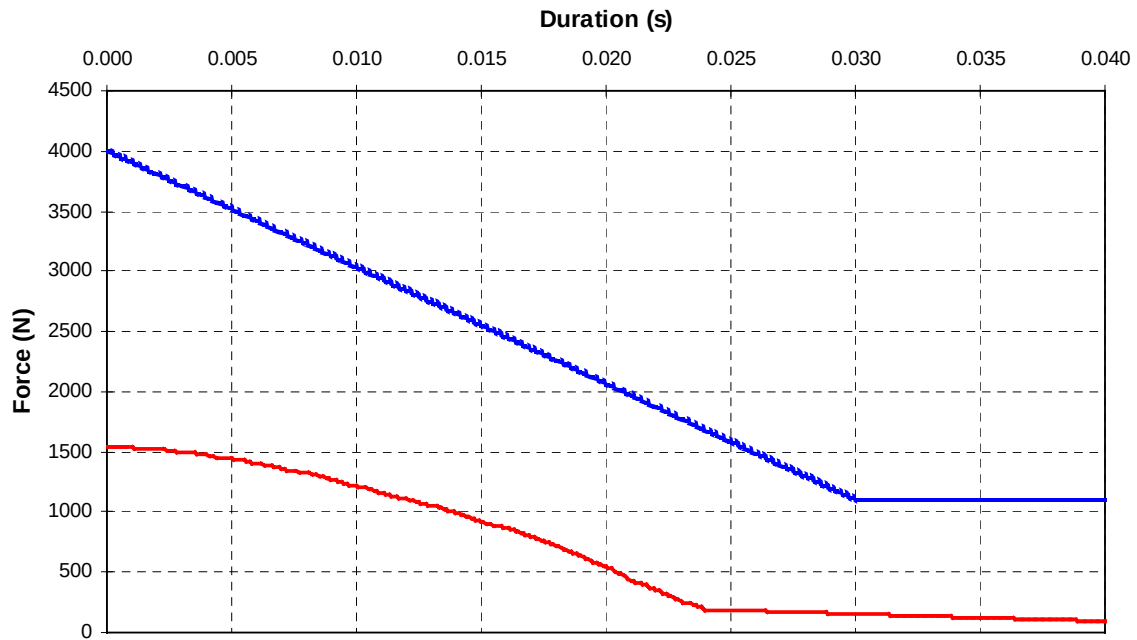
A- 12 CF00012 2000 Toyota Avalon Neck Occipital A-P Moment



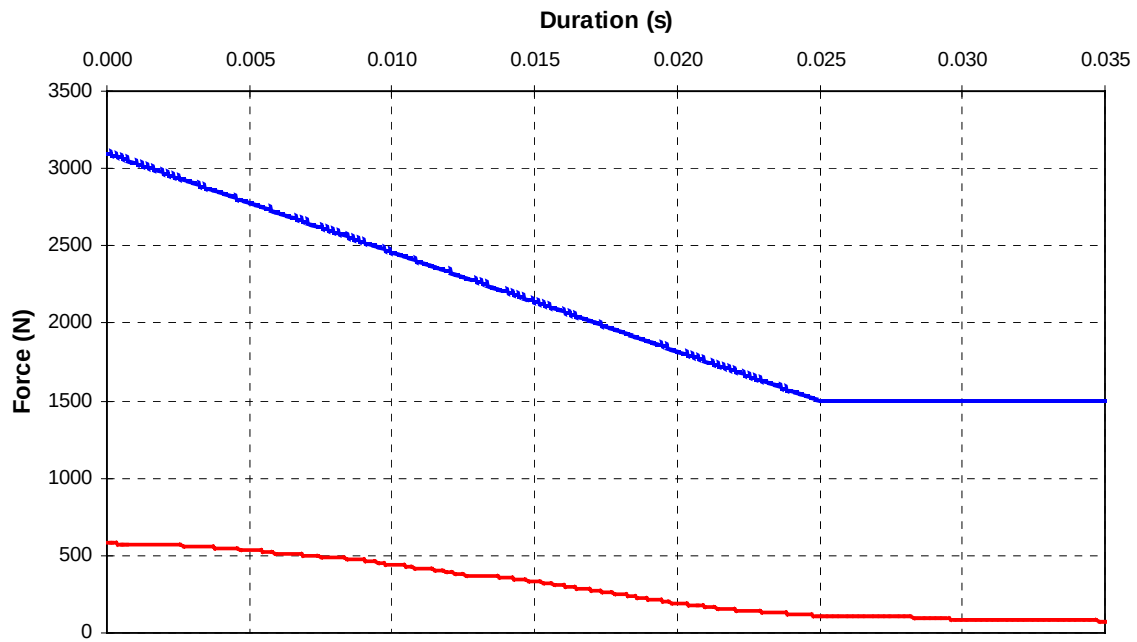
A- 13 CF00012 2000 Toyota Avalon Neck Tension Analysis



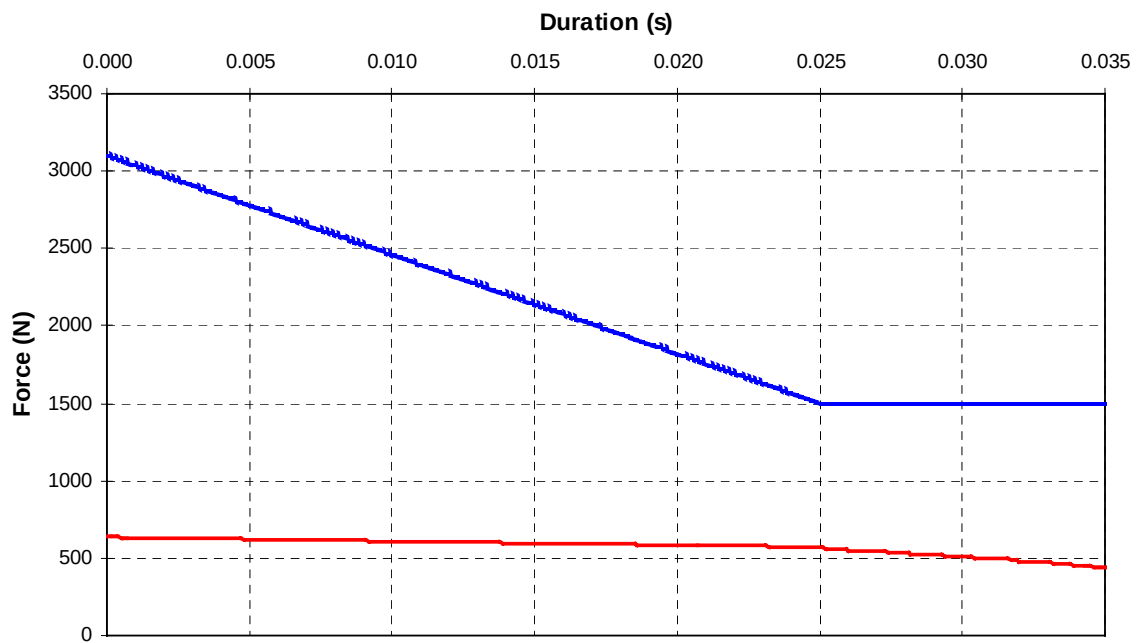
A- 14 CF00012 2000 Toyota Avalon Neck Compression Analysis



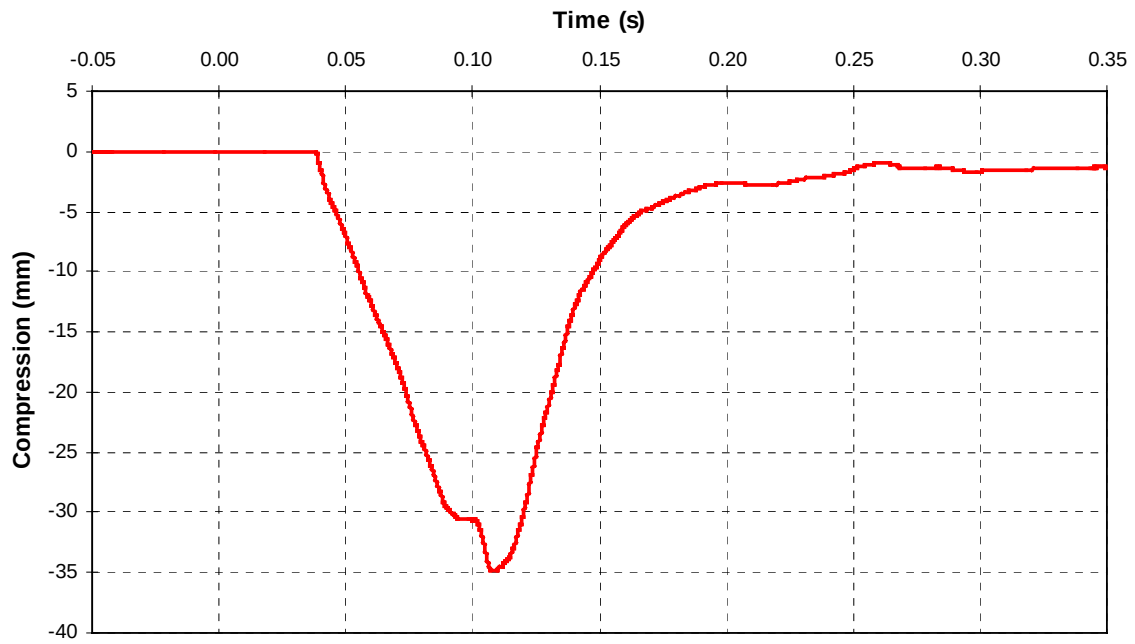
A- 15 CF00012 2000 Toyota Avalon Neck A-P Shear (Positive) Analysis



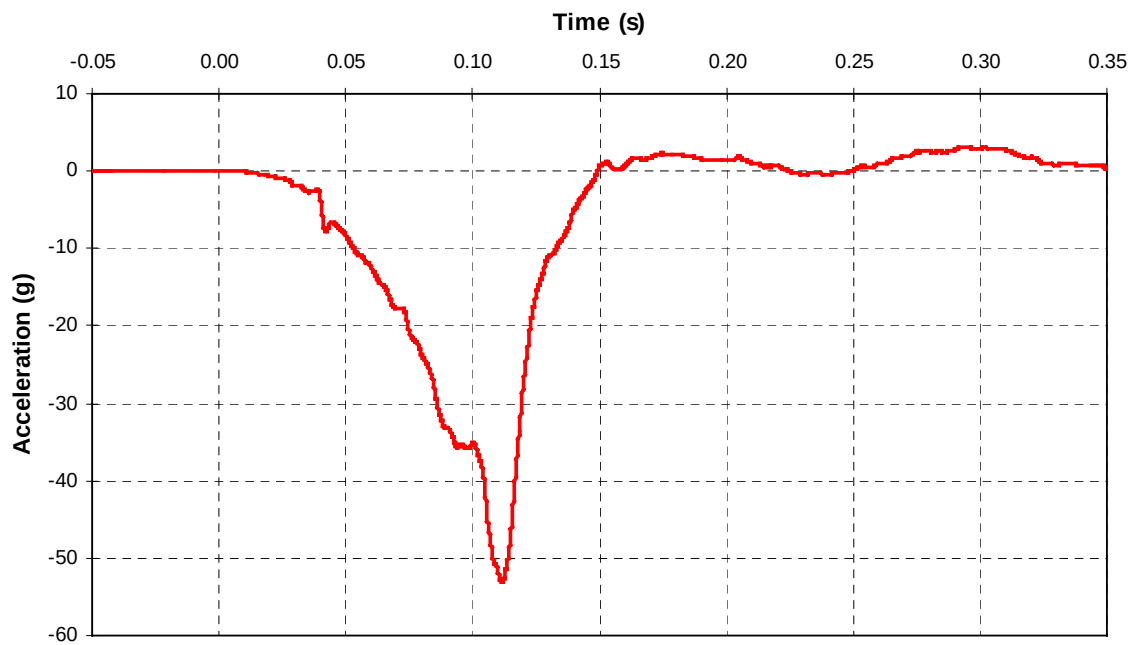
A- 16 CF00012 2000 Toyota Avalon Neck A-P Shear (Negative) Analysis



