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AN ANALYTICAL COMPARISON OF A EUROPEAN HEAVY VEHICLE AND A GENERIC U.S. HEAVY VEHICLE

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16. Abstract

This report documents a comparative study of the dynamic performance of U.S. and European tractor-semitrailer combinations. The project was accomplished in two phases—measurement of the suspension and inertial properties of a European tractor and semitrailer supplied by NHTSA, and comparison of the observed properties to those of a typical U.S. tractor-semitrailer in the context of their influence on dynamic performance as determined by simulation with computer models.

A number of qualities related to turning behavior were evaluated. The U.S. and European vehicles were both stable and very comparable in turning performance up to 0.3 g lateral acceleration. In the laden condition, the rollover threshold of the European tractor-semitrailer was 9 percent better than that of the U.S. vehicle due to higher suspension roll stiffness, and a lower center of gravity height. With regard to suspension roll stiffness, the stiffness on the European vehicle was comparable to the highest used on U.S. vehicles (in contrast to the mid-range values assumed for the comparison U.S. vehicle). The lower center of gravity on the European tractor-semitrailer was due to heavier tare weight and lower load capacity.

The European tractor-semitrailer exhibited better braking performance than the U.S. vehicle in the conditions evaluated. Higher front-axle braking levels account for the braking advantage. When unladen, the advantage of the European vehicle is largely attributable to use of load- sensing proportioning valves on the tractor and semitrailer, which allow the front brakes to be used more effectively at lightly loaded conditions.

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AN ANALYTICAL COMPARISON OF THE DYNAMIC PERFORMANCE OF A EUROPEAN HEAVY VEHICLE AND A GENERIC U.S. HEAVY VEHICLE

INTRODUCTION

Background

This report documents a study performed by The University of Michigan Transportation Research Institute (UMTRI) for the National Highway Traffic Safety Administration (NHTSA) under the title, "Heavy Vehicle Dynamic Performance--A Comparison of U.S. and European Design Approach."

Many claims have been made regarding the superior braking and/or steering performance (especially in accident-avoidance maneuvers) of European- versus U.S.-designed heavy trucks. Design differences do exist. For example, because of ECE Regulation No. 13, power steering and load-sensitive brake proportioning are standard on European heavy vehicles. The NHTSA has purchased a tractor-trailer of European design to evaluate its performance in this regard. A need existed to:

—characterize the performance of the various components of this vehicle,
—develop dynamic performance maps comparing the performance of the European vehicle to similar U.S. vehicles, and
—analyze the design features of the European vehicle which account for the performance differences.

The project was accomplished in two phases—measurement of the suspension and inertial properties of the NHTSA European tractor and trailer, and comparison of the observed properties to those typical of U.S. heavy trucks in the context of their influence on dynamic performance as determined by simulation with computer models.

Scope

A rigorous comparison of European versus U.S. heavy vehicles would necessarily recognize the fact that the population of each contains a broad range of vehicles, and that within each population the performance properties will vary. In addition to the population variables, the choice of maneuvers in which comparison is made will affect the observed behavior; and there may not be a clear consensus among truck owners, operators, engineers, and vehicle dynamicists on the interpretation of that behavior. The classic example of different interpretations of performance is seen in the controversy surrounding the desirability of proportioning heavy-truck brake systems to produce lockup at front brakes prior to that on the rear. Some argue that front-brake lockup is preferred for stability as well as stopping distance reasons, while others argue it is undesirable because of the loss of steering control and associated risks.

The scope of this project was limited to examination of performance questions with a single European tractor-semitrailer combination, capitalizing on the availability of the unit

on hand at NHTSA. While limited, it provides a first look at some of the differences believed to exist.

No specific U.S tractor-semitrailer combination was used for comparison. Rather, a generic U.S. vehicle was formulated with properties that would be representative of equipment in use in a transport mission for which the European unit might be used. That is, the tractor and semitrailer were chosen to be similar in wheelbase to the European unit. Similar suspensions (four-springs) were selected for the U.S. vehicle. The same tires were assumed to be used at all positions on both vehicles. The values for each relevant property of the U.S. vehicle were selected to be approximately midway in the range of that present in the U.S. fleet, using the data in the publication, "A Factbook of the Mechanical Properties of the Components for Single-Unit and Articulated Heavy Trucks." [1]

Although an infinite variety of maneuvers can be suggested for comparing the performance of different vehicles, a specific set for evaluating steering and braking performance of heavy trucks has been proposed by Fancher.[2] The suggested maneuvers cover steady and transient turning maneuvers, as well as transient and constant deceleration braking. In addition, these maneuvers provide a set of performance signatures and measures by which to interpret the results obtained. A subset of these maneuvers were used to compare the steering and braking behavior of the European tractor-semitrailer combination to that of the U.S. vehicle.

Report Organization

The remainder of this report contains the findings presented in three sections. The next section, Vehicle Parameter Measurements, describes the measurements made by UMTRI of the suspension, inertial, and dimensional properties of the vehicles. In addition, brake measurements made by NHTSA's Vehicle Research and Test Center needed for the simulations of braking performance are presented. The subsequent section, Performance Comparisons, describes the types of computer simulation tests performed, the results obtained, and the interpretation of those results. The final section, Conclusions, presents a short summary of the project and the conclusions that can be drawn from the simulation results.

VEHICLE PARAMETER MEASUREMENTS

Vehicle Descriptions

The European tractor is a Volvo F10, 6x4 cab-over-engine (COE) model. A more detailed description is provided in the properties listed in Table 1, along with the comparable properties assumed for the U.S. tractor. The European semitrailer is a French-manufactured ("Trailor") tandem axle flatbed. Properties of the European trailer, and the assumed properties for the U.S. trailer are provided in Table 2. Figure 1 shows the European tractor and semitrailer.

Dimensional Data

For purposes of simulating and comparing vehicles, a number of dimensional parameters are needed to describe the vehicles. These include such parameters as wheelbase, longitudinal spreads on tandem axles, lateral spreads on suspension springs, etc. These measurements were made on the European tractor and semitrailer while at UMTRI. A number of the dimensional properties are listed in Tables 1 and 2 for these vehicles. Table 3 summarizes the vehicle dimensions that define the configuration in the side view.

Mass/Inertial Properties

Equally important for simulation of the vehicles are the weights and inertial properties of the primary components. These properties are measured and compiled for the sprung and unsprung masses, and for the load that is carried on the vehicle. The European unit was unladen when delivered to UMTRI. Mass and inertia properties were obtained for the unladen vehicles, and composite values were calculated for the laden cases.

The vehicle masses were determined by weighing the unladen vehicles (with full liquids) on an axle-by-axle basis on weigh scales. The unsprung masses of the trailer were determined from the suspension measurements (lash in the suspension springs allowed measurement of the unsprung weights during the force/deflection measurements). In the case of the tractor, the unsprung weights were estimated on the basis of a visual inspection and comparison with a library of data from previous measurements. The sprung and unsprung values for the European and (assumed) U.S. vehicles are listed in Table 1.

The center of gravity (CG) locations and pitch moments of inertia were measured on the Pitch-Plane Inertial Properties Tester. The tester is a swing by which the vehicle is supported on knife-edge pivots. From measurement of the angle assumed by the swing while a known moment is imposed about the pivot axis, the CG height is determined. By measurement of the free-oscillation period, the pitch moment of inertia is determined. Based on past experience, the yaw moment of inertia can be estimated with reasonable accuracy from the pitch moment. Likewise, the roll moments of inertia for the tractor and trailer were estimated. CG locations and moments of inertia are summarized in Table 3.

Table 1. Summary of Tractor Properties

	European	U.S.
General Properties		
Total weight (lb)	19,720	17,000
Sprung mass (lb)	13,020	10,800
Wheelbase (in)	153.25	153.00
CG to rear articulation (in)	81.65	69.12
CG height (in)	35.40	32.00
Front Axle		
CG to axle distance (in)	66.50	68.18
Track width (in)	78.50	80.00
Unsprung mass (lb)	1500	1200
Roll center height (in)		
(Loaded)	17.73	19.00
(Empty)	18.00	19.00
Suspension stiffness/spring (lb/in)	1255	1032
Springs spacing (in)	30.00	35.00
Auxiliary roll stiffness (in-lb/deg)		
(Loaded)	25,000	8,000
(Empty)	28,000	8,000
Radius of a tire (in)	20.50	20.50
Steering gear ratio	24.35	25.00
Steering stiffness (in-lb/deg)	12,685	12,000
Tie rod stiffness (in-lb/deg)	40,000	20,000
Mechanical trail (in)	1.50	1.50
Tandem Leading Axle		
CG to axle distance (in)	59.75	58.82
Track width (in)	72.00	72.00
Unsprung mass (lb)	2700	2500
Roll center height (in)		
(Loaded)	34.18	27.00
(Empty)	34.72	28.50
Suspension stiffness/spring (lb/in)		
(Loaded)	7340	5783
(Empty)	6013	4200
Springs spacing (in)	38.50	40.00
Auxiliary roll stiffness (in-lb/deg)	11,000	15,000
Radius of a tire (in)	20.50	20.50
Tandem Trailing Axle		
CG to axle distance (in)	113.75	110.82
Track width (in)	72.00	72.00
Unsprung mass (lb)	2500	2500
Roll center height (in)		
(Loaded)	33.86	27.00
(Empty)	34.85	28.50
Suspension stiffness/spring (lb/in)		
(Loaded)	7340	5783
(Empty)	6013	4200
Spring spacing (in)	38.50	40.00
Auxiliary roll stiffness (in-lb/deg)		
(Loaded)	11,000	15,000
(Empty)	10,000	15,000
Radius of a tire (in)	20.50	20.50

Table 2. Summary of Semitrailer Properties

	European	U.S.
General Properties		
Total weight (lb)		
(Loaded)	61,180	64,100
(Empty)	12,580	12,580
Sprung mass (lb)	8980	9580
Wheelbase (in)	349.25	349.25
C.G. to rear articulation (in)		
(Loaded)	248.10	254.51
(Empty)	176.25	192.06
C.G. height (in)		
(Loaded)	73.80	75.60
(Empty)	40.56	40.50
Tandem Leading Axle		
C.G. to axle distance (in)		
(Loaded)	126.85	137.26
(Empty)	55.00	74.81
Track width (in)	71.25	72.00
Unsprung mass (lb)	1800	1500
Roll center height (in)		
(Loaded)	29.00	24.00
(Empty)	30.40	24.61
Suspension stiffness/spring (lb/in)		
(Loaded)	8459	6375
(Empty)	5586	4550
Springs spacing (in)	38.00	38.00
Auxiliary roll stiffness (in-lb/deg)	20,000	30,000
Radius of a tire (in)	20.00	20.50
Tandem Trailing Axle		
C.G. to axle distance (in)		
(Loaded)	180.85	187.26
(Empty)	109.00	124.81
Track width (in)	71.25	72.00
Unsprung mass (lb)	1800	1500
Roll center height (in)		
(Loaded)	28.10	24.00
(Empty)	29.70	24.61
Suspension stiffness/spring (lb/in)		
(Loaded)	8459	6375
(Empty)	5586	4550
Spring spacing (in)	38.00	38.00
Auxiliary roll stiffness (in-lb/deg)	20,000	30,000
Radius of a tire (in)	20.00	20.50

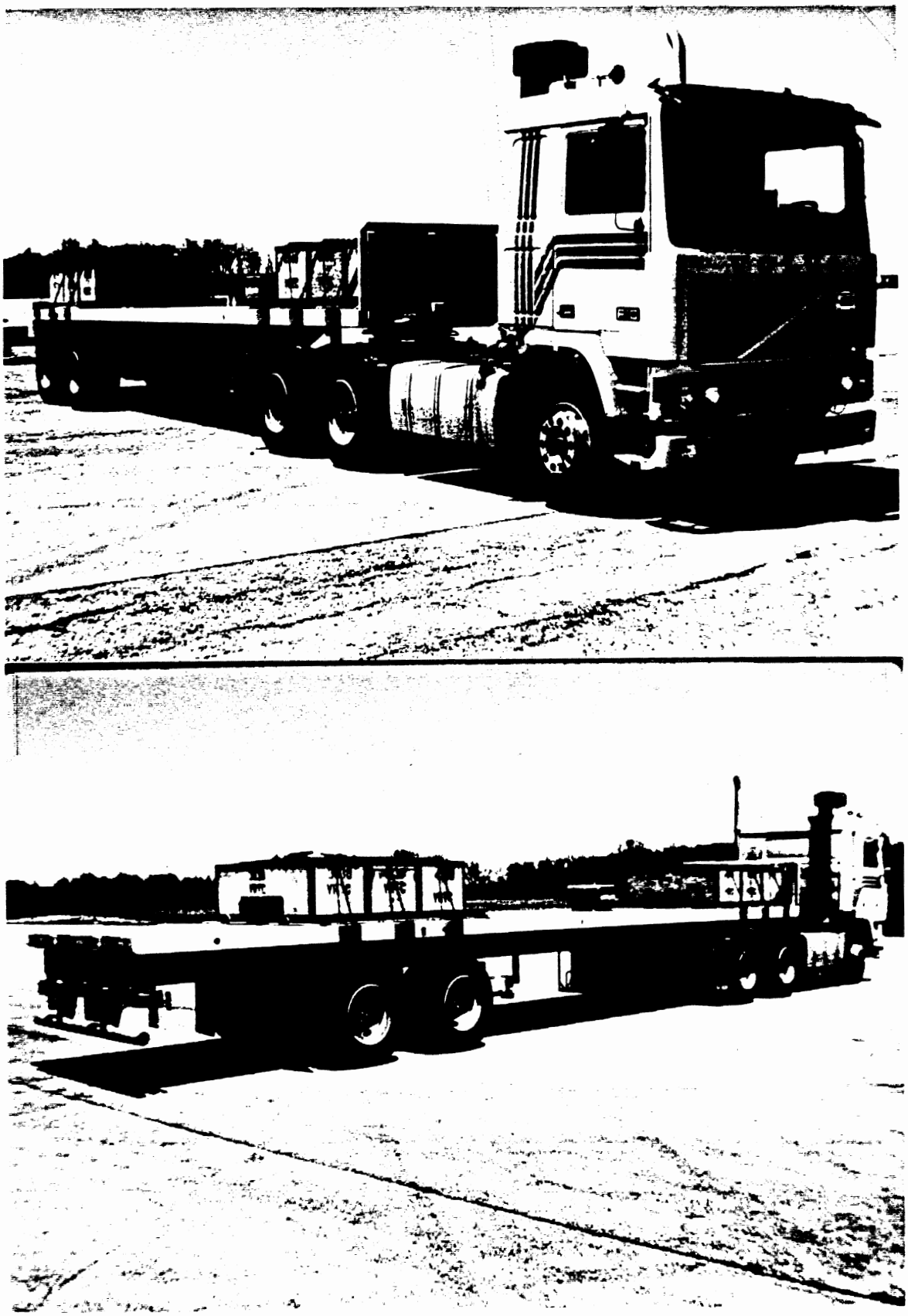
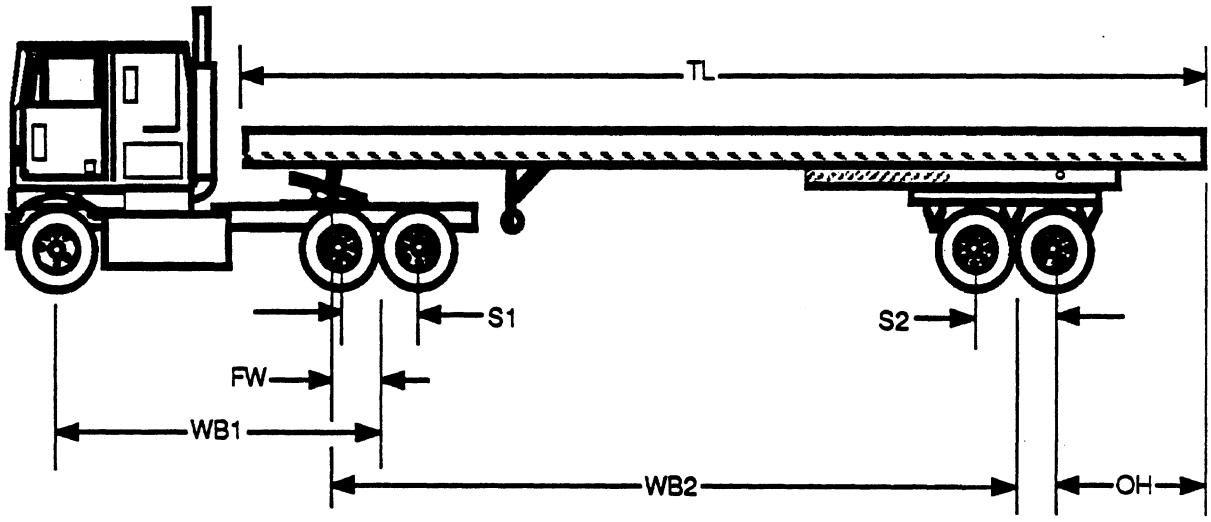


Figure 1. The Volvo F10 tractor and "Trailor" flatbed trailer

Table 3. Sizes and Weights



Vehicle Dimensions (in)

Vehicle	WB1	FW	S1	WB2	OH	S2	TL
European	153.25	5.10	54.00	349.25	67.25	54.00	479.50
U.S.	153.00	15.70	52.00	349.25	67.25	50.00	477.50

	Axles Loads (lb)				Total CG Heights (in)		
Vehicle	W1	W2	W3	GCW	Tractor	Semitrailer	Composite
European							
(Loaded)	12,060	34,610	34,230	80,900	35.40	73.80	64.40
(Empty)	11,263	11,401	9,636	32,300	35.40	40.56	37.41
U.S.							
(Loaded)	12,480	34,300	34,320	81,100	32.00	75.60	66.46
(Empty)	9,793	10,803	8,985	29,580	32.00	40.50	35.62

Note: Payload density = 34.00 lb/ft^3

Total Mass Moments of Inertia (in-lb-sec^2)

Vehicle	Pitch	Roll	Yaw
European Tractor	338,800	52,300	329,400
European Trailer	650,100	33,900	671,100
U.S. Tractor	287,785	42,566	300,145
U.S. Trailer	754,122	94,182	758,000

All laden vehicle mass and inertial properties were obtained from calculation with an assumed loading condition. The load was taken to be a fixed, intermediate density material (34 lb/ft^3) distributed uniformly on the trailer bed to bring the combination up to approximately 80,000-lb gross combination weight (GCW). Under these assumed loadings, axle curb weights were obtained, as shown in Table 3. It might be noted that because of the lower tare weight of the U.S. tractor-semitrailer, it had a load-carrying capacity nearly 3000 lb greater than the European vehicle.

Suspension Properties

The suspension properties of the European tractor and semitrailer were measured on the UMTRI Suspension Properties Tester. This facility is capable of measuring virtually all of the compliance, kinematic, and Coulomb friction properties of suspension and steering systems as they react to vertical force, roll moment, lateral force, brake force, and aligning moment. The facility can accept single-axle and tandem-axle suspensions in their normal configuration as mounted on the vehicle. All measurements are performed at steady-state or quasi-steady-state conditions. Although the European unit was unladen when delivered to UMTRI, the facility allows tests to be performed at all conditions representative of the laden state.

On the Suspension Properties Tester the suspension is exercised through a full range of load and roll moment conditions while the individual wheel forces and displacements are monitored. The data are reduced to provide detailed records of:

—Vertical force-deflection response
—Roll moment generation (and auxiliary roll stiffness)
—Roll center location
—Interaxle load redistribution caused by braking forces
—Roll steer response
—Steering system stiffnesses

The complete records of suspension measurements for the tractor front axle, tractor tandem axles, and the trailer tandem axles are provided in Appendices A, B and C, respectively. Summary properties used in simulations are listed for each suspension in Table 1.

Brake Properties

In order to evaluate braking performance, certain key properties of the brake systems must be known. With regard to the performance evaluated here, these properties are:

—Brake force versus actuation pressure for the brakes on each axle.
—Application (treadle) versus actuation (chamber) pressure at each axle.

(The application pressure is defined as the pressure produced at the output of the treadle valve, whereas the actuation pressure is the pressure experienced at the brake chamber. In the case where some sort of a proportioning valve is used, these two pressures will differ significantly. The European tractor and trailer were each outfitted with load-sensing proportioning valves.)

Tests of the brake systems were not performed by UMTRI. Staff at NHTSA'S Vehicle Research and Test Center had performed appropriate tests on the brake systems of the European tractor and trailer[3] and made the results available to UMTRI. Those tests included parallel evaluation of a U.S. tractor and semitrailer unit, results from which were also supplied and used to characterize the braking system for the U.S. unit in this evaluation. The relevant NHTSA data for both the European and U.S. units are summarized in Table 4.

Table 4. Summary of Brake System Properties

	European	U.S.
Tractor		
Front Axle		
Torque Gain (ft-lb/psi)		
(Loaded)	2296.0	1332.5
(Empty)	2296.0	1332.5
Pushout Pressure (psi)	9.4	13.5
Tandem Leading Axle		
Torque Gain (ft-lb/psi)		
(Loaded)	2001.9	3280.0
(Empty)	882.5	3280.0
Pushout Pressure (psi)	8.5	5.8
Tandem Trailing Axle		
Torque Gain (ft-lb/psi)		
(Loaded)	2001.9	3280.0
(Empty)	882.5	3280.0
Pushout Pressure (psi)	8.5	5.8
Trailer		
Tandem Leading Axle		
Torque Gain (ft-lb/psi)		
(Loaded)	2056.4	2818.8
(Empty)	848.0	2818.8
Pushout Pressure (psi)	4.2	5.5
Tandem Trailing Axle		
Torque Gain (ft-lb/psi)		
(Loaded)	2056.4	2818.8
(Empty)	848.0	2818.8
Pushout Pressure (psi)	4.2	5.5

PERFORMANCE COMPARISONS

Introduction

In this work the focus of interest is the performance characteristics of trucks affecting directional response and braking. In the case of an articulated vehicle, specifically a tractor-semitrailer, the desired characteristics are generally:

—Stable turning response,
—Minimal offtracking in low and high-speed cornering,
—Resistance to rollover, and
—Effective and stable braking response.

While these performance characteristics can be measured empirically, a number of computer simulation models have been developed in recent years that allow close estimates of such performance with sufficient knowledge of detailed truck properties. The simulation approach is not only less costly to accomplish than full-scale testing, but permits performance evaluation under diverse and closely controlled conditions. From a study[4] of analytical approaches for evaluating such performance a series of simulation programs, suggested maneuvers, and performance measures were identified.[2] The resulting family of associated maneuvers and performance measures is summarized in Table 5.

The computer models used in this evaluation are products of research which has been conducted at UMTRI over the past few decades for the Motor Vehicle Manufacturers Association (MVMA), the Federal Highway Administration (FHWA), the National Highway Traffic Safety Administration (NHTSA), and the State of Michigan. The simulations and their internal models vary in complexity, ranging from simple calculations of closed-form equations to very detailed representation of a vehicle-driver system in comprehensive programs that perform time-based numerical integration of the governing equations (time-domain simulations). Most maneuvers are "open loop" meaning that the vehicle is given a defined steering and/or brake input for which the response is simply observed. From the nature of that response, characterized by performance signatures and performance measures, inferences can be made with respect to the vehicle's accident-avoidance capabilities.

Parametric data describing the mechanical properties of the vehicle are required in order to perform the simulations. The more important of these properties have been summarized in the tables of the preceding section.

Among the maneuvers listed in Table 5 only a portion are applicable to the project at hand. The offtracking performance, reflected in the "Tracking" and "Low-Speed Cornering" maneuvers is dependent only on the geometric layout (wheelbases) of the tractor and semitrailer, and the cornering properties of the tires. Thus, offtracking performance is not indicative of any fundamental difference between European and U.S. designs. The last two maneuvers, "Responding to External Disturbances" and "Braking in a Turn," are also excluded from this analysis because of insufficient data to characterize the vehicles accurately.

The comparative performance of each of the vehicle combinations studied is summarized in Table 6. The following sections examine each of the performance measures individually.

Table 5. Performance Signatures and Measures for Various Manuvers

Maneuvers	Performance Signatures (Or Operating Condition)	Performance Measures
Steady Turning		
a. Roll	Lateral acceleration versus roll angle	Rollover threshold
b. Tracking	(360-m radius at 88 kph)	Offtracking
c. Handling	Handling diagram [22,6] and critical speed versus lateral acceleration [23]	1. Steering gain at 80 kph 2. Critical speed at 0.3 g
Constant Deceleration Stopping	Friction utilization and deceleration versus pressure	Braking efficiency at 0.4 g
Low-Speed Cornering (In-Town Corner)	(12.3-m radius, 90° corner)	Maximum offtracking
Transient Turning (Ramp-Step Steer)	Steering wheel angle (200°/sec to 28°)	Lateral acceleration response times (50% steering to 90% of steady state)
Obstacle Evasion (Rearward Amplification)	Transfer function: lateral acceleration of last unit to that of the first unit	Maximum rearward amplification (steering frequency < 0.5 Hz)
Responding to External Disturbances	Transfer function: steering control to equivalent disturbance input	Maximum closed-loop steering gain
Braking in a Turn	(2-second braking pulse while following a 360-m turn at 80 kph)	Open-loop: maximum changes in yaw rate and sideslip Closed-loop: deviation from a reference yaw rate

Table 6. Summary of Performance Measures.

Vehicle	Rollover Threshold (g)	Critical Velocity[1] (mi/h)	Braking Efficiency @ 0.4 g	Lat. Accel. Response Time (sec)	Steering Gain[2] (g/deg)	Rearward Amplification[3] (--)
European (Laden)	0.46	Stable	0.87	0.72	0.14	1.00
European (Unladen)	0.90	Stable	0.80	0.59	0.10	0.97
U.S. (Laden)	0.42	Stable	0.71	0.53	0.13	0.99
U.S. (Unladen)	0.92	Stable	0.53	0.59	0.10	0.97

Notes

1 - Stable indicates that the vehicle is understeer at 0.3 g, and thus has no critical velocity.

2 - Rate of change of lateral acceleration with front wheel steer angle at 0.3 g and 50 mi/h.

3 - Ratio of maximum lateral acceleration at CG of semitrailer to that at CG of tractor.

Roll

Roll performance in steady turning can be evaluated by means of the simplified Static Roll Model. The model solves the set of equations describing the static equilibrium of the vehicle in the roll plane under exposure to lateral acceleration. Roll angles of the individual axles and sprung masses are calculated separately, identifying the level at which liftoff of the inside wheel will occur on each axle, and the point where roll instability of the overall vehicle occurs. The model determines the level of lateral acceleration at which a vehicle will roll over during steady turning maneuvers—the parameter known as the "rollover threshold." The results obtained with this model are analogous to those of a tilt table experiment.

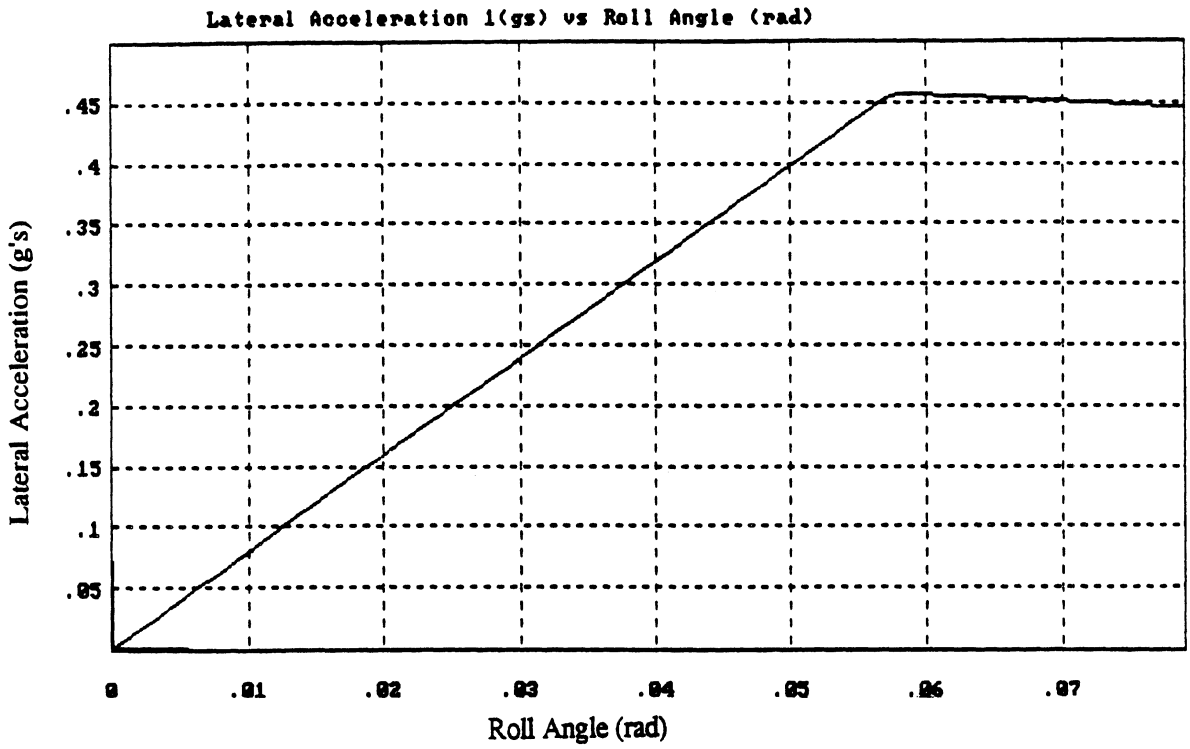
The information required to describe a vehicle for this model includes the following:
—Suspension roll stiffness
—Suspension roll-center height
—Tire vertical stiffness
—Sprung and unsprung mass values and CG heights
—Track widths, axle loads, spacing between springs

The Static Roll Model was used to examine the performance of both the European and U.S. vehicles in both the laden and unladen conditions. Copies of the simulation results are provided in Appendix D. The calculated rollover thresholds for each combination are listed in Table 6.

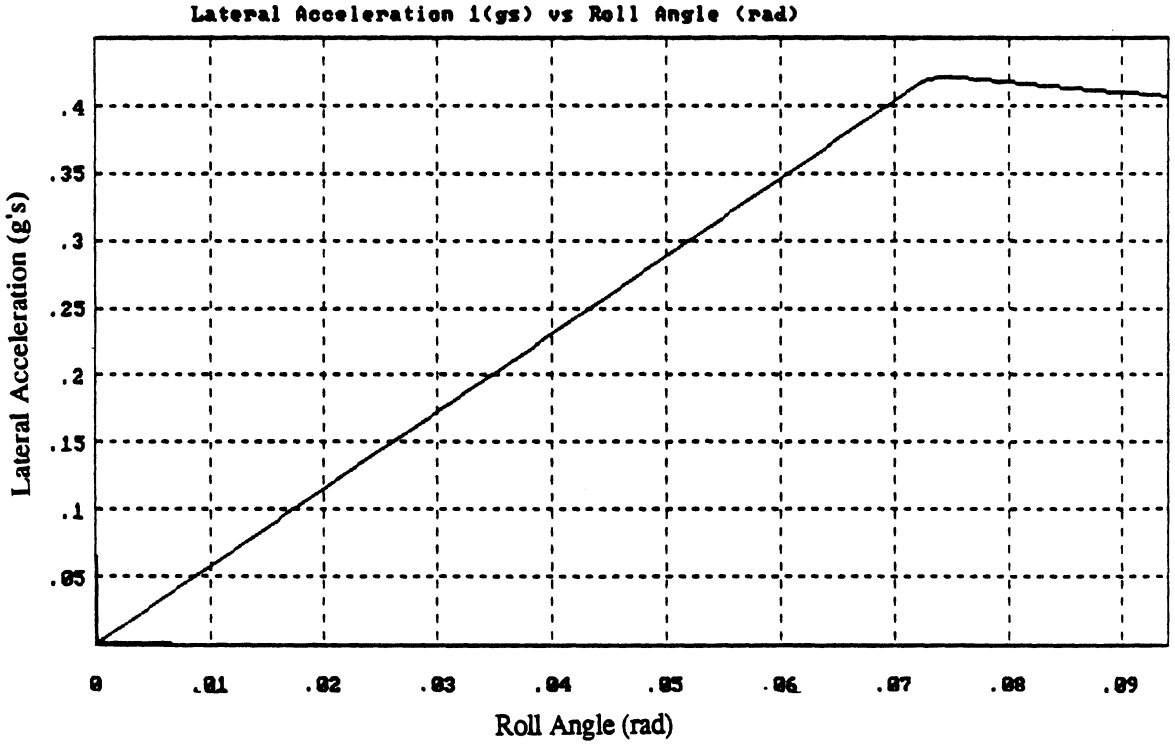
Calculations for the unladen conditions show that the U.S. vehicle has a rollover threshold of 0.92 g, followed by the European vehicle at 0.90 g. This level is high enough for both vehicles that rollover will be a rare event when empty.[5]

For the laden conditions the threshold for the European vehicle is 0.46 g compared to 0.42 for the U.S. unit (see Table 6). Figure 2 shows a plot of the computed roll response for these two cases. It should be noted that the absolute levels of the thresholds reported here are a consequence of the cargo density which has been assumed (34 lb/ft^3). Lower-density cargo would produce an even lower rollover threshold at the same load condition, due to a higher load center. In any case, thresholds for the laden vehicles with certain cargo types will be low enough that rollover will be involved in a significant fraction of accidents,[5] thus warranting attention to this condition.

The major differences between the European vehicle and the U.S. vehicle affecting laden rollover thresholds are the suspension properties, and the total CG heights. The European vehicle benefits from the fact that the composite CG height is 3.2% lower than that of the U.S. vehicle. This difference arises from the fact that the European tractor and semitrailer are significantly heavier than the U.S. unit. For the assumed loading method (cargo of uniform density loaded to achieve 80,000 lb GCW), the U.S. vehicle carries more load with the consequence of a higher load center and higher CG. The European vehicle has a rollover threshold that is about 9% higher. CG height has a first order influence on rollover threshold, and the CG height of the U.S. vehicle is 3.2% higher due to its greater payload. Thus, approximately one-third of the difference must be discounted to this effect. With equal payloads, the European vehicle would be about 6% better in its



(a) European unit



(b) U.S. unit

Figure 2. Roll response, laden units

rollover threshold than the U.S. vehicle. (See [6] for discussions on the influences of payload capacities on the likelihood of accidents.)

The remaining 6% difference in the rollover thresholds is primarily the result of differences in suspension roll stiffness. In particular, the suspensions on the European tractor and semitrailer exhibit higher roll stiffness than that selected for the mid-range of U.S. vehicles. In total, the roll stiffness of all axles on the European vehicle is roughly 16% greater. (It should be noted here that the values chosen for the U.S. vehicle are in the middle of the range of those properties on U.S. vehicles, and that there is no information to indicate where this European combination falls in the range of the general population of trucks in Europe. A U.S. vehicle utilizing the highest roll stiffness values among U.S. trucks would yield performance equivalent to this European example.) High suspension roll stiffness is favorable to roll performance by resisting chassis roll which allows the CG of the vehicle to move toward the outside wheels in a turn. Best performance in this regard is obtained when the suspension roll stiffness is at least equivalent to that of the axle on its tires, and when the roll stiffnesses of the different axles on a combination vehicle are matched to yield liftoff of the inside wheels on all axles simultaneously.

Close examination of the results with the European tractor (see Appendix D) indicates liftoff first at the rear axles at about 0.4566 g (occurring at a vehicle roll angle of 3.32°). The leading axle of the trailer lifts off at the same lateral acceleration level (3.32° of trailer roll angle), then the trailing axle lifts off at 0.4571 g (3.38° roll angle). The difference in these two last axles can be expected since the trailing axle has higher roll stiffness than the leading axle. When the trailing axle lifts off, roll instability occurs and the rollover threshold has been reached.

By comparison, on the U.S. vehicle the trailer suspension lifts off first at a lateral acceleration of 0.4196 g (at 4.18° roll angle), and the tractor rear suspension lifts off at a lateral acceleration of 0.4212 g (a roll angle of 4.29°).

Overall, the roll analysis concludes that the example European vehicle is better than a U.S. tractor-semitrailer with mid-range levels of suspension roll stiffness.

Handling

Gain and stability are important response characteristics of a vehicle in a steady turn maneuver. These performance qualities can be evaluated in the "Steady Turning, Handling" maneuver listed in Table 5, and may be calculated with the Simplified Handling model, which is combined with the Static Roll Model. The model repeatedly solves a set of equations describing the static equilibrium of the vehicle in both the yaw and roll planes for small increments of lateral acceleration. The simplified Static Roll Model is incorporated into this model in order to compute side-to-side load transfer at each axle. In its current version, the Simplified Handling Model does not include the effects of roll steer. Therefore, the results reported here may differ slightly from the actual.

The parametric data required for this model are the following:
—Suspension roll stiffness
—Suspension roll center height
—Tire vertical stiffness
—Sprung and unsprung masses
—Track widths, axle loads, spacing between springs
—CG heights
—Tire cornering stiffness properties
—Steering system stiffness

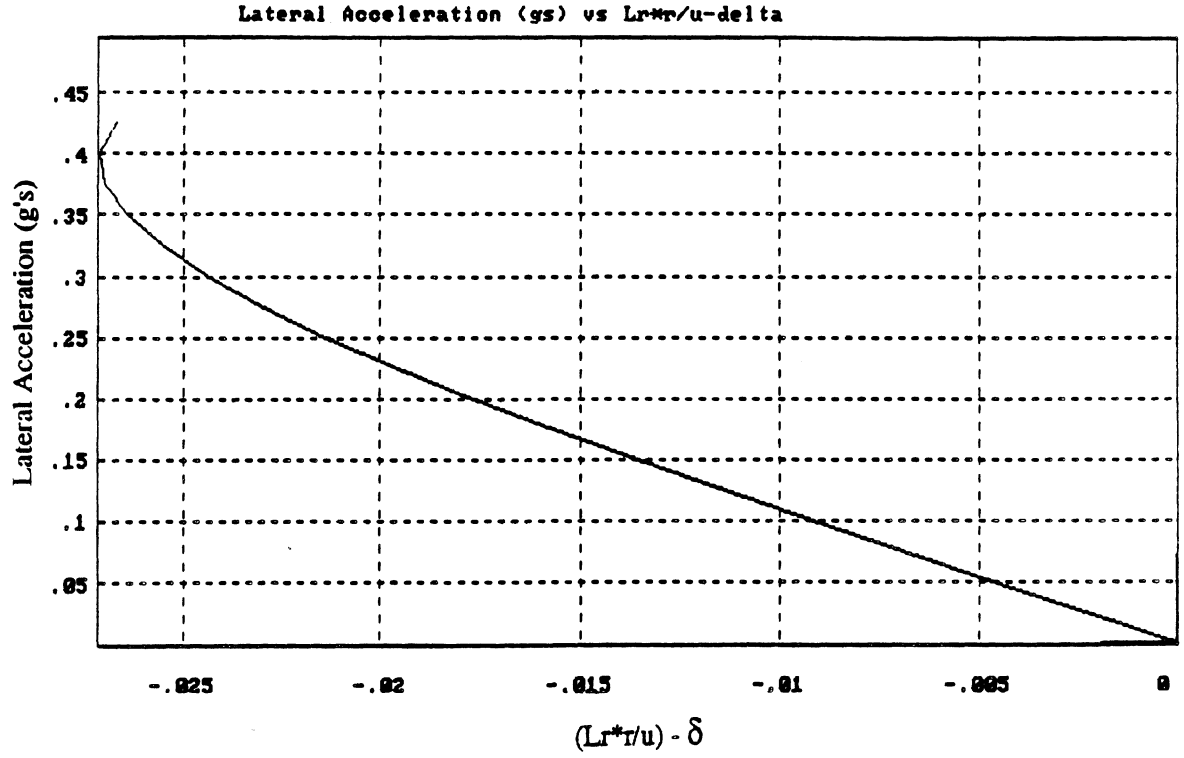
The most relevant properties affecting handling performance are those of the towing unit. The major factors are the tire characteristics affecting cornering stiffness and its sensitivity to load. Tire cornering force production, in turn, is dependent on the load distribution on the vehicle, its reaction through the suspensions, and certain geometric properties. The cornering stiffness of a tire in the model is represented as a quadratic function of its vertical load. Inasmuch as the tires are very important to this maneuver, and both European and U.S. vehicles may use the same tires, identical tires (Michelin XZA 11 R 22.5) were used on both vehicles for the simulations.

The parametric data used for this model are shown in the computer runs for the Handling Model contained in Appendix E. In addition to differences between these two vehicles in suspension parameters and CG heights, the stiffness of the steering system is also of importance in this maneuver. In a steady turn, compliance in the steering system reduces front tire cornering stiffness. Comparing the two units, the steering system stiffness on the European vehicle is greater.

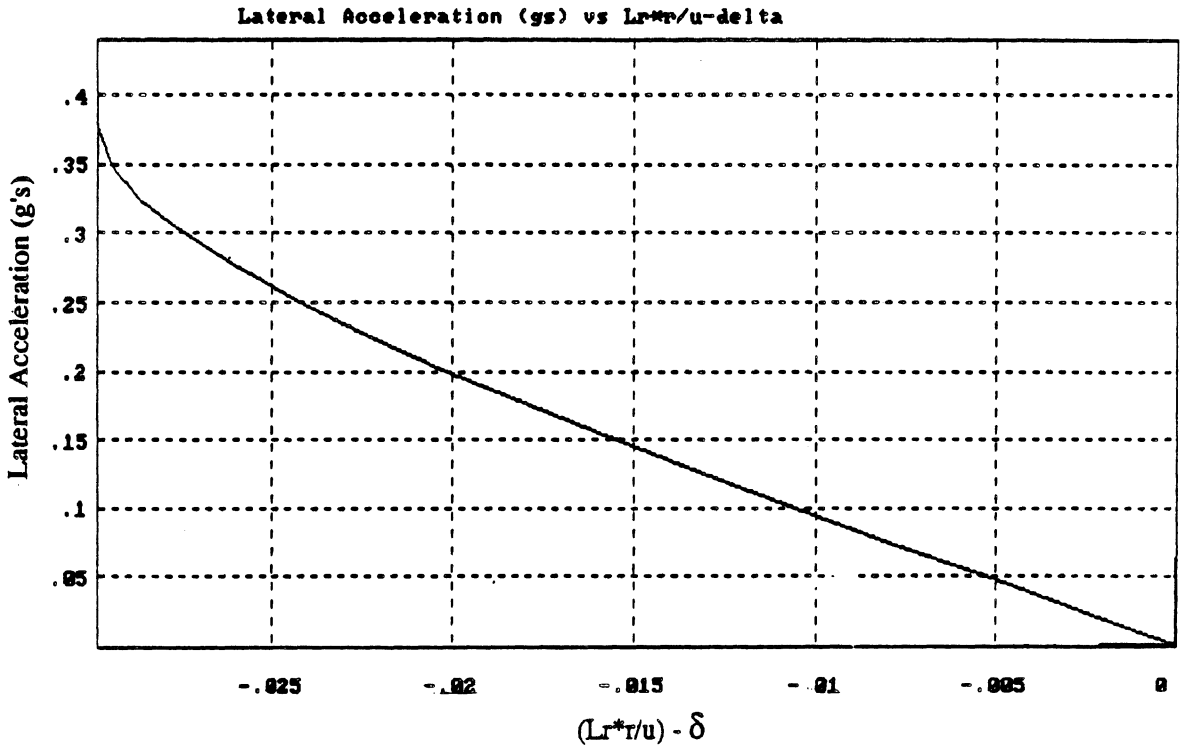
The results of the handling calculations are typically displayed as a handling diagram, which depicts the influence of changes in lateral acceleration on changes in the steer angle, delta, required for an equilibrium turn. Figure 3 shows examples of these diagrams for the European and U.S. vehicles in the laden condition. A line sloping upward to the left corresponds to understeer, an inherently stable condition. The performance measure of handling is the critical velocity, V_C, at a lateral acceleration of 0.3 g. The critical velocity is that at which an oversteer vehicle would become directionally unstable if the driver did not make compensatory steering corrections. If the vehicle is understeer, there is no critical velocity and the vehicle is stable. Both the European and U.S. vehicles are stable at the 0.3 g level of lateral acceleration. At the level of 0.37 g and above the curves for both vehicles turn upward and to the right (neutral steer to oversteer). This suggests the potential for directional instability above these levels of lateral acceleration, although it should be recalled that both vehicles are approaching rollover anyway.

The Handling Model computations for these diagrams do not currently include axle roll steer effects. For both the European and U.S. vehicles the roll steer characteristics are such that the understeer level would be slightly increased due to their presence (the slope of the curve on the handling diagram will drop slightly). The fact that roll steer will increase understeer level adds to stability, and the conclusions above are unaffected.

Alternatively, the handling performance can be described by the steering gain at the 0.3 g lateral acceleration level. Steering gain is defined as the rate of change of lateral acceleration with steer angle. A steering gain of infinity indicates a vehicle which is



(a) European unit



(b) U.S. unit

Figure 3. Handling diagrams, laden units

unstable (yaw divergent). For these two vehicles the gains listed in Table 6 are always reasonable and are equivalent for both vehicles.

In general, longer vehicles with lightly loaded tires are more stable and have lower steering gains. This is seen in Table 6 in the comparison of the steering gains for the laden and unladen vehicles.

Constant Deceleration Stopping

The performance of a tractor-semitrailer combination in braking is dependent on the distribution of loads on the axles, and on its compatibility with the torque of the brakes on each axle. An over-braked axle will produce wheel lockup with loss of directional control forces on the axle. Depending on which axle locks up first, the vehicle may lose steering control (lockup of the front axle), or directional stability (lockup of rear axles). Ideally, the brake forces developed on each axle will be proportioned to the instantaneous load on the axle, with the same proportion at each axle. Because of the range of loads carried on trucks, the load transfer that occurs during braking, and the range of surface friction levels available under diverse road conditions, it is difficult to design a brake system to achieve equal proportioning under all conditions. Thus, one basis for comparing vehicles is to examine the efficiency of the brake system in using the available tire-road friction. The efficiency is defined as the deceleration level (in g) divided by the friction utilization (friction force divided by axle load) for the worst case axle. This parameter is sensitive to an over-braked axle (high friction utilization) which may unnecessarily limit brake application level on the vehicle by causing lockup and instability.

The Simplified Braking Model can be used to evaluate brake system efficiency as described above. The program calculates the dynamic loads at each axle for constant deceleration braking from the force and moment equations in the pitch plane. The braking efficiency is calculated as the ratio of deceleration level to highest friction utilization required at any axle at the given deceleration level.

The parametric data required for this model are the following:
—Relationship of brake torque to treadle pressure (brake gain, pushout pressures, etc.)
—Vehicle weight and distribution on the axles (axle loads)
—CG heights
—Hitch locations
—Interaxle load transfer coefficients on tandem axles
—Wheelbases

Appendix F contains the the vehicle parameter data and the simulation results from the Simplified Braking Model for both the U.S. and European vehicles, laden and unladen. The most relevant difference between the European and U.S. vehicles is in the brake parameters. The U.S. vehicle has higher pushout pressure on the front axle, and on the trailer axles, whereas the European vehicle has higher pushout pressure on the tractor rear axles. Furthermore, the European tractor and semitrailer have load-sensing proportioning systems which reduce pressure to the tractor rear axles and the trailer axles when the load is reduced. Although the U.S. vehicle has significant interaxle load transfer on both the

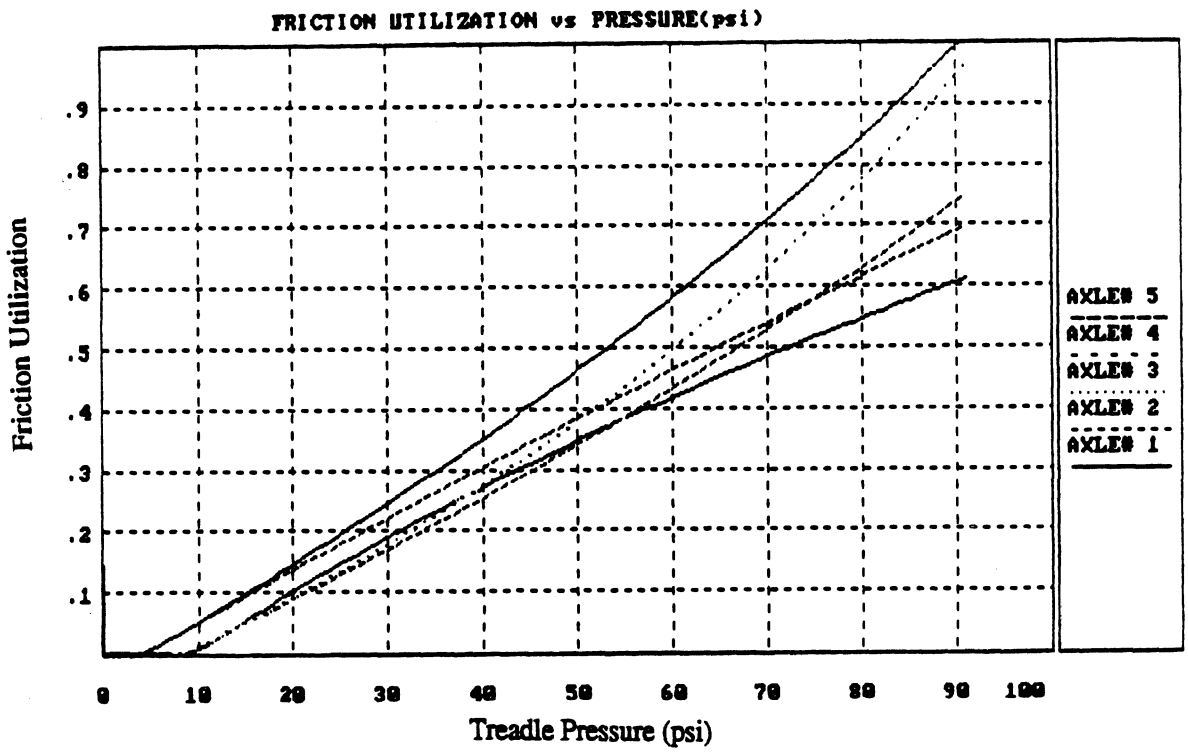
tractor and semitrailer tandems during braking, the tandem on the European trailer also has significant interaxle load transfer when unladen.

The results of the braking efficiency computations are summarized in Table 6. In the laden condition the European vehicle has somewhat better braking efficiency than the U.S. unit (0.87 versus 0.71) at the prescribed steady deceleration of 0.4 g. In effect, the European vehicle is about 20% more efficient than the U.S. vehicle at utilizing the available road surface friction in braking. That is, on a surface of intermediate friction level (near 0.45 coefficient) the European vehicle can achieve a stopping distance without wheel lockup which is about 20% shorter than that of the U.S. vehicle.

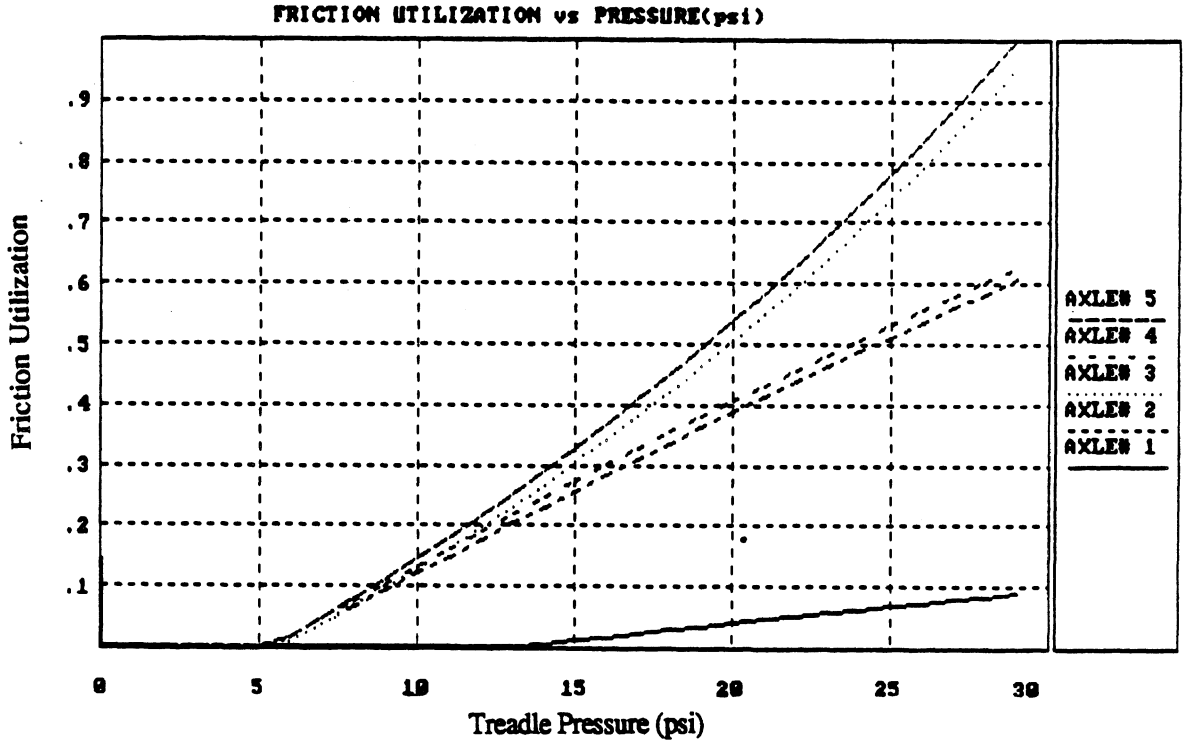
These analytical results differ somewhat from the experimental results obtained in NHTSA testing.[3] In the experimental tests, the "best-effort" stops of the U.S. and European vehicles in the laden condition were comparable in distance. The braking level in "best-effort" stops was only limited by the requirement to maintain stability. It is likely that lockup on one axle of a tandem set could be tolerated in the testing without loss of stability, because the remaining axle would provide the cornering control forces necessary for stability. This condition can be duplicated in the calculated performance by defining a "modified braking efficiency" as the deceleration level divided by the lowest friction utilization on a tandem axle set (allowing the axle with the higher friction utilization level to lock up). The modified braking efficiency for the European vehicle at 0.4 g deceleration is then 0.93 (0.4 g divided by 0.43 friction utilization on the leading axle of the trailer tandem). The trailing axle on the European trailer is at a higher friction utilization and is thus assumed to lock up; whereas the tractor rear axles are both at a lower friction utilization level with no risk of lockup. The modified braking efficiency of the U.S. vehicle is 0.95 (0.4 g divided by 0.42 friction utilization on the leading axle of the tractor). The trailing axles on the tractor and trailer are at higher friction utilization levels, and are thus assumed to lock up. That of the leading axle of the trailer is lower, thus it does not lock up. NHTSA testing [3] provides braking results for the unladen trailer, as well as the bobtail tractor and the half-laden trailer. These experimental results indicated the same trends as those described in the following discussion of the vehicle with an unladen trailer.

In the analysis of the unladen state, the European unit again shows better efficiency, 0.8, compared to 0.53 for the U.S. vehicle. To a large extent, this is due to the presence of the load-sensing proportioning valves on the tractor and semitrailer. The reduction of braking effort on the tractor and trailer tandems produced by the valves at light loads allows the tractor front axle to contribute more to the overall braking force. This effect is illustrated in the graphs of friction utilization versus pressure shown in Figure 4 for the unladen vehicles. At the 0.4 g deceleration level the application pressure on the European vehicle is 53 psi. At this condition the front axle is worked to a 0.36 friction utilization, and develops nearly 5000 lb of braking effort. In contrast, the U.S. vehicle only reaches 24 psi application pressure at 0.4 g deceleration. Because of the 13.5 psi pushout pressure on the front brakes, very little braking effort is obtained.

The higher application pressure on the European vehicle may also contribute to ease of treadle pressure modulation during braking. Modulating pressure about 53 psi is likely to be easier than at 24 psi, improving the driver's ability to maintain braking near the optimum level.



(a) European unit



(b) U.S. unit

Figure 4. Friction utilization groups, unladen units

The friction utilization plots reveal one more feature in the brake systems compromising braking ability. The tandem axles on the U.S. vehicle and on the European trailer have a significant amount of interaxle load transfer during braking. Due to the kinematics of the suspension designs, brake torque reaction in the suspension tends to shift load from the trailing to the leading axle of the tandem. The more lightly loaded trailing axle then exhibits higher friction utilization, and becomes the limiting factor in braking efficiency. Referring to the European vehicle in Figure 4, at 53 psi the friction utilization on the leading and trailing axles of the trailer tandem are 0.41 and 0.50 respectively. The latter axle limits the braking efficiency to 0.8 (i.e., 0.4 deceleration/0.5 coefficient = 0.8 efficiency). If the interaxle load transfer did not exist, both axles would have a friction utilization of 0.45 resulting in a braking efficiency of 0.88 (a 10% improvement).

The plots of Figure 4 provide a good visual picture of the degree of optimization achieved in the design of a brake system. Optimum performance (for a given load condition) is achieved when the friction utilization curves for all axles lie on top of one another. In the comparison of the two vehicles, the European tractor-semitrailer is optimized much better. Its primary deficiency arises from the interaxle load transfer on the trailer tandem. A slight additional loss in efficiency derives from the fact that the trailer tandem has higher brake power level than the tractor axles.

The U.S. vehicle incorporates similar shortcomings limiting the braking efficiency that is achieved. The dominant factors are low braking effort from the front axle, and interaxle load transfer on the tractor and trailer tandems.

Transient Turning

Transient turning measures the quickness of the lateral acceleration response of the first unit in a combination vehicle when the driver applies a rapid steer input. A ramp steer input to a fixed level of steer angle is used. The response time is defined as the difference between the time when the steer input reaches 50% of its final value and the time when the lateral acceleration reaches 90% of its final value. The response time depends upon tire properties, forward speed, the vehicle loading, and the amplitude of the ramp steer input.

The Constant Velocity Yaw/Roll Model is used to evaluate this performance. It simulates the directional and roll response of articulated and straight vehicles during steer maneuvers up to those that approach the rollover threshold. The model requires a complete description of all the vehicle components with the exception of brakes. The results of the simulations are time histories of response variables such as yaw rates, lateral accelerations, roll angles, wheel loads, etc. Input to the simulation for this performance evaluation is a ramp steer from 0° to 28° with a steering wheel angle slope of 200°/sec.

The Yaw/Roll simulation results are presented in Appendix G. Included are plots of lateral acceleration versus time which provide a visual indication of the response predicted. Figure 5 shows examples of those plots for the laden European and U.S. vehicles. The response times are summarized in Table 6 for both vehicles in laden and unladen conditions. In the table it is seen that the laden U.S. vehicle has quicker response (37%) than the laden European vehicle, whereas, both are essentially the same unladen. In part,

the quicker response may be a result of the lower mass and yaw moment of inertia for the U.S. tractor.

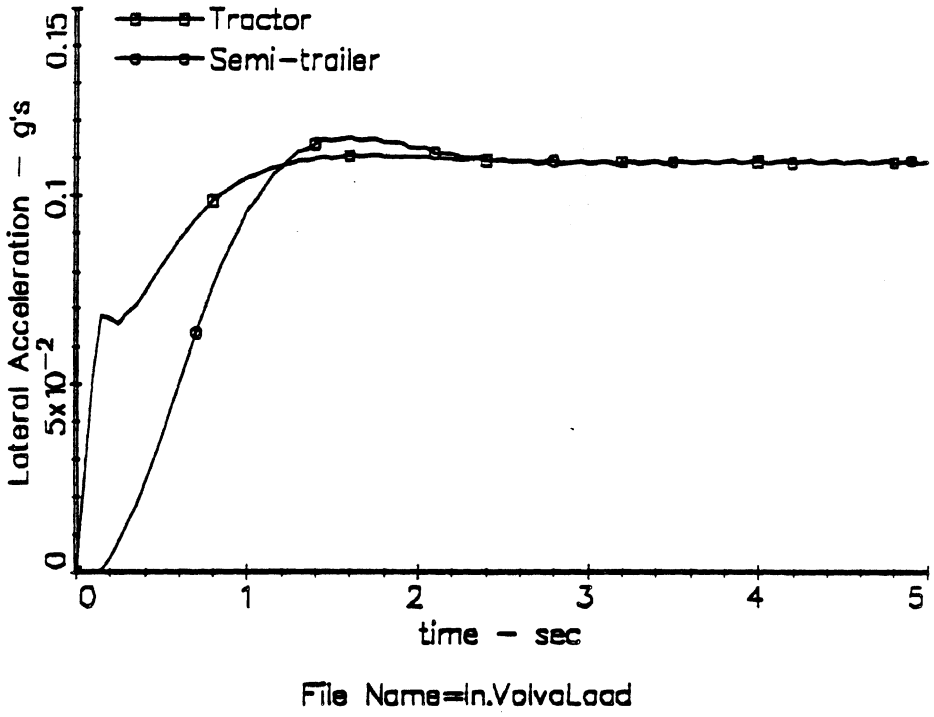
Obstacle Evasion

The obstacle evasion maneuver is based on traffic conflicts in which the driver attempts to avoid a collision by suddenly swerving into another lane. Quick maneuvers may excite amplified responses at the last unit of a combination vehicle, especially when those units are full trailers. One consequence of the amplified response is exposure of the rear unit(s) to higher lateral acceleration levels with an increased risk of rollover. A second consequence is enlargement of the swept path of the vehicle on the highway, increasing the risk of conflict with other vehicles.

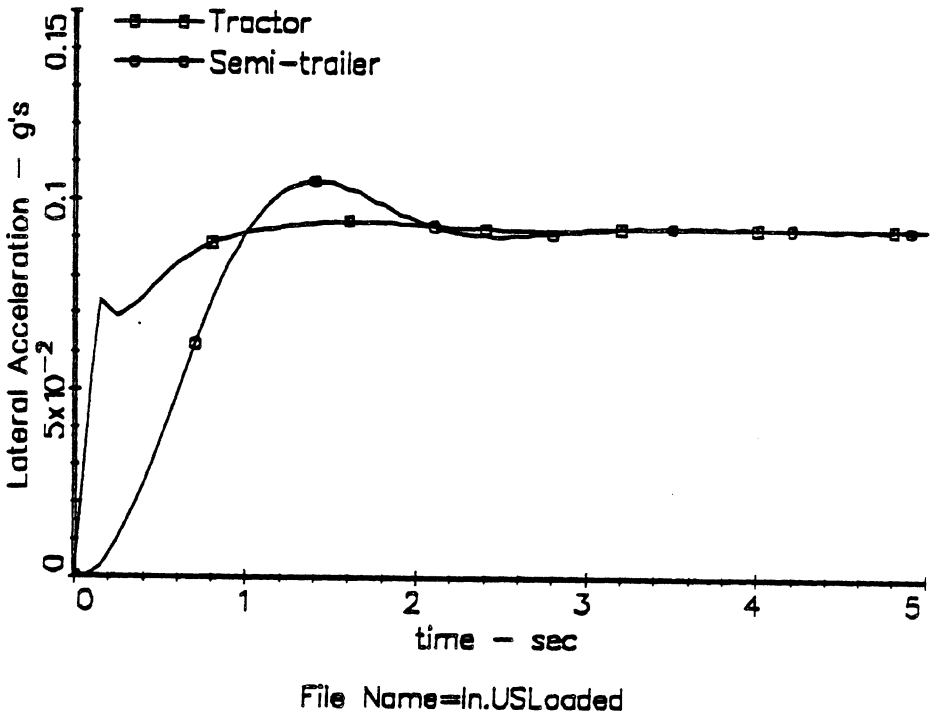
The amplified response of a combination vehicle in a quick obstacle-evasion maneuver is characterized by a "rearward amplification" factor. This factor is the ratio of peak lateral acceleration at the CG of a trailer to that at the CG of the tractor.

The magnitude of rearward amplification is frequency sensitive. The Linear Yaw Plane Model performs computations in both the time and frequency domains, and determines the rearward amplification value at the "worst-case" frequency. Table 6 lists the values for the European and U.S. vehicles in the laden and unladen conditions.

Tractor-semitrailers are normally well behaved with regard to rearward amplification. This is true of all cases examined here. In all four cases, amplification factors very close to 1.0 are observed. This is interpreted to mean that the trailers do not exhibit any exaggeration of the maneuver executed by the tractor. Further, the European and U.S. vehicles are essentially equivalent in this performance measure.



(a) European unit



(b) U.S. unit

Figure 5. Response time, laden units

CONCLUSIONS

Examples of a European tractor and semitrailer were obtained for comparison of the handling and braking performance to that of similar U.S. tractor-semitrailer combinations. The inertial and suspension properties of the European equipment were measured by UMTRI, and properties of the brake system were measured by NHTSA staff. Properties for a generic U.S. tractor-semitrailer combination of equivalent size, weight, and mission were formulated as a basis for comparison. The properties for the U.S vehicle were selected to be in the mid-range of U.S. designs. Brake properties were provided by NHTSA from its own measurements of U.S. equipment.

Using analytical tools, the vehicles were compared in a series of maneuvers for which performance measures served as a basis for quantitative comparison. The conclusions from this analysis may be summarized as follows:

Braking—The European tractor-semitrailer showed braking performance superior to the U.S. unit.

Fully laden, its braking efficiency without wheel lockup on any axle is over 20% better (approximately equivalent to 20% shorter stopping distances under a no-wheels-locked condition). The performance advantage of the European unit in this mode arises from higher braking efforts on the front axle of the tractor, and less interaxle load transfer in the suspensions of the tandem axle sets. However, If wheel lockup on one axle of a tandem set is permissible, the European and U.S. vehicles are essentially equivalent in braking performance, as demonstrated in the NHTSA experimental tests and in the analyses. Unladen, the efficiency of the European unit is calculated to be nearly 50% better. The primary difference accounting for the better performance is use of load-sensing proportioning valves on the tractor rear axles and on the trailer axles. By reducing rear brake torque in approximate proportion to the load, the front brakes can be used more efficiently during unladen braking. A secondary effect is that the control pressures that the driver must apply remain more consistent regardless of load. That is, for a 0.4 g deceleration, the control pressure on the European tractor is 70 psi laden, changing to 53 psi unladen. On the U.S. tractor, the control pressure is 55 psi laden, reducing to 24 psi unladen.

Turning—A number of qualities contributing to the "handling" behavior of the units were evaluated. Lateral acceleration response time, characterizing the quickness of the vehicle's response to steering commands was the only significant distinction between the vehicles. In the unladen condition both vehicles were equivalent ($\approx$ 0.59 sec). When laden, the European tractor increased its response time significantly (0.72 sec), while that of the U.S. vehicle decreased slightly. Although the response of the laden European vehicle was much slower, it was still well within the common range for tractor-semitrailer combinations. Stability in the normal range of lateral accelerations was evaluated by examining understeer properties, looking for a critical speed, and determining steering gain. Both the European and U.S. vehicles are stable throughout the range up to 0.3 g lateral acceleration, and are very comparable in behavior.

Rollover—A special case of the turning limit for motor vehicles is the lateral acceleration level at which rollover occurs (the rollover threshold). In the unladen case, the U.S. unit was slightly higher in rollover threshold, although the threshold for both vehicles was high enough that it would have little impact on safety. In the laden case, rollover thresholds are much lower and likely to have influence on the occurrence of rollover in an accident. Loaded to the same gross vehicle weight, the rollover threshold of the European vehicle is approximately 9% better than that of the U.S. vehicle. Two factors contribute to the better performance of the European vehicle. One is the higher roll stiffnesses in the suspensions of the European vehicle, which is a favorable design feature from the perspective of rollover prevention. The other is a higher tare weight for the European combination. At GCW the European combination has a lower CG because it carries less payload. At the same payload, the rollover threshold on the U.S. unit would be improved, but would still be approximately 6% less than the European vehicle. Using the most favorable suspensions (highest roll stiffness), the U.S. vehicle would have essentially the same rollover threshold as the European vehicle.

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3. Radlinski, R.W., "Comparison of U.S. and European Heavy Vehicle Brake Perfomance." NHTSA Heavy-Duty Vehicle Brake Research Program, Report No. 8. (To be published)

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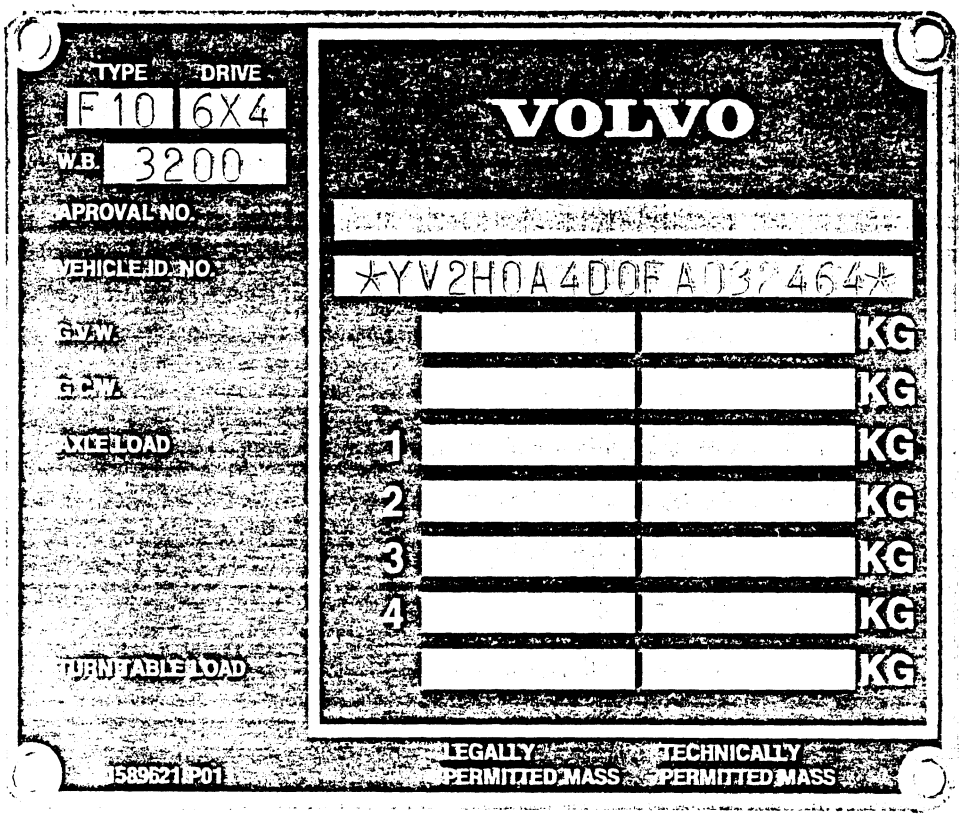
Appendix A

Front Suspension Properties


TYPE
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6X4
W.B.
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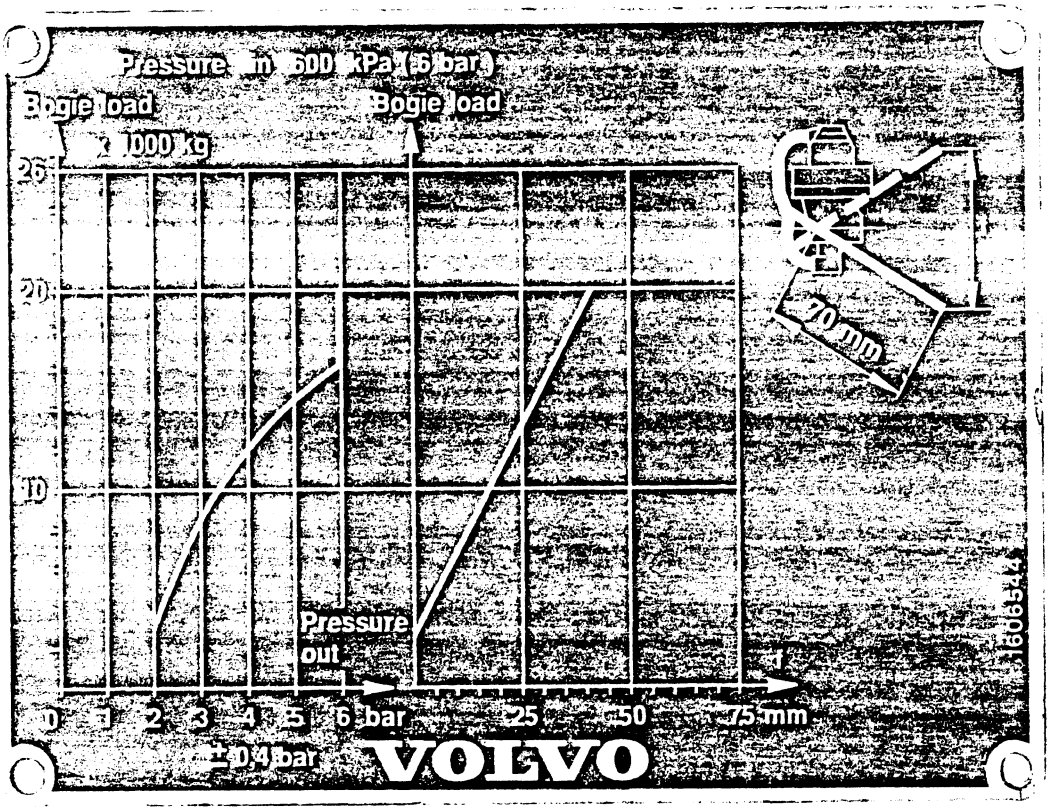
VEHICLE ID. NO.
G.V.W.
G.C.W.
AXLE LOAD
TURNTABLE LOAD
VOLVO
YV2H0A400FA03464
KG
1
2
3
4
LEGALLY PERMITTED MASS
TECHNICALLY PERMITTED MASS
3589621 P01


Pressure in 600 kPa (6 bar)
Bogie load
2 1000 kg
Bogie load
1
26
20
10
Pressure out
0 1 2 3 4 5 6 bar
0 4 bar
25
50
75 mm
70 mm
VOLVO

Single Steering Axle Suspension Reduced Data

Suspension I.D. NHTSA
VCL-VO V-10, FRONT

Unsprung Weight. ("Measured" from lash indication in vertical rate data.)

	Left Side	Right Side
Estimate	750	750

Spring Properties.

Boundry Tables: See attached sheet.

Betas:

Sus Load, lb.	8,000	12,000	10,000
Compression β	0.25	0.27	0.28
Extension β	0.30	0.30	0.30

Suspension Properties.

Sus Load, lb.	14,000	12,000	10,000
Roll Center Height, inches above ground	17.24	17.73	18.30
Auxilary Roll Stiffness, in-lb/deg	25,000	25,000	28,000

	Left	Right	Left	Right	Left	Right
Roll Steer Coefficient, deg/deg	0.047	0.091	0.047	0.070	0.056	0.073
Aligning Moment Steer Coefficient (C_{Mz}),[1] deg/in-lb	0.154E-3	0.179E-3	0.158E-3	0.182E-3	0.16E-3	0.18E-3

Phase IV Steering System Parameters[2]

K_T, in-lb/deg	40,000	40,000	33,333
K_S, in-lb/deg	12,990	12,660	12,500

Lateral Force Steer Coefficient,[3] deg/lb _____ _____ _____ _____ _____ _____

[1] Aligning moment per wheell; applied to left and right sides simultaneously.

[2] Aligning moment coefficients converted to Phase IV model parameters.

$K_T = 1/(C_{MzR} - C_{MzL})$ $K_S = 2/C_{MzL}$

[3] Lateral force per wheell; applied to left and right sides simultaneously.

COMPRESSION ENVELOPE

Deflection, in	Force, lb
1.13	-442.83
1.36	239.76
1.82	1024.74
2.98	2628.84
4.40	4130.55
5.66	5325.08
8.65	8567.41
8.93	8980.37
9.93	10639.09
10.96	12635.66

EXTENSION ENVELOPE

Deflection, in	Force, lb
1.25	-613.48
1.44	-33.28
1.94	581.06
3.02	1809.73
4.18	3038.40
5.61	4574.23
6.74	5724.40
8.02	7236.35
8.70	8058.87
10.93	11284.13

Single Axle ~~Rear~~ Front Suspension Data Reduction Form

Suspension I.D. NHTSA, VOLVO FRONT

Unsprung Weight. ("Measured" from lash indication in vertical rate data.)

	Left Side	Right Side

Betas:

Sus Load, lb.	18,000	14,000	10,000
Compression β	0.25	0.27	0.28
Extension β	0.30	0.30	0.30

Roll Response

Sus Load, lb.	14,000	12,000	10,000
$d\phi_T/d\phi_A$	1.15	1.14	1.17
$dy/d\phi_A$, in/deg	0.29	0.28	0.269
$dy/d\phi_A$, in/rad	16.62	16.04	15.41
h_y, inches	0.62	1.69	2.59
h_{RC}, inches	17.24	17.73	18.30
Aux K_ϕ, in-lb/deg	25,000	25,000	28,000

	Left	Right	Left	Right	Left	Right
$d\delta/d\phi_A$	0.0474 ?	0.0915 ?	0.0465 ?	0.0701 (?)	0.0555 (?)	0.0755 (?)

Aligning Moment

$d\delta/dM_Z$	0.154E-03	0.179E-03	0.158E-03	0.183E-03	0.16E-03	0.19E-03

Lateral Force

$d\delta/dF_H$						

Longitudinal Force

$d\delta/dF_H$	? 0.312E-04	-0.292E-04 ?	0.344E-04 ?	-0.456E-04 ?	0.754E-05 ?	-0.841E-04 ?

Date: January 7, 1987

ATE 11-12-1986 16:13:47
YPE OF TEST:VERTICAL
USTOMER:NHTSA
PERATOR:WINKLER
ILE NAME:C:NHTSAVF0.DAT
OMMENT:NHTSA VOLVO FRONT

TEST CONDITIONS

ITCH ANGLE= .00
OMINAL SUSPENSION LOAD= 0.
OMINAL STEER ANGLE= .00

SUSPENSION DATA

YPE:FRONT
ANUFACTURER:VOLVO
ODEL:?
ATING:?
THER:

VEHICLE DATA

ANUFACTURER:VOLVO
ODEL:F 10 CDE
THER:

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	66.50	.00
SPRING SPACING	30.00	.00
SPRING LASH	.00	.00
TANDEM SPREAD	.00	.00

FACILITY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	78.00	.00
LATERAL Z-POT SPACING	107.90	.00
VERTICAL Y-POT POSITION	.00	.00
	LEFT	RIGHT
LONG. PAD SPACING	.00	.00

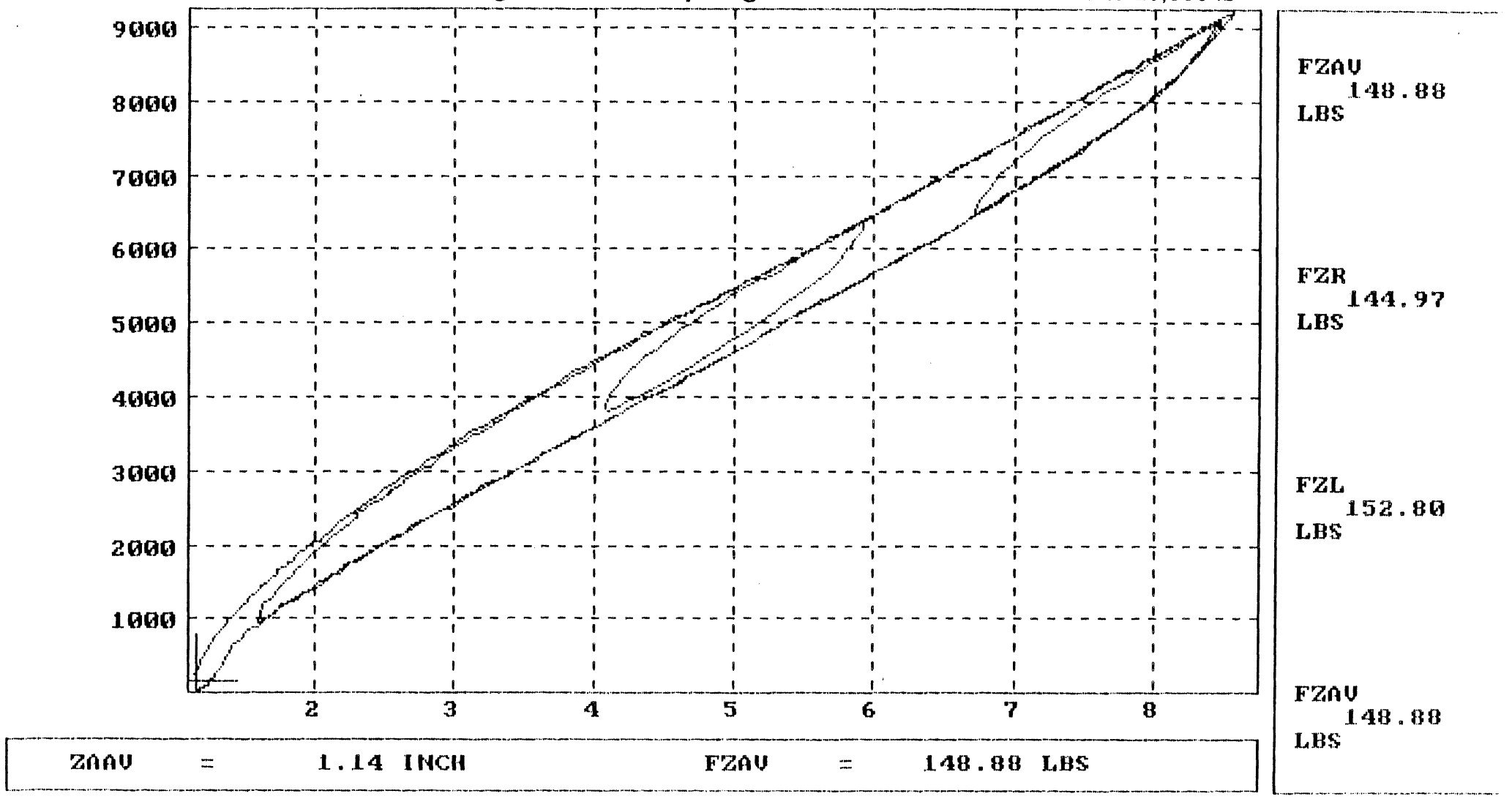
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Average Vertical Spring Rate

Axle Load: 0 to 20,000 lb



Ordinate: Average vertical wheel load (FZAV); pounds; spring compression, positive.

Abscissa: Average vertical axle displacement (ZAAV); inches; spring compression, positive.

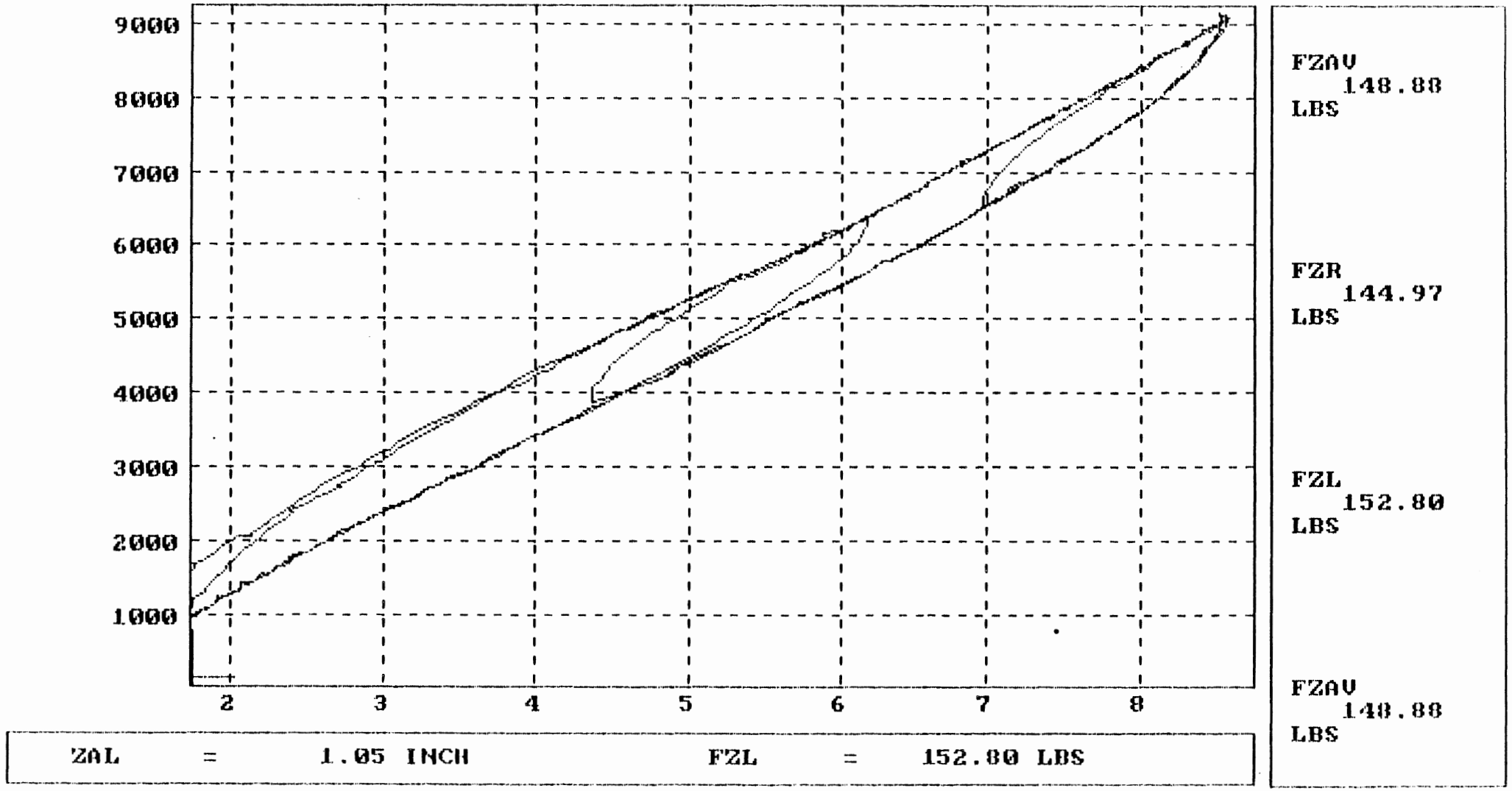
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Left Side Vertical Spring Rate

Axle Load: 0 to 20,000 lb



Ordinate: Left wheel vertical load (FZL); pounds; spring compression, positive.

Abscissa: Left wheelvertical\ displacement (ZAL); inches; spring compression, positive.

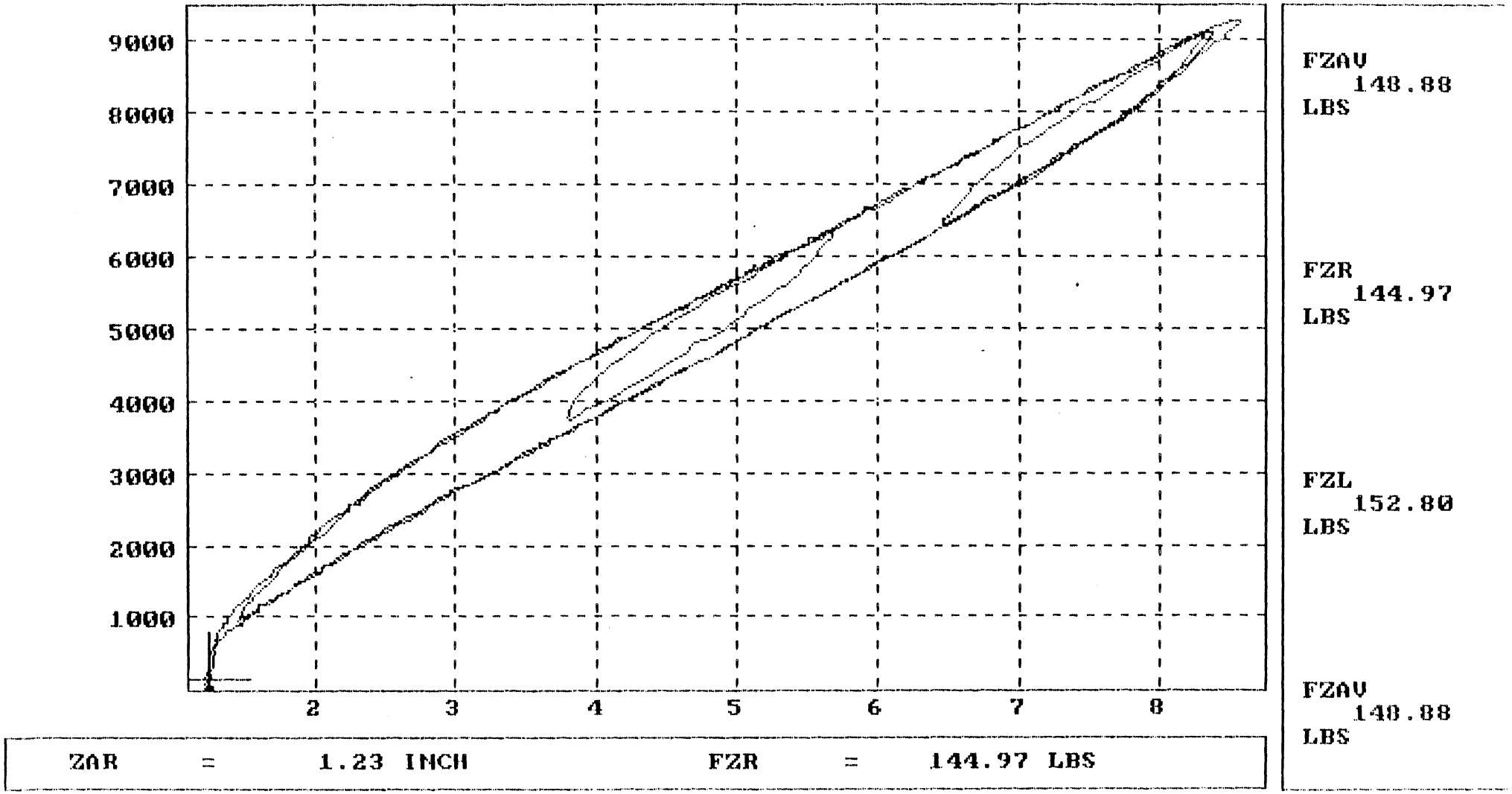
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Right Side Vertical Spring Rate

Axle Load: 0 to 20,000 lb



Ordinate: Left wheel vertical load (FZR); pounds; spring compression, positive.

Abscissa: Left wheelvertical\ displacement (ZAR); inches; spring compression, positive.

ATE 12-11-1986 16:52:3e
YPE OF TEST:VERTICAL
USTOMER:NHTSA
PERATOR:WINKLER
ILE NAME:C:NHTSAVF1.DAT
OMMENT:

TEST CONDITIONS

ITCH ANGLE= .00
OMINAL SUSPENSION LOAD= 0.
OMINAL STEER ANGLE= .00

SUSPENSION DATA

YPE:FRONT
ANUFACTURER:VOLVO
ODEL:?
ATING:?
THER:

VEHICLE DATA

ANUFACTURER:VOLVO
ODEL:F 1? CDE
THER:

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	66.50	.00
SPRING SPACING	30.00	.00
SPRING LASH	.00	.00
TANDEM SPREAD	.00	.00

FACILITY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	78.00	.00
LATERAL Z-POT SPACING	107.90	.00
VERTICAL Y-POT POSITION	.00	.00
	LEFT	RIGHT
LONG. PAD SPACING	.00	.00

Date: January 7, 1987

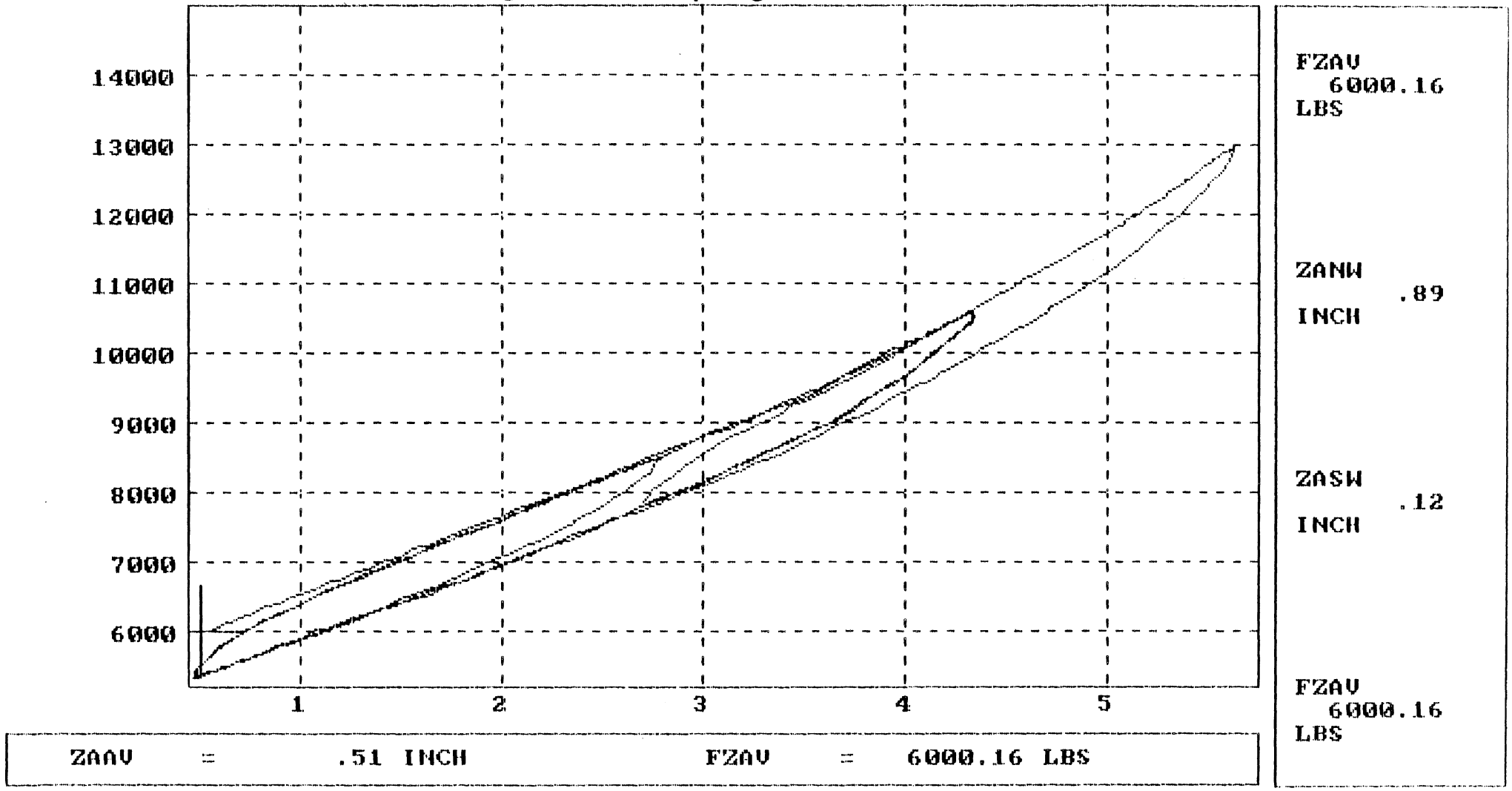
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Average Vertical Spring Rate

Axle Load: 10,000 to 26,000 lb



Ordinate: Average vertical wheel load (FZAV); pounds; spring compression, positive.