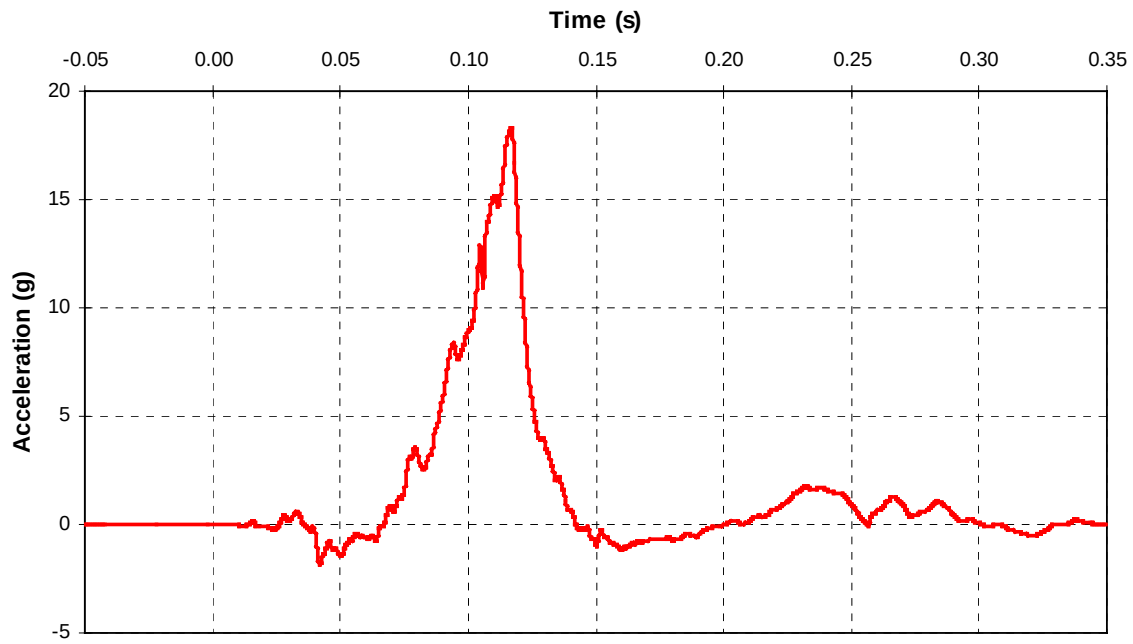
A- 17 CF00012 2000 Toyota Avalon Chest Compression



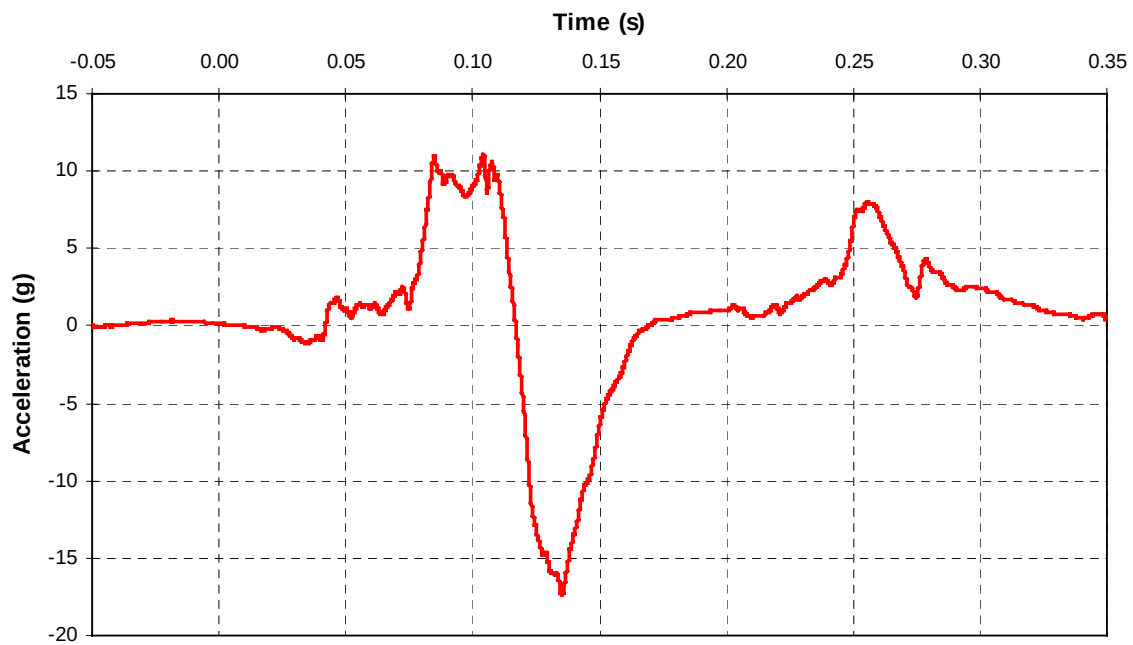
A- 18 CF00012 2000 Toyota Avalon Chest A-P Acceleration



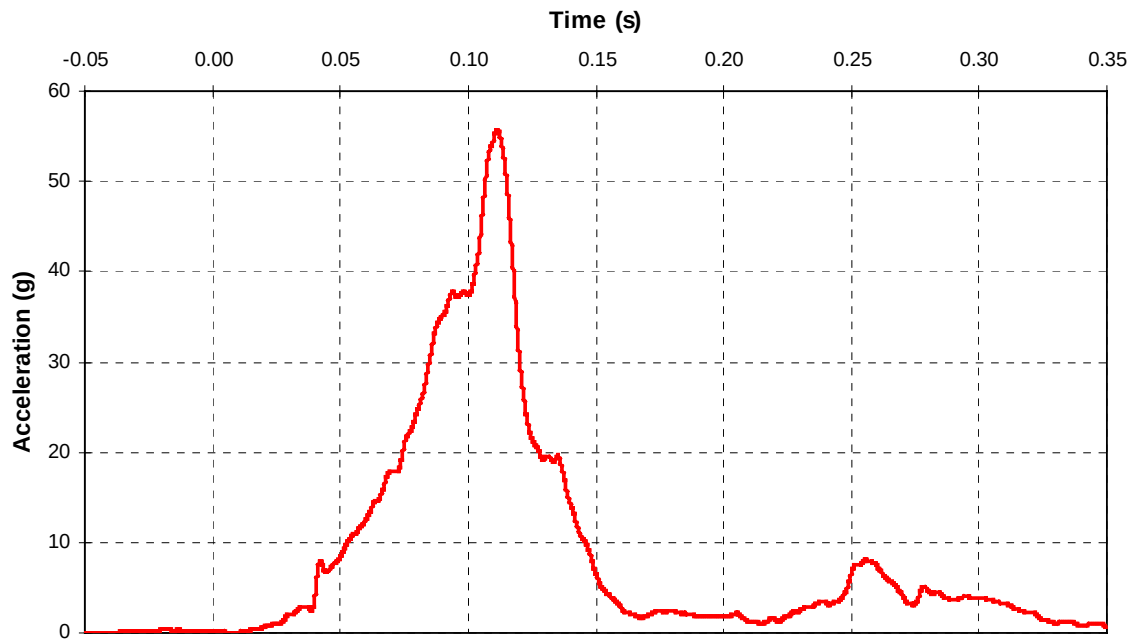
A- 19 CF00012 2000 Toyota Avalon Chest L-M Acceleration



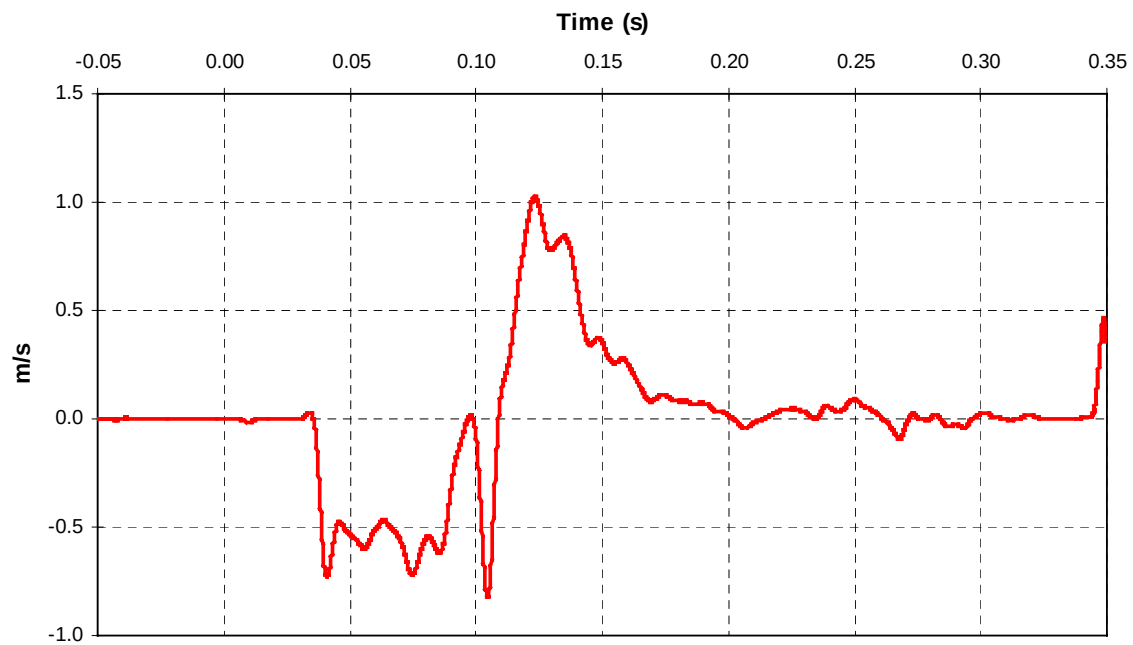
A- 20 CF00012 2000 Toyota Avalon Chest I-S Acceleration