Abscissa: Average vertical axle displacement (ZAAV); inches; spring compression, positive.

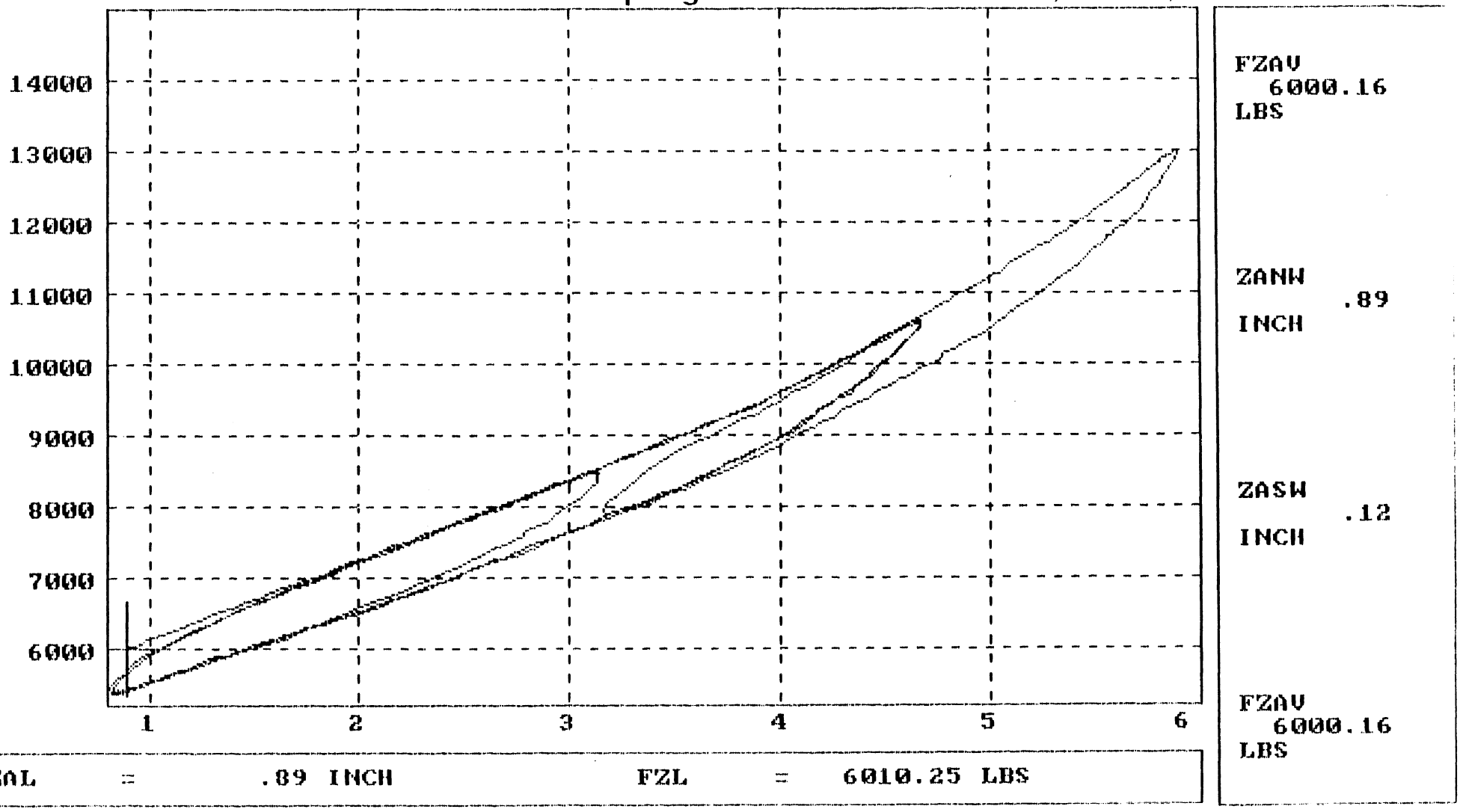
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Left Side Vertical Spring Rate

Axle Load: 10,000 to 26,000 lb



Ordinate: Left wheel vertical load (FZL); pounds; spring compression, positive.

Abscissa: Left wheelvertical\ displacement (ZAL); inches; spring compression, positive.

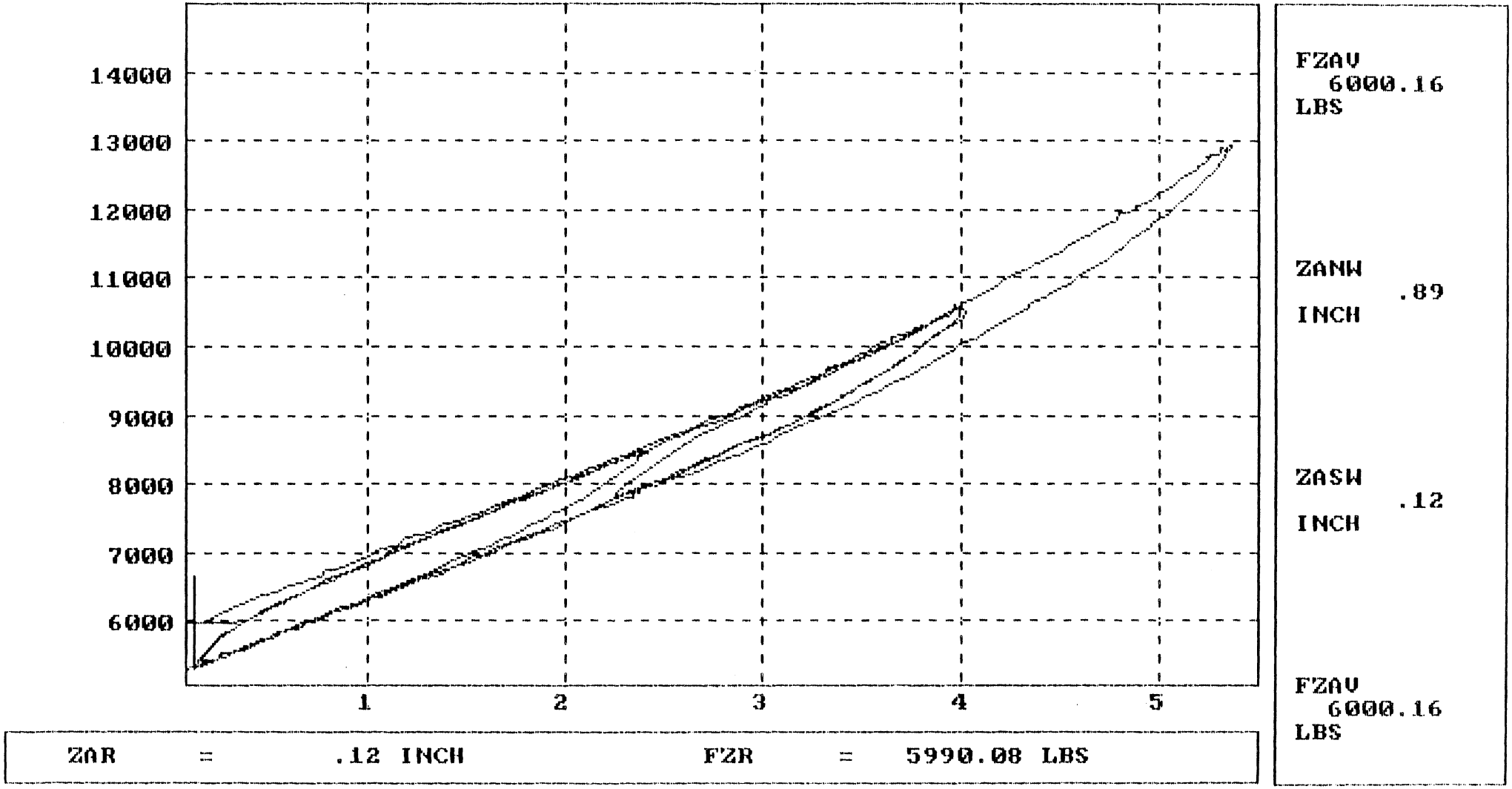
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Right Side Vertical Spring Rate

Axle Load: 10,000 to 26,000 lb



Ordinate: Left wheel vertical load (FZR); pounds; spring compression, positive.

Abscissa: Left wheelvertical\ displacement (ZAR); inches; spring compression, positive.

ATE 12-1=-1F8= 14:22: F
YPE OF TEST:ROLL
USTOMER:NHTSA
PERATOR:WINKLER
ILE NAME:C:NHTSAVFS.DAT
OMMENT:

TEST CONDITIONS

ITCH ANGLE= .0
OMINAL SUSPENSION LOAD=14000.
OMINAL STEER ANGLE= .00

SUSPENSION DATA

YPE:FRONT
ANUFACTURER:VOLVO
ODEL:?
ATING:?
THER:

VEHICLE DATA

ANUFACTURER:VOLVO
ODEL:F 10 COE
THER:

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	66.50	.00
SPRING SPACING	30.00	.00
SPRING LASH	.00	.00
TANDEM SPREAD	.00	.00

FACILTY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	76.00	.00
LATERAL I-PCT SPACING	107.90	.00
VERTICAL Y-PCT POSITION	.62	.00
	LEFT	RIGHT
LONG. PAD SPACING	.00	.00

Date:January 7, 1987

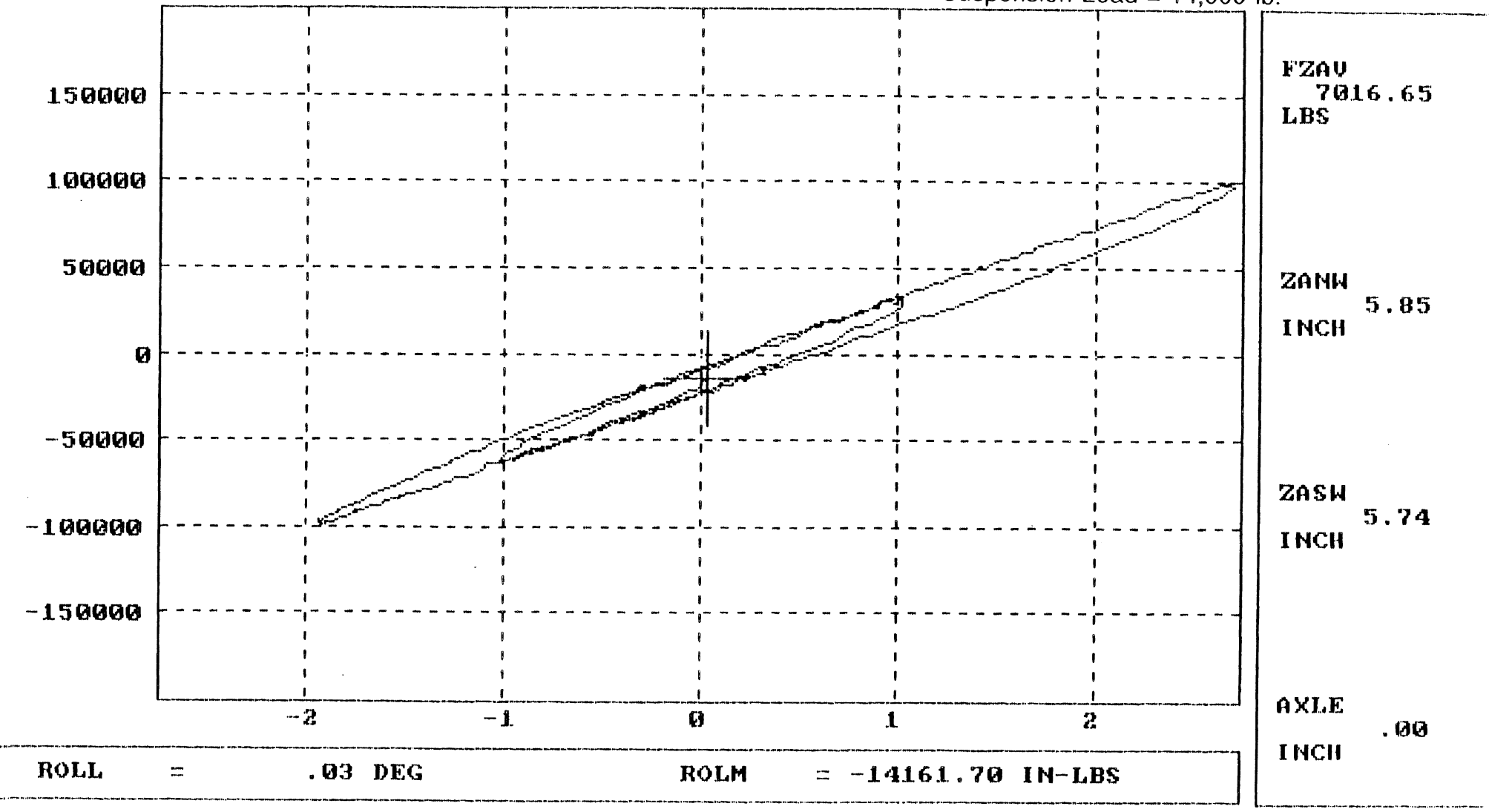
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Axle Roll Rate

Suspension Load = 14,000 lb.



Ordinate: Axle roll moment in load cell coordinate system (ROLM); in-lb; right side compressed, positive.

Abscissa: Axle roll angle (ROLL); degrees; right side compressed, positive.

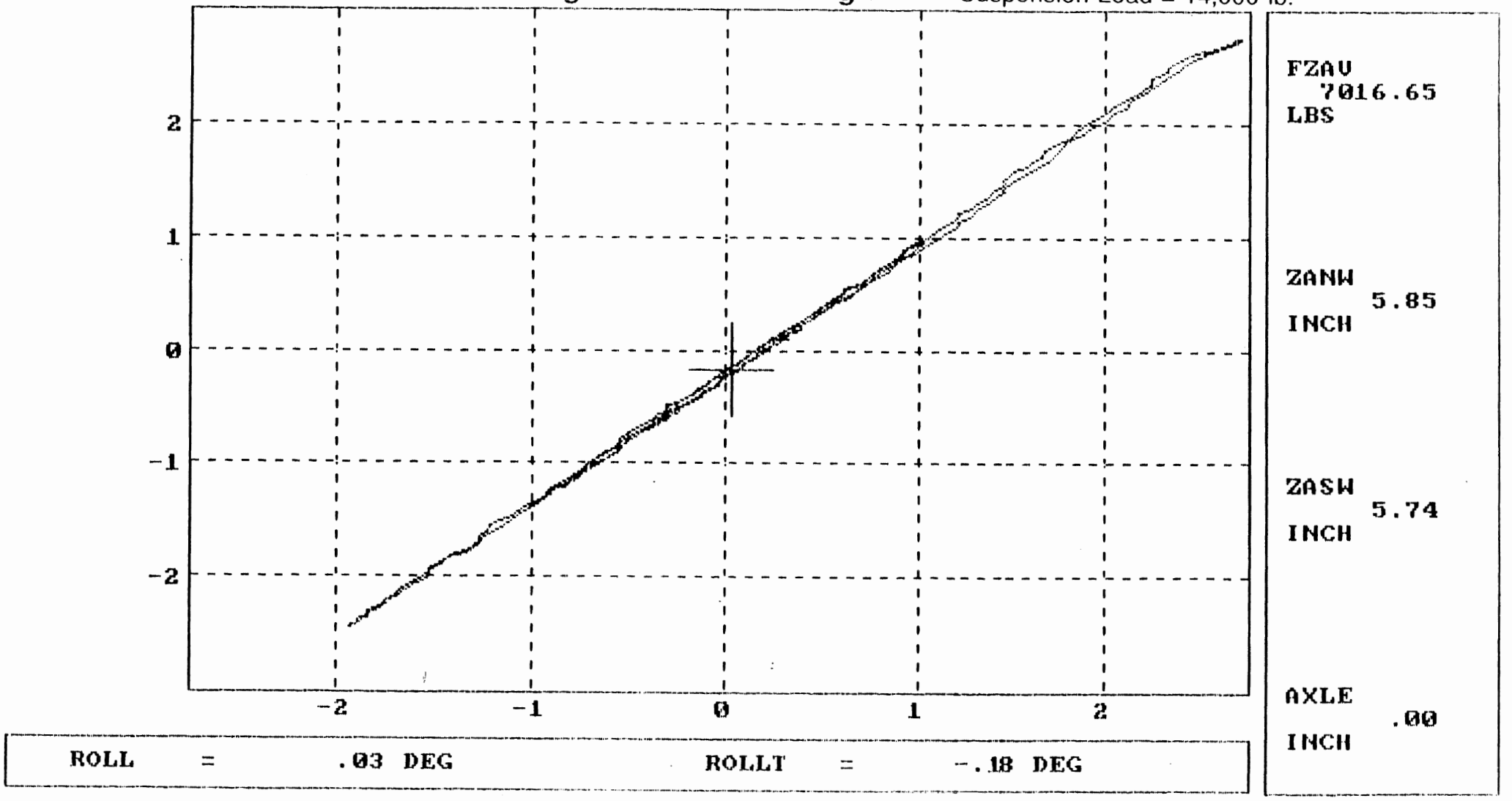
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Table Roll Angle vs Axle Roll Angle

Suspension Load = 14,000 lb.



Ordinate: Table roll angle (ROLLT); degrees; right side compressed, positive.

Abscissa: Axle roll angle (ROLL); degrees; right side compressed, positive.

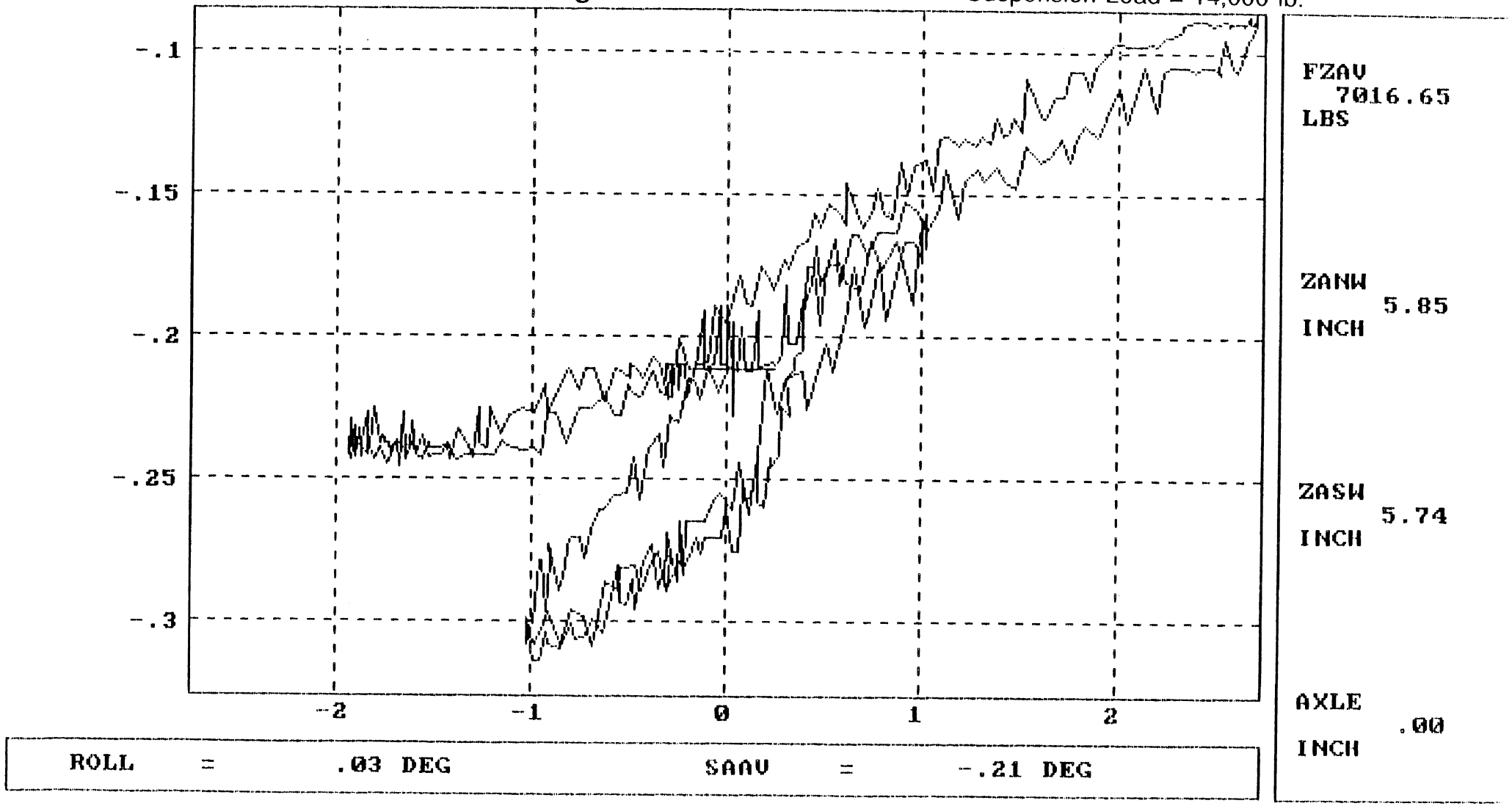
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Average Roll Steer

Suspension Load = 14,000 lb.



Ordinate: Average steer angle (SAAV); degrees; steer toward right, positive.

Abscissa: Axle roll angle (ROLL); degrees; right side compressed, positive.

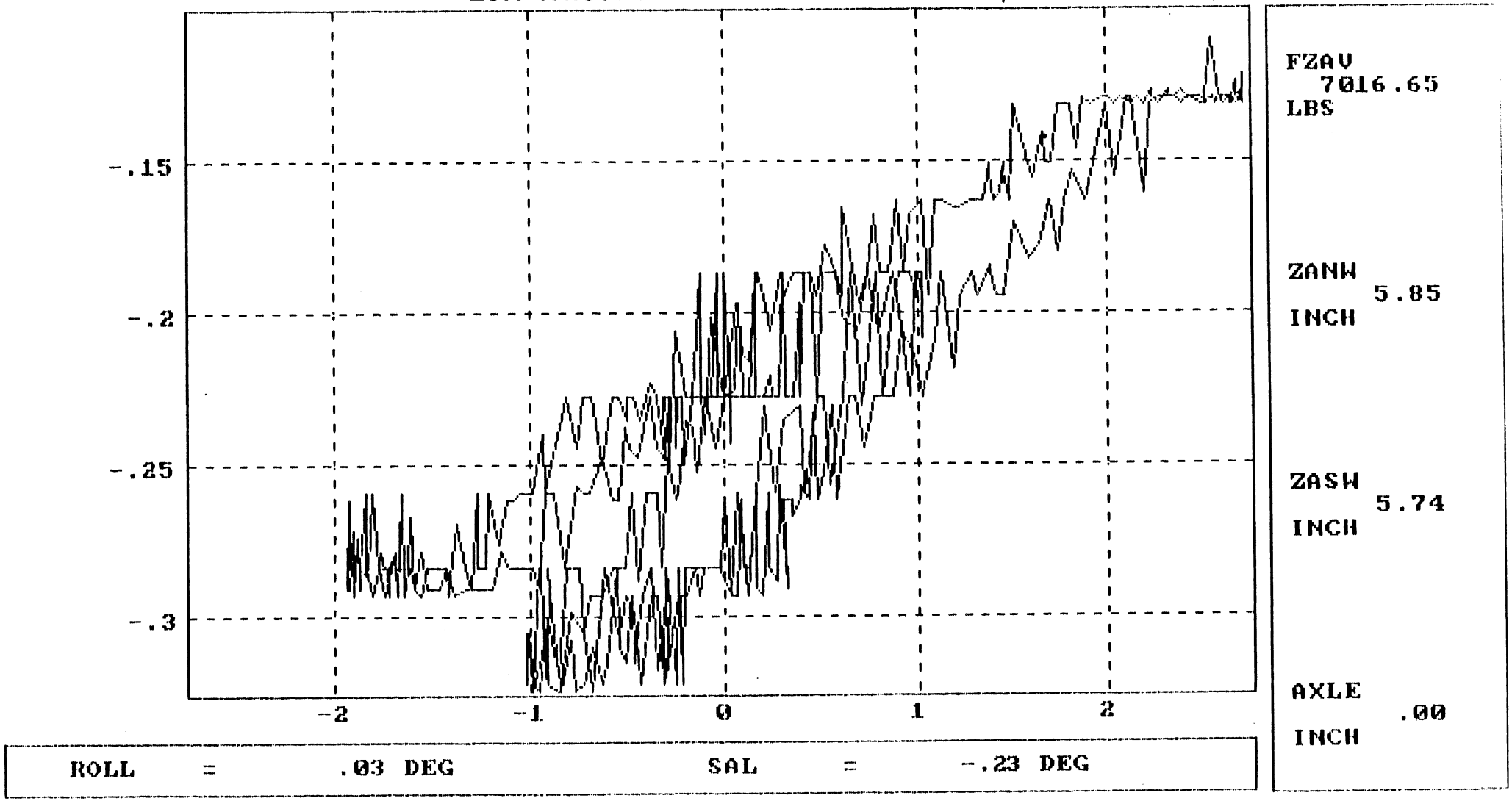
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Left Wheel Roll Steer

Suspension Load = 14,000 lb.



Ordinate: Left wheel steer angle (SAL); degrees; steer toward right, positive.

Abscissa: Axle roll angle (ROLL); degrees; right side compressed, positive.

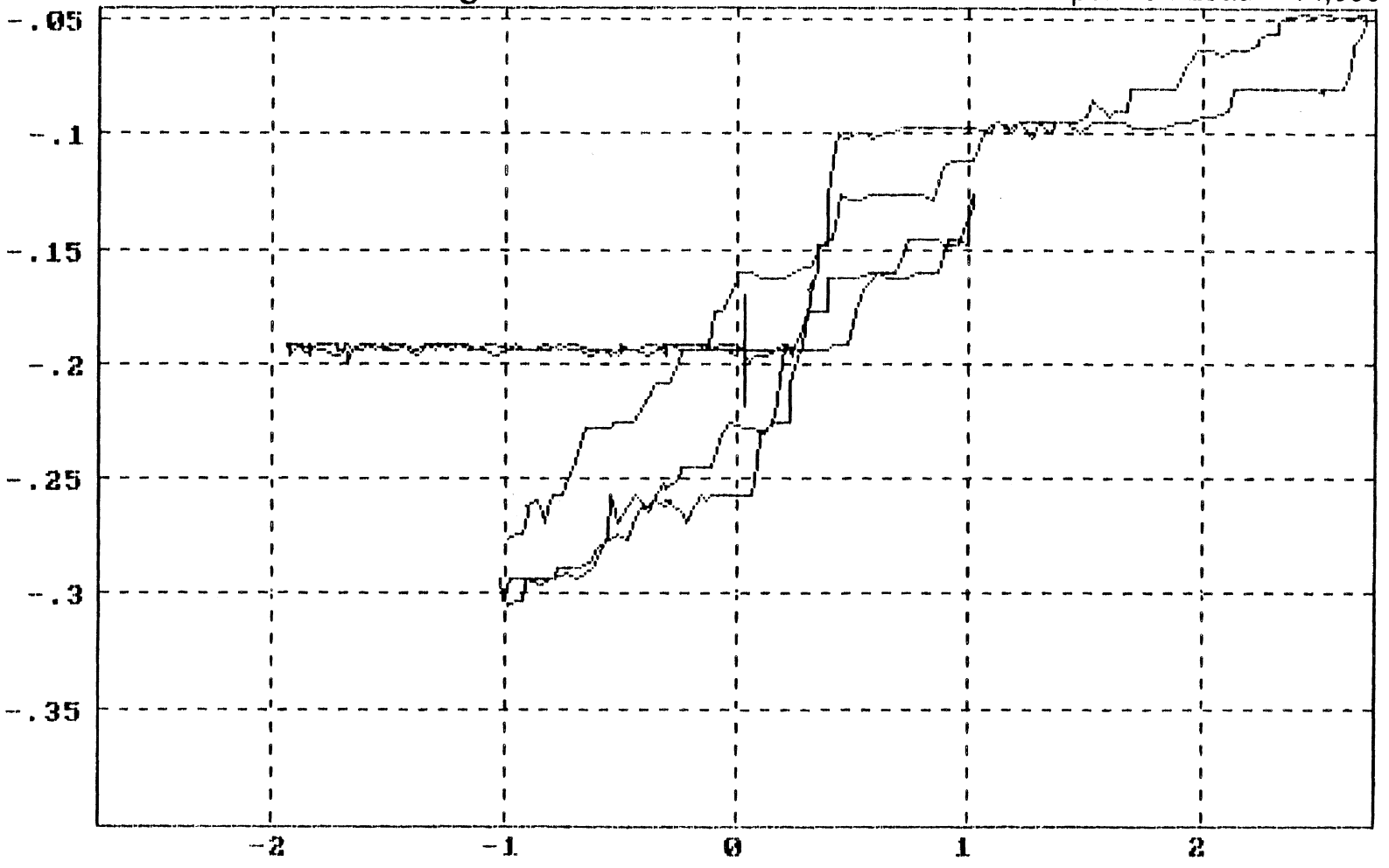
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Right Wheel Roll Steer

Suspension Load = 14,000 lb.



FZAV
7016.65
LBS

ZANW
5.85
INCH

ZASW
5.74
INCH

AXLE
.00
INCH

ROLL = .03 DEG SAR = -.19 DEG

Ordinate: Right wheel steer angle (SAR); degrees; steer toward right, positive.

Abscissa: Axle roll angle (ROLL); degrees; right side compressed, positive.

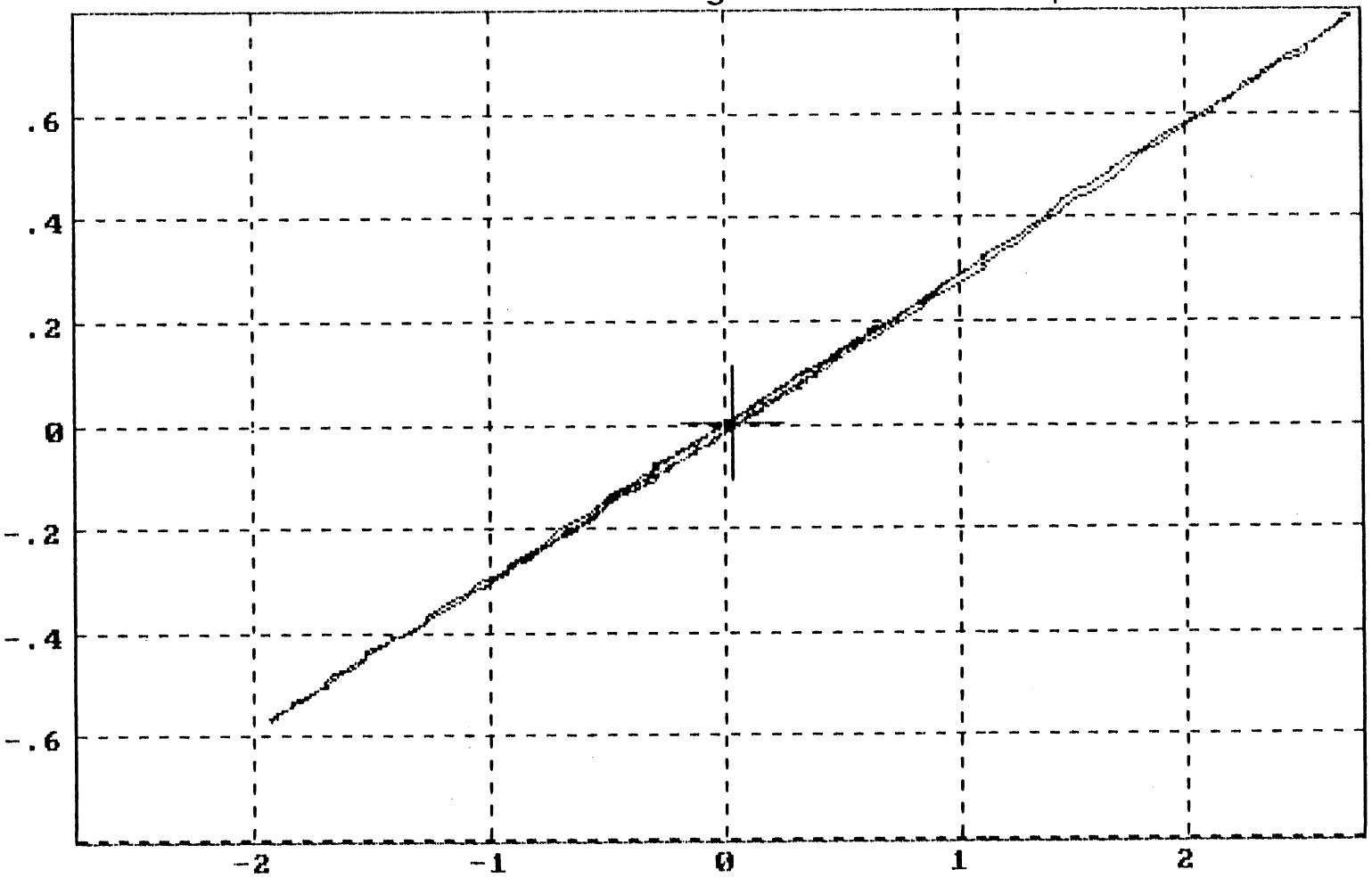
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Roll Center Height

Suspension Load = 14,000 lb.



Ordinate: Axle lateral translation (AXTW) at a position .62 inches above the ground; inches; motion toward right, positive.

Abscissa: Axle roll angle (ROLL); degrees; right side compressed, positive.

DATE 12-1st-1986 14:14:51
TYPE OF TEST:ROLL
CUSTOMER:NHTSA
OPERATOR:WINKLER
FILE NAME:C:NHTSAVF4.DAT
COMMENT:

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD=12000.
NOMINAL STEER ANGLE= .00

SUSPENSION DATA

TYPE:FRONT
MANUFACTURER:VOLVO
MODEL:?
RATING:?
OTHER:

VEHICLE DATA

MANUFACTURER:VOLVO
MODEL:F 10 COE
OTHER:

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	66.50	.00
SPRING SPACING	30.00	.00
SPRING LASH	.00	.00
TANDEM SPREAD	.00	.00

FACILTY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	78.00	.00
LATERAL I-POT SPACING	107.90	.00
VERTICAL Y-POT POSITION	1.69	.00
	LEFT	RIGHT
LONG. PAD SPACING	.00	.00

Date:January 7, 1987

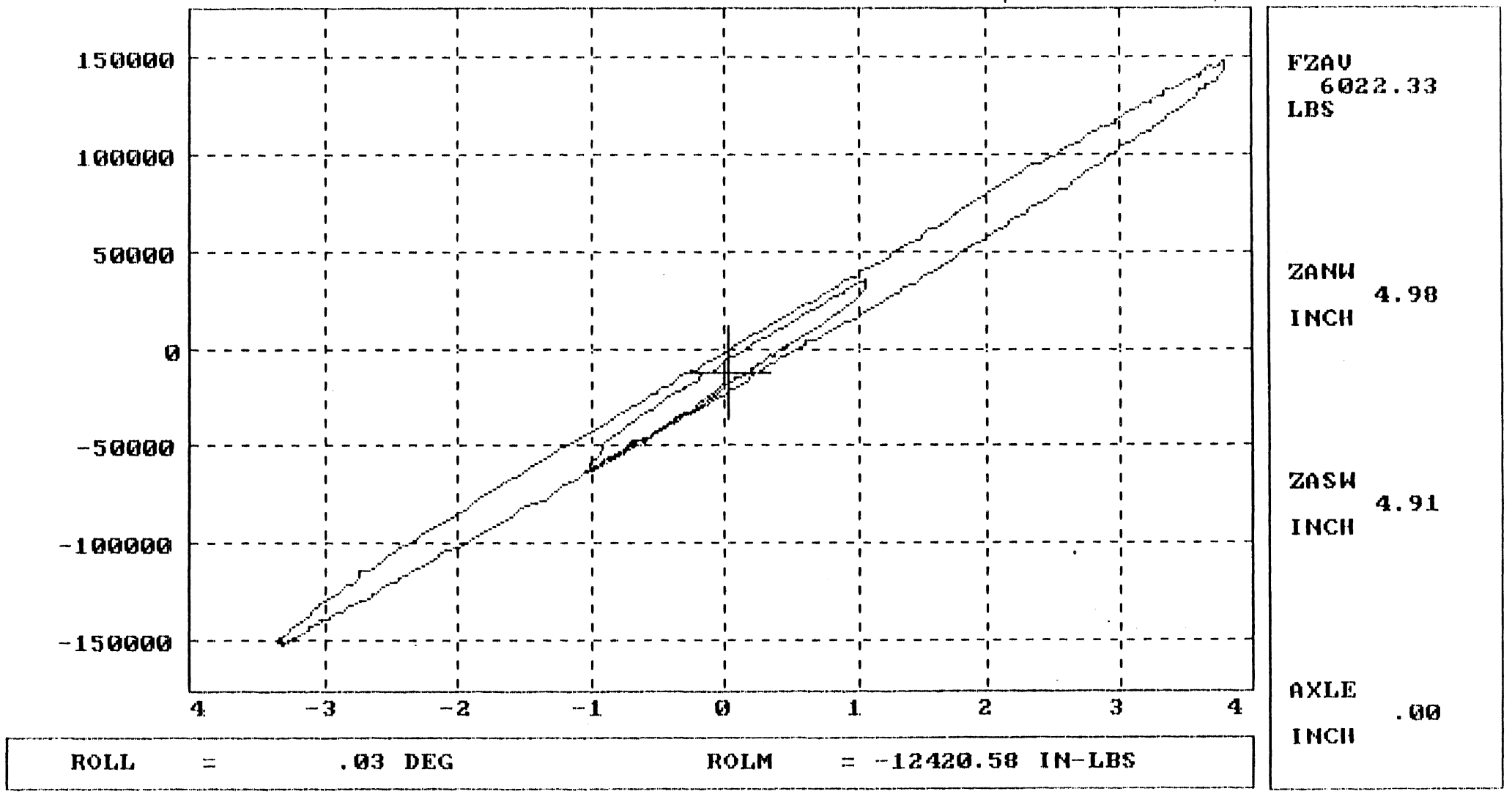
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Axle Roll Rate

Suspension Load = 12,000 lb.



Ordinate: Axle roll moment in load cell coordinate system (ROLM); in-lb; right side compressed, positive.

Abscissa: Axle roll angle (ROLL); degrees; right side compressed, positive.

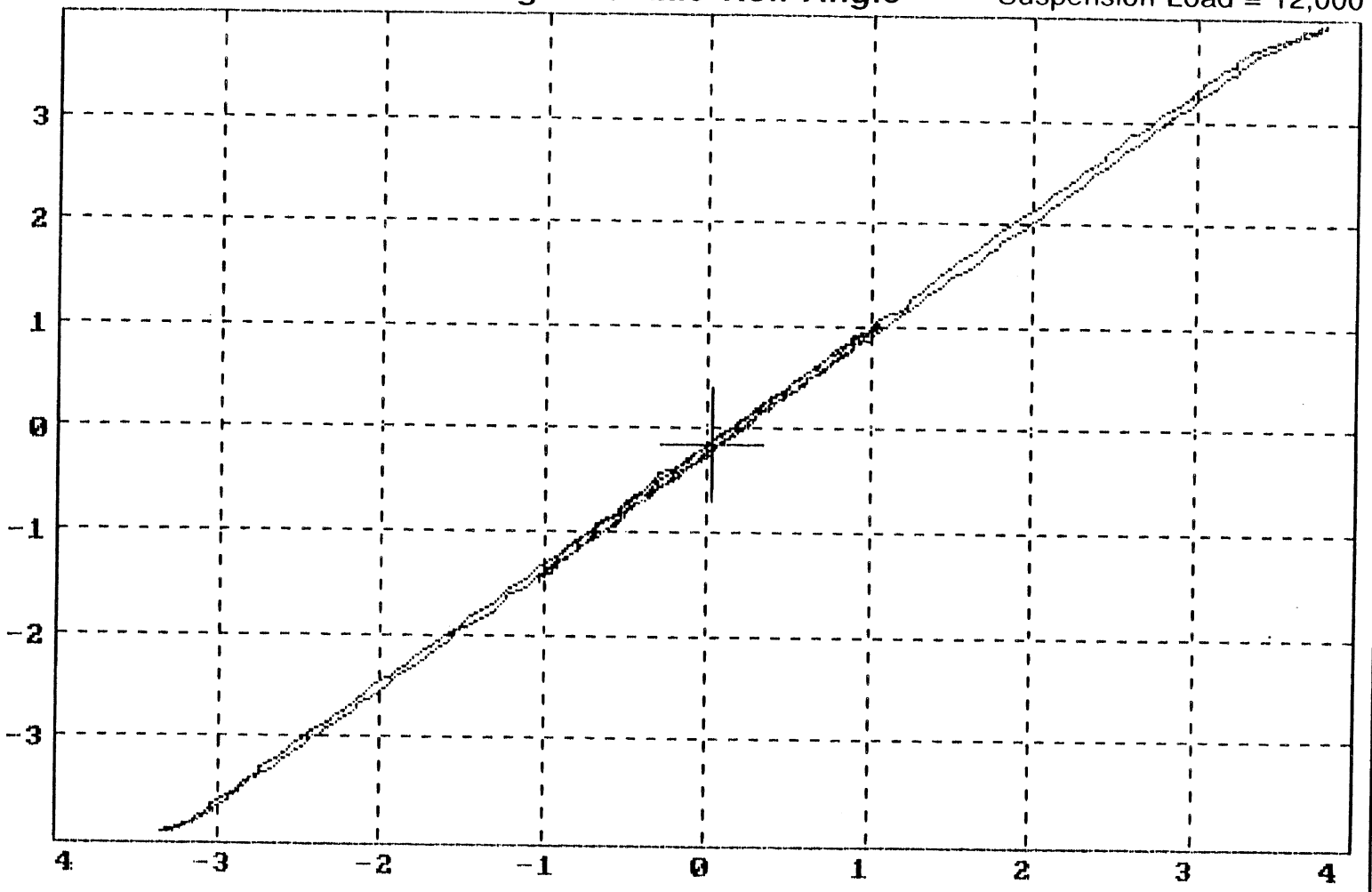
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Table Roll Angle vs Axle Roll Angle

Suspension Load = 12,000 lb.



FZAV
6022.33
LBS

ZANW
4.98
INCH

ZASW
4.91
INCH

AXLE
.00
INCH

ROLL = .03 DEG ROLLT = -.16 DEG

Ordinate: Table roll angle (ROLLT); degrees; right side compressed, positive.

Abscissa: Axle roll angle (ROLL); degrees; right side compressed, positive.

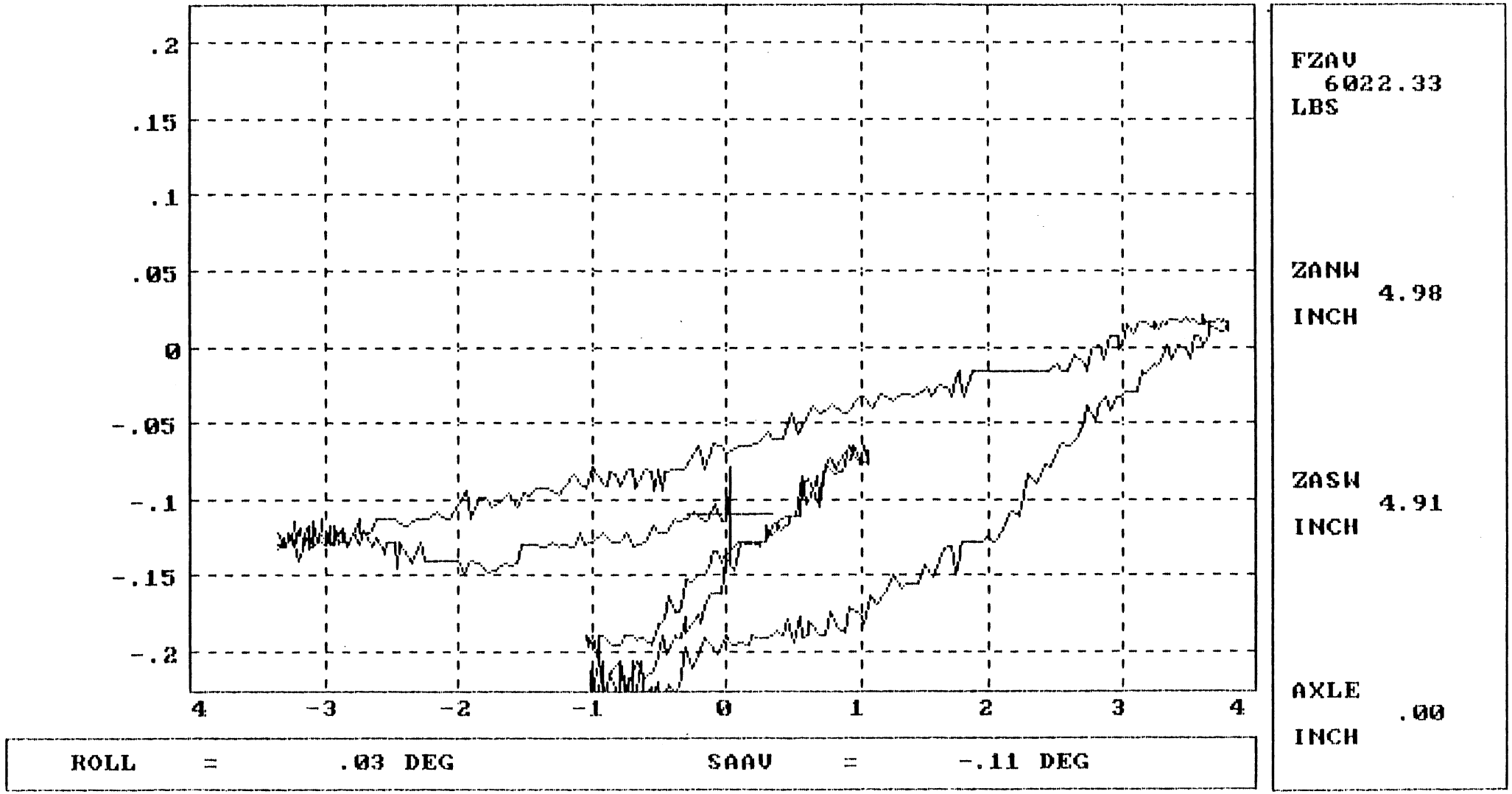
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Average Roll Steer

Suspension Load = 12,000 lb.



Ordinate: Average steer angle (SAAV); degrees; steer toward right, positive.

Abscissa: Axle roll angle (ROLL); degrees; right side compressed, positive.

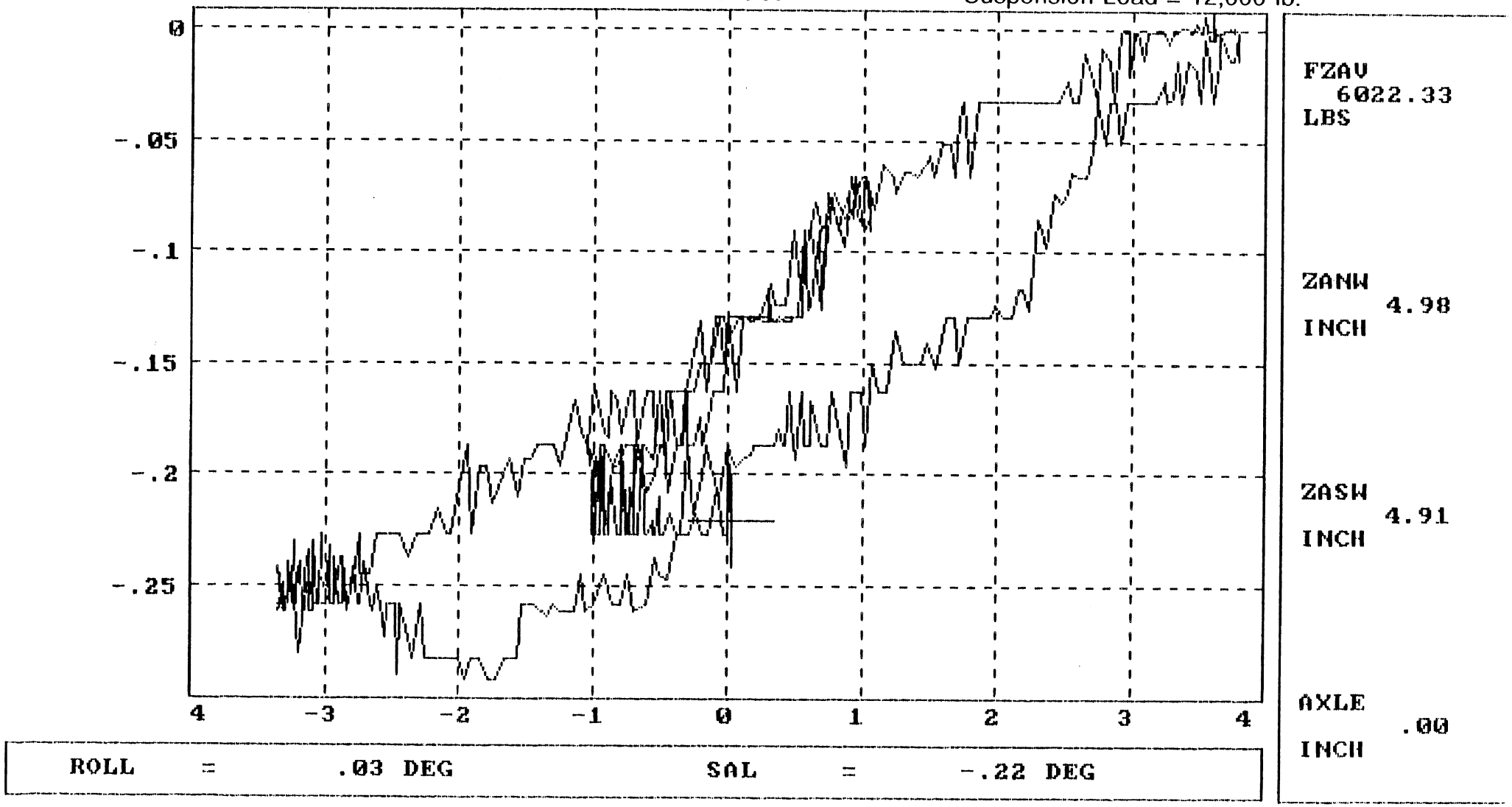
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Left Wheel Roll Steer

Suspension Load = 12,000 lb.



Ordinate: Left wheel steer angle (SAL); degrees; steer toward right, positive.

Abscissa: Axle roll angle (ROLL); degrees; right side compressed, positive.

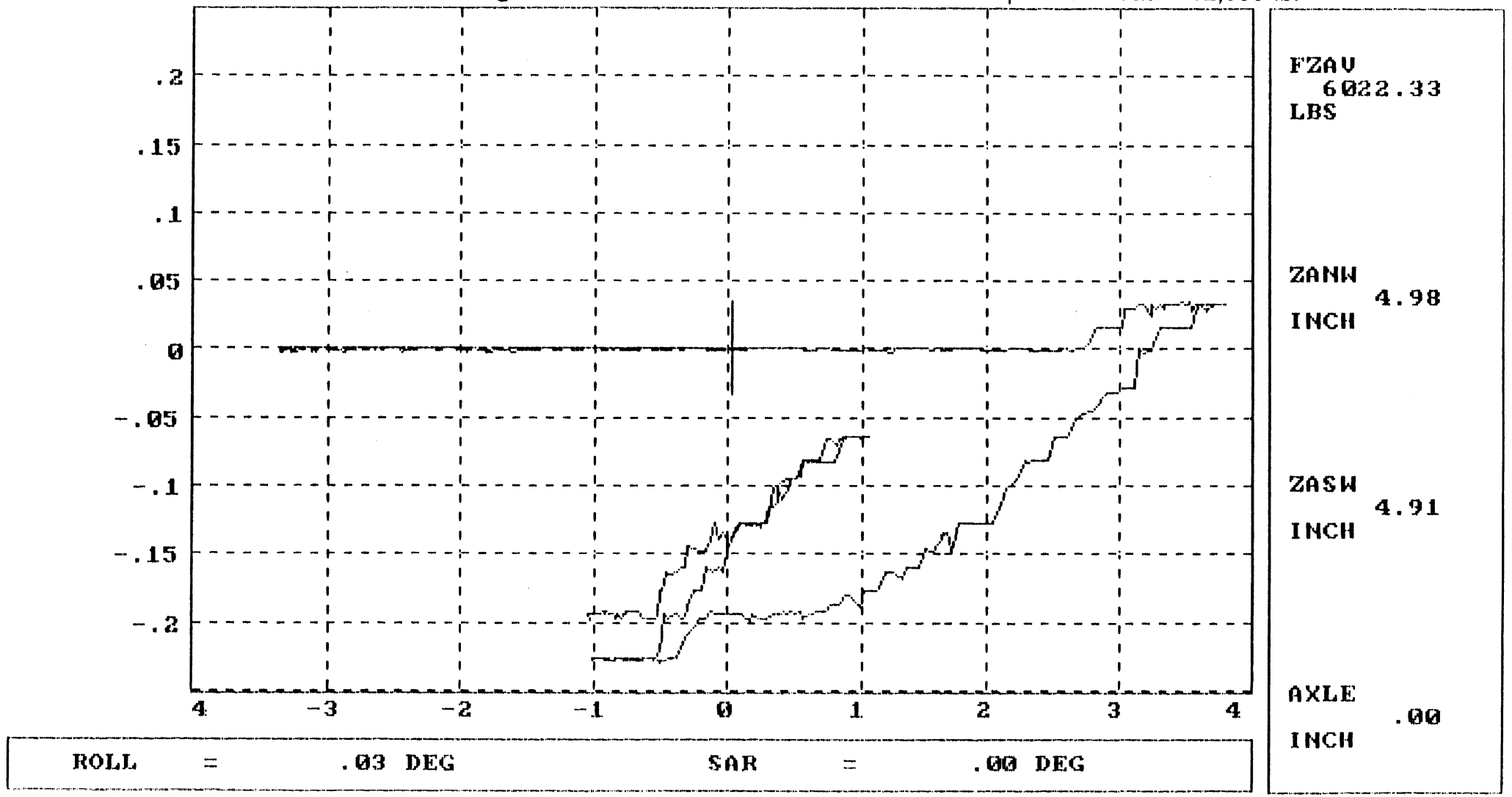
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Right Wheel Roll Steer

Suspension Load = 12,000 lb.



Ordinate: Right wheel steer angle (SAR); degrees; steer toward right, positive.

Abscissa: Axle roll angle (ROLL); degrees; right side compressed, positive.

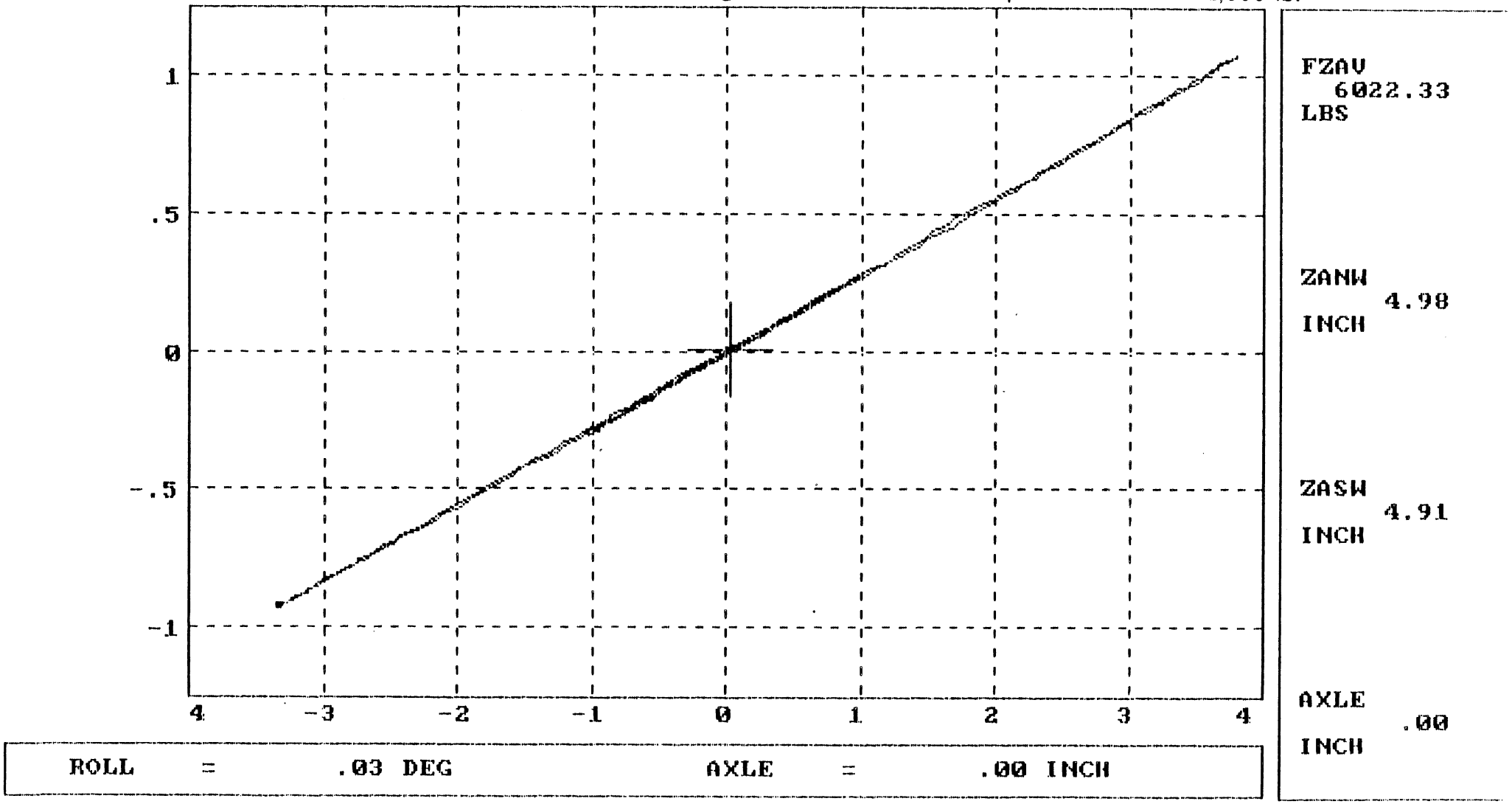
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Roll Center Height

Suspension Load = 12,000 lb.



Ordinate: Axle lateral translation (AXTW) at a position 1.69 inches above the ground; inches; motion toward right, positive.

Abscissa: Axle roll angle (ROLL); degrees; right side compressed, positive.

ATE 11-1e-1986 14: 6:44
YPE OF TEST:ROLL
USTOMER:NHTSA
PERATOR:WINKLER
ILE NAME:C:NHTSAVF3.DAT
OMMENT:

TEST CONDITIONS

ITCH ANGLE= .00
OMINAL SUSPENSION LOAD=10000.
OMINAL STEER ANGLE= .00

SUSPENSION DATA

YPE:FRONT
ANUFACTURER:VOLVO
ODEL:?
ATING:?
THER:

VEHICLE DATA

ANUFACTURER:VOLVO
ODEL:F 11 DOE
THER:

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	66.50	.00
SPRING SPACING	30.00	.00
SPRING LASH	.00	.00
TANDEM SPREAD	.00	.00

FACILTY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	78.00	.00
LATERAL Z-POT SPACING	107.90	.00
VERTICAL Y-POT POSITION	2.89	.00
	LEFT	RIGHT
LONG. PAD SPACING	.00	.00

Date:January 7, 1987

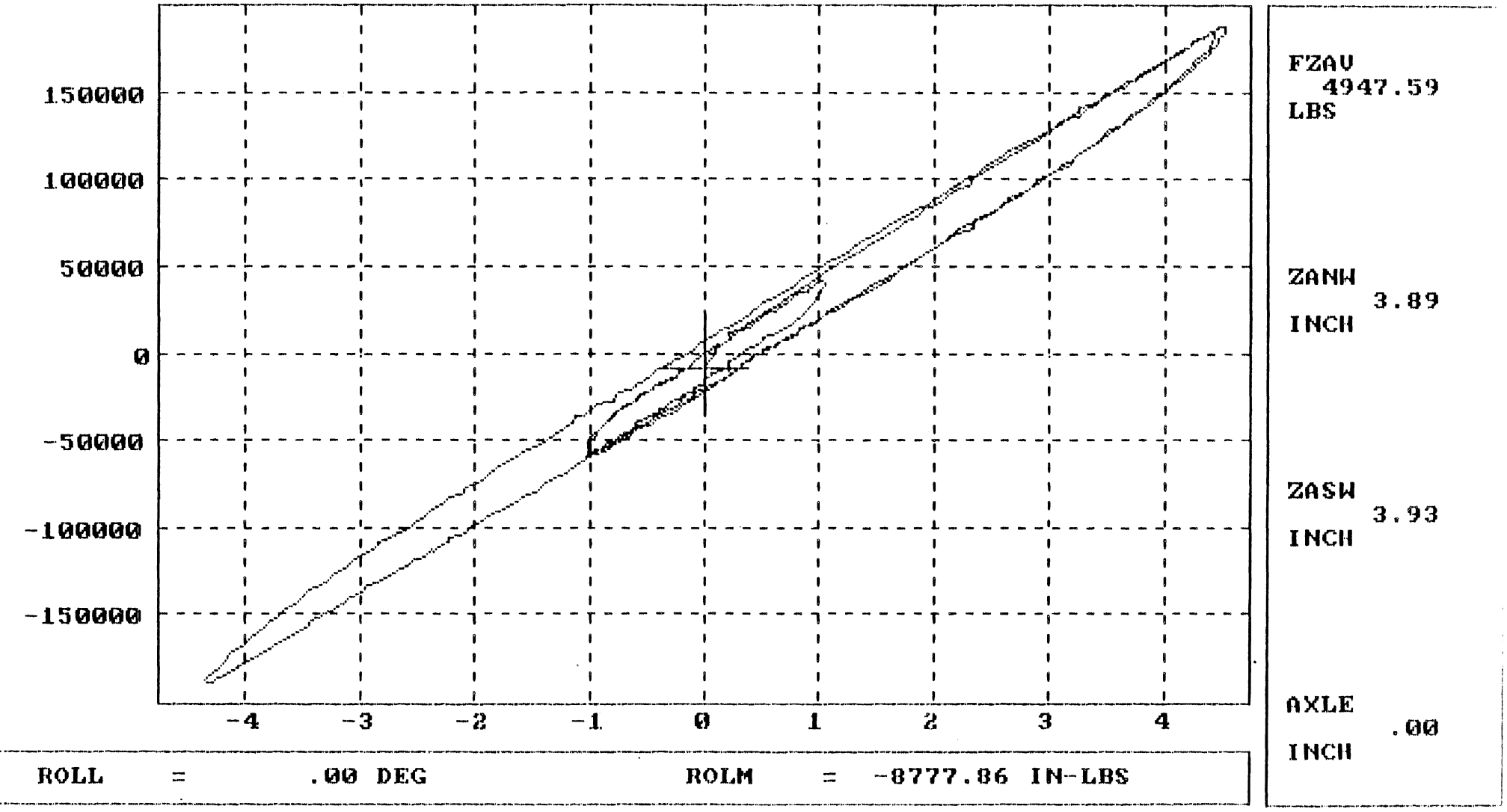
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Axle Roll Rate

Suspension Load = 10,000 lb.



Ordinate: Axle roll moment in load cell coordinate system (ROLM); in-lb; right side compressed, positive.

Abscissa: Axle roll angle (ROLL); degrees; right side compressed, positive.

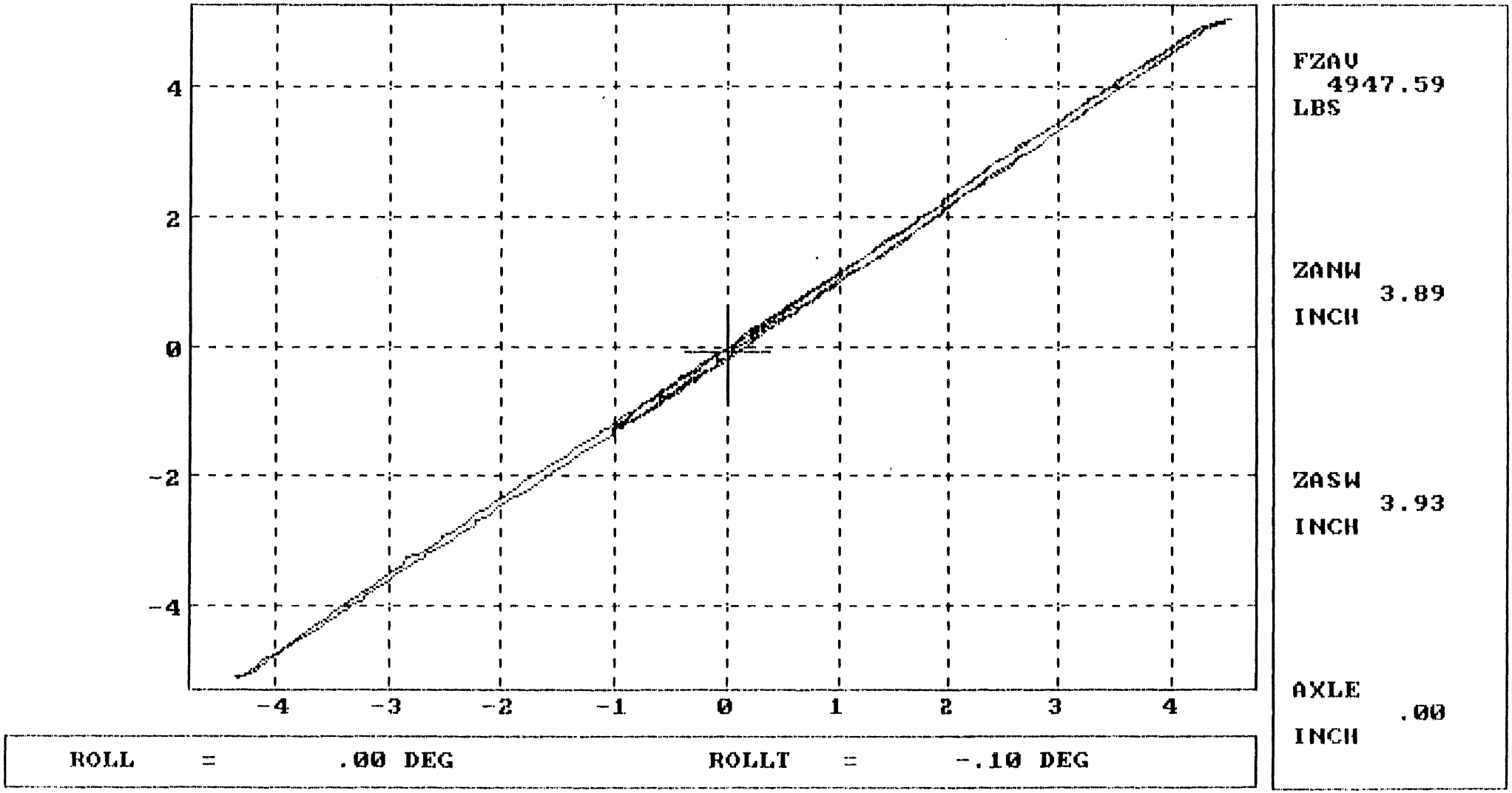
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Table Roll Angle vs Axle Roll Angle

Suspension Load = 10,000 lb.



Ordinate: Table roll angle (ROLLT); degrees; right side compressed, positive.

Abscissa: Axle roll angle (ROLL); degrees; right side compressed, positive.

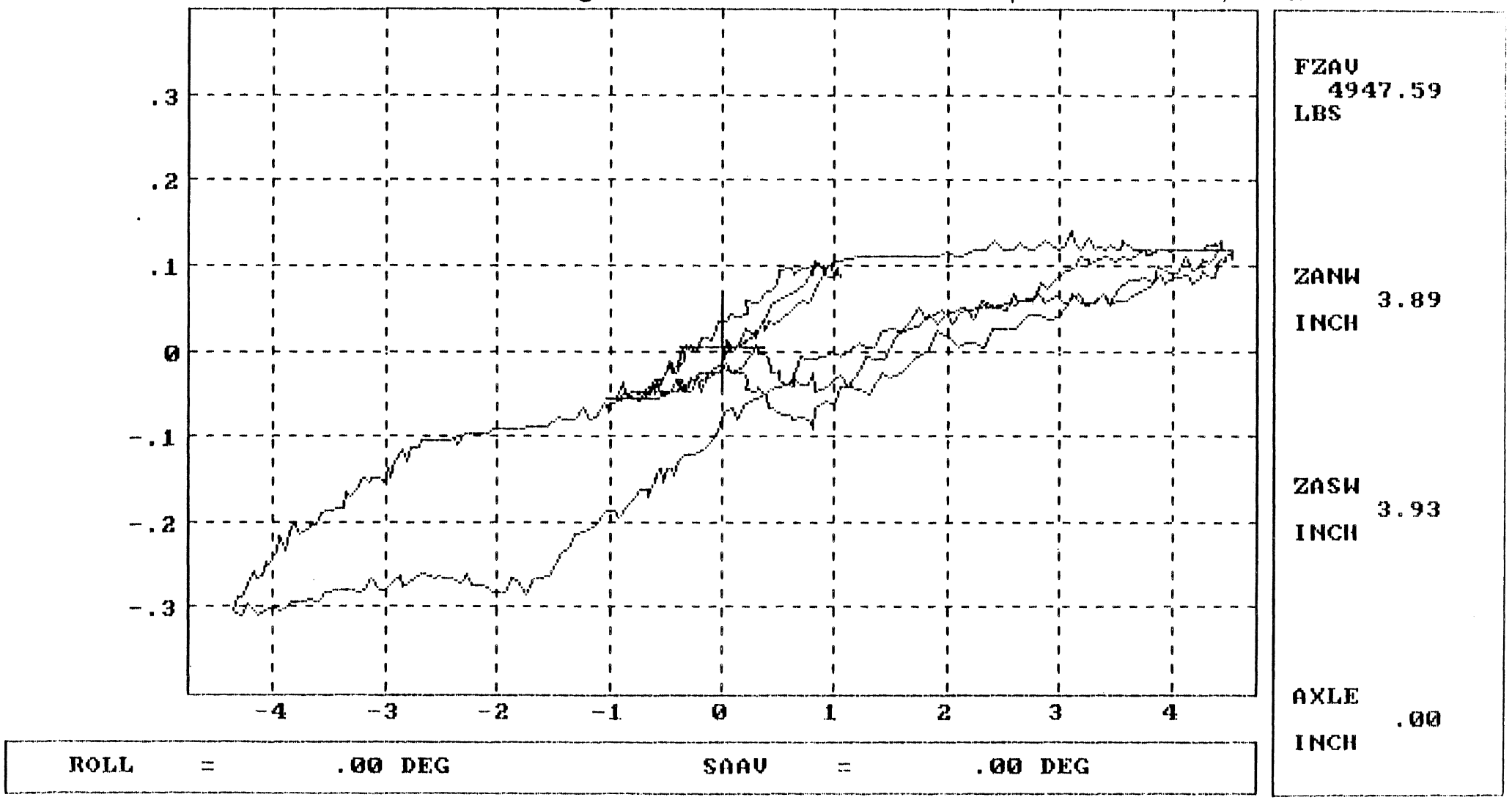
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Average Roll Steer

Suspension Load = 10,000 lb.



Ordinate: Average steer angle (SAAV); degrees; steer toward right, positive.

Abscissa: Axle roll angle (ROLL); degrees; right side compressed, positive.

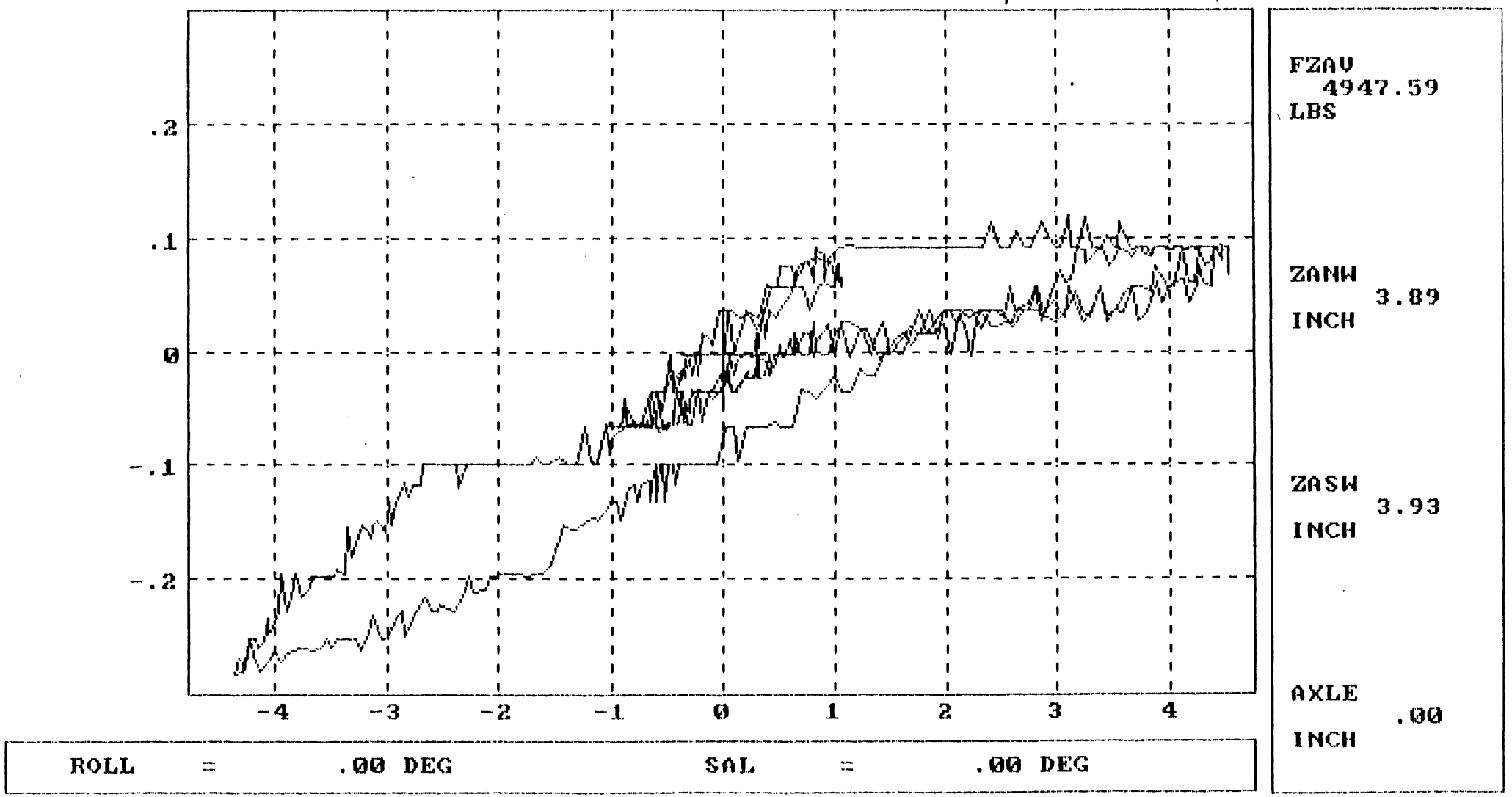
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Left Wheel Roll Steer

Suspension Load = 10,000 lb.



Ordinate: Left wheel steer angle (SAL); degrees; steer toward right, positive.

Abscissa: Axle roll angle (ROLL); degrees; right side compressed, positive.

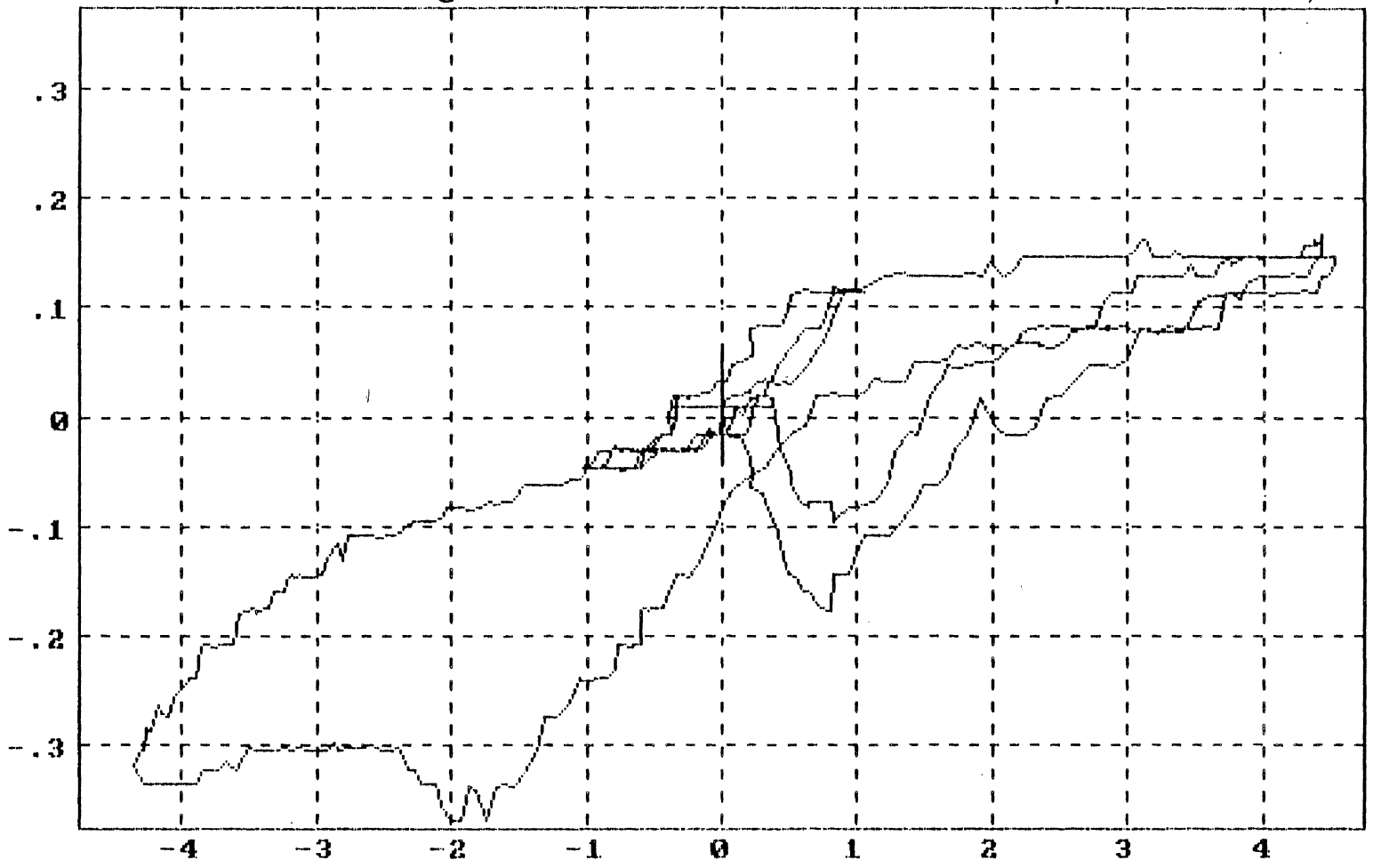
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Right Wheel Roll Steer

Suspension Load = 10,000 lb.



FZAV
4947.59
LBS

ZANW
3.89
INCH

ZASW
3.93
INCH

AXLE
.00
INCH

ROLL = .00 DEG SAR = .01 DEG

Ordinate: Right wheel steer angle (SAR); degrees; steer toward right, positive.

Abscissa: Axle roll angle (ROLL); degrees; right side compressed, positive.

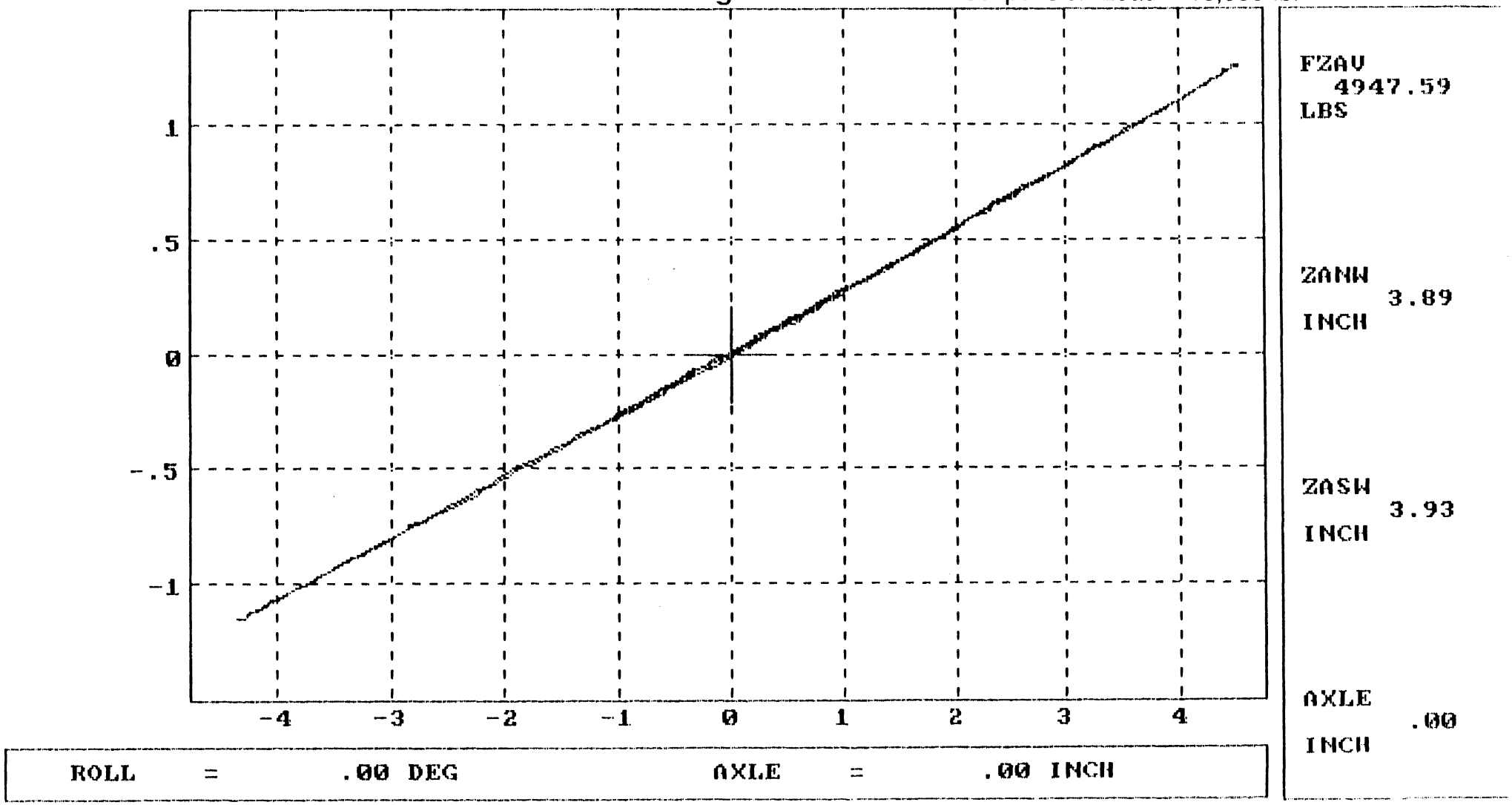
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Roll Center Height

Suspension Load = 10,000 lb.



Ordinate: Axle lateral translation (AXTW) at a position 2.89 inches above the ground; inches; motion toward right, positive.

Abscissa: Axle roll angle (ROLL); degrees; right side compressed, positive.

DATE 12-16-1986 14:38:18
TYPE OF TEST:ALIGNING MOMENT
CUSTOMER:NHTSA
OPERATOR:WINKLER
FILE NAME:C:NHTSAVF7.DAT
COMMENT:

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD=14000.
NOMINAL STEER ANGLE= .00

SUSPENSION DATA

TYPE:FRONT
MANUFACTURER:VOLVO
MODEL:?
RATING:?
OTHER:

VEHICLE DATA

MANUFACTURER:VOLVO
MODEL:F 10 COE
OTHER:

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	66.50	.00
SPRING SPACING	30.00	.00
SPRING LASH	.00	.00
TANDEM SPREAD	.00	.00

FACILTY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	78.00	.00
LATERAL I-POT SPACING	107.90	.00
VERTICAL Y-POT POSITION	.00	.00
	LEFT	RIGHT
LONG. PAD SPACING	.00	.00

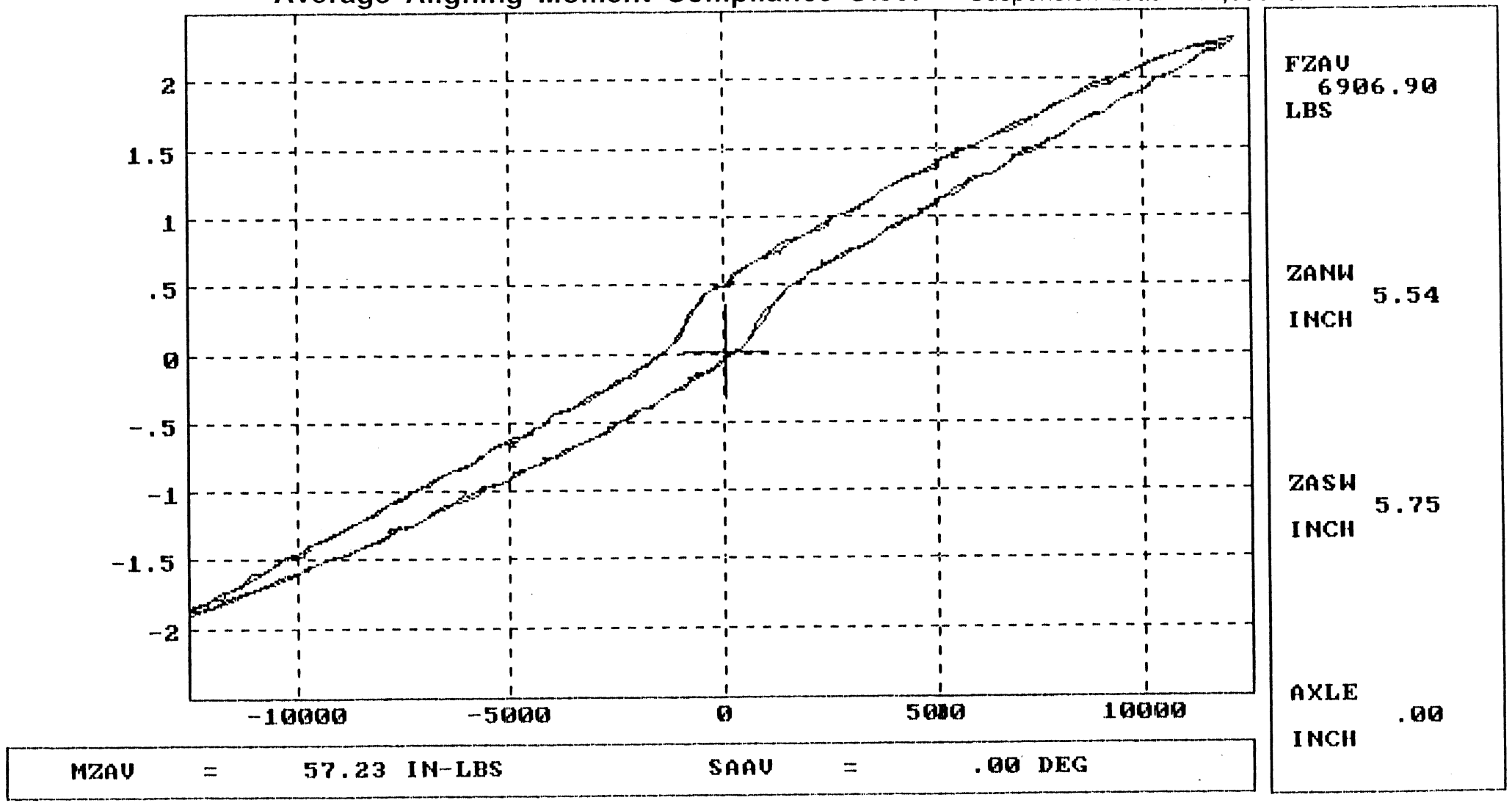
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Average Aligning Moment Compliance Steer

Suspension Load = 14,000 lb.



Ordinate: Average steer angle (SAAV); degrees; steer toward right, positive.

Abscissa: Average aligning moment (MZAV); in-lb per wheel; applied to left and right wheel sets simultaneously; downward (right hand rule) moment vector, positive.

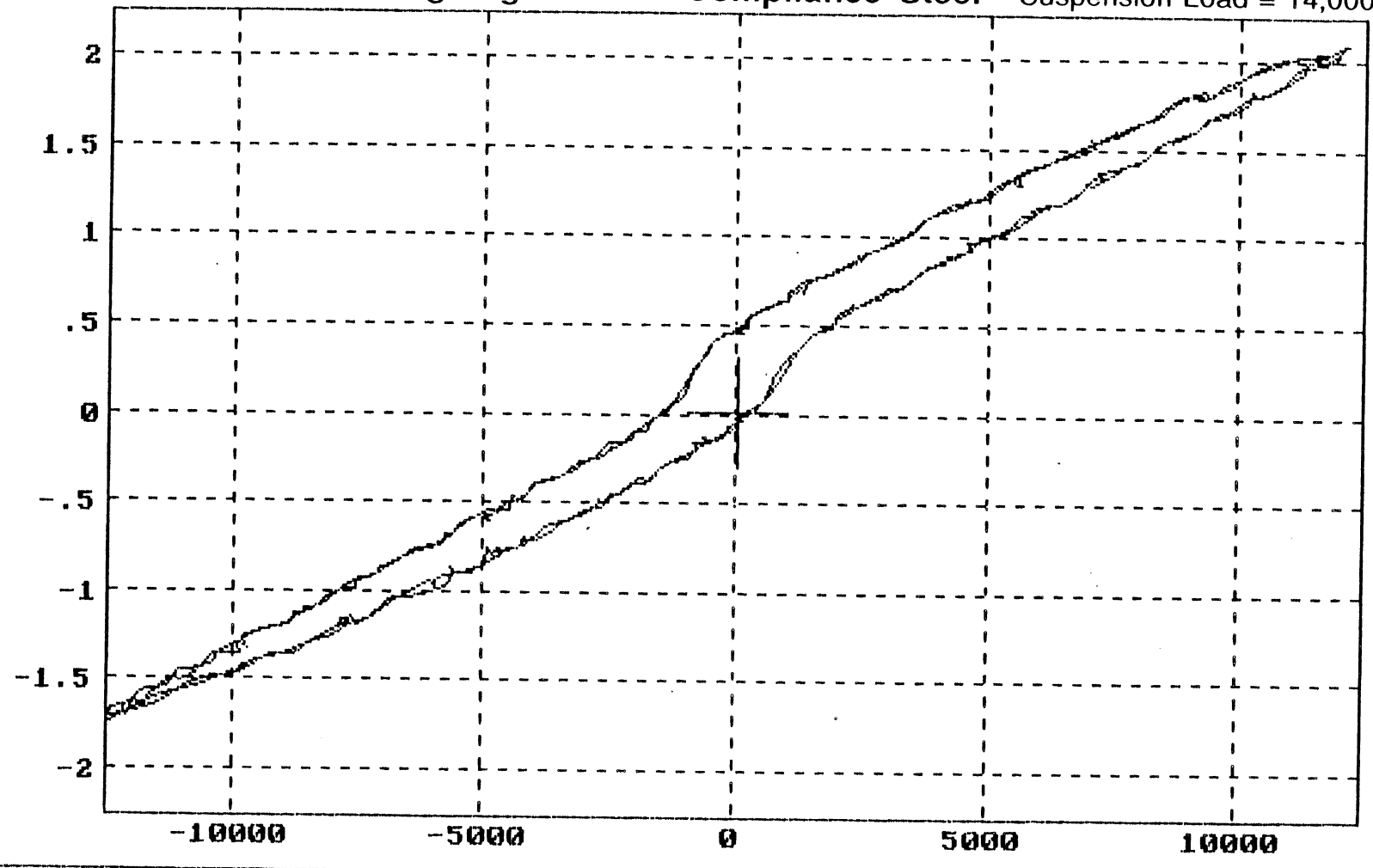
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Left Wheel Aligning Moment Compliance Steer

Suspension Load = 14,000 lb.