A- 21 CF00012 2000 Toyota Avalon Chest Vector Resultant Acceleration

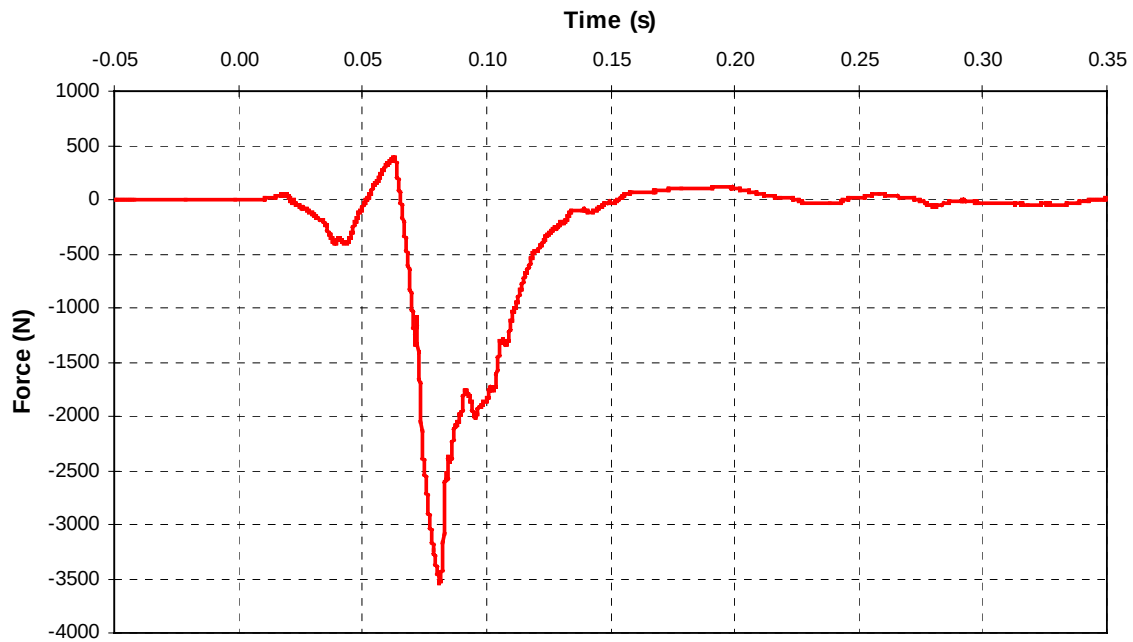


A- 22 CF00012 2000 Toyota Avalon Sternum Deflection Rate

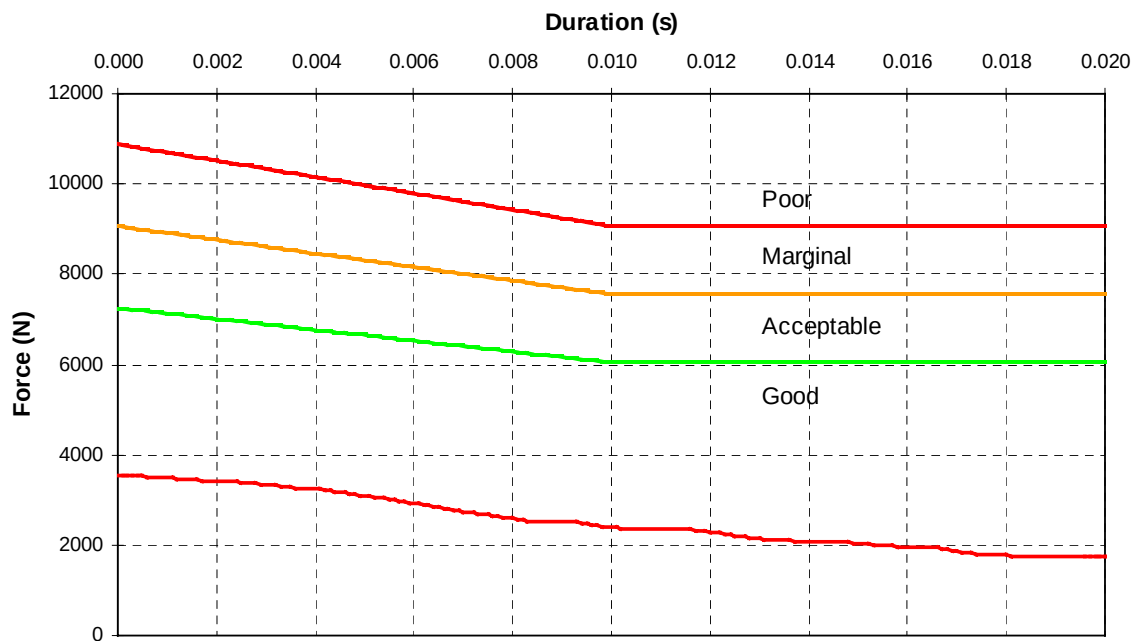


Sternum deflection rate is calculated from the sternum deflection filtered to CFC 60

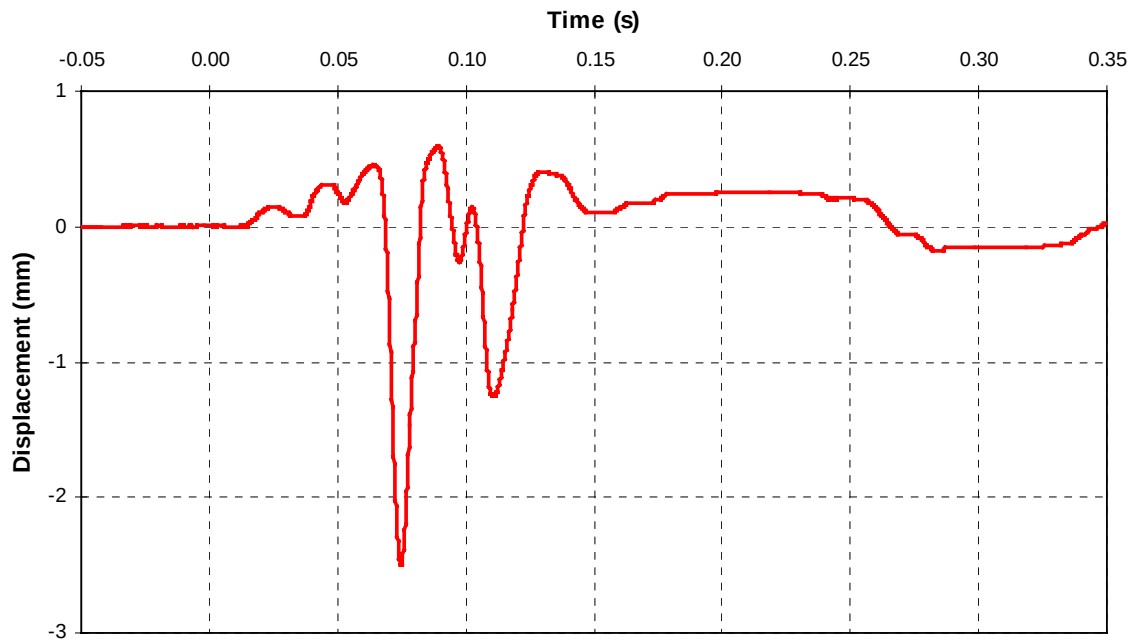
A- 23 CF00012 2000 Toyota Avalon Left Femur Axial Force



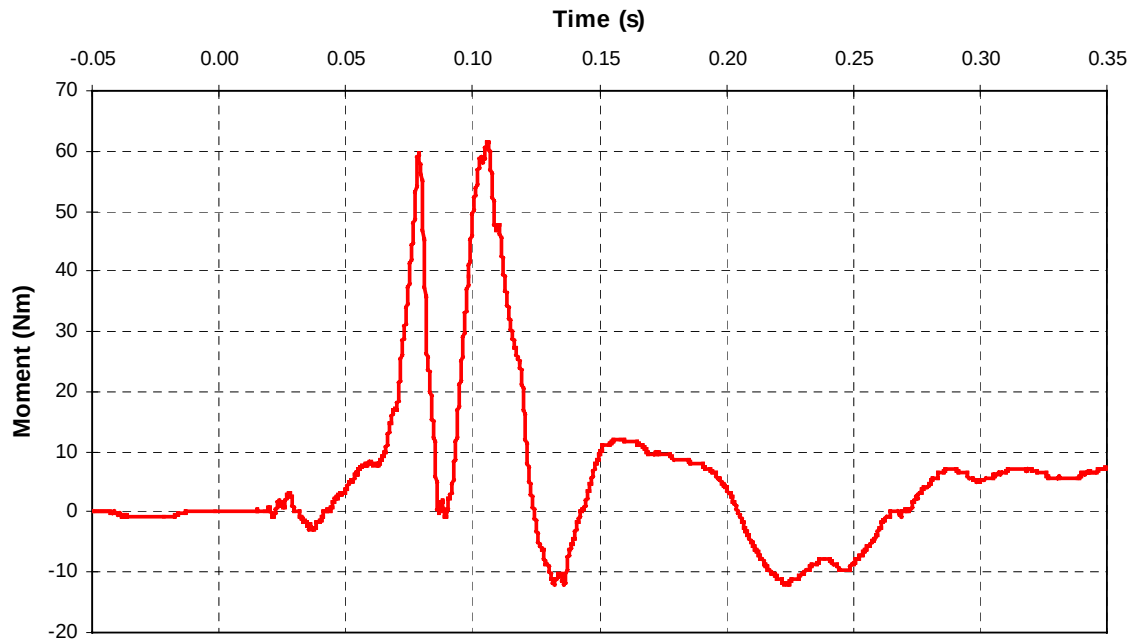
A- 24 CF00012 2000 Toyota Avalon Left Femur Axial Force Analysis



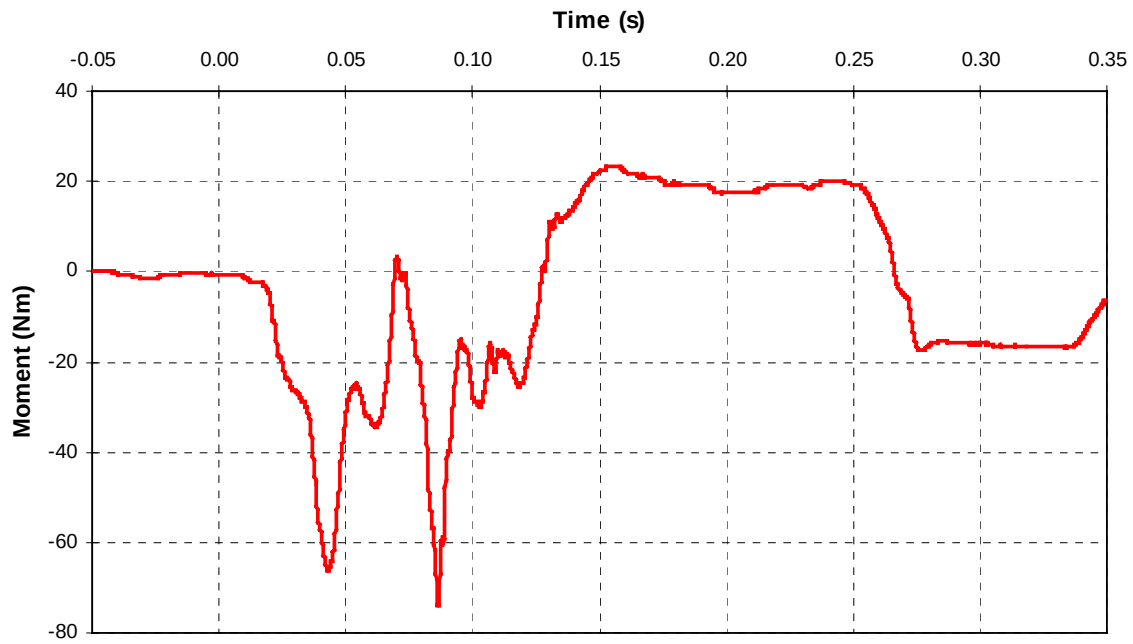
A- 25 CF00012 2000 Toyota Avalon Left Tibia-Femur Displacement



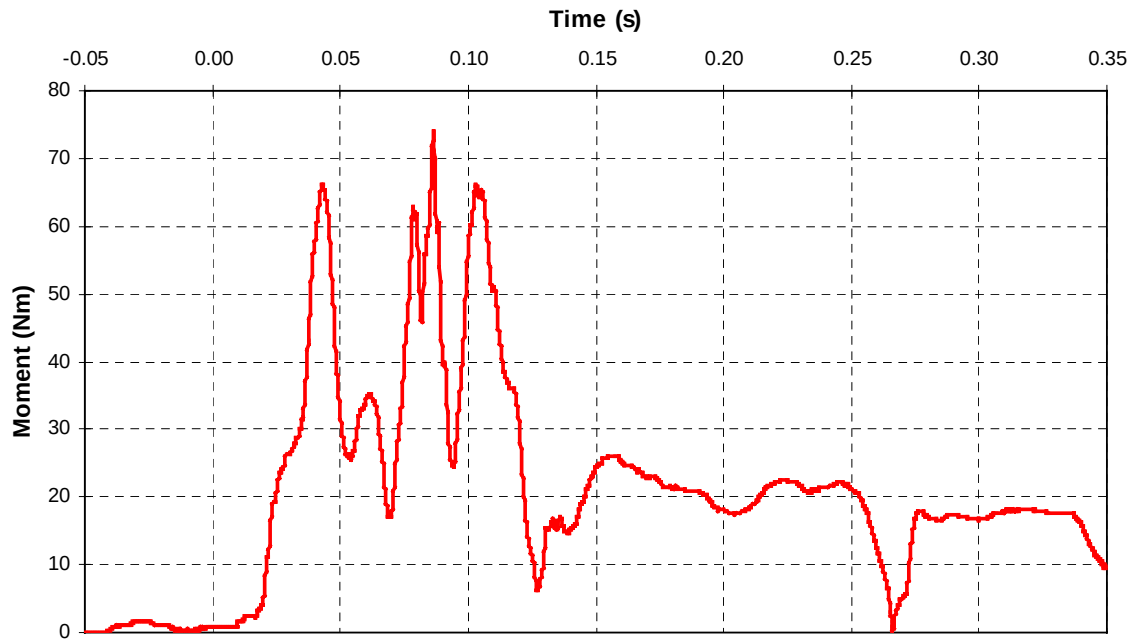
A- 26 CF00012 2000 Toyota Avalon Left Upper Tibia L-M Moment



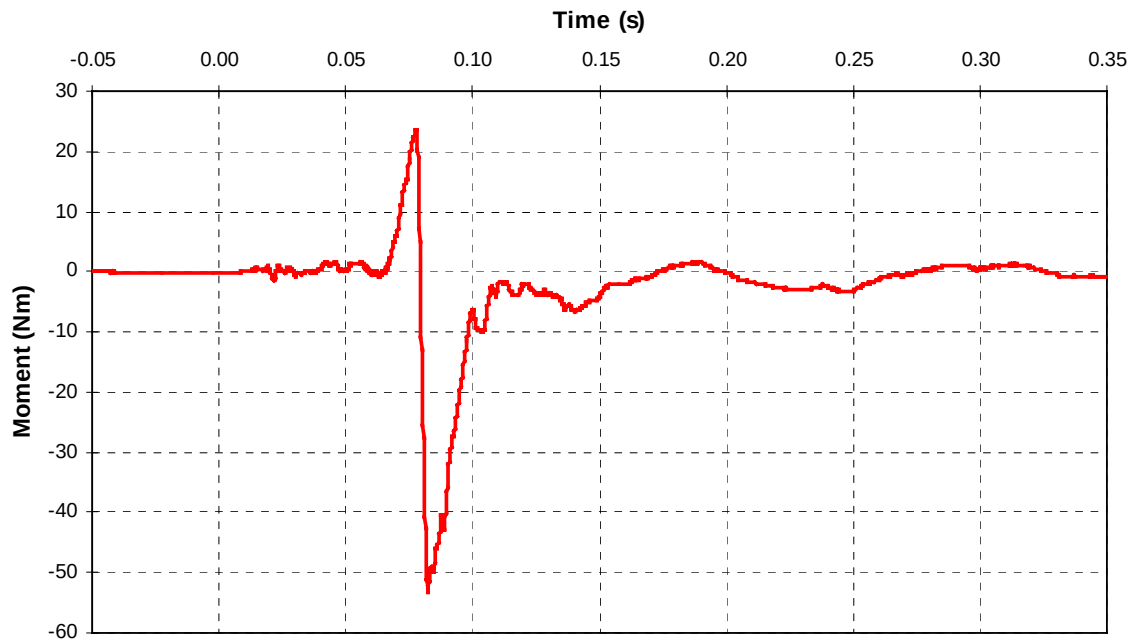
A- 27 CF00012 2000 Toyota Avalon Left Upper Tibia A-P Moment



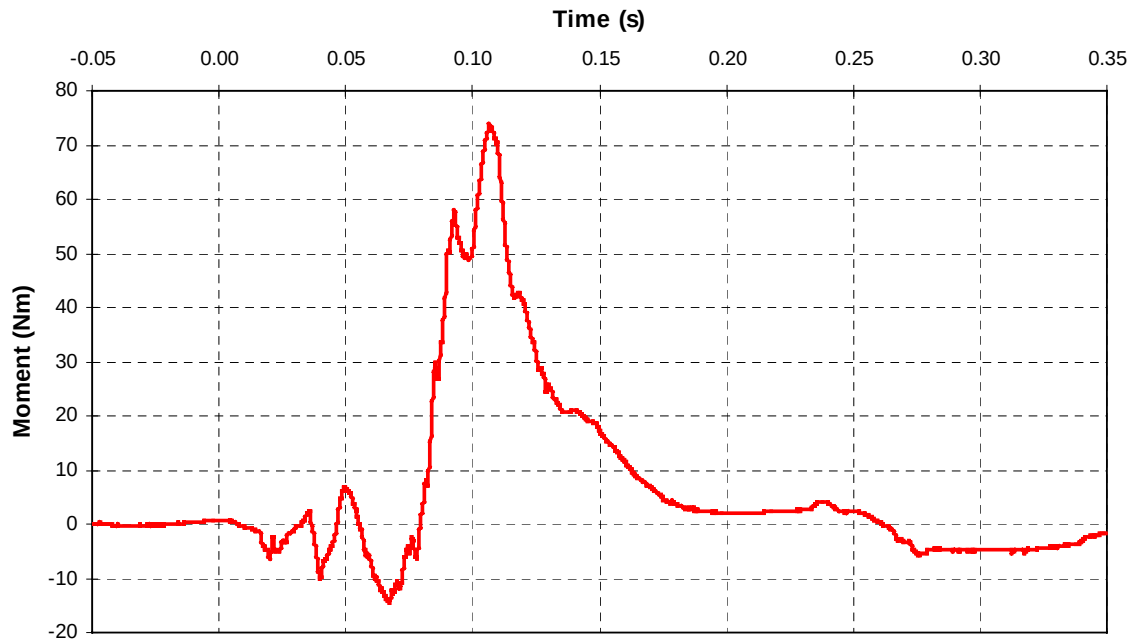
A- 28 CF00012 2000 Toyota Avalon Left Upper Tibia Vector Resultant Moment



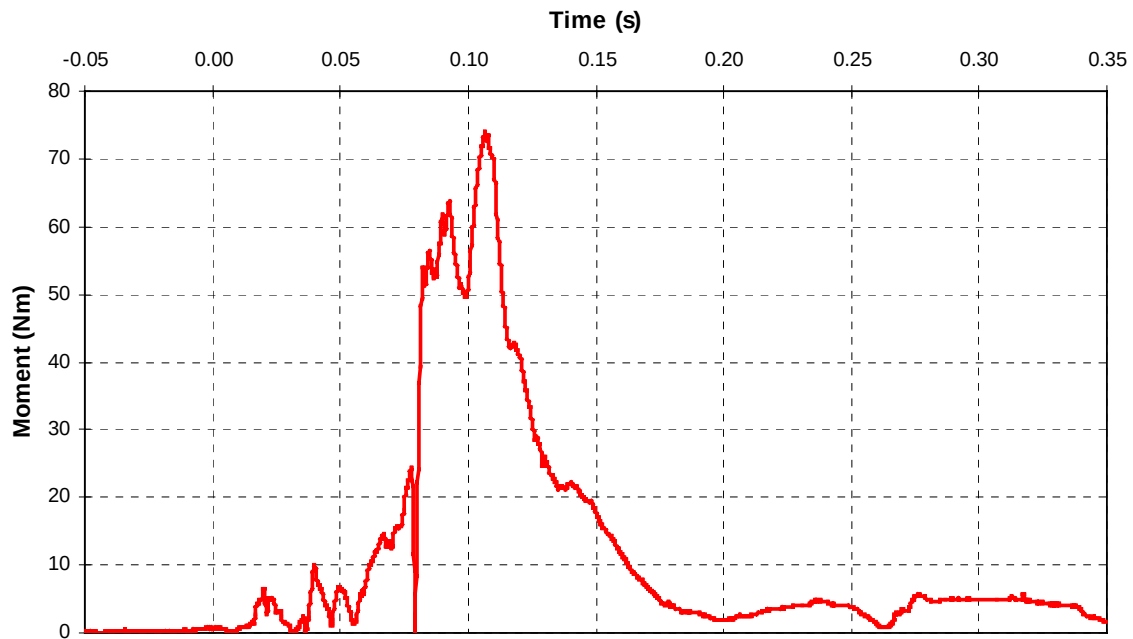
A- 29 CF00012 2000 Toyota Avalon Left Lower Tibia L-M Moment



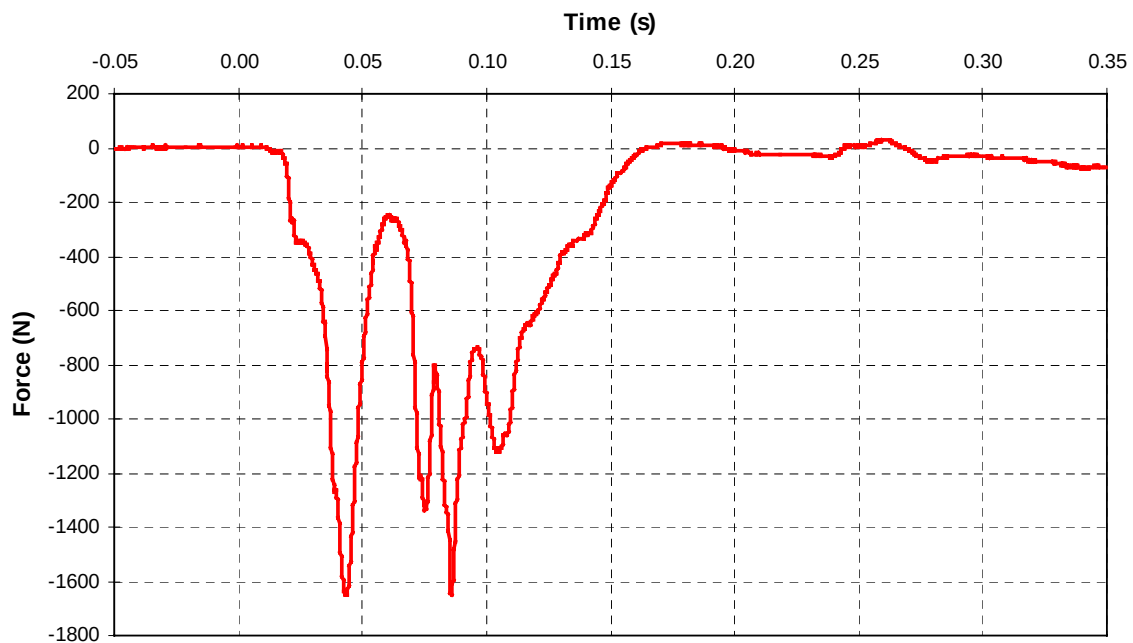
A- 30 CF00012 2000 Toyota Avalon Left Lower Tibia A-P Moment