Ordinate: Left wheel steer angle (SAL); degrees; steer toward right, positive.

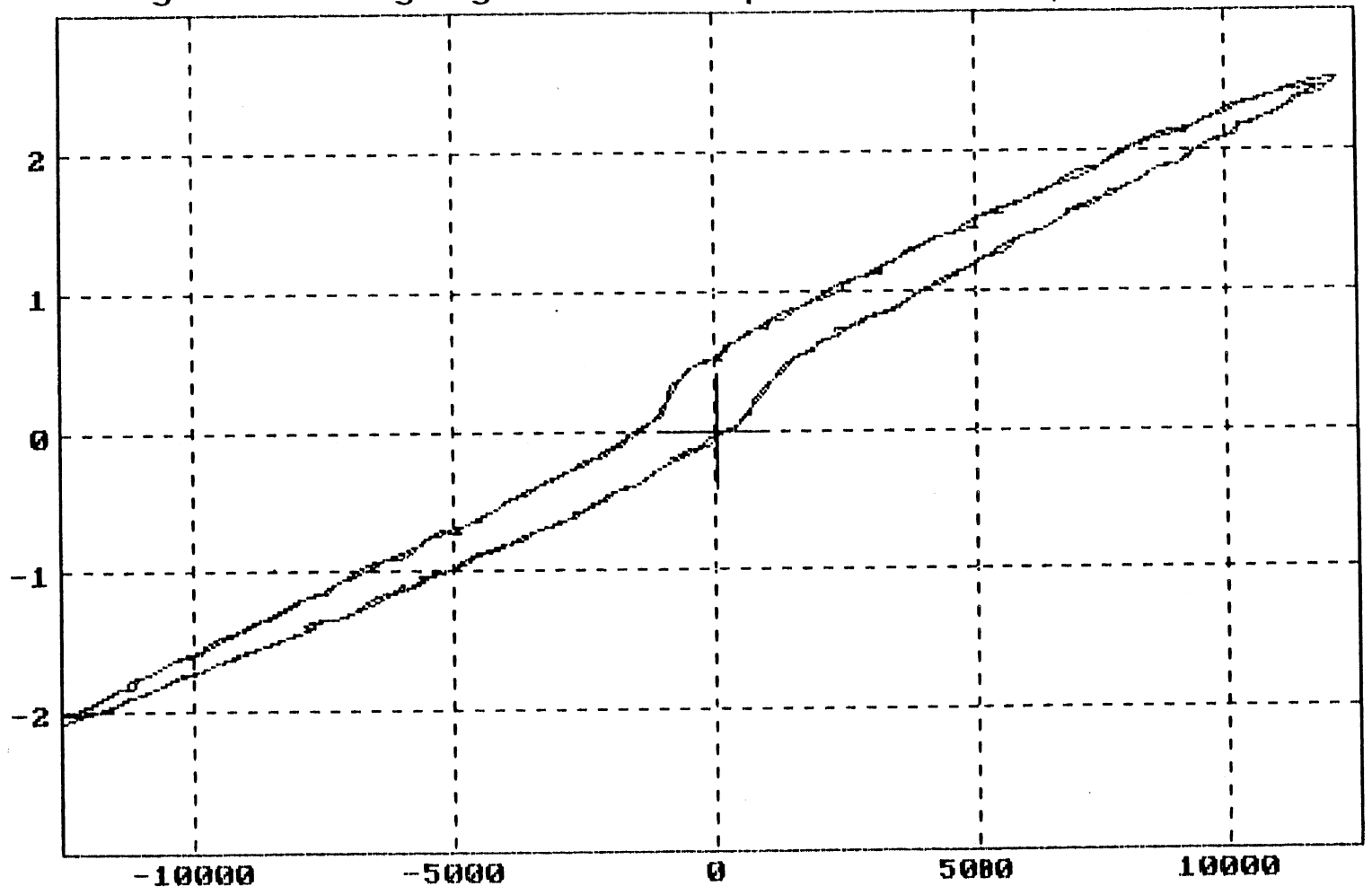
Abscissa: Average aligning moment (MZAV); in-lb per wheel; applied to left and right wheel sets simultaneously; downward (right hand rule) moment vector, positive.

NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Right Wheel Aligning Moment Compliance Steer Suspension Load = 14,000 lb.



FZAV
6906.90
LBS

ZANW
5.54
INCH

ZASW
5.75
INCH

AXLE
.00
INCH

MZAV = 57.23 IN-LBS SAR = -.01 DEG

Ordinate: Right wheel steer angle (SAR); degrees; steer toward right, positive.

Abscissa: Average aligning moment (MZAV); in-lb per wheel; applied to left and right wheel sets simultaneously; downward (right hand rule) moment vector, positive.

DATE 12-16-1986 14:41:54
TYPE OF TEST:ALIGNING MOMENT
CUSTOMER:NHTSA
OPERATOR:WINKLER
FILE NAME:C:NHTSAVF8.DAT
COMMENT:

****

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD=12000.
NOMINAL STEER ANGLE= .00

****

SUSPENSION DATA

TYPE:FRONT
MANUFACTURER:VOLVO
MODEL:?
RATING:?
OTHER:

****

VEHICLE DATA

MANUFACTURER:VOLVO
MODEL:F 10 COE
OTHER:

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	66.50	.00
SPRING SPACING	30.00	.00
SPRING LASH	.00	.00
TANDEM SPREAD	.00	.00

FACILTY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	78.00	.00
LATERAL Z-POT SPACING	107.90	.00
VERTICAL Y-POT POSITION	.00	.00
	LEFT	RIGHT
LONG. PAD SPACING	.00	.00

Date: January 7, 1987

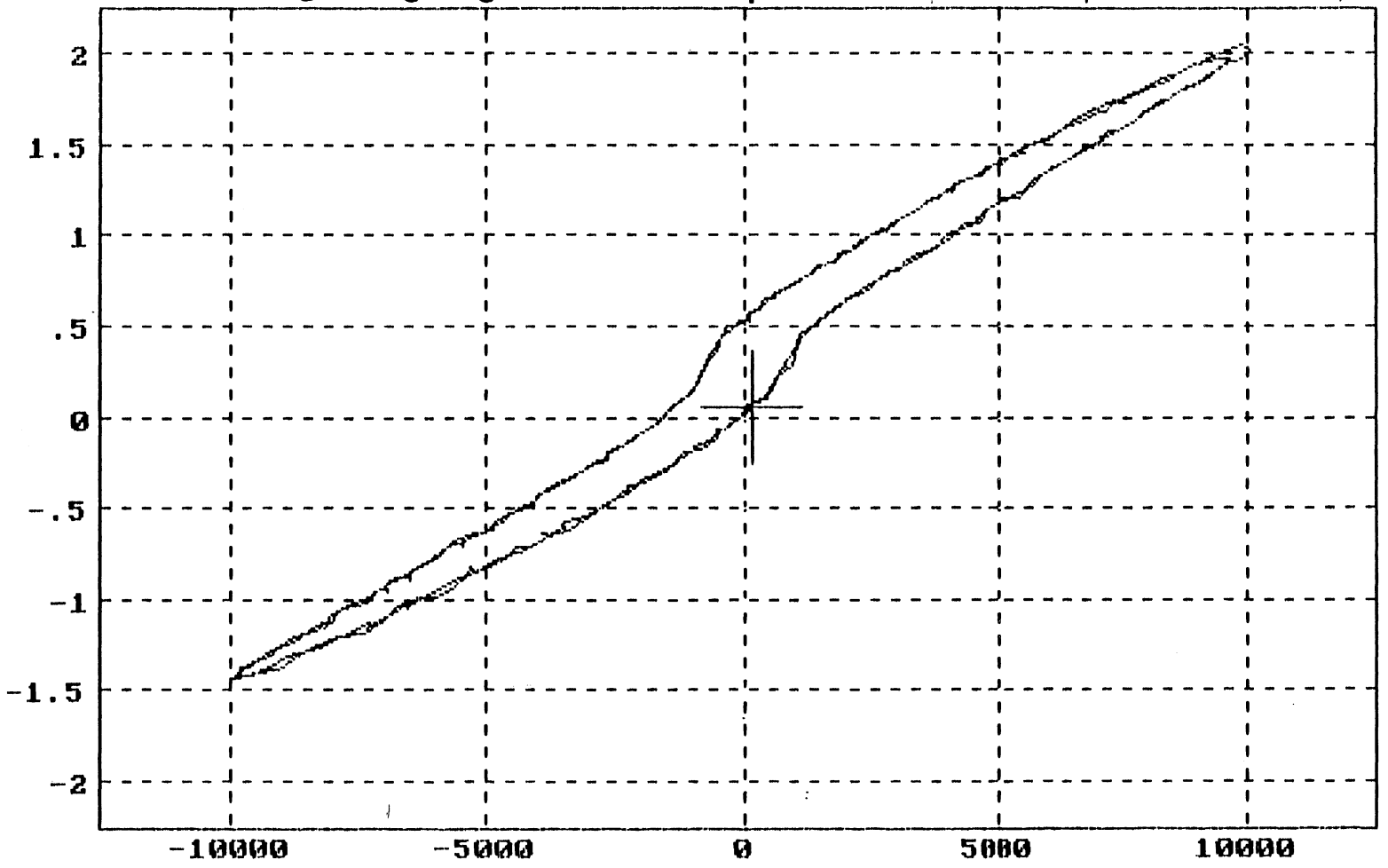
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Average Aligning Moment Compliance Steer

Suspension Load = 12,000 lb.



FZAV
6112.85
LBS

ZANW
4.99
INCH

ZASW
5.19
INCH

AXLE
.00
INCH

MZAV = 141.22 IN-LBS SAAV = .06 DEG

Ordinate: Average steer angle (SAAV); degrees; steer toward right, positive.

Abscissa: Average aligning moment (MZAV); in-lb per wheel; applied to left and right wheel sets simultaneously; downward (right hand rule) moment vector, positive.

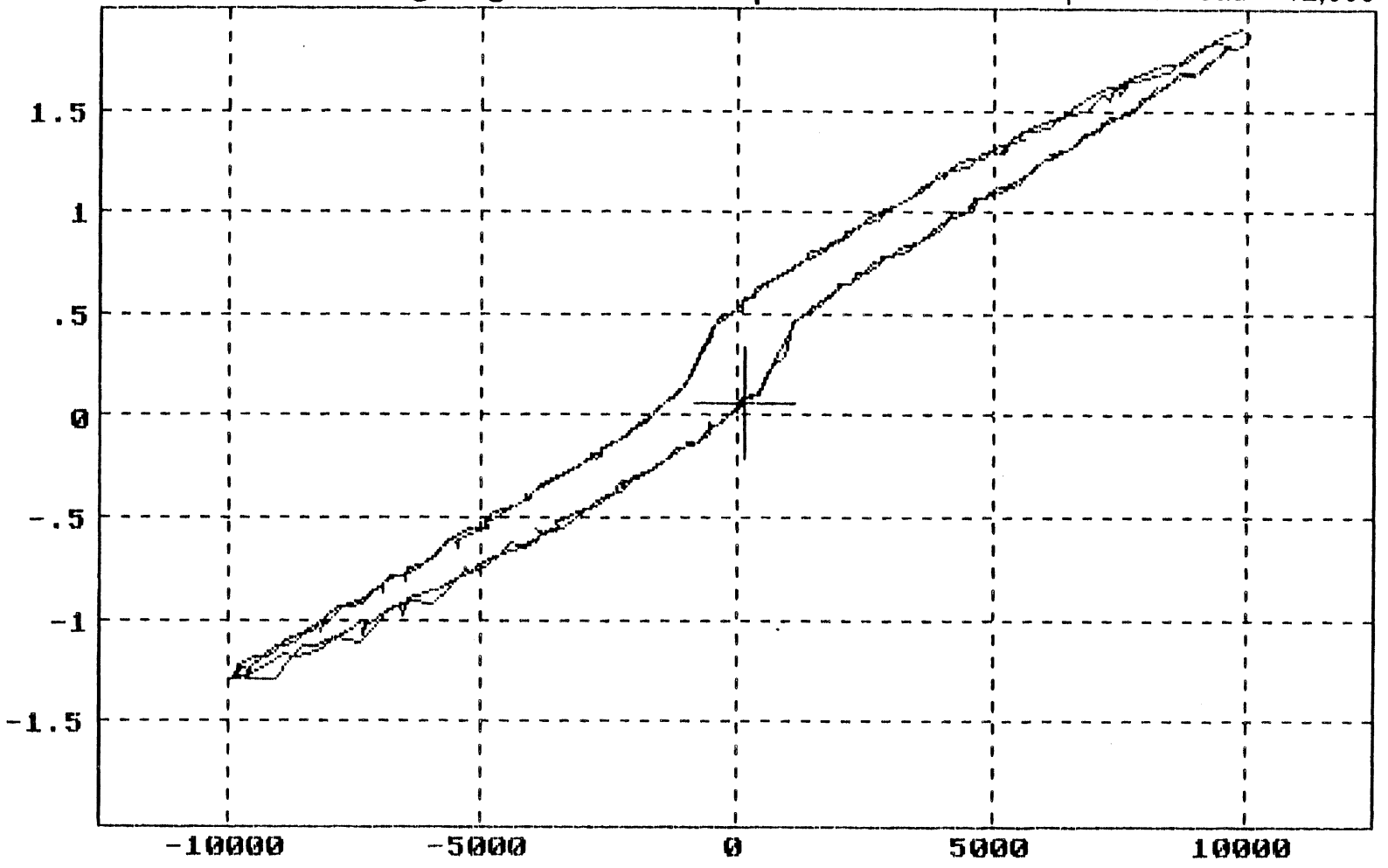
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Left Wheel Aligning Moment Compliance Steer

Suspension Load = 12,000 lb.



FZAV
6112.85
LBS

ZANW
4.99
INCH

ZASW
5.19
INCH

AXLE
.00
INCH

MZAV = 141.22 IN-LBS	SAL = .07 DEG

Ordinate: Left wheel steer angle (SAL); degrees; steer toward right, positive.

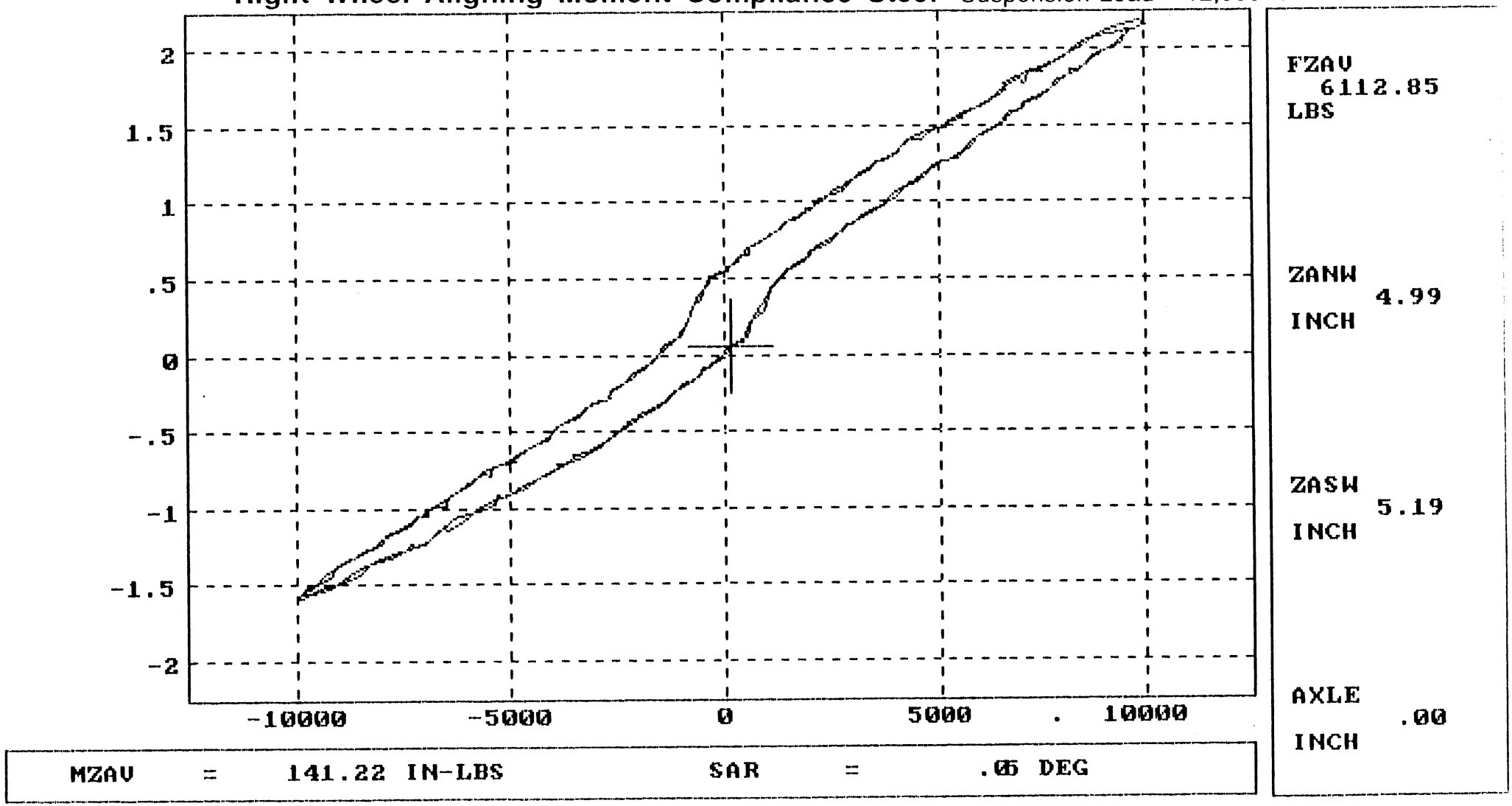
Abscissa: Average aligning moment (MZAV); in-lb per wheel; applied to left and right wheel sets simultaneously; downward (right hand rule) moment vector, positive.

NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Right Wheel Aligning Moment Compliance Steer Suspension Load = 12,000 lb.



Ordinate: Right wheel steer angle (SAR); degrees; steer toward right, positive.

Abscissa: Average aligning moment (MZAV); in-lb per wheel; applied to left and right wheel sets simultaneously; downward (right hand rule) moment vector, positive.

DATE 12-16-1986 14:44:12
TYPE OF TEST:ALIGNING MOMENT
CUSTOMER:NHTSA
OPERATOR:WINKLER
FILE NAME:C:NHTSAVF9.DAT
COMMENT:

****

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD=10000.
NOMINAL STEER ANGLE= .00

****

SUSPENSION DATA

TYPE:FRONT
MANUFACTURER:VOLVO
MODEL:?
RATING:?
OTHER:

****

VEHICLE DATA

MANUFACTURER:VOLVO
MODEL:F 10 COE
OTHER:

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	66.50	.00
SPRING SPACING	30.00	.00
SPRING LASH	.00	.00
TANDEM SPREAD	.00	.00

FACILTY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	78.00	.00
LATERAL Z-POT SPACING	107.90	.00
VERTICAL Y-POT POSITION	.00	.00
	LEFT	RIGHT
LONG. PAD SPACING	.00	.00

Date: January 7, 1987

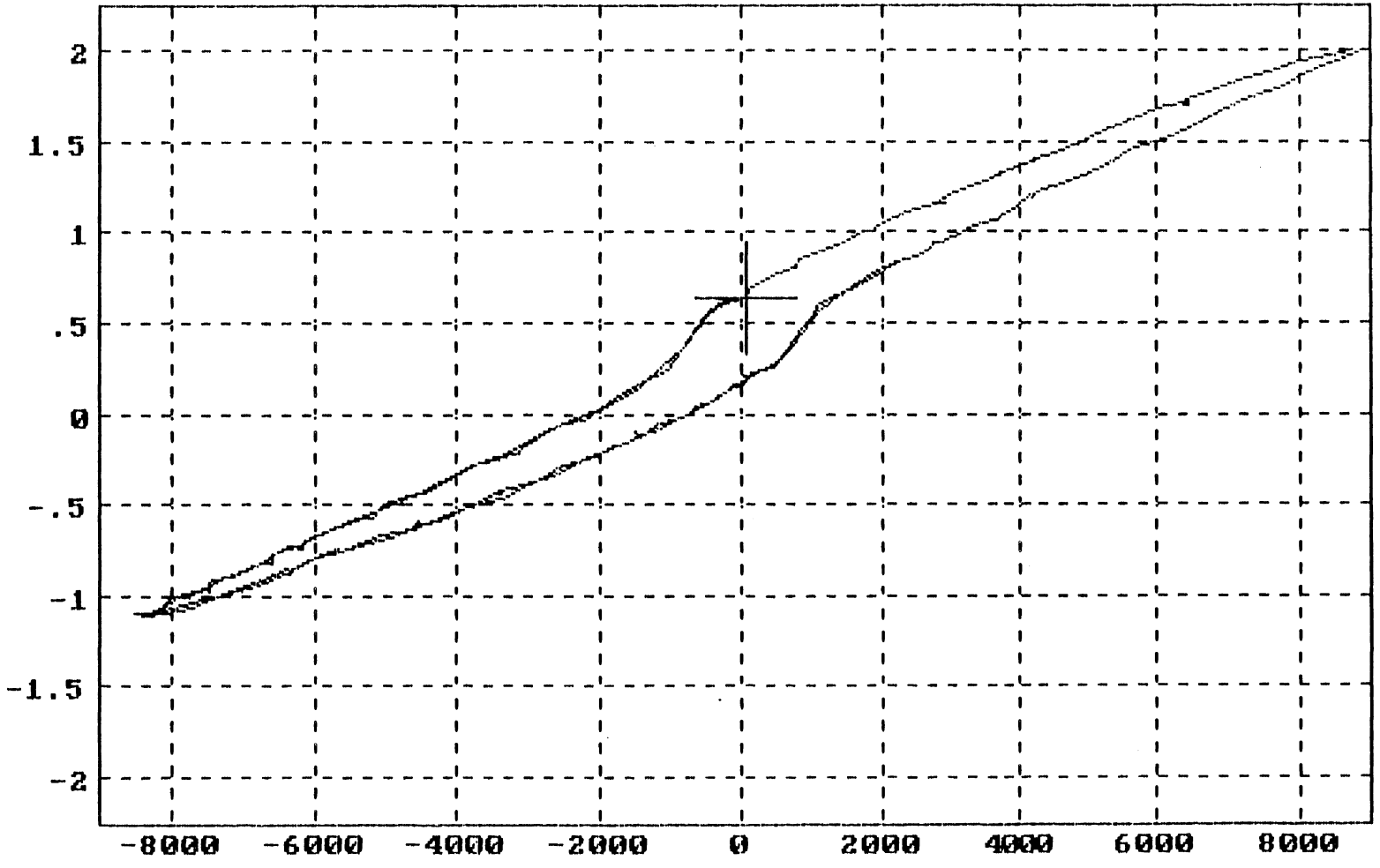
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Average Aligning Moment Compliance Steer

Suspension Load = 10,000 lb.



FZAV
5128.58
LBS

ZANW
4.06
INCH

ZASW
4.27
INCH

AXLE
.00
INCH

MZAV = 53.74 IN-LBS SAAV = .64 DEG

Ordinate: Average steer angle (SAAV); degrees; steer toward right, positive.

Abscissa: Average aligning moment (MZAV); in-lb per wheel; applied to left and right wheel sets simultaneously; downward (right hand rule) moment vector, positive.

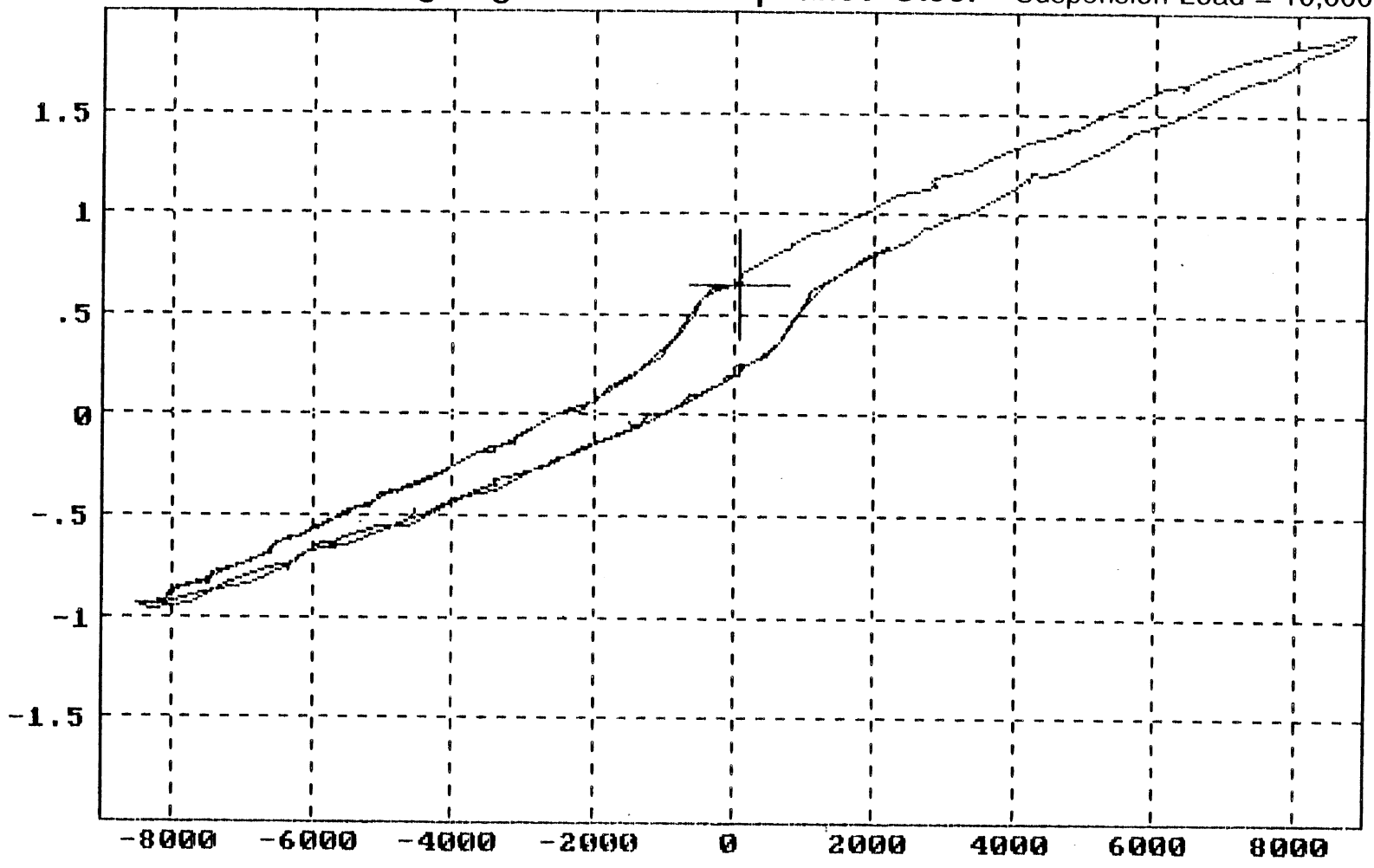
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Left Wheel Aligning Moment Compliance Steer

Suspension Load = 10,000 lb.



FZAV
5128.58
LBS

ZANW
4.06
INCH

ZASW
4.27
INCH

AXLE
.00
INCH

MZAV = 53.74 IN-LBS SAL = .65 DEG

Ordinate: Left wheel steer angle (SAL); degrees; steer toward right, positive.

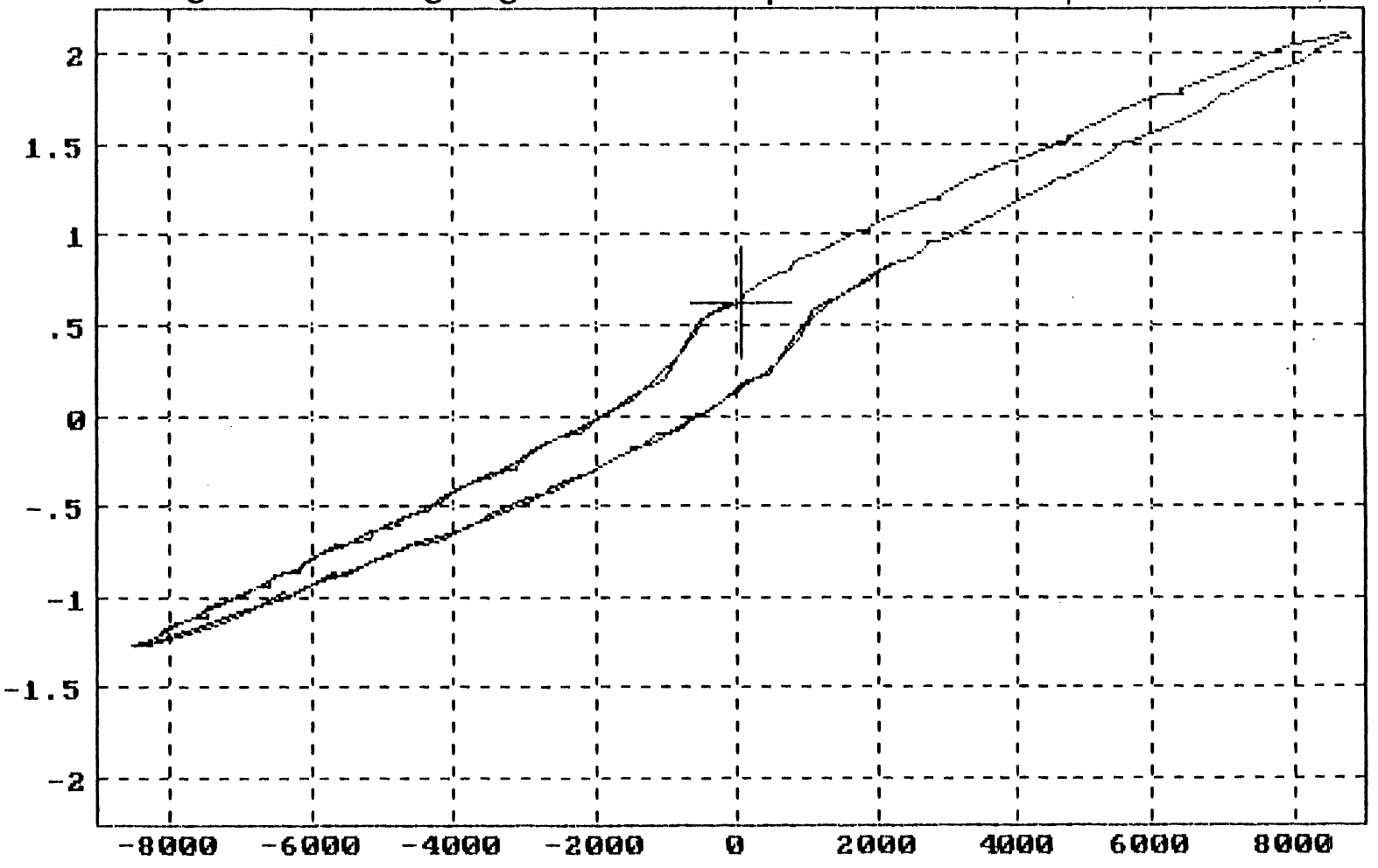
Abscissa: Average aligning moment (MZAV); in-lb per wheel; applied to left and right wheel sets simultaneously; downward (right hand rule) moment vector, positive.

NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Right Wheel Aligning Moment Compliance Steer Suspension Load = 10,000 lb.



FZAV
5128.58
LBS

ZANW
4.06
INCH

ZASW
4.27
INCH

AXLE
.00
INCH

MZAV = 53.74 IN-LBS SAR = .62 DEG

Ordinate: Right wheel steer angle (SAR); degrees; steer toward right, positive.

Abscissa: Average aligning moment (MZAV); in-lb per wheel; applied to left and right wheel sets simultaneously; downward (right hand rule) moment vector, positive.

DATE 12-1-1986 16:33:27
TYPE OF TEST:LONGITUDINAL FORCE
CUSTOMER:NHTSA
OPERATOR:WINKLER
FILE NAME:C:NHTSAVFA.DAT
COMMENT:

****

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD=14000.
NOMINAL STEER ANGLE= .00

****

SUSPENSION DATA

TYPE:FRONT
MANUFACTURER:VOLVO
MODEL:?
RATING:?
OTHER:

****

VEHICLE DATA

MANUFACTURER:VOLVO
MODEL:F 10 DOE
OTHER:

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	66.50	.00
SPRING SPACING	30.00	.00
SPRING LASH	.00	.00
TANDEM SPREAD	.00	.00

FACILTY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	78.00	.00
LATERAL Z-POT SPACING	107.90	.00
VERTICAL Y-POT POSITION	.00	.00
	LEFT	RIGHT
LONG. PAD SPACING	.00	.00

Date: January 7, 1987

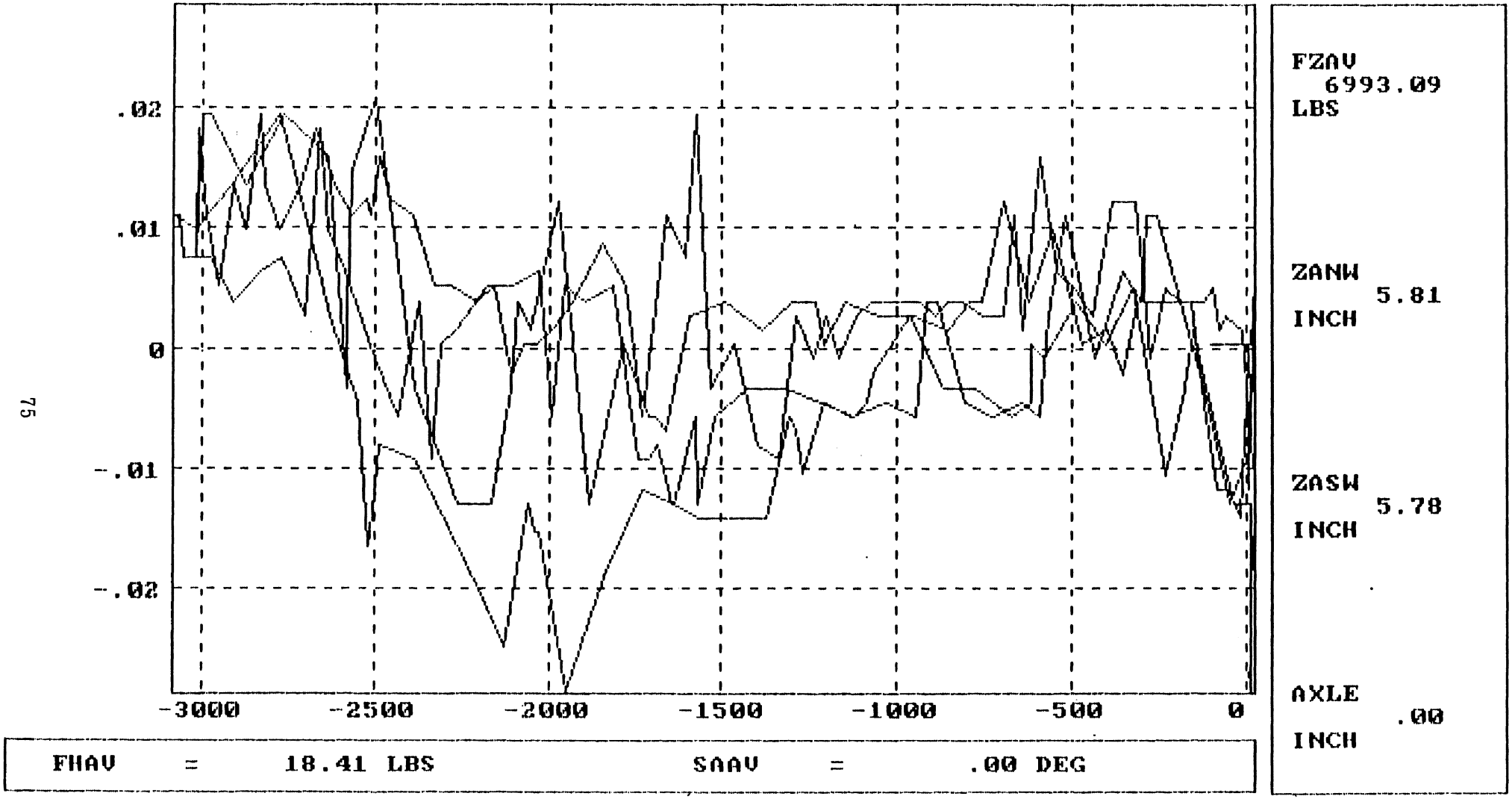
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Average Longitudinal Force Compliance Steer

Suspension Load = 14,000 lb.



Ordinate: Average steer angle (SAAV); degrees; steer toward right, positive.

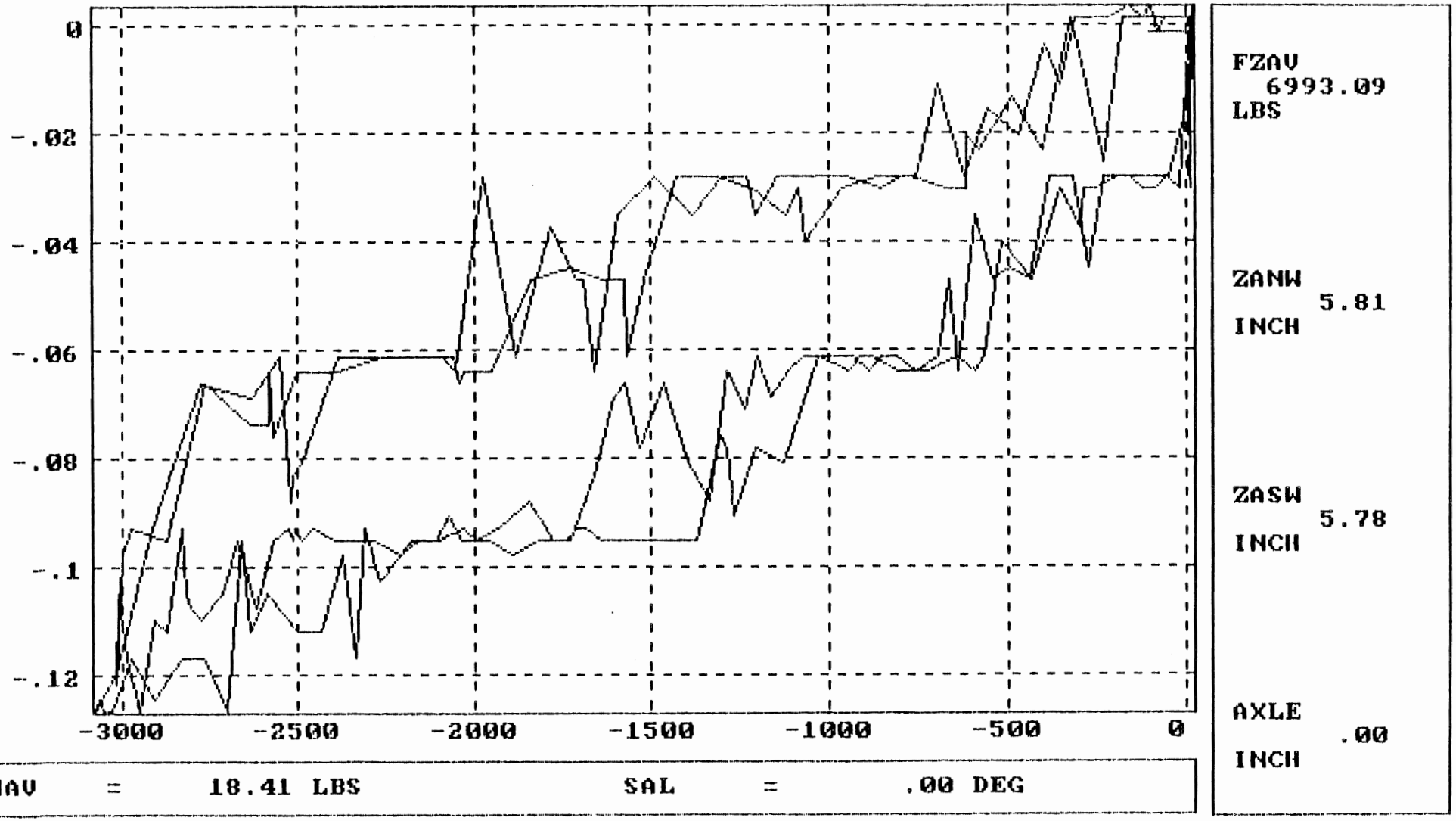
Abscissa: Average Longitudinal Force (FHAV); in-lb per wheel; applied to left and right wheel sets simultaneously; force applied toward rear, negative.

NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Left Wheel Longitudinal Force Compliance Steer Suspension Load = 14,000 lb.



Ordinate: Left wheel steer angle (SAL); degrees; steer toward right, positive.

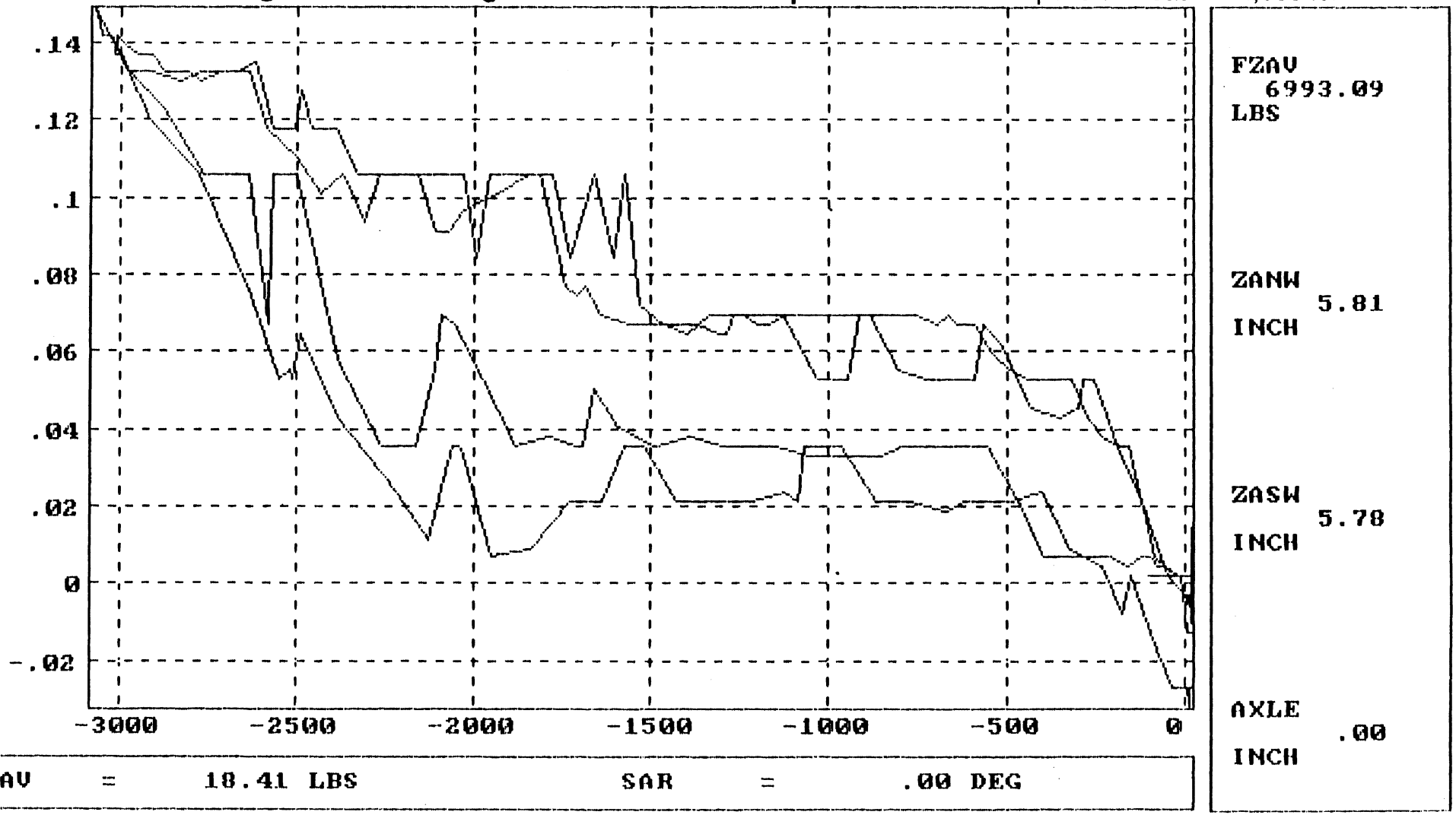
Abscissa: Average Longitudinal Force (FHAV); in-lb per wheel; applied to left and right wheel sets simultaneously; force applied toward rear, negative.

NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Right Wheel Longitudinal Force Compliance Steer Suspension Load = 14,000 lb.



Ordinate: Right wheel steer angle (SAR); degrees; steer toward right, positive.

Abscissa: Average Longitudinal Force (FHAV); in-lb per wheel; applied to left and right wheel sets simultaneously; force applied toward rear, negative.

DATE 12-Jan-1988 16:38:32
TYPE OF TEST:LONGITUDINAL FORCE
CUSTOMER:NHTSA
OPERATOR:WINKLER
FILE NAME:C:NHTSAVFB.DAT
COMMENT:

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD=12000.
NOMINAL STEER ANGLE= .00

SUSPENSION DATA

TYPE:FRONT
MANUFACTURER:VOLVO
MODEL:?
RATING:?
OTHER:

VEHICLE DATA

MANUFACTURER:VOLVO
MODEL:F 10 DOE
OTHER:

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	66.50	.00
SPRING SPACING	30.00	.00
SPRING LASH	.00	.00
TANDEM SPREAD	.00	.00

FACILTY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	78.00	.00
LATERAL Z-POT SPACING	107.90	.00
VERTICAL Y-POT POSITION	.00	.00

	LEFT	RIGHT
LONG. PAD SPACING	.00	.00

Date: January 7, 1987

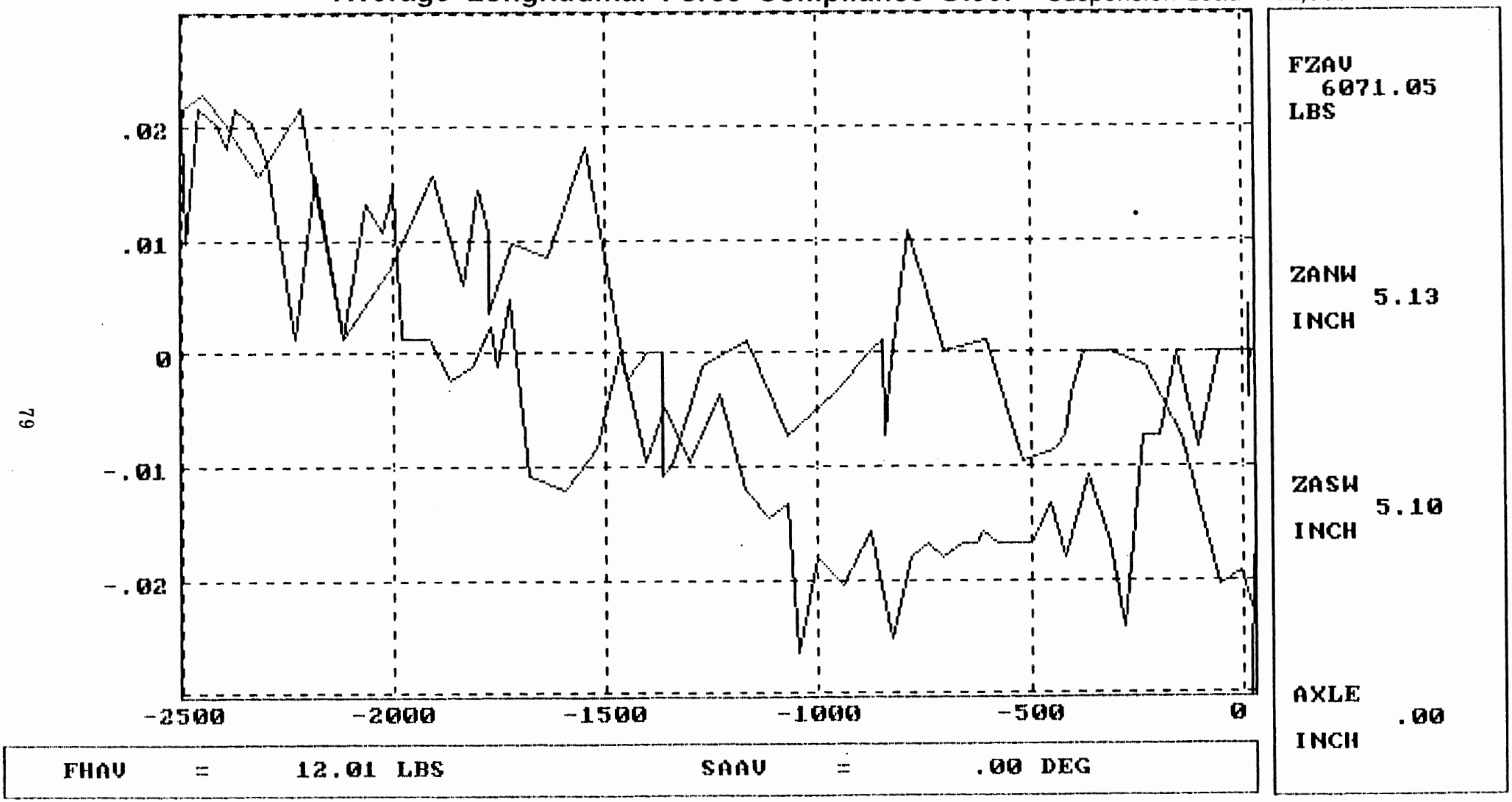
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Average Longitudinal Force Compliance Steer

Suspension Load = 12,000 lb.



Ordinate: Average steer angle (SAAV); degrees; steer toward right, positive.

Abscissa: Average Longitudinal Force (FHAV); in-lb per wheel; applied to left and right wheel sets simultaneously; force applied toward rear, negative.

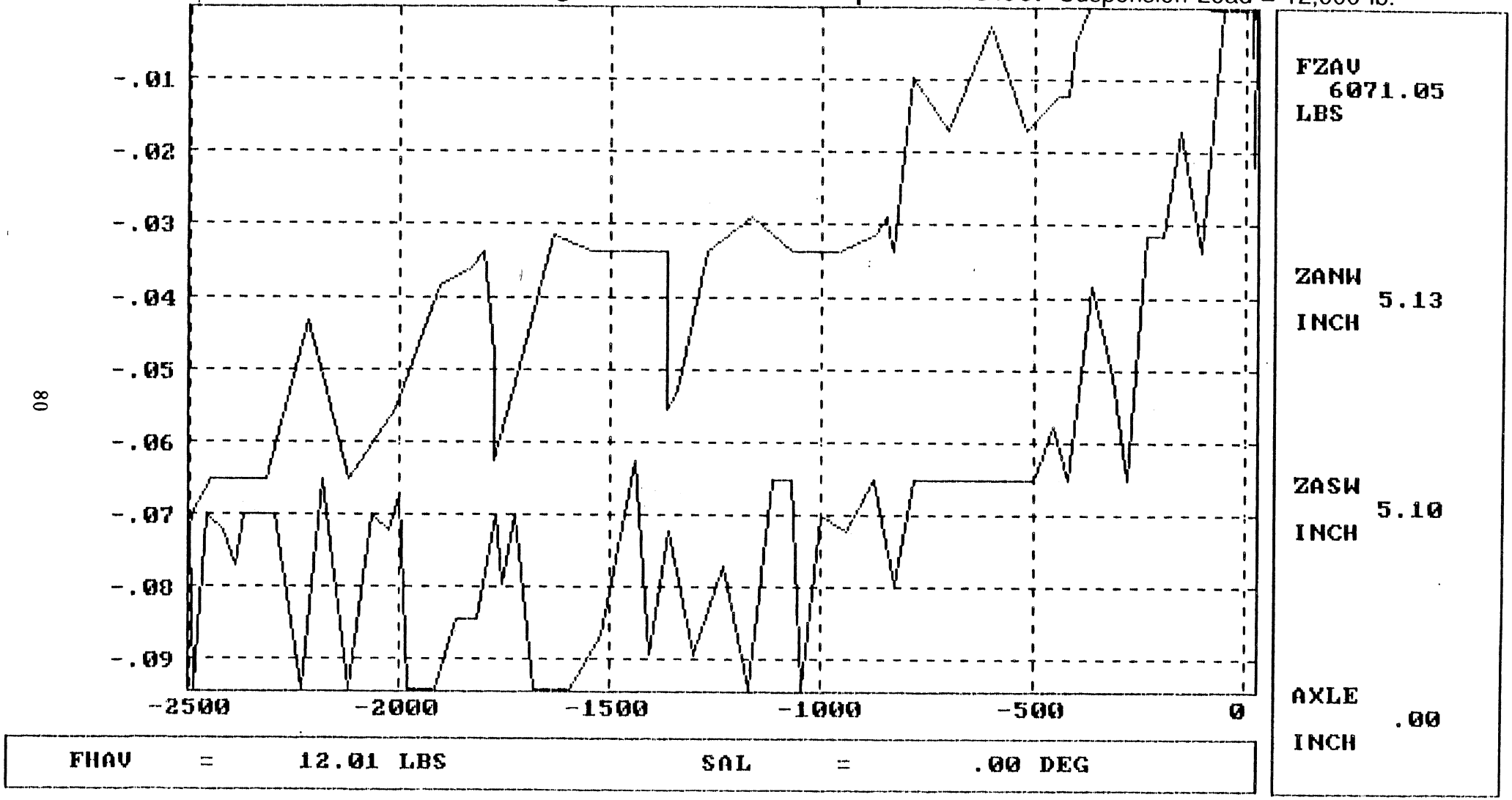
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Left Wheel Longitudinal Force Compliance Steer

Suspension Load = 12,000 lb.



80

Ordinate: Left wheel steer angle (SAL); degrees; steer toward right, positive.

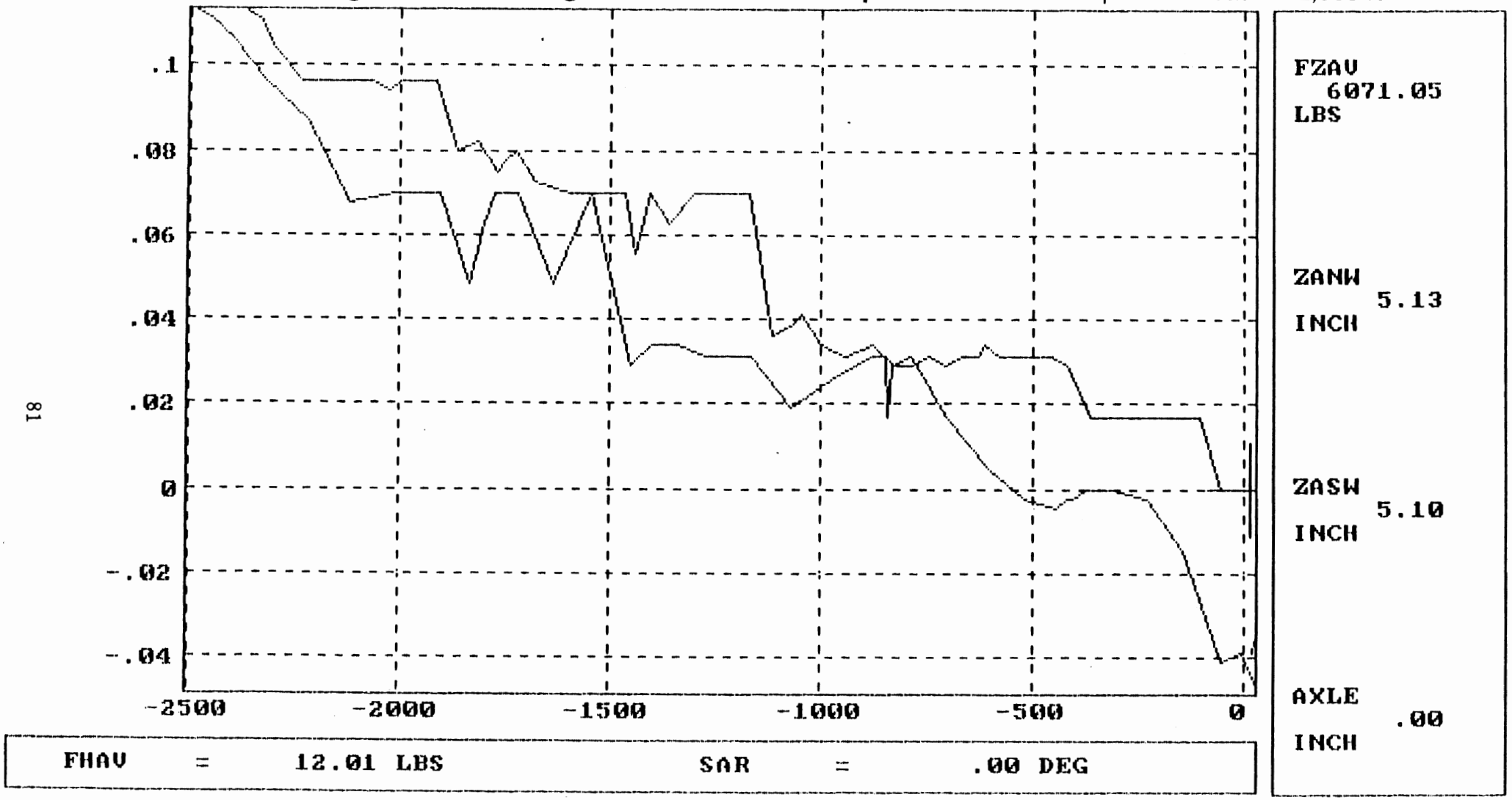
Abscissa: Average Longitudinal Force (FHAV); in-lb per wheel; applied to left and right wheel sets simultaneously; force applied toward rear, negative.

NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Right Wheel Longitudinal Force Compliance Steer Suspension Load = 12,000 lb.



Ordinate: Right wheel steer angle (SAR); degrees; steer toward right, positive.

Abscissa: Average Longitudinal Force (FHAV); in-lb per wheel; applied to left and right wheel sets simultaneously; force applied toward rear, negative.

DATE 12-16-1986 16:37:42
TYPE OF TEST:LONGITUDINAL FORCE
CUSTOMER:NHTSA
OPERATOR:WINKLER
FILE NAME:C:NHTSAVFC.DAT
COMMENT:

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD=10000.
NOMINAL STEER ANGLE= .00

SUSPENSION DATA

TYPE:FRONT
MANUFACTURER:VOLVO
MODEL:?
RATING:?
OTHER:

VEHICLE DATA

MANUFACTURER:VOLVO
MODEL:F 10 COE
OTHER:

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	66.50	.00
SPRING SPACING	30.00	.00
SPRING LASH	.00	.00
TANDEM SPREAD	.00	.00

FACILTY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	78.00	.00
LATERAL I-POT SPACING	107.90	.00
VERTICAL Y-POT POSITION	.00	.00
	LEFT	RIGHT
LONG. PAD SPACING	.00	.00

Date: January 7, 1987

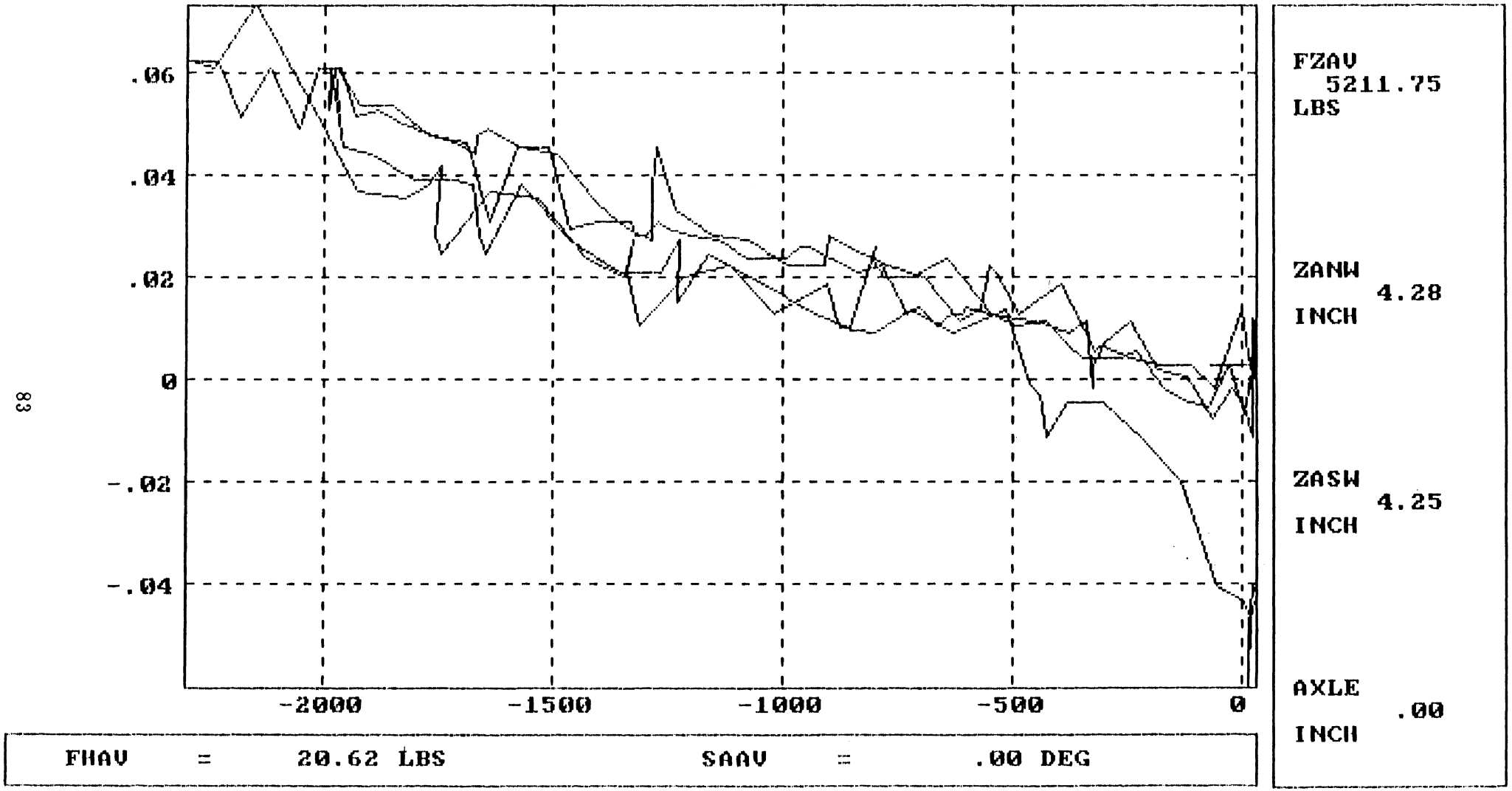
NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Average Longitudinal Force Compliance Steer

Suspension Load = 10,000 lb.



Ordinate: Average steer angle (SAAV); degrees; steer toward right, positive.

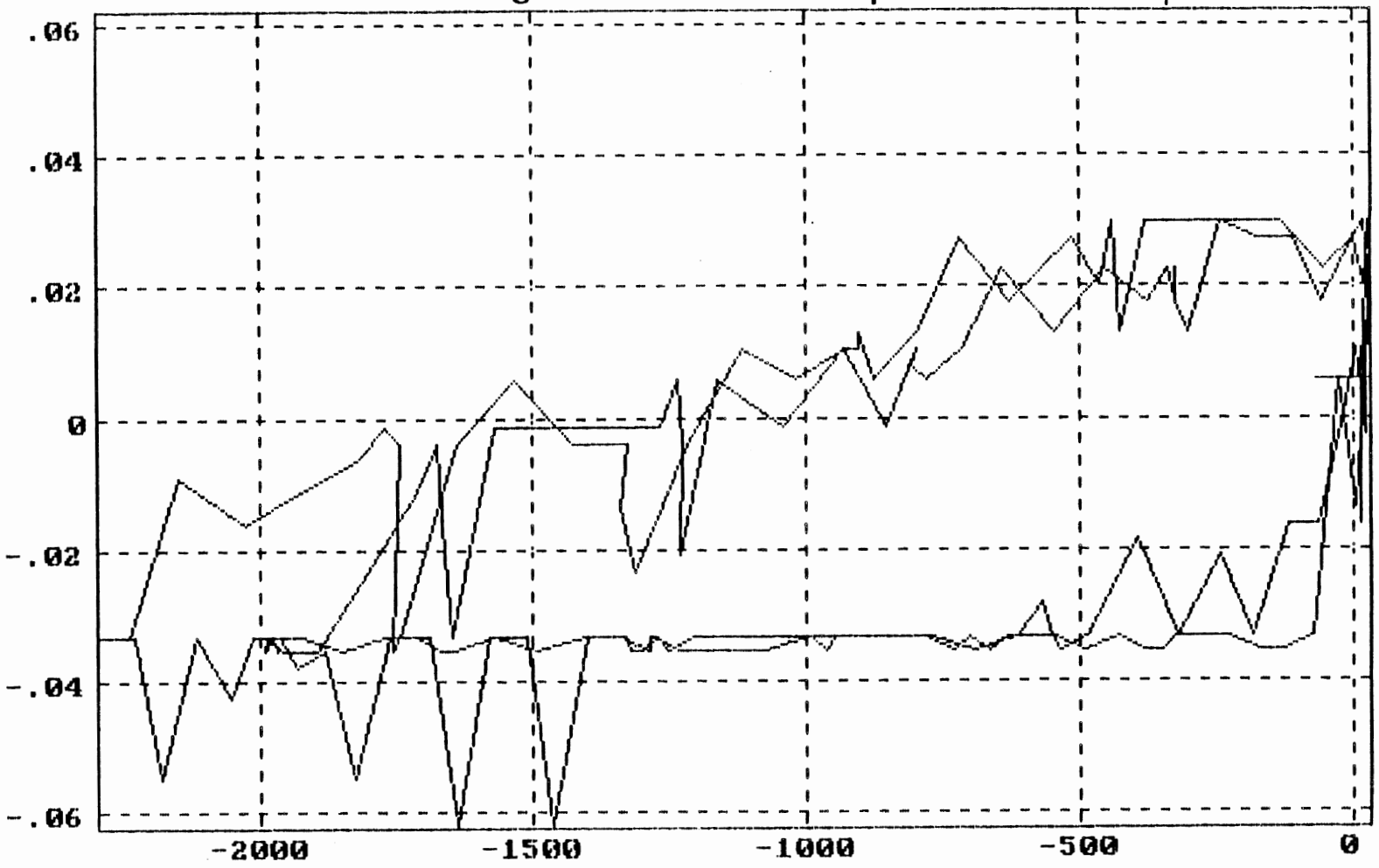
Abscissa: Average Longitudinal Force (FHAV); in-lb per wheel; applied to left and right wheel sets simultaneously; force applied toward rear, negative.

NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Left Wheel Longitudinal Force Compliance Steer Suspension Load = 10,000 lb.



FZAV 5211.75 LBS

ZANW 4.28 INCH

ZASW 4.25 INCH

AXLE .00 INCH

FHAV = 20.62 LBS SAL = .01 DEG

Ordinate: Left wheel steer angle (SAL); degrees; steer toward right, positive.

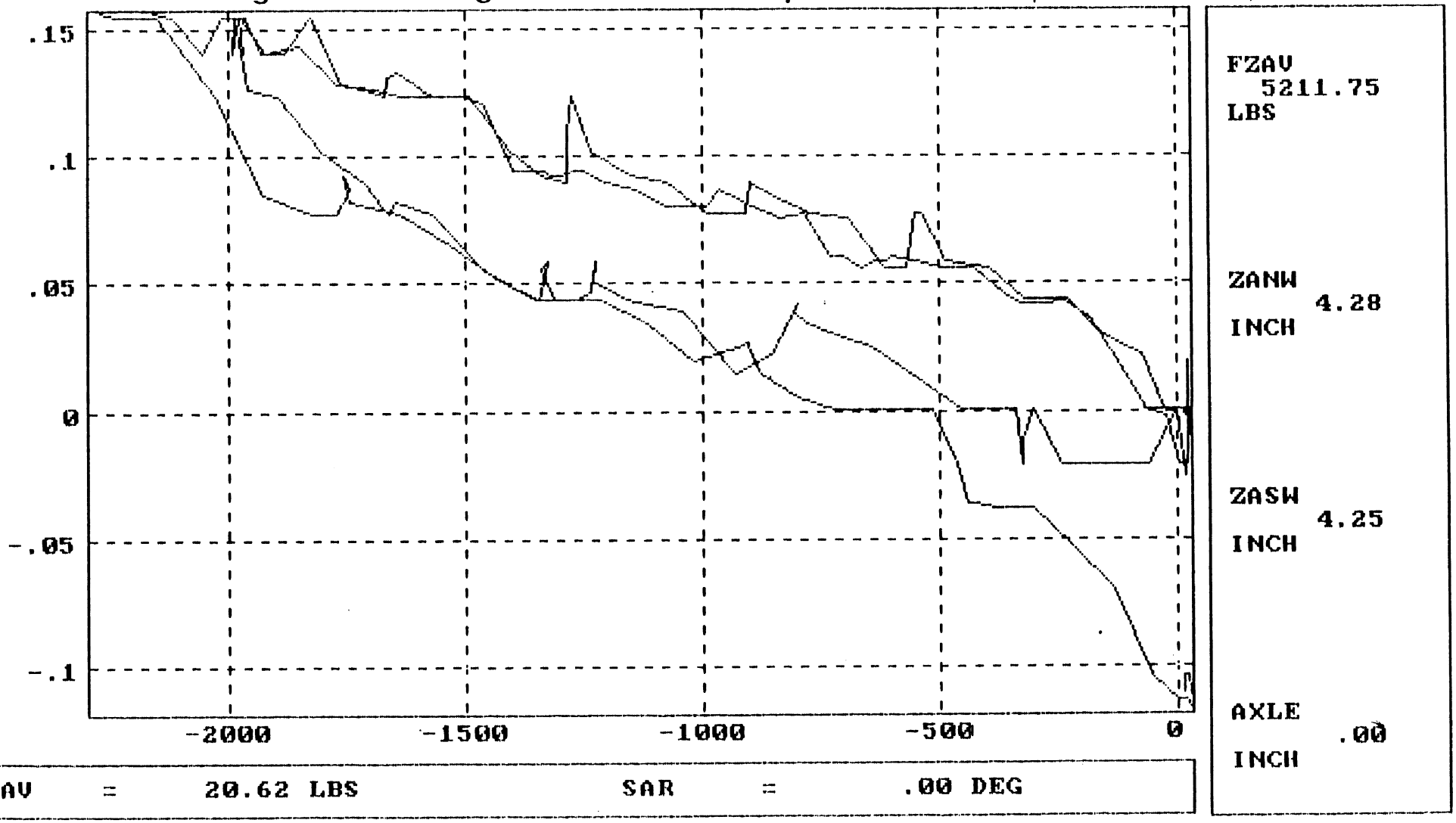
Abscissa: Average Longitudinal Force (FHAV); in-lb per wheel; applied to left and right wheel sets simultaneously; force applied toward rear, negative.

NHTSA
Volvo V-10 COE

Front Suspension

Date: January 7, 1987
Pitch = 0.0 degrees

Right Wheel Longitudinal Force Compliance Steer Suspension Load = 10,000 lb.



Ordinate: Right wheel steer angle (SAR); degrees; steer toward right, positive.

Abscissa: Average Longitudinal Force (FHAV); in-lb per wheel; applied to left and right wheel sets simultaneously; force applied toward rear, negative.

Appendix B

Tractor Rear Suspension Properties

Tandem Suspension Reduced Data

Suspension I.D. NHTSA, Volvo, Tandem Tractor [illegible]

Unsprung Weight. ("Measured" from lash indication in vertical rate data.)

Leading Axle		Trailing Axle	
Right	Left	Right	Left
[2700]		[3500]	

Spring Properties.

Boundry Tables: See attached sheet.

Betas:

Sus Load, lb.	24,000	20,000	13,000
Compression β	0.045	0.045	0.045
Extension β	0.050	0.050	0.055

Suspension Properties.

Sus Load, lb.	36,000		24,000		12,000	
Axle	Lead	Trail	Lead	Trail	Lead	Trail
Roll Center Height, inches above ground	33.91	34.15	34.18	33.96	34.72	34.5-
Auxilary Roll Stiffness, in-lb/deg	10,000	13,000	11,000	11,000	10,001	10,2[illegible]
Roll Steer Coefficient, deg/deg	-0.0194	0.0433	-0.0329	0.0549	-0.0[illegible]2	0.0709
Aligning Moment Steer Coefficient,[1] deg/in-lb	0.466E-05	0.336E-05	-	-	-	-
Lateral Force Steer Coefficient,[2] deg/lb	-0.252E-05	-0.121E-05	-	-	-	-
Inter-Axle Load Transfer, dF_{ZTRA}/dF_H[3] lb/lb	0.0710		0.0652		0.080	
Inter-Axle Load Transfer, Phase IV Coeff[4] in-lb/in-lb	0.0935		0.0959		0.1054	

[1] Aligning moment per dual tire/wheel set; applied to all four sets simultaneously.

[2] Lateral force per dual tire/wheel set; applied to all four sets simultaneously.

[3] dF_{ZTRA}/dF_H where F_{ZTRA} ≡ Average trailing axle wheel load

F_H ≡ Longitudinal force per dual tire/wheel set; applied to all four sets simultaneously; brake force is negative.

[4] (dF_{ZTRA}/dF_H) x (Tandem Spead)/(2 x Rolling Radius)

shifted 1300 lbs

COMPRESSION ENVELOPE

Deflection, in	Force, lb
2.49	-1054.27
2.63	-132.76
2.86	1403.07
3.25	3614.68
3.56	5519.11
3.93	8037.88
4.26	10495.22
4.56	12891.12
4.85	15348.46

EXTENSION ENVELOPE

Deflection, in	Force, lb
2.54	-1177.13
2.69	-132.76
3.13	1955.97
3.51	3798.98
3.91	6256.31
4.24	8836.52
4.45	10433.79
4.91	14365.53

Tandem Suspension Data Reduction Form

Suspension I.D. NHTSA Volvo [illegible]
[illegible] Tape [illegible]
(tractor rear)

Unsprung Weight. ("Measured" from lash indication in vertical rate data.)

	Leading Axle		Trailing Axle	
	Right	Left	Right	Left

Betas:

Sus Load, lb.	24,000	20,000	12,000
Compression β	0.045	0.045	0.045
Extension β	0.050	0.050	0.0[illegible]

Roll Response

Sus Load, lb.	36,000		24,000		12,000	
Axle	Lead	Trail	Lead	Trail	Lead	Trail
$d\phi_T/d\phi_A$	1.19	1.18	1.17	1.16	1.20	1.19
$dy/d\phi_A$, in/deg	0.209	0.211	0.204	0.195	0.198	0.196
$dy/d\phi_A$, in/rad	11.97	12.09	11.68	11.17	11.34	11.23
h_y, inches	21.94	22.06	22.50	22.69	23.38	23.62
h_{RC}, inches	33.91	34.15	34.18	33.86	34.72	34.85
Aux K_ϕ	10,000	13,000	11,000	11,000	16,000	10,000
$d\delta/d\phi_A$	-0.0199 ?	0.0433	-0.0329	0.0549	-0.0442	0.0709

Aligning Moment

$d\delta/dM_Z$	0.466E-05	0.536E-05	—	—	—	—

Lateral Force

$d\delta/dF_H$	-0.252E-05	-0.121E-04	—	—	—	—

Longitudinal Force

dF_{ZTR}/dF_H	0.0710	0.0652	0.0800

DATE [illegible] 14:16:37
TYPE OF TEST: [illegible] FORCE
Vertical
CUSTOMER:NHTSA
OPERATOR:WINKLER
FILE NAME:C:NHTSAVRO.DAT
COMMENT:*****WRONG TYPE. REALLY VERTICAL********

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD= 0.
NOMINAL STEER ANGLE= .00

SUSPENSION DATA

TYPE:CAMELBACK 1TAPER
MANUFACTURER:VOLVO
MODEL:?
RATING:?
OTHER:CAMEL BACK STYLE.1 TAPER LEAF. RUBBER END PADS

VEHICLE DATA

MANUFACTURER:VOLVO
MODEL:F 10 DOE
OTHER:

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	54.00	54.00
SPRING SPACING	38.50	38.50
SPRING LASH	.00	.00
TANDEM SPREAD	54.00	54.00

FACILTY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	71.75	.00
LATERAL Z-POT SPACING	108.62	106.88
VERTICAL Y-POT POSITION	.00	.00
	LEFT	RIGHT
LONG. PAD SPACING	54.32	54.30

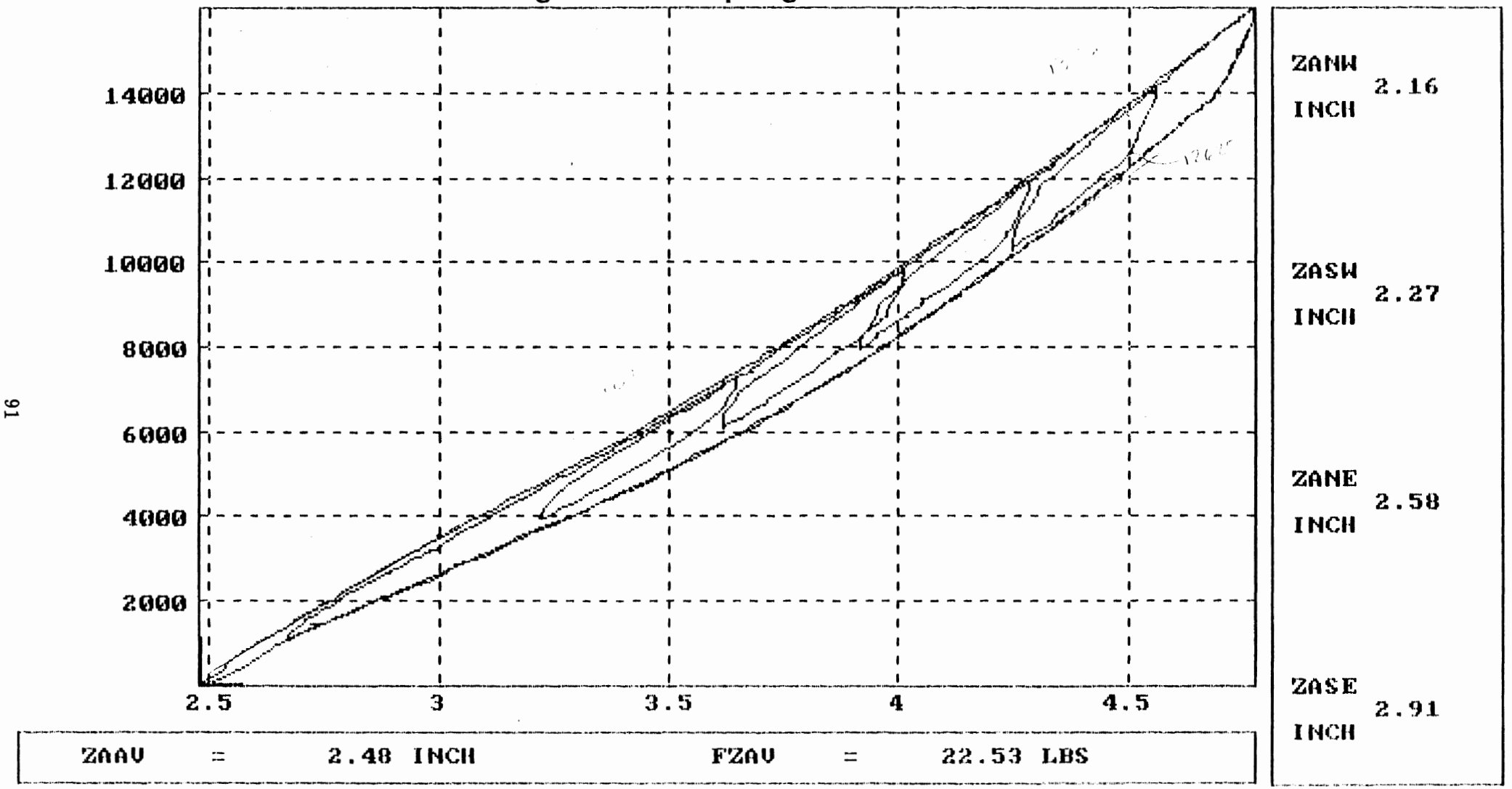
Date: 1/6/87

NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: 1/6/87
Pitch = 0.0 degrees

Average Vertical Spring Rate



Ordinate: Average vertical wheel load (FZAV); pounds; spring compression, positive.

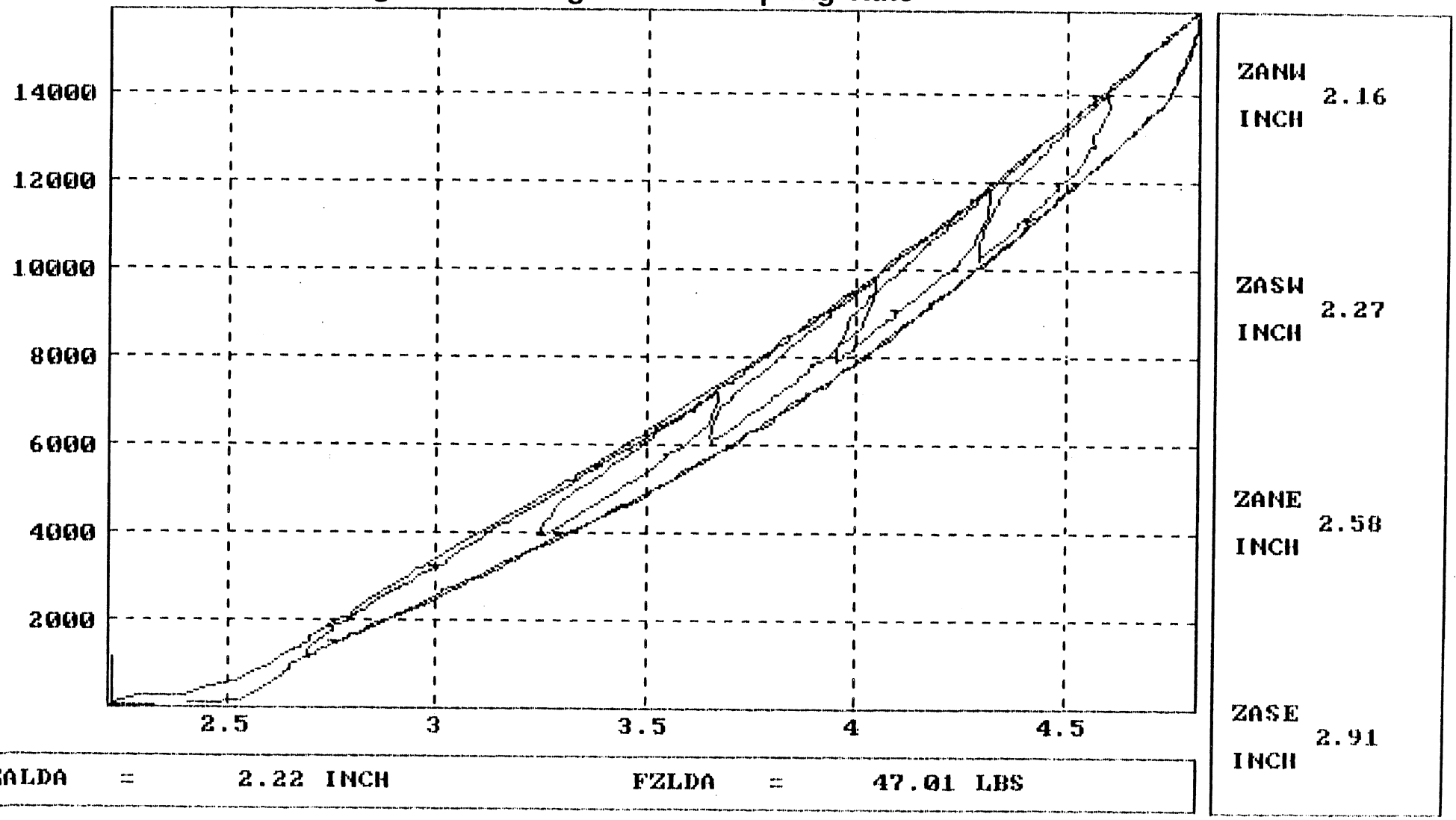
Abscissa: Average vertical axle displacement (ZAAV); inches; spring compression, positive.

NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: 1/6/87
Pitch = 0.0 degrees

Leading Axle Average Vertical Spring Rate



Ordinate: Average leading axle vertical wheel load (FZLDA); pounds; spring compression, positive.

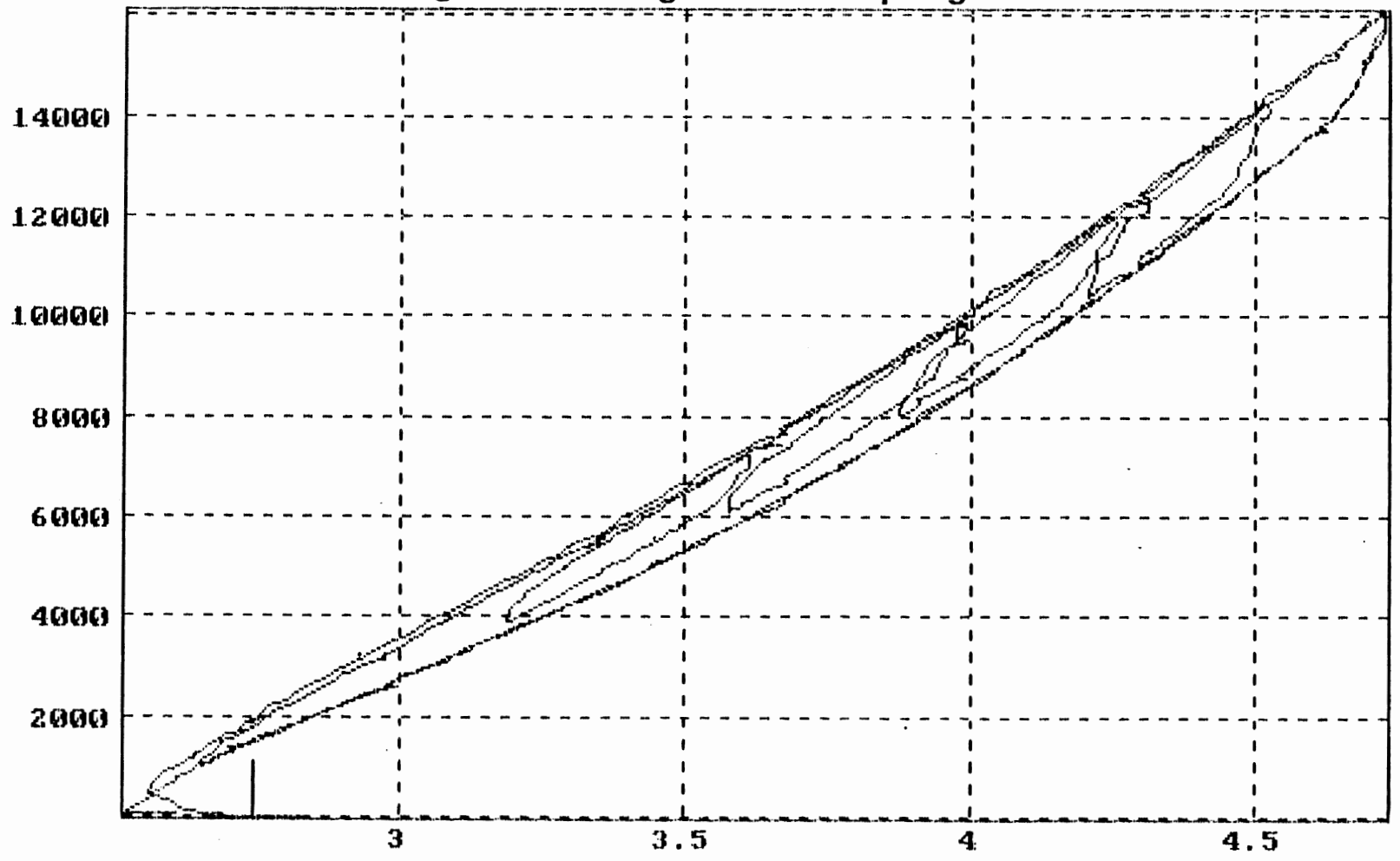
Abscissa: Average leading axle vertical axle displacement (ZALDA); inches; spring compression, positive.

NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: 1/6/87
Pitch = 0.0 degrees

Trailing Axle Average Vertical Spring Rate



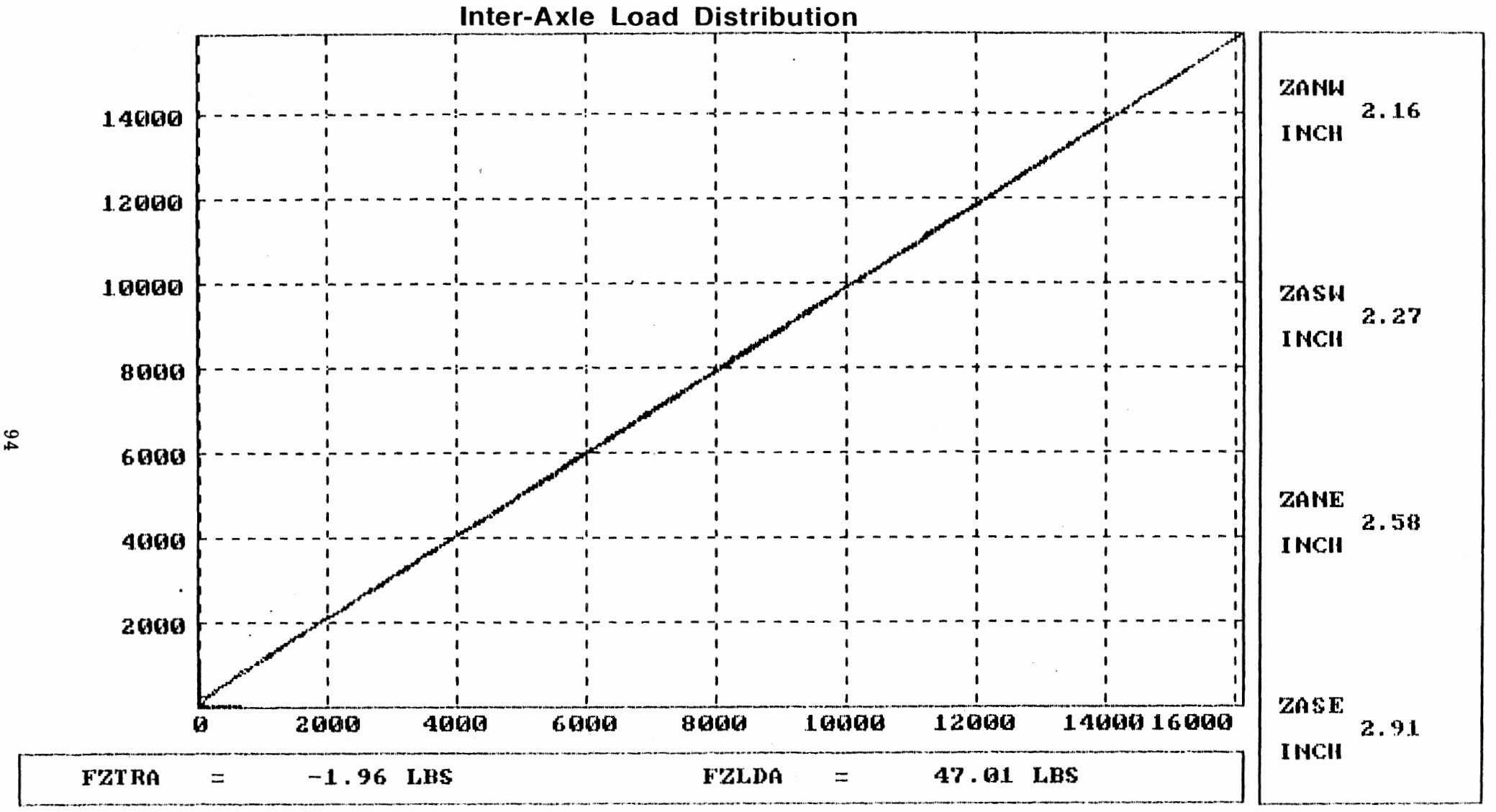
Ordinate: Average trailing axle vertical wheel load (FZTRA); pounds; spring compression, positive.