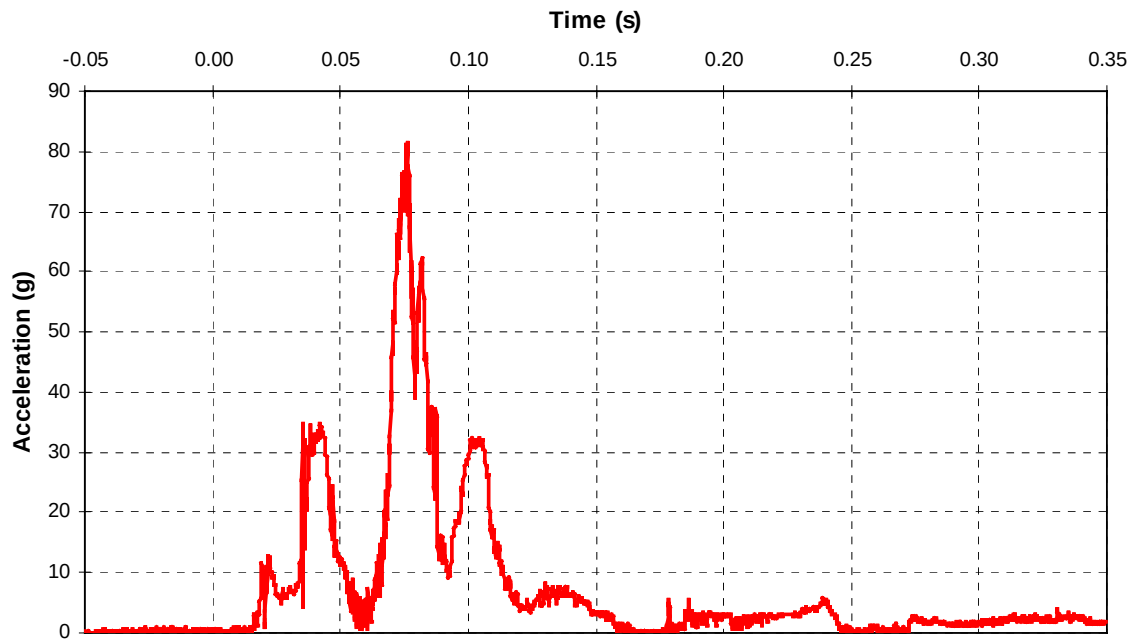
A- 31 CF00012 2000 Toyota Avalon Left Lower Tibia Vector Resultant Moment



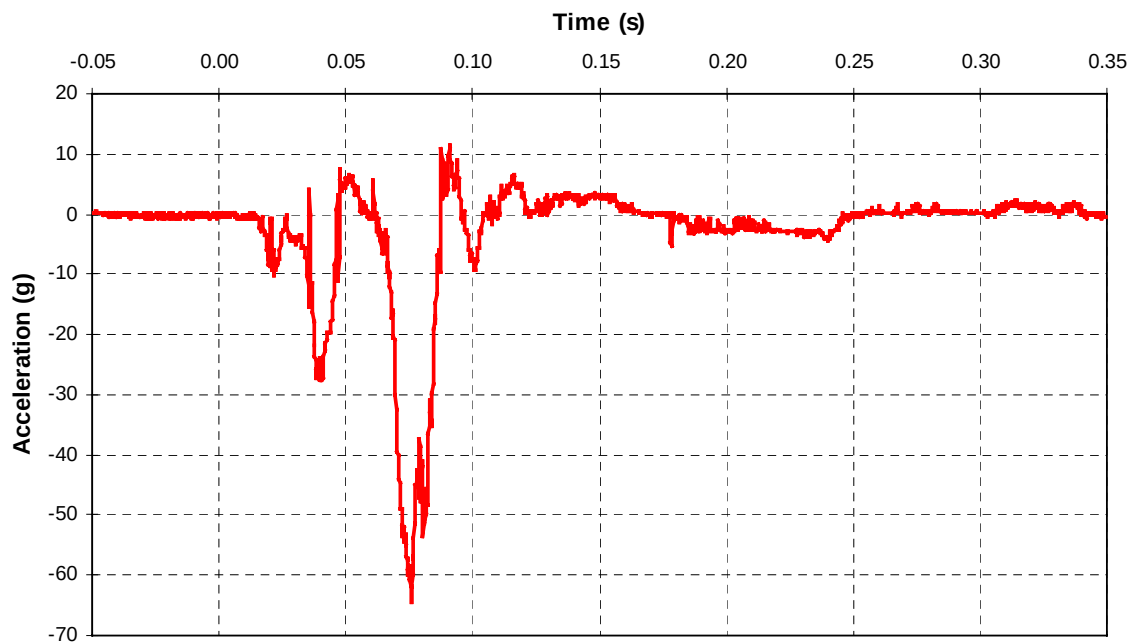
A- 32 CF00012 2000 Toyota Avalon Left Lower Tibia Axial Force



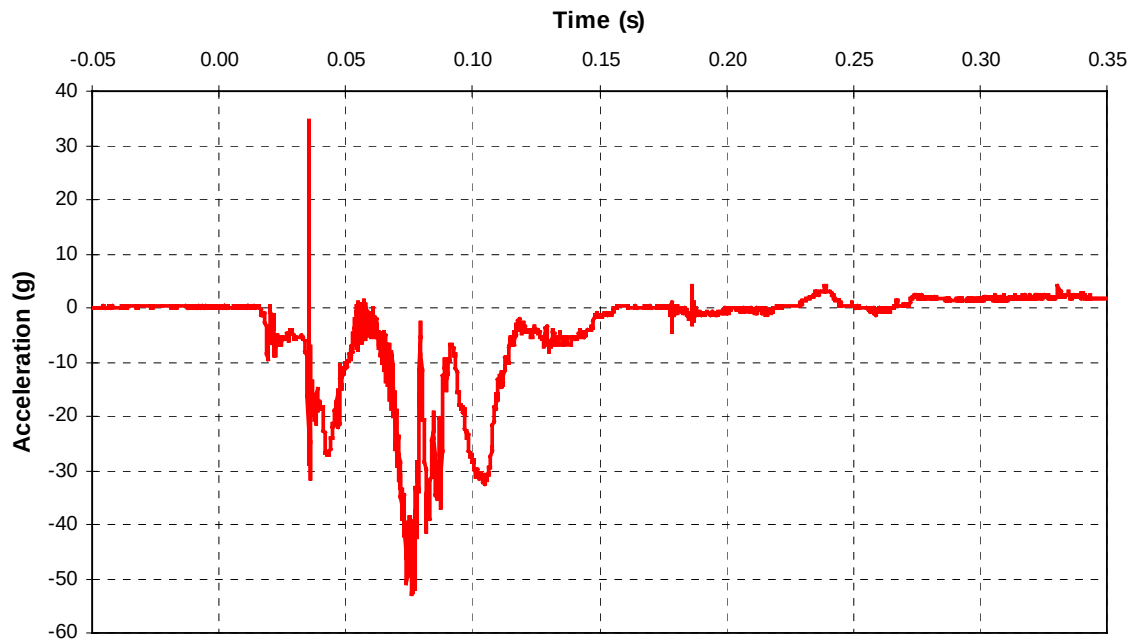
A- 33 CF00012 2000 Toyota Avalon Left Foot Vector Resultant Acceleration



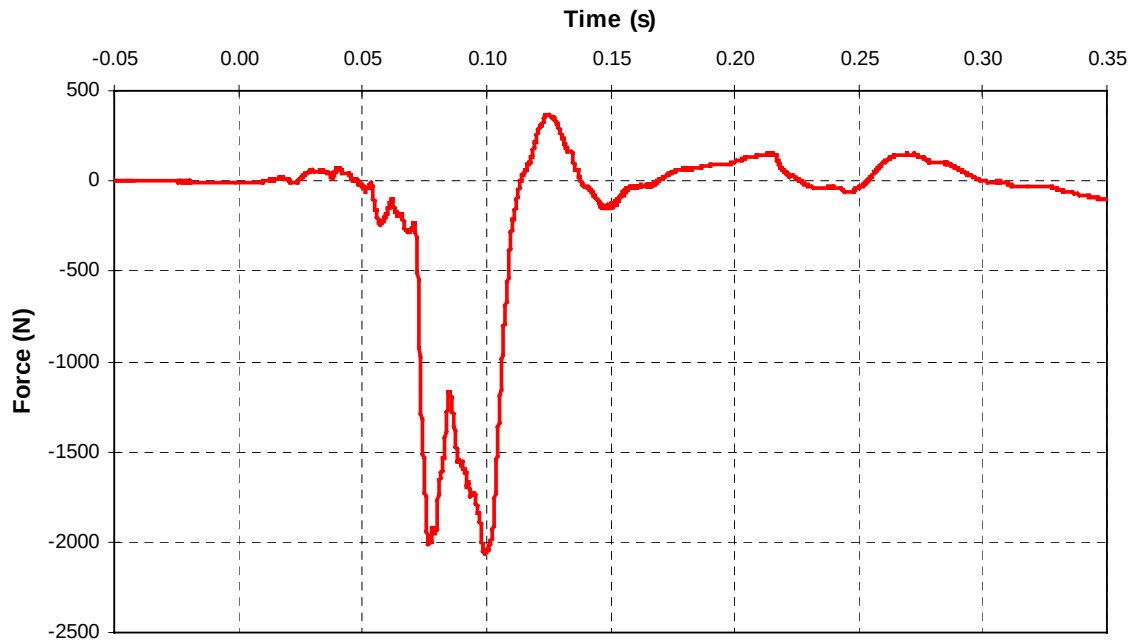
A- 34 CF00012 2000 Toyota Avalon Left Foot A-P Acceleration



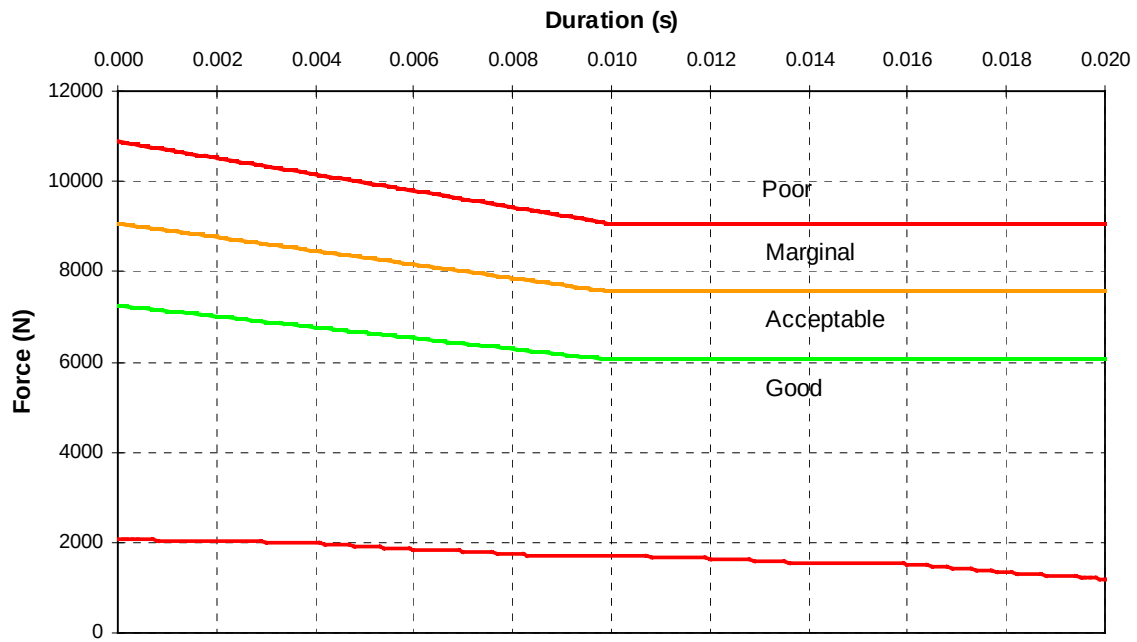
A- 35 CF00012 2000 Toyota Avalon Left Foot I-S Acceleration



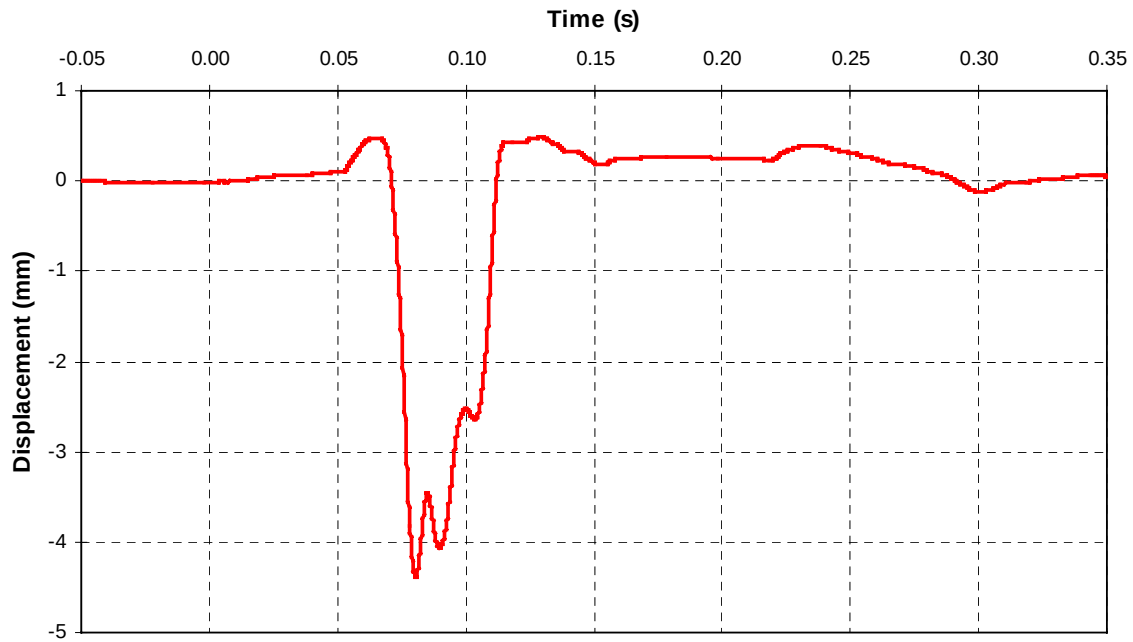
A- 36 CF00012 2000 Toyota Avalon Right Femur Axial Force



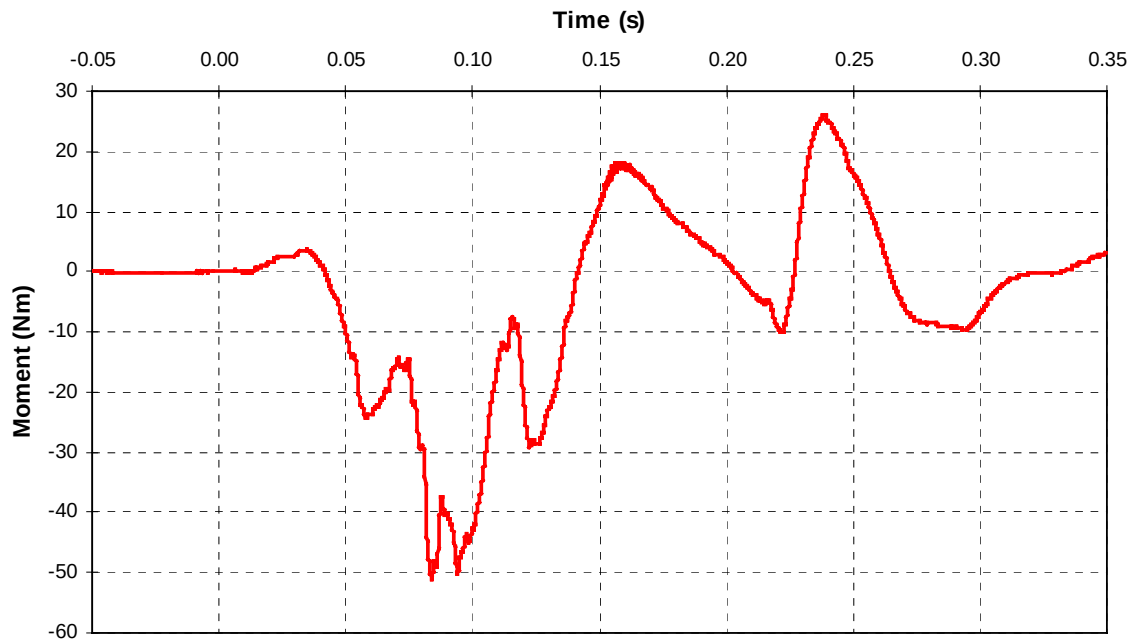
A- 37 CF00012 2000 Toyota Avalon Right Femur Axial Force Analysis



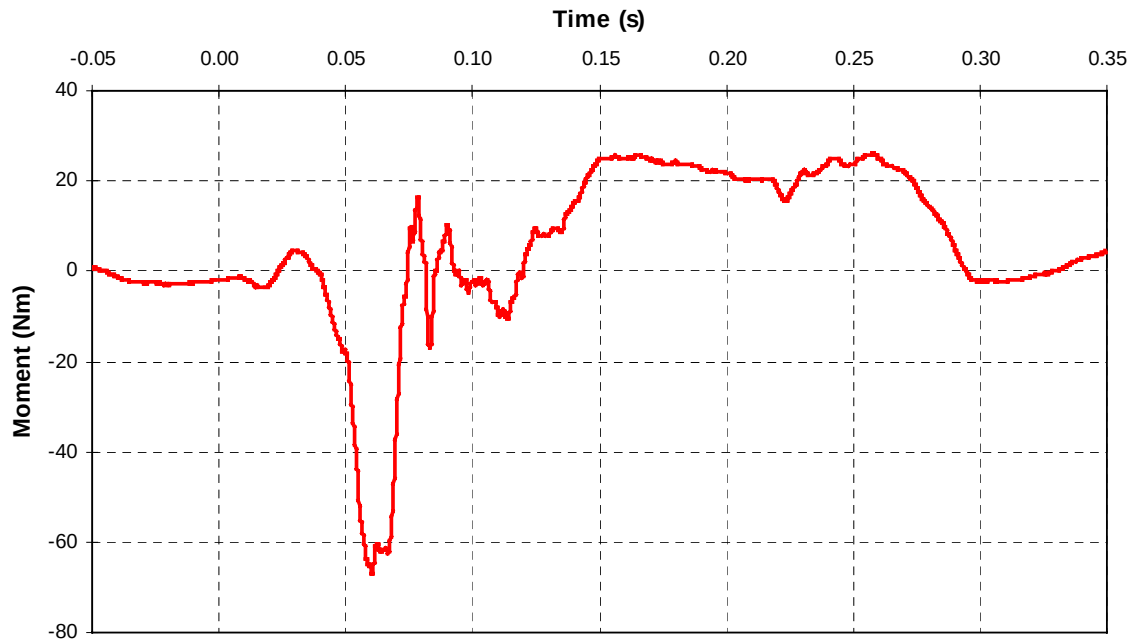
A- 38 CF00012 2000 Toyota Avalon Right Tibia-Femur Displacement



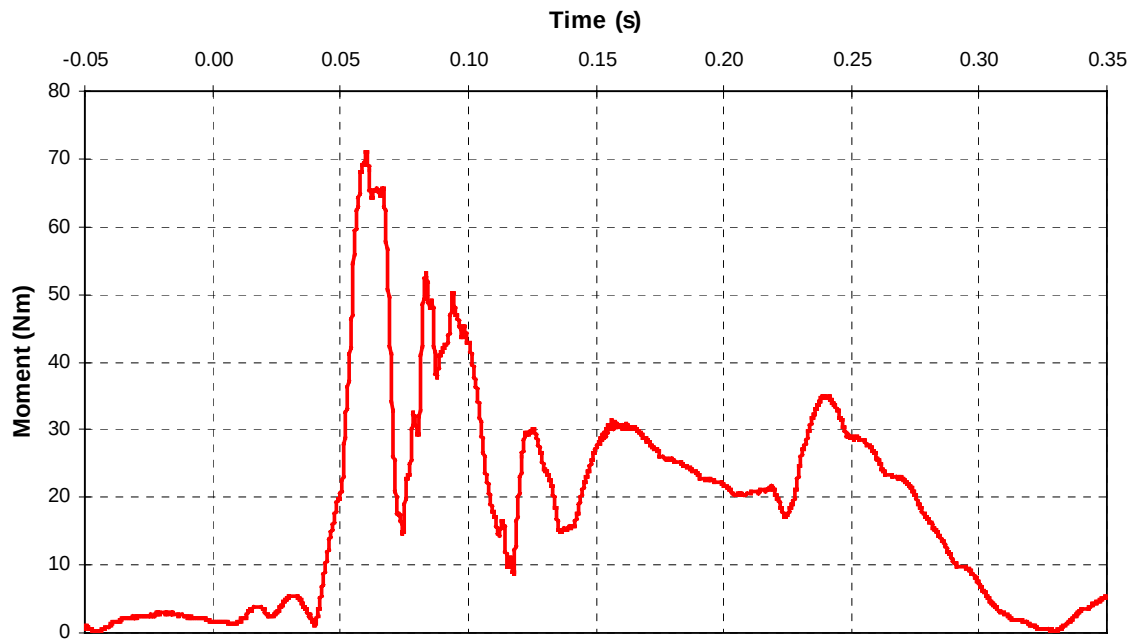
A- 39 CF00012 2000 Toyota Avalon Right Upper Tibia L-M Moment