Abscissa: Average trailing axle vertical axle displacement (ZATRA); inches; spring compression, positive.

NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: 1/6/87
Pitch = 0.0 degrees



Ordinate: Average leading axle vertical wheel load (FZLDA); pounds; spring compression, positive.

Abscissa: Average trailing axle vertical wheel load (FZTRA); pounds; spring compression, positive.

DATE 1- 5-1987 14:37:23
TYPE OF TEST:ROLL
CUSTOMER:NHTSA
OPERATOR:WINKLER
FILE NAME:C:NHTSAVR1.DAT
COMMENT:

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD=36000.
NOMINAL STEER ANGLE= .00

SUSPENSION DATA

TYPE:CAMELBACK 2TAPER
MANUFACTURER:VOLVO
MODEL:?
RATING:?
OTHER:CAMEL BACK STYLE.2 TAPER LEAF. RUBBER END PADS

VEHICLE DATA

MANUFACTURER:VOLVO
MODEL:F 10 COE
OTHER:

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	54.00	54.00
SPRING SPACING	38.50	38.50
SPRING LASH	.00	.00
TANDEM SPREAD	54.00	54.00

FACILTY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	71.75	.00
LATERAL Z-POT SPACING	108.62	106.38
VERTICAL Y-POT POSITION	21.94	22.06
	LEFT	RIGHT
LONG. PAD SPACING	54.32	54.50

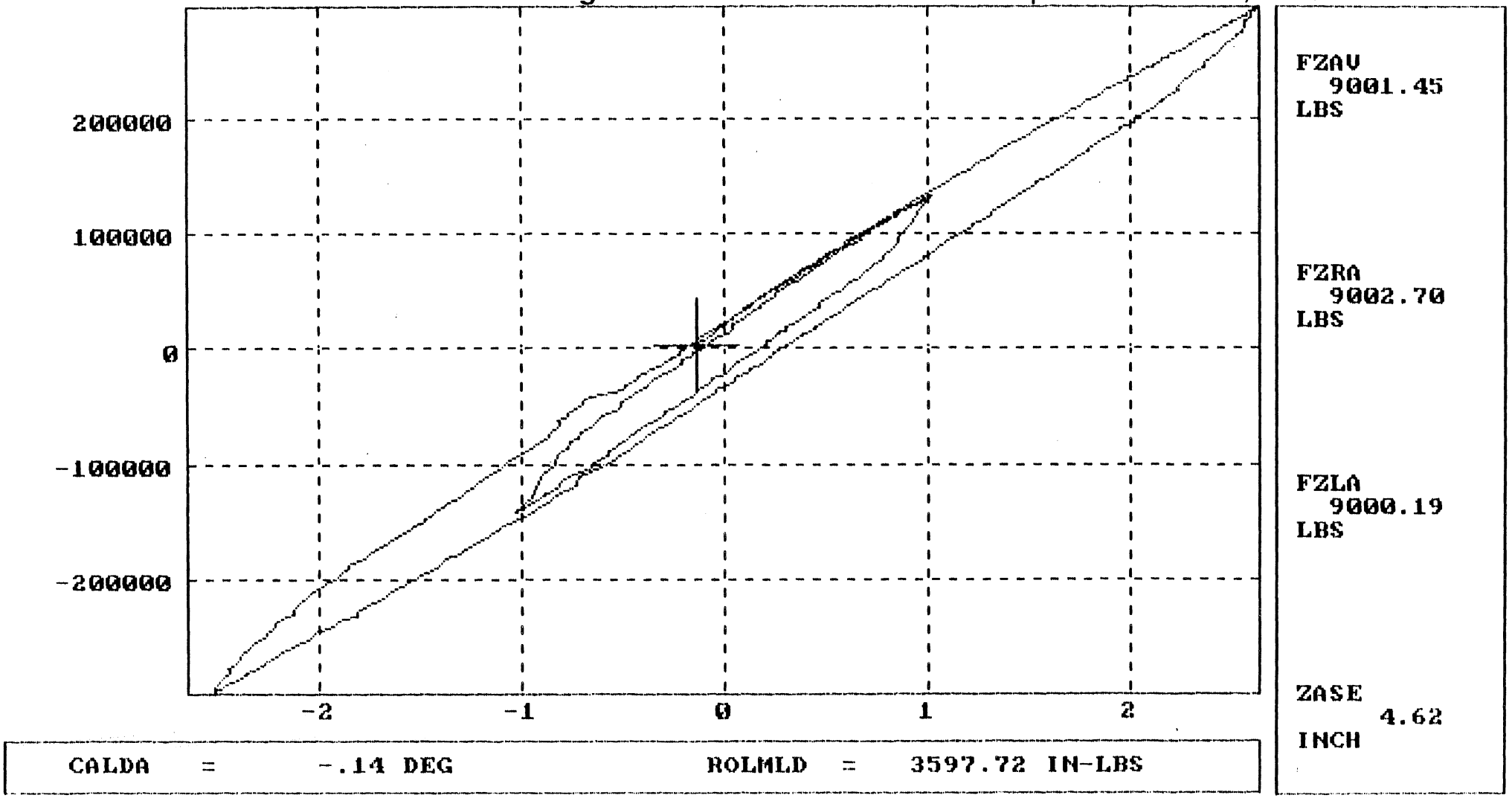
Date:1/6/87

NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Leading Axle Roll Rate

Date: 1/6/87
Pitch = 0.0 degrees
Suspension Load = 36,000 lb.



Ordinate: Leading axle roll moment in load cell coordinate system (ROLMLD); in-lb; right side compressed, positive.

Abscissa: Average leading axle roll (camber) angle (CALDA); degrees; right side compressed, positive.

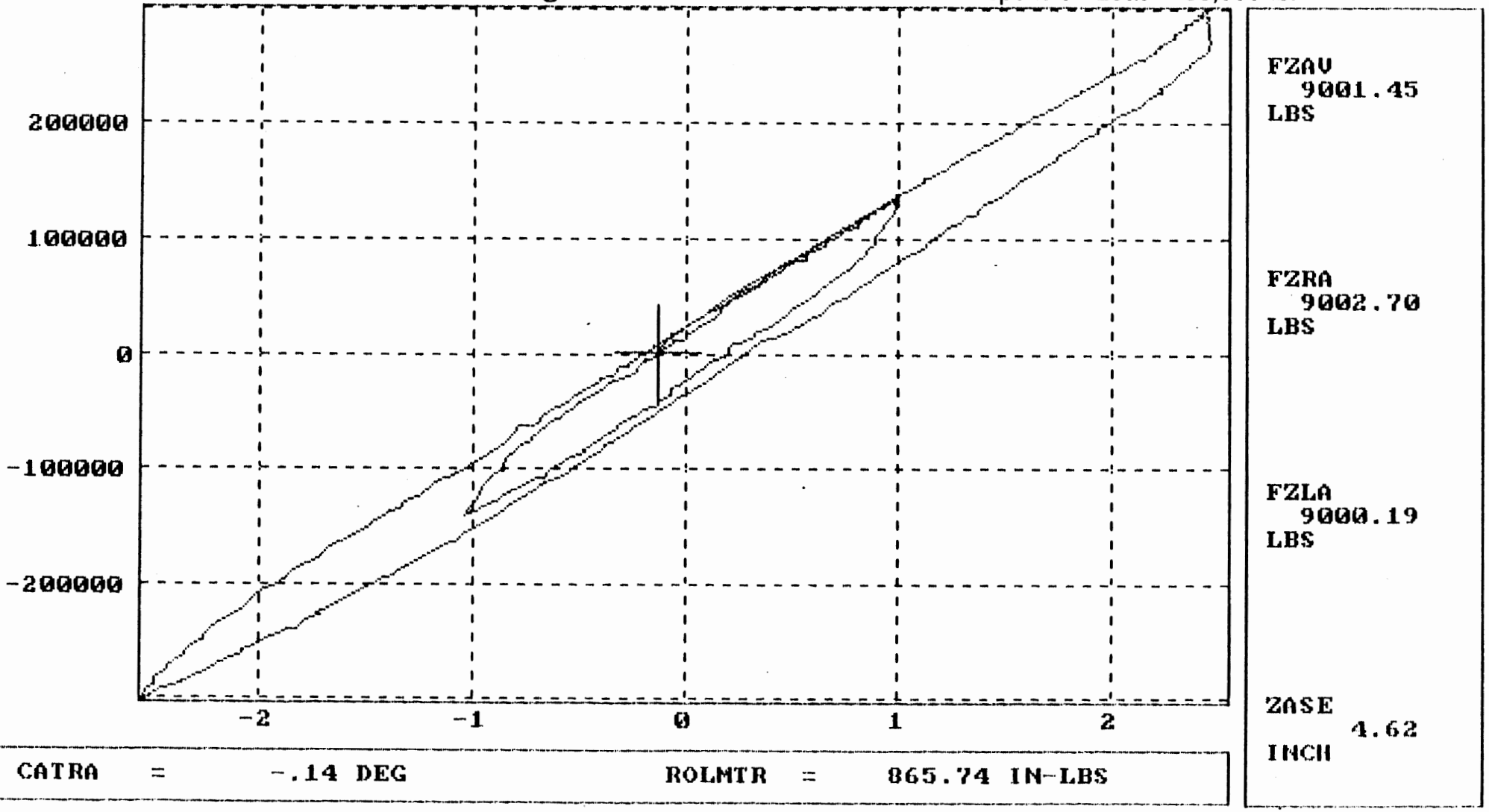
NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Trailing Axle Roll Rate

Date: 1/6/87
Pitch = 0.0 degrees

Suspension Load = 36,000 lb.



Ordinate: Trailing axle roll moment in load cell coordinate system (ROLMTR); in-lb; right side compressed, positive.

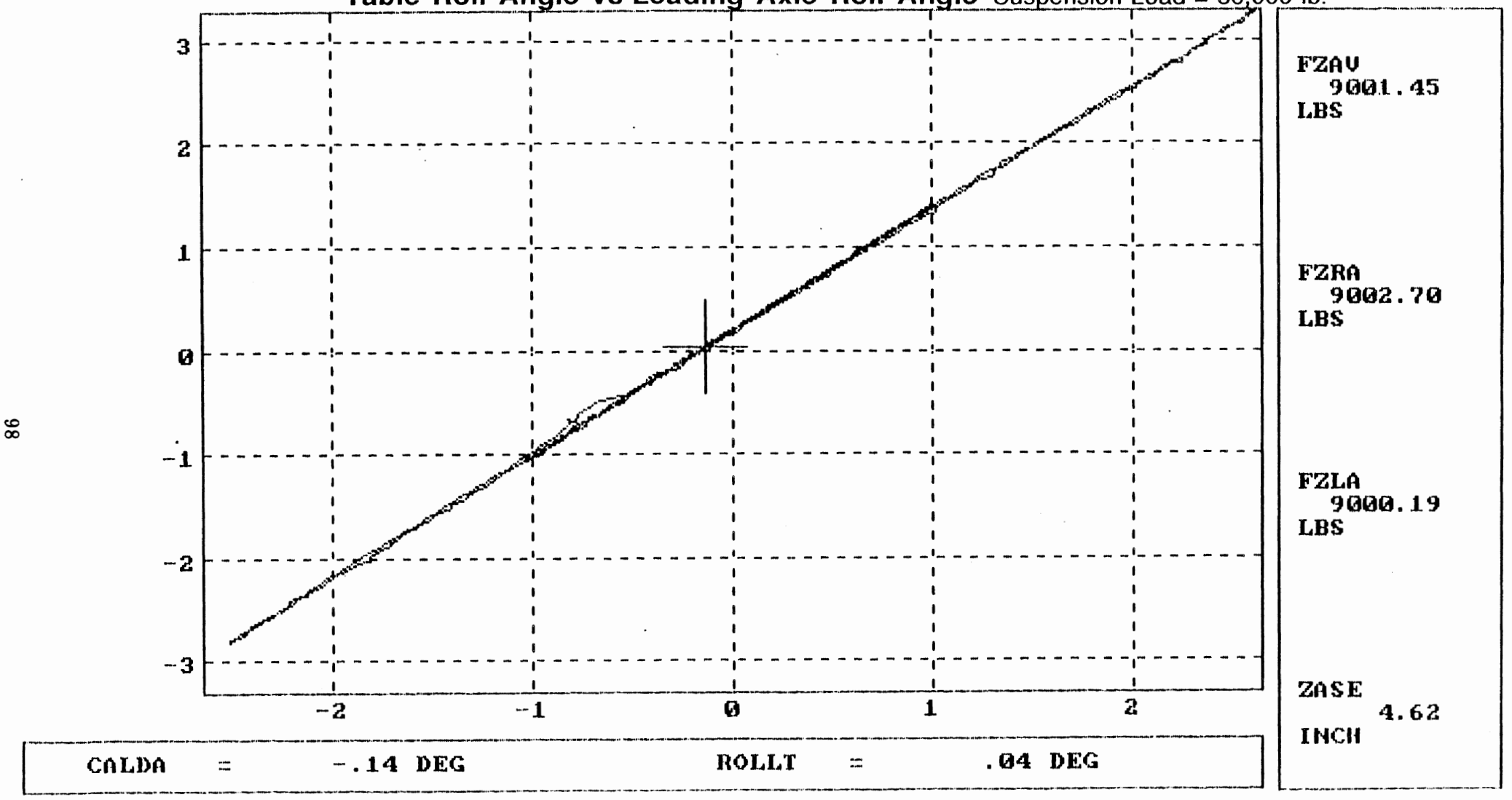
Abscissa: Average trailing axle roll (camber) angle (CATRA); degrees; right side compressed, positive.

NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: 1/6/87
Pitch = 0.0 degrees

Table Roll Angle vs Leading Axle Roll Angle Suspension Load = 36,000 lb.



Ordinate: Table roll angle (ROLLT); degrees; right side compressed, positive.

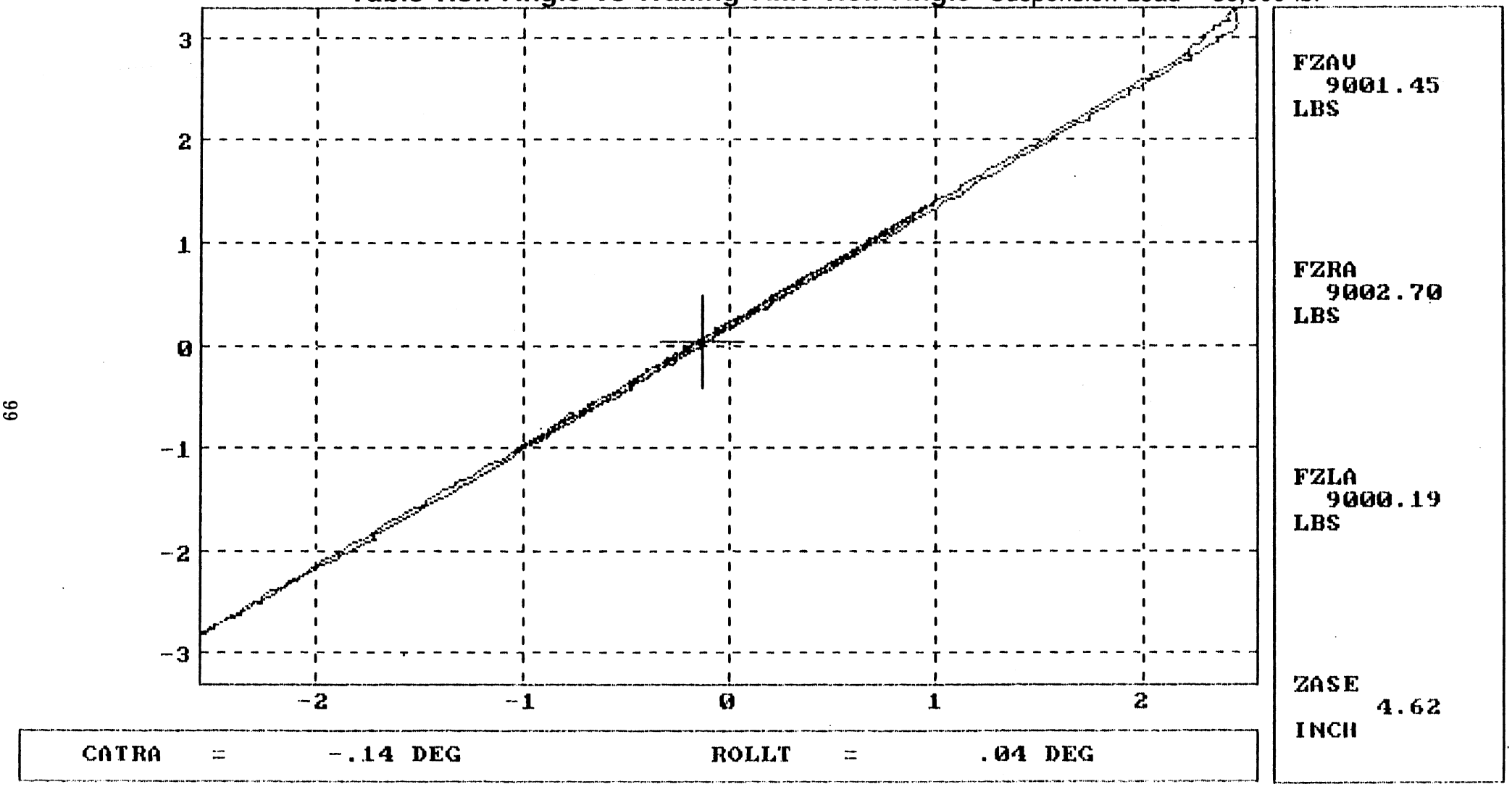
Abscissa: Average leading axle roll (camber) angle (CALDA); degrees; right side compressed, positive.

NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: 1/6/87
Pitch = 0.0 degrees

Table Roll Angle vs Trailing Axle Roll Angle Suspension Load = 36,000 lb.



Ordinate: Table roll angle (ROLLT); degrees; right side compressed, positive.

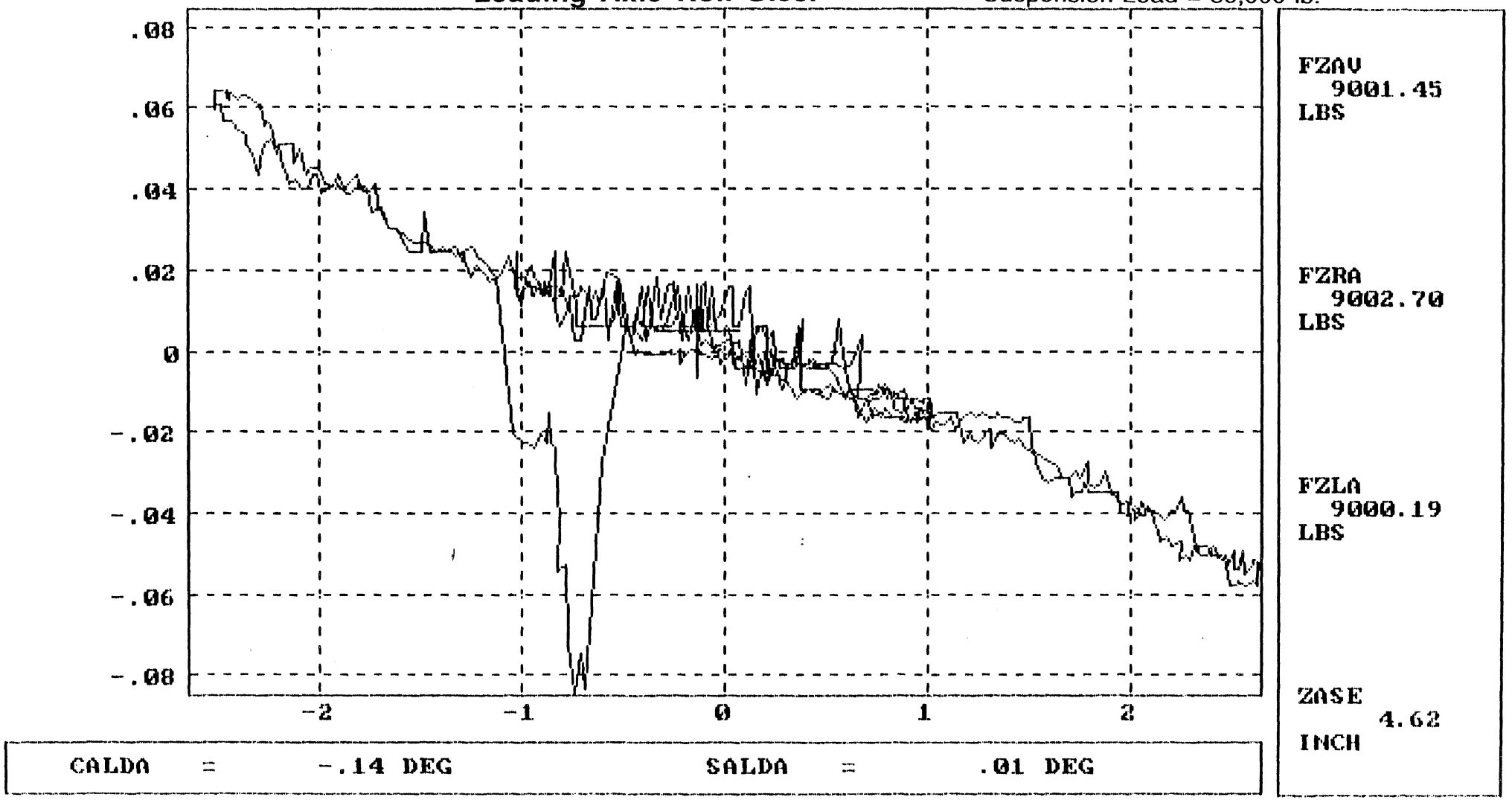
Abscissa: Average trailing axle roll (camber) angle (CATRA); degrees; right side compressed, positive.

NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Leading Axle Roll Steer

Date: 1/6/87
Pitch = 0.0 degrees
Suspension Load = 36,000 lb.



Ordinate: Average leading axle steer angle (SALDA); degrees; steer toward right, positive.

Abscissa: Average leading axle roll (camber) angle (CALDA); degrees; right side compressed, positive.

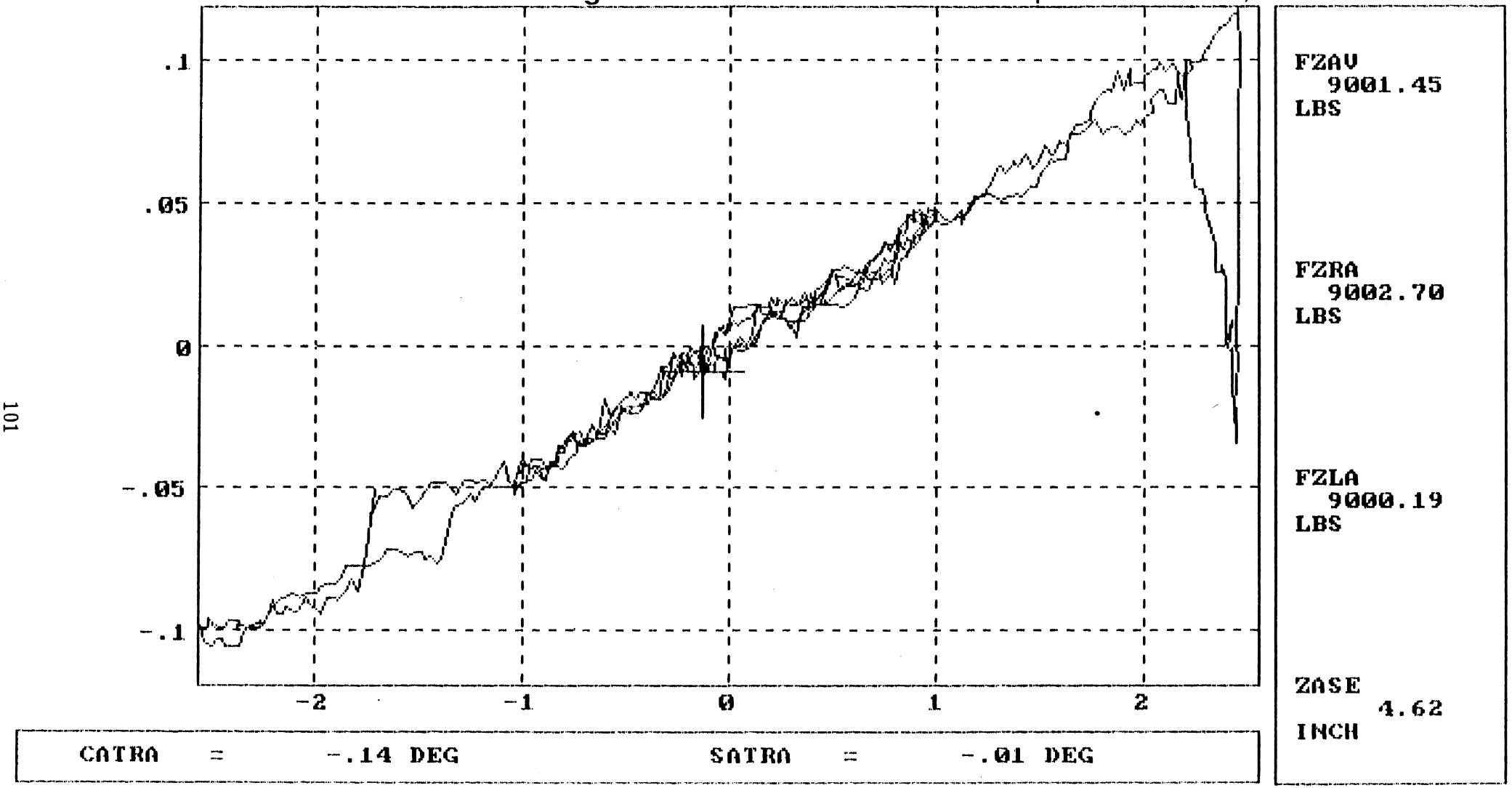
NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: 1/6/87
Pitch = 0.0 degrees

Trailing Axle Roll Steer

Suspension Load = 36,000 lb.



Ordinate: Average trailing axle steer angle (SATRA); degrees; steer toward right, positive.

Abscissa: Average trailing axle roll (camber) angle (CATRA); degrees; right side compressed, positive.

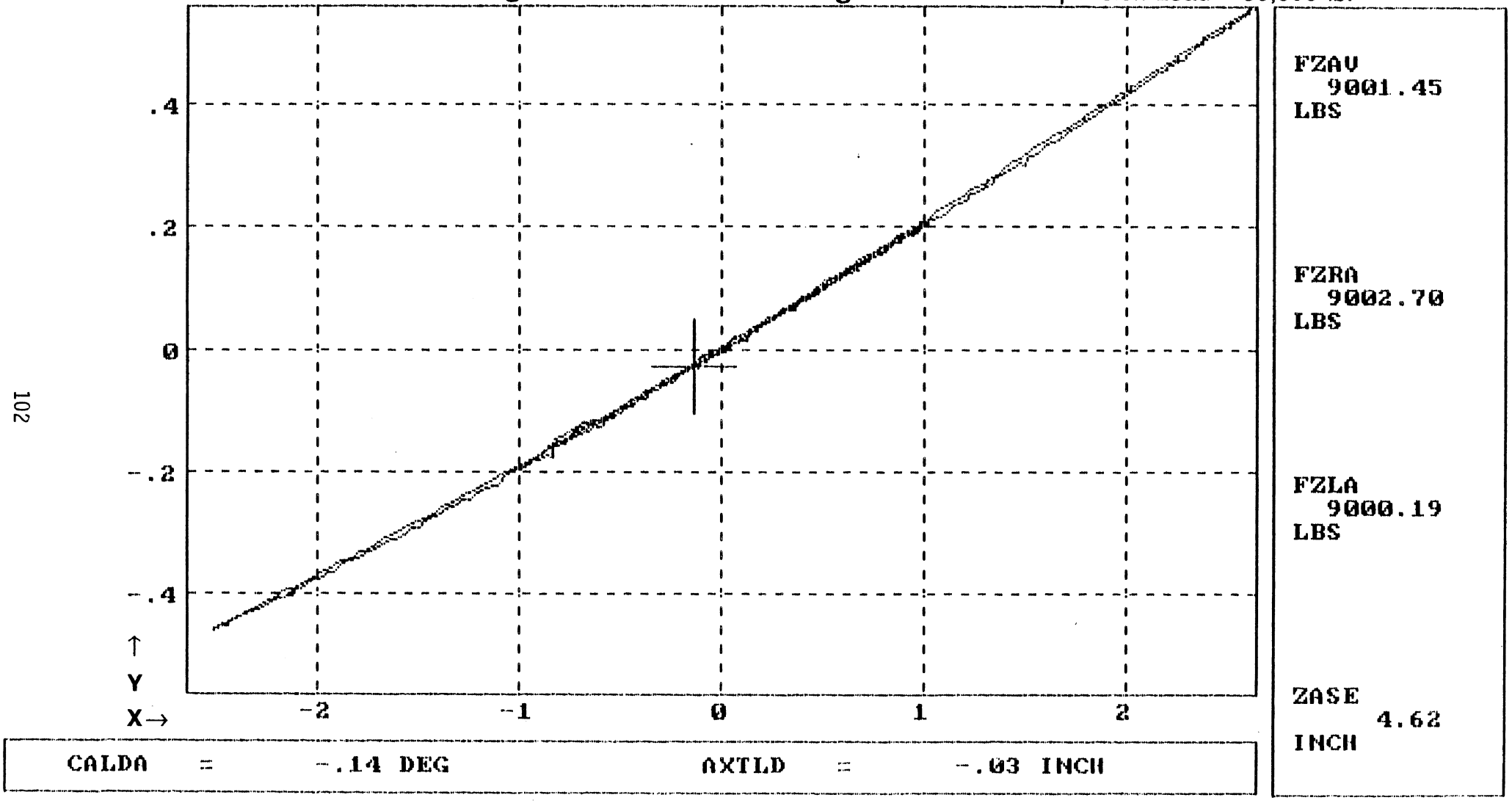
NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: January 13, 1987 (reprint)
Pitch = 0.0 degrees

Leading Axle Roll Center Height

Suspension Load = 36,000 lb.



Abscissa (X): Average leading axle roll (camber) angle (CALDA); degrees; right side compressed, positive.

Ordinate (Y): Leading axle lateral translation (AXTLD) at a position 21.94 inches above the ground; inches; motion toward right, positive.

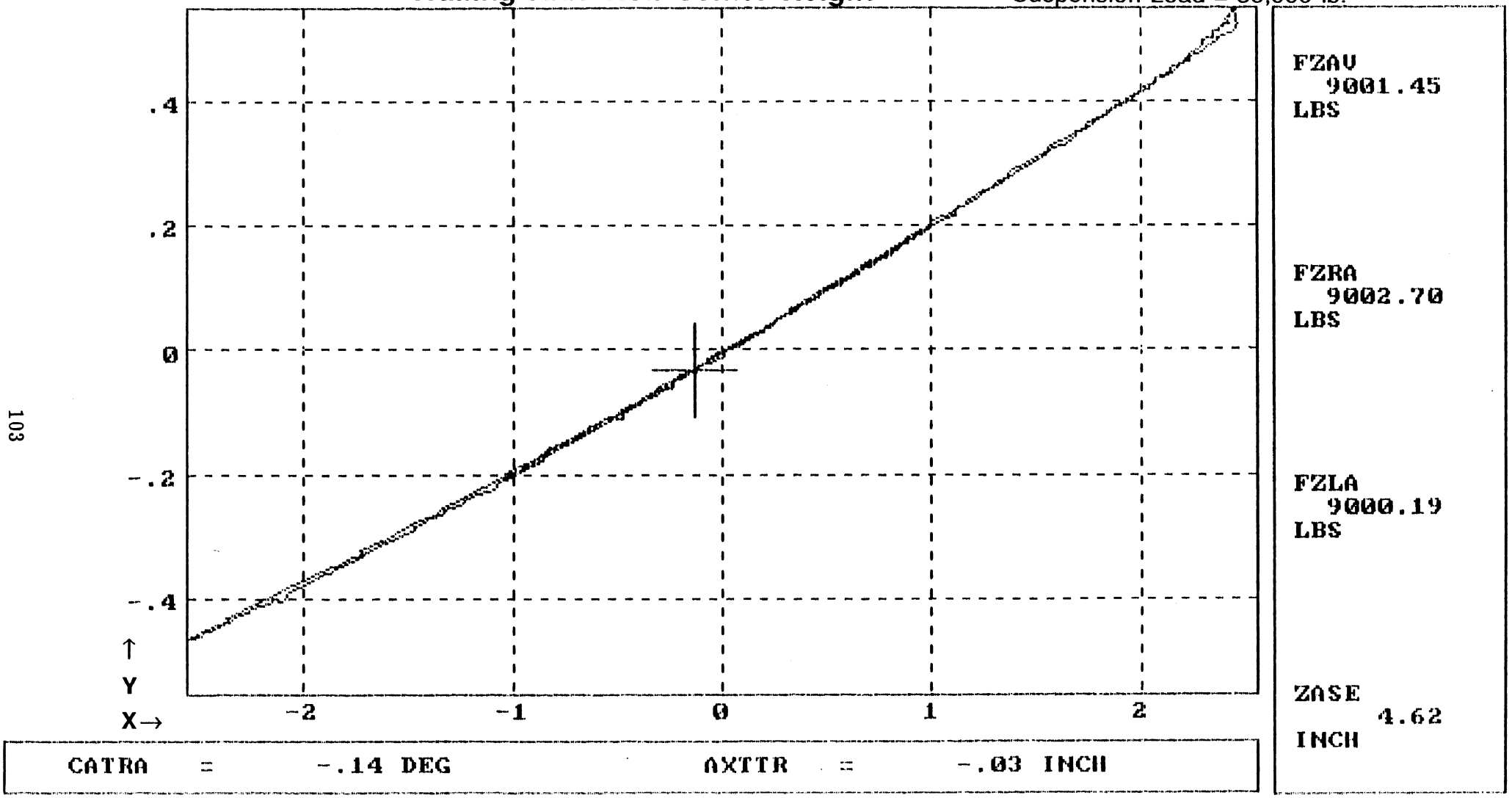
NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: January 13, 1987 (reprint)
Pitch = 0.0 degrees

Trailing Axle Roll Center Height

Suspension Load = 36,000 lb.



Abscissa (X): Average trailing axle roll (camber) angle (CATRA); degrees; right side compressed, positive.

Ordinate (Y): Trailing axle lateral translation (AXTTR) at a position 22.06 inches above the ground; inches; motion toward right, positive.

DATE 1- 8-1987   15:17:30
TYPE OF TEST:ROLL
CUSTOMER:NHTSA
OPERATOR:WINKLER
FILE NAME:C:NHTSAVR2.DAT
COMMENT:

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD=24000.
NOMINAL STEER ANGLE= .00

SUSPENSION DATA

TYPE:CAMELBACK TAPER
MANUFACTURER:VOLVO
MODEL:?
RATING:?
OTHER:CAMEL BACK STYLE.2 TAPER LEAF. RUBBER END PADS

VEHICLE DATA

MANUFACTURER:VOLVO
MODEL:F 10 COE
OTHER:

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	54.00	54.00
SPRING SPACING	38.50	38.50
SPRING LASH	.00	.00
TANDEM SPREAD	54.00	54.00

FACILTY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	71.75	.00
LATERAL Z-POT SPACING	106.62	106.88
VERTICAL Y-POT POSITION	22.50	22.67
	LEFT	RIGHT
LONG. PAD SPACING	54.32	54.50

Date:1/6/87

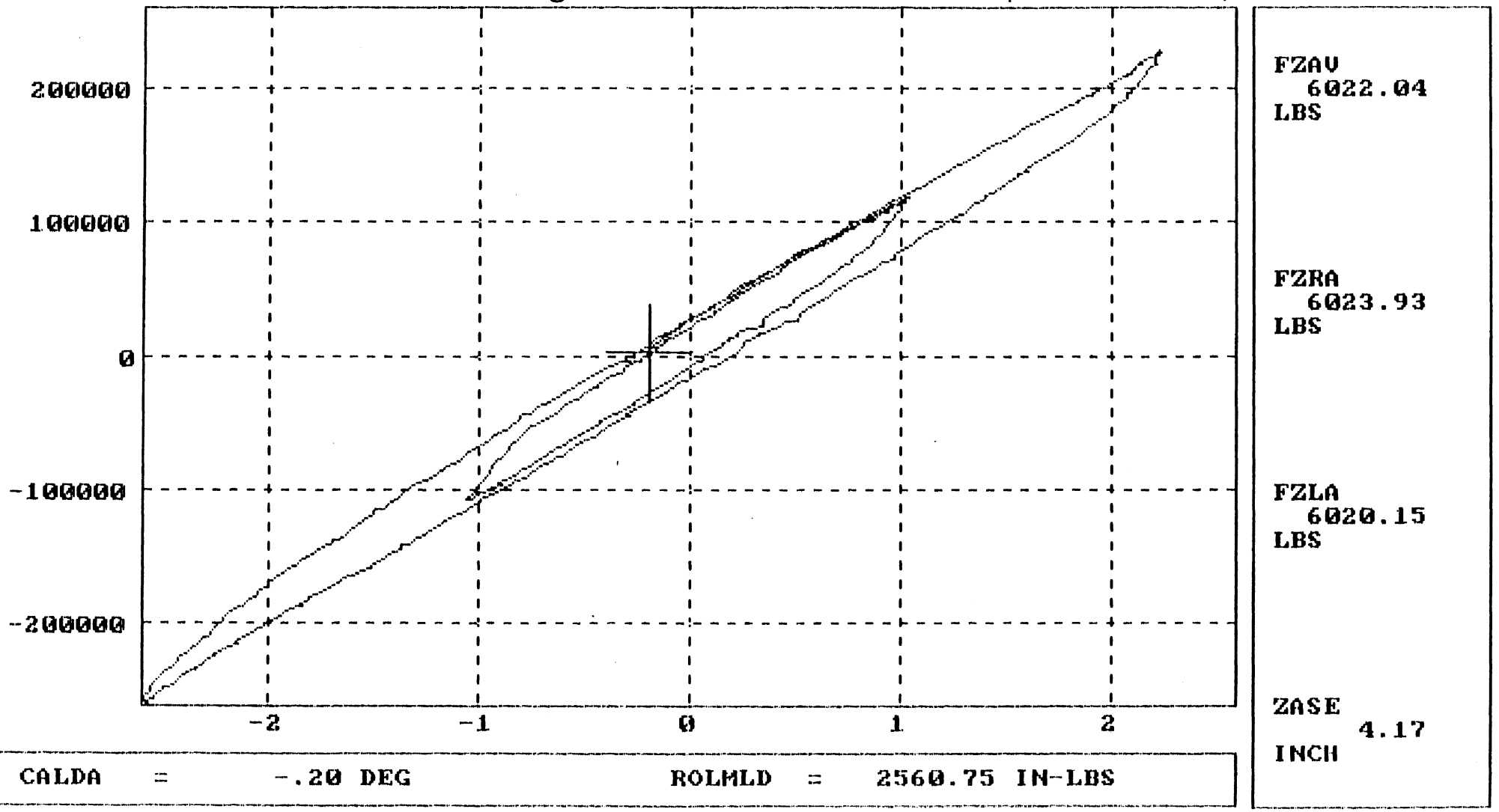
NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: 1/6/87
Pitch = 0.0 degrees

Leading Axle Roll Rate

Suspension Load = 24,000 lb.



Ordinate: Leading axle roll moment in load cell coordinate system (ROLMLD); in-lb; right side compressed, positive.

Abscissa: Average leading axle roll (camber) angle (CALDA); degrees; right side compressed, positive.

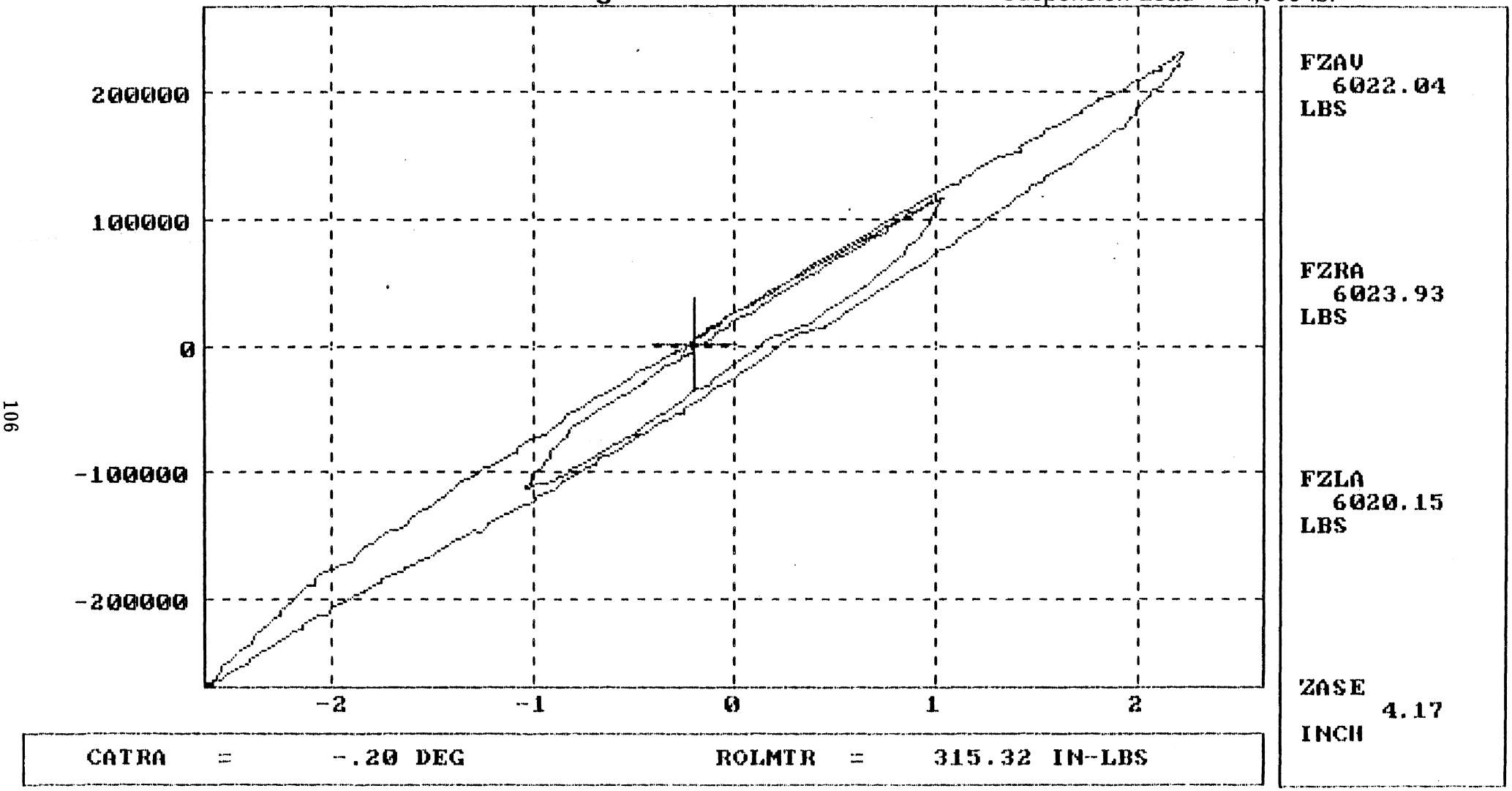
NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: 1/6/87
Pitch = 0.0 degrees

Trailing Axle Roll Rate

Suspension Load = 24,000 lb.



Ordinate: Trailing axle roll moment in load cell coordinate system (ROLMTR); in-lb; right side compressed, positive.

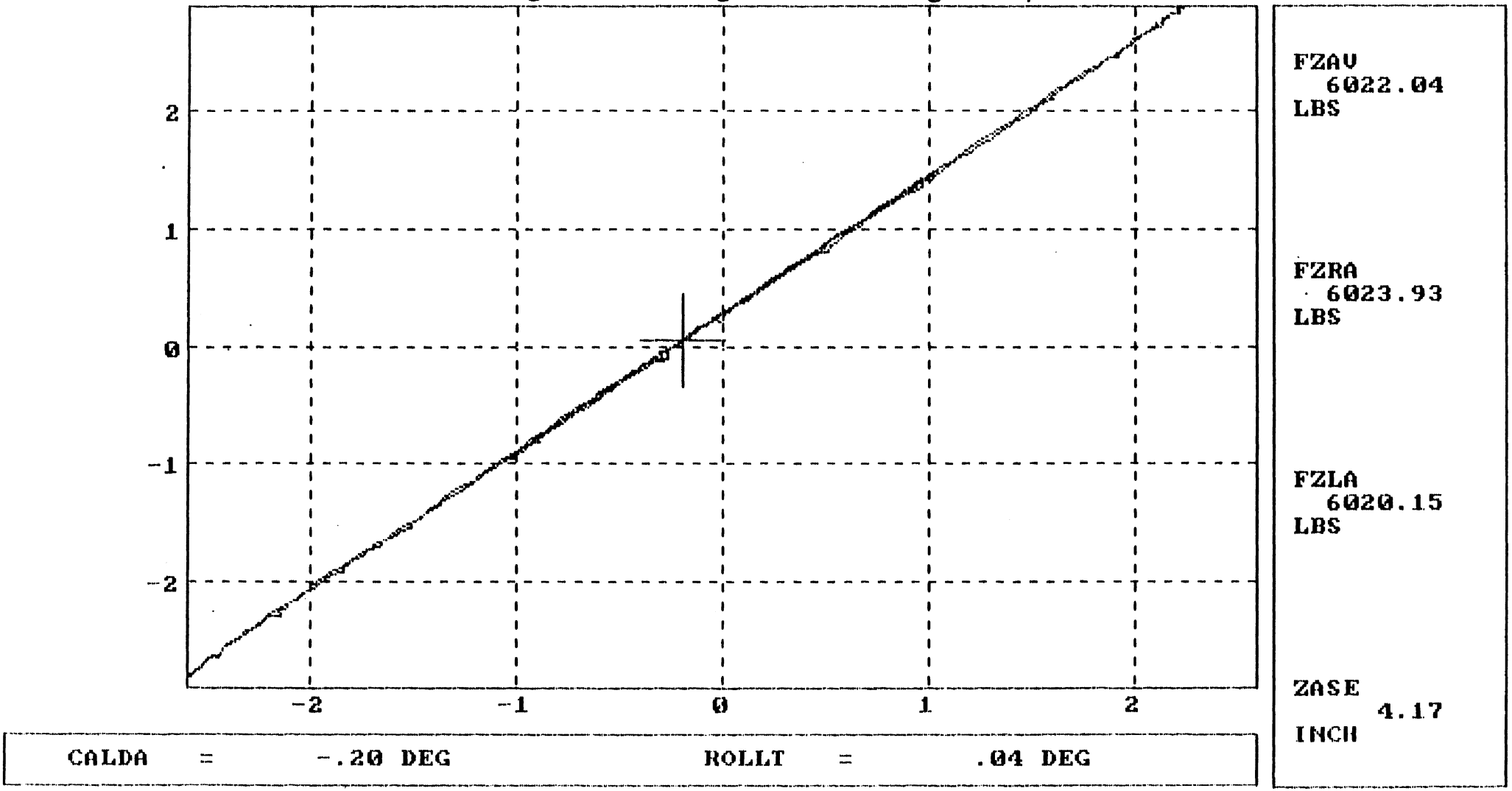
Abscissa: Average trailing axle roll (camber) angle (CATRA); degrees; right side compressed, positive.

NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: 1/6/87
Pitch = 0.0 degrees

Table Roll Angle vs Leading Axle Roll Angle Suspension Load = 24,000 lb.



Ordinate: Table roll angle (ROLLT); degrees; right side compressed, positive.

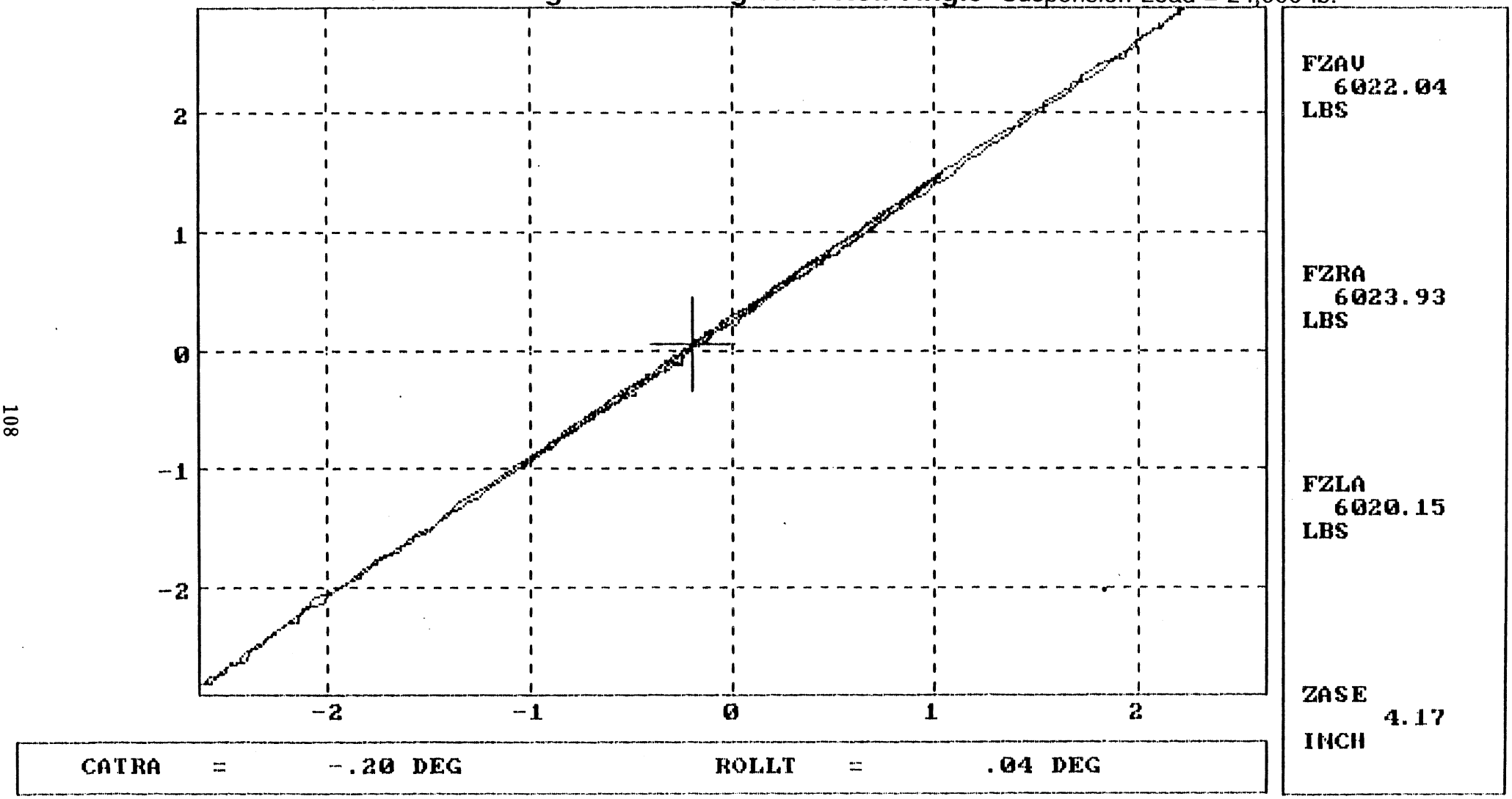
Abscissa: Average leading axle roll (camber) angle (CALDA); degrees; right side compressed, positive.

NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: 1/6/87
Pitch = 0.0 degrees

Table Roll Angle vs Trailing Axle Roll Angle Suspension Load = 24,000 lb.



Ordinate: Table roll angle (ROLLT); degrees; right side compressed, positive.

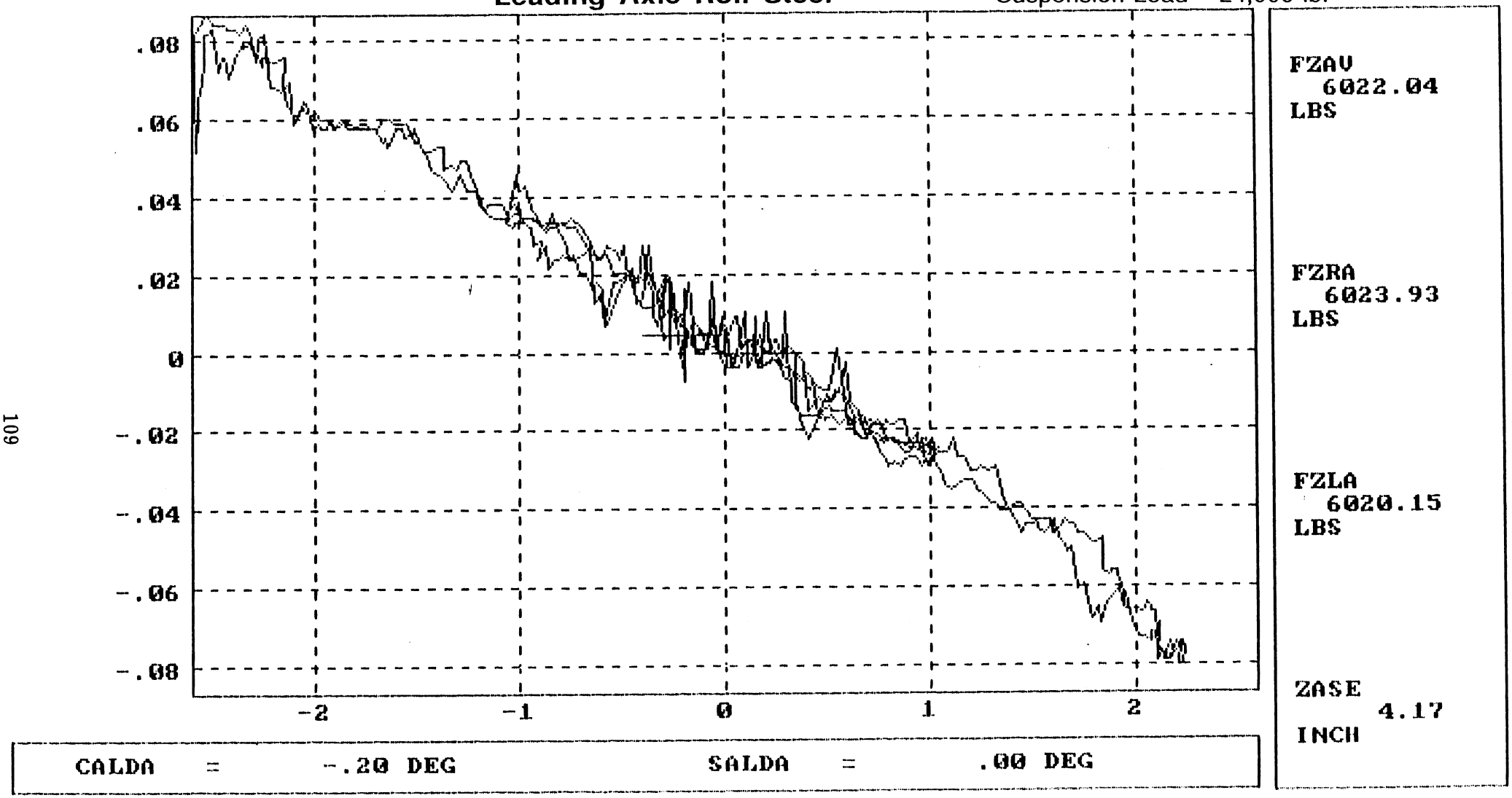
Abscissa: Average trailing axle roll (camber) angle (CATRA); degrees; right side compressed, positive.

NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Leading Axle Roll Steer

Date: 1/6/87
Pitch = 0.0 degrees
Suspension Load = 24,000 lb.



Ordinate: Average leading axle steer angle (SALDA); degrees; steer toward right, positive.

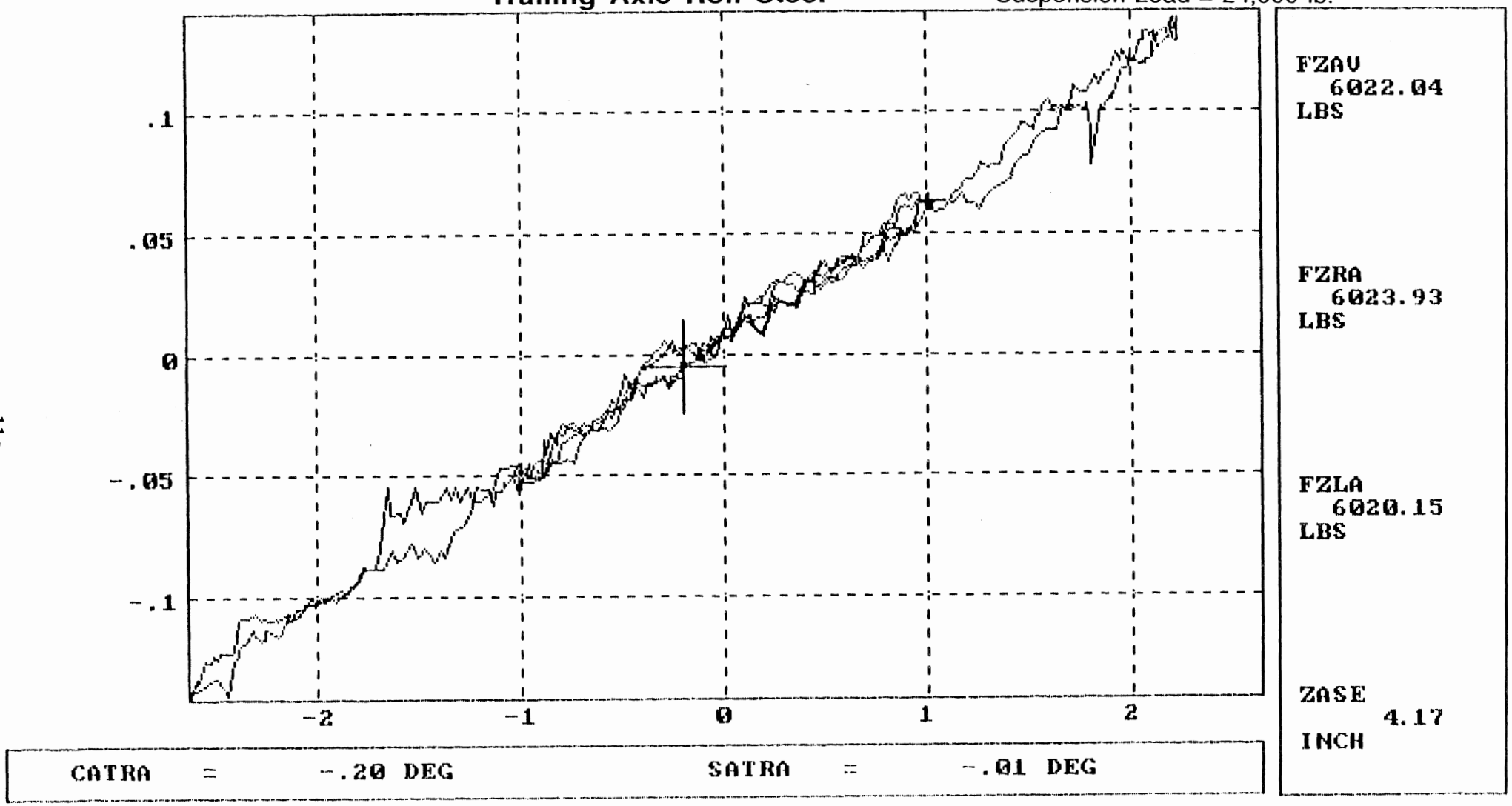
Abscissa: Average leading axle roll (camber) angle (CALDA); degrees; right side compressed, positive.

NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Trailing Axle Roll Steer

Date: 1/6/87
Pitch = 0.0 degrees
Suspension Load = 24,000 lb.



Ordinate: Average trailing axle steer angle (SATRA); degrees; steer toward right, positive.

Abscissa: Average trailing axle roll (camber) angle (CATRA); degrees; right side compressed, positive.

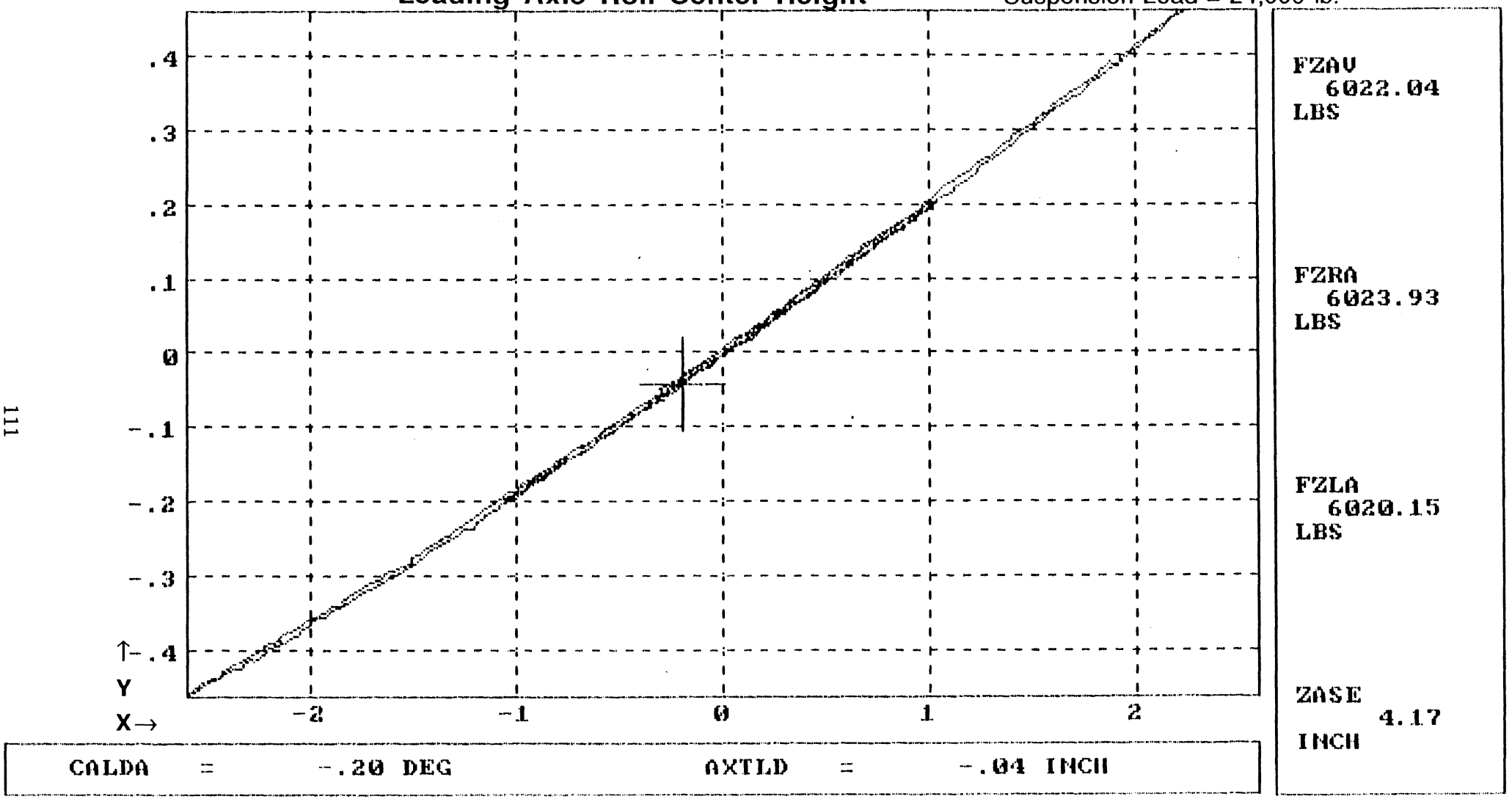
NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: January 13, 1987 (reprint)
Pitch = 0.0 degrees

Leading Axle Roll Center Height

Suspension Load = 24,000 lb.



Abscissa (X): Average leading axle roll (camber) angle (CALDA); degrees; right side compressed, positive.

Ordinate (Y): Leading axle lateral translation (AXTLD) at a position 22.50 inches above the ground; inches; motion toward right, positive.

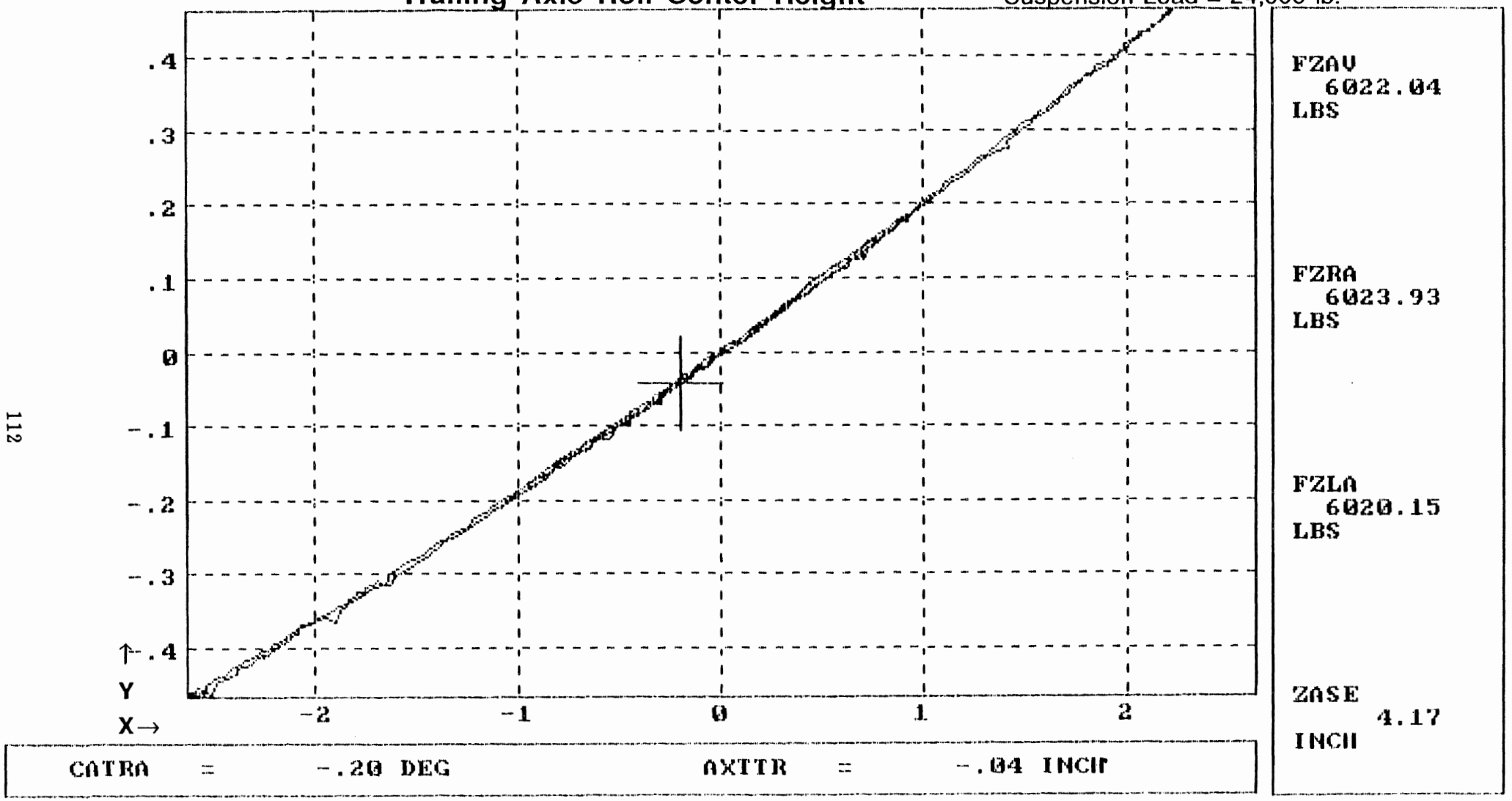
NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: January 13, 1987 (reprint)
Pitch = 0.0 degrees

Trailing Axle Roll Center Height

Suspension Load = 24,000 lb.



Abscissa (X): Average trailing axle roll (camber) angle (CATRA); degrees; right side compressed, positive.

Ordinate (Y): Trailing axle lateral translation (AXTTR) at a position 22.69 inches above the ground; inches; motion toward right, positive.

DATE 12-3-1987 15:23:58
TYPE OF TEST:ROLL
CUSTOMER:NHTSA
OPERATOR:WINKLER
FILE NAME:C:NHTSAVR3.DAT
COMMENT:

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD=12000.
NOMINAL STEER ANGLE= .00

SUSPENSION DATA

TYPE:CAMELBACK 2TAPER
MANUFACTURER:VOLVO
MODEL:?
RATING:?
OTHER:CAMEL BACK STYLE.2 TAPER LEAF. RUBBER END PADS

VEHICLE DATA

MANUFACTURER:VOLVO
MODEL:F 10 6X6
OTHER:

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	54.00	54.00
SPRING SPACING	38.50	38.50
SPRING LASH	.00	.00
TANDEM SPREAD	54.00	54.00

FACILITY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	71.75	.00
LATERAL Z-POT SPACING	108.62	106.88
VERTICAL Y-POT POSITION	23.38	23.62
	LEFT	RIGHT
LONG. PAD SPACING	54.32	54.50

Date:1/6/87

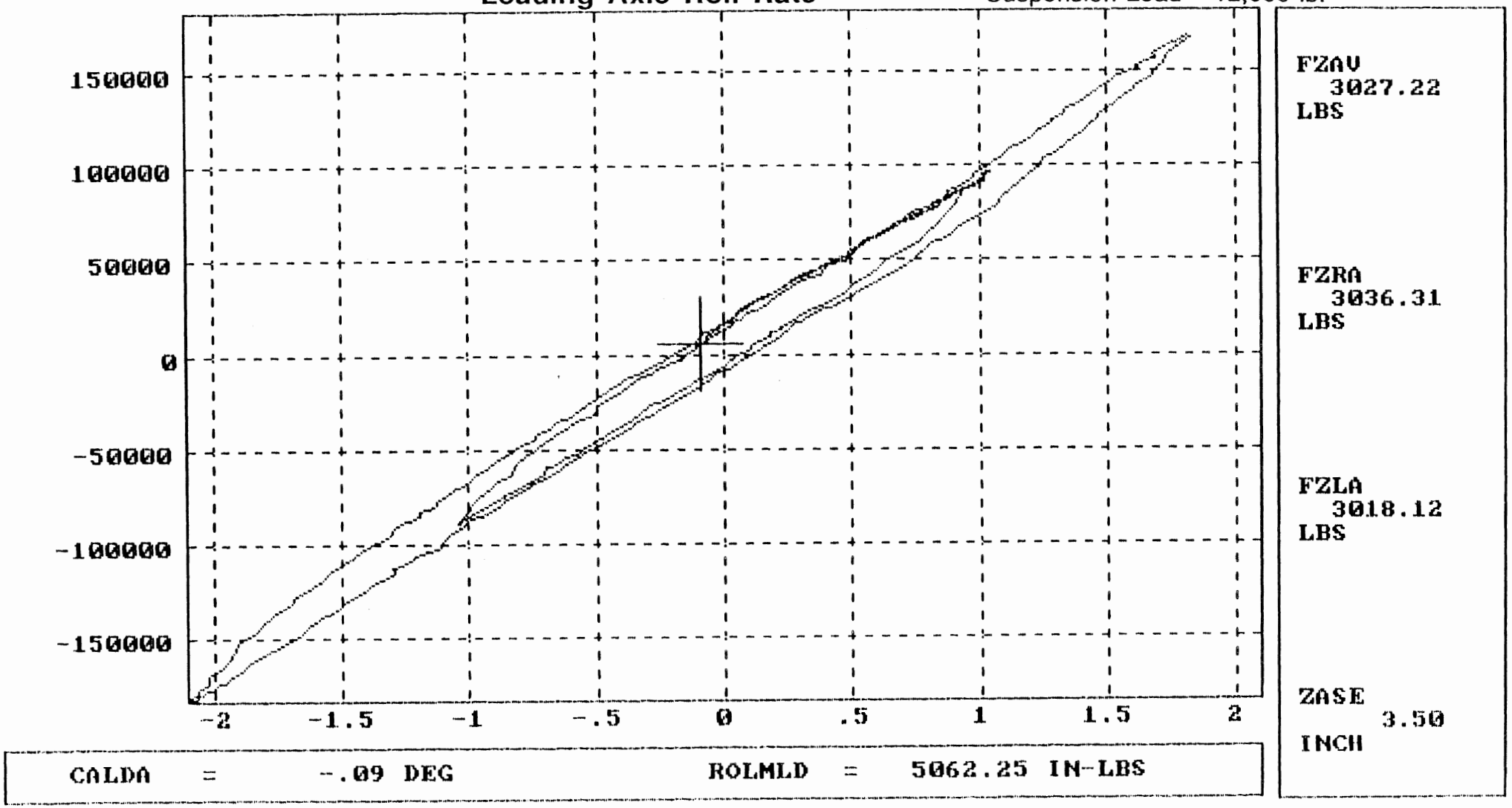
NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: 1/6/87
Pitch = 0.0 degrees

Leading Axle Roll Rate

Suspension Load = 12,000 lb.



Ordinate: Leading axle roll moment in load cell coordinate system (ROLMLD); in-lb; right side compressed, positive.

Abscissa: Average leading axle roll (camber) angle (CALDA); degrees; right side compressed, positive.

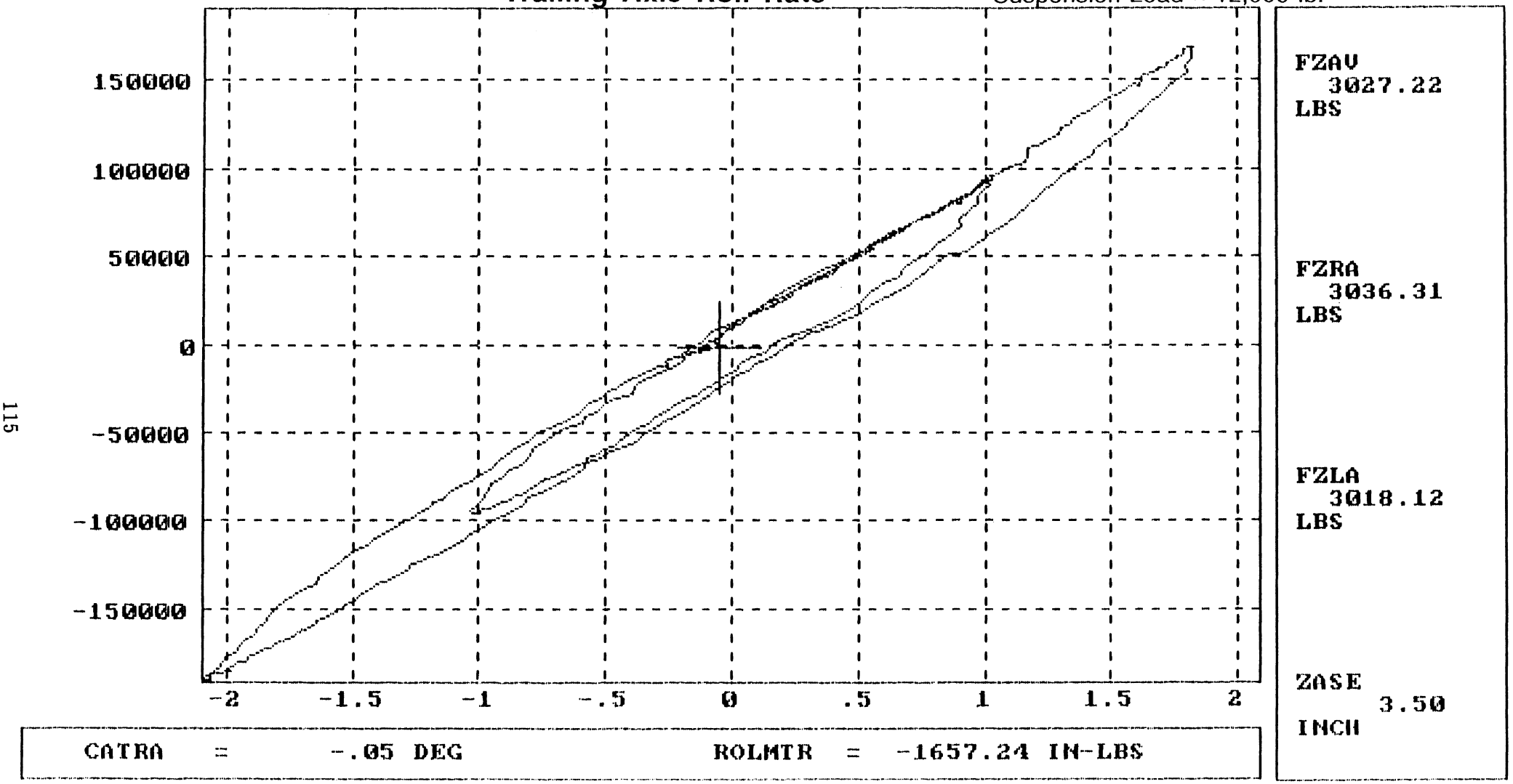
NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: 1/6/87
Pitch = 0.0 degrees

Trailing Axle Roll Rate

Suspension Load = 12,000 lb.



Ordinate: Trailing axle roll moment in load cell coordinate system (ROLMTR); in-lb; right side compressed, positive.

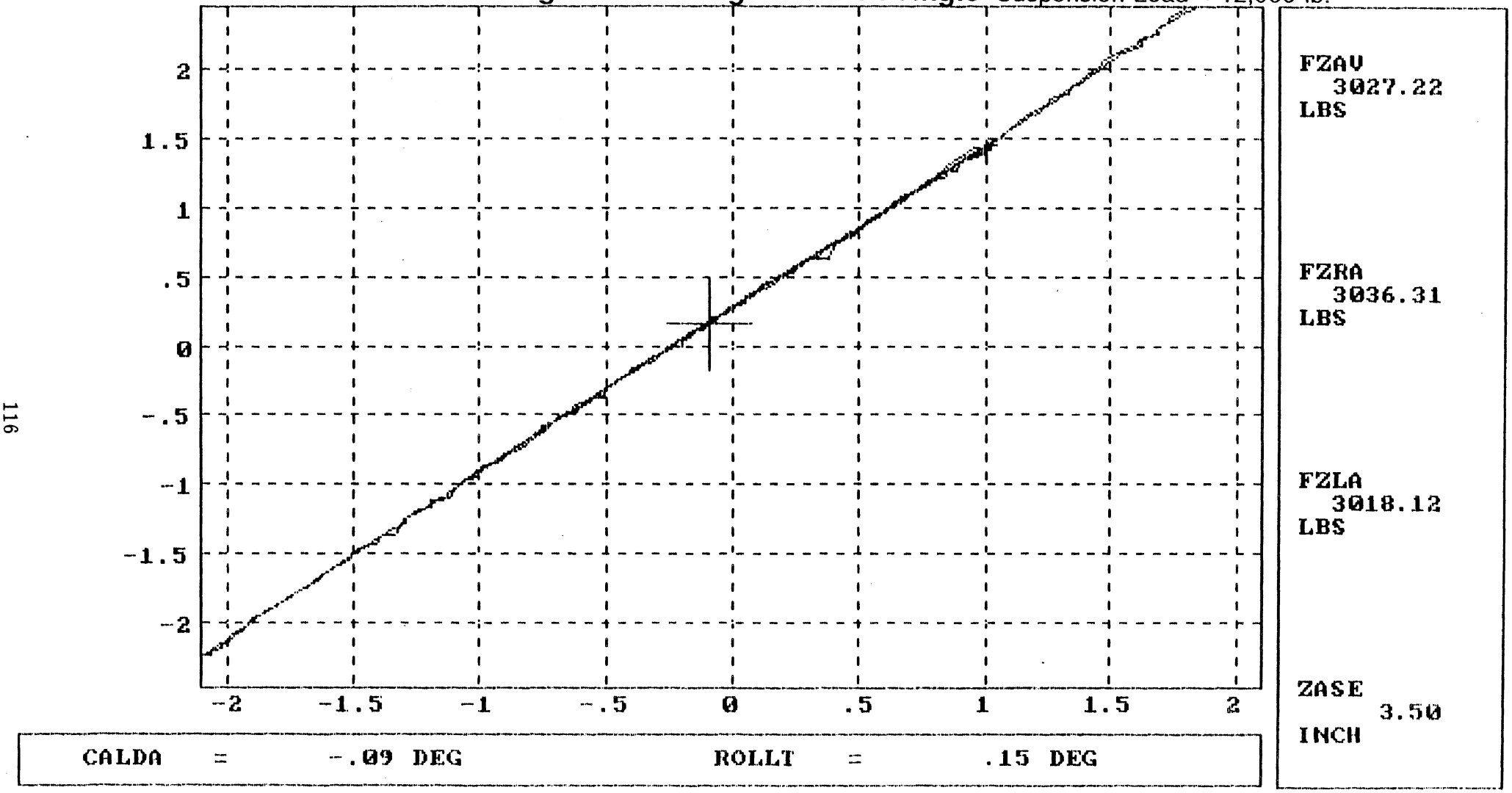
Abscissa: Average trailing axle roll (camber) angle (CATRA); degrees; right side compressed, positive.

NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: 1/6/87
Pitch = 0.0 degrees

Table Roll Angle vs Leading Axle Roll Angle Suspension Load = 12,000 lb.



Ordinate: Table roll angle (ROLLT); degrees; right side compressed, positive.

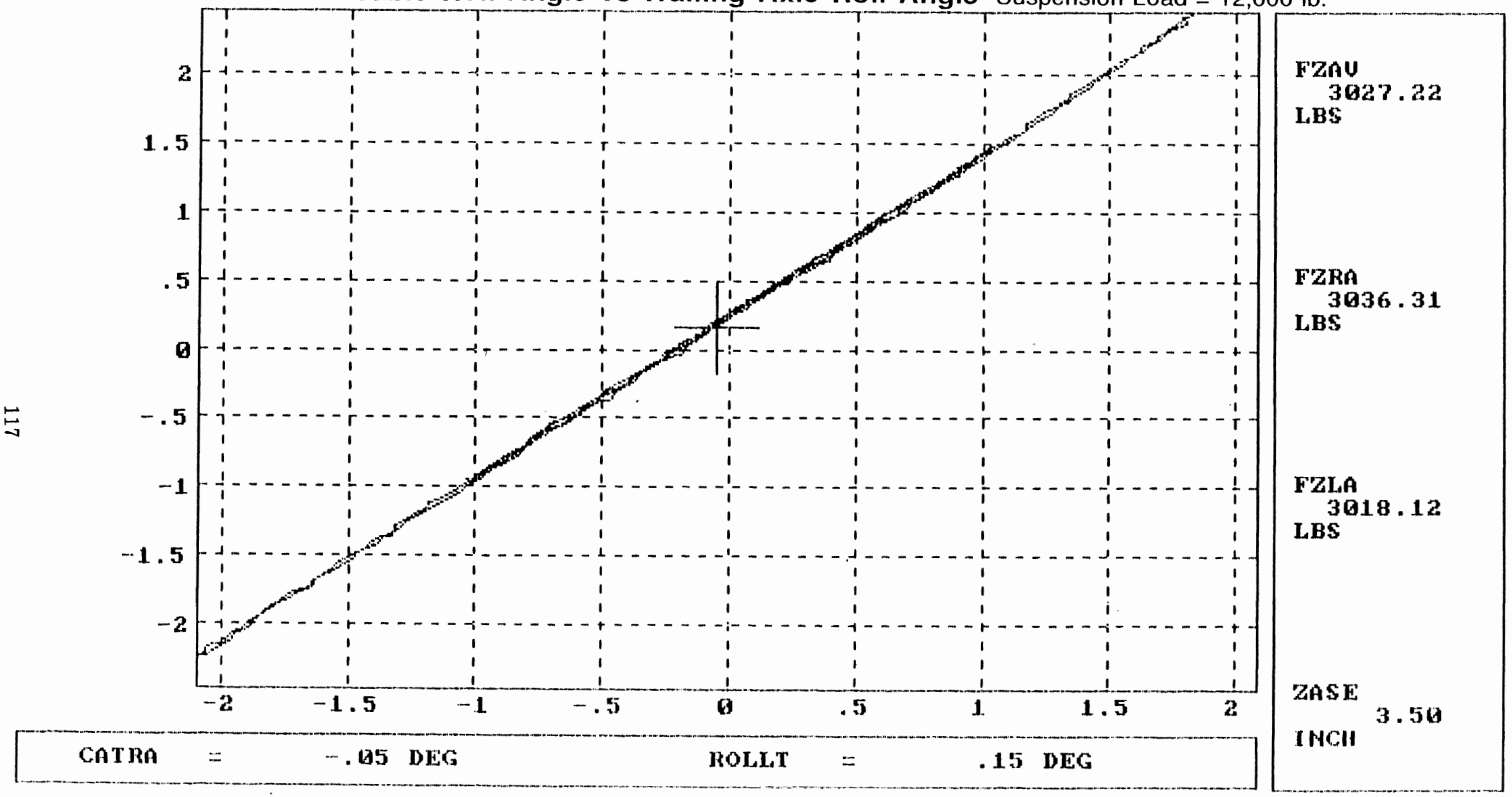
Abscissa: Average leading axle roll (camber) angle (CALDA); degrees; right side compressed, positive.

NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: 1/6/87
Pitch = 0.0 degrees

Table Roll Angle vs Trailing Axle Roll Angle Suspension Load = 12,000 lb.



Ordinate: Table roll angle (ROLLT); degrees; right side compressed, positive.

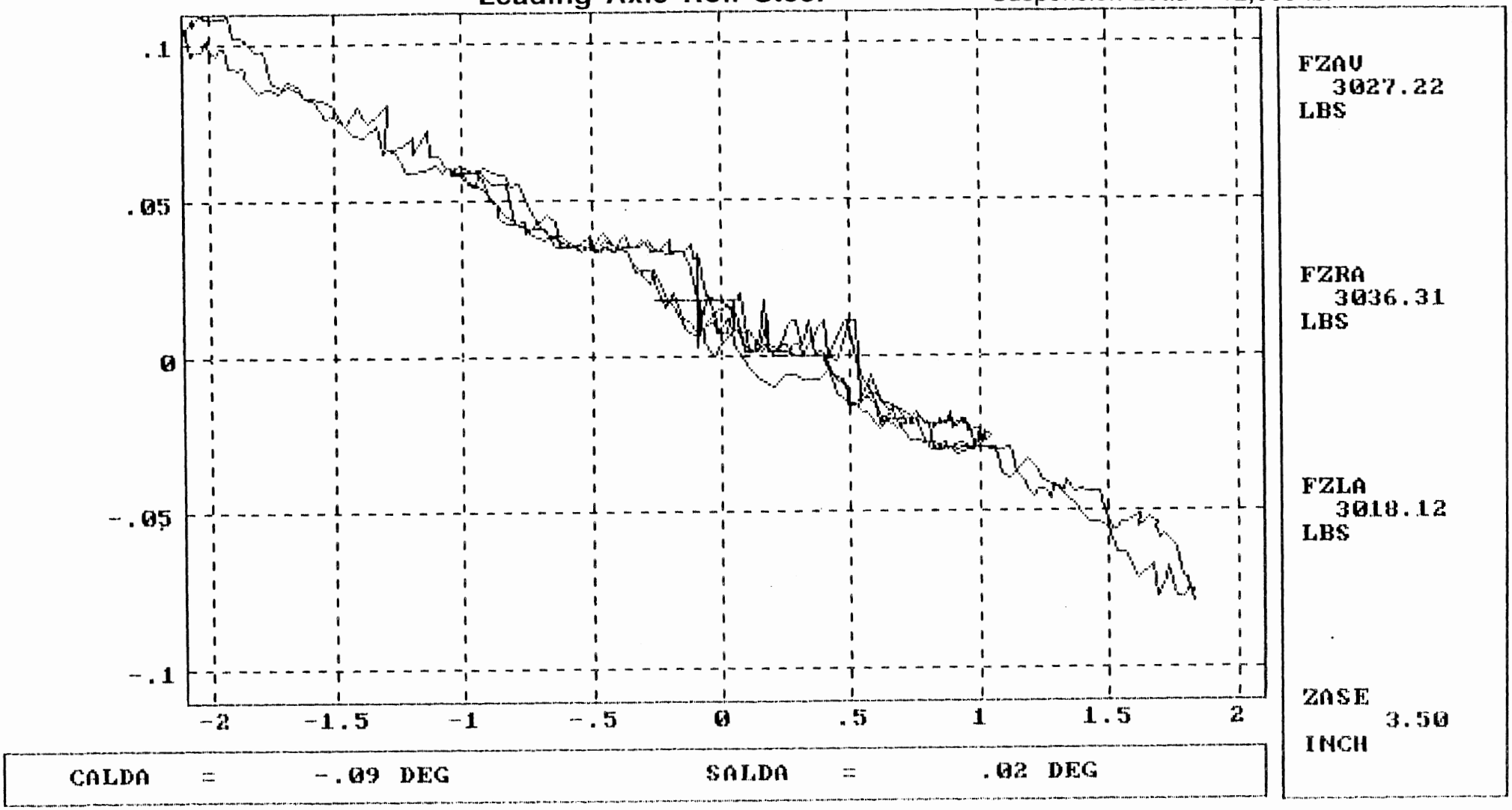
Abscissa: Average trailing axle roll (camber) angle (CATRA); degrees; right side compressed, positive.

NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Leading Axle Roll Steer

Date: 1/6/87
Pitch = 0.0 degrees
Suspension Load = 12,000 lb.



Ordinate: Average leading axle steer angle (SALDA); degrees; steer toward right, positive.

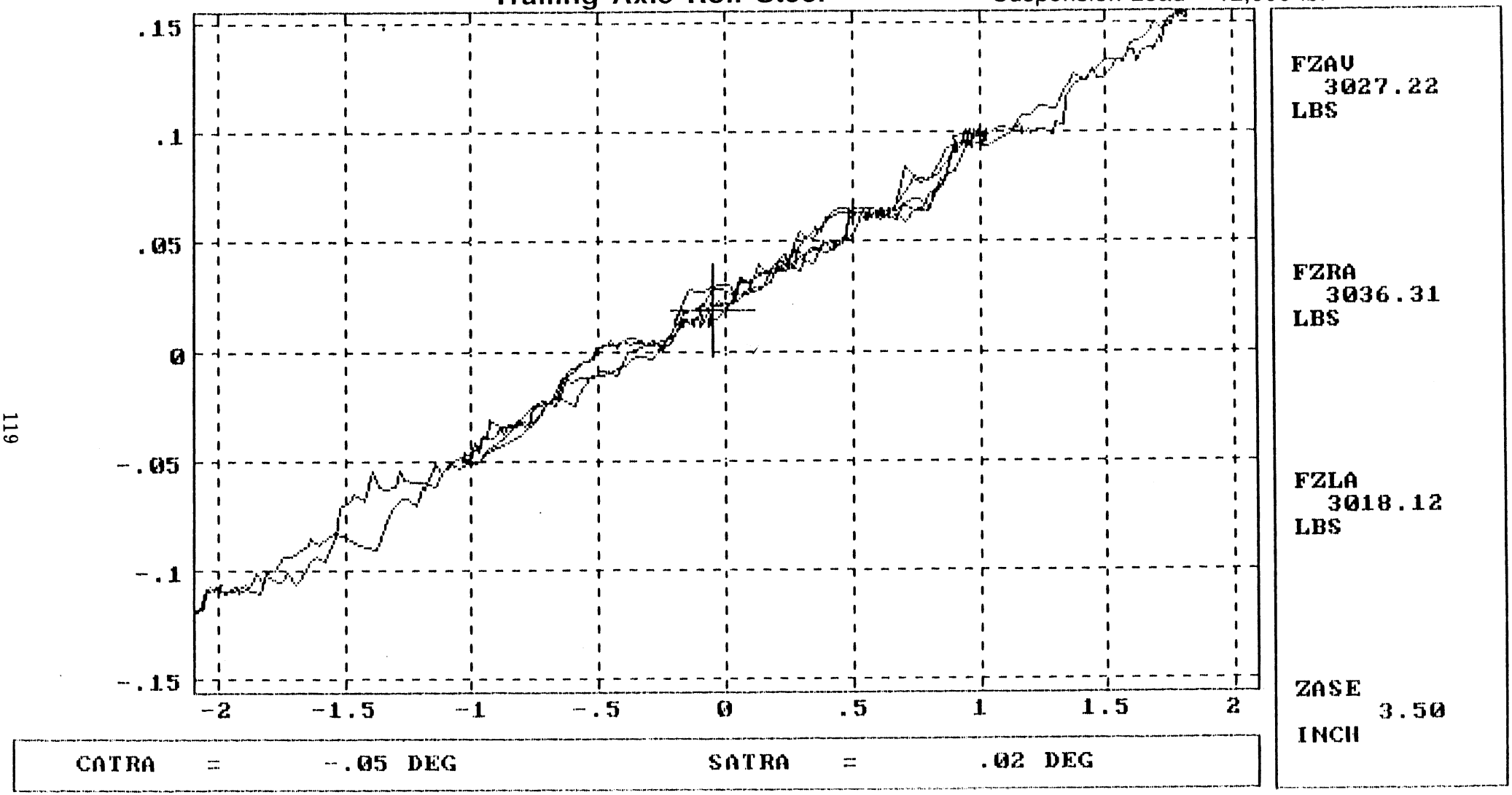
Abscissa: Average leading axle roll (camber) angle (CALDA); degrees; right side compressed, positive.

NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Trailing Axle Roll Steer

Date: 1/6/87
Pitch = 0.0 degrees
Suspension Load = 12,000 lb.



Ordinate: Average trailing axle steer angle (SATRA); degrees; steer toward right, positive.

Abscissa: Average trailing axle roll (camber) angle (CATRA); degrees; right side compressed, positive.

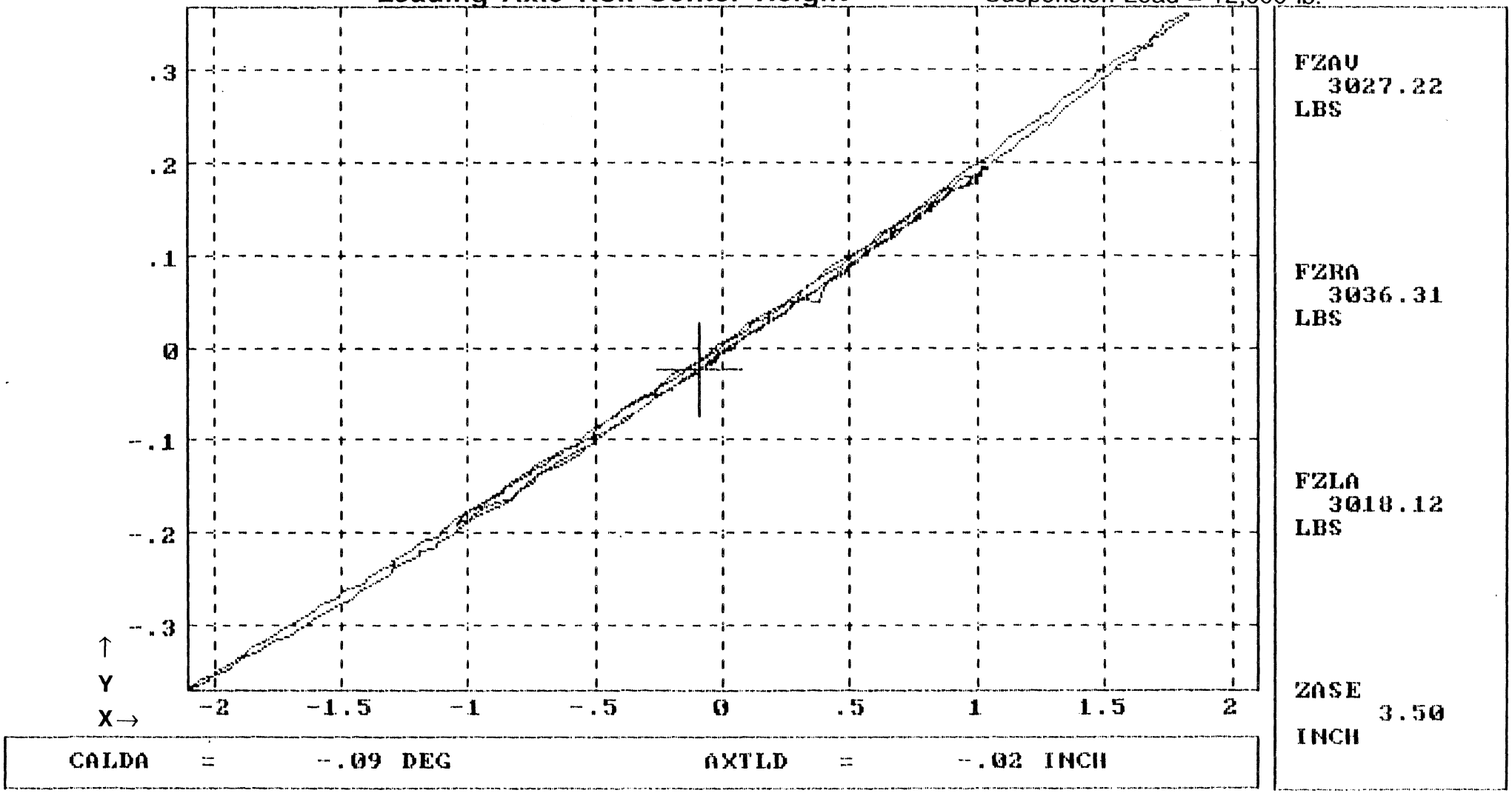
NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: January 13, 1987 (reprint)
Pitch = 0.0 degrees

Leading Axle Roll Center Height

Suspension Load = 12,000 lb.



Abscissa (X): Average leading axle roll (camber) angle (CALDA); degrees; right side compressed, positive.

Ordinate (Y): Leading axle lateral translation (AXTLD) at a position 23.38 inches above the ground; inches; motion toward right, positive.

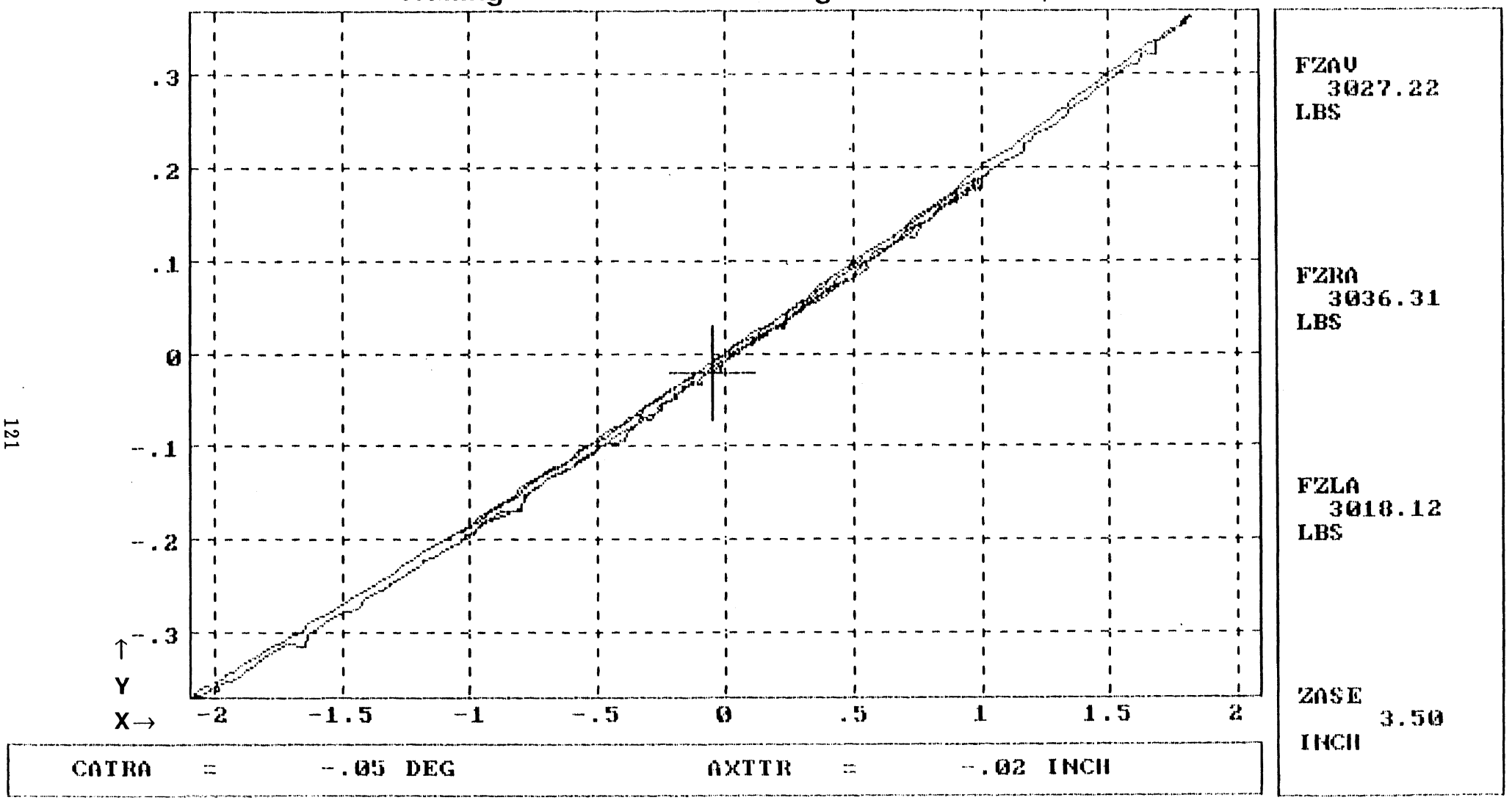
NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: January 13, 1987 (reprint)
Pitch = 0.0 degrees

Trailing Axle Roll Center Height

Suspension Load = 12,000 lb.



Abscissa (X): Average trailing axle roll (camber) angle (CATRA); degrees; right side compressed, positive.

Ordinate (Y): Trailing axle lateral translation (AXTTR) at a position 23.62 inches above the ground; inches; motion toward right, positive.

DATE: 1- 8-1987 16:33:48
TYPE OF TEST:ALIGNING MOMENT
CUSTOMER:NETSA
OPERATOR:WINKLER
FILE NAME:C:\NATSAVR4.DAT
COMMENT:

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD=36000.
NOMINAL STEER ANGLE= .00

SUSPENSION DATA

TYPE:CAMELBACK TAPER
MANUFACTURER:VOLVO
MODEL:?
RATING:?
OTHER:CAMEL BACK STYLE.2 TAPER LEAF. RUBBER END PADS

VEHICLE DATA

MANUFACTURER:VOLVO
MODEL:F 10 COE
OTHER:

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	54.00	54.00
SPRING SPACING	38.50	38.50
SPRING LASH	.00	.00
TANDEM SPREAD	54.00	54.00

FACILTY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	71.75	.00
LATERAL I-POT SPACING	106.62	106.88
VERTICAL Y-POT POSITION	23.38	23.62
	LEFT	RIGHT
LONG. PAD SPACING	54.32	54.50

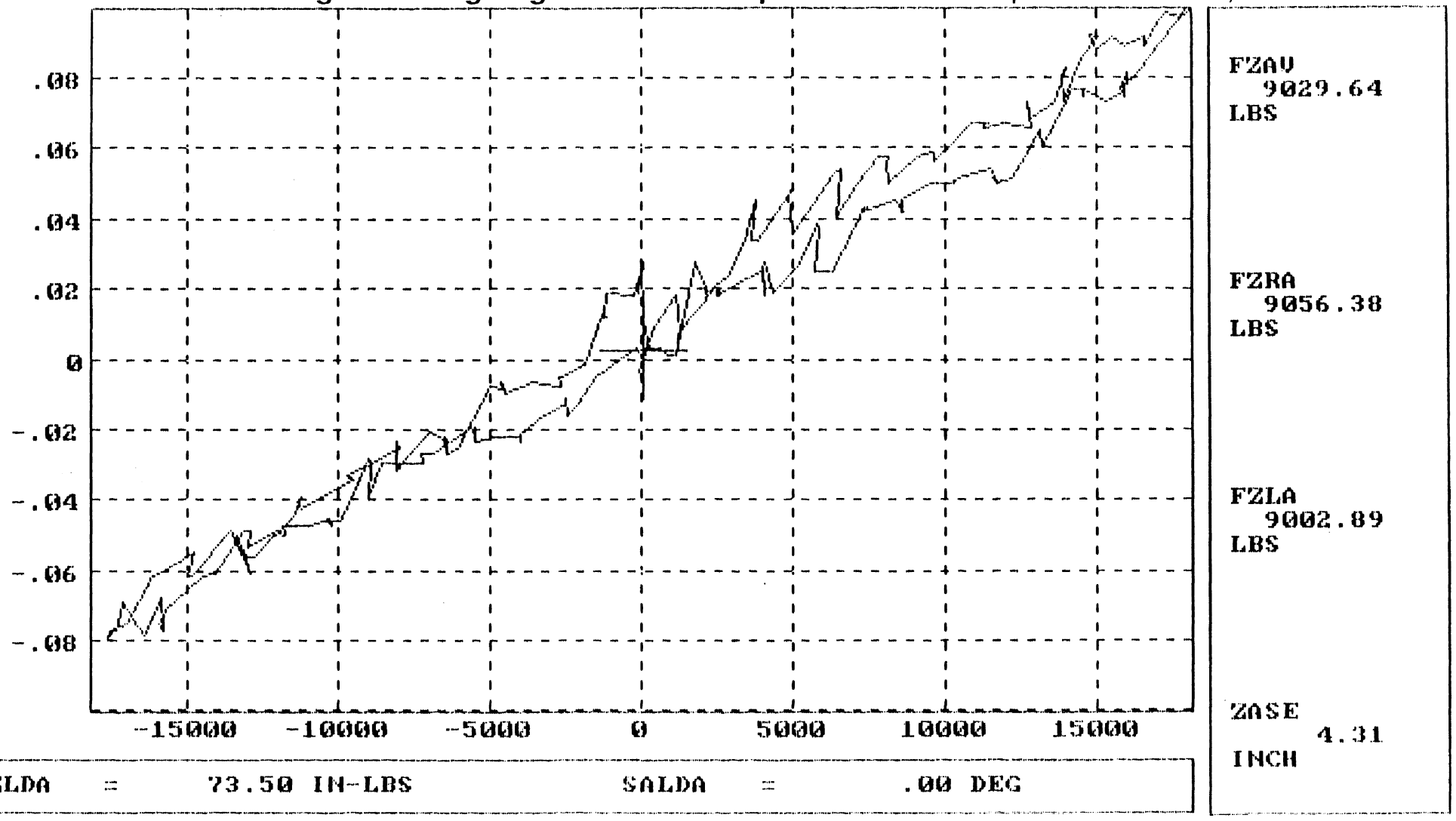
Date: 1/6/87

NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: 1/6/87
Pitch = 0.0 degrees

Leading Axle Aligning Moment Compliance Steer Suspension Load = 36,000 lb.



Ordinate: Average leading axle steer angle (SALDA); degrees; steer toward right, positive.

Abscissa: Average leading axle aligning moment (MZLDA); in-lb per wheel set; applied to all four wheel sets simultaneously; downward (right hand rule) moment vector, positive.

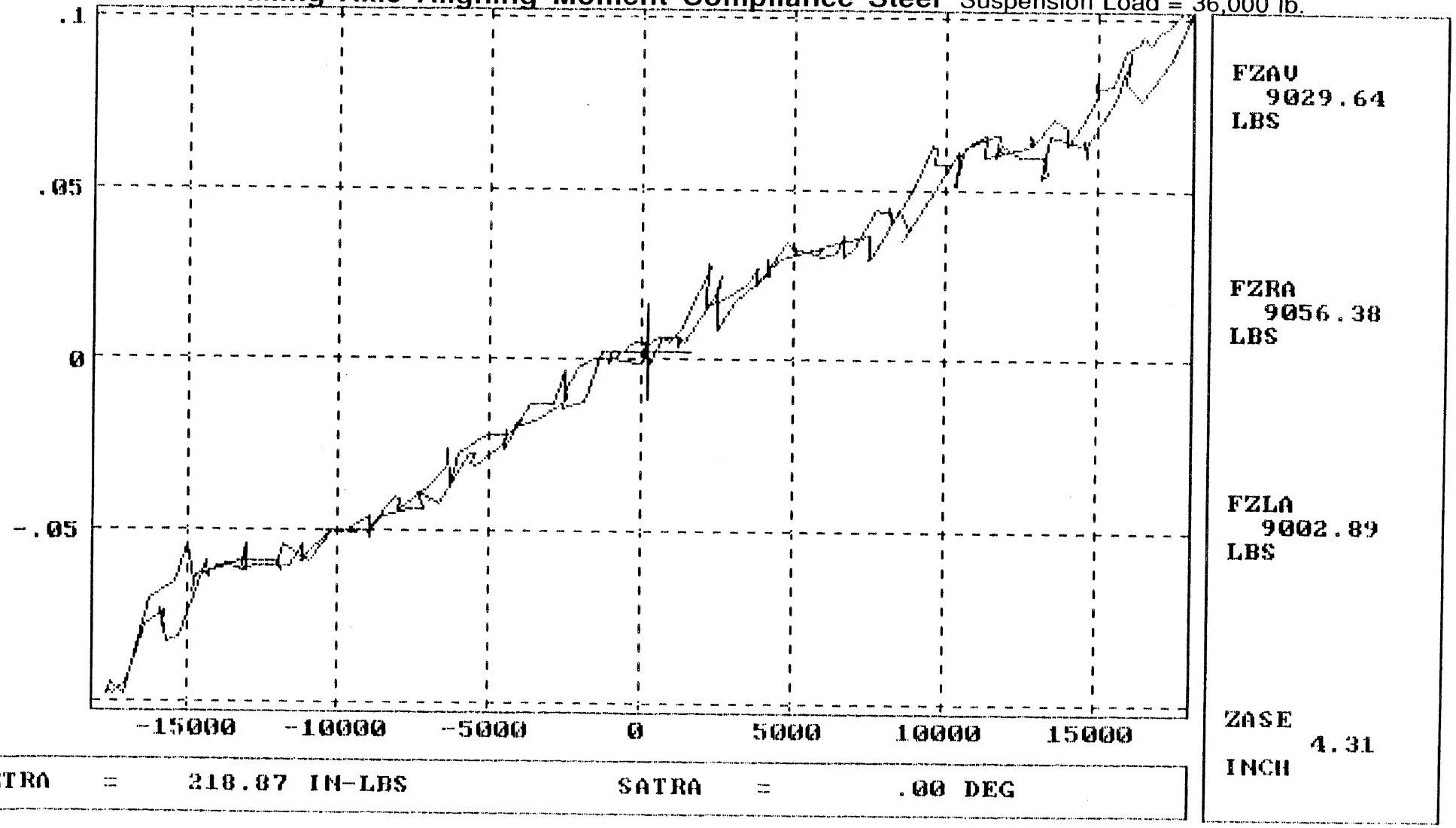
NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: 1/6/87
Pitch = 0.0 degrees

Trailing Axle Aligning Moment Compliance Steer

Suspension Load = 36,000 lb.



Ordinate: Average trailing axle steer angle (SATRA); degrees; steer toward right, positive.

Abscissa: Average trailing axle aligning moment (MZTRA); in-lb per wheel set; applied to all four wheel sets simultaneously; downward (right hand rule) moment vector, positive.

DATE 1- 5-1987 15:36:17
TYPE OF TEST:LATERAL FORCE
CUSTOMER:NHTSA
OPERATOR:WINKLER
FILE NAME:C:NHTSAVRS.DAT
COMMENT:

****

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD=36000.
NOMINAL STEER ANGLE= .00

****

SUSPENSION DATA

TYPE:CAMELBACK 2TAPER
MANUFACTURER:VOLVO
MODEL:?
RATING:?
OTHER:CAMEL BACK STYLE.2 TAPER LEAF. RUBBER END PADS

****

VEHICLE DATA

MANUFACTURER:VOLVO
MODEL:F 10 COE
OTHER:

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	54.00	54.00
SPRING SPACING	38.50	38.50
SPRING LASH	.00	.00
TANDEM SPREAD	54.00	54.00

FACILTY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	71.75	.00
LATERAL Z-POT SPACING	108.62	106.88
VERTICAL Y-POT POSITION	23.38	23.62
	LEFT	RIGHT
LONG. PAD SPACING	54.32	54.50

Date: 1/6/87

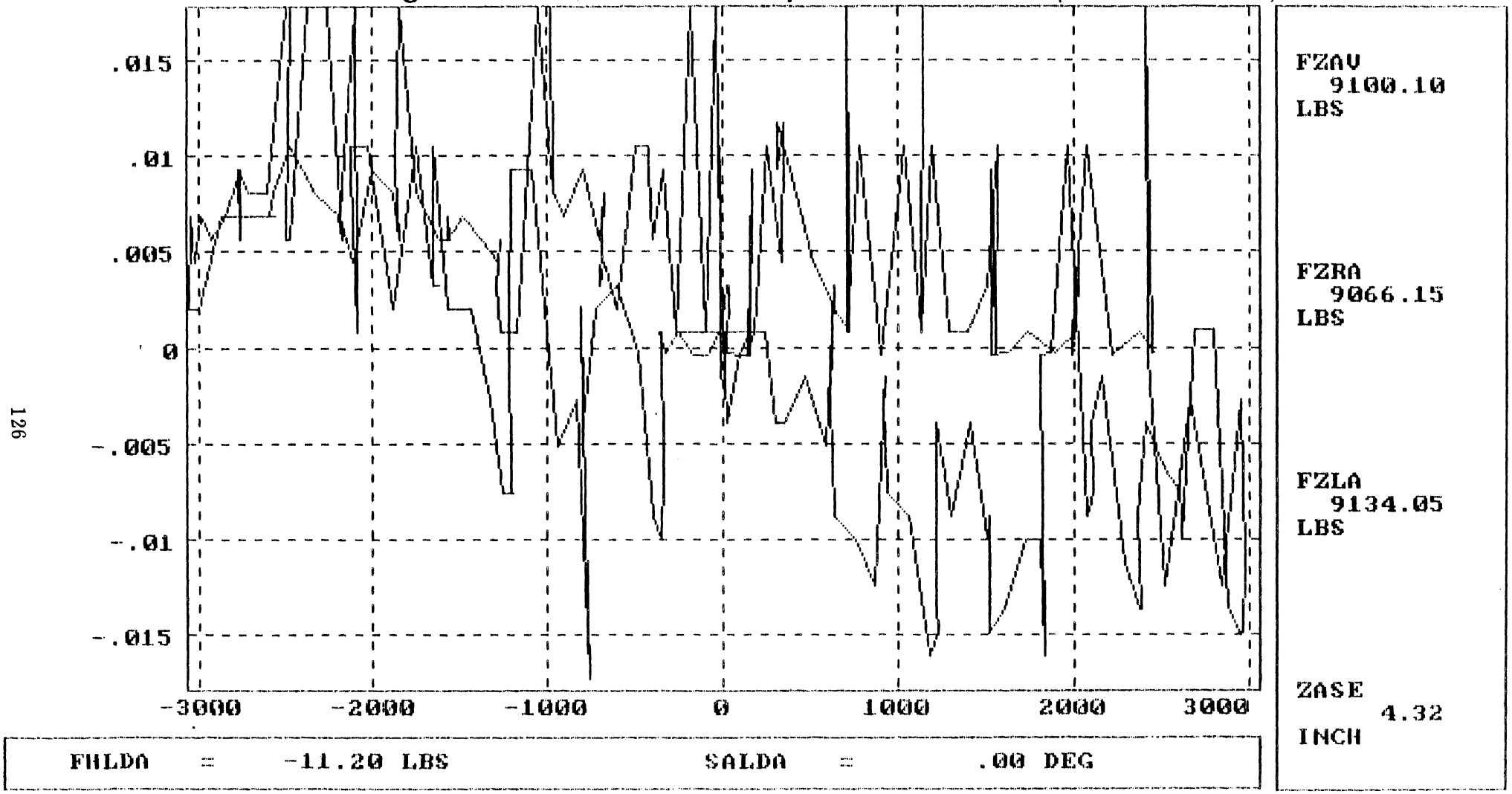
NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: 1/6/87
Pitch = 0.0 degrees

Leading Axle Lateral Force Compliance Steer

Suspension Load = 36,000 lb.



Ordinate: Average leading axle steer angle (SALDA); degrees; steer toward right, positive.

Abscissa: Average leading axle lateral force (FHLDA); lb per wheel set; applied to all four wheel sets simultaneously; force applied toward right, positive.

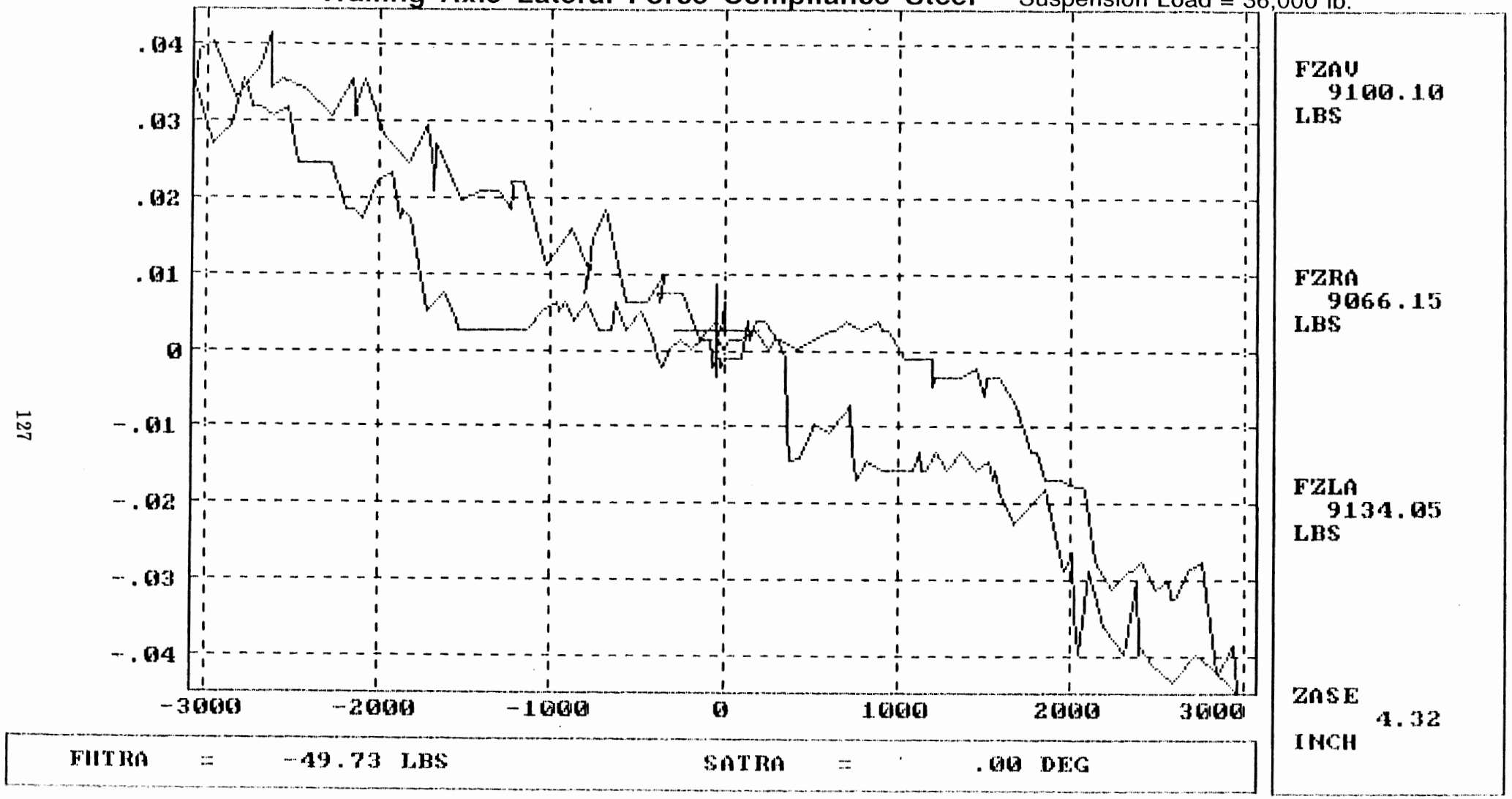
NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: 1/6/87
Pitch = 0.0 degrees

Trailing Axle Lateral Force Compliance Steer

Suspension Load = 36,000 lb.



Ordinate: Average trailing axle steer angle (SATRA); degrees; steer toward right, positive.

Abscissa: Average trailing axle lateral force (FHTRA); lb per wheel set; applied to all four wheel sets simultaneously; force applied toward right, positive.

DATE 1- 5-1987 16: 1:41
TYPE OF TEST:LONGITUDINAL FORCE
CUSTOMER:NHTSA
OPERATOR:WINKLER
FILE NAME:C:NHTSAVR6.DAT
COMMENT:
****

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD=36000.
NOMINAL STEER ANGLE= .00
****

SUSPENSION DATA

TYPE:CAMELBACK 2TAPER
MANUFACTURER:VOLVO
MODEL:?
RATING:?
OTHER:CAMEL BACK STYLE.2 TAPER LEAF. RUBBER END PADS
****

VEHICLE DATA

MANUFACTURER:VOLVO
MODEL:F 1[illegible] COE
OTHER:

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	54.00	54.00
SPRING SPACING	38.50	38.50
SPRING LASH	.00	.00
TANDEM SPREAD	54.00	54.00

FACILTY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	71.75	.00
LATERAL Z-POT SPACING	108.62	106.88
VERTICAL Y-POT POSITION	23.38	22.62

	LEFT	RIGHT
LONG. PAD SPACING	54.32	54.50

Date: 1/6/87

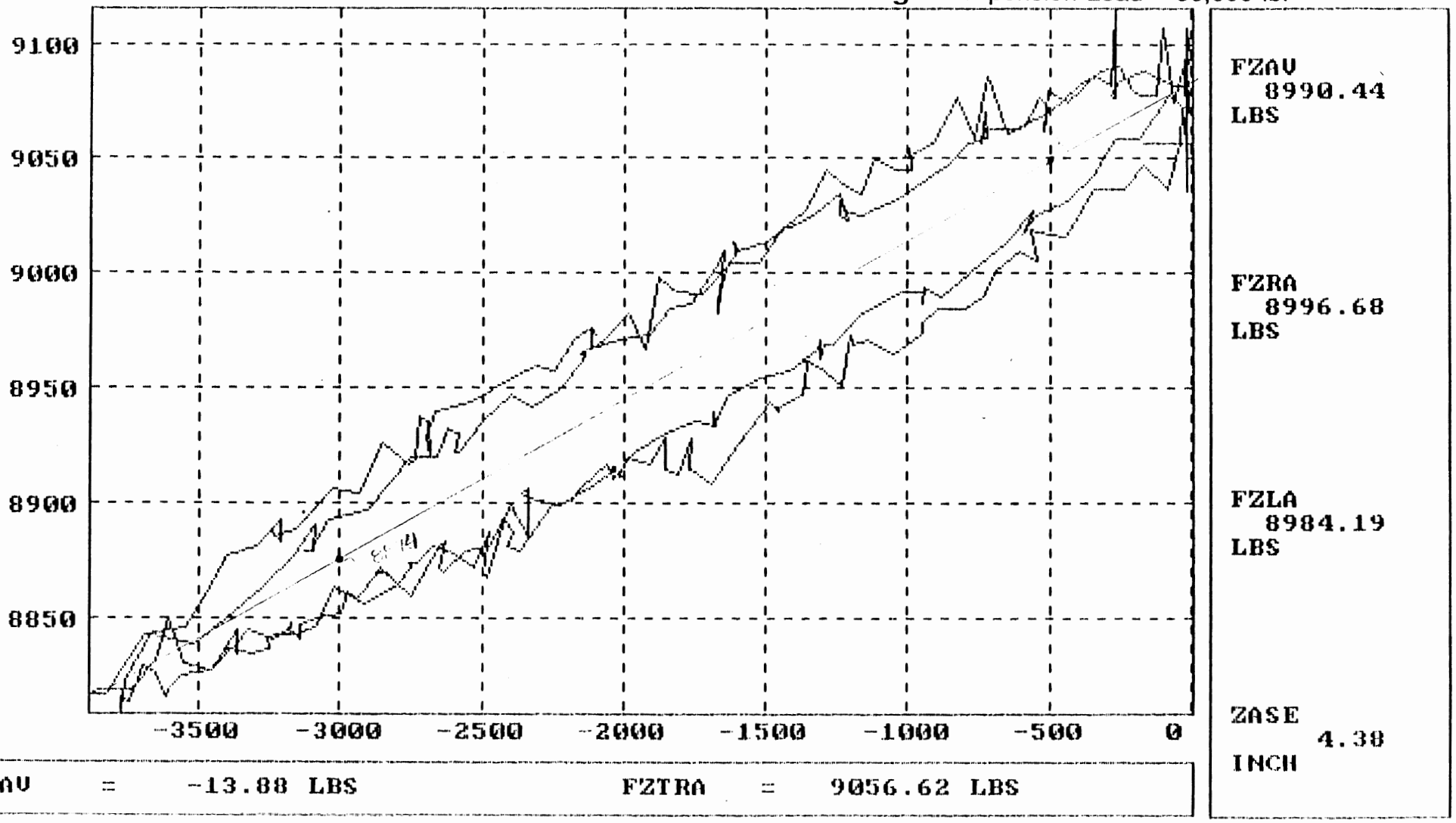
NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: 1/6/87
Pitch = 0.0 degrees

Inter-Axle Load Transfer Due To Braking

Suspension Load = 36,000 lb.



Ordinate: Average trailing axle vertical wheel load (FZTRA); pounds; spring compression, positive.

Abscissa: Average longitudinal force (FHAV); lb per wheel set; applied to all four wheel sets simultaneously; braking force, negative.

DATE [illegible]
TYPE OF TEST:LONGITUDINAL FORCE
CUSTOMER:WHITE
OPERATOR:JINKLER
FILE NAME:C:\WHTEAVRT.DAT
COMMENT:

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD=24000.
NOMINAL STEER ANGLE= .00

SUSPENSION DATA

TYPE:CAMELBACK TAPER
MANUFACTURER:VOLVO
MODEL:?
RATING:?
OTHER:CAMEL BACK STYLE.2 TAPER LEAF. RUBBER END PADS

VEHICLE DATA

MANUFACTURER:VOLVO
MODEL:F 12 6X2
OTHER:

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	54.00	54.00
SPRING SPACING	36.50	36.50
SPRING LASH	.00	.00
TANDEM SPREAD	54.00	54.00

FACILITY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	71.75	.00
LATERAL Z-POT SPACING	108.62	108.88
VERTICAL Y-POT POSITION	23.38	22.62
	LEFT	RIGHT
LONG. PAD SPACING	54.32	54.81

Date: 1/6/87

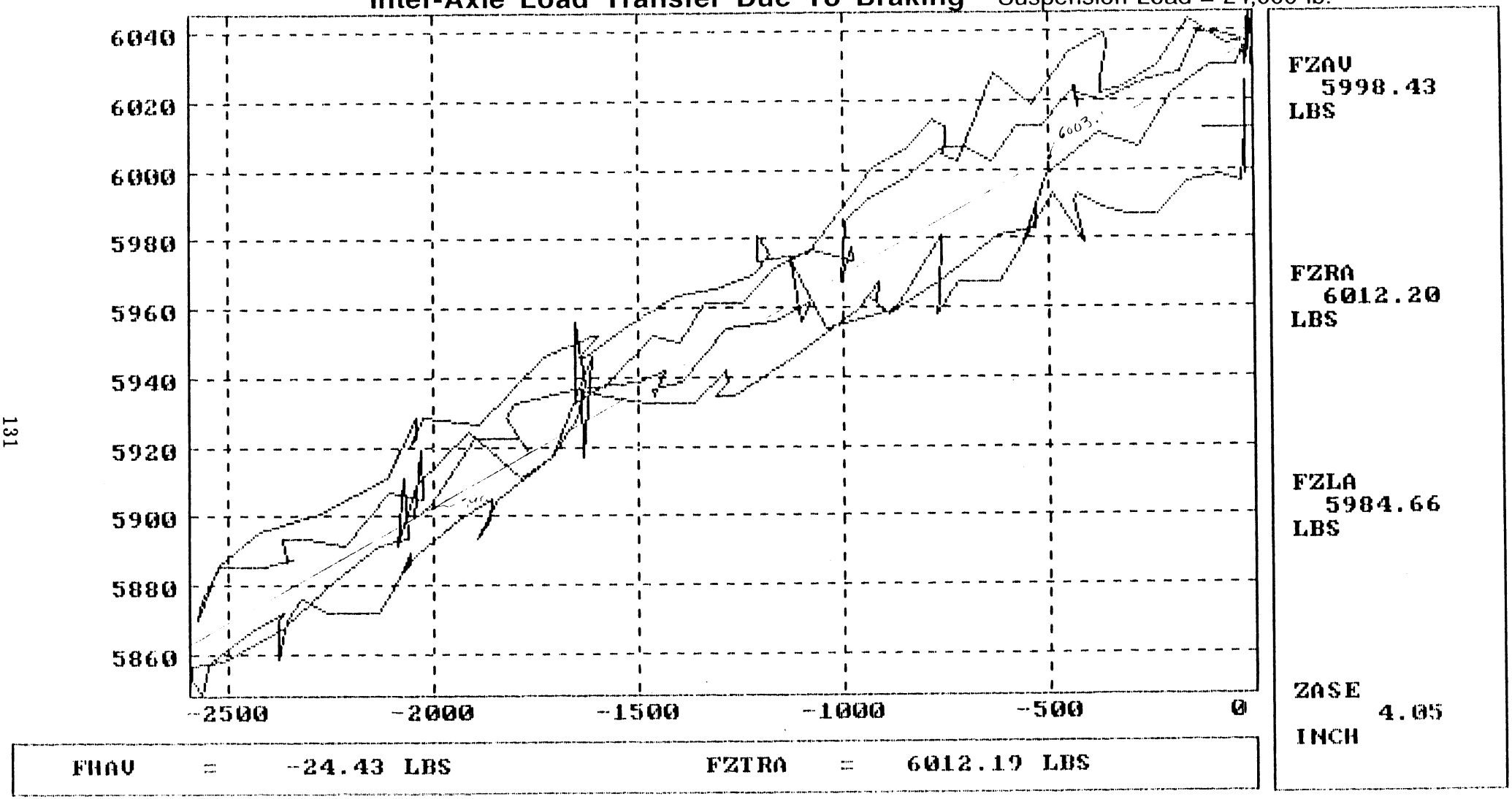
NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: 1/6/87
Pitch = 0.0 degrees

Inter-Axle Load Transfer Due To Braking

Suspension Load = 24,000 lb.



Ordinate: Average trailing axle vertical wheel load (FZTRA); pounds; spring compression, positive.

Abscissa: Average longitudinal force (FHAV); lb per wheel set; applied to all four wheel sets simultaneously; braking force, negative.

DATE: 1- 5-1987 16: 5:21
TYPE OF TEST:LONGITUDINAL FORCE
CUSTOMER:NHTSA
OPERATOR:WINKLER
FILE NAME:D:NHTSAVR8.DAT
COMMENT:

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD=12000.
NOMINAL STEER ANGLE= .00

SUSPENSION DATA

TYPE:CAMELBACK STAPER
MANUFACTURER:VOLVO
MODEL:
RATING:?
OTHER:CAMEL BACK STYLE.2 TAPER LEAF, RUBBER END PADS

VEHICLE DATA

MANUFACTURER:VOLVO
MODEL:F 12 6X6
OTHER:

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	54.00	54.00
SPRING SPACING	36.50	36.50
SPRING LASH	.00	.00
TANDEM SPREAD	54.00	54.00

FACILITY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	71.75	.00
LATERAL I-POT SPACING	108.62	108.38
VERTICAL Y-POT POSITION	23.38	23.62
	LEFT	RIGHT
LONG. PAD SPACING	54.12	54.38

Date: 1/6/87

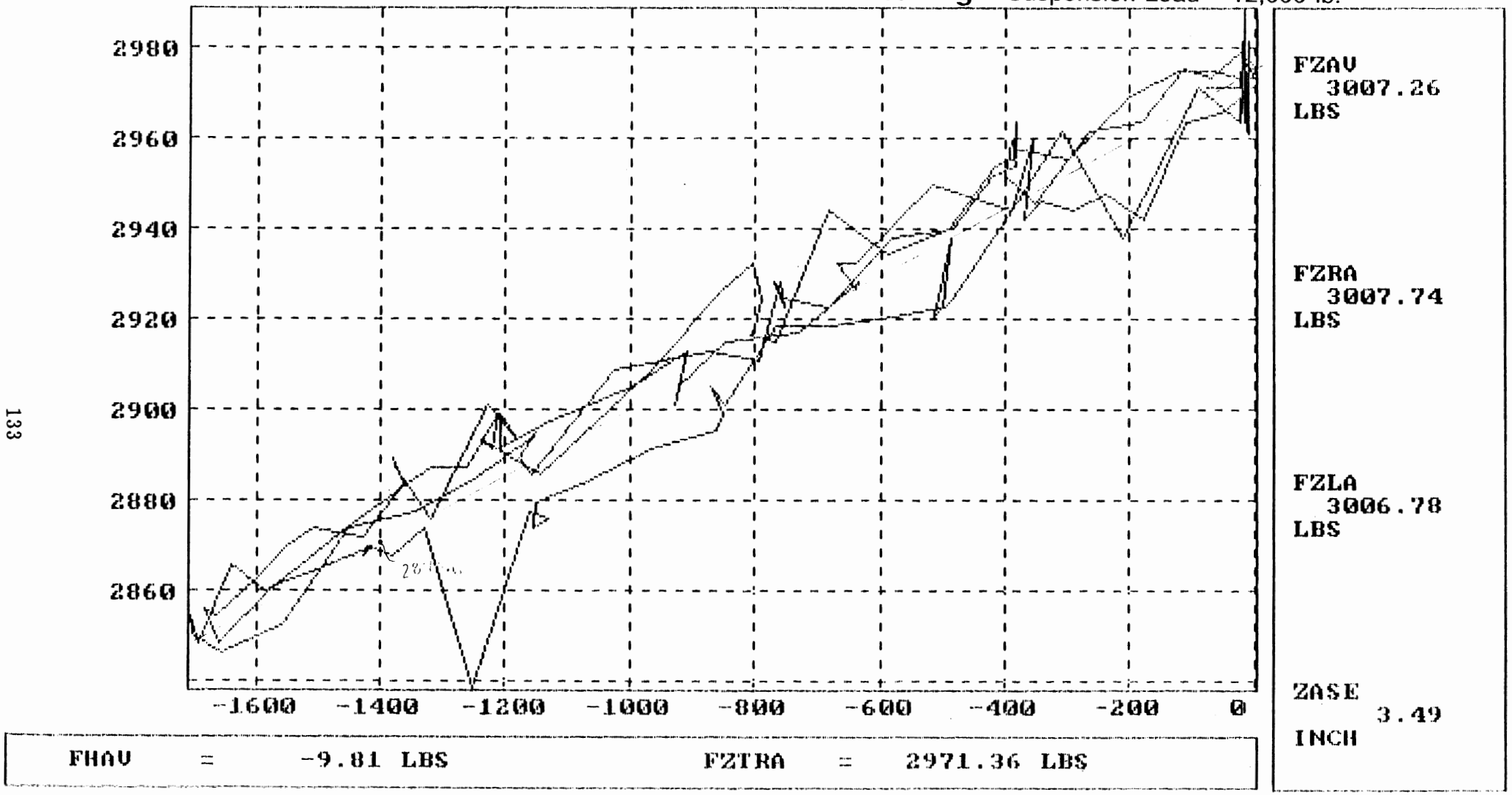
NHTSA: US DOT
Volvo: F10; COE

Tandem Rear Suspension

Date: 1/6/87
Pitch = 0.0 degrees

Inter-Axle Load Transfer Due To Braking

Suspension Load = 12,000 lb.

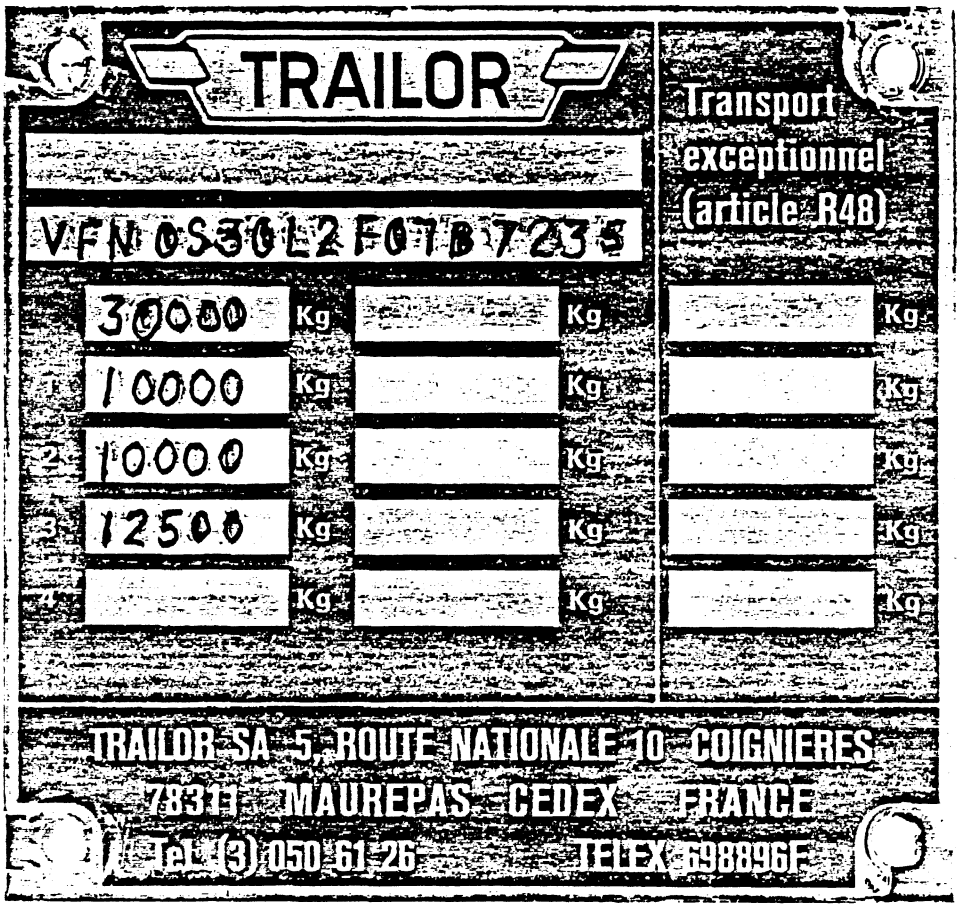


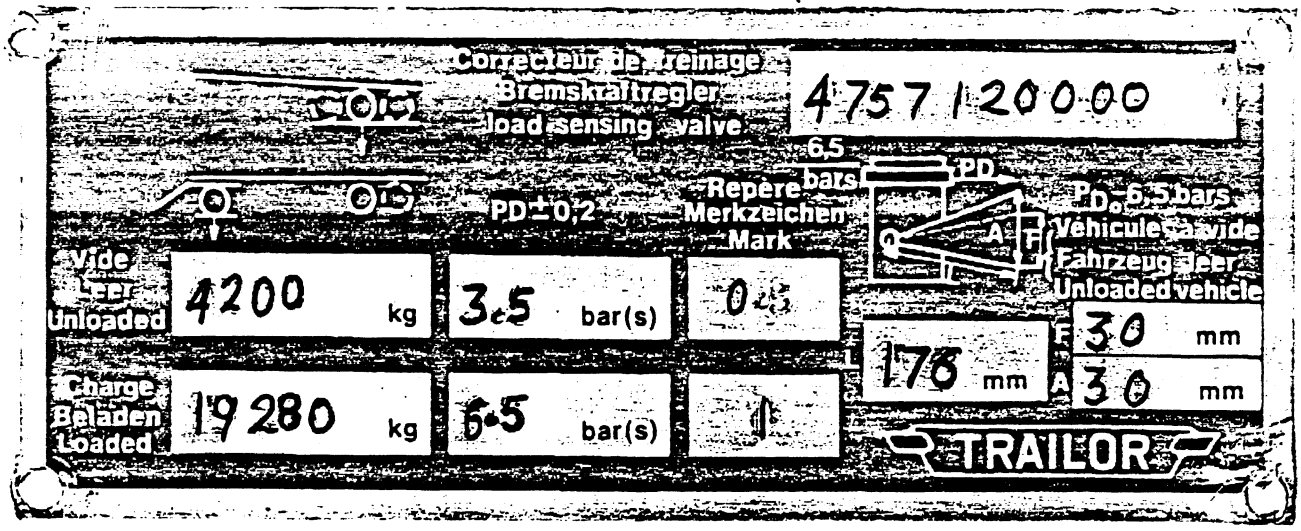
Ordinate: Average trailing axle vertical wheel load (FZTRA); pounds; spring compression, positive.

Abscissa: Average longitudinal force (FHAV); lb per wheel set; applied to all four wheel sets simultaneously; braking force, negative.

Appendix C

Trailer Suspension Properties


TRAILOR
Transport exceptionnel (article R48)
VFN0S30L2F07B7235
30000 Kg
10000 Kg
10000 Kg
12500 Kg
Kg
TRAILOR SA 5 ROUTE NATIONALE 10 COIGNIERES
78311 MAUREPAS CEDEX FRANCE
Tel. (3) 050 61 26 TELEX 698896F


Correcteur de freinage
Bremskraftregler
load sensing valve
4757120000
6,5 bars
PD
PD ± 0,2
Repère
Merkzeichen
Mark
PD 6,5 bars
Véhicule à vide
Fahrzeug leer
Unloaded vehicle
Vide
Leer
Unloaded
4200 kg
3,5 bar(s)
0,5
Charge
Beladen
Loaded
19280 kg
6,5 bar(s)
178 mm
E 30 mm
A 30 mm
TRAILOR

Tandem Suspension Reduced Data

Suspension I.D. NHTSA "TRAILOR" trailer (French manufacture)
4-Spring suspension with "long Equalizer"
(ie, Equalizer from lead-rear shaft to trail-rear shaft)

Unsprung Weight. ("Measured" from lash indication in vertical rate data.)

Leading Axle		Trailing Axle	
Right	Left	Right	Left
1800		1800	

Spring Properties.

Boundry Tables: See attached sheet.

Betas:

Sus Load, lb.	32,000	24000	16000
Compression β	0.09	0.09	0.09
Extension β	0.10	0.10	0.08

Suspension Properties.

Sus Load, lb.	38,000		24,000		12,000	
Axle	Lead	Trail	Lead	Trail	Lead	Trail
Roll Center Height, inches above ground	29.0	28.1	29.7	29.2	30.4	29.7
Auxilary Roll Stiffness, in-lb/deg	20,000	20,000	20,000	20,000	20,000	20,000
Roll Steer Coefficient, deg/deg	.030	.058	.061	.095	.103	.112
Aligning Moment Steer Coefficient,[1] deg/in-lb	.287 E-5	.340 E-5	.312 E-5	.363 E-5	.340 E-5	.437 E-5
Lateral Force Steer Coefficient,[2] deg/lb	NA	—	—	—	—	—

Inter-Axle Load Transfer, dF_{ZTRA}/dF_H[3] lb/lb	.0276	.0245	.0824
Inter-Axle Load Transfer, Phase IV Coeff[4] in-lb/in-lb	.037	.033	.111

[1] Aligning moment per dual tire/wheel set; applied to all four sets simultaneously.

[2] Lateral force per dual tire/wheel set; applied to all four sets simultaneously.

[3] dF_{ZTRA}/dF_H where F_{ZTRA} ≡ Average trailing axle wheel load
F_H ≡ Longitudinal force per dual tire/wheel set; applied to all four sets simultaneously; brake force is negative.

[4] (dF_{ZTRA}/dF_H) x (Tandem Spead)/(2 x Rolling Radius)

Phase II Tables

COMPRESSION ENVELOPE

Deflection, in	Force, lb
2.16	-836.18
2.41	-17.06
3.61	146.76
3.73	419.80
3.94	1675.77
5.05	11013.68
5.40	14726.96

EXTENSION ENVELOPE

Deflection, in	Force, lb
2.36	-781.57
2.80	-180.89
3.66	-17.06
3.79	37.54
4.09	856.66
4.55	2713.31
5.47	7901.02

Tandem Suspension Data Reduction Form

Suspension I.D. Trailer (NHTSA)

Unsprung Weight. ("Measured" from lash indication in vertical rate data.)

Leading Axle		Trailing Axle	
Right	Left	Right	Left
900	550		
1450			

Betas:

Sus Load, lb.	8,000 x4	5600 x	4
Compression β	0.09	0.09	0.09
Extension β	0.10	0.10	0.09

Roll Response

Sus Load, lb.	32,000		24,000		12,000	
Axle	Lead	Trail	Lead	Trail	Lead	Trail
$d\phi_T/d\phi_A$	1.25	1.25	1.17	1.22	1.11	1.12
$dy/d\phi_A$, in/deg	0.138	0.121	0.137	0.126	0.136	0.123
$dy/d\phi_A$, in/rad	7.907	6.933	7.85	7.22	7.79	7.05
h_y, inches	21.06	21.12	21.83	21.94	22.62	22.62
h_{RC}, inches	28.967	28.053	31.73	29.16	30.41	29.67
Aux K_ϕ	20,000	20,000	20,000	20,000	20,000	20,000
$d\delta/d\phi_A$	.030 ~.118	.058 ~.124	.061 ~.1416	.095 -.143	.103 ~.162	.112 -.159

Aligning Moment

$d\delta/dM_Z$	0.287E-05	0.340E-05	0.512E-05	0.363E-05	0.346E-5	0.437E-05

Lateral Force

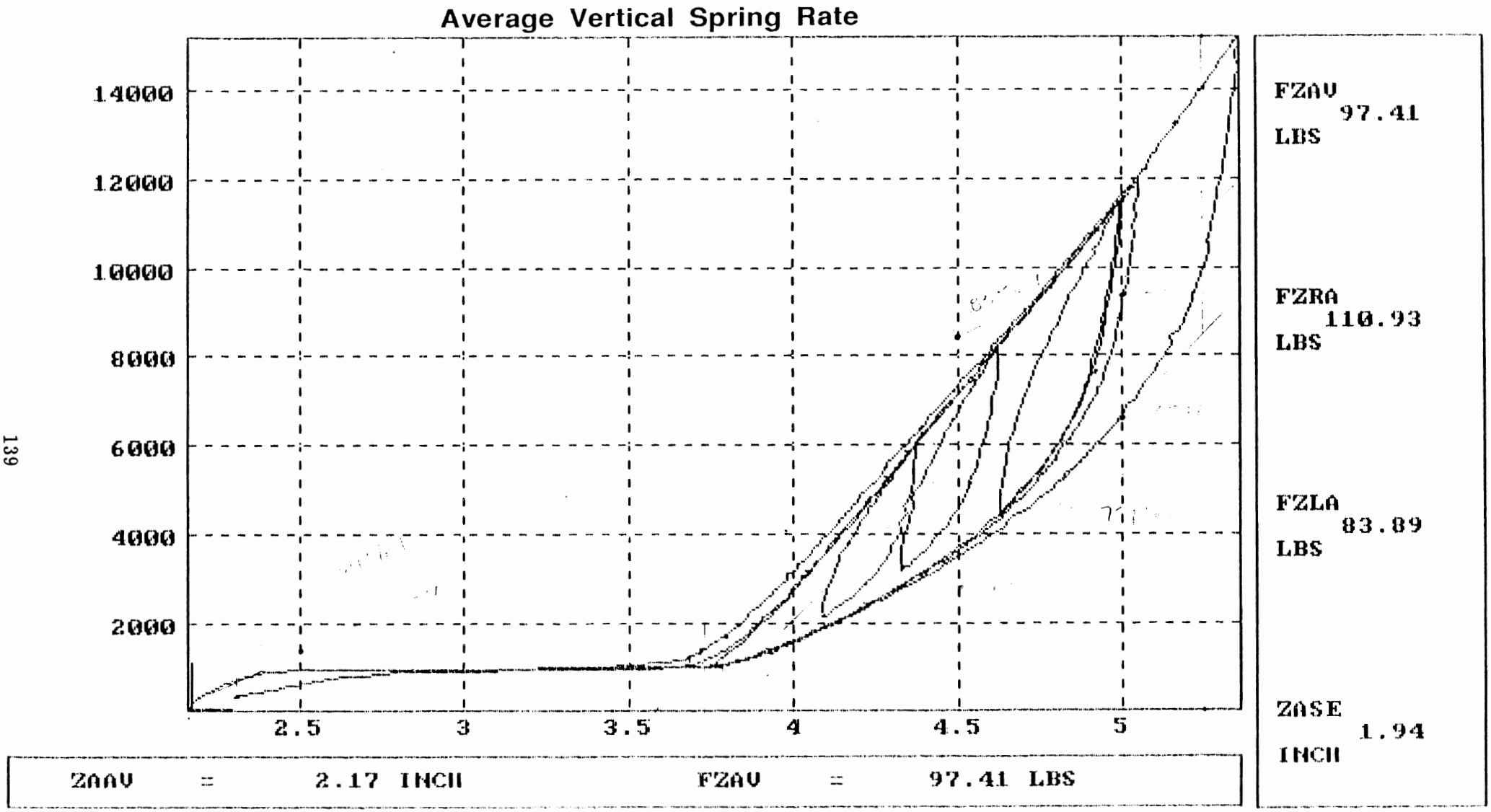
$d\delta/dF_H$	N.A	N.A	N.A	N.A	N.A	N.A

Longitudinal Force

dF_{ZTR}/dF_H	0.0276	0.0245	0.0824

US DOT
Trailor (France):Flatbed Trailer Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

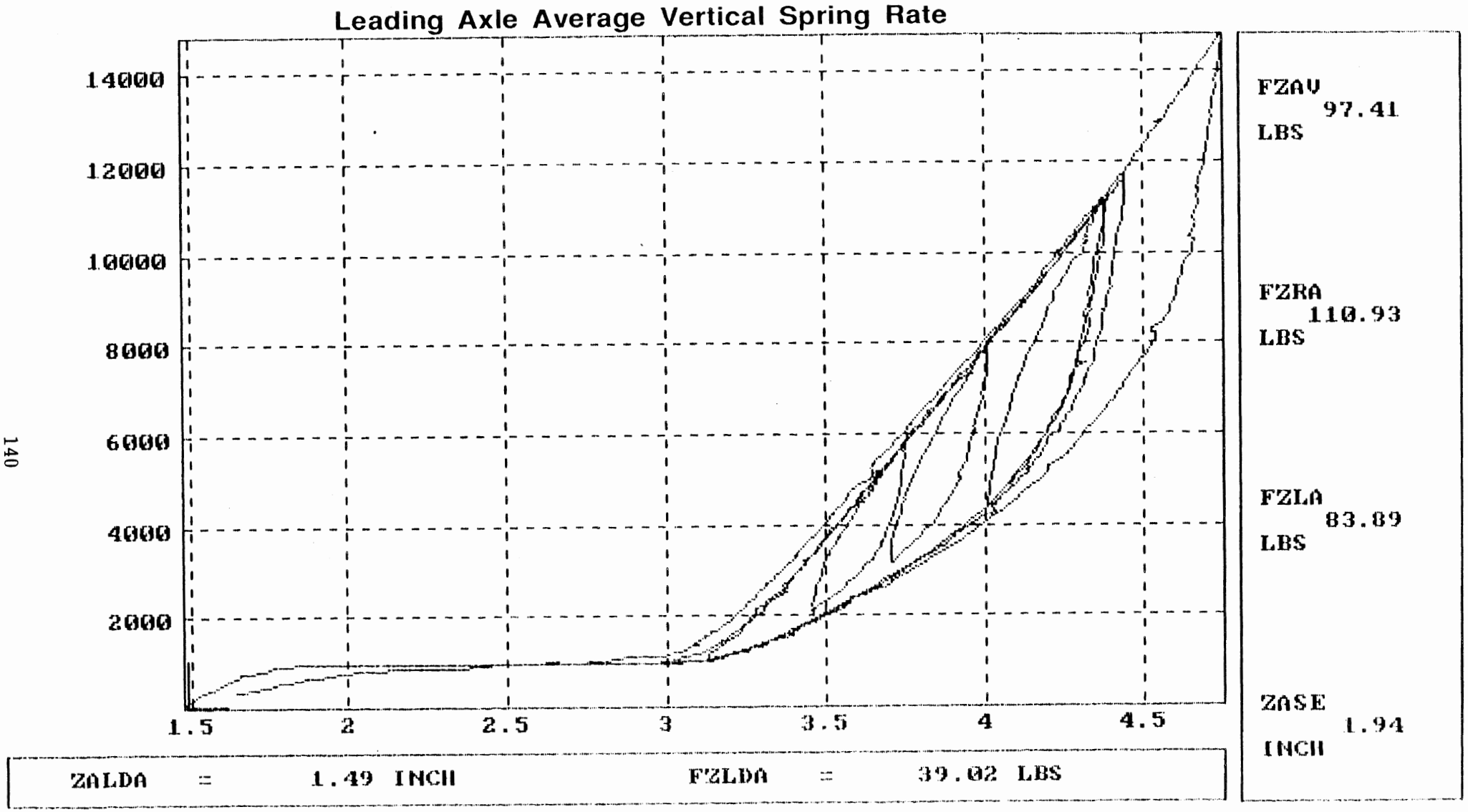


Ordinate: Average vertical wheel load (FZAV); pounds; spring compression, positive.

Abscissa: Average vertical axle displacement (ZAAV); inches; spring compression, positive.

US DOT
Trailor (France):Flatbed Trailer Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees



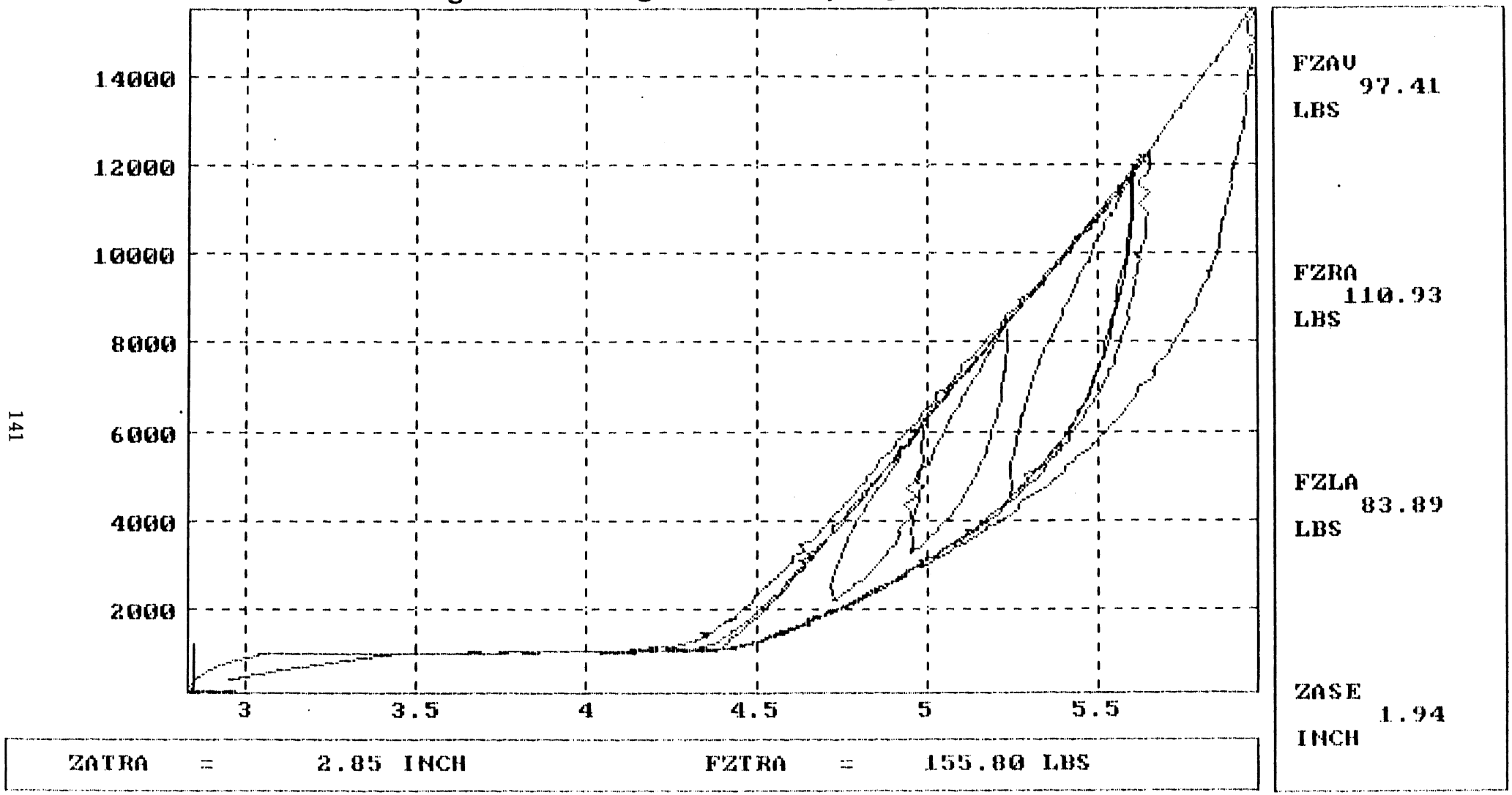
Ordinate: Average leading axle vertical wheel load (FZLDA); pounds; spring compression, positive.

Abscissa: Average leading axle vertical axle displacement (ZALDA); inches; spring compression, positive.

US DOT
Trailor (France):Flatbed Trailer Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Trailing Axle Average Vertical Spring Rate



Ordinate: Average trailing axle vertical wheel load (FZTRA); pounds; spring compression, positive.

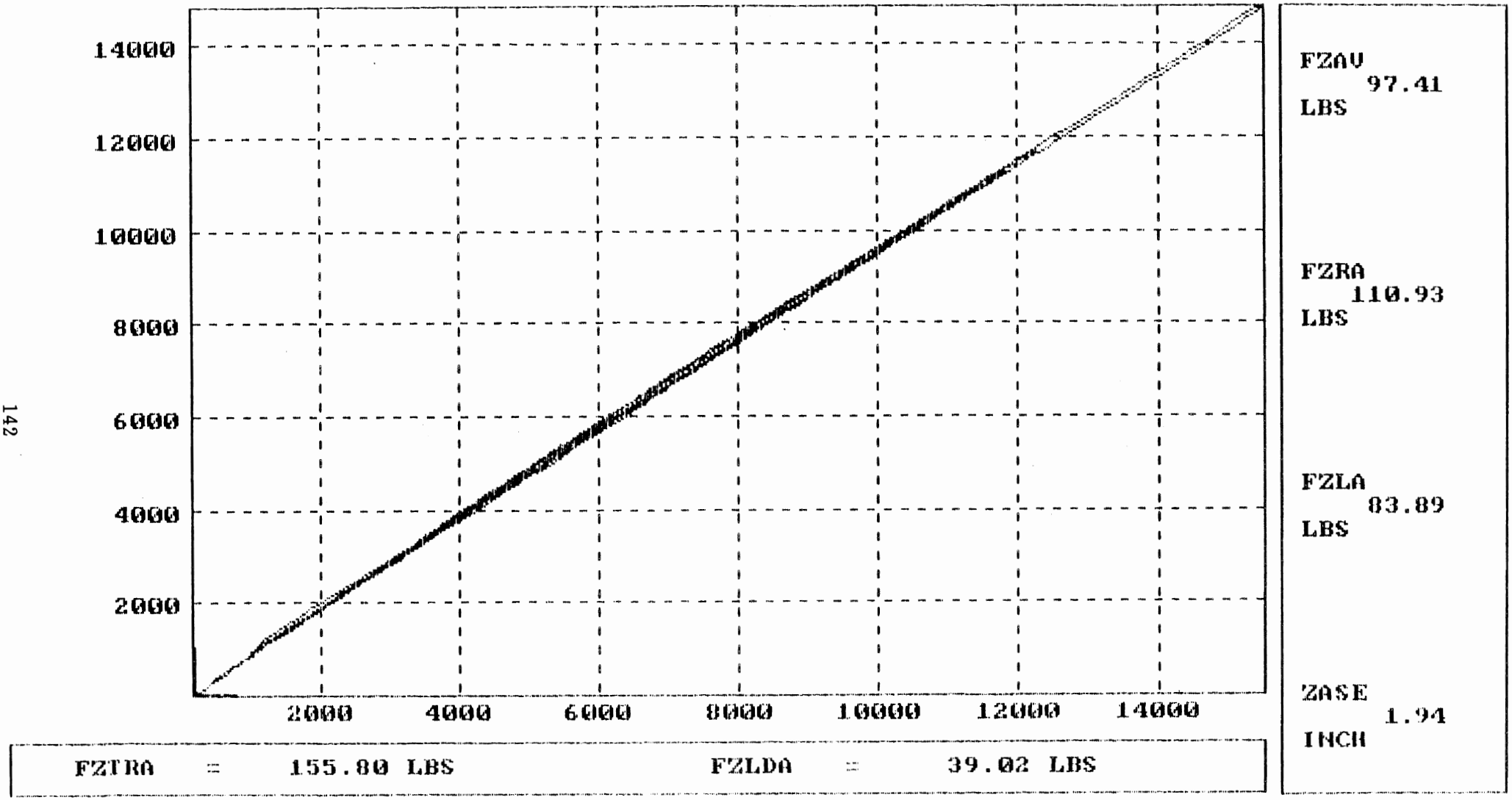
Abscissa: Average trailing axle vertical axle displacement (ZATRA); inches; spring compression, positive.

US DOT
Trailor (France):Flatbed Trailer

Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Inter-Axle Load Distribution



Ordinate: Average leading axle vertical wheel load (FZLDA); pounds; spring compression, positive.

Abscissa: Average trailing axle vertical wheel load (FZTRA); pounds; spring compression, positive.

DATE 14-OCT-87 14:17:28
TYPE OF TEST:ROLL
CUSTOMER:UNITBA
OPERATOR:WINKLER
FILE NAME:C:\MATBATR1.DAT
COMMENT:

TEST CONDITIONS

PITCH ANGLE= .0C
NOMINAL SUSPENSION LOAD=36000.
NOMINAL STEER ANGLE= .0C

SUSPENSION DATA

TYPE:4-SPRING LONG EQL
MANUFACTURER:TRAILOR
MODEL:
RATING:
OTHER:4-SPRING WITH LONG EQUALIZER (REAR SLIPER TO REAR SLIPPER)

VEHICLE DATA

MANUFACTURER:TRAILOR
MODEL:FLATBED
OTHER:EUROPEAN (FRANCE) MANUFACTURE

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	37.00	37.00
SPRING SPACING	38.00	38.00
SPRING LASH	.00	.00
TANDEM SPREAD	54.00	54.00

FACILITY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	72.50	72.38
LATERAL I-POT SPACING	109.62	107.62
VERTICAL Y-POT POSITION	21.06	21.12
	LEFT	RIGHT
LONG. PAD SPACING	54.50	54.00

Date:Jan 8, 1987

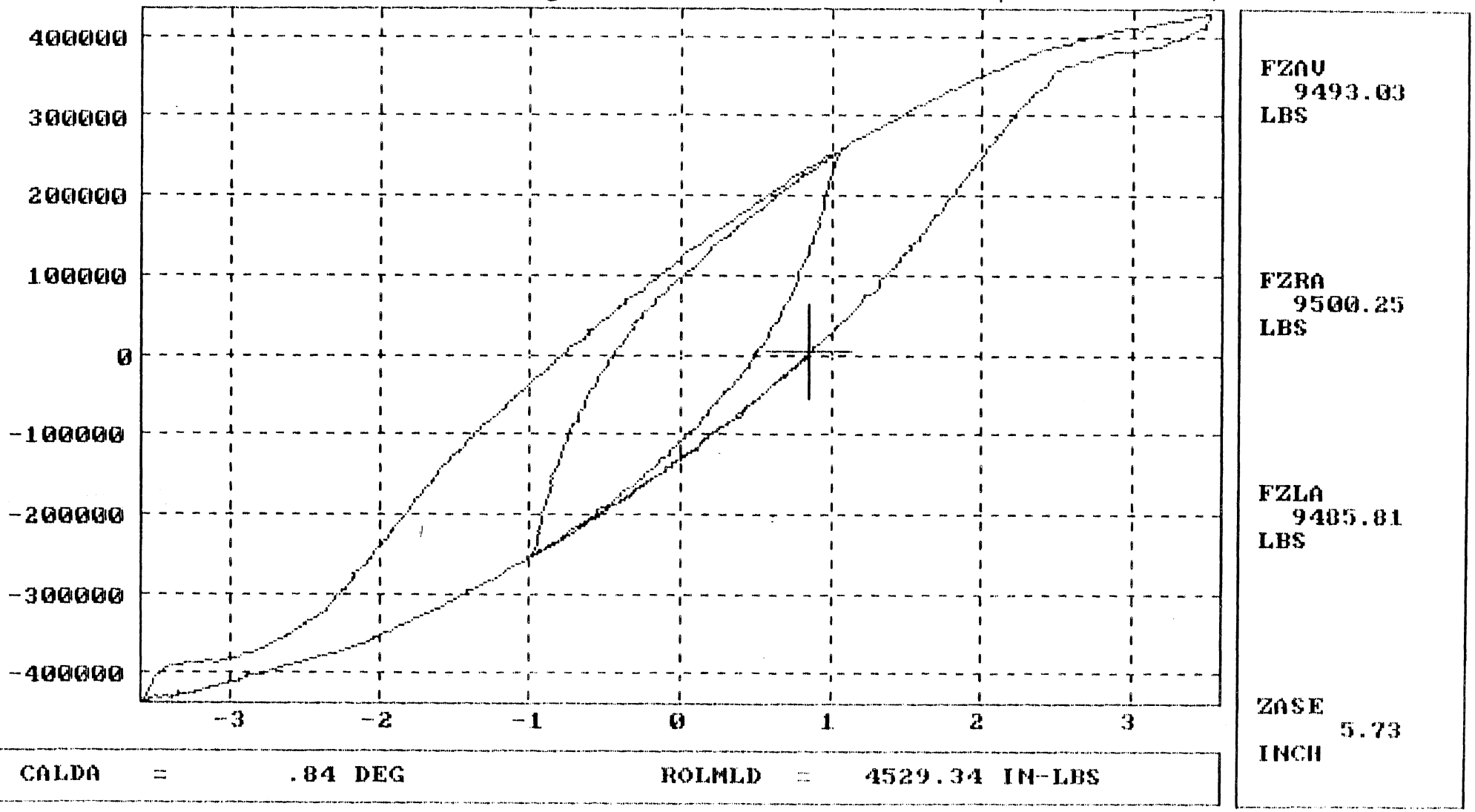
US DOT
Trailor (France):Flatbed Trailer

Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Leading Axle Roll Rate

Suspension Load = 38,000 lb.



Ordinate: Leading axle roll moment in load cell coordinate system (ROLMLD); in-lb; right side compressed, positive.

Abscissa: Average leading axle roll (camber) angle (CALDA); degrees; right side compressed, positive.

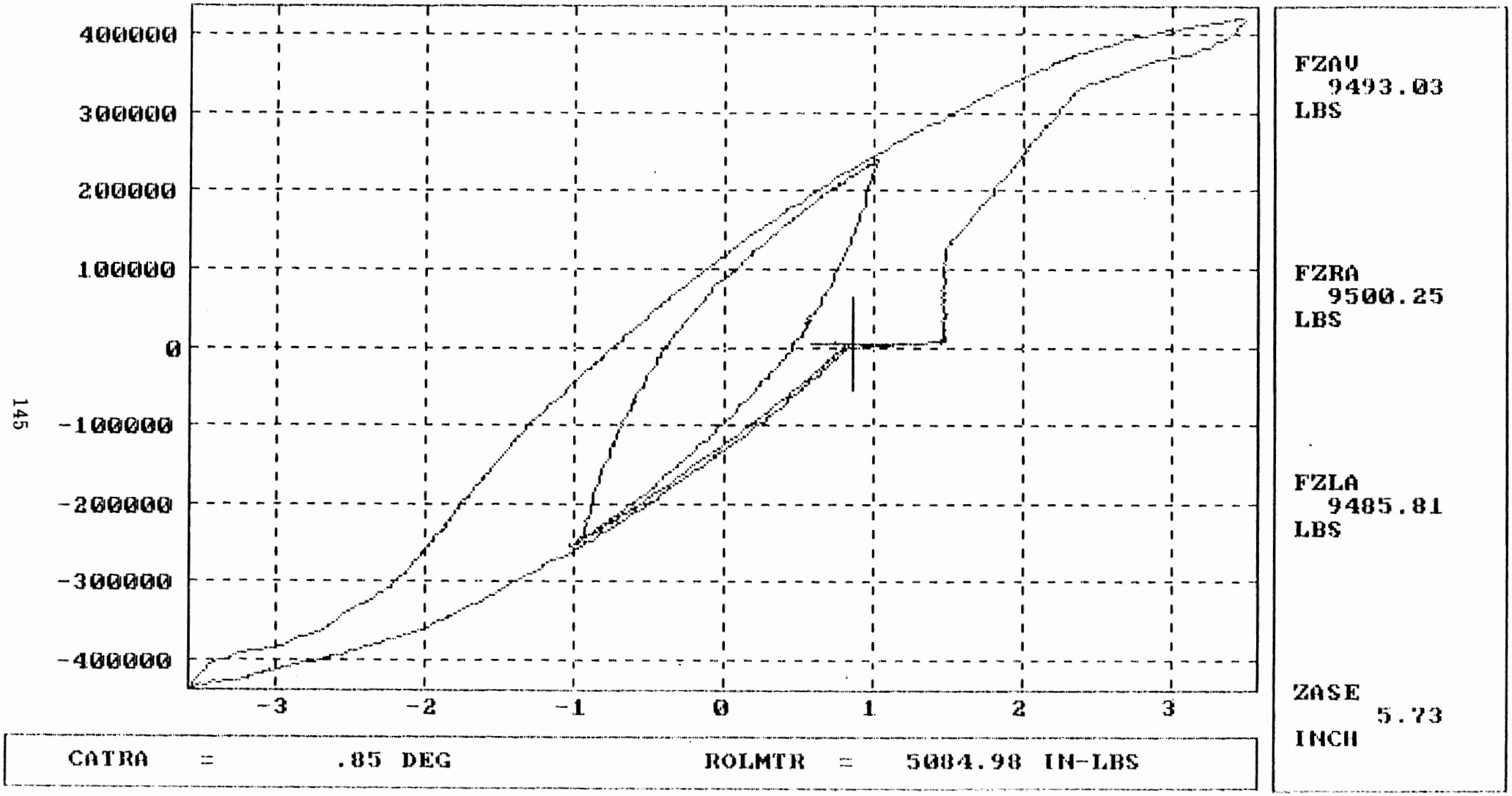
US DOT
Trailor (France):Flatbed Trailer

Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Trailing Axle Roll Rate

Suspension Load = 38,000 lb.



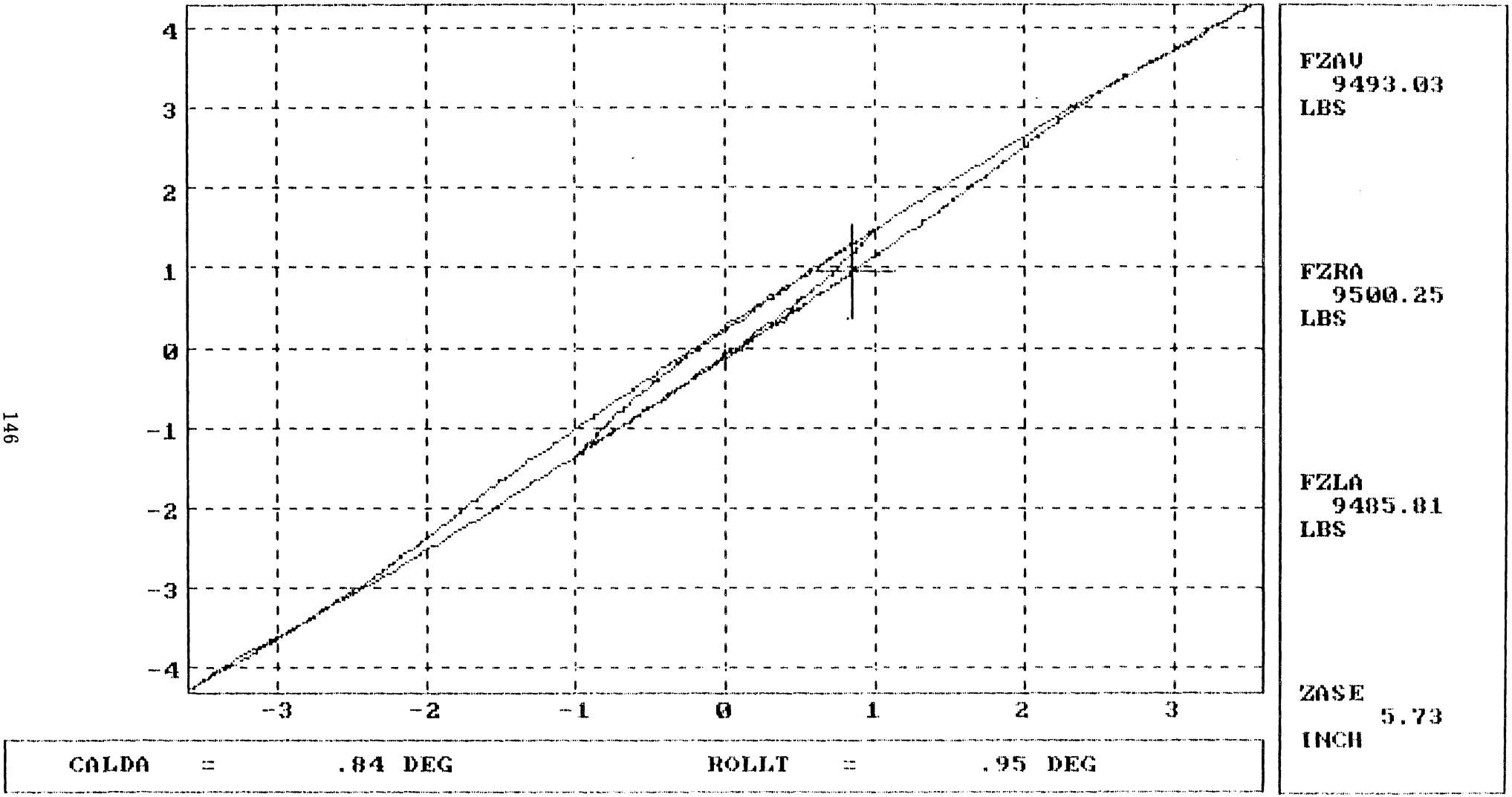
Ordinate: Trailing axle roll moment in load cell coordinate system (ROLMTR); in-lb; right side compressed, positive.

Abscissa: Average trailing axle roll (camber) angle (CATRA); degrees; right side compressed, positive.

US DOT
Trailor (France):Flatbed Trailer Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Table Roll Angle vs Leading Axle Roll Angle Suspension Load = 38,000 lb.



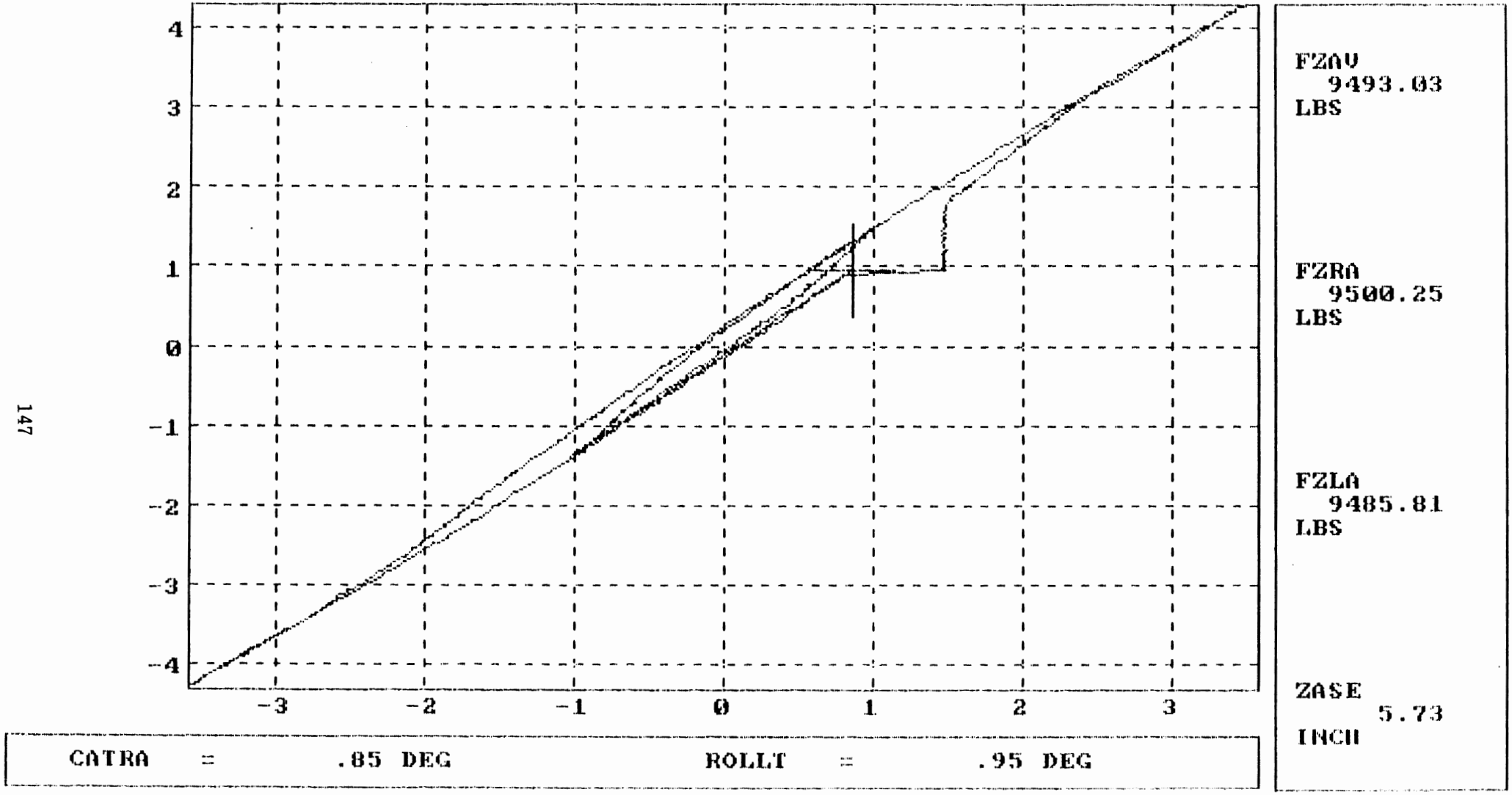
Ordinate: Table roll angle (ROLLT); degrees; right side compressed, positive.

Abscissa: Average leading axle roll (camber) angle (CALDA); degrees; right side compressed, positive.

US DOT
Trailor (France):Flatbed Trailer Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Table Roll Angle vs Trailing Axle Roll Angle Suspension Load = 38,000 lb.



Ordinate: Table roll angle (ROLLT); degrees; right side compressed, positive.

Abscissa: Average trailing axle roll (camber) angle (CATRA); degrees; right side compressed, positive.

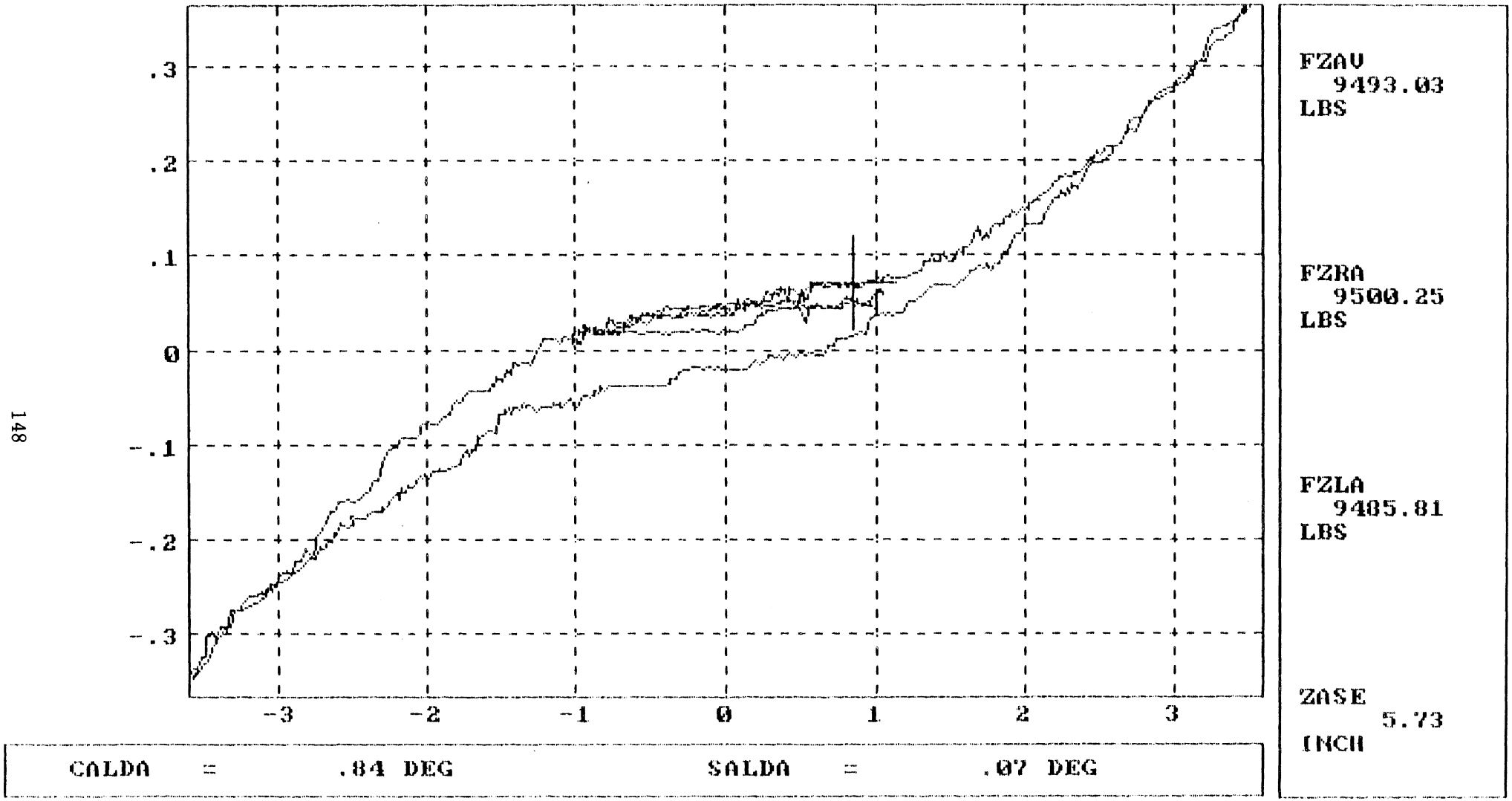
US DOT
Trailor (France):Flatbed Trailer

Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Leading Axle Roll Steer

Suspension Load = 38,000 lb.



Ordinate: Average leading axle steer angle (SALDA); degrees; steer toward right, positive.

Abscissa: Average leading axle roll (camber) angle (CALDA); degrees; right side compressed, positive.

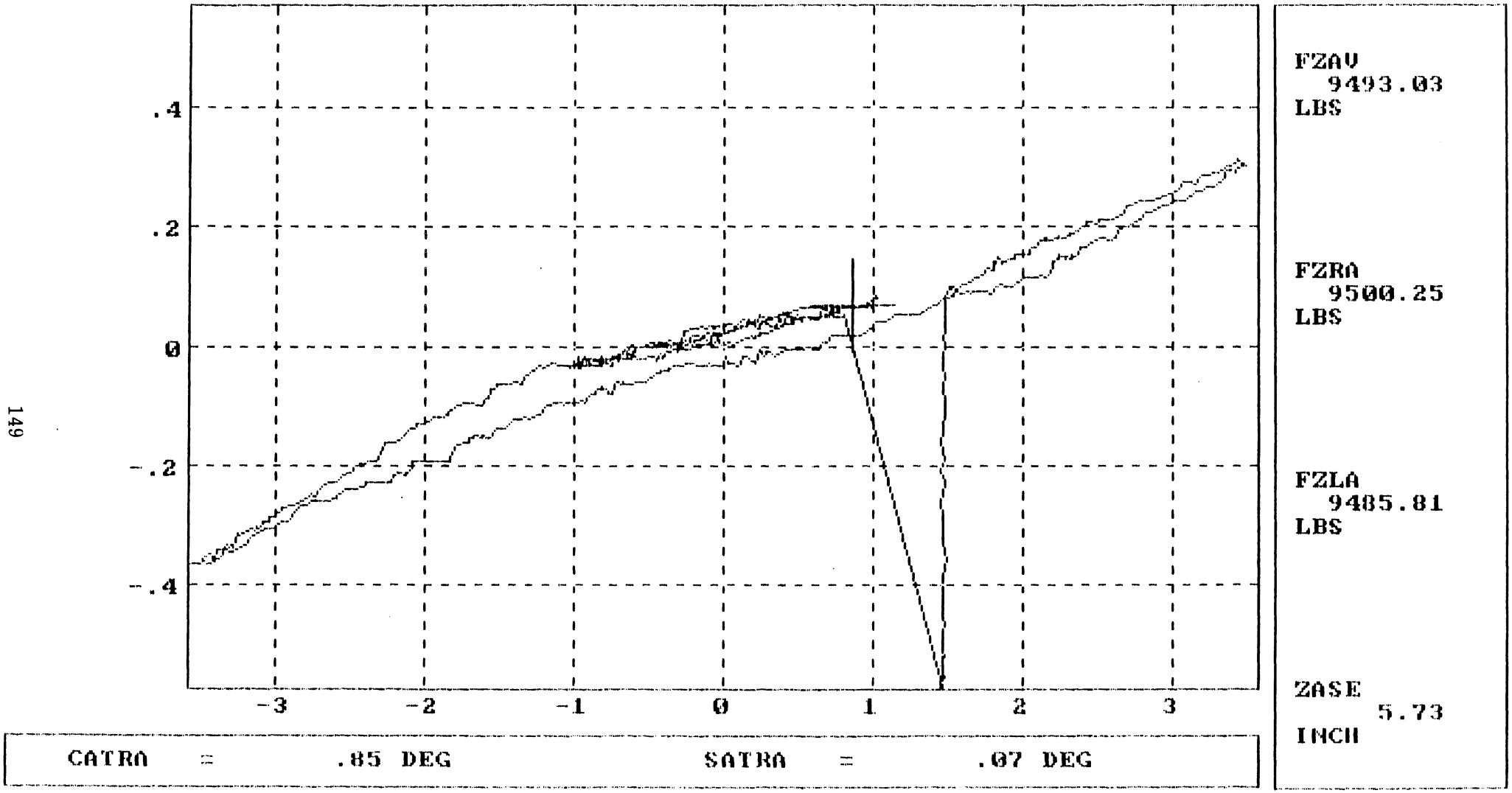
US DOT
Trailor (France):Flatbed Trailer

Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Trailing Axle Roll Steer

Suspension Load = 38,000 lb.