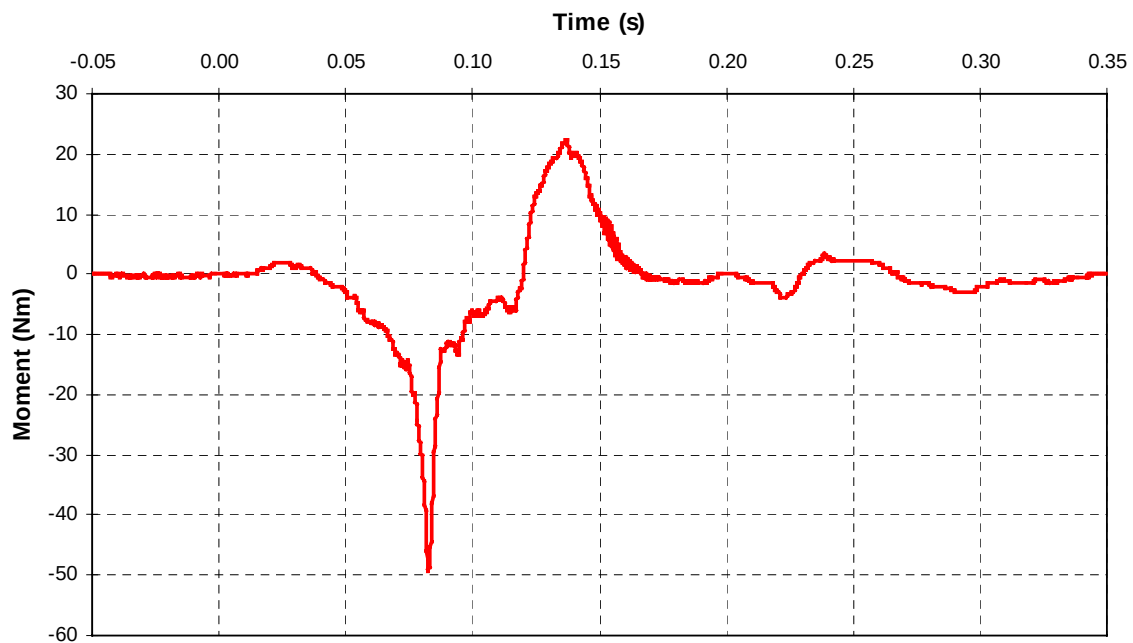
A- 40 CF00012 2000 Toyota Avalon Right Upper Tibia A-P Moment



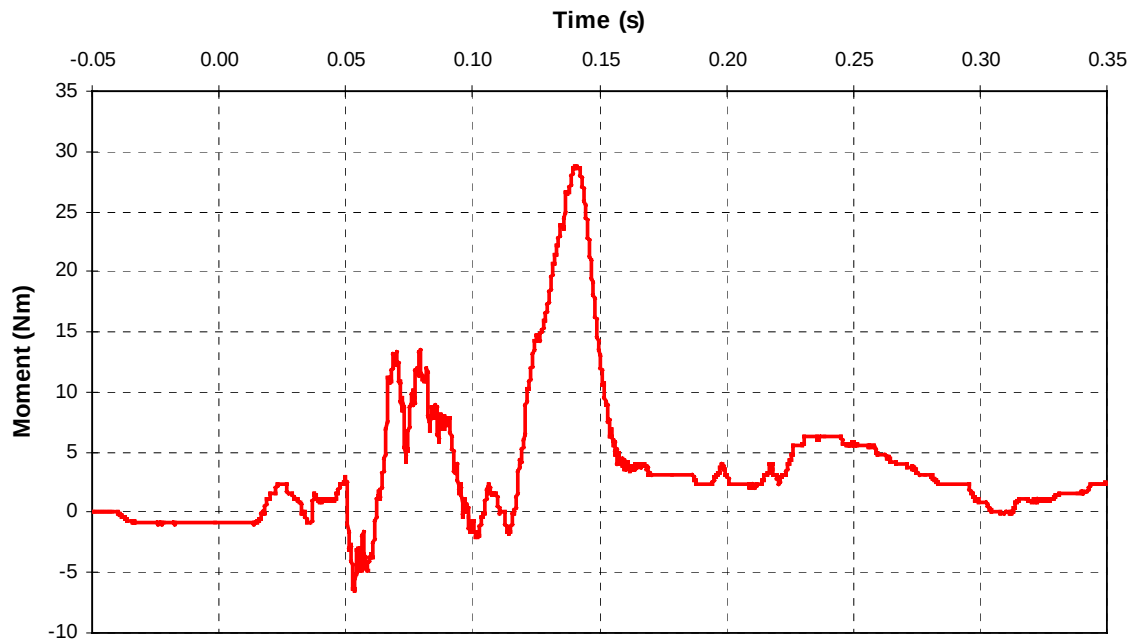
A- 41 CF00012 2000 Toyota Avalon Right Upper Tibia Vector Resultant Moment



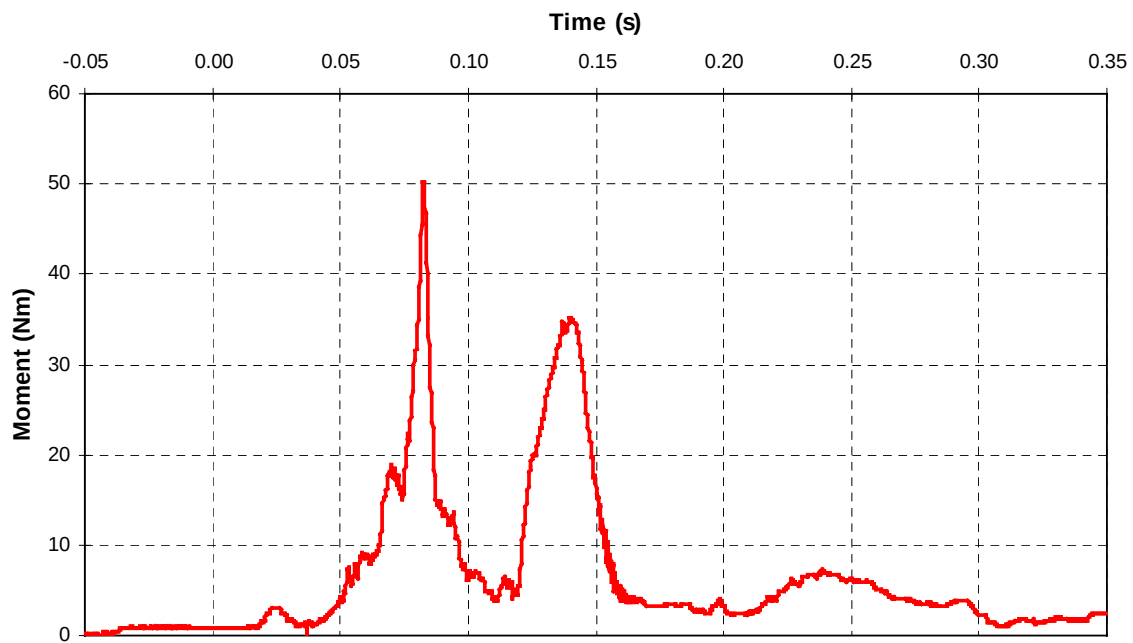
A- 42 CF00012 2000 Toyota Avalon Right Lower Tibia L-M Moment



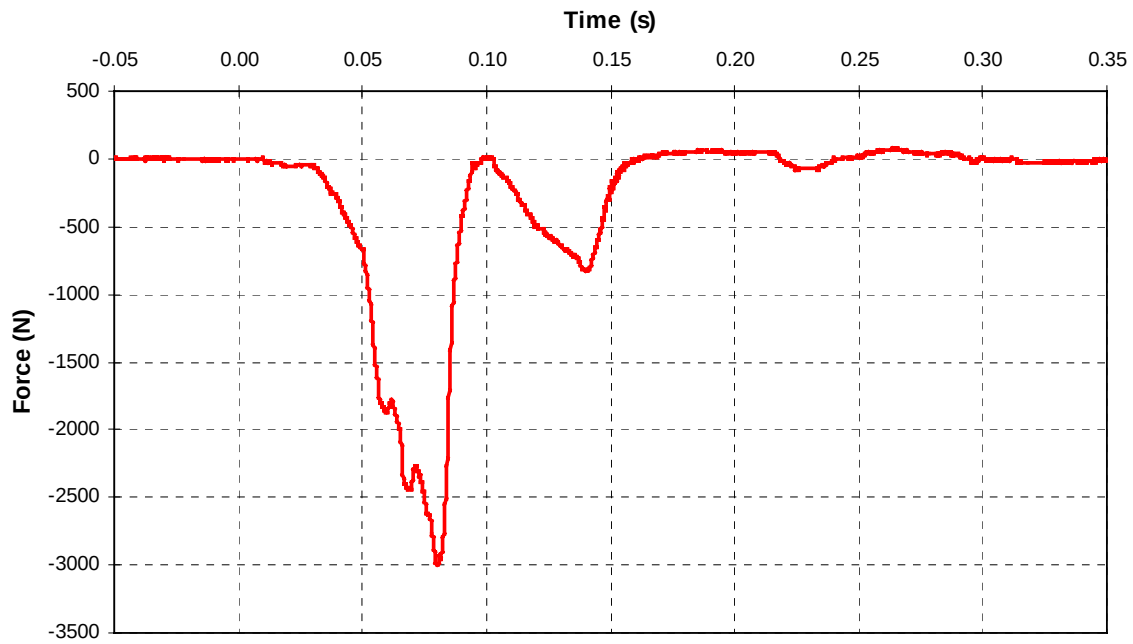
A- 43 CF00012 2000 Toyota Avalon Right Lower Tibia A-P Moment



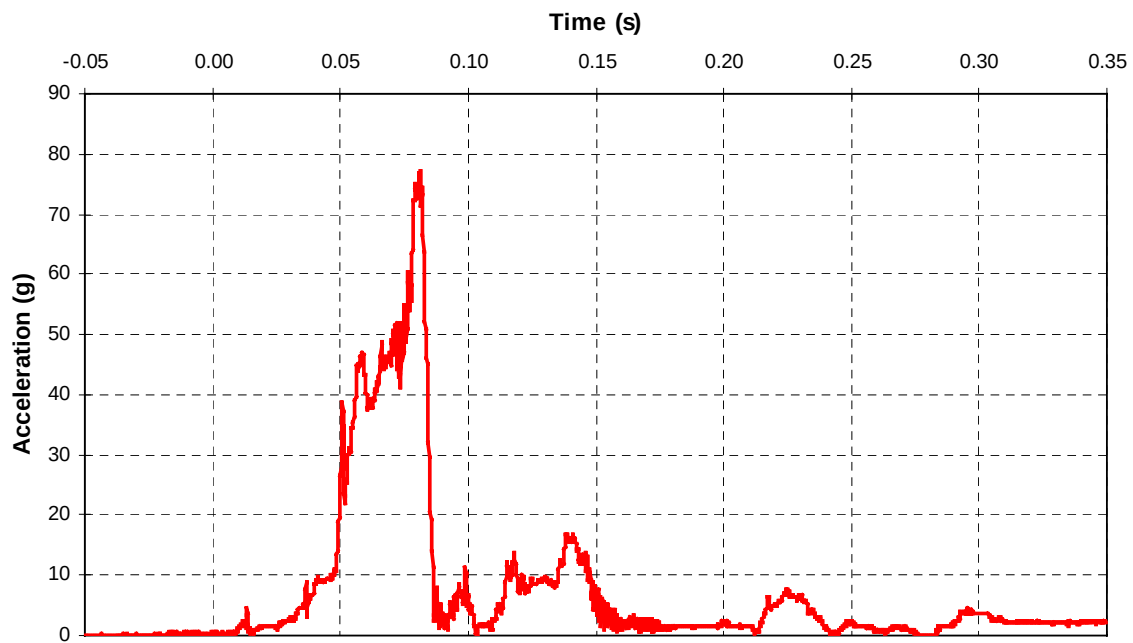
A- 44 CF00012 2000 Toyota Avalon Right Lower Tibia Vector Resultant Moment