Ordinate: Average trailing axle steer angle (SATRA); degrees; steer toward right, positive.

Abscissa: Average trailing axle roll (camber) angle (CATRA); degrees; right side compressed, positive.

NHTSA: US DOT

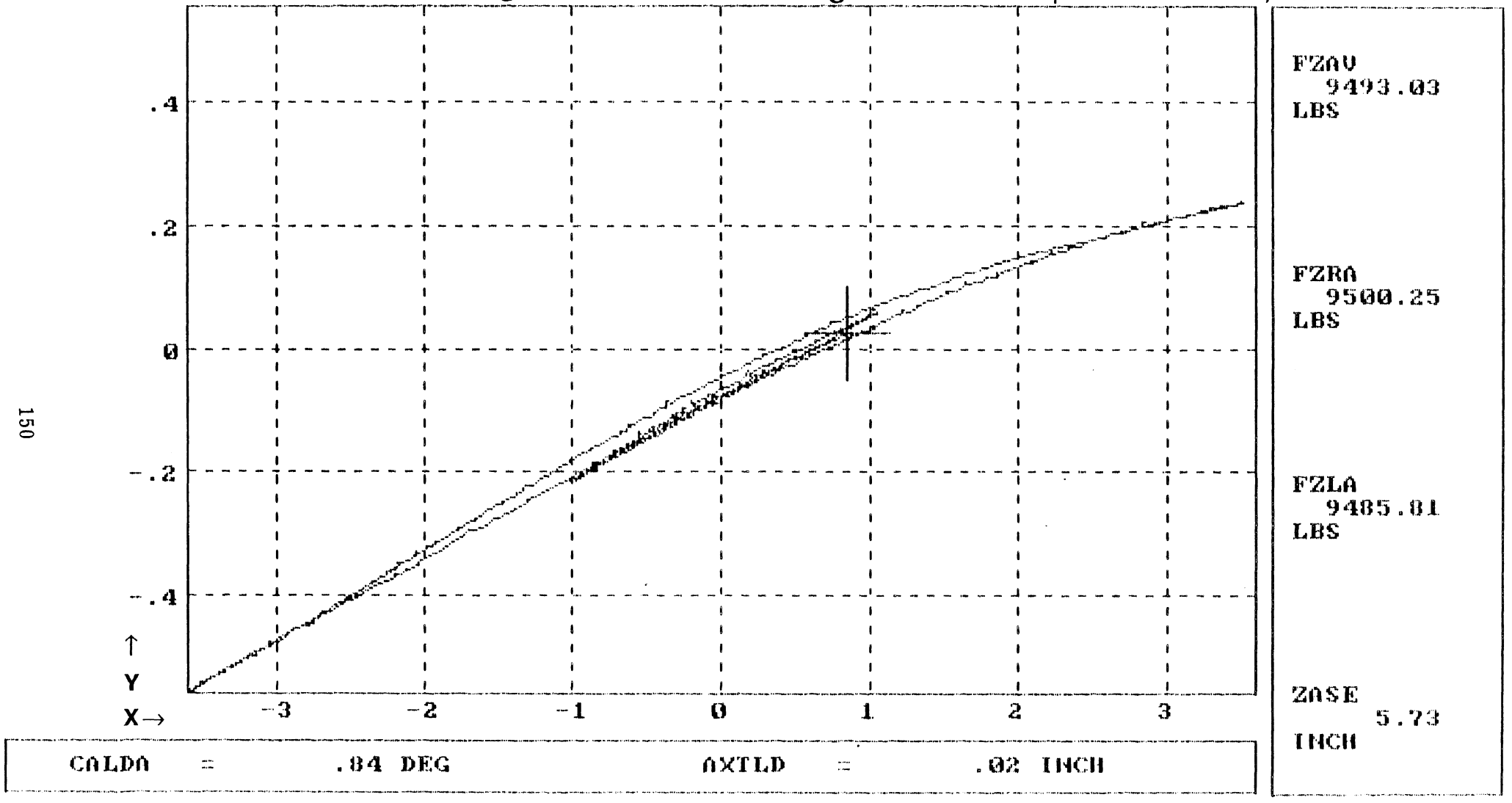
Trailor (France): Flatbed Trailer Tandem Rear Suspension

Date: January 13, 1987 (reprint)

Pitch = 0.0 degrees

Leading Axle Roll Center Height

Suspension Load = 38,000 lb.



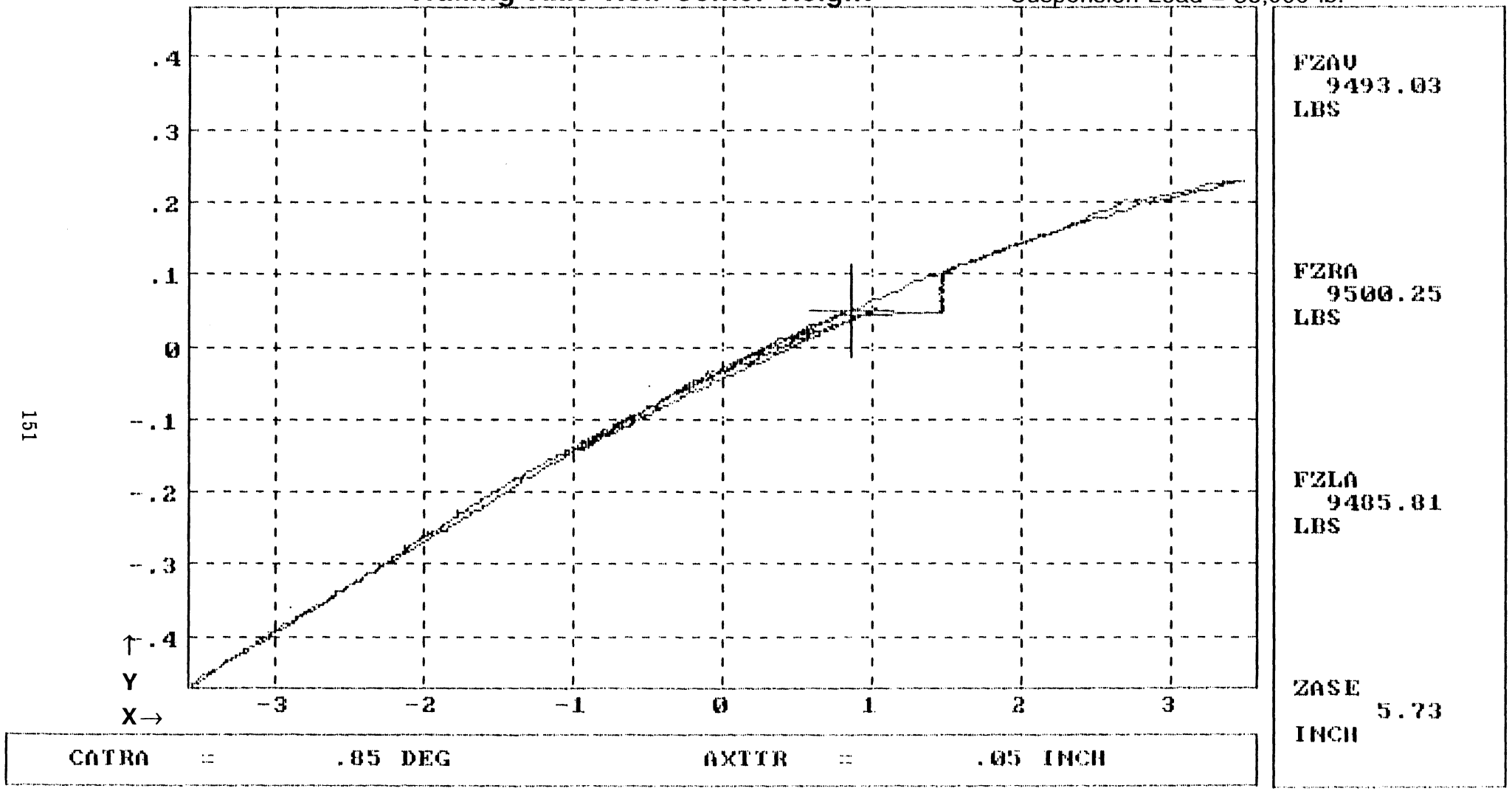
Abscissa (X): Average leading axle roll (camber) angle (CALDA); degrees; right side compressed, positive.

Ordinate (Y): Leading axle lateral translation (AXTLD) at a position 21.06 inches above the ground; inches; motion toward right, positive.

NHTSA: US DOT
Trailor (France): Flatbed Trailer Tandem Rear Suspension

Date: January 13, 1987 (reprint)
Pitch = 0.0 degrees

Suspension Load = 38,000 lb.



Abscissa (X): Average trailing axle roll (camber) angle (CATRA); degrees; right side compressed, positive.

Ordinate (Y): Trailing axle lateral translation (AXTTR) at a position 21.12 inches above the ground; inches; motion toward right, positive.

DATE [illegible] 14:4[illegible]
TYPE OF TEST:ROLL
CUSTOMER:NHTSA
OPERATOR:[illegible]
FILE NAME:C:NHTSATRI.DAT
COMMENT:

****

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD=24000.
NOMINAL STEER ANGLE= .00

****

SUSPENSION DATA

TYPE:4-SPRING LONG EQU
MANUFACTURER:TRAILOR
MODEL:[illegible]
RATING:?
OTHER:4-SPRING WITH LONG EQUALIZER (REAR SLIPER TO REAR SLIPPER)

****

VEHICLE DATA

MANUFACTURER:TRAILOR
MODEL:FLATBED
OTHER:EUROPEAN (FRANCE) MANUFACTURE

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	37.00	37.00
SPRING SPACING	38.00	38.00
SPRING LASH	.00	.00
TANDEM SPREAD	54.00	54.00

FACILITY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	72.50	72.38
LATERAL Z-POT SPACING	109.62	107.62
VERTICAL Y-POT POSITION	21.88	21.64

	LEFT	RIGHT
LONG. PAD SPACING	54.50	54.00

Date:Jan 8, 1987

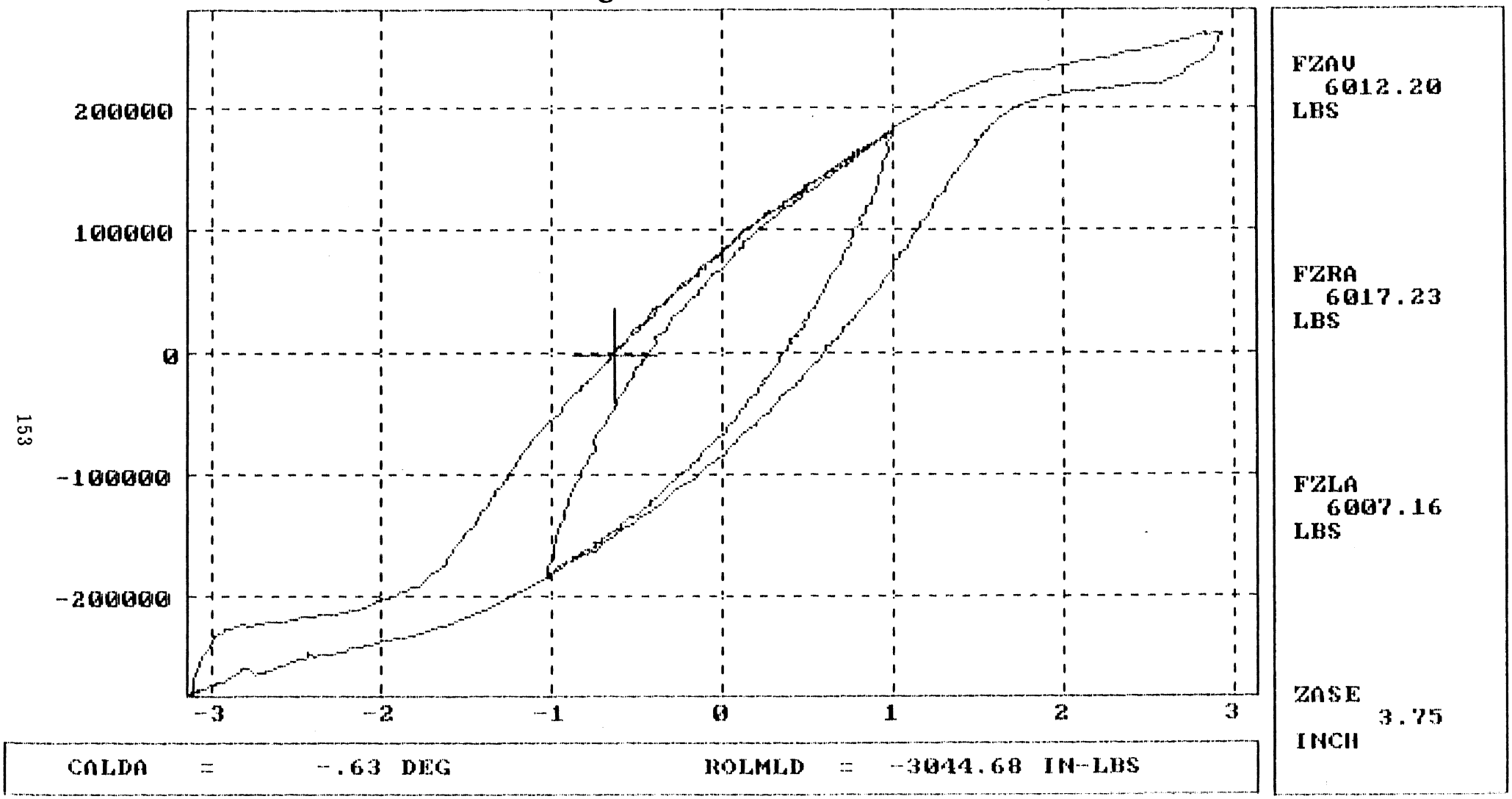
US DOT
Trailor (France):Flatbed Trailer

Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Leading Axle Roll Rate

Suspension Load = 24,000 lb.



Ordinate: Leading axle roll moment in load cell coordinate system (ROLMLD); in-lb; right side compressed, positive.

Abscissa: Average leading axle roll (camber) angle (CALDA); degrees; right side compressed, positive.

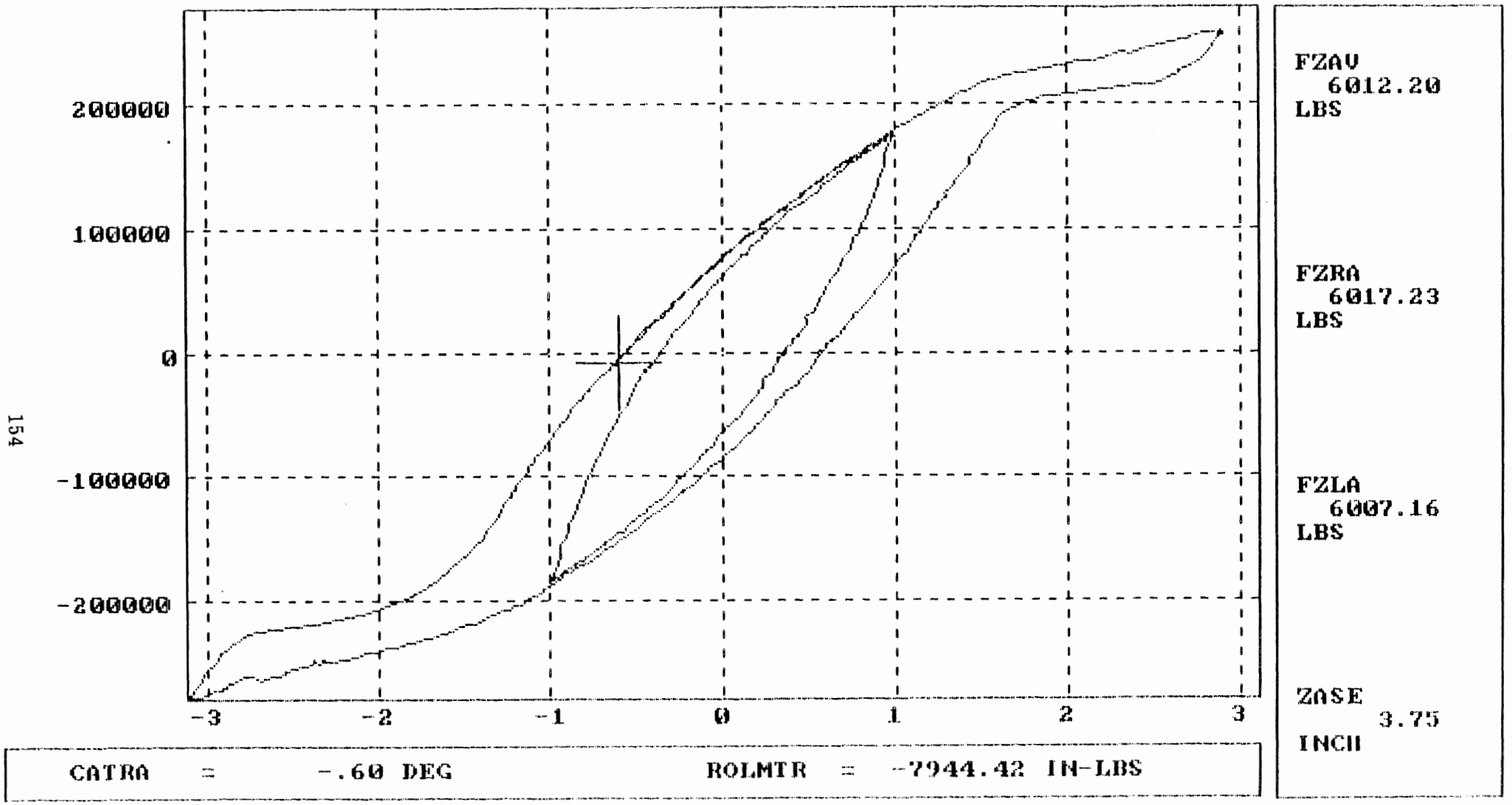
US DOT
Trailor (France):Flatbed Trailer

Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Trailing Axle Roll Rate

Suspension Load = 24,000 lb.



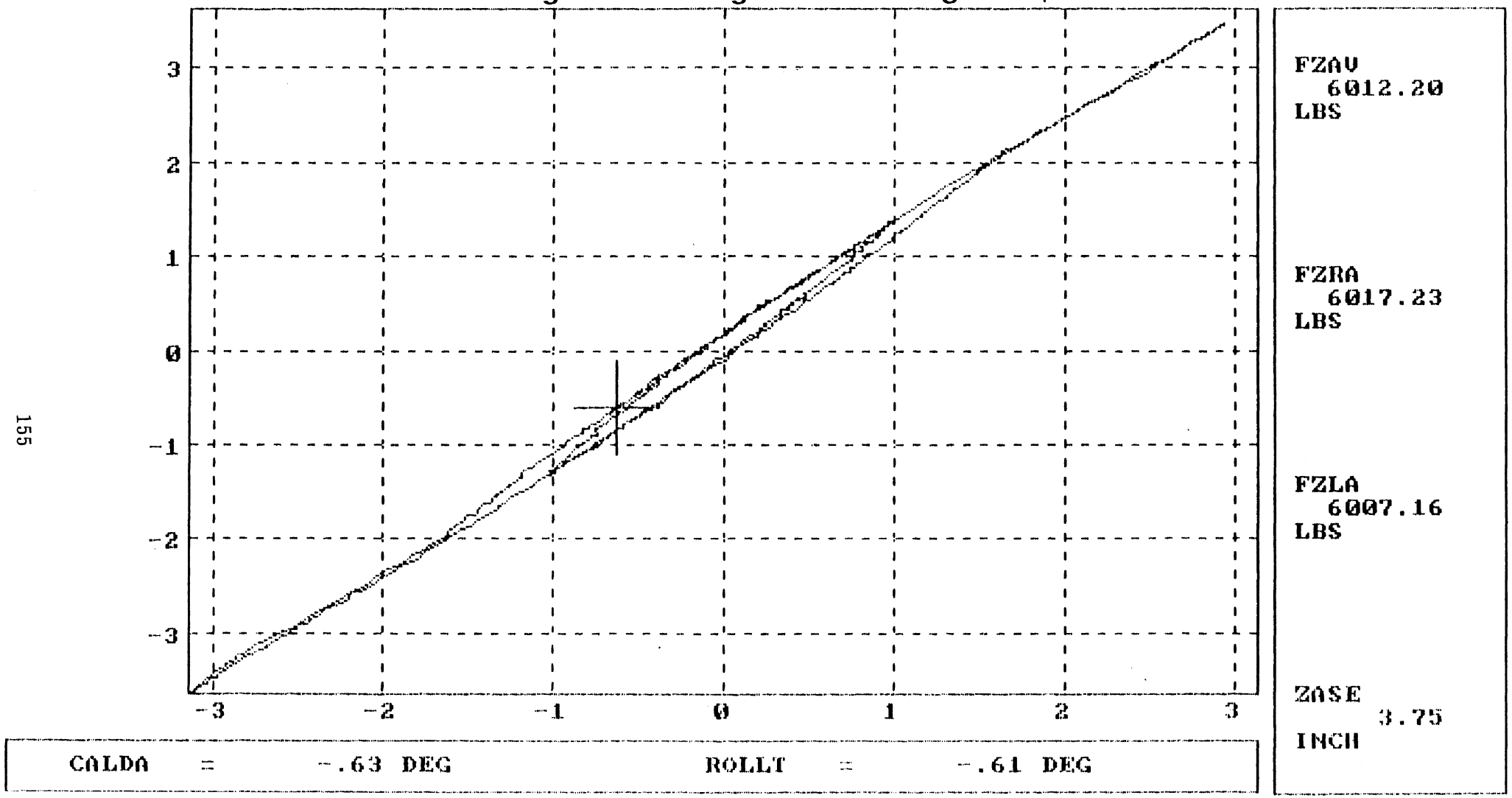
Ordinate: Trailing axle roll moment in load cell coordinate system (ROLMTR); in-lb; right side compressed, positive.

Abscissa: Average trailing axle roll (camber) angle (CATRA); degrees; right side compressed, positive.

US DOT
Trailor (France):Flatbed Trailer Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Table Roll Angle vs Leading Axle Roll Angle Suspension Load = 24,000 lb.



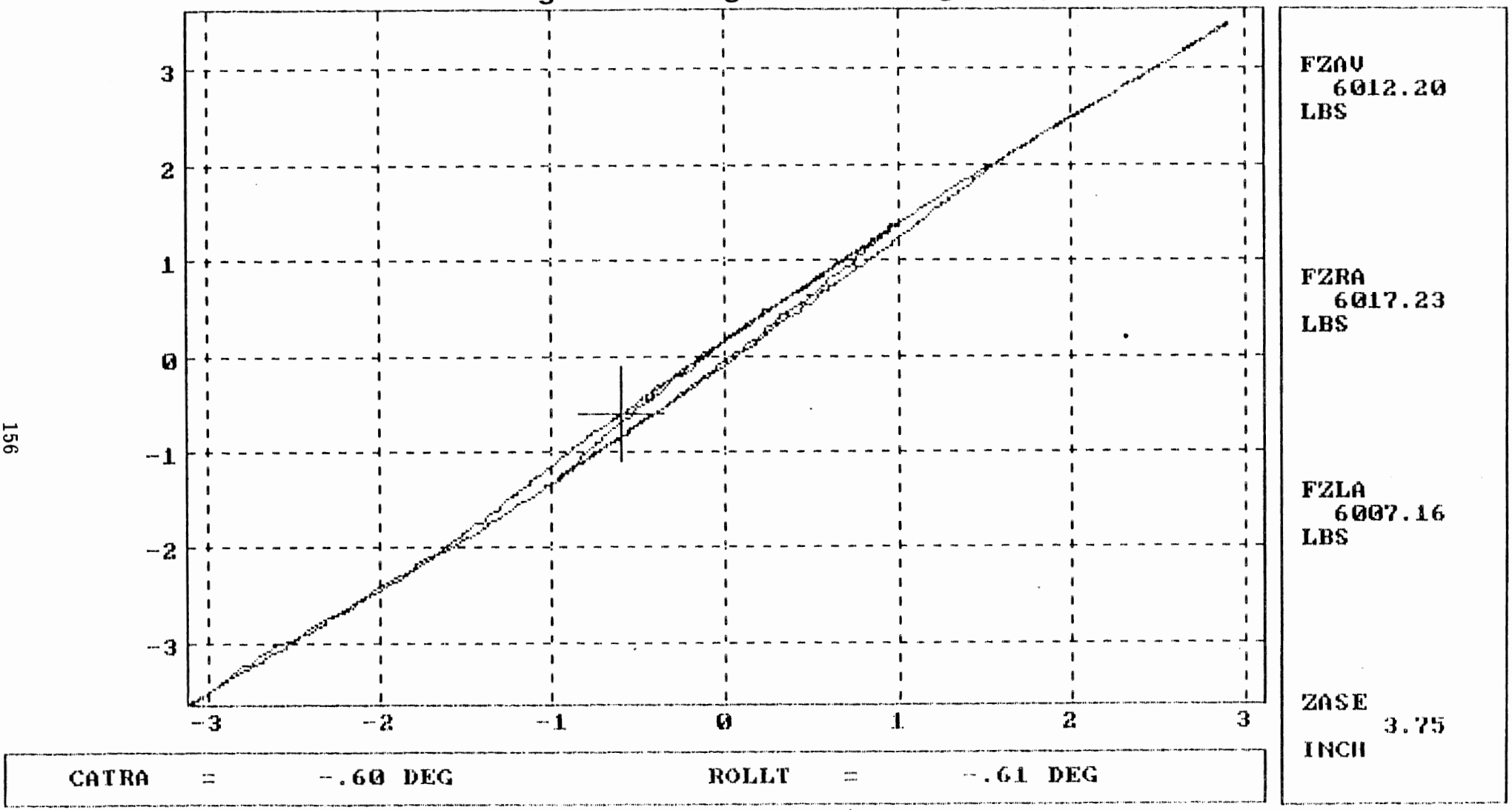
Ordinate: Table roll angle (ROLLT); degrees; right side compressed, positive.

Abscissa: Average leading axle roll (camber) angle (CALDA); degrees; right side compressed, positive.

US DOT
Trailor (France):Flatbed Trailer Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Table Roll Angle vs Trailing Axle Roll Angle Suspension Load = 24,000 lb.



Ordinate: Table roll angle (ROLLT); degrees; right side compressed, positive.

Abscissa: Average trailing axle roll (camber) angle (CATRA); degrees; right side compressed, positive.

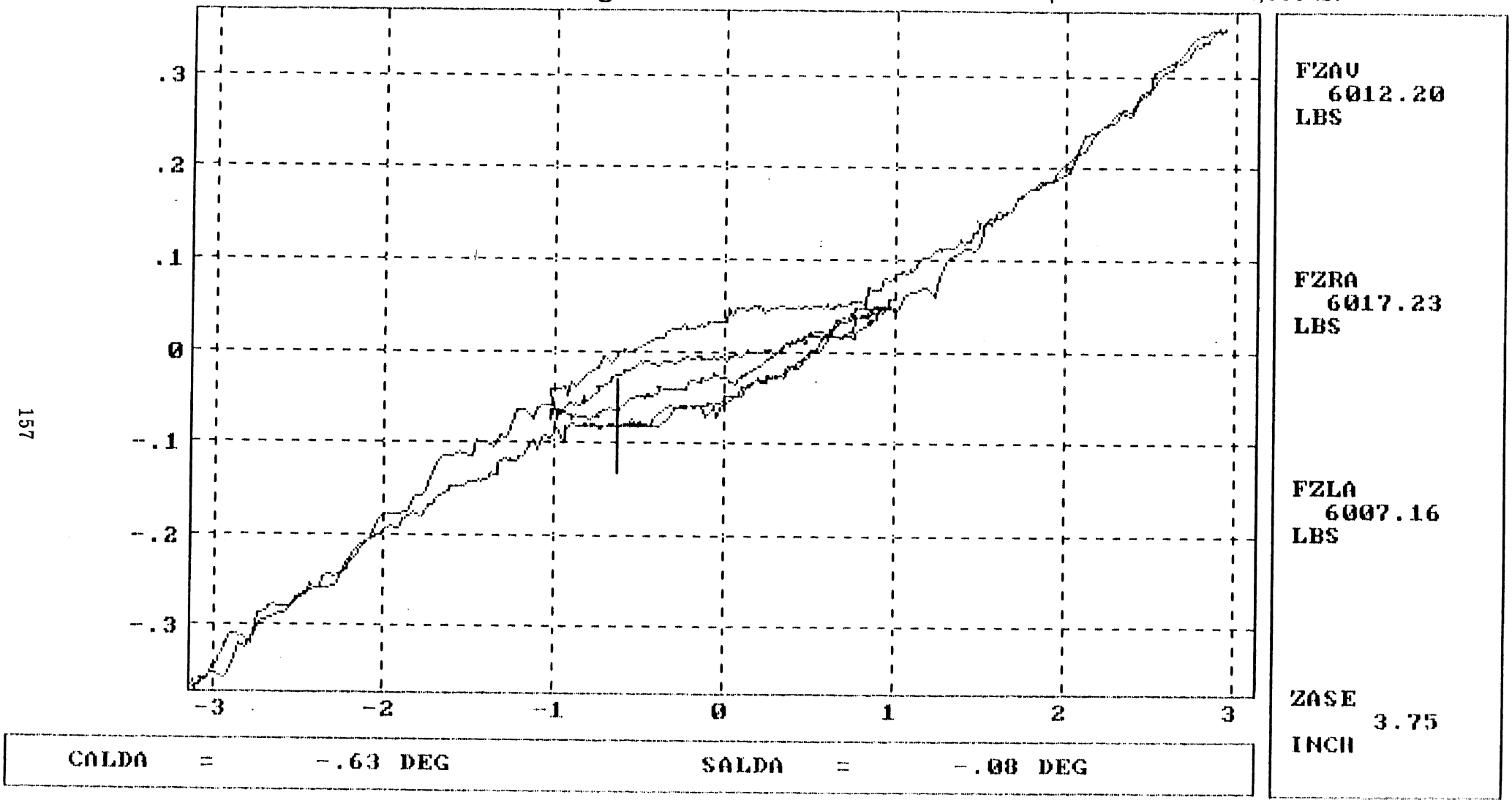
US DOT
Trailor (France):Flatbed Trailer

Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Leading Axle Roll Steer

Suspension Load = 24,000 lb.



Ordinate: Average leading axle steer angle (SALDA); degrees; steer toward right, positive.

Abscissa: Average leading axle roll (camber) angle (CALDA); degrees; right side compressed, positive.

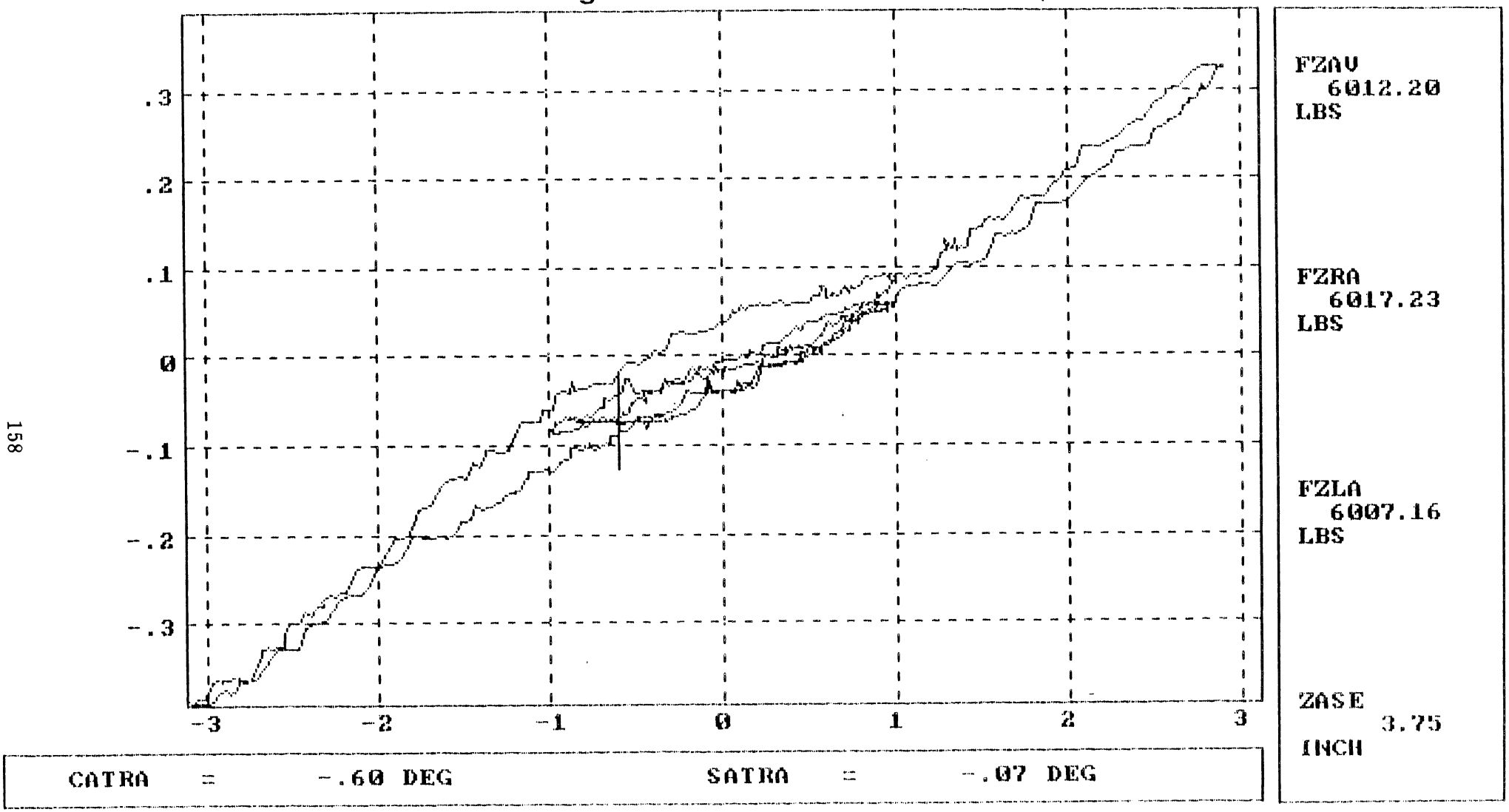
US DOT
Trailor (France):Flatbed Trailer

Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Trailing Axle Roll Steer

Suspension Load = 24,000 lb.



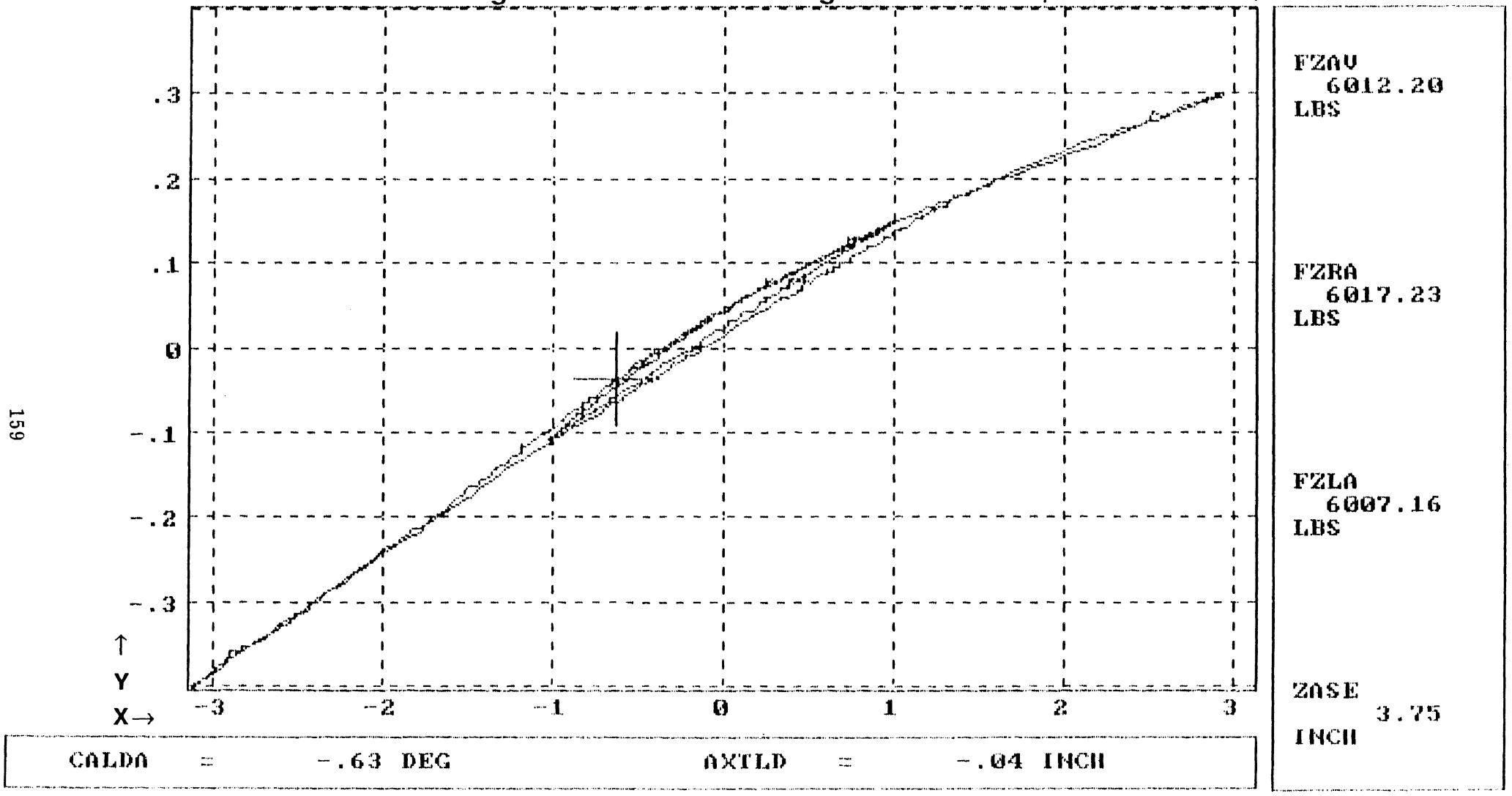
Ordinate: Average trailing axle steer angle (SATRA); degrees; steer toward right, positive.

Abscissa: Average trailing axle roll (camber) angle (CATRA); degrees; right side compressed, positive.

NHTSA: US DOT
Trailor (France): Flatbed Trailer Tandem Rear Suspension

Date: January 13, 1987 (reprint)
Pitch = 0.0 degrees
Suspension Load = 24,000 lb.

Leading Axle Roll Center Height

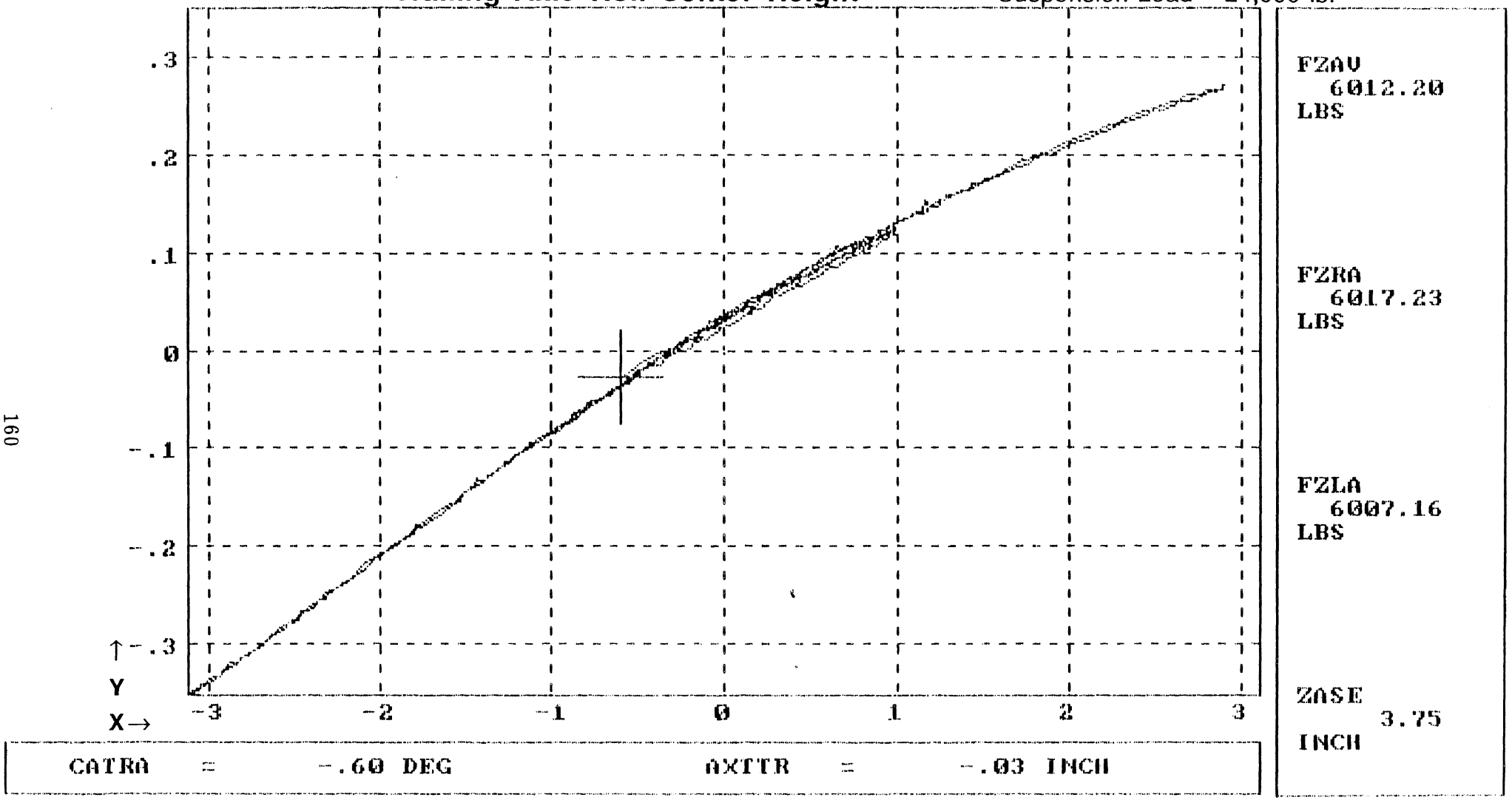


Abscissa (X): Average leading axle roll (camber) angle (CALDA); degrees; right side compressed, positive.

Ordinate (Y): Leading axle lateral translation (AXTLD) at a position 21.88 inches above the ground; inches; motion toward right, positive.

NHTSA: US DOT
Trailor (France): Flatbed Trailer Tandem Rear Suspension

Date: January 13, 1987 (reprint)
Pitch = 0.0 degrees
Suspension Load = 24,000 lb.



Abscissa (X): Average trailing axle roll (camber) angle (CATRA); degrees; right side compressed, positive.

Ordinate (Y): Trailing axle lateral translation (AXTTR) at a position 21.94 inches above the ground; inches; motion toward right, positive.

DATE [illegible]-87 14:51: [illegible]
TYPE OF TEST: ROLL
CUSTOMER: NHTSA
OPERATOR: WINKLER
FILE NAME: C:NHTSATRO.DAT
COMMENT:

****

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD=12000.
NOMINAL STEER ANGLE= .00

****

SUSPENSION DATA

TYPE: 4-SPRING LONG EQU
MANUFACTURER: TRAILOR
MODEL: ?
RATING: ?
OTHER: 4-SPRING WITH LONG EQUALIZER (REAR SLIPER TO REAR SLIPPER)

****

VEHICLE DATA

MANUFACTURER: TRAILOR
MODEL: FLATBED
OTHER: EUROPEAN (FRANCE) MANUFACTURE

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	37.00	37.00
SPRING SPACING	38.00	38.00
SPRING LASH	.00	.00
TANDEM SPREAD	54.00	54.00

FACILITY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	72.50	72.38
LATERAL Z-POT SPACING	109.62	107.62
VERTICAL Y-POT POSITION	22.62	22.62
	LEFT	RIGHT
LONG. PAD SPACING	54.50	54.00

Date:Jan 8, 1987

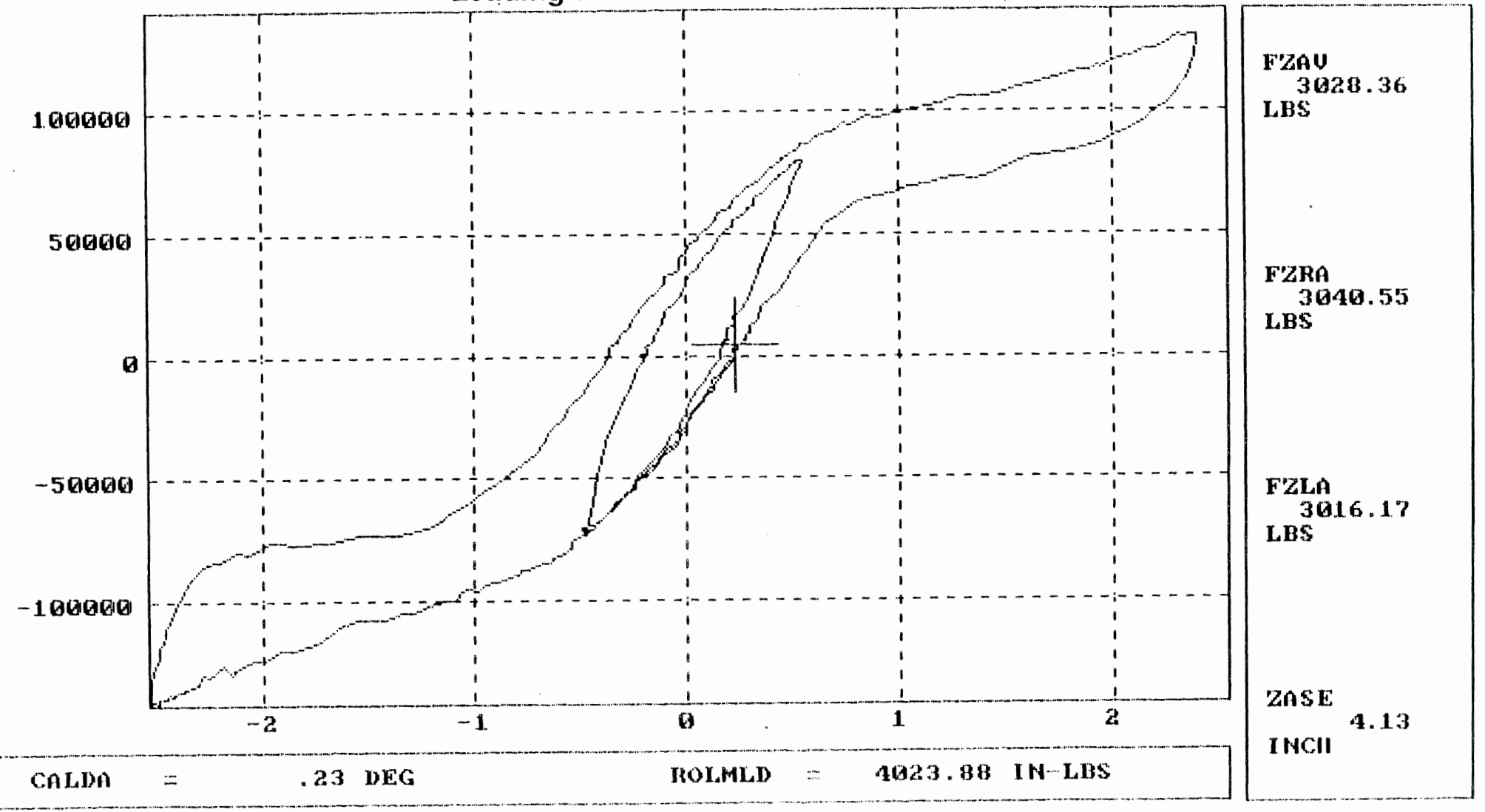
US DOT
Trailor (France):Flatbed Trailer

Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Leading Axle Roll Rate

Suspension Load = 12,000 lb.



Ordinate: Leading axle roll moment in load cell coordinate system (ROLMLD); in-lb; right side compressed, positive.

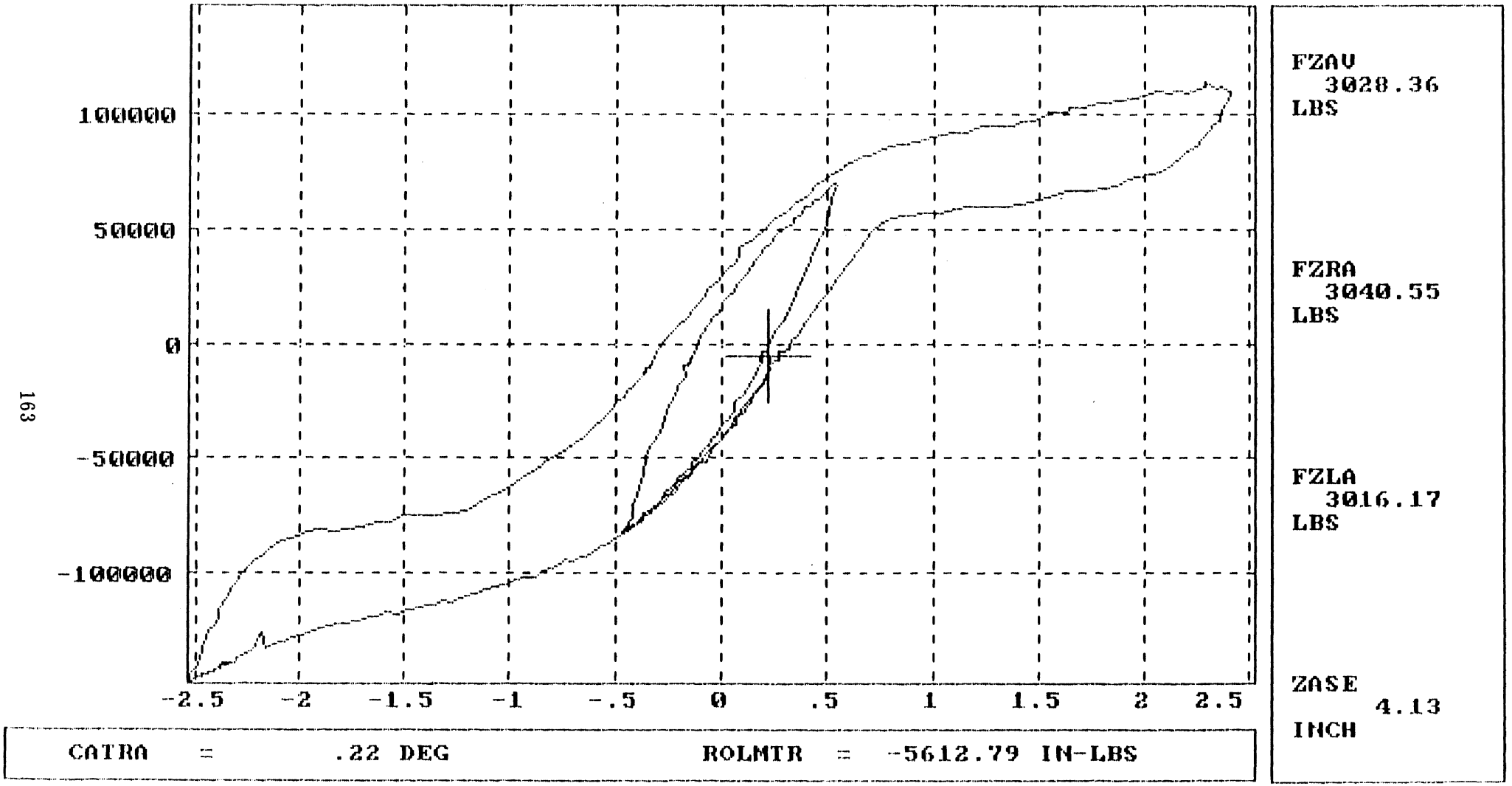
Abscissa: Average leading axle roll (camber) angle (CALDA); degrees; right side compressed, positive.

US DOT
Trailor (France):Flatbed Trailer

Tandem Rear Suspension

Trailing Axle Roll Rate

Date: Jan 8, 1987
Pitch = 0.0 degrees
Suspension Load = 12,000 lb.



Ordinate: Trailing axle roll moment in load cell coordinate system (ROLMTR); in-lb; right side compressed, positive.

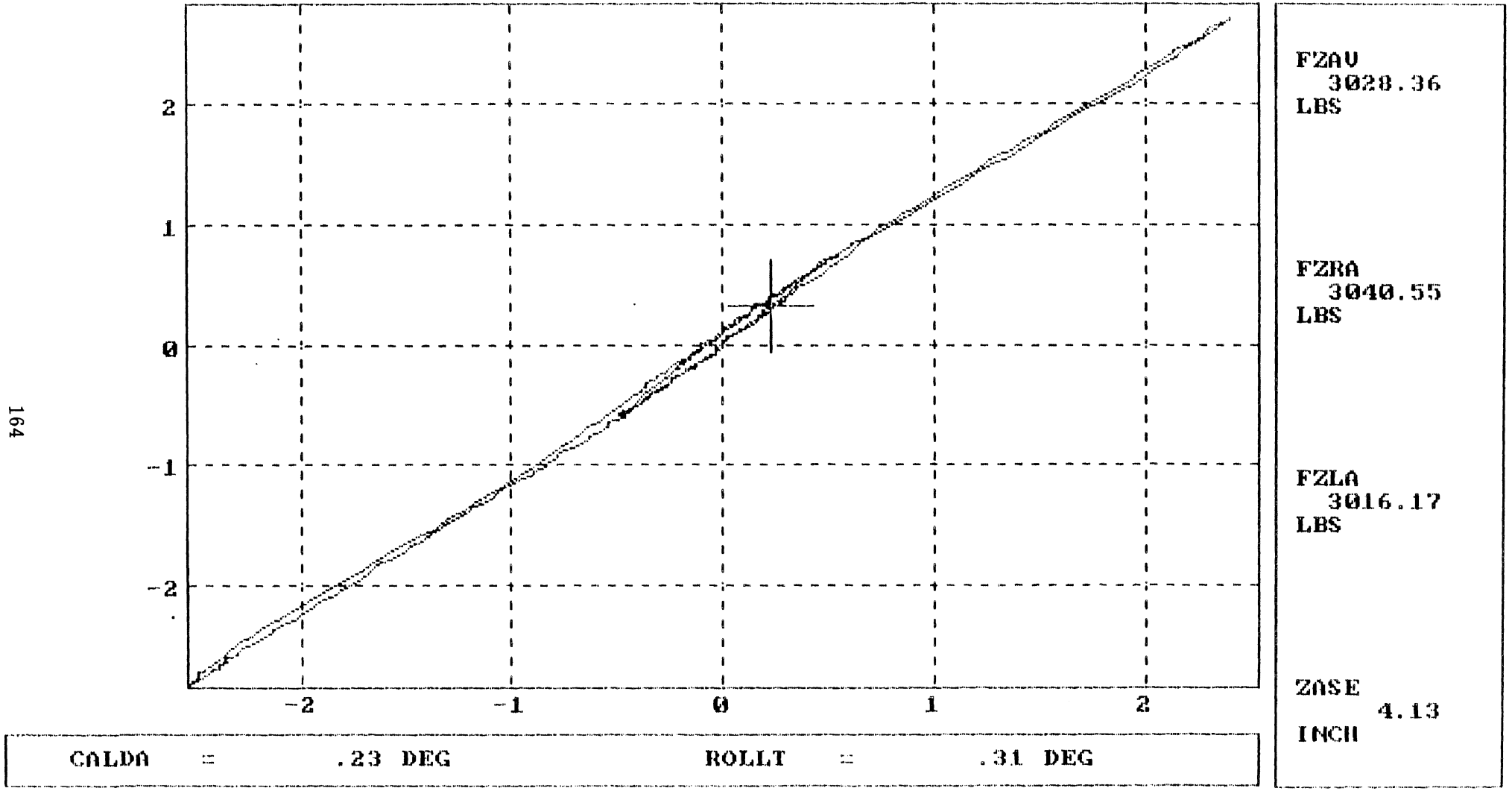
Abscissa: Average trailing axle roll (camber) angle (CATRA); degrees; right side compressed, positive.

US DOT
Trailor (France):Flatbed Trailer

Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Table Roll Angle vs Leading Axle Roll Angle Suspension Load = 12,000 lb.



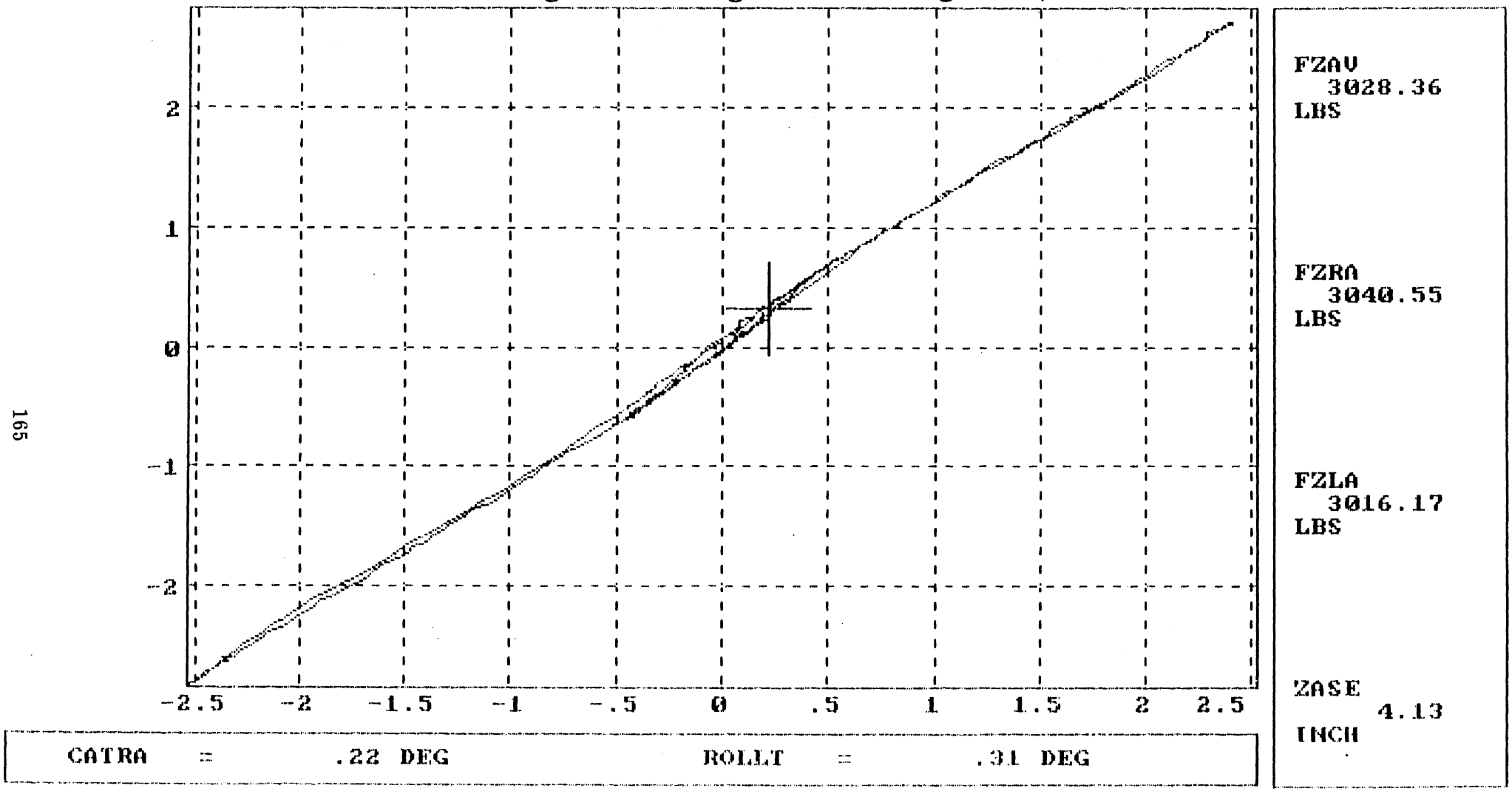
Ordinate: Table roll angle (ROLLT); degrees; right side compressed, positive.

Abscissa: Average leading axle roll (camber) angle (CALDA); degrees; right side compressed, positive.

US DOT
Trailor (France):Flatbed Trailer Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Table Roll Angle vs Trailing Axle Roll Angle Suspension Load = 12,000 lb.



Ordinate: Table roll angle (ROLLT); degrees; right side compressed, positive.

Abscissa: Average trailing axle roll (camber) angle (CATRA); degrees; right side compressed, positive.

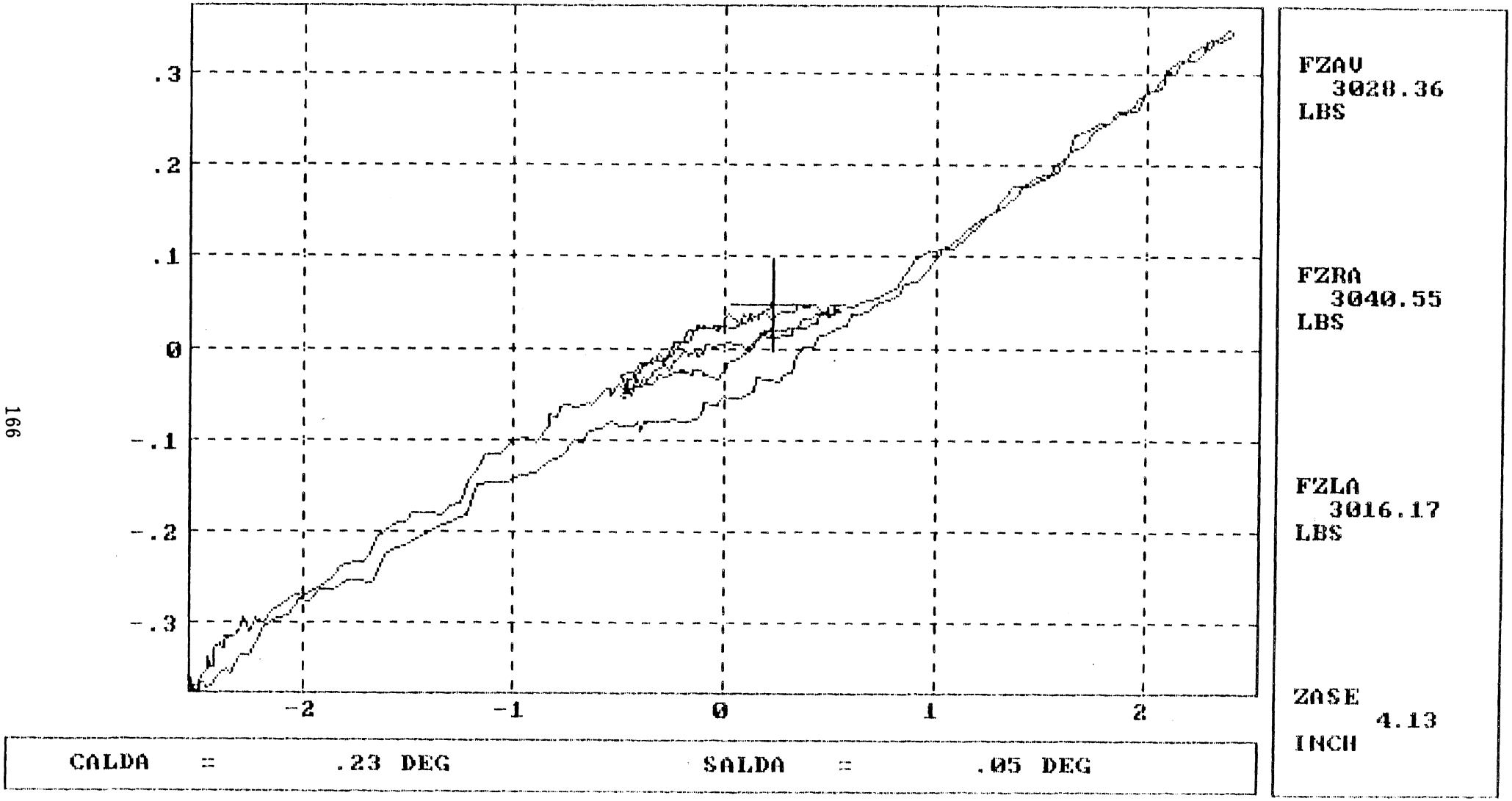
US DOT
Trailor (France):Flatbed Trailer

Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Leading Axle Roll Steer

Suspension Load = 12,000 lb.



Ordinate: Average leading axle steer angle (SALDA); degrees; steer toward right, positive.

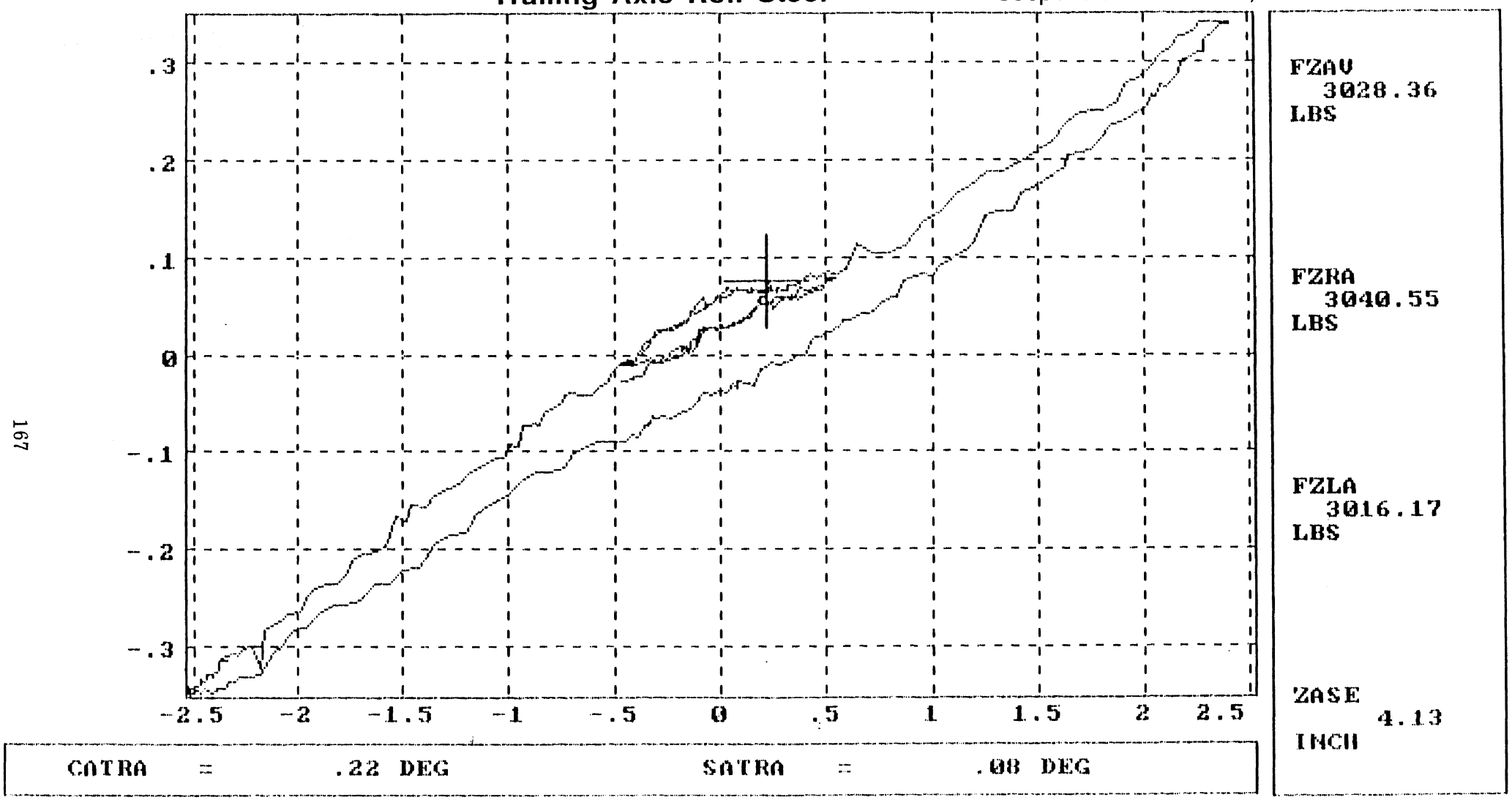
Abscissa: Average leading axle roll (camber) angle (CALDA); degrees; right side compressed, positive.

US DOT
Trailor (France):Flatbed Trailer

Tandem Rear Suspension

Trailing Axle Roll Steer

Date: Jan 8, 1987
Pitch = 0.0 degrees
Suspension Load = 12,000 lb.



Ordinate: Average trailing axle steer angle (SATRA); degrees; steer toward right, positive.

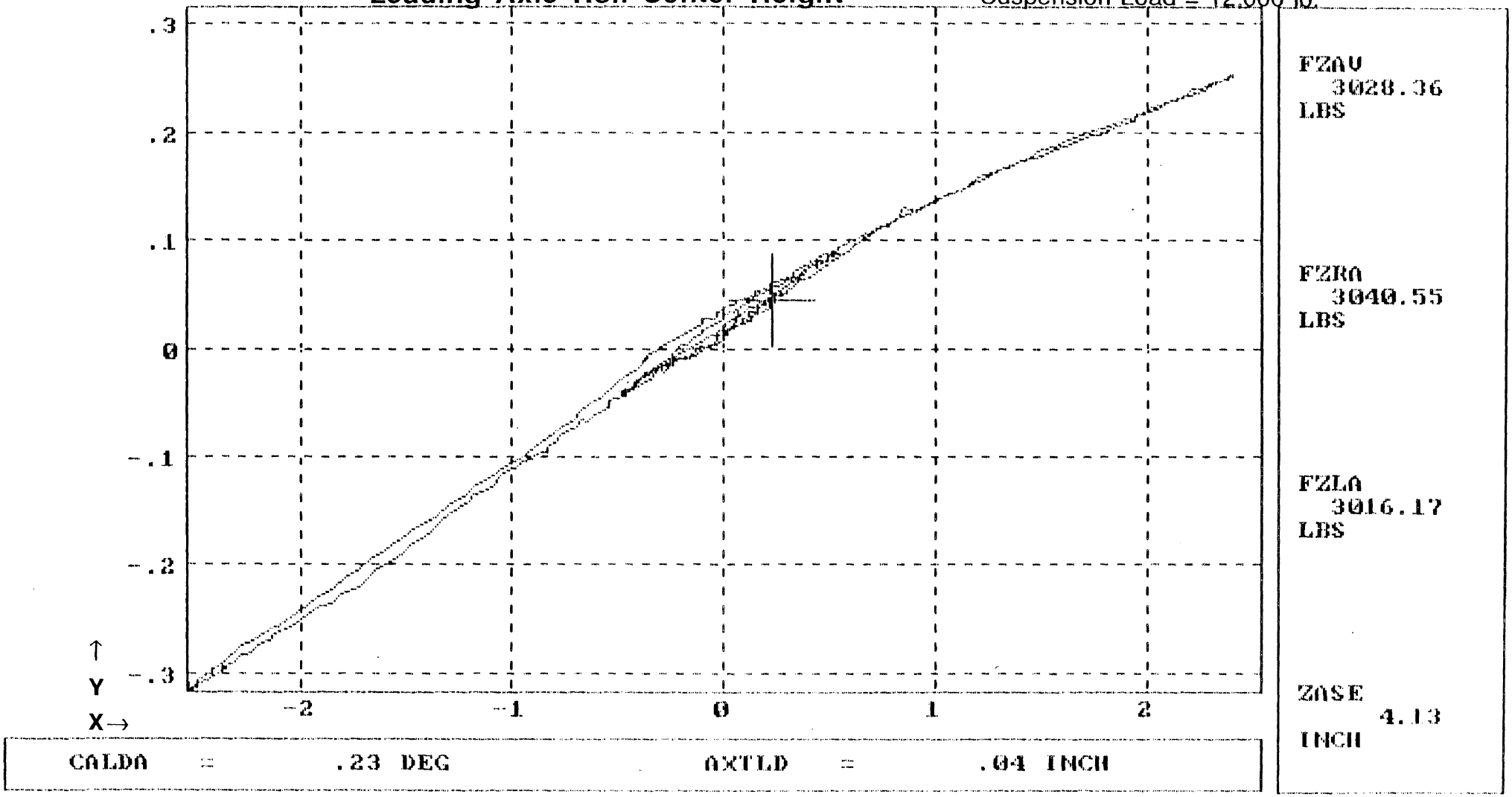
Abscissa: Average trailing axle roll (camber) angle (CATRA); degrees; right side compressed, positive.

NHTSA: US DOT
Trailor (France): Flatbed Trailer Tandem Rear Suspension

Date: January 13, 1987 (reprint)
Pitch = 0.0 degrees

Leading Axle Roll Center Height

Suspension Load = 12,000 lb

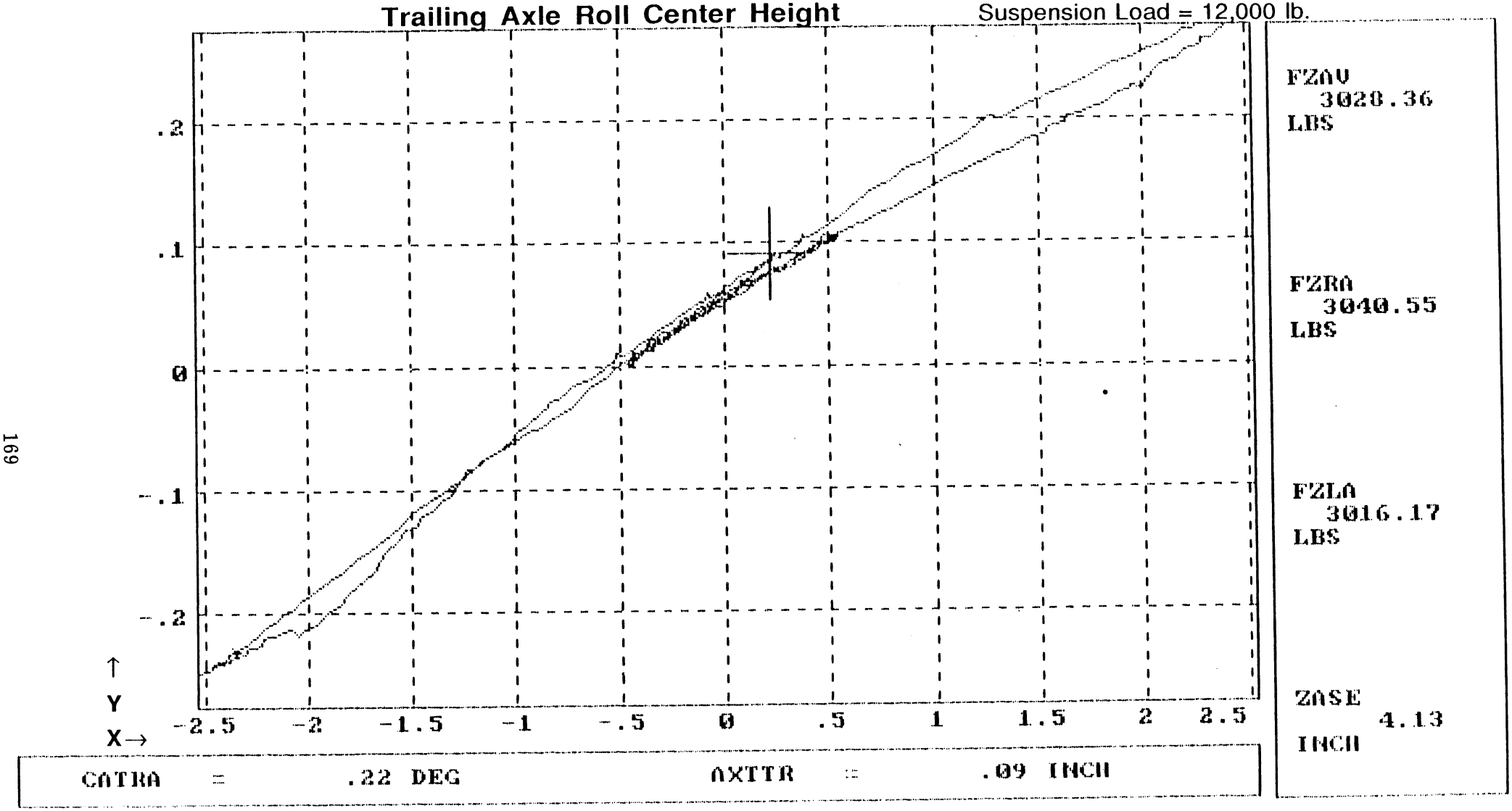


Abscissa (X): Average leading axle roll (camber) angle (CALDA); degrees; right side compressed, positive.

Ordinate (Y): Leading axle lateral translation (AXTLD) at a position 22.62 inches above the ground; inches; motion toward right, positive.

NHTSA: US DOT
Trailor (France): Flatbed Trailer Tandem Rear Suspension

Date: January 13, 1987 (reprint)
Pitch = 0.0 degrees
Suspension Load = 12,000 lb.



Abscissa (X): Average trailing axle roll (camber) angle (CATRA); degrees; right side compressed, positive.

Ordinate (Y): Trailing axle lateral translation (AXTTR) at a position 22.62 inches above the ground; inches; motion toward right, positive.

DATE 1- 7-1987 14:52:22
TYPE OF TEST:ALIGNING MOMENT
CUSTOMER:NHTSA
OPERATOR:WINKLER
FILE NAME:C:NHTSATR4.DAT
COMMENT:

****

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD=38000.
NOMINAL STEER ANGLE= .00

****

SUSPENSION DATA

TYPE:4-SPRING LONG EQU
MANUFACTURER:TRAILOR
MODEL:?
RATING:?
OTHER:4-SPRING WITH LONG EQUALIZER (REAR SLIPER TO REAR SLIPPER)

****

VEHICLE DATA

MANUFACTURER:TRAILOR
MODEL:FLATBED
OTHER:EUROPEAN (FRANCE) MANUFACTURE

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	37.00	37.00
SPRING SPACING	38.00	38.00
SPRING LASH	.00	.00
TANDEM SPREAD	54.00	54.00

FACILTY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	72.50	72.38
LATERAL Z-POT SPACING	109.62	107.62
VERTICAL Y-POT POSITION	22.62	22.62

	LEFT	RIGHT
LONG. PAD SPACING	54.50	54.00

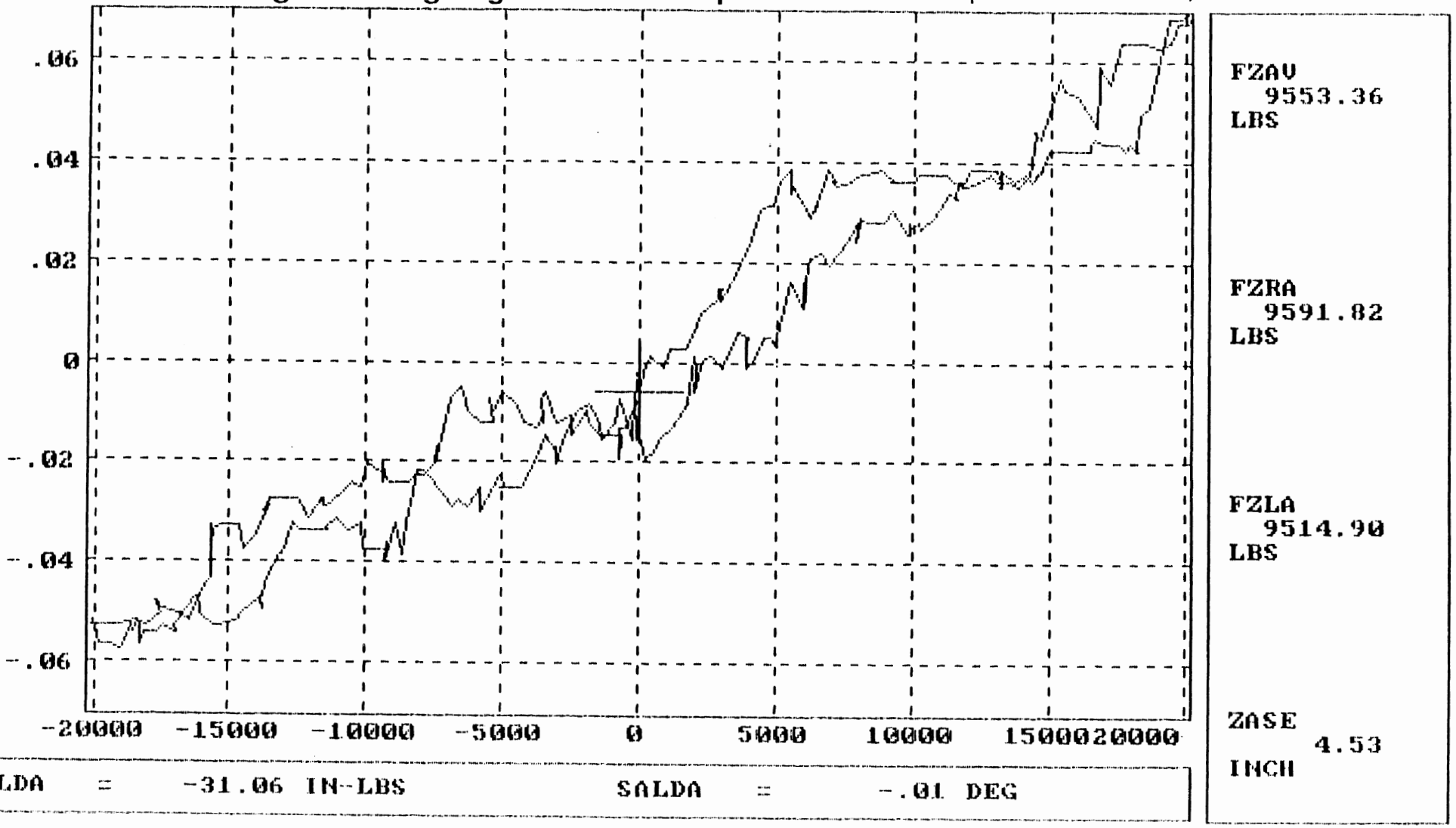
Date: Jan 8, 1987

US DOT
Trailor (France):Flatbed Trailer Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Leading Axle Aligning Moment Compliance Steer

Suspension Load = 38,000 lb.



Ordinate: Average leading axle steer angle (SALDA); degrees; steer toward right, positive.

Abscissa: Average leading axle aligning moment (MZLDA); in-lb per wheel set; applied to all four wheel sets simultaneously; downward (right hand rule) moment vector, positive.

US DOT

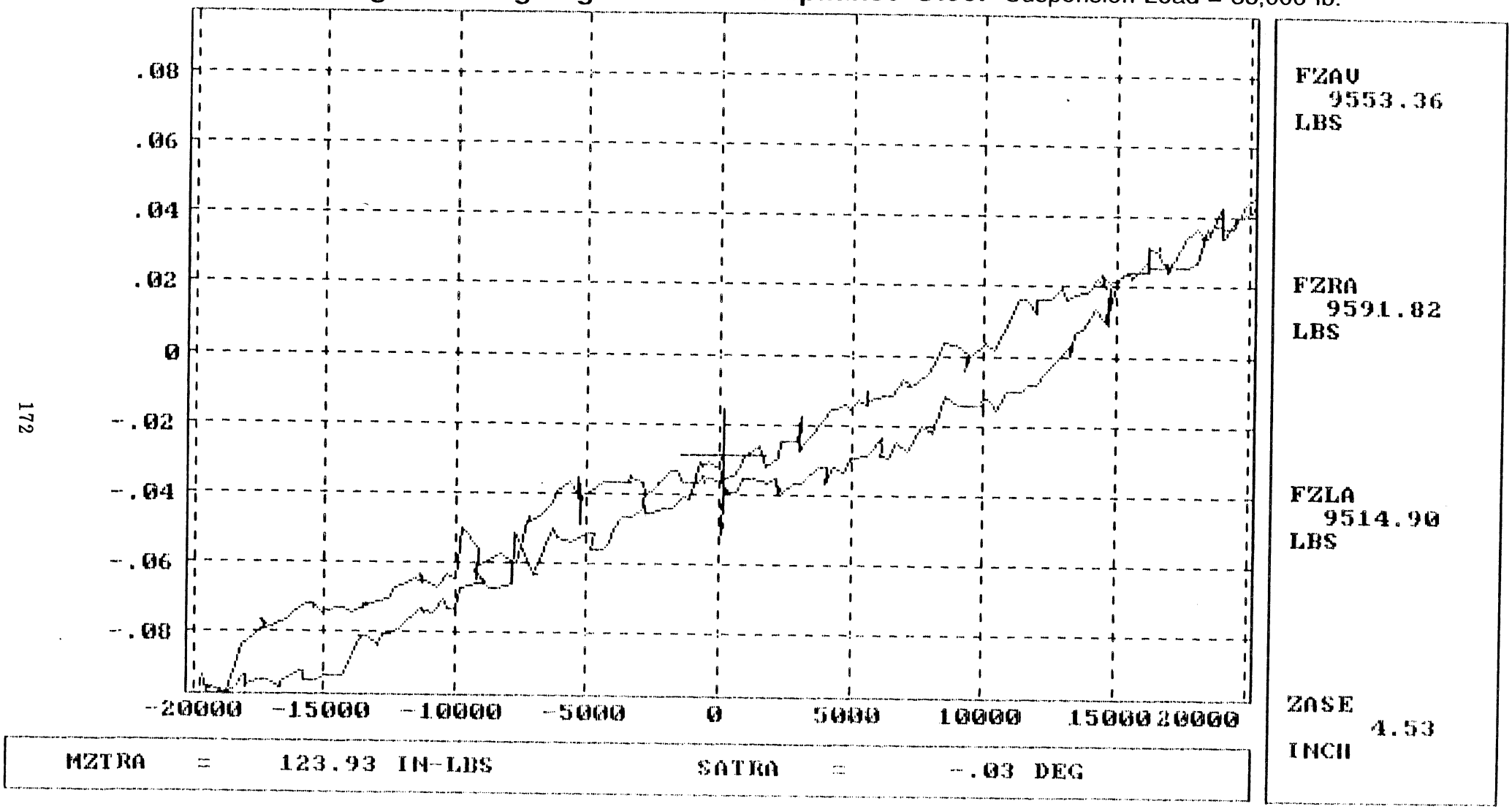
Trailor (France):Flatbed Trailer Tandem Rear Suspension

Date: Jan 8, 1987

Pitch = 0.0 degrees

Trailing Axle Aligning Moment Compliance Steer

Suspension Load = 38,000 lb.



Ordinate: Average trailing axle steer angle (SATRA); degrees; steer toward right, positive.

Abscissa: Average trailing axle aligning moment (MZTRA); in-lb per wheel set; applied to all four wheel sets simultaneously; downward (right hand rule) moment vector, positive.

DATE: [illegible] 14:57: 7
TYPE OF TEST:ALIGNING MOMENT
CUSTOMER:NHTSA
OPERATOR:WINKLER
FILE NAME:C:NHTSATR5.DAT
COMMENT:

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD=24000.
NOMINAL STEER ANGLE= .00

SUSPENSION DATA

TYPE:4-SPRING LONG EQU
MANUFACTURER:TRAILOR
MODEL:?
RATING:?
OTHER:4-SPRING WITH LONG EQUALIZER (REAR SLIPER TO REAR SLIPPER)

VEHICLE DATA

MANUFACTURER:TRAILOR
MODEL:FLATBED
OTHER:EUROPEAN (FRANCE) MANUFACTURE

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	37.00	37.00
SPRING SPACING	38.00	38.00
SPRING LASH	.00	.00
TANDEM SPREAD	54.00	54.00

FACILTY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	72.50	72.38
LATERAL Z-POT SPACING	109.62	107.62
VERTICAL Y-POT POSITION	22.62	22.62

	LEFT	RIGHT
LONG. PAD SPACING	54.50	54.00

Date: Jan 8, 1987

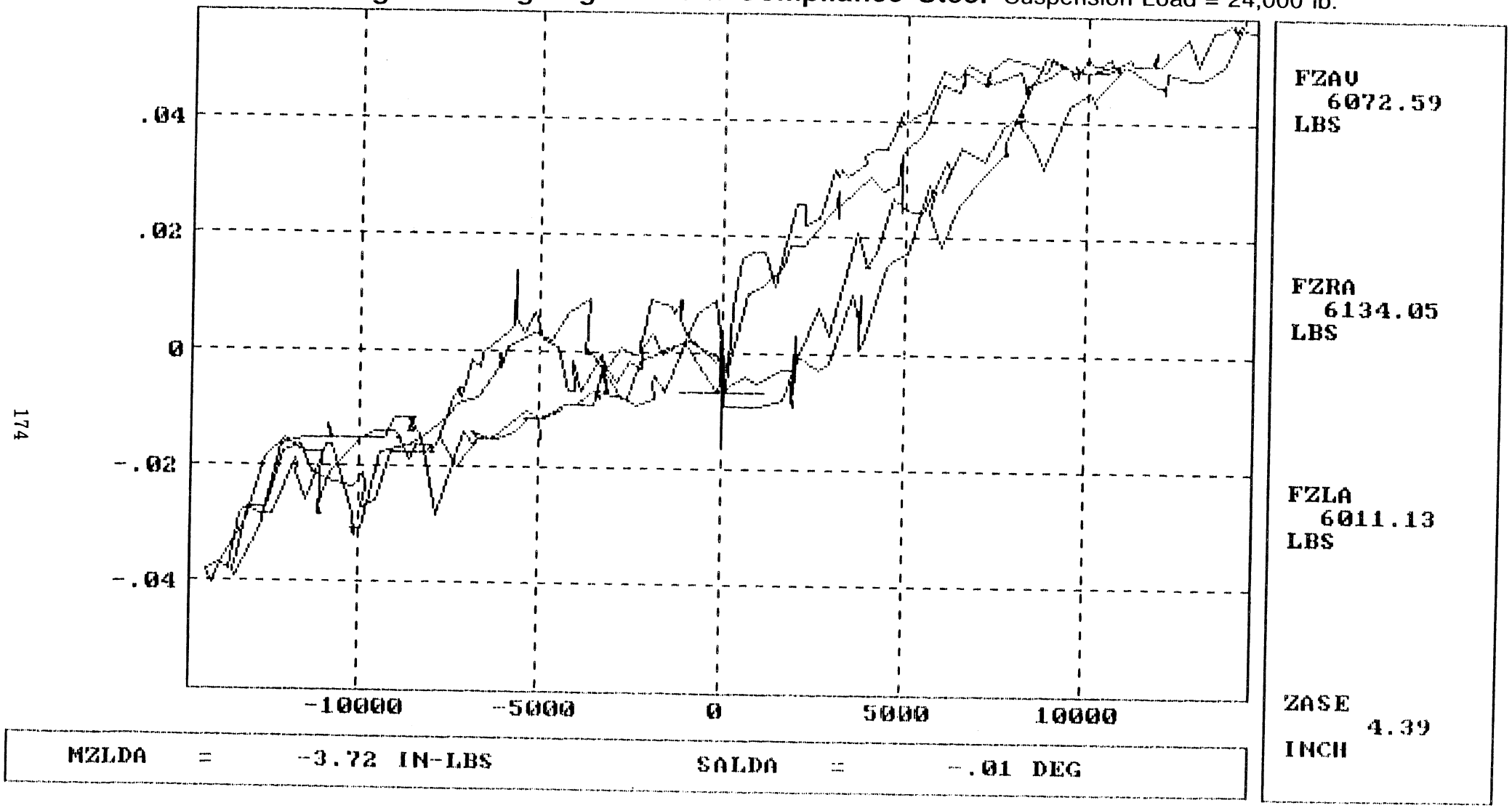
US DOT

Trailor (France):Flatbed Trailer Tandem Rear Suspension

Date: Jan 8, 1987

Pitch = 0.0 degrees

Leading Axle Aligning Moment Compliance Steer Suspension Load = 24,000 lb.



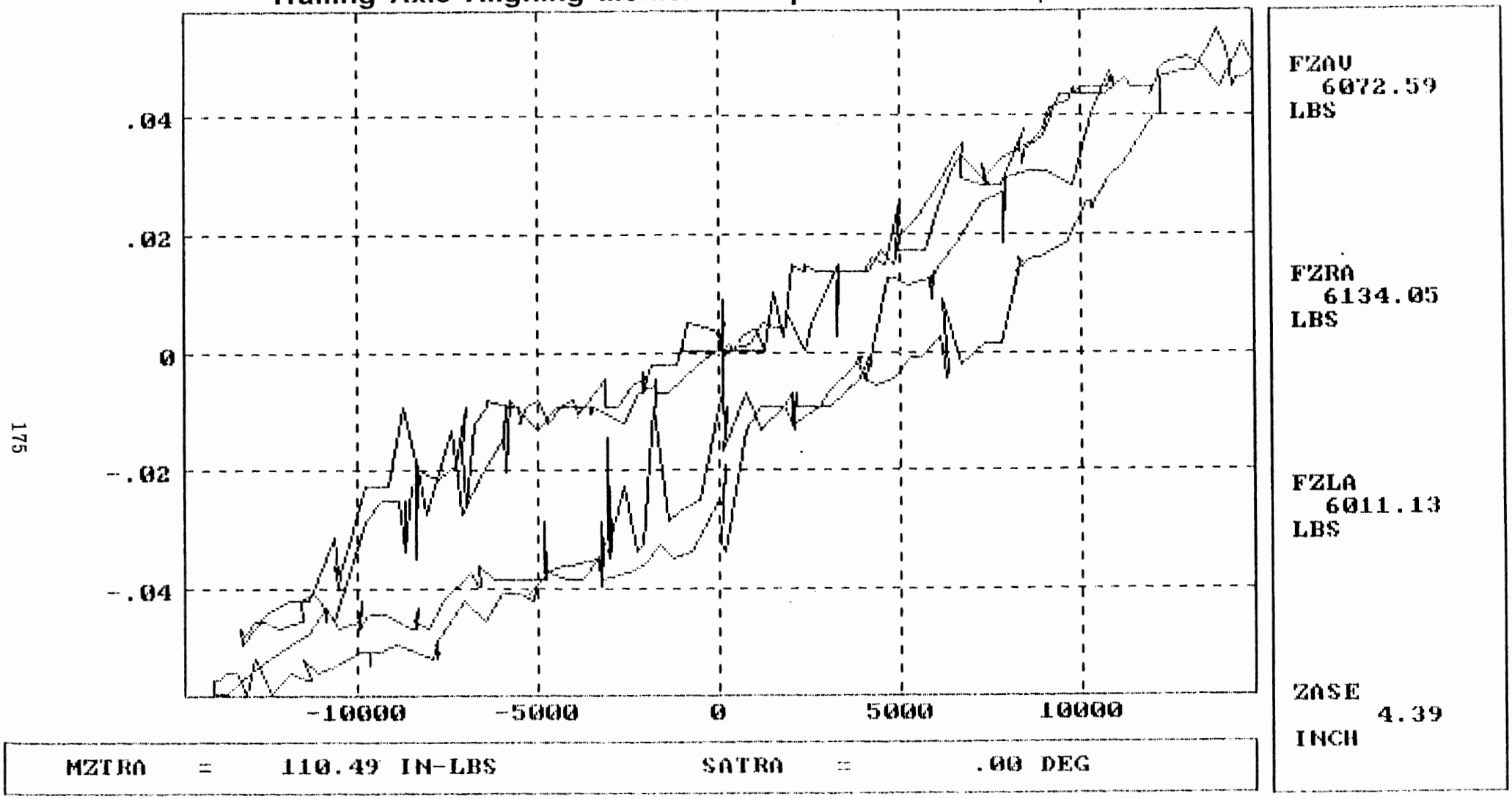
Ordinate: Average leading axle steer angle (SALDA); degrees; steer toward right, positive.

Abscissa: Average leading axle aligning moment (MZLDA); in-lb per wheel set; applied to all four wheel sets simultaneously; downward (right hand rule) moment vector, positive.

US DOT
Trailor (France):Flatbed Trailer Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Trailing Axle Aligning Moment Compliance Steer Suspension Load = 24,000 lb.



Ordinate: Average trailing axle steer angle (SATRA); degrees; steer toward right, positive.

Abscissa: Average trailing axle aligning moment (MZTRA); in-lb per wheel set; applied to all four wheel sets simultaneously; downward (right hand rule) moment vector, positive.

DATE: 1- 7-1987 15: 1:24
TYPE OF TEST:ALIGNING MOMENT
CUSTOMER:UMTSA
OPERATOR:WINKLER
FILE NAME:C:\MTSATR1.DAT
COMMENT:

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD=12000.
NOMINAL STEER ANGLE= .00

SUSPENSION DATA

TYPE:4-SPRING LONG EQU
MANUFACTURER:TRAILOR
MODEL:?
DATE:84?
OTHER:4-SPRING WITH LONG EQUALIZER (REAR SLIPER TO REAR SLIPPER)

VEHICLE DATA

MANUFACTURER:TRAILOR
MODEL:FLATBED
OTHER:EUROPEAN (FRANCE) MANUFACTURE

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	37.00	37.00
SPRING SPACING	38.00	38.00
SPRING LASH	.00	.00
TANDEM SPREAD	54.00	54.00

FACILTY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	72.50	72.38
LATERAL Z-POT SPACING	109.62	107.62
VERTICAL Y-POT POSITION	22.62	22.62
	LEFT	RIGHT
LONG. PAD SPACING	54.50	54.00

Date: Jan 8, 1987

US DOT

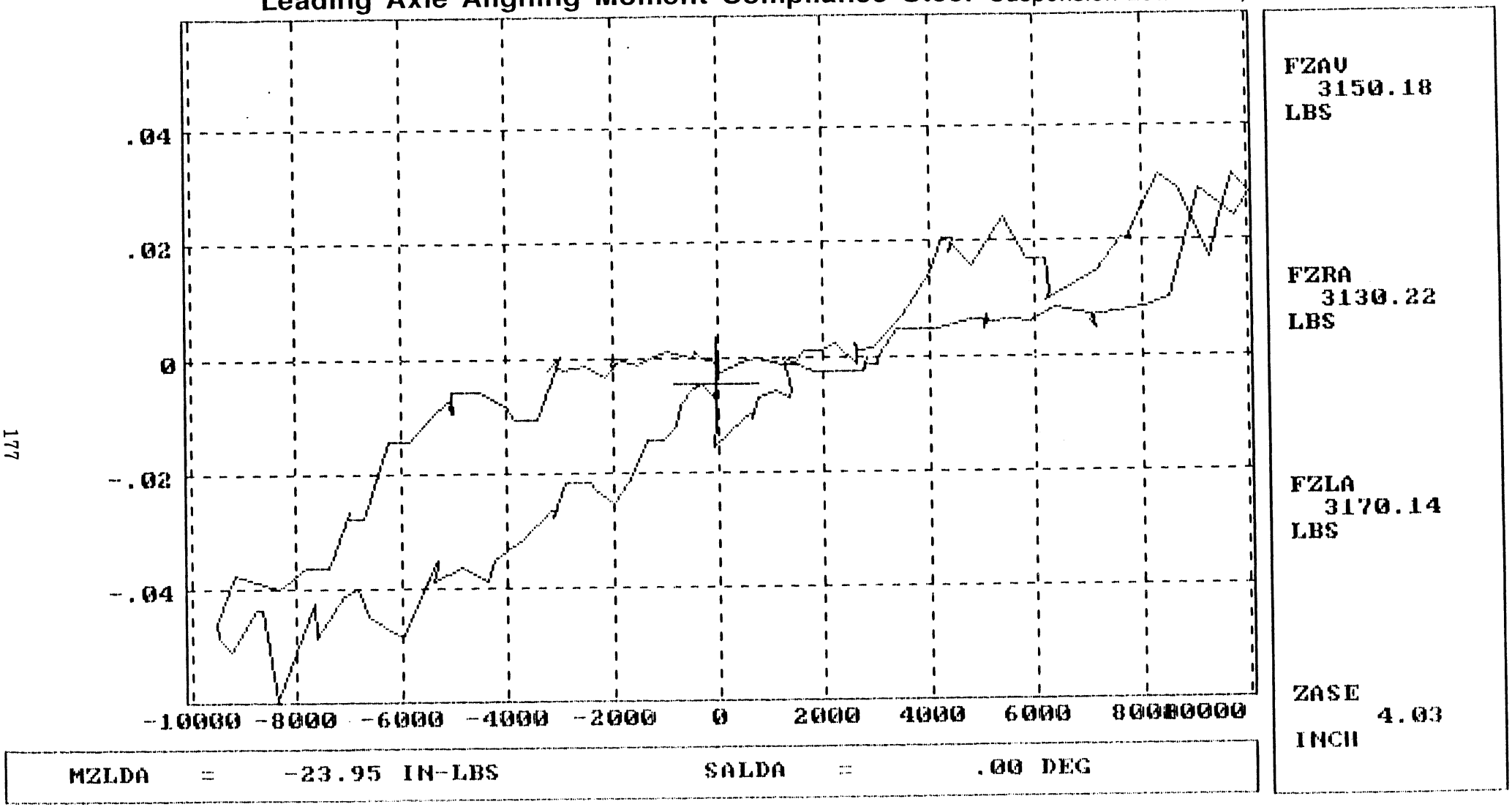
Trailor (France):Flatbed Trailer Tandem Rear Suspension

Date: Jan 8, 1987

Pitch = 0.0 degrees

Leading Axle Aligning Moment Compliance Steer

Suspension Load = 12,000 lb.



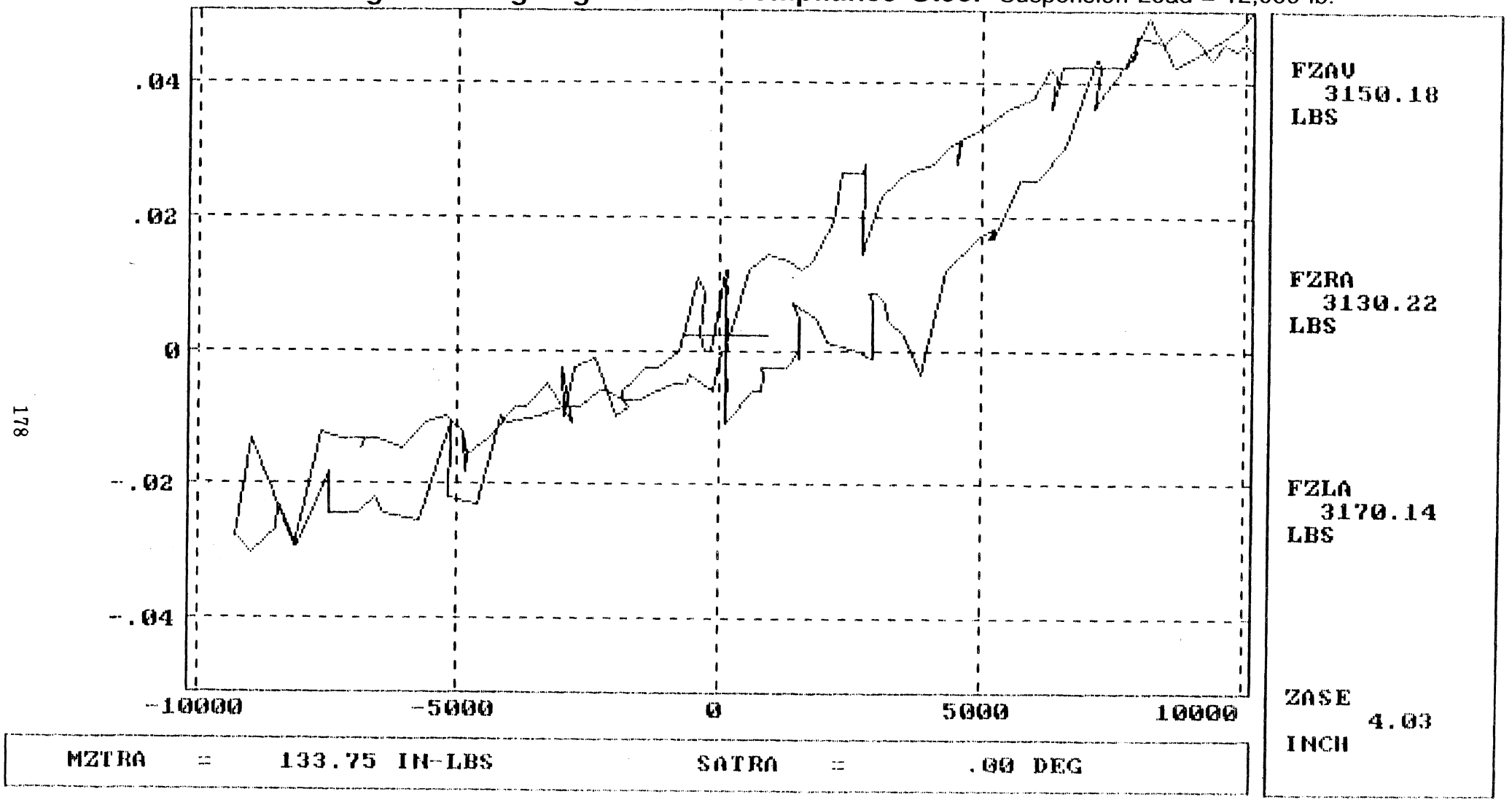
Ordinate: Average leading axle steer angle (SALDA); degrees; steer toward right, positive.

Abscissa: Average leading axle aligning moment (MZLDA); in-lb per wheel set; applied to all four wheel sets simultaneously; downward (right hand rule) moment vector, positive.

US DOT
Trailor (France):Flatbed Trailer Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Trailing Axle Aligning Moment Compliance Steer Suspension Load = 12,000 lb.



Ordinate: Average trailing axle steer angle (SATRA); degrees; steer toward right, positive.

Abscissa: Average trailing axle aligning moment (MZTRA); in-lb per wheel set; applied to all four wheel sets simultaneously; downward (right hand rule) moment vector, positive.

ATE 1- 7-1987 15: 4:1
YPE OF TEST:LATERAL FORCE
CUSTOMER:NHTSA
OPERATOR:WINKLER
FILE NAME:D:NHTSATR7.DAT
COMMENT:

****

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD=36000.
NOMINAL STEER ANGLE= .00

****

SUSPENSION DATA

TYPE:4-SPRING LONG EQL
MANUFACTURER:TRAILOR
MODEL:?
RATING:?
OTHER:4-SPRING WITH LONG EQUALIZER (REAR SLIPER TO REAR SLIPPER)

****

VEHICLE DATA

MANUFACTURER:TRAILOR
MODEL:FLATBED
OTHER:EUROPEAN (FRANCE) MANUFACTURE

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	37.00	37.00
SPRING SPACING	38.00	38.00
SPRING LASH	.00	.00
TANDEM SPREAD	54.00	54.00

FACILITY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	72.50	72.38
LATERAL Z-POT SPACING	109.62	107.62
VERTICAL Y-POT POSITION	22.62	22.62
	LEFT	RIGHT
LONG. PAD SPACING	54.50	54.00

Date: Jan 8, 1987

US DOT

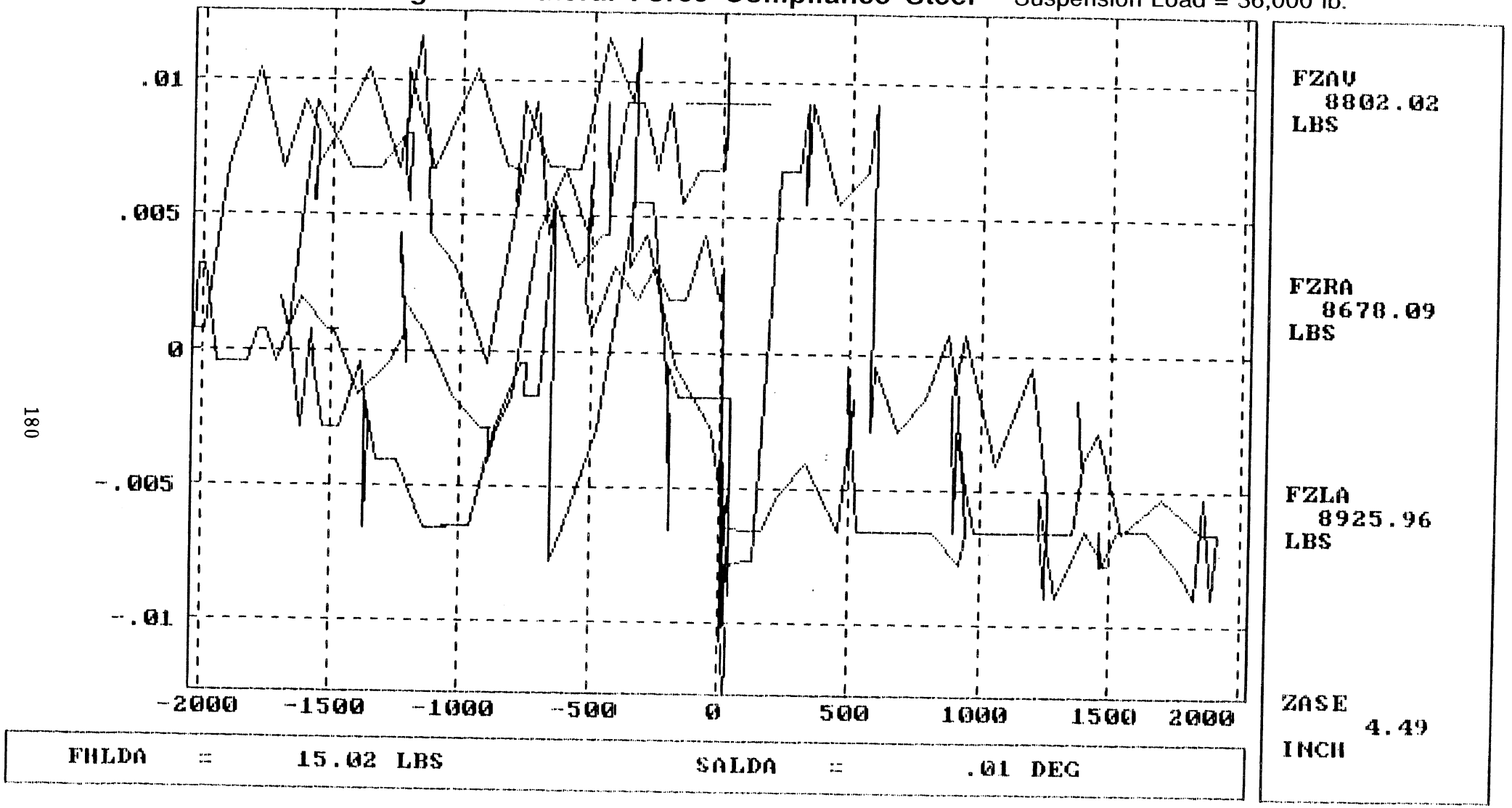
Trailor (France):Flatbed Trailer Tandem Rear Suspension

Date: Jan 8, 1987

Pitch = 0.0 degrees

Leading Axle Lateral Force Compliance Steer

Suspension Load = 36,000 lb.



Ordinate: Average leading axle steer angle (SALDA); degrees; steer toward right, positive.

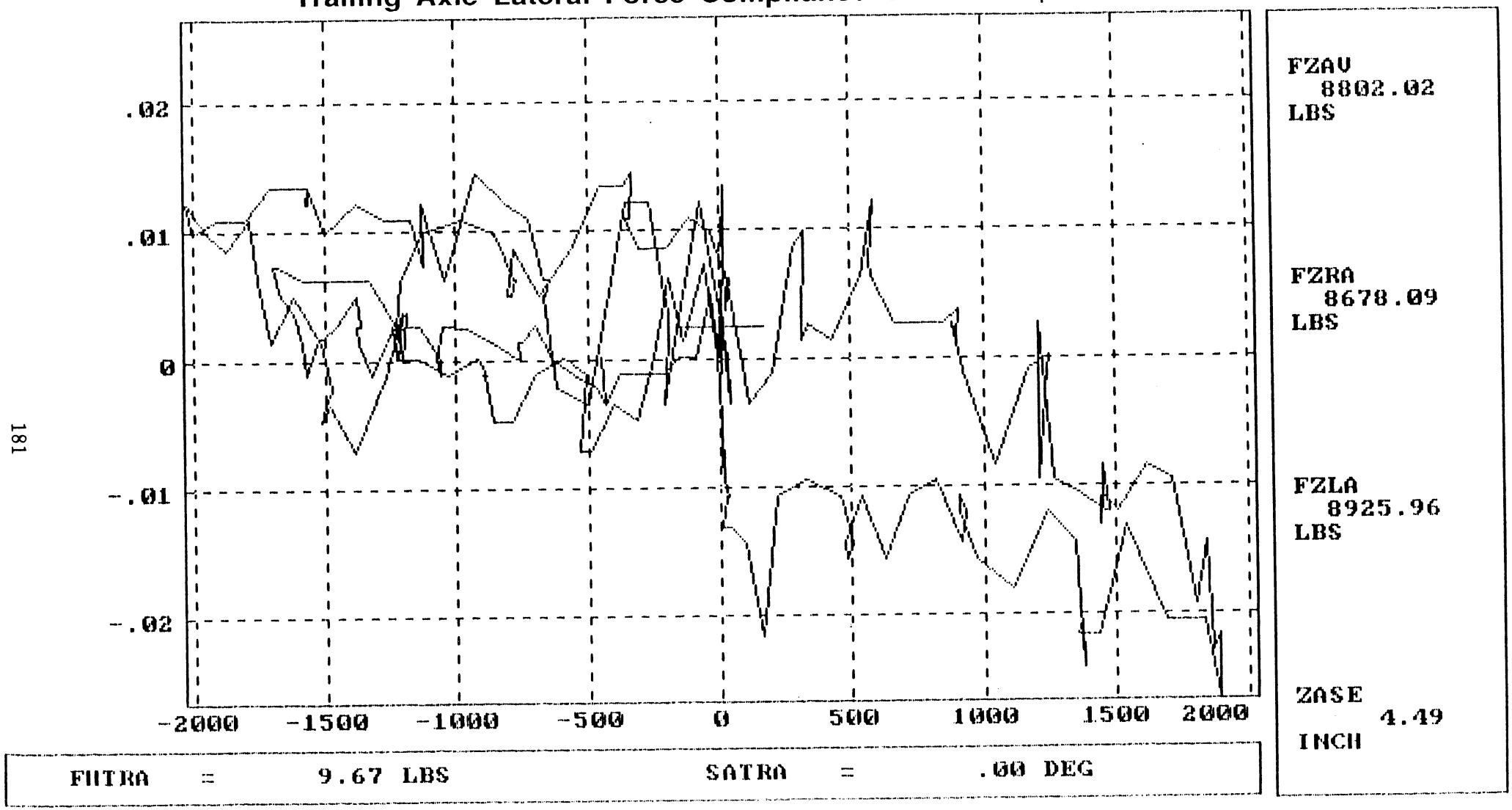
Abscissa: Average leading axle lateral force (FHLDA); lb per wheel set; applied to all four wheel sets simultaneously; force applied toward right, positive.

US DOT
Trailor (France):Flatbed Trailer Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Trailing Axle Lateral Force Compliance Steer

Suspension Load = 36,000 lb.



Ordinate: Average trailing axle steer angle (SATRA); degrees; steer toward right, positive.

Abscissa: Average trailing axle lateral force (FHTRA); lb per wheel set; applied to all four wheel sets simultaneously; force applied toward right, positive.

DATE 1- 7-1987 15:38:22
TYPE OF TEST:LONGITUDINAL FORCE
CUSTOMER:NHTSA
OPERATOR:WINKLER
FILE NAME:D:NHTSATRS.DAT
COMMENT:

****

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD=38000.
NOMINAL STEER ANGLE= .00

****

SUSPENSION DATA

TYPE:4-SPRING LONG EQU
MANUFACTURER:TRAILOR
MODEL:?
RATING:?
OTHER:4-SPRING WITH LONG EQUALIZER (REAR SLIPER TO REAR SLIPPER)

****

VEHICLE DATA

MANUFACTURER:TRAILOR
MODEL:FLATBED
OTHER:EUROPEAN (FRANCE) MANUFACTURE

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	37.00	37.00
SPRING SPACING	38.00	38.00
SPRING LASH	.00	.00
TANDEM SPREAD	54.00	54.00

FACILITY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	72.50	72.38
LATERAL Z-POT SPACING	109.62	107.62
VERTICAL Y-POT POSITION	22.62	22.62

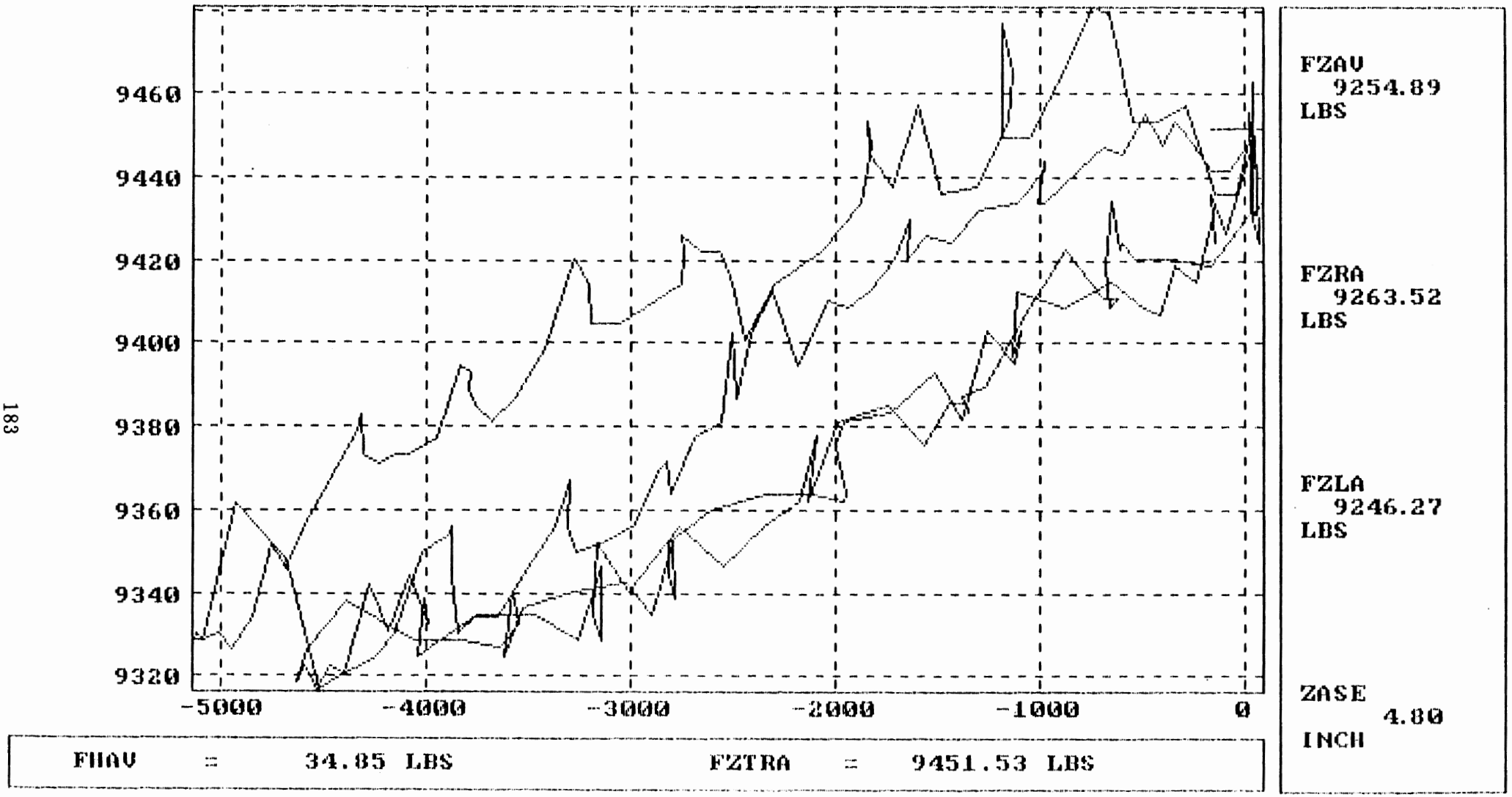
	LEFT	RIGHT
LONG. PAD SPACING	54.50	54.00

Date: Jan 8, 1987

US DOT
Trailor (France):Flatbed Trailer Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Inter-Axle Load Transfer Due To Braking Suspension Load = 38,000 lb.



Ordinate: Average trailing axle vertical wheel load (FZTRA); pounds; spring compression, positive.

Abscissa: Average longitudinal force (FHAV); lb per wheel set; applied to all four wheel sets simultaneously; braking force, negative.

DATE: 1- 7-1987 13:30:25
TYPE OF TEST:LONGITUDINAL FORCE
CUSTOMER:MATSA
OPERATOR:WINKLER
FILE NAME:C:\MATSA7\9.DAT
COMMENT:

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD=24000.
NOMINAL STEER ANGLE= .00

SUSPENSION DATA

TYPE:4-SPRING LONG EQU
MANUFACTURER:TRAILOR
MODEL:?
RATING:?
OTHER:4-SPRING WITH LONG EQUALIZER (REAR SLIPER TO REAR SLIPPER)

VEHICLE DATA

MANUFACTURER:TRAILOR
MODEL:FLATBED
OTHER:EUROPEAN (FRANCE) MANUFACTURE

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	37.00	37.00
SPRING SPACING	38.00	38.00
SPRING LASH	.00	.00
TANDEM SPREAD	54.00	54.00

FACILITY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	72.50	72.38
LATERAL Z-POT SPACING	109.62	107.62
VERTICAL Y-POT POSITION	22.62	22.62
	LEFT	RIGHT
LONG. PAD SPACING	54.50	54.00

Date: Jan 8, 1987

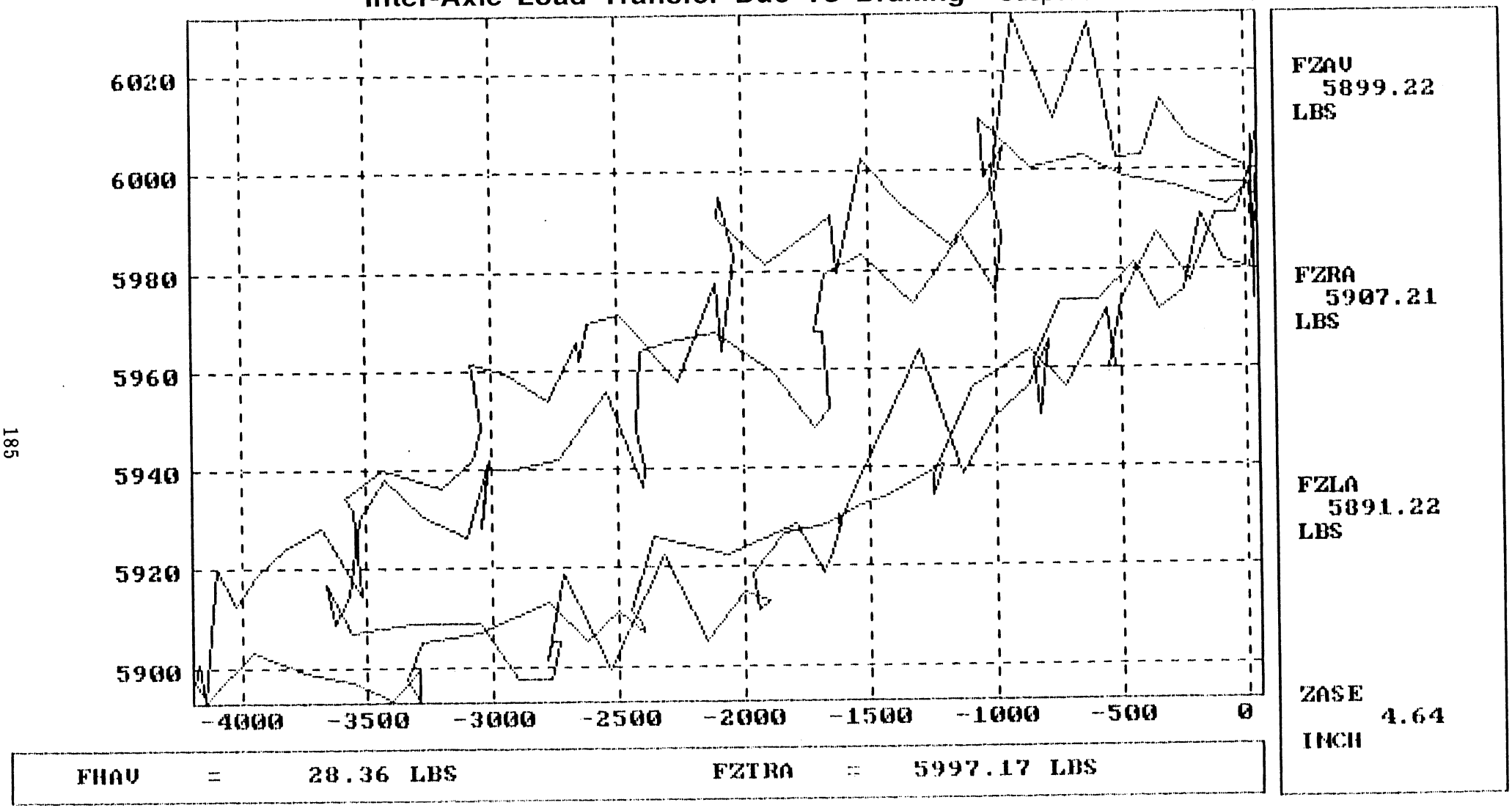
US DOT
Trailor (France):Flatbed Trailer

Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Inter-Axle Load Transfer Due To Braking

Suspension Load = 24,000 lb.



Ordinate: Average trailing axle vertical wheel load (FZTRA); pounds; spring compression, positive.

Abscissa: Average longitudinal force (FHAV); lb per wheel set; applied to all four wheel sets simultaneously; braking force, negative.

DATE 1- 7-1987 15:35: [illegible]
TYPE OF TEST:LONGITUDINAL FORCE
CUSTOMER:NHTSA
OPERATOR:WINKLER
FILE NAME:D:NHTSATRA.DAT
COMMENT:

****

TEST CONDITIONS

PITCH ANGLE= .00
NOMINAL SUSPENSION LOAD=12000.
NOMINAL STEER ANGLE= .00

****

SUSPENSION DATA

TYPE:4-SPRING LONG EQU
MANUFACTURER:TRAILOR
MODEL:?
RATING:?
OTHER:4-SPRING WITH LONG EQUALIZER (REAR SLIPER TO REAR SLIPPER)

****

VEHICLE DATA

MANUFACTURER:TRAILOR
MODEL:FLATBED
OTHER:EUROPEAN (FRANCE) MANUFACTURE

MEASURED DATA

SUSPENSION	LEADING AXLE	TRAILING AXLE
UNSPRUNG MASS	.00	.00
SPRING LENGTH	37.00	37.00
SPRING SPACING	38.00	38.00
SPRING LASH	.00	.00
TANDEM SPREAD	54.00	54.00

FACILTY	LEADING AXLE	TRAILING AXLE
LATERAL PAD SPACING	72.50	72.38
LATERAL Z-POT SPACING	109.62	107.62
VERTICAL Y-POT POSITION	22.62	22.62
	LEFT	RIGHT
LONG. PAD SPACING	54.50	54.00

Date: Jan 8, 1987

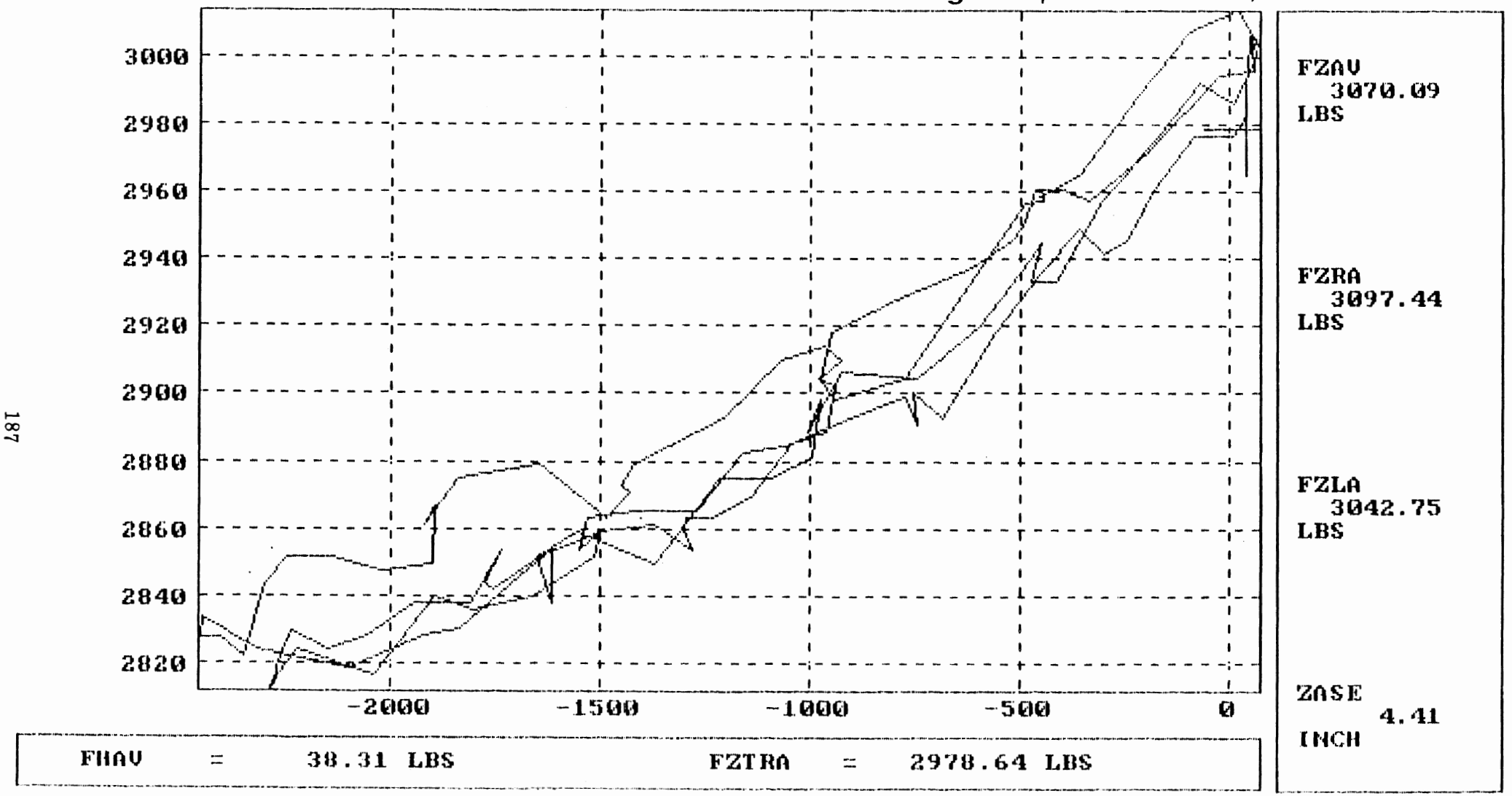
US DOT
Trailor (France):Flatbed Trailer

Tandem Rear Suspension

Date: Jan 8, 1987
Pitch = 0.0 degrees

Inter-Axle Load Transfer Due To Braking

Suspension Load = 12,000 lb.



Ordinate: Average trailing axle vertical wheel load (FZTRA); pounds; spring compression, positive.

Abscissa: Average longitudinal force (FHAV); lb per wheel set; applied to all four wheel sets simultaneously; braking force, negative.

Appendix D

Roll Data Sets and Simulations Results

STATIC ROLL MODEL

FILE NAME:C:VOLVO-LD.ROL

Date: 4-17-1987 Time:10: 9:13

Information for Unit # 1 (Towing Unit)

General Information

Total Weight = 19720.00 Lbs
Total C.G. Height = 35.40 inches
Total Number of Axles = 3

Axles Information, Unit # 1

Axle # 1
Axle load = 12060.00 Lbs
Track Width of the Axle = 78.50 inches
Mass of the Axle = 1500.00 Lbs
Roll Center Height = 17.73 inches
Suspension Stiffness (per Spring) = 1255.40 Lbs/in
Spacing between Suspension Springs = 30.00 inches
Auxiliary Roll Stiffness = 25000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 2
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches

Axle # 2
Axle load = 17305.00 Lbs
Track Width of the Axle = 72.00 inches
Mass of the Axle = 2700.00 Lbs
Roll Center Height = 34.18 inches
Suspension Stiffness (per Spring) = 7340.00 Lbs/in
Spacing between Suspension Springs = 38.50 inches
Auxiliary Roll Stiffness = 10000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches

Axle # 3
Axle load = 17305.00 Lbs
Track Width of the Axle = 72.00 inches
Mass of the Axle = 2500.00 Lbs
Roll Center Height = 33.86 inches
Suspension Stiffness (per Spring) = 7340.00 Lbs/in
Spacing between Suspension Springs = 38.50 inches
Auxiliary Roll Stiffness = 12000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4

Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches

Information for Unit # 2 (Semitrailer)

General Information

Total Weight = 61180.00 Lbs
Total C.G. Height = 73.80 inches
Total Number of Axles = 2

Axles Information, Unit # 2

Axle # 1
Axle load = 17115.00 Lbs
Track Width of the Axle = 71.25 inches
Mass of the Axle = 1800.00 Lbs
Roll Center Height = 29.00 inches
Suspension Stiffness (per Spring) = 8459.40 Lbs/in
Spacing between Suspension Springs = 38.00 inches
Auxiliary Roll Stiffness = 20000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.00 inches

Axle # 2
Axle load = 17115.00 Lbs
Track Width of the Axle = 71.25 inches
Mass of the Axle = 1800.00 Lbs
Roll Center Height = 28.10 inches
Suspension Stiffness (per Spring) = 8459.40 Lbs/in
Spacing between Suspension Springs = 38.00 inches
Auxiliary Roll Stiffness = 20000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.00 inches

STATIC ROLL MODEL
FILE NAME:C:VOLVO-LD.ROL

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00000	.00000	.00000	.00	.00000
1	2	.00000	.00000	.00000	.00	.00000
1	3	.00000	.00000	.00000	.00	.00000
2	1	.00000	.00000	.00000	.00	.00000
2	2	.00000	.00000	.00000	.00	.00000

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.01348	.04870	.05000	2381.31	.39785
1	2	.02330	.05156	.05000	7550.00	.39785
1	3	.02337	.05099	.05000	7571.92	.39785
2	1	.02323	.04530	.05000	7449.51	.39785
2	2	.02286	.04496	.05000	7330.96	.39785

Axle # 2 of Unit # 1 has Lift Off
Axle # 3 of Unit # 1 has Lift Off
Axle # 1 of Unit # 2 has Lift Off

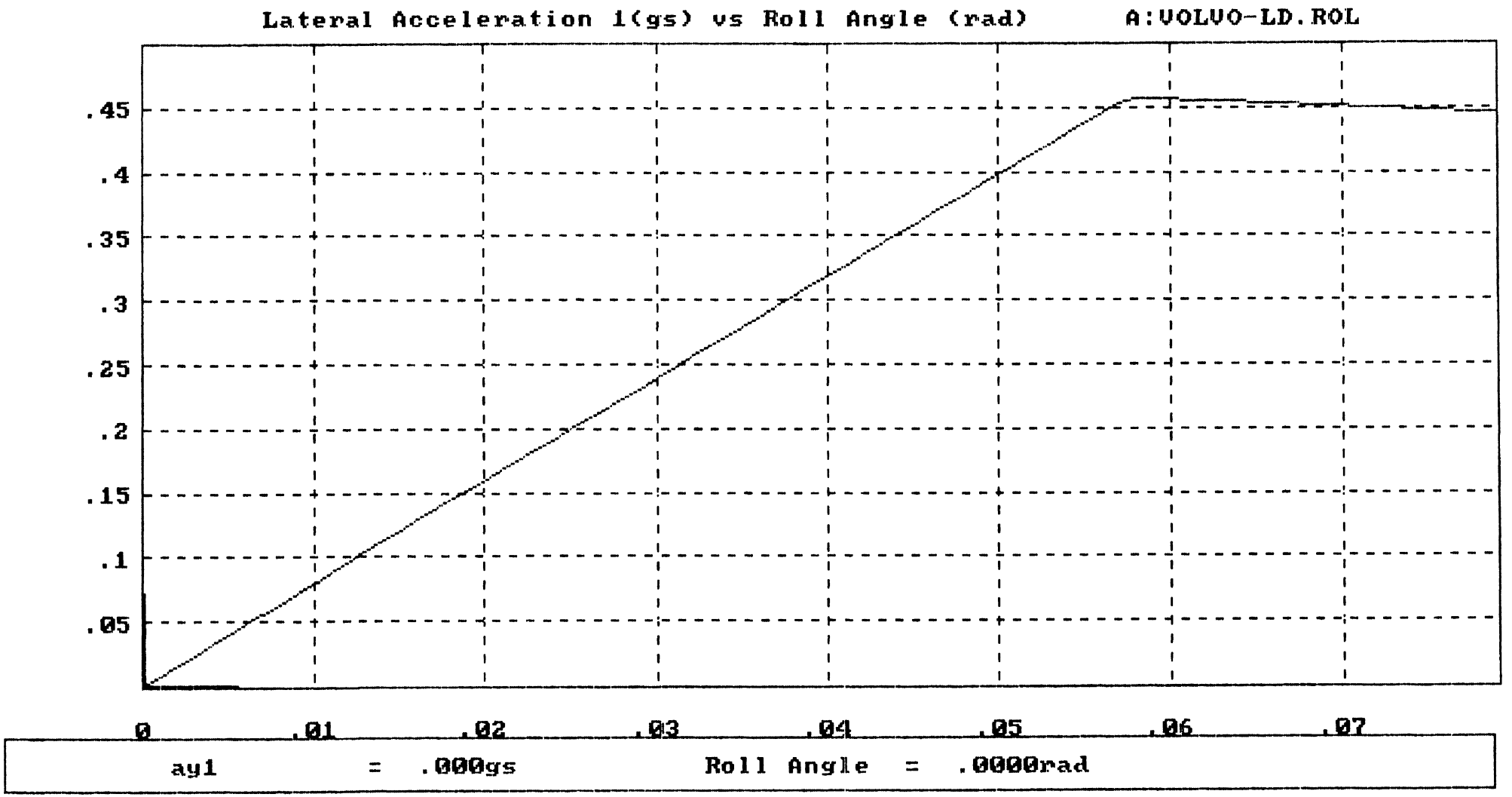
Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.01557	.05658	.05800	2762.31	.45662
1	2	.02747	.05896	.05800	8757.99	.45662
1	3	.02771	.05800	.05800	8783.42	.45662
2	1	.02726	.05203	.05800	8641.43	.45662
2	2	.02646	.05226	.05800	8503.91	.45662

Axle # 2 of Unit # 2 has Lift Off

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.01574	.05767	.05900	2782.15	.45710
1	2	.02855	.05882	.05900	8757.99	.45710
1	3	.02878	.05786	.05900	8783.42	.45710
2	1	.02832	.05193	.05900	8641.43	.45710
2	2	.02705	.05293	.05900	8599.36	.45710

Axle Liftoffs

Unit No	Axle No	Roll Angle (rad)	Lateral Acceleration (g's)
1	2	.05800	.45662
1	3	.05800	.45662
2	1	.05800	.45662
2	2	.05900	.45710


Lateral Acceleration 1(gs) vs Roll Angle (rad)
A:VOLVO-LD.ROL
.45
.4
.35
.3
.25
.2
.15
.1
.05
0
.01
.02
.03
.04
.05
.06
.07
ay1 = .000gs
Roll Angle = .0000rad

STATIC ROLL MODEL

FILE NAME:A:VOLVO-EM.ROL

Date: 4-17-1987 Time:10:39:23

Information for Unit # 1 (Towing Unit)

General Information

Total Weight = 19720.00 Lbs
Total C.G. Height = 35.40 inches
Total Number of Axles = 3

Axles Information, Unit # 1

Axle # 1
Axle load = 11263.00 Lbs
Track Width of the Axle = 78.50 inches
Mass of the Axle = 1500.00 Lbs
Roll Center Height = 18.00 inches
Suspension Stiffness (per Spring) = 1255.40 Lbs/in
Spacing between Suspension Springs = 30.00 inches
Auxiliary Roll Stiffness = 29000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 2
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches

Axle # 2
Axle load = 5700.50 Lbs
Track Width of the Axle = 72.00 inches
Mass of the Axle = 2700.00 Lbs
Roll Center Height = 34.72 inches
Suspension Stiffness (per Spring) = 6013.00 Lbs/in
Spacing between Suspension Springs = 38.50 inches
Auxiliary Roll Stiffness = 10000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches

Axle # 3
Axle load = 5700.50 Lbs
Track Width of the Axle = 72.00 inches
Mass of the Axle = 2500.00 Lbs
Roll Center Height = 34.85 inches
Suspension Stiffness (per Spring) = 60113.00 Lbs/in
Spacing between Suspension Springs = 38.50 inches
Auxiliary Roll Stiffness = 10000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4

Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches

Information for Unit # 2 (Semitrailer)

General Information

Total Weight = 12580.00 Lbs
Total C.G. Height = 40.56 inches
Total Number of Axles = 2

Axles Information, Unit # 2

Axle # 1
Axle load = 4819.00 Lbs
Track Width of the Axle = 71.25 inches
Mass of the Axle = 1800.00 Lbs
Roll Center Height = 30.40 inches
Suspension Stiffness (per Spring) = 5586.00 Lbs/in
Spacing between Suspension Springs = 38.00 inches
Auxiliary Roll Stiffness = 20000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.00 inches

Axle # 2
Axle load = 4819.00 Lbs
Track Width of the Axle = 71.25 inches
Mass of the Axle = 1800.00 Lbs
Roll Center Height = 29.70 inches
Suspension Stiffness (per Spring) = 5586.00 Lbs/in
Spacing between Suspension Springs = 38.00 inches
Auxiliary Roll Stiffness = 20000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.00 inches

STATIC ROLL MODEL
FILE NAME: A:VOLVO-EM.ROL

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00000	.00000	.00000	.00	.00000
1	2	.00000	.00000	.00000	.00	.00000
1	3	.00000	.00000	.00000	.00	.00000
2	1	.00000	.00000	.00000	.00	.00000
2	2	.00000	.00000	.00000	.00	.00000

Axle # 3 of Unit # 1 has Lift Off

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00977	.00037	.01000	1765.05	.64266
1	2	.00710	.01232	.01000	2321.51	.64266
1	3	.00949	.00220	.01000	3054.96	.64266
2	1	.00622	.01143	.01000	2014.01	.64266
2	2	.00611	.01123	.01000	1979.93	.64266

Axle # 2 of Unit # 1 has Lift Off
Axle # 1 of Unit # 2 has Lift Off
Axle # 2 of Unit # 2 has Lift Off

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.01162	.00229	.01300	2083.18	.74463
1	2	.00902	.01690	.01300	2901.91	.74463
1	3	.01258	.00182	.01300	3054.96	.74463
2	1	.00818	.01457	.01300	2511.52	.74463
2	2	.00785	.01489	.01300	2467.04	.74463

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.02005	.04962	.05000	3541.34	.80501
1	2	.04675	.01379	.05000	2901.91	.80501
1	3	.04966	.00146	.05000	3054.96	.80501
2	1	.04598	.01215	.05000	2511.52	.80501
2	2	.04567	.01251	.05000	2467.04	.80501

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.03144	.11358	.10000	5553.42	.88659
1	2	.09774	.00958	.10000	2901.91	.88659
1	3	.09777	.00099	.10000	3054.96	.88659
2	1	.09707	.00828	.10000	2511.52	.88659
2	2	.09679	.00929	.10000	2467.04	.88659

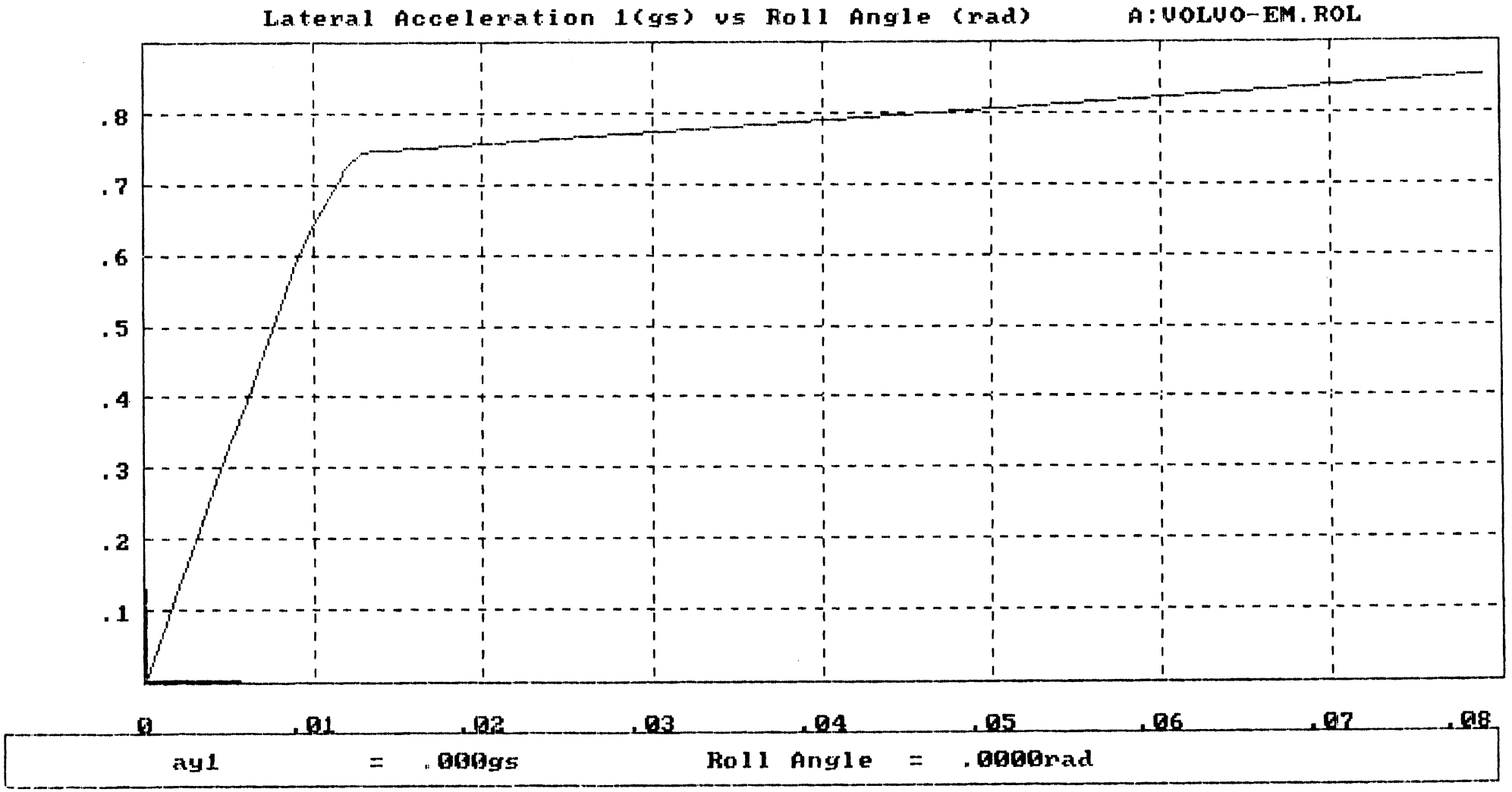
Axle # 1 of Unit # 1 has Lift Off

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.03194	.11606	.10200	5633.90	.88969
1	2	.09978	.00942	.10200	2901.91	.88969

1	3	.10177	.00097	.10200	3054.96	.88969
2	1	.09911	.00875	.10200	2511.52	.88969
2	2	.09883	.00916	.10200	2467.04	.88969

Axle Liftoffs

Unit No	Axle No	Roll Angle (rad)	Lateral Acceleration (g's)
1	1	.10200	.98949
1	2	.01300	.74463
1	3	.01000	.64266
2	1	.01300	.74463
2	2	.01300	.74463


Lateral Acceleration 1(gs) vs Roll Angle (rad)
A:VOLVO-EM.ROL
.8
.7
.6
.5
.4
.3
.2
.1
0
.01
.02
.03
.04
.05
.06
.07
.08
ay1 = .000gs
Roll Angle = .0000rad

STATIC ROLL MODEL

FILE NAME:A:USA-LD.ROL

Date: 4-17-1987 Time:10: 5: 1

Information for Unit # 1 (Towing Unit)

General Information

Total Weight = 17000.00 Lbs
Total C.G. Height = 32.00 inches
Total Number of Axles = 3

Axles Information, Unit # 1

Axle # 1
Axle load = 12480.00 Lbs
Track Width of the Axle = 80.00 inches
Mass of the Axle = 1200.00 Lbs
Roll Center Height = 19.00 inches
Suspension Stiffness (per Spring) = 1032.06 Lbs/in
Spacing between Suspension Springs = 35.00 inches
Auxiliary Roll Stiffness = 8000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 2
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches

Axle # 2
Axle load = 17150.00 Lbs
Track Width of the Axle = 72.00 inches
Mass of the Axle = 2500.00 Lbs
Roll Center Height = 27.00 inches
Suspension Stiffness (per Spring) = 5783.17 Lbs/in
Spacing between Suspension Springs = 40.00 inches
Auxiliary Roll Stiffness = 15000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches

Axle # 3
Axle load = 17150.00 Lbs
Track Width of the Axle = 72.00 inches
Mass of the Axle = 2500.00 Lbs
Roll Center Height = 27.00 inches
Suspension Stiffness (per Spring) = 5783.17 Lbs/in
Spacing between Suspension Springs = 40.00 inches
Auxiliary Roll Stiffness = 15000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4

Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches

Information for Unit # 2 (Semitrailer)

General Information

Total Weight = 64100.00 Lbs
Total C.G. Height = 75.60 inches
Total Number of Axles = 2

Axles Information, Unit # 2

Axle # 1
Axle load = 17160.00 Lbs
Track Width of the Axle = 72.00 inches
Mass of the Axle = 1500.00 Lbs
Roll Center Height = 24.00 inches
Suspension Stiffness (per Spring) = 6375.50 Lbs/in
Spacing between Suspension Springs = 38.00 inches
Auxiliary Roll Stiffness = 30000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches

Axle # 2
Axle load = 17160.00 Lbs
Track Width of the Axle = 72.00 inches
Mass of the Axle = 1500.00 Lbs
Roll Center Height = 24.00 inches
Suspension Stiffness (per Spring) = 6375.50 Lbs/in
Spacing between Suspension Springs = 38.00 inches
Auxiliary Roll Stiffness = 30000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches

STATIC ROLL MODEL
FILE NAME:A:USA-LD.ROL

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00000	.00000	.00000	.00	.00000
1	2	.00000	.00000	.00000	.00	.00000
1	3	.00000	.00000	.00000	.00	.00000
2	1	.00000	.00000	.00000	.00	.00000
2	2	.00000	.00000	.00000	.00	.00000

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00913	.05542	.05000	1643.93	.28835
1	2	.01791	.05120	.05000	5801.91	.28835
1	3	.01791	.05120	.05000	5801.91	.28835
2	1	.01823	.04755	.05000	5906.00	.28835
2	2	.01823	.04755	.05000	5906.00	.28835

Axle # 1 of Unit # 2 has Lift Off
Axle # 2 of Unit # 2 has Lift Off

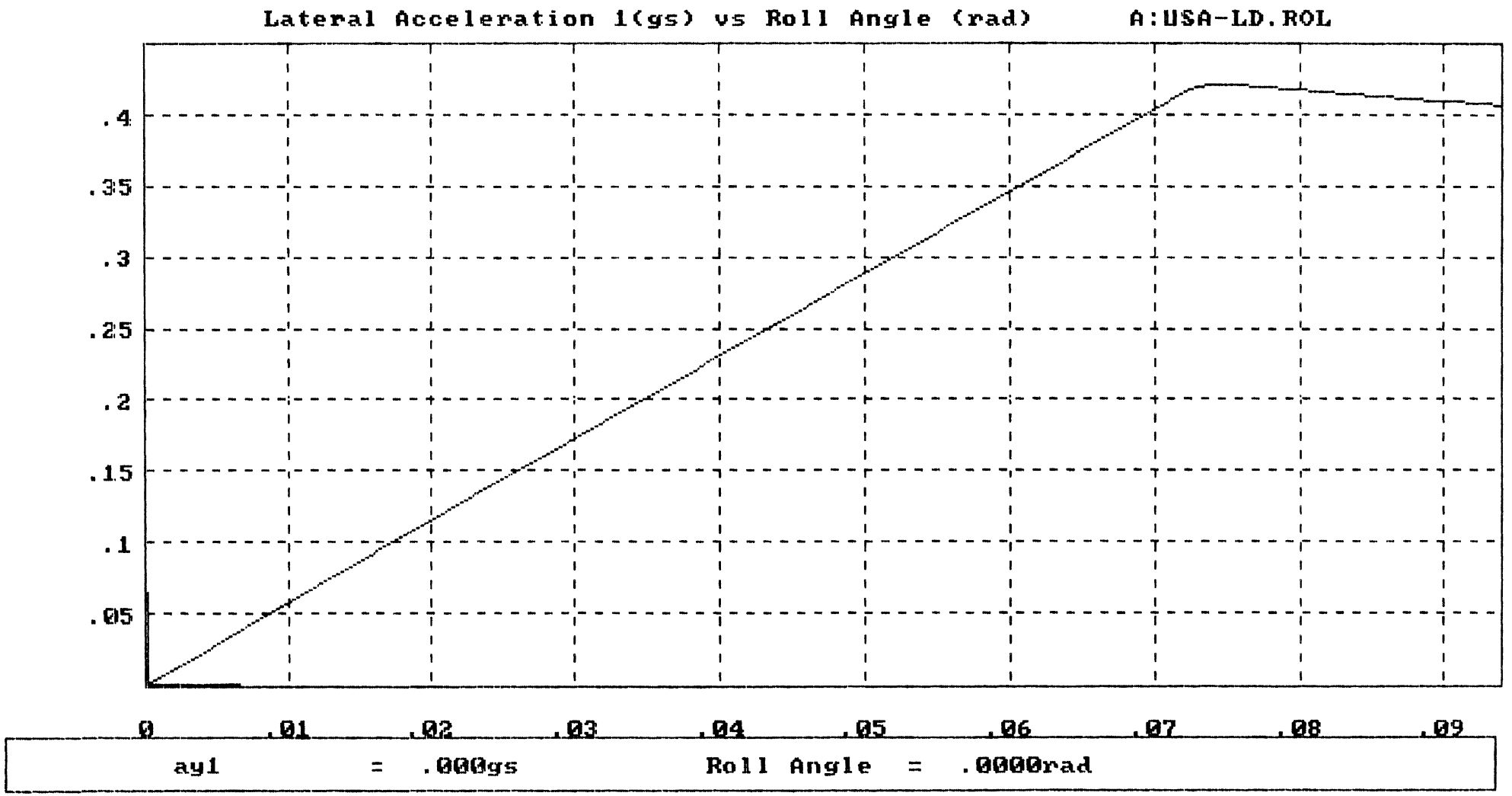
Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.01331	.08095	.07300	2400.14	.41963
1	2	.02613	.07479	.07300	8470.79	.41963
1	3	.02613	.07479	.07300	8470.79	.41963
2	1	.02689	.06900	.07300	8622.76	.41963
2	2	.02689	.06900	.07300	8622.76	.41963

Axle # 2 of Unit # 1 has Lift Off
Axle # 3 of Unit # 1 has Lift Off

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.01353	.08337	.07500	2441.35	.42117
1	2	.02736	.07601	.07500	8662.01	.42117
1	3	.02736	.07601	.07500	8662.01	.42117
2	1	.02905	.06876	.07500	8622.76	.42117
2	2	.02905	.06876	.07500	8622.76	.42117

Axle Liftoffs

Unit No	Axle No	Roll Angle (rad)	Lateral Acceleration (g's)
1	2	.07500	.42117
1	3	.07500	.42117
2	1	.07300	.41963
2	2	.07300	.41963


Lateral Acceleration 1(gs) vs Roll Angle (rad)
A:USA-LD.ROL
.4
.35
.3
.25
.2
.15
.1
.05
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
ay1 = .000gs
Roll Angle = .0000rad

STATIC ROLL MODEL

FILE NAME:A:USA-EM.ROL

Date: 4-17-1987 Time:10:12:27

Information for Unit # 1 (Towing Unit)

General Information

Total Weight = 17000.00 Lbs
Total C.G. Height = 32.00 inches
Total Number of Axles = 3

Axles Information, Unit # 1

Axle # 1
Axle load = 9792.50 Lbs
Track Width of the Axle = 80.00 inches
Mass of the Axle = 1200.00 Lbs
Roll Center Height = 19.00 inches
Suspension Stiffness (per Spring) = 1032.06 Lbs/in
Spacing between Suspension Springs = 35.00 inches
Auxiliary Roll Stiffness = 8000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 2
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches

Axle # 2
Axle load = 5401.40 Lbs
Track Width of the Axle = 72.00 inches
Mass of the Axle = 2500.00 Lbs
Roll Center Height = 28.50 inches
Suspension Stiffness (per Spring) = 4200.00 Lbs/in
Spacing between Suspension Springs = 40.00 inches
Auxiliary Roll Stiffness = 15000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches

Axle # 3
Axle load = 5401.40 Lbs
Track Width of the Axle = 72.00 inches
Mass of the Axle = 2500.00 Lbs
Roll Center Height = 28.50 inches
Suspension Stiffness (per Spring) = 4200.00 Lbs/in
Spacing between Suspension Springs = 40.00 inches
Auxiliary Roll Stiffness = 15000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4

Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches

Information for Unit # 2 (Semitrailer)

General Information

Total Weight = 12580.00 Lbs
Total C.G. Height = 40.50 inches
Total Number of Axles = 2

Axles Information, Unit # 2

Axle # 1
Axle load = 4492.35 Lbs
Track Width of the Axle = 72.00 inches
Mass of the Axle = 1500.00 Lbs
Roll Center Height = 24.61 inches
Suspension Stiffness (per Spring) = 4550.00 Lbs/in
Spacing between Suspension Springs = 38.00 inches
Auxiliary Roll Stiffness = 30000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches

Axle # 2
Axle load = 4492.35 Lbs
Track Width of the Axle = 72.00 inches
Mass of the Axle = 1500.00 Lbs
Roll Center Height = 24.61 inches
Suspension Stiffness (per Spring) = 4550.00 Lbs/in
Spacing between Suspension Springs = 38.00 inches
Auxiliary Roll Stiffness = 30000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches

STATIC ROLL MODEL
FILE NAME:A:USA-EM.ROL

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00000	.00000	.00000	.00	.00000
1	2	.00000	.00000	.00000	.00	.00000
1	3	.00000	.00000	.00000	.00	.00000
2	1	.00000	.00000	.00000	.00	.00000
2	2	.00000	.00000	.00000	.00	.00000

Axle # 1 of Unit # 2 has Lift Off
Axle # 2 of Unit # 2 has Lift Off

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.01094	.00554	.01400	1999.49	.79556
1	2	.00795	.01843	.01400	2592.18	.79556
1	3	.00795	.01843	.01400	2592.18	.79556
2	1	.00746	.01557	.01400	2317.53	.79556
2	2	.00746	.01557	.01400	2317.53	.79556

Axle # 2 of Unit # 1 has Lift Off
Axle # 3 of Unit # 1 has Lift Off

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.01131	.00668	.01500	2042.27	.81687
1	2	.00847	.01989	.01500	2719.67	.81687
1	3	.00847	.01989	.01500	2719.67	.81687
2	1	.00866	.01510	.01500	2317.53	.81687
2	2	.00866	.01510	.01500	2317.53	.81687

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.01591	.06172	.05000	2863.83	.84536
1	2	.04414	.01785	.05000	2719.67	.84536
1	3	.04414	.01785	.05000	2719.67	.84536
2	1	.04422	.01376	.05000	2317.53	.84536
2	2	.04422	.01376	.05000	2317.53	.84536

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.02248	.14036	.10000	4046.71	.88606
1	2	.09509	.01494	.10000	2719.67	.88606
1	3	.09509	.01494	.10000	2719.67	.88606
2	1	.09502	.01185	.10000	2317.53	.88606
2	2	.09502	.01185	.10000	2317.53	.88606

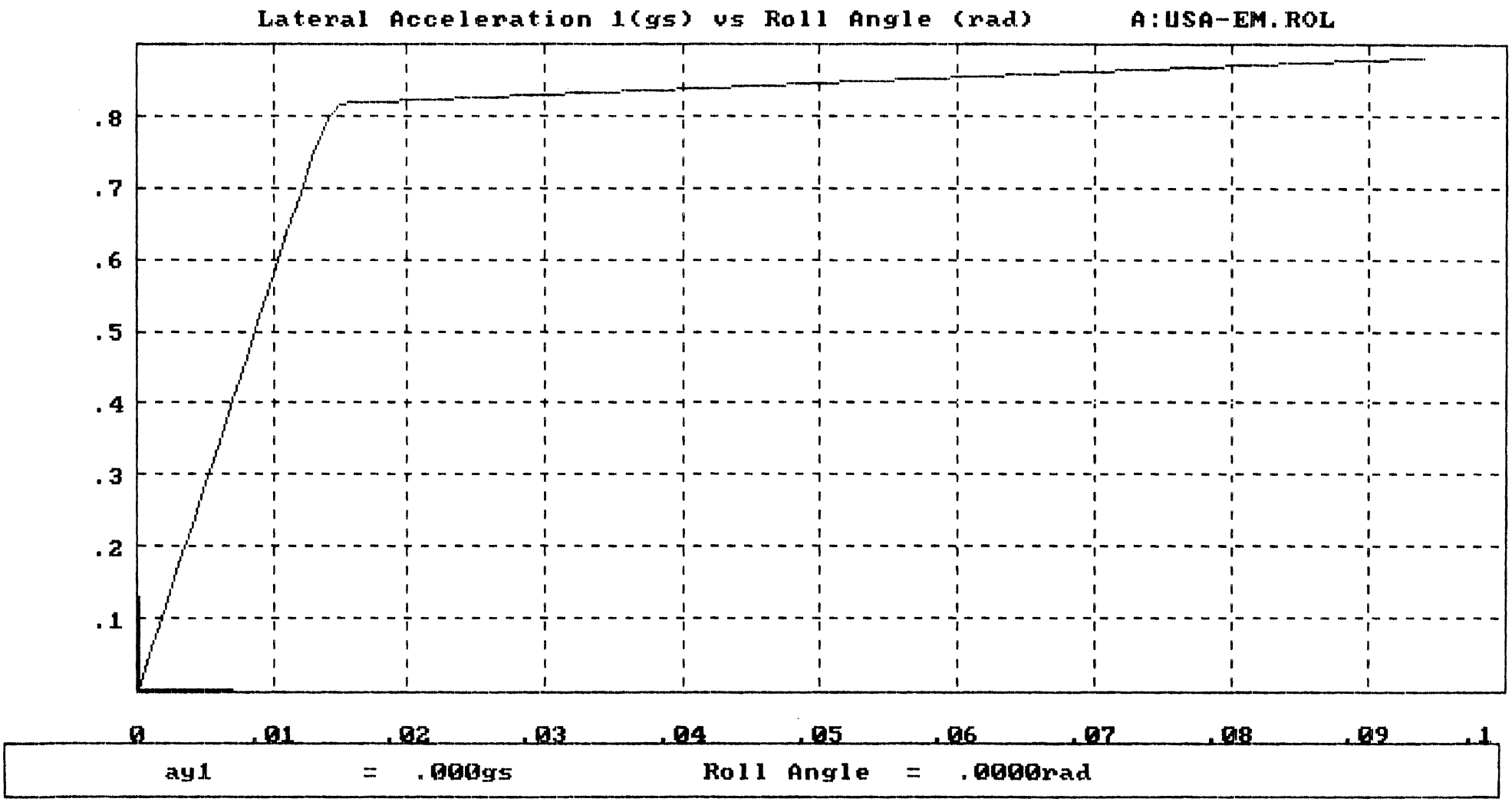
Axle # 1 of Unit # 1 has Lift Off

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.02729	.19683	.13600	4898.39	.91520
1	2	.13178	.01285	.13600	2719.67	.91520
1	3	.13178	.01285	.13600	2719.67	.91520

2	1	.13160	.01048	.13600	2317.53	.91520
2	2	.13160	.01048	.13600	2317.53	.91520

Axle Liftoffs

Unit No	Axle No	Roll Angle (rad)	Lateral Acceleration (g's)
1	1	.13600	.91520
1	2	.01500	.81687
1	3	.01500	.81687
2	1	.01400	.79556
2	2	.01400	.79556


Lateral Acceleration 1(gs) vs Roll Angle (rad)
A:USA-EM.ROL
.8
.7
.6
.5
.4
.3
.2
.1
0
.01
.02
.03
.04
.05
.06
.07
.08
.09
.1
ay1 = .000gs
Roll Angle = .0000rad

Appendix E

Handling Data Sets and Simulations Results

HANDLING MODEL

FILE NAME:A:VOLVO-LD.HND

Date: 4-17-1987 Time:10:27:53

Information for Unit # 1 (Towing Unit)

General Information

Total Weight = 19720.00 Lbs
Total C.G. Height = 35.40 inches
Total Number of Axles = 3
Distance from C.G. to Rear Articulation Point = 81.65 inches

Steering System Information

Steering Gear Ratio = 24.35
Steering Stiffness = 12685.00 in-lb/deg
Tie Rod Stiffness = 40000.00 in-lb/deg
Mechanical Trail = 1.500
Aligning Moment per Tire = 1786.00 in-lb/deg

Axles Information, Unit # 1

Axle # 1
C.G - Axle Distance (negative if rear of CG) = 66.50 inches
Axle load = 12060.00 Lbs
Track Width of the Axle = 78.50 inches
Mass of the Axle = 1500.00 Lbs
Roll Center Height = 17.73 inches
Suspension Stiffness (per Spring) = 1255.40 Lbs/in
Spacing between Suspension Springs = 30.00 inches
Auxiliary Roll Stiffness = 25000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 2
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches
Nominal Load of the Tire = 6040.00 Lbs

Cornering Stiffness Table

Vertical Force (Lbs)	Cornering Stiffness (Lb/deg)
1983.00	356.94
5967.00	835.38
9441.00	944.10

Axle # 2
C.G - Axle Distance (negative if rear of CG) = -59.75 inches
Axle load = 17305.00 Lbs
Track Width of the Axle = 72.00 inches
Mass of the Axle = 2700.00 Lbs
Roll Center Height = 33.91 inches
Suspension Stiffness (per Spring) = 7340.00 Lbs/in
Spacing between Suspension Springs = 38.50 inches

Auxiliary Roll Stiffness = 11000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.00 inches
Nominal Load of the Tire = 6040.00 Lbs

Cornering Stiffness Table

Vertical Force (Lbs)	Cornering Stiffness (Lb/deg)
1983.00	356.94
5967.00	835.38
9441.00	944.10

Axle # 3
C.G - Axle Distance (negative if rear of CG) = -113.75 inches
Axle load = 17305.00 Lbs
Track Width of the Axle = 72.00 inches
Mass of the Axle = 2500.00 Lbs
Roll Center Height = 34.15 inches
Suspension Stiffness (per Spring) = 7340.00 Lbs/in
Spacing between Suspension Springs = 38.50 inches
Auxiliary Roll Stiffness = 11000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.00 inches
Nominal Load of the Tire = 6040.00 Lbs

Cornering Stiffness Table

Vertical Force (Lbs)	Cornering Stiffness (Lb/deg)
1983.00	356.94
5967.00	835.38
9441.00	944.10

Information for Unit # 2 (Semitrailer)

General Information

Total Weight = 61180.00 Lbs
Total C.G. Height = 73.80 inches
Total Number of Axles = 2
Distance from C.G. to Rear Articulation Point = 248.10 inches
Distance from C.G. to Front Articulation Point = 195.40 inches

Axles Information, Unit # 2

Axle # 1
C.G - Axle Distance (negative if rear of CG) = -126.85 inches
Axle load = 17115.00 Lbs
Track Width of the Axle = 71.25 inches
Mass of the Axle = 1800.00 Lbs
Roll Center Height = 29.00 inches
Suspension Stiffness (per Spring) = 8459.40 Lbs/in
Spacing between Suspension Springs = 38.00 inches
Auxiliary Roll Stiffness = 20000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.00 inches
Nominal Load of the Tire = 6040.00 Lbs

Cornering Stiffness Table

Vertical Force (Lbs)	Cornering Stiffness (Lb/deg)
1983.00	356.94
5967.00	835.38
9441.00	944.10

Axle # 2
C.G - Axle Distance (negative if rear of CG) = -180.85 inches
Axle load = 17115.00 Lbs
Track Width of the Axle = 71.25 inches
Mass of the Axle = 1800.00 Lbs
Roll Center Height = 28.10 inches
Suspension Stiffness (per Spring) = 8459.40 Lbs/in
Spacing between Suspension Springs = 38.00 inches
Auxiliary Roll Stiffness = 20000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.00 inches
Nominal Load of the Tire = 6040.00 Lbs

Cornering Stiffness Table

Vertical Force (Lbs)	Cornering Stiffness (Lb/deg)
1983.00	356.94
5967.00	835.38
9441.00	944.10

STEADY TURN MODEL
FILE NAME:A:VOLVO-LD.HND
FORWARD VELOCITY = 50.00 MPH

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00000	.00000	.00000	.00	.00000
1	2	.00000	.00000	.00000	.00	.00000
1	3	.00000	.00000	.00000	.00	.00000
2	1	.00000	.00000	.00000	.00	.00000
2	2	.00000	.00000	.00000	.00	.00000

*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 179.8550 in
*Rate of Change of Le = -.4578 in/g
*Understeer Gradient (Ue) = .0797 rad/g
*Rate of Change of Ue = .0002 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0000 rad
*Rate of Change of delta = .1693
*Force at the Fifth Wheel = .00 Lbs

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00169	.00612	.00629	299.37	.05000
1	2	.00292	.00645	.00629	947.27	.05000
1	3	.00294	.00646	.00629	952.83	.05000
2	1	.00292	.00570	.00629	936.55	.05000
2	2	.00287	.00565	.00629	921.65	.05000

*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 179.7865 in
*Rate of Change of Le = -3.5095 in/g
*Understeer Gradient (Ue) = .0795 rad/g
*Rate of Change of Ue = -.0090 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0085 rad
*Rate of Change of delta = .1685
*Force at the Fifth Wheel = 1363.67 Lbs

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00339	.01225	.01258	598.73	.10000
1	2	.00585	.01289	.01258	1894.55	.10000
1	3	.00588	.01291	.01258	1905.65	.10000
2	1	.00584	.01139	.01258	1873.09	.10000
2	2	.00575	.01131	.01258	1843.30	.10000

*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 179.5801 in
*Rate of Change of Le = -5.3406 in/g
*Understeer Gradient (Ue) = .0788 rad/g
*Rate of Change of Ue = -.0194 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0168 rad
*Rate of Change of delta = .1661
*Force at the Fifth Wheel = 2727.02 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.00508	.01837	.01886	898.10	.15000
1	2	.00877	.01934	.01886	2841.82	.15000
1	3	.00882	.01937	.01886	2858.48	.15000
2	1	.00876	.01709	.01886	2809.64	.15000
2	2	.00862	.01696	.01886	2764.95	.15000

*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 179.2334 in
*Rate of Change of Le = -8.6975 in/g
*Understeer Gradient (Ue) = .0775 rad/g
*Rate of Change of Ue = -.0304 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0250 rad
*Rate of Change of delta = .1616
*Force at the Fifth Wheel = 4089.73 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.00678	.02450	.02515	1197.47	.20000
1	2	.01169	.02579	.02515	3789.10	.20000
1	3	.01176	.02582	.02515	3811.30	.20000
2	1	.01168	.02279	.02515	3746.19	.20000
2	2	.01150	.02261	.02515	3686.60	.20000

*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 178.7415 in
*Rate of Change of Le = -11.4441 in/g
*Understeer Gradient (Ue) = .0756 rad/g
*Rate of Change of Ue = -.0449 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0329 rad
*Rate of Change of delta = .1546
*Force at the Fifth Wheel = 5451.51 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.00847	.03062	.03144	1496.83	.25000

1	2	.01462	.03224	.03144	4736.37	.25000
1	3	.01470	.03228	.03144	4764.13	.25000
2	1	.01461	.02848	.03144	4682.74	.25000
2	2	.01437	.02827	.03144	4608.25	.25000

*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 178.0979 in
*Rate of Change of Le = -14.6484 in/g
*Understeer Gradient (Ue) = .0729 rad/g
*Rate of Change of Ue = -.0628 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0404 rad
*Rate of Change of delta = .1442
*Force at the Fifth Wheel = 6812.05 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.01017	.03674	.03773	1796.20	.30000
1	2	.01754	.03868	.03773	5683.65	.30000
1	3	.01764	.03874	.03773	5716.96	.30000
2	1	.01753	.03418	.03773	5619.28	.30000
2	2	.01725	.03392	.03773	5529.90	.30000

*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 177.2934 in
*Rate of Change of Le = -17.7002 in/g
*Understeer Gradient (Ue) = .0692 rad/g
*Rate of Change of Ue = -.0873 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0473 rad
*Rate of Change of delta = .1287
*Force at the Fifth Wheel = 8171.09 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.01186	.04287	.04402	2095.57	.35000
1	2	.02047	.04513	.04402	6630.92	.35000
1	3	.02059	.04519	.04402	6669.78	.35000
2	1	.02045	.03988	.04402	6555.83	.35000
2	2	.02012	.03958	.04402	6451.54	.35000

*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 176.3160 in
*Rate of Change of Le = -21.3623 in/g
*Understeer Gradient (Ue) = .0640 rad/g
*Rate of Change of Ue = -.1223 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0532 rad
*Rate of Change of delta = .1054
*Force at the Fifth Wheel = 9528.39 Lbs

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.01356	.04899	.05030	2394.93	.40000
1	2	.02339	.05158	.05030	7578.20	.40000
1	3	.02353	.05165	.05030	7622.61	.40000
2	1	.02337	.04557	.05030	7492.38	.40000
2	2	.02300	.04523	.05030	7373.19	.40000

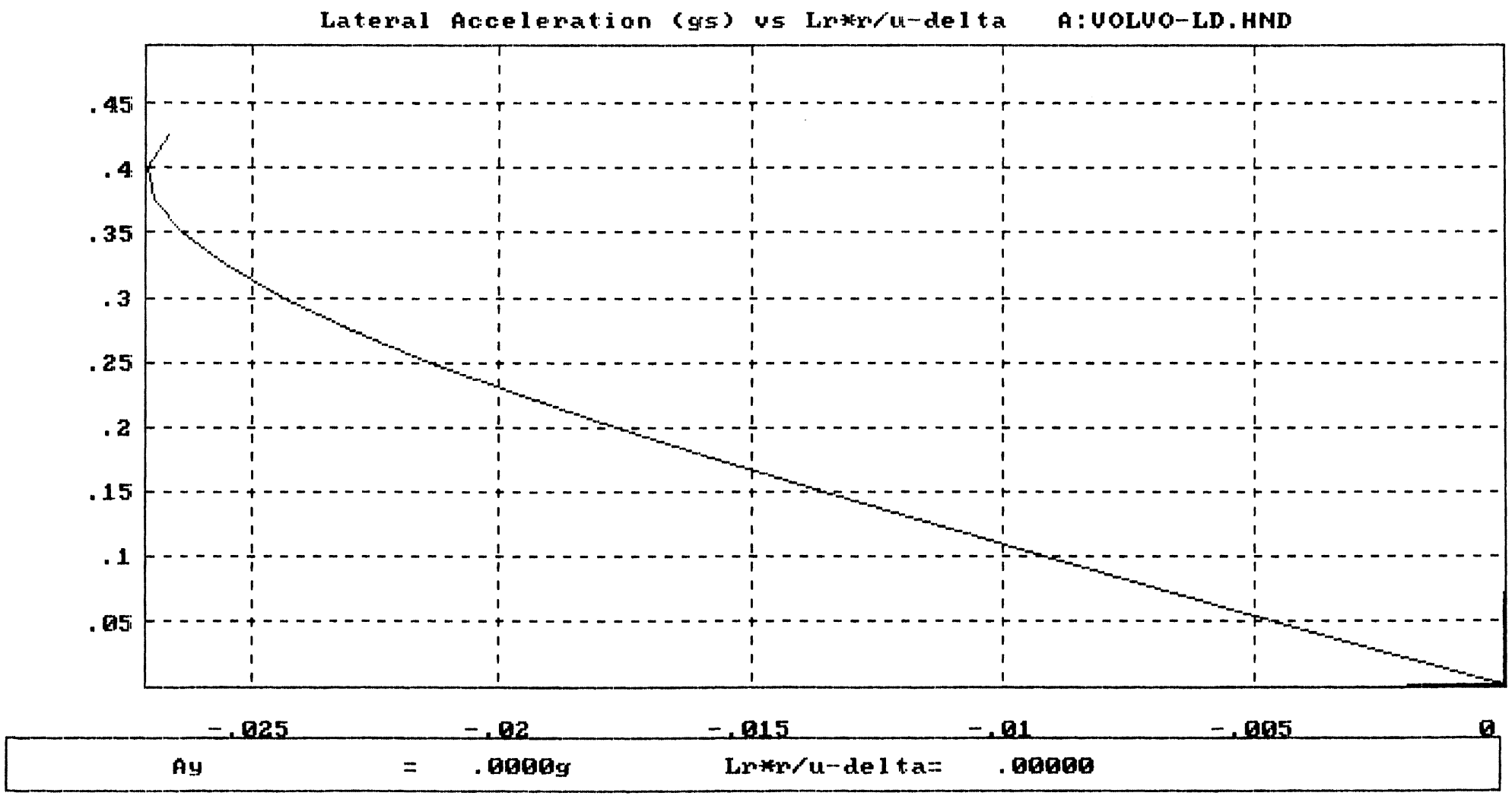
*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 175.1501 in
*Rate of Change of Le = -25.4822 in/g
*Understeer Gradient (Ue) = .0568 rad/g
*Rate of Change of Ue = -.1709 rad
*Critical Velocity = 133.2792 mph
*Steer Angle (delta) = .0576 rad
*Rate of Change of delta = .0706
*Force at the Fifth Wheel = 10883.79 Lbs

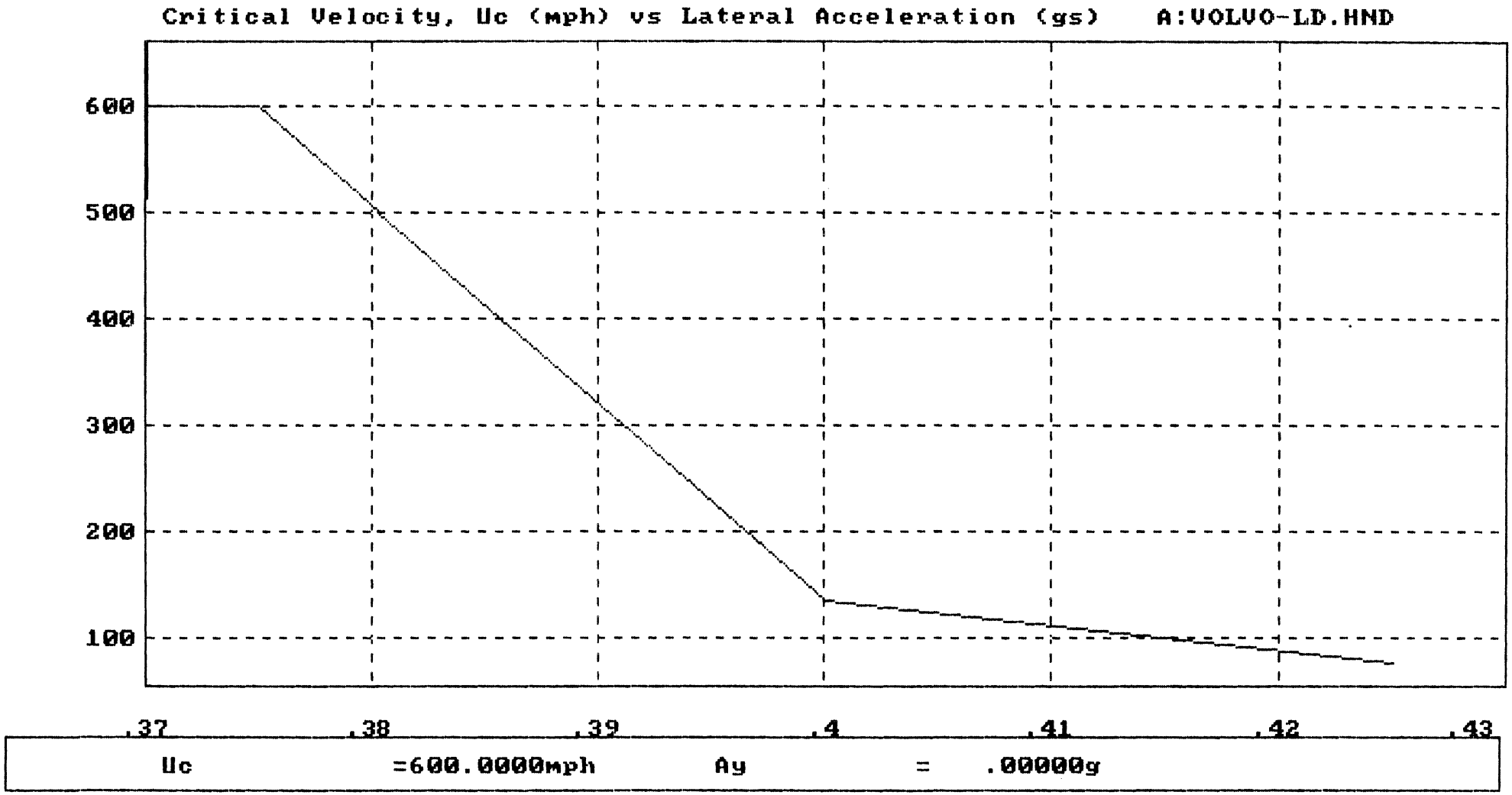
Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.01525	.05512	.05659	2694.30	.45000
1	2	.02631	.05802	.05659	8525.47	.45000
1	3	.02647	.05811	.05659	8575.43	.45000
2	1	.02629	.05127	.05659	8428.92	.45000
2	2	.02587	.05088	.05659	8294.84	.45000

*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 173.7756 in
*Rate of Change of Le = -30.0598 in/g
*Understeer Gradient (Ue) = .0465 rad/g
*Rate of Change of Ue = -.2461 rad
*Critical Velocity = 55.7546 mph
*Steer Angle (delta) = .0599 rad
*Rate of Change of delta = .0156
*Force at the Fifth Wheel = 12237.21 Lbs

Axle # 2 of Unit # 1 has Lift Off

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	2	.02778	.06125	.05973	8999.11	.47500


Lateral Acceleration (gs) vs Lr*r/u-delta A:VOLVO-LD.HND
.45
.4
.35
.3
.25
.2
.15
.1
.05
-.025
-.02
-.015
-.01
-.005
0
Ay = .0000g Lr*r/u-delta= .00000


Critical Velocity, Uc (mph) vs Lateral Acceleration (gs) A:VOLVO-LD.HND
600
500
400
300
200
100
.37
.38
.39
.4
.41
.42
.43
Uc =600.0000mph Ay = .00000g

HANDLING MODEL

FILE NAME:A:VOLVO-EM.HND

Date: 4-17-1987 Time:10:42:26

Information for Unit # 1 (Towing Unit)

General Information

Total Weight = 19720.00 Lbs
Total C.G. Height = 35.40 inches
Total Number of Axles = 3
Distance from C.G. to Rear Articulation Point = 81.65 inches

Steering System Information

Steering Gear Ratio = 24.35
Steering Stiffness = 12685.00 in-lb/deg
Tie Rod Stiffness = 40000.00 in-lb/deg
Mechanical Trail = 1.500
Aligning Moment per Tire = 1640.00 in-lb/deg

Axles Information, Unit # 1

Axle # 1
C.G - Axle Distance (negative if rear of CG) = 66.50 inches
Axle load = 11263.00 Lbs
Track Width of the Axle = 78.50 inches
Mass of the Axle = 1500.00 Lbs
Roll Center Height = 18.00 inches
Suspension Stiffness (per Spring) = 1255.40 Lbs/in
Spacing between Suspension Springs = 30.00 inches
Auxiliary Roll Stiffness = 28000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 2
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches
Nominal Load of the Tire = 6040.00 Lbs

Cornering Stiffness Table

Vertical Force (Lbs)	Cornering Stiffness (Lb/deg)
1983.00	356.94
5967.00	835.38
9441.00	944.17

Axle # 2
C.G - Axle Distance (negative if rear of CG) = -59.75 inches
Axle load = 5700.50 Lbs
Track Width of the Axle = 72.00 inches
Mass of the Axle = 2700.00 Lbs
Roll Center Height = 34.72 inches
Suspension Stiffness (per Spring) = 6013.00 Lbs/in
Spacing between Suspension Springs = 38.50 inches

Auxiliary Roll Stiffness = 10000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches
Nominal Load of the Tire = 6040.00 Lbs

Cornering Stiffness Table

Vertical Force (Lbs)	Cornering Stiffness (Lb/deg)
500.00	94.00
2000.00	391.58
4000.00	690.24

Axle # 3
C.G - Axle Distance (negative if rear of CG) = -113.75 inches
Axle load = 5700.50 Lbs
Track Width of the Axle = 72.00 inches
Mass of the Axle = 2500.00 Lbs
Roll Center Height = 34.85 inches
Suspension Stiffness (per Spring) = 6013.00 Lbs/in
Spacing between Suspension Springs = 38.50 inches
Auxiliary Roll Stiffness = 10000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches
Nominal Load of the Tire = 6040.00 Lbs

Cornering Stiffness Table

Vertical Force (Lbs)	Cornering Stiffness (Lb/deg)
500.00	94.00
2000.00	391.58
4000.00	690.24

Information for Unit # 2 (Semitrailer)

General Information

Total Weight = 12580.00 Lbs
Total C.G. Height = 40.56 inches
Total Number of Axles = 2
Distance from C.G. to Rear Articulation Point = 176.25 inches
Distance from C.G. to Front Articulation Point = 267.25 inches

Axles Information, Unit # 2

Axle # 1
C.G - Axle Distance (negative if rear of CG) = -55.00 inches
Axle load = 4818.00 Lbs
Track Width of the Axle = 71.25 inches
Mass of the Axle = 1800.00 Lbs
Roll Center Height = 30.40 inches
Suspension Stiffness (per Spring) = 5586.00 Lbs/in
Spacing between Suspension Springs = 38.00 inches
Auxiliary Roll Stiffness = 20000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.00 inches
Nominal Load of the Tire = 6040.00 Lbs

Cornering Stiffness Table

Vertical Force (Lbs)	Cornering Stiffness (Lb/deg)
500.00	94.00
2000.00	391.58
4000.00	690.24

Axle # 2
C.G - Axle Distance (negative if rear of CG) = -109.00 inches
Axle load = 4818.00 Lbs
Track Width of the Axle = 71.25 inches
Mass of the Axle = 1800.00 Lbs
Roll Center Height = 29.70 inches
Suspension Stiffness (per Spring) = 5586.00 Lbs/in
Spacing between Suspension Springs = 38.00 inches
Auxiliary Roll Stiffness = 20000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.00 inches
Nominal Load of the Tire = 6040.00 Lbs

Cornering Stiffness Table

Vertical Force (Lbs)	Cornering Stiffness (Lb/deg)
500.00	94.00
2000.00	391.58
4000.00	690.24

STEADY TURN MODEL
FILE NAME:A:VOLVO-EM.HND
FORWARD VELOCITY = 50.00 MPH

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00000	.00000	.00000	.00	.00000
1	2	.00000	.00000	.00000	.00	.00000
1	3	.00000	.00000	.00000	.00	.00000
2	1	.00000	.00000	.00000	.00	.00000
2	2	.00000	.00000	.00000	.00	.00000

*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 166.3616 in
*Rate of Change of Le = -.1526 in/g
*Understeer Gradient (Ue) = .0928 rad/g
*Rate of Change of Ue = .0001 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0000 rad
*Rate of Change of delta = .1757
*Force at the Fifth Wheel = .00 Lbs

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00077	.00012	.00085	136.87	.05000
1	2	.00059	.00111	.00085	189.74	.05000
1	3	.00059	.00110	.00085	191.43	.05000
2	1	.00051	.00101	.00085	164.24	.05000
2	2	.00050	.00099	.00085	161.35	.05000

*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 166.3593 in
*Rate of Change of Le = .1526 in/g
*Understeer Gradient (Ue) = .0928 rad/g
*Rate of Change of Ue = .0004 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0088 rad
*Rate of Change of delta = .1758
*Force at the Fifth Wheel = 153.44 Lbs

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00155	.00024	.00169	273.74	.10000
1	2	.00117	.00222	.00169	379.47	.10000
1	3	.00118	.00221	.00169	382.85	.10000
2	1	.00102	.00203	.00169	328.49	.10000
2	2	.00101	.00199	.00169	322.69	.10000

*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 166.3524 in
*Rate of Change of Le = -.3052 in/g
*Understeer Gradient (Ue) = .0928 rad/g
*Rate of Change of Ue = .0001 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0176 rad
*Rate of Change of delta = .1758
*Force at the Fifth Wheel = 306.87 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.00232	.00036	.00254	410.61	.15000
1	2	.00176	.00334	.00254	569.21	.15000
1	3	.00177	.00331	.00254	574.28	.15000
2	1	.00154	.00304	.00254	492.73	.15000
2	2	.00151	.00298	.00254	484.04	.15000

*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 166.3409 in
*Rate of Change of Le = -.3052 in/g
*Understeer Gradient (Ue) = .0928 rad/g
*Rate of Change of Ue = .0004 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0264 rad
*Rate of Change of delta = .1758
*Force at the Fifth Wheel = 460.28 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.00310	.00048	.00339	547.48	.20000
1	2	.00234	.00445	.00339	758.94	.20000
1	3	.00236	.00441	.00339	765.71	.20000
2	1	.00205	.00405	.00339	656.97	.20000
2	2	.00201	.00398	.00339	645.38	.20000

*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 166.3246 in
*Rate of Change of Le = -.1526 in/g
*Understeer Gradient (Ue) = .0929 rad/g
*Rate of Change of Ue = .0004 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0352 rad
*Rate of Change of delta = .1758
*Force at the Fifth Wheel = 613.65 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.00387	.00060	.00424	684.35	.25000

1	2	.00293	.00556	.00424	948.68	.25000
1	3	.00295	.00551	.00424	957.13	.25000
2	1	.00256	.00507	.00424	821.22	.25000
2	2	.00252	.00497	.00424	806.73	.25000

*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 166.3037 in
*Rate of Change of Le = -.3052 in/g
*Understeer Gradient (Ue) = .0929 rad/g
*Rate of Change of Ue = .0007 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0439 rad
*Rate of Change of delta = .1759
*Force at the Fifth Wheel = 766.97 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.00465	.00072	.00508	821.22	.30000
1	2	.00351	.00667	.00508	1138.41	.30000
1	3	.00354	.00662	.00508	1148.56	.30000
2	1	.00307	.00608	.00508	985.46	.30000
2	2	.00302	.00597	.00508	968.07	.30000

*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 166.2780 in
*Rate of Change of Le = -.6104 in/g
*Understeer Gradient (Ue) = .0929 rad/g
*Rate of Change of Ue = .0005 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0527 rad
*Rate of Change of delta = .1759
*Force at the Fifth Wheel = 920.24 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.00542	.00084	.00593	958.09	.35000
1	2	.00410	.00778	.00593	1328.15	.35000
1	3	.00414	.00772	.00593	1339.98	.35000
2	1	.00359	.00710	.00593	1149.70	.35000
2	2	.00352	.00696	.00593	1129.42	.35000

*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 166.2475 in
*Rate of Change of Le = -.6104 in/g
*Understeer Gradient (Ue) = .0930 rad/g
*Rate of Change of Ue = .0010 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0615 rad
*Rate of Change of delta = .1761
*Force at the Fifth Wheel = 1073.43 Lbs

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00620	.00096	.00678	1094.96	.40000
1	2	.00468	.00889	.00678	1517.88	.40000
1	3	.00473	.00882	.00678	1531.41	.40000
2	1	.00410	.00811	.00678	1313.95	.40000
2	2	.00403	.00796	.00678	1290.76	.40000

*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 166.2120 in
*Rate of Change of Le = -.7629 in/g
*Understeer Gradient (Ue) = .0930 rad/g
*Rate of Change of Ue = .0010 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0703 rad
*Rate of Change of delta = .1761
*Force at the Fifth Wheel = 1226.55 Lbs

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00697	.00108	.00763	1231.83	.45000
1	2	.00527	.01001	.00763	1707.62	.45000
1	3	.00532	.00993	.00763	1722.84	.45000
2	1	.00461	.00912	.00763	1478.19	.45000
2	2	.00453	.00895	.00763	1452.11	.45000

*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 166.1715 in
*Rate of Change of Le = -.9155 in/g
*Understeer Gradient (Ue) = .0931 rad/g
*Rate of Change of Ue = .0008 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0791 rad
*Rate of Change of delta = .1761
*Force at the Fifth Wheel = 1379.57 Lbs

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00775	.00120	.00847	1368.70	.50000
1	2	.00586	.01112	.00847	1897.36	.50000
1	3	.00591	.01103	.00847	1914.26	.50000
2	1	.00512	.01014	.00847	1642.43	.50000
2	2	.00503	.00995	.00847	1613.46	.50000

*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 166.1260 in
*Rate of Change of Le = -1.2207 in/g
*Understeer Gradient (Ue) = .0931 rad/g

*Rate of Change of Ue = .0010 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0880 rad
*Rate of Change of delta = .1761
*Force at the Fifth Wheel = 1532.48 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.00852	.00132	.00932	1505.57	.55000
1	2	.00644	.01223	.00932	2087.09	.55000
1	3	.00650	.01213	.00932	2105.69	.55000
2	1	.00563	.01115	.00932	1806.68	.55000
2	2	.00554	.01094	.00932	1774.80	.55000

*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 166.0751 in
*Rate of Change of Le = -1.2207 in/g
*Understeer Gradient (Ue) = .0931 rad/g
*Rate of Change of Ue = .0010 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0968 rad
*Rate of Change of delta = .1761
*Force at the Fifth Wheel = 1685.28 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.00930	.00144	.01017	1642.44	.60000
1	2	.00703	.01334	.01017	2276.83	.60000
1	3	.00709	.01324	.01017	2297.12	.60000
2	1	.00615	.01216	.01017	1970.92	.60000
2	2	.00604	.01193	.01017	1936.15	.60000

*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 166.0188 in
*Rate of Change of Le = -1.5259 in/g
*Understeer Gradient (Ue) = .0932 rad/g
*Rate of Change of Ue = .0010 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .1056 rad
*Rate of Change of delta = .1761
*Force at the Fifth Wheel = 1837.96 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.01007	.00156	.01101	1779.31	.65000
1	2	.00761	.01445	.01101	2466.56	.65000
1	3	.00768	.01434	.01101	2488.54	.65000
2	1	.00666	.01318	.01101	2135.16	.65000
2	2	.00654	.01293	.01101	2097.49	.65000

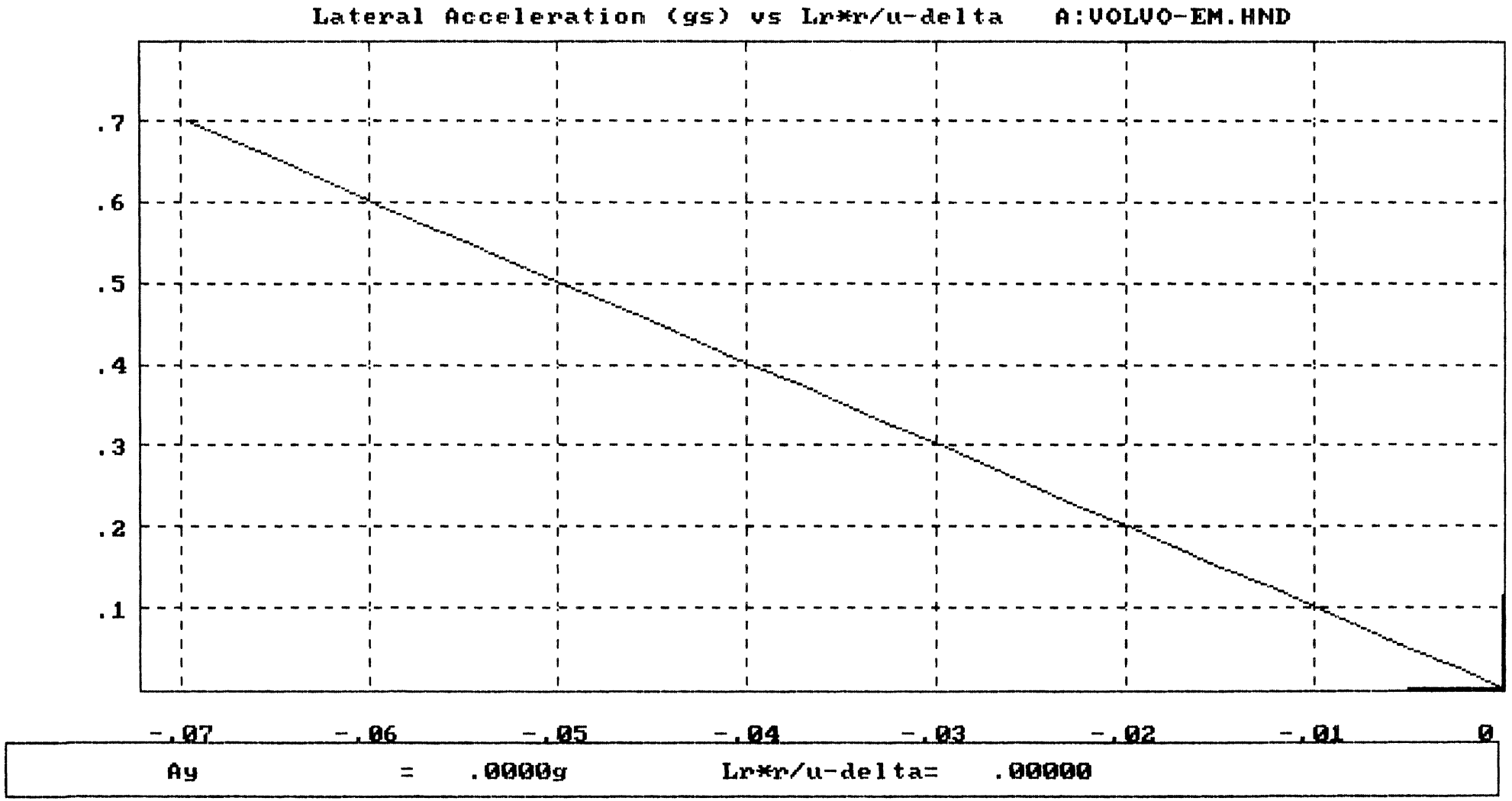
*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 165.9569 in
*Rate of Change of Le = -1.0681 in/g
*Understeer Gradient (Ue) = .0932 rad/g
*Rate of Change of Ue = .0008 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .1144 rad
*Rate of Change of delta = .1761
*Force at the Fifth Wheel = 1990.49 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.01085	.00168	.01186	1916.18	.70000
1	2	.00820	.01556	.01186	2656.30	.70000
1	3	.00827	.01544	.01186	2679.97	.70000
2	1	.00717	.01419	.01186	2299.41	.70000
2	2	.00705	.01392	.01186	2258.84	.70000

*Reference Wheelbase (Lr) = 153.25 in
*Effective Wheelbase (Le) = 165.8893 in
*Rate of Change of Le = -1.5259 in/g
*Understeer Gradient (Ue) = .0932 rad/g
*Rate of Change of Ue = .0006 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .1231 rad
*Rate of Change of delta = .1758
*Force at the Fifth Wheel = 2142.88 Lbs

Axle # 3 of Unit # 1 has Lift Off

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	3	.00886	.01654	.01271	2871.39	.75000


Lateral Acceleration (gs) vs Lr*r/u-delta A:VOLVO-EM.HND
.7
.6
.5
.4
.3
.2
.1
-.07
-.06
-.05
-.04
-.03
-.02
-.01
0
Ay = .0000g
Lr*r/u-delta= .00000

HANDLING MODEL

FILE NAME:A:USA-LD.HND

Date: 4-17-1987 Time:12:37:15

Information for Unit # 1 (Towing Unit)

General Information

Total Weight = 17000.00 Lbs
Total C.G. Height = 32.00 inches
Total Number of Axles = 3
Distance from C.G. to Rear Articulation Point = 69.12 inches

Steering System Information

Steering Gear Ratio = 25.00
Steering Stiffness = 12000.00 in-lb/deg
Tie Rod Stiffness = 20000.00 in-lb/deg
Mechanical Trail = 1.500
Aligning Moment per Tire = 1862.00 in-lb/deg

Axles Information, Unit # 1

Axle # 1
C.G - Axle Distance (negative if rear of CG) = 68.18 inches
Axle load = 12480.00 Lbs
Track Width of the Axle = 80.00 inches
Mass of the Axle = 1200.00 Lbs
Roll Center Height = 19.00 inches
Suspension Stiffness (per Spring) = 1032.06 Lbs/in
Spacing between Suspension Springs = 35.00 inches
Auxiliary Roll Stiffness = 8000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 2
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches
Nominal Load of the Tire = 6040.00 Lbs

Cornering Stiffness Table

Vertical Force (Lbs)	Cornering Stiffness (Lb/deg)
1983.00	356.94
5967.00	835.38
9441.00	944.10

Axle # 2
C.G - Axle Distance (negative if rear of CG) = -58.82 inches
Axle load = 17150.00 Lbs
Track Width of the Axle = 72.00 inches
Mass of the Axle = 2500.00 Lbs
Roll Center Height = 27.00 inches
Suspension Stiffness (per Spring) = 5783.17 Lbs/in
Spacing between Suspension Springs = 40.00 inches

Auxiliary Roll Stiffness = 15000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches
Nominal Load of the Tire = 6040.00 Lbs

Cornering Stiffness Table

Vertical Force (Lbs)	Cornering Stiffness (Lb/deg)
1983.00	356.94
5967.00	835.38
9441.00	944.10

Axle # 3
C.G - Axle Distance (negative if rear of CG) = -110.82 inches
Axle load = 17150.00 Lbs
Track Width of the Axle = 72.00 inches
Mass of the Axle = 2500.00 Lbs
Roll Center Height = 27.00 inches
Suspension Stiffness (per Spring) = 5783.17 Lbs/in
Spacing between Suspension Springs = 40.00 inches
Auxiliary Roll Stiffness = 15000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches
Nominal Load of the Tire = 6040.00 Lbs

Cornering Stiffness Table

Vertical Force (Lbs)	Cornering Stiffness (Lb/deg)
1983.00	356.94
5967.00	835.38
9441.00	944.10

Information for Unit # 2 (Semitrailer)

General Information

Total Weight = 64100.00 Lbs
Total C.G. Height = 75.60 inches
Total Number of Axles = 2
Distance from C.G. to Rear Articulation Point = 254.51 inches
Distance from C.G. to Front Articulation Point = 186.99 inches

Axles Information, Unit # 2

Axle # 1
C.G - Axle Distance (negative if rear of CG) = -137.26 inches
Axle load = 17160.00 Lbs
Track Width of the Axle = 72.00 inches
Mass of the Axle = 1500.00 Lbs
Roll Center Height = 24.00 inches
Suspension Stiffness (per Spring) = 6375.50 Lbs/in
Spacing between Suspension Springs = 38.00 inches
Auxiliary Roll Stiffness = 30000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches
Nominal Load of the Tire = 6040.00 Lbs

Cornering Stiffness Table

Vertical Force (Lbs)	Cornering Stiffness (Lb/deg)
1983.00	356.94
5967.00	835.38
9441.00	944.10

Axle # 2
C.G - Axle Distance (negative if rear of CG) = -187.26 inches
Axle load = 17160.00 Lbs
Track Width of the Axle = 72.00 inches
Mass of the Axle = 1500.00 Lbs
Roll Center Height = 24.00 inches
Suspension Stiffness (per Spring) = 6375.50 Lbs/in
Spacing between Suspension Springs = 38.00 inches
Auxiliary Roll Stiffness = 30000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches
Nominal Load of the Tire = 6040.00 Lbs

Cornering Stiffness Table

Vertical Force (Lbs)	Cornering Stiffness (Lb/deg)
1983.00	356.94
5967.00	835.38
9441.00	944.10

STEADY TURN MODEL
FILE NAME:A:USA-LD.HND
FORWARD VELOCITY = 50.00 MPH

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00000	.00000	.00000	.00	.00000
1	2	.00000	.00000	.00000	.00	.00000
1	3	.00000	.00000	.00000	.00	.00000
2	1	.00000	.00000	.00000	.00	.00000
2	2	.00000	.00000	.00000	.00	.00000

*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 179.1995 in
*Rate of Change of Le = .0000 in/g
*Understeer Gradient (Ue) = .0935 rad/g
*Rate of Change of Ue = .0000 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0000 rad
*Rate of Change of delta = .1828
*Force at the Fifth Wheel = .00 Lbs

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00158	.00961	.00867	285.06	.05000
1	2	.00311	.00888	.00867	1006.05	.05000
1	3	.00311	.00888	.00867	1006.05	.05000
2	1	.00316	.00824	.00867	1024.10	.05000
2	2	.00316	.00824	.00867	1024.10	.05000

*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 179.1183 in
*Rate of Change of Le = -3.3569 in/g
*Understeer Gradient (Ue) = .0932 rad/g
*Rate of Change of Ue = -.0119 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0091 rad
*Rate of Change of delta = .1818
*Force at the Fifth Wheel = 1502.87 Lbs

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00317	.01922	.01734	570.11	.10000
1	2	.00621	.01776	.01734	2012.09	.10000
1	3	.00621	.01776	.01734	2012.09	.10000
2	1	.00632	.01649	.01734	2048.19	.10000
2	2	.00632	.01649	.01734	2048.19	.10000

*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 178.8741 in
*Rate of Change of Le = -6.5613 in/g
*Understeer Gradient (Ue) = .0923 rad/g
*Rate of Change of Ue = -.0250 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0181 rad
*Rate of Change of delta = .1786
*Force at the Fifth Wheel = 3005.35 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.00475	.02883	.02601	855.17	.15000
1	2	.00932	.02664	.02601	3018.14	.15000
1	3	.00932	.02664	.02601	3018.14	.15000
2	1	.00948	.02473	.02601	3072.29	.15000
2	2	.00948	.02473	.02601	3072.29	.15000

*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 178.4640 in
*Rate of Change of Le = -9.9182 in/g
*Understeer Gradient (Ue) = .0907 rad/g
*Rate of Change of Ue = -.0393 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0269 rad
*Rate of Change of delta = .1730
*Force at the Fifth Wheel = 4507.07 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.00633	.03844	.03468	1140.23	.20000
1	2	.01242	.03551	.03468	4024.19	.20000
1	3	.01242	.03551	.03468	4024.19	.20000
2	1	.01264	.03298	.03468	4096.39	.20000
2	2	.01264	.03298	.03468	4096.39	.20000

*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 177.8835 in
*Rate of Change of Le = -13.4277 in/g
*Understeer Gradient (Ue) = .0883 rad/g
*Rate of Change of Ue = -.0582 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0354 rad
*Rate of Change of delta = .1640
*Force at the Fifth Wheel = 6007.64 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.00792	.04805	.04335	1425.28	.25000

1	2	.01553	.04439	.04335	5030.24	.25000
1	3	.01553	.04439	.04335	5030.24	.25000
2	1	.01580	.04122	.04335	5120.48	.25000
2	2	.01580	.04122	.04335	5120.48	.25000

*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 177.1260 in
*Rate of Change of Le = -17.0898 in/g
*Understeer Gradient (Ue) = .0848 rad/g
*Rate of Change of Ue = -.0820 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0433 rad
*Rate of Change of delta = .1504
*Force at the Fifth Wheel = 7506.68 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.00950	.05766	.05202	1710.34	.30000
1	2	.01863	.05327	.05202	6036.28	.30000
1	3	.01863	.05327	.05202	6036.28	.30000
2	1	.01896	.04947	.05202	6144.58	.30000
2	2	.01896	.04947	.05202	6144.58	.30000

*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 176.1827 in
*Rate of Change of Le = -21.0571 in/g
*Understeer Gradient (Ue) = .0799 rad/g
*Rate of Change of Ue = -.1145 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0503 rad
*Rate of Change of delta = .1302
*Force at the Fifth Wheel = 9003.80 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.01109	.06727	.06069	1995.40	.35000
1	2	.02174	.06215	.06069	7042.33	.35000
1	3	.02174	.06215	.06069	7042.33	.35000
2	1	.02213	.05771	.06069	7168.68	.35000
2	2	.02213	.05771	.06069	7168.68	.35000

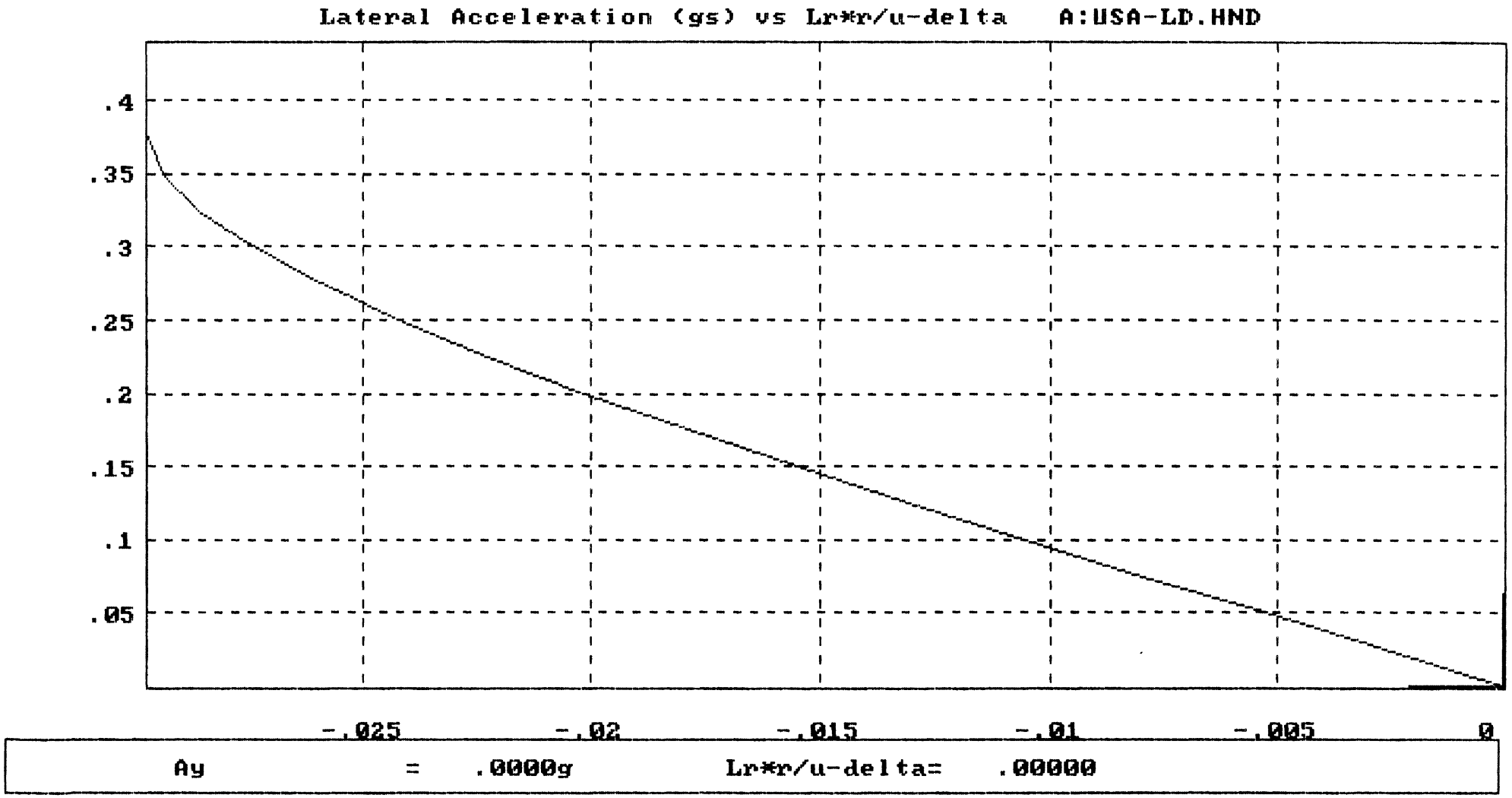
*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 175.0421 in
*Rate of Change of Le = -24.5667 in/g
*Understeer Gradient (Ue) = .0731 rad/g
*Rate of Change of Ue = -.1619 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0561 rad
*Rate of Change of delta = .0994
*Force at the Fifth Wheel = 10498.63 Lbs

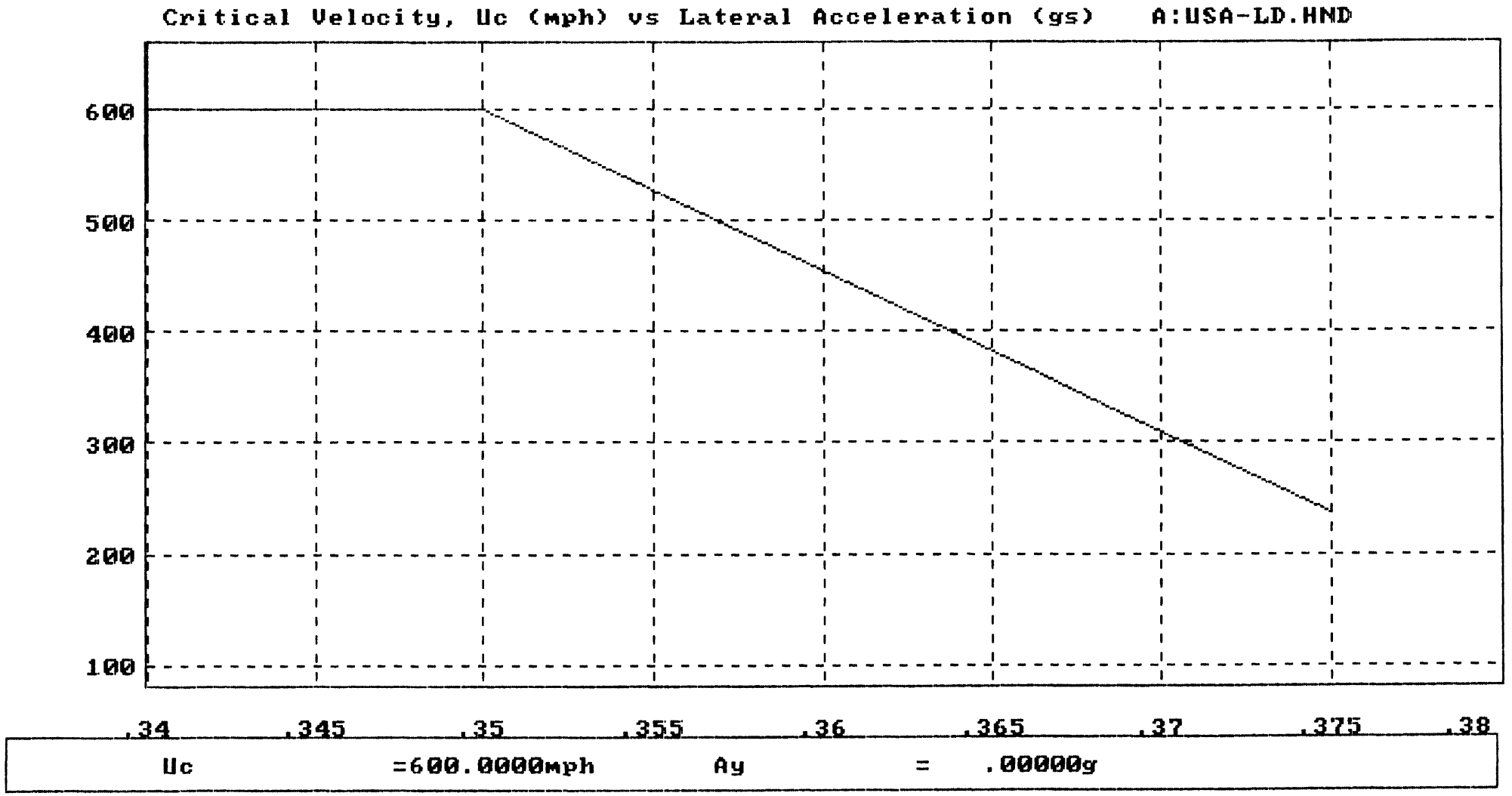
Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.01267	.07688	.06936	2280.46	.40000
1	2	.02484	.07103	.06936	8048.38	.40000
1	3	.02484	.07103	.06936	8048.38	.40000
2	1	.02529	.06595	.06936	8192.77	.40000
2	2	.02529	.06595	.06936	8192.77	.40000

*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 173.6899 in
*Rate of Change of Le = -28.9917 in/g
*Understeer Gradient (Ue) = .0634 rad/g
*Rate of Change of Ue = -.2320 rad
*Critical Velocity = 82.8731 mph
*Steer Angle (delta) = .0600 rad
*Rate of Change of delta = .0513
*Force at the Fifth Wheel = 11990.78 Lbs

Axle # 1 of Unit # 2 has Lift Off

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
2	1	.02687	.07008	.07369	8704.82	.42500


Lateral Acceleration (gs) vs Lr*r/u-delta A:USA-LD.HND
.4
.35
.3
.25
.2
.15
.1
.05
-.025
-.02
-.015
-.01
-.005
0
Ay = .0000g
Lr*r/u-delta= .00000


Critical Velocity, Uc (mph) vs Lateral Acceleration (gs) A:USA-LD.HND
600
500
400
300
200
100
.34
.345
.35
.355
.36
.365
.37
.375
.38
Uc =600.0000mph Ay = .00000g

HANDLING MODEL

FILE NAME:A:USA-EM.HND

Date: 4-17-1987 Time:12:51:26

Information for Unit # 1 (Towing Unit)

General Information

Total Weight = 17000.00 Lbs
Total C.G. Height = 32.00 inches
Total Number of Axles = 3
Distance from C.G. to Rear Articulation Point = 69.12 inches

Steering System Information

Steering Gear Ratio = 25.00
Steering Stiffness = 12000.00 in-lb/deg
Tie Rod Stiffness = 20000.00 in-lb/deg
Mechanical Trail = 1.500
Aligning Moment per Tire = 1370.00 in-lb/deg

Axles Information, Unit # 1

Axle # 1

C.G - Axle Distance (negative if rear of CG) = 68.18 inches
Axle load = 9792.50 Lbs
Track Width of the Axle = 80.00 inches
Mass of the Axle = 1200.00 Lbs
Roll Center Height = 19.00 inches
Suspension Stiffness (per Spring) = 1032.06 Lbs/in
Spacing between Suspension Springs = 35.00 inches
Auxiliary Roll Stiffness = 8000.00 in-lb/deg

Tire Information

Total Number of Tires on the Axle = 2
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches
Nominal Load of the Tire = 6040.00 Lbs

Cornering Stiffness Table

Vertical Force (Lbs)	Cornering Stiffness (Lb/deg)
1983.00	356.94
5967.00	835.38
9441.00	944.10

Axle # 2

C.G - Axle Distance (negative if rear of CG) = -58.82 inches
Axle load = 5401.40 Lbs
Track Width of the Axle = 72.00 inches
Mass of the Axle = 2500.00 Lbs
Roll Center Height = 28.50 inches
Suspension Stiffness (per Spring) = 4200.00 Lbs/in
Spacing between Suspension Springs = 40.00 inches

Auxiliary Roll Stiffness = 15000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches
Nominal Load of the Tire = 6040.00 Lbs

Cornering Stiffness Table

Vertical Force (Lbs)	Cornering Stiffness (Lb/deg)
500.00	94.00
2000.00	391.58
6000.00	690.24

Axle # 3
C.G - Axle Distance (negative if rear of CG) = -110.82 inches
Axle load = 5401.40 Lbs
Track Width of the Axle = 72.00 inches
Mass of the Axle = 2500.00 Lbs
Roll Center Height = 28.50 inches
Suspension Stiffness (per Spring) = 4200.00 Lbs/in
Spacing between Suspension Springs = 40.00 inches
Auxiliary Roll Stiffness = 15000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches
Nominal Load of the Tire = 6040.00 Lbs

Cornering Stiffness Table

Vertical Force (Lbs)	Cornering Stiffness (Lb/deg)
500.00	94.00
2000.00	391.58
4000.00	690.24

Information for Unit # 2 (Semitrailer)

General Information

Total Weight = 12580.00 Lbs
Total C.G. Height = 40.50 inches
Total Number of Axles = 2
Distance from C.G. to Rear Articulation Point = 192.06 inches
Distance from C.G. to Front Articulation Point = 249.44 inches

Axles Information, Unit # 2

Axle # 1
C.G - Axle Distance (negative if rear of CG) = -74.81 inches
Axle load = 4492.35 Lbs
Track Width of the Axle = 72.00 inches
Mass of the Axle = 1500.00 Lbs
Roll Center Height = 24.61 inches
Suspension Stiffness (per Spring) = 4550.00 Lbs/in
Spacing between Suspension Springs = 38.00 inches
Auxiliary Roll Stiffness = 30000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches
Nominal Load of the Tire = 6040.00 Lbs

Cornering Stiffness Table

Vertical Force (Lbs)	Cornering Stiffness (Lb/deg)
500.00	94.00
2000.00	391.58
4000.00	690.24

Axle # 2
C.G - Axle Distance (negative if rear of CG) = -124.81 inches
Axle load = 4492.35 Lbs
Track Width of the Axle = 72.00 inches
Mass of the Axle = 1500.00 Lbs
Roll Center Height = 24.61 inches
Suspension Stiffness (per Spring) = 4550.00 Lbs/in
Spacing between Suspension Springs = 38.00 inches
Auxiliary Roll Stiffness = 30000.00 in-lb/deg

Tire Information
Total Number of Tires on the Axle = 4
Vertical Stiffness of a Tire = 4500.00 Lbs/in
Radius of a Tire = 20.50 inches
Nominal Load of the Tire = 6040.00 Lbs

Cornering Stiffness Table

Vertical Force (Lbs)	Cornering Stiffness (Lb/deg)
500.00	94.00
2000.00	391.58
4000.00	690.24

STEADY TURN MODEL
FILE NAME:A:USA-EM.HND
FORWARD VELOCITY = 50.00 MPH

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00000	.00000	.00000	.00	.00000
1	2	.00000	.00000	.00000	.00	.00000
1	3	.00000	.00000	.00000	.00	.00000
2	1	.00000	.00000	.00000	.00	.00000
2	2	.00000	.00000	.00000	.00	.00000

*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 165.7542 in
*Rate of Change of Le = .0000 in/g
*Understeer Gradient (Ue) = .0824 rad/g
*Rate of Change of Ue = -.0001 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0000 rad
*Rate of Change of delta = .1650
*Force at the Fifth Wheel = .00 Lbs

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00069	.00032	.00086	123.43	.05000
1	2	.00049	.00113	.00086	160.01	.05000
1	3	.00049	.00113	.00086	160.01	.05000
2	1	.00044	.00101	.00086	143.06	.05000
2	2	.00044	.00101	.00086	143.06	.05000

*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 165.7542 in
*Rate of Change of Le = .1526 in/g
*Understeer Gradient (Ue) = .0824 rad/g
*Rate of Change of Ue = .0002 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0083 rad
*Rate of Change of delta = .1650
*Force at the Fifth Wheel = 184.36 Lbs

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00137	.00065	.00173	246.85	.10000
1	2	.00099	.00226	.00173	320.03	.10000
1	3	.00099	.00226	.00173	320.03	.10000
2	1	.00088	.00201	.00173	286.12	.10000
2	2	.00088	.00201	.00173	286.12	.10000

*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 165.7545 in
*Rate of Change of Le = .3052 in/g
*Understeer Gradient (Ue) = .0824 rad/g
*Rate of Change of Ue = -.0001 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0165 rad
*Rate of Change of delta = .1650
*Force at the Fifth Wheel = 368.71 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.00206	.00097	.00259	370.28	.15000
1	2	.00148	.00338	.00259	480.04	.15000
1	3	.00148	.00338	.00259	480.04	.15000
2	1	.00132	.00302	.00259	429.18	.15000
2	2	.00132	.00302	.00259	429.18	.15000

*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 165.7549 in
*Rate of Change of Le = -.1526 in/g
*Understeer Gradient (Ue) = .0824 rad/g
*Rate of Change of Ue = .0003 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0248 rad
*Rate of Change of delta = .1651
*Force at the Fifth Wheel = 553.05 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.00274	.00129	.00346	493.71	.20000
1	2	.00198	.00451	.00346	640.05	.20000
1	3	.00198	.00451	.00346	640.05	.20000
2	1	.00177	.00402	.00346	572.24	.20000
2	2	.00177	.00402	.00346	572.24	.20000

*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 165.7555 in
*Rate of Change of Le = .1526 in/g
*Understeer Gradient (Ue) = .0825 rad/g
*Rate of Change of Ue = .0007 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0330 rad
*Rate of Change of delta = .1652
*Force at the Fifth Wheel = 737.36 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.00343	.00162	.00432	617.13	.25000

1	2	.00247	.00564	.00432	800.07	.25000
1	3	.00247	.00564	.00432	800.07	.25000
2	1	.00221	.00503	.00432	715.30	.25000
2	2	.00221	.00503	.00432	715.30	.25000

*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 165.7563 in
*Rate of Change of Le = .1526 in/g
*Understeer Gradient (Ue) = .0825 rad/g
*Rate of Change of Ue = .0003 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0413 rad
*Rate of Change of delta = .1652
*Force at the Fifth Wheel = 921.63 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.00411	.00194	.00519	740.56	.30000
1	2	.00296	.00677	.00519	960.08	.30000
1	3	.00296	.00677	.00519	960.08	.30000
2	1	.00265	.00604	.00519	858.36	.30000
2	2	.00265	.00604	.00519	858.36	.30000

*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 165.7575 in
*Rate of Change of Le = -.1526 in/g
*Understeer Gradient (Ue) = .0825 rad/g
*Rate of Change of Ue = .0006 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0495 rad
*Rate of Change of delta = .1653
*Force at the Fifth Wheel = 1105.86 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.00480	.00226	.00605	863.99	.35000
1	2	.00346	.00789	.00605	1120.09	.35000
1	3	.00346	.00789	.00605	1120.09	.35000
2	1	.00309	.00704	.00605	1001.42	.35000
2	2	.00309	.00704	.00605	1001.42	.35000

*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 165.7590 in
*Rate of Change of Le = .1526 in/g
*Understeer Gradient (Ue) = .0825 rad/g
*Rate of Change of Ue = .0007 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0578 rad
*Rate of Change of delta = .1654
*Force at the Fifth Wheel = 1290.04 Lbs

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00549	.00259	.00691	987.42	.40000
1	2	.00395	.00902	.00691	1280.11	.40000
1	3	.00395	.00902	.00691	1280.11	.40000
2	1	.00353	.00805	.00691	1144.47	.40000
2	2	.00353	.00805	.00691	1144.47	.40000

*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 165.7610 in
*Rate of Change of Le = .0000 in/g
*Understeer Gradient (Ue) = .0826 rad/g
*Rate of Change of Ue = .0007 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0661 rad
*Rate of Change of delta = .1655
*Force at the Fifth Wheel = 1474.16 Lbs

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00617	.00291	.00778	1110.84	.45000
1	2	.00444	.01015	.00778	1440.12	.45000
1	3	.00444	.01015	.00778	1440.12	.45000
2	1	.00397	.00906	.00778	1287.53	.45000
2	2	.00397	.00906	.00778	1287.53	.45000

*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 165.7635 in
*Rate of Change of Le = .0000 in/g
*Understeer Gradient (Ue) = .0826 rad/g
*Rate of Change of Ue = .0007 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0744 rad
*Rate of Change of delta = .1656
*Force at the Fifth Wheel = 1658.20 Lbs

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00686	.00323	.00864	1234.27	.50000
1	2	.00494	.01128	.00864	1600.13	.50000
1	3	.00494	.01128	.00864	1600.13	.50000
2	1	.00442	.01006	.00864	1430.59	.50000
2	2	.00442	.01006	.00864	1430.59	.50000

*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 165.7667 in
*Rate of Change of Le = .1526 in/g
*Understeer Gradient (Ue) = .0826 rad/g

*Rate of Change of Ue = .0010 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0826 rad
*Rate of Change of delta = .1658
*Force at the Fifth Wheel = 1842.17 Lbs

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00754	.00356	.00951	1357.70	.55000
1	2	.00543	.01240	.00951	1760.15	.55000
1	3	.00543	.01240	.00951	1760.15	.55000
2	1	.00486	.01107	.00951	1573.65	.55000
2	2	.00486	.01107	.00951	1573.65	.55000

*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 165.7707 in
*Rate of Change of Le = .0000 in/g
*Understeer Gradient (Ue) = .0827 rad/g
*Rate of Change of Ue = .0006 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0909 rad
*Rate of Change of delta = .1656
*Force at the Fifth Wheel = 2026.04 Lbs

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00823	.00388	.01037	1481.12	.60000
1	2	.00593	.01353	.01037	1920.16	.60000
1	3	.00593	.01353	.01037	1920.16	.60000
2	1	.00530	.01207	.01037	1716.71	.60000
2	2	.00530	.01207	.01037	1716.71	.60000

*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 165.7756 in
*Rate of Change of Le = .3052 in/g
*Understeer Gradient (Ue) = .0827 rad/g
*Rate of Change of Ue = .0007 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .0992 rad
*Rate of Change of delta = .1658
*Force at the Fifth Wheel = 2209.83 Lbs

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Load Transfer (Lbs)	Lateral Acceleration (g's)
1	1	.00891	.00420	.01123	1604.55	.65000
1	2	.00642	.01466	.01123	2080.17	.65000
1	3	.00642	.01466	.01123	2080.17	.65000
2	1	.00574	.01308	.01123	1859.77	.65000
2	2	.00574	.01308	.01123	1859.77	.65000

*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 165.7817 in
*Rate of Change of Le = .1526 in/g
*Understeer Gradient (Ue) = .0827 rad/g
*Rate of Change of Ue = .0003 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .1075 rad
*Rate of Change of delta = .1656
*Force at the Fifth Wheel = 2393.50 Lbs

		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.00960	.00452	.01210	1727.98	.70000
1	2	.00691	.01579	.01210	2240.18	.70000
1	3	.00691	.01579	.01210	2240.18	.70000
2	1	.00618	.01409	.01210	2002.83	.70000
2	2	.00618	.01409	.01210	2002.83	.70000

*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 165.7892 in
*Rate of Change of Le = .3052 in/g
*Understeer Gradient (Ue) = .0827 rad/g
*Rate of Change of Ue = .0004 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .1158 rad
*Rate of Change of delta = .1658
*Force at the Fifth Wheel = 2577.06 Lbs

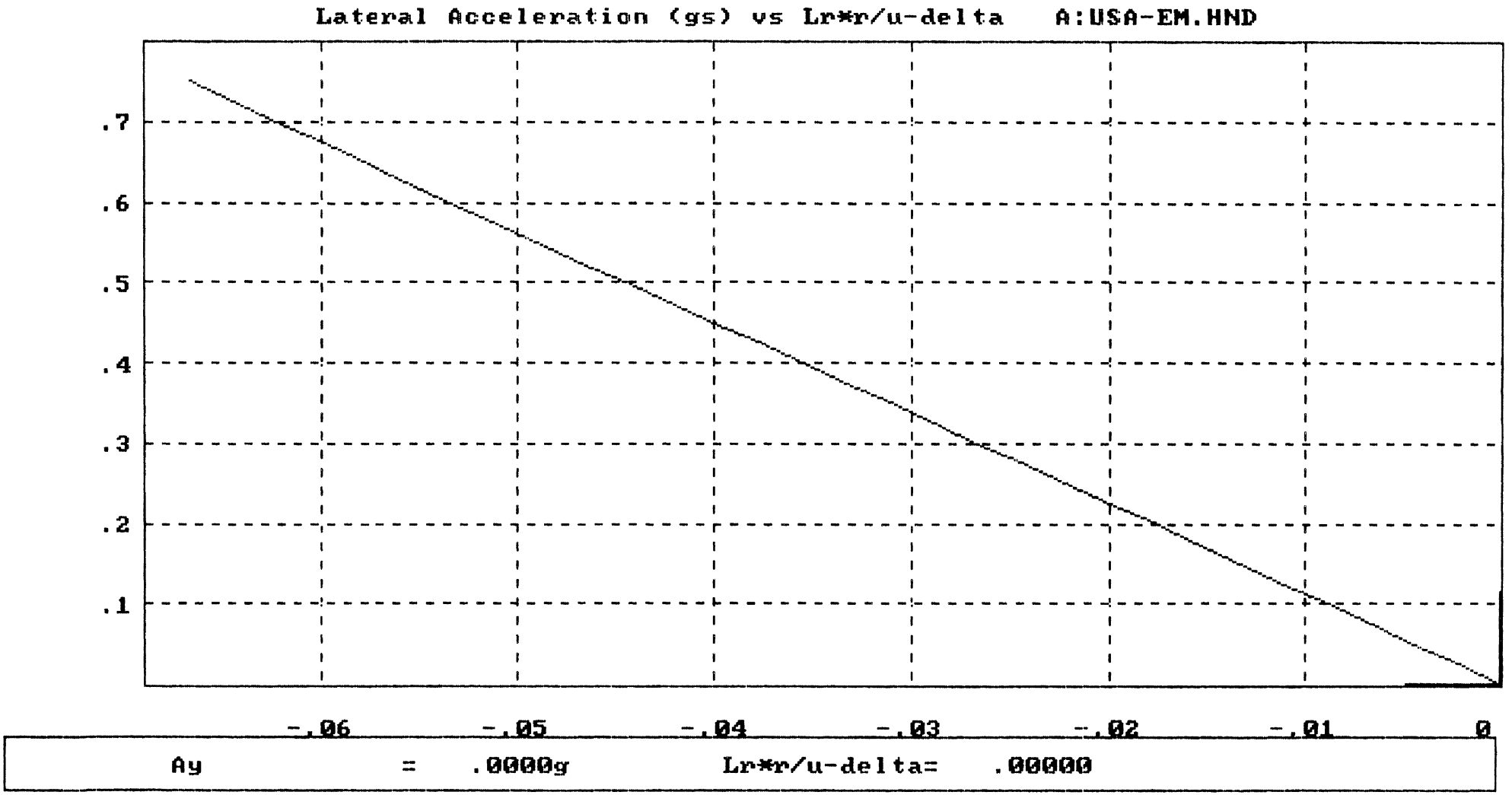
		Roll Angles (rad)			Load Transfer	Lateral Acceleration
Unit	Axle	Unsprung	Sprung	Total	(Lbs)	(g's)
1	1	.01029	.00485	.01296	1851.40	.75000
1	2	.00741	.01691	.01296	2400.20	.75000
1	3	.00741	.01691	.01296	2400.20	.75000
2	1	.00662	.01509	.01296	2145.89	.75000
2	2	.00662	.01509	.01296	2145.89	.75000

*Reference Wheelbase (Lr) = 153.00 in
*Effective Wheelbase (Le) = 165.7982 in
*Rate of Change of Le = .1526 in/g
*Understeer Gradient (Ue) = .0828 rad/g
*Rate of Change of Ue = .0004 rad
*Critical Velocity = 600.0000 mph
*Steer Angle (delta) = .1241 rad
*Rate of Change of delta = .1658
*Force at the Fifth Wheel = 2760.50 Lbs

Axle # 1 of Unit # 2 has Lift Off

					Load	Lateral

Unit	Axle	Roll Angles (rad) Unsprung	Sprung	Total	Transfer (Lbs)	Acceleration (g's)
2	1	.00706	.01610	.01383	2288.95	.80000


Lateral Acceleration (gs) vs Lr*r/u-delta A:USA-EM.HND
.7
.6
.5
.4
.3
.2
.1
-.06
-.05
-.04
-.03
-.02
-.01
0
Ay = .0000g
Lr*r/u-delta= .00000

Appendix F

Braking Data Sets and Simulations Results

STRAIGHT LINE BRAKING MODEL

FILE NAME:B:VOLVO-LD.BRK

Date: 6- 3-1987 Time: 7:55:44

Information for Unit # 1

General Information

Total Weight = 19720.00 Lbs
Wheelbase = 153.250 inches
Distance of Rear Articulation from Front Suspension = 148.15 inches
Rear Articulation Height = 43.00 inches
Total C.G. Height = 35.40 inches

Suspension # 1 (Single)
Suspension Load = 12060.0 Lbs
Axle # 1
Radius of a Tire = 20.50 inches
Pushout Pressure = 9.40 PSI
Brake Key (1=Linear, 2=Non-linear) = 1
Brake Gain = 2296.00 in-lb/psi

Suspension # 2 (Tandem)
Suspension Load = 34610.0 Lbs
Tandem Axle Separation = 54.00 inches
Dynamic Load Transfer Coefficient (between -1 & 1) = .0704
Axle # 1
Radius of a Tire = 20.50 inches
Pushout Pressure = 8.50 PSI
Brake Key (1=Linear, 2=Non-linear) = 1
Brake Gain = 2001.83 in-lb/psi
Axle # 2
Radius of a Tire = 20.50 inches
Pushout Pressure = 8.50 PSI
Brake Key (1=Linear, 2=Non-linear) = 1
Brake Gain = 2001.83 in-lb/psi

Information for Unit # 2

General Information

Total Weight = 61180.00 Lbs
Wheelbase = 349.250 inches
Distance of Rear Articulation from Forward Articulation = 443.50 inches
Rear Articulation Height = 40.00 inches
Total C.G. Height = 73.80 inches
Unit Key (1 - Independent Unit, Dolly or Semi) = 1
(2 - Full Trailer - Fixed Dolly)

Suspension # 1 (Tandem)
Suspension Load = 34230.0 Lbs

```
Tandem Axle Separation =  54.00 inches
Dynamic Load Transfer Coefficient (between -1 & 1) =    .0350
                  Axle # 1
Radius of a Tire =  20.00 inches
Pushout Pressure =   4.20 PSI
Brake Key (1=Linear, 2=Non-linear) =  1
Brake Gain = 2056.40 in-lb/psi
                  Axle # 2
Radius of a Tire =  20.00 inches
Pushout Pressure =   4.20 PSI
Brake Key (1=Linear, 2=Non-linear) =  1
Brake Gain = 2056.40 in-lb/psi
```

STRAIGHT LINE BRAKING MODEL
FILE NAME:B:VOLVO-LD.BRK

Treadle Pressure= .00 psi
Deceleration= .00000 gs
Braking Efficiency= .00000

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	.00	12060.00	.0000
1	2	1	.00	17305.00	.0000
1	2	2	.00	17305.00	.0000
2	1	1	.00	17115.00	.0000
2	1	2	.00	17115.00	.0000

Treadle Pressure= 10.00 psi
Deceleration= .01919 gs
Braking Efficiency= .54561

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	67.20	12143.13	.0055
1	2	1	146.48	17406.04	.0084
1	2	2	146.48	17364.79	.0084
2	1	1	596.36	17034.77	.0350
2	1	2	596.36	16951.28	.0352

Treadle Pressure= 20.00 psi
Deceleration= .08260 gs
Braking Efficiency= .84336

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	1187.20	12914.37	.0919
1	2	1	1122.98	17449.98	.0644
1	2	2	1122.98	17133.75	.0655
2	1	1	1624.56	16814.67	.0966
2	1	2	1624.56	16587.23	.0979

Treadle Pressure= 30.00 psi
Deceleration= .14600 gs
Braking Efficiency= .86605

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	2307.20	13685.60	.1686
1	2	1	2099.48	17493.94	.1200
1	2	2	2099.48	16902.72	.1242
2	1	1	2652.76	16594.57	.1599
2	1	2	2652.76	16223.18	.1635

Treadle Pressure= 40.00 psi
Deceleration= .20941 gs
Braking Efficiency= .88334

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	3427.20	14456.83	.2371
1	2	1	3075.98	17537.88	.1754
1	2	2	3075.98	16671.69	.1845
2	1	1	3680.96	16374.46	.2248
2	1	2	3680.96	15859.13	.2321

Treadle Pressure= 50.00 psi
Deceleration= .27281 gs
Braking Efficiency= .89766

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	4547.20	15228.06	.2986
1	2	1	4052.49	17581.84	.2305
1	2	2	4052.49	16440.66	.2465
2	1	1	4709.16	16154.36	.2915
2	1	2	4709.16	15495.08	.3039

Treadle Pressure= 60.00 psi
Deceleration= .33622 gs
Braking Efficiency= .88670

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	5667.20	15999.29	.3542
1	2	1	5028.99	17625.79	.2853
1	2	2	5028.99	16209.62	.3102
2	1	1	5737.36	15934.26	.3601
2	1	2	5737.36	15131.03	.3792

Treadle Pressure= 70.00 psi
Deceleration= .39962 gs
Braking Efficiency= .87224

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	6787.20	16770.52	.4047
1	2	1	6005.49	17669.74	.3399
1	2	2	6005.49	15978.59	.3758
2	1	1	6765.56	15714.16	.4305
2	1	2	6765.56	14766.99	.4582

Treadle Pressure= 80.00 psi
Deceleration= .46302 gs
Braking Efficiency= .85567

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	7907.20	17541.76	.4508
1	2	1	6981.99	17713.69	.3942
1	2	2	6981.99	15747.56	.4434
2	1	1	7793.76	15494.06	.5030
2	1	2	7793.76	14402.94	.5411

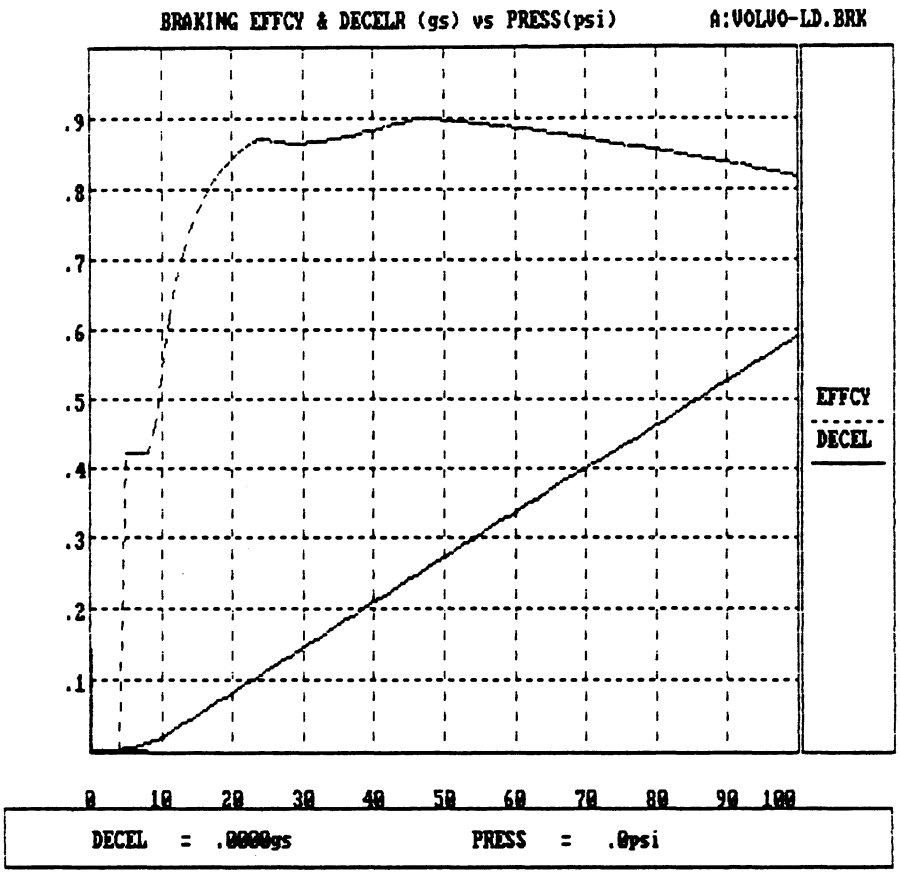
Treadle Pressure= 90.00 psi
Deceleration= .52643 gs
Braking Efficiency= .83774

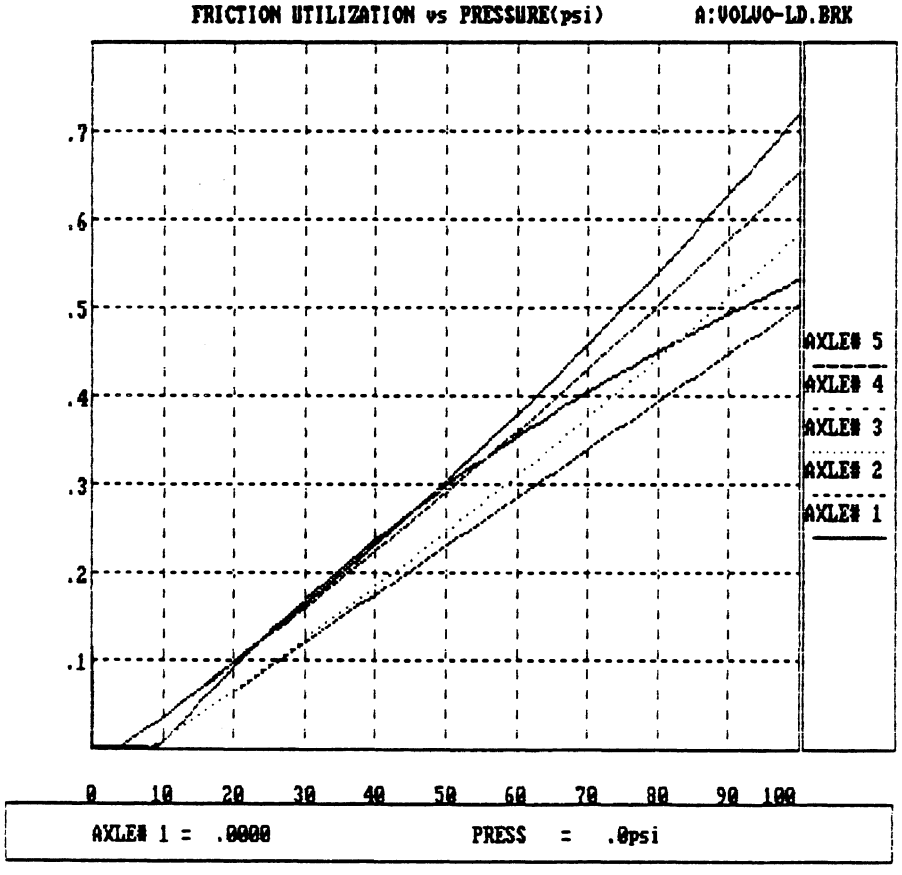
Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	9027.20	18312.99	.4929
1	2	1	7958.49	17757.64	.4482
1	2	2	7958.49	15516.52	.5129
2	1	1	8821.96	15273.96	.5776
2	1	2	8821.96	14038.89	.6284

Treadle Pressure= 100.00 psi
Deceleration= .58983 gs
Braking Efficiency= .81886

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization

1	1	1	10147.20	19084.22	.5317
1	2	1	8935.00	17801.58	.5019
1	2	2	8935.00	15285.49	.5845
2	1	1	9850.16	15053.86	.6543
2	1	2	9850.16	13674.84	.7203


BRAKING EFFCY & DECELR (gs) vs PRESS(psi)
A:VOLVO-LD.BRK
.9
.8
.7
.6
.5
.4
.3
.2
.1
EFFCY
DECEL
0 10 20 30 40 50 60 70 80 90 100
DECEL = .0000gs
PRESS = .0psi


FRICTION UTILIZATION vs PRESSURE(psi)
A:VOLVO-LD.BRK
.7
.6
.5
.4
.3
.2
.1
AXLE# 5
AXLE# 4
AXLE# 3
AXLE# 2
AXLE# 1
0 10 20 30 40 50 60 70 80 90 100
AXLE# 1 = .0000
PRESS = .0psi

STRAIGHT LINE BRAKING MODEL

FILE NAME:B:VOLVO-EM.BRK

Date: 6- 3-1987 Time: 8:22:59

Information for Unit # 1

General Information

Total Weight = 19720.00 Lbs
Wheelbase = 153.250 inches
Distance of Rear Articulation from Front Suspension = 148.15 inches
Rear Articulation Height = 43.00 inches
Total C.G. Height = 35.40 inches

Suspension # 1 (Single)
Suspension Load = 11263.0 Lbs
Axle # 1
Radius of a Tire = 20.50 inches
Pushout Pressure = 9.40 PSI
Brake Key (1=Linear, 2=Non-linear) = 1
Brake Gain = 2296.00 in-lb/psi

Suspension # 2 (Tandem)
Suspension Load = 11401.0 Lbs
Tandem Axle Separation = 54.00 inches
Dynamic Load Transfer Coefficient (between -1 & 1) = .0745
Axle # 1
Radius of a Tire = 20.50 inches
Pushout Pressure = 8.50 PSI
Brake Key (1=Linear, 2=Non-linear) = 1
Brake Gain = 882.50 in-lb/psi
Axle # 2
Radius of a Tire = 20.50 inches
Pushout Pressure = 8.50 PSI
Brake Key (1=Linear, 2=Non-linear) = 1
Brake Gain = 882.50 in-lb/psi

Information for Unit # 2

General Information

Total Weight = 12580.00 Lbs
Wheelbase = 349.250 inches
Distance of Rear Articulation from Forward Articulation = 443.50 inches
Rear Articulation Height = 40.00 inches
Total C.G. Height = 40.56 inches
Unit Key (1 - Independent Unit, Dolly or Semi) = 1
(2 - Full Trailer - Fixed Dolly)

Suspension # 1 (Tandem)

```
Suspension Load =    9636.0 Lbs
Tandem Axle Separation =  54.00 inches
Dynamic Load Transfer Coefficient (between -1 & 1) =    .1100
                 Axle # 1
Radius of a Tire =  20.00 inches
Pushout Pressure =    4.20 PSI
Brake Key (1=Linear, 2=Non-linear) =  1
Brake Gain =  848.00 in-lb/psi
                 Axle # 2
Radius of a Tire =  20.00 inches
Pushout Pressure =    4.20 PSI
Brake Key (1=Linear, 2=Non-linear) =  1
Brake Gain =  848.00 in-lb/psi
```

STRAIGHT LINE BRAKING MODEL
FILE NAME:B:VOLVO-EM.BRK

Treadle Pressure= .00 psi
Deceleration= .00000 gs
Braking Efficiency= .00000

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	.00	11263.00	.0000
1	2	1	.00	5700.50	.0000
1	2	2	.00	5700.50	.0000
2	1	1	.00	4818.00	.0000
2	1	2	.00	4818.00	.0000

Treadle Pressure= 10.00 psi
Deceleration= .02131 gs
Braking Efficiency= .41056

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	67.20	11295.54	.0059
1	2	1	64.57	5719.01	.0113
1	2	2	64.57	5699.77	.0113
2	1	1	245.92	4846.94	.0507
2	1	2	245.92	4738.74	.0519

Treadle Pressure= 20.00 psi
Deceleration= .10889 gs
Braking Efficiency= .74840

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	1187.20	11745.86	.1011
1	2	1	495.06	5599.14	.0884
1	2	2	495.06	5451.61	.0908
2	1	1	669.92	4899.08	.1367
2	1	2	669.92	4604.32	.1455

Treadle Pressure= 30.00 psi
Deceleration= .19647 gs
Braking Efficiency= .80282

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	2307.20	12196.18	.1892
1	2	1	925.55	5479.26	.1689
1	2	2	925.55	5203.45	.1779
2	1	1	1093.92	4951.22	.2209
2	1	2	1093.92	4469.89	.2447

Treadle Pressure= 40.00 psi
Deceleration= .28406 gs
Braking Efficiency= .81133

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	3427.20	12646.50	.2710
1	2	1	1356.04	5359.39	.2530
1	2	2	1356.04	4955.29	.2737
2	1	1	1517.92	5003.35	.3034
2	1	2	1517.92	4335.47	.3501

Treadle Pressure= 50.00 psi
Deceleration= .37164 gs
Braking Efficiency= .80399

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	4547.20	13096.82	.3472
1	2	1	1786.52	5239.51	.3410
1	2	2	1786.52	4707.13	.3795
2	1	1	1941.92	5055.49	.3841
2	1	2	1941.92	4201.05	.4622

Treadle Pressure= 60.00 psi
Deceleration= .45923 gs
Braking Efficiency= .78934

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	5667.20	13547.14	.4183
1	2	1	2217.01	5119.64	.4330
1	2	2	2217.01	4458.97	.4972
2	1	1	2365.92	5107.63	.4632
2	1	2	2365.92	4066.62	.5818

Treadle Pressure= 70.00 psi
Deceleration= .54681 gs
Braking Efficiency= .77069

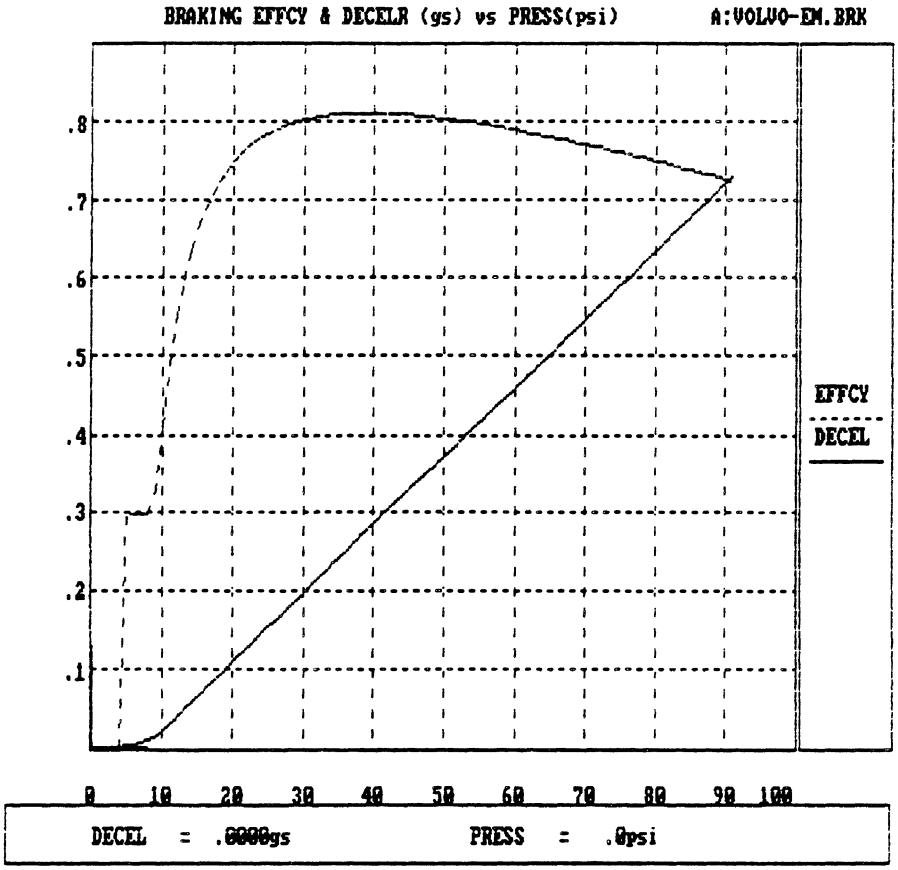
Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	6787.20	13997.46	.4849
1	2	1	2647.50	4999.77	.5295
1	2	2	2647.50	4210.81	.6287
2	1	1	2789.92	5159.76	.5407
2	1	2	2789.92	3932.20	.7095

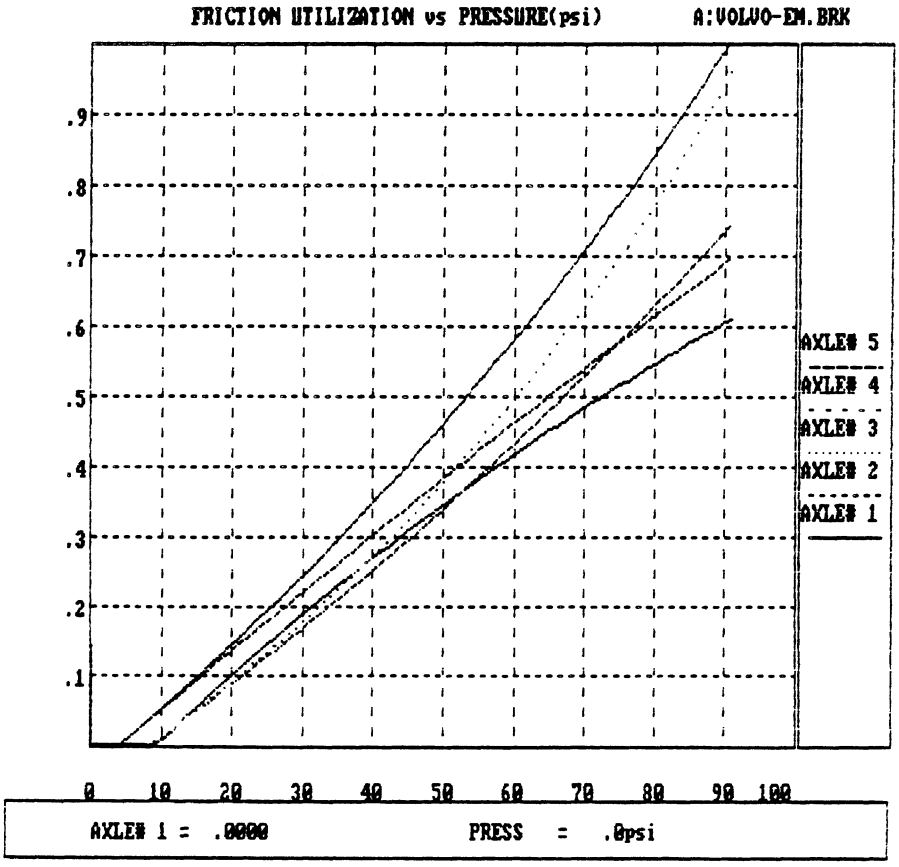
Treadle Pressure= 80.00 psi
Deceleration= .63440 gs
Braking Efficiency= .74964

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	7907.20	14447.78	.5473
1	2	1	3077.99	4879.89	.6307
1	2	2	3077.99	3962.65	.7767
2	1	1	3213.92	5211.90	.6167
2	1	2	3213.92	3797.78	.8463

Treadle Pressure= 90.00 psi
Deceleration= .72198 gs
Braking Efficiency= .72703

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	9027.20	14898.10	.6059
1	2	1	3508.48	4760.02	.7371
1	2	2	3508.48	3714.49	.9445
2	1	1	3637.92	5264.04	.6911
2	1	2	3637.92	3663.35	.9931


BRAKING EFFCY & DECELR (gs) vs PRESS(psi)
A:VOLVO-EM.BRK
.8
.7
.6
.5
.4
.3
.2
.1
EFFCY
DECEL
0 10 20 30 40 50 60 70 80 90 100
DECEL = .0000gs
PRESS = .0psi


FRICTION UTILIZATION vs PRESSURE(psi)
A:VOLVO-EM.BRK
.9
.8
.7
.6
.5
.4
.3
.2
.1
AXLE# 5
AXLE# 4
AXLE# 3
AXLE# 2
AXLE# 1
0 10 20 30 40 50 60 70 80 90 100
AXLE# 1 = .0000
PRESS = .0psi

STRAIGHT LINE BRAKING MODEL

FILE NAME:B:USA-LD.BRK

Date: 6- 3-1987 Time: 8:39:24

Information for Unit # 1

General Information

Total Weight = 17000.00 Lbs
Wheelbase = 153.000 inches
Distance of Rear Articulation from Front Suspension = 137.30 inches
Rear Articulation Height = 49.00 inches
Total C.G. Height = 32.00 inches

Suspension # 1 (Single)
Suspension Load = 12480.0 Lbs
Axle # 1
Radius of a Tire = 20.50 inches
Pushout Pressure = 13.50 PSI
Brake Key (1=Linear, 2=Non-linear) = 1
Brake Gain = 1332.50 in-lb/psi

Suspension # 2 (Tandem)
Suspension Load = 34300.0 Lbs
Tandem Axle Separation = 52.00 inches
Dynamic Load Transfer Coefficient (between -1 & 1) = .1500
Axle # 1
Radius of a Tire = 20.50 inches
Pushout Pressure = 5.80 PSI
Brake Key (1=Linear, 2=Non-linear) = 1
Brake Gain = 3280.00 in-lb/psi
Axle # 2
Radius of a Tire = 20.50 inches
Pushout Pressure = 5.80 PSI
Brake Key (1=Linear, 2=Non-linear) = 1
Brake Gain = 3280.00 in-lb/psi

Information for Unit # 2

General Information

Total Weight = 64100.00 Lbs
Wheelbase = 349.250 inches
Distance of Rear Articulation from Forward Articulation = 441.50 inches
Rear Articulation Height = 40.00 inches
Total C.G. Height = 75.60 inches
Unit Key (1 - Independent Unit, Dolly or Semi) = 1
(2 - Full Trailer - Fixed Dolly)

Suspension # 1 (Tandem)

```
Suspension Load =  34320.0 Lbs
Tandem Axle Separation =  50.00 inches
Dynamic Load Transfer Coefficient (between -1 & 1) =   .1500
                 Axle # 1
Radius of a Tire =  20.50 inches
Pushout Pressure =   5.50 PSI
Brake Key (1=Linear, 2=Non-linear) =  1
Brake Gain = 2818.75 in-lb/psi
                 Axle # 2
Radius of a Tire =  20.50 inches
Pushout Pressure =   5.50 PSI
Brake Key (1=Linear, 2=Non-linear) =  1
Brake Gain = 2818.75 in-lb/psi
```

STRAIGHT LINE BRAKING MODEL
FILE NAME:B:USA-LD.BRK

Treadle Pressure= .00 psi
Deceleration= .00000 gs
Braking Efficiency= .00000

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	.00	12480.00	.0000
1	2	1	.00	17150.00	.0000
1	2	2	.00	17150.00	.0000
2	1	1	.00	17160.00	.0000
2	1	2	.00	17160.00	.0000

Treadle Pressure= 10.00 psi
Deceleration= .03183 gs
Braking Efficiency= .80209

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	.00	12812.82	.0000
1	2	1	672.00	17336.41	.0388
1	2	2	672.00	16933.21	.0397
2	1	1	618.75	17194.40	.0360
2	1	2	618.75	16823.15	.0368

Treadle Pressure= 20.00 psi
Deceleration= .11041 gs
Braking Efficiency= .79441

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	422.50	13734.31	.0308
1	2	1	2272.00	17710.86	.1283
1	2	2	2272.00	16347.66	.1390
2	1	1	1993.75	17251.71	.1156
2	1	2	1993.75	16055.46	.1242

Treadle Pressure= 30.00 psi
Deceleration= .19179 gs
Braking Efficiency= .77936

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	1072.50	14724.76	.0728
1	2	1	3872.00	18057.68	.2144
1	2	2	3872.00	15734.48	.2461
2	1	1	3368.75	17302.17	.1947
2	1	2	3368.75	15280.92	.2205

Treadle Pressure= 40.00 psi
Deceleration= .27317 gs
Braking Efficiency= .75487

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	1722.50	15715.21	.1096
1	2	1	5472.00	18404.49	.2973
1	2	2	5472.00	15121.29	.3619
2	1	1	4743.75	17352.63	.2734
2	1	2	4743.75	14506.38	.3270

Treadle Pressure= 50.00 psi
Deceleration= .35455 gs
Braking Efficiency= .72735

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	2372.50	16705.66	.1420
1	2	1	7072.00	18751.30	.3771
1	2	2	7072.00	14508.11	.4875
2	1	1	6118.75	17403.09	.3516
2	1	2	6118.75	13731.84	.4456

Treadle Pressure= 60.00 psi
Deceleration= .43593 gs
Braking Efficiency= .69848

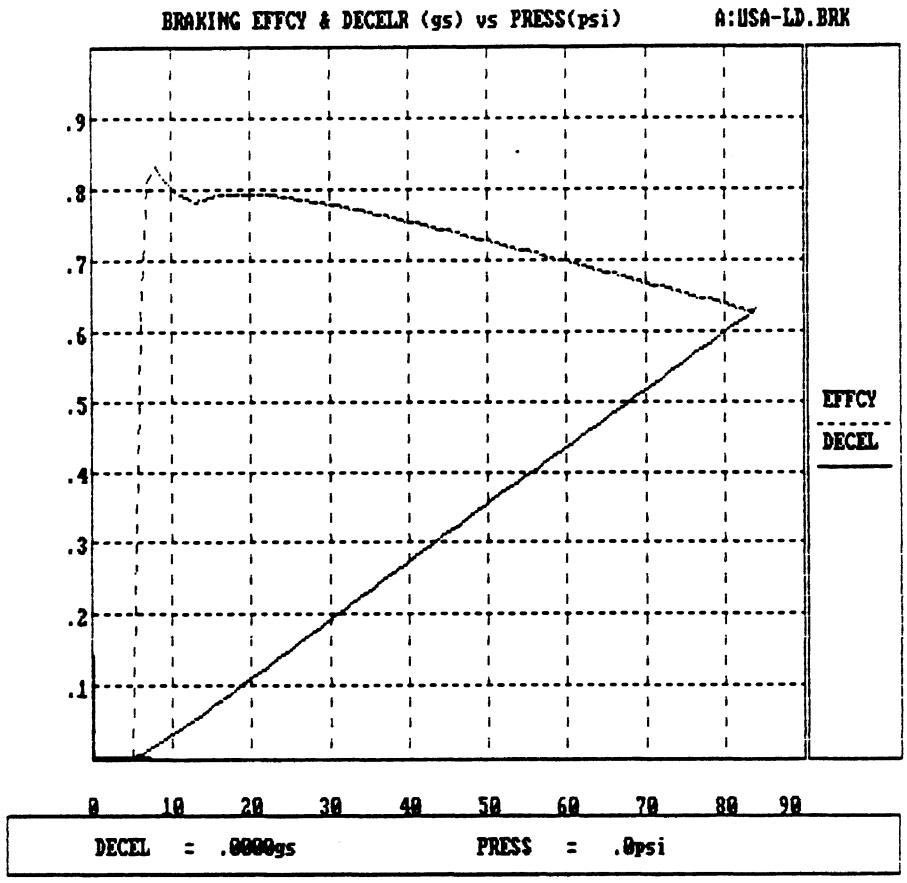
Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	3022.50	17696.11	.1708
1	2	1	8672.00	19098.12	.4541
1	2	2	8672.00	13894.92	.6241
2	1	1	7493.75	17453.55	.4294
2	1	2	7493.75	12957.30	.5783

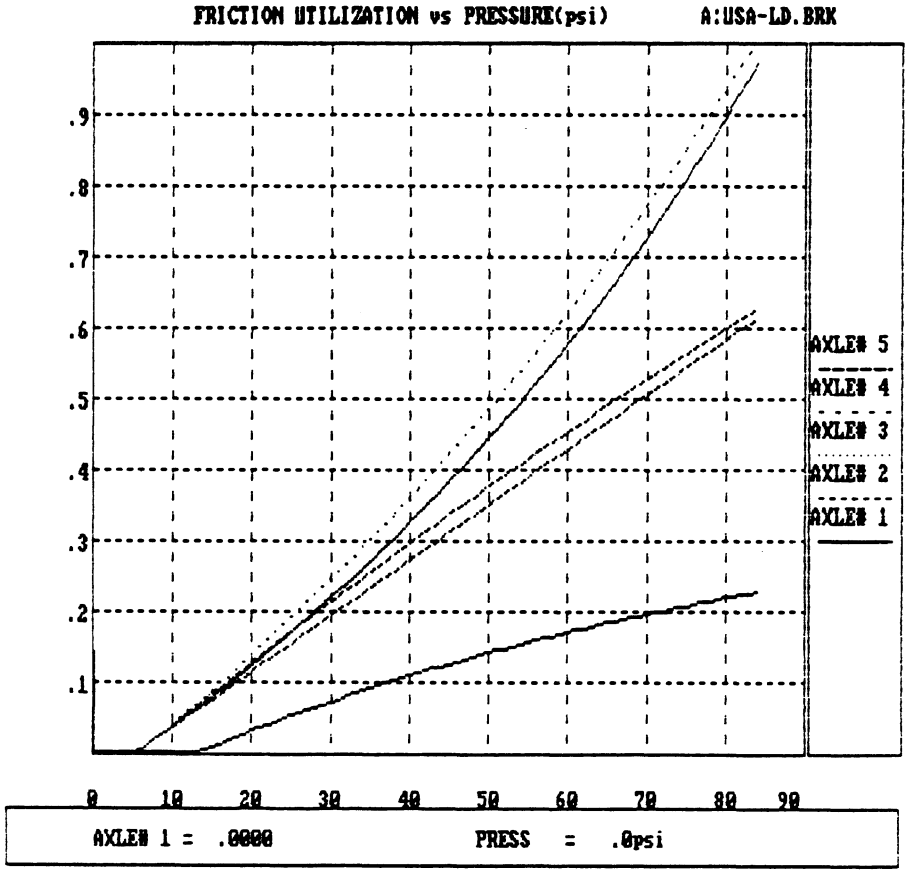
Treadle Pressure= 70.00 psi
Deceleration= .51731 gs
Braking Efficiency= .66889

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	3672.50	18686.56	.1965
1	2	1	10272.00	19444.93	.5283
1	2	2	10272.00	13281.73	.7734
2	1	1	8868.75	17504.01	.5067
2	1	2	8868.75	12182.76	.7280

Treadle Pressure= 80.00 psi
Deceleration= .59869 gs
Braking Efficiency= .63886

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	4322.50	19677.01	.2197
1	2	1	11872.00	19791.75	.5998
1	2	2	11872.00	12668.55	.9371
2	1	1	10243.75	17554.47	.5835
2	1	2	10243.75	11408.22	.8979


BRAKING EFFCY & DECELR (gs) vs PRESS(psi)
A:USA-LD.BRK
.9
.8
.7
.6
.5
.4
.3
.2
.1
EFFCY
DECEL
0
10
20
30
40
50
60
70
80
90
DECEL = .0000gs
PRESS = .0psi


FRICTION UTILIZATION vs PRESSURE(psi)
A:USA-LD.BRK
.9
.8
.7
.6
.5
.4
.3
.2
.1
AXLE# 5
AXLE# 4
AXLE# 3
AXLE# 2
AXLE# 1
0
10
20
30
40
50
60
70
80
90
AXLE# 1 = .0000
PRESS = .0psi

STRAIGHT LINE BRAKING MODEL

FILE NAME:B:USA-EM.BRK

Date: 6- 3-1987 Time: 8:55:51

Information for Unit # 1

General Information

Total Weight = 17000.00 Lbs
Wheelbase = 153.000 inches
Distance of Rear Articulation from Front Suspension = 137.30 inches
Rear Articulation Height = 49.00 inches
Total C.G. Height = 32.00 inches

Suspension # 1 (Single)
Suspension Load = 9792.5 Lbs
Axle # 1
Radius of a Tire = 20.50 inches
Pushout Pressure = 13.50 PSI
Brake Key (1=Linear, 2=Non-linear) = 1
Brake Gain = 1332.50 in-lb/psi

Suspension # 2 (Tandem)
Suspension Load = 10802.8 Lbs
Tandem Axle Separation = 52.00 inches
Dynamic Load Transfer Coefficient (between -1 & 1) = .1500
Axle # 1
Radius of a Tire = 20.50 inches
Pushout Pressure = 5.80 PSI
Brake Key (1=Linear, 2=Non-linear) = 1
Brake Gain = 3280.00 in-lb/psi
Axle # 2
Radius of a Tire = 20.50 inches
Pushout Pressure = 5.80 PSI
Brake Key (1=Linear, 2=Non-linear) = 1
Brake Gain = 3280.00 in-lb/psi

Information for Unit # 2

General Information

Total Weight = 12580.00 Lbs
Wheelbase = 349.250 inches
Distance of Rear Articulation from Forward Articulation = 441.50 inches
Rear Articulation Height = 40.00 inches
Total C.G. Height = 40.50 inches
Unit Key (1 - Independent Unit, Dolly or Semi) = 1
(2 - Full Trailer - Fixed Dolly)

Suspension # 1 (Tandem)

```
Suspension Load =    8984.7 Lbs
Tandem Axle Separation =   50.00 inches
Dynamic Load Transfer Coefficient (between -1 & 1) =    .1500
                  Axle # 1
Radius of a Tire =   20.50 inches
Pushout Pressure =    5.50 PSI
Brake Key (1=Linear, 2=Non-linear) =   1
Brake Gain = 2818.75 in-lb/psi
                  Axle # 2
Radius of a Tire =   20.50 inches
Pushout Pressure =    5.50 PSI
Brake Key (1=Linear, 2=Non-linear) =   1
Brake Gain = 2818.75 in-lb/psi
```

STRAIGHT LINE BRAKING MODEL
FILE NAME:B:USA-EM.BRK

Treadle Pressure= .00 psi
Deceleration= .00000 gs
Braking Efficiency= .00000

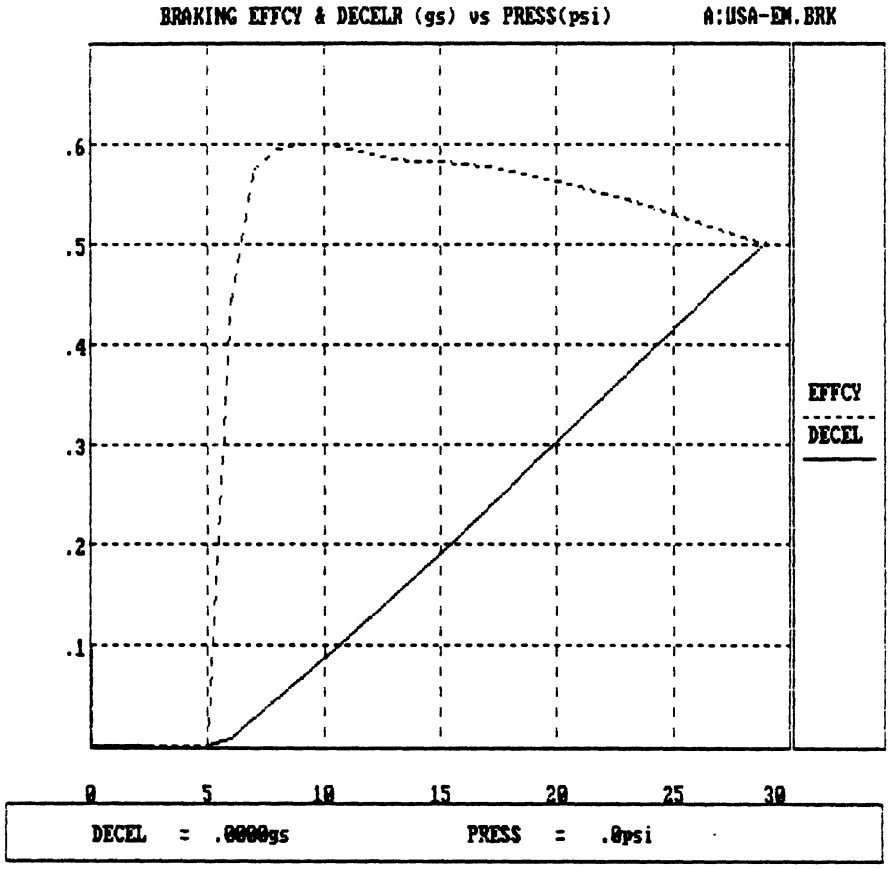
Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	.00	9792.50	.0000
1	2	1	.00	5401.40	.0000
1	2	2	.00	5401.40	.0000
2	1	1	.00	4492.35	.0000
2	1	2	.00	4492.35	.0000

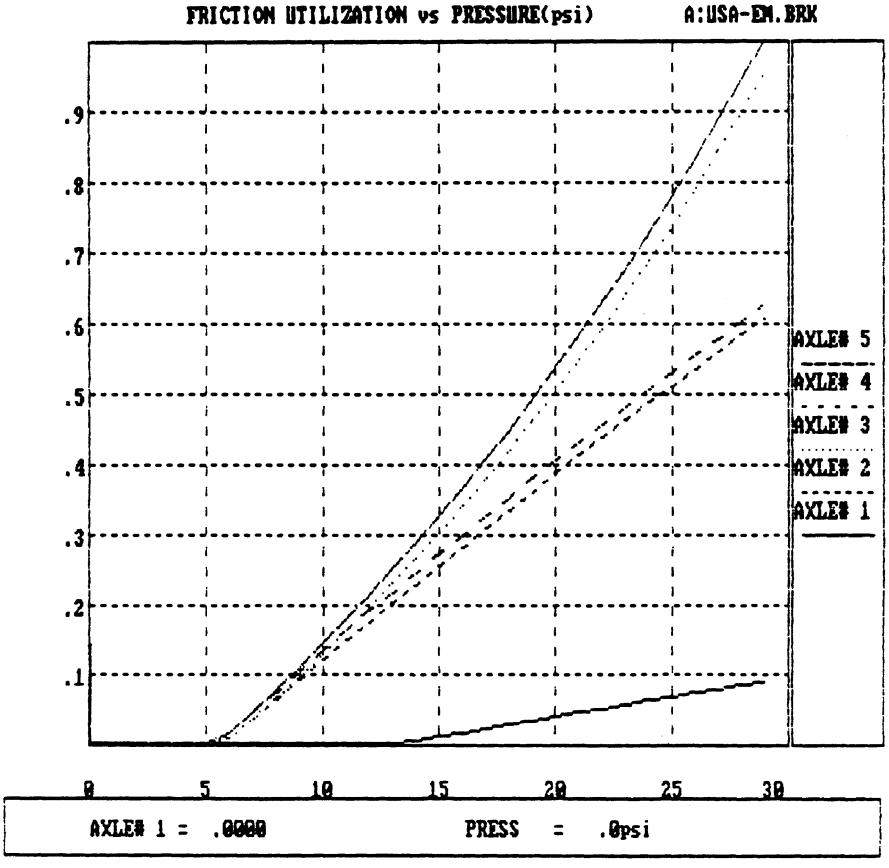
Treadle Pressure= 10.00 psi
Deceleration= .08727 gs
Braking Efficiency= .59896

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	.00	10001.91	.0000
1	2	1	672.00	5558.46	.1209
1	2	2	672.00	5155.26	.1304
2	1	1	618.75	4617.81	.1340
2	1	2	618.75	4246.56	.1457

Treadle Pressure= 20.00 psi
Deceleration= .30270 gs
Braking Efficiency