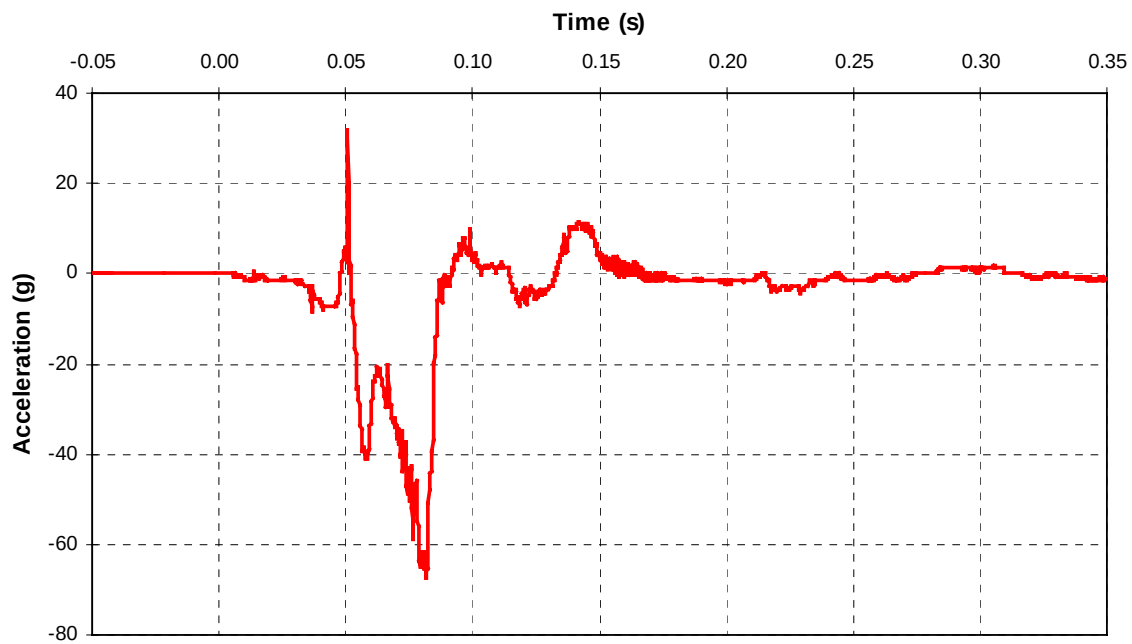
A- 45 CF00012 2000 Toyota Avalon Right Lower Tibia Axial Force



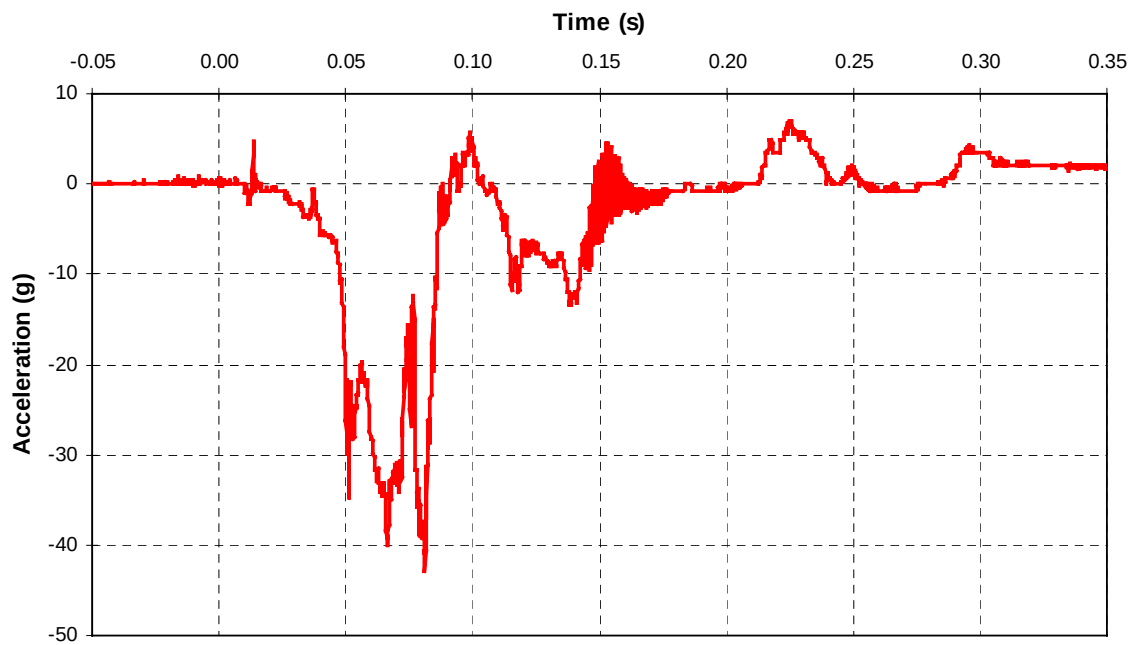
A- 46 CF00012 2000 Toyota Avalon Right Foot Vector Resultant Acceleration



A- 47 CF00012 2000 Toyota Avalon Right Foot A-P Acceleration



A- 48 CF00012 2000 Toyota Avalon Right Foot I-S Acceleration



TOYOTA Every day

STANDARD FEATURES

- | | |
|---|--|
| MECHANICAL & PERFORMANCE <ul style="list-style-type: none"> - 3.0 LITER, V-6, FOUR-CAM, 24 VALVE, VVT-I, EFI ENGINE - 4-SPEED AUTOMATIC ECT-I TRANS - POWER RACK AND PINION STEERING - 4-WHEEL INDEPENDENT SUSPENSION - POWER 4-WHEEL DISC BRAKES - 205/65R15 RADIAL TIRES (5) | <ul style="list-style-type: none"> - DUAL FR. AIR BAGS, FR SEAT MOUNTED SIDE AIR BAGS (SRS) - ANTI-LOCK BRAKE SYSTEM (ABS) - 3-POINT FRONT/REAR SEAT BELTS WITH AIR/ELR PASSENGER BELTS - SIDE IMPACT DOOR BEAMS - CHILD PROTECTOR RR DOOR LOCKS - DAYTIME RUNNING LIGHTS |
| SAFETY <ul style="list-style-type: none"> - MULTI-REFLEC HALOGEN HEADLAMPS - SOLAR ENERGY ABSORBING GLASS - CHROME BODYSIDE MOLDLING - COLOR-KEYED BUMPERS | <ul style="list-style-type: none"> - DUAL PMR O/S HEATED MIRRORS - ALUMINUM ALLOY WHEELS (4) - COMFORT & CONVENIENCE - XLS FABRIC PMR FR BUCKET SEATS - ADJ FRNT SHOULDER BELT ANCHORS - CRUISE CONTROL/CIRCUIDERS - CENTER CONSOLE W/STORAGE BOX - DIGITAL CLOCK/COMPASS - OUTSIDE TEMP/FUEL RANGE METER - ODOMETER/TRIPMETER/CALENDAR - VARIABLE INTERMITTENT WIPERS - JBL ETR/CASS/CD W/7SPKRS & DIVERSITY ANTENNA - AUTO TEMP CONTROL SYSTEM - W/ DUAL CONTROL/TILT WHEEL - POWER WINDOWS AND DOOR LOCKS - THEFT DETERRENT SYSTEM - KEYLESS ENTRY W/TRUNK RELEASE - LEATHER WRAPPED STEERING WHEEL - AND SHIFT KNOB/HOMELINK SYSTM - REAR SEAT PERSONAL LAMPS - AUTO ON/OFF HEADLAMPS |

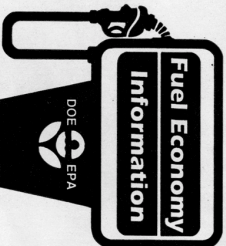
Compare this vehicle to others in the FREE FUEL ECONOMY GUIDE available at the dealer.

CITY MPG

21

HIGHWAY MPG

29



Actual Mileage will vary with options, driving conditions, driving habits and vehicle's condition. Results reported to EPA indicate that the majority of vehicles with these estimates will achieve between

17 and 25 mpg in the city, and between 24 and 34 mpg on the highway.

2000 MY AVALON, V-6 CYL., 3.0 LITER DISP., FOUR CAM ENGINE, FUEL INJECTION, 4-SPEED AUTOMATIC ECT-I TRANSMISSION.

Estimated Annual Fuel Cost:

\$ 751

13 to 21 mpg city and 20 to 32 mpg highway.

For Comparison Shopping, all vehicles classified as LARGE have been issued mileage ratings ranging from

DEALER NAME/ADDRESS: ROSNER TOYOTA

3507 JEFFERSON DAVIS HWY
P.O. BOX 7045
FREDERICKSBURG VA22408

SHIP TO:

PORT/PLANT: BALTIMORE

45037

Manufacturer's suggested retail price includes manufacturer's recommended pre-delivery service, gasoline, license and title fees, applicable federal, state local taxes and dealer and distributor installed options and accessories are not included in the manufacturer's suggested retail price.

AVALON 4-DOOR XLS SEDAN

VIN: 4T1BF28B7YU042528 MODEL/YEAR: 3544A/2000
COLOR: DESERT SAND MICA /IVORY LEAT (04Q2/01)

MANUFACTURER'S SUGGESTED RETAIL PRICE \$29,755.00

OPTIONAL EQUIPMENT

FE 50 STATE EMISSIONS	910.00
SR POWER TILT/SLIDE MOONROOF	
GV XLS LTHR PACKAGE W/HTD SEAT:	1,940.00
LEATHER TRIM HEATED POWER SEATS, OUTSIDE MIRRORS W/ MEMORY, DRIVER SEAT W/ MEMORY, 115V OUTLET, REAR CONSOLE A/C VENT, 16" ALLOY WHEELS W/P205/60R16 TIRES, JBL PREMIUM AM/FM/CASS/6DISC IN-DASH CHANGER W/7 SPKRS	
DK, PREFERRED OWNER'S PORTFOLIO CF, CARPET/CARGO MAT SET	158.00
GF, FULL TANK OF FUEL	

DESTINATION CHARGE 455.00

TOTAL \$33,218.00

TOYOTA'S LIMITED WARRANTY PROVIDES 36 MONTH/36,000 MILE COMPREHENSIVE COVERAGE, 5 YEAR/60,000 MILE POWERTRAIN COVERAGE, PLUS 5 YEAR BODY PANEL CORROSION PERFORATION WARRANTY. SEE OWNER'S GUIDE FOR DETAILS.

An extended service contract may be available for this vehicle. Ask dealer for details.

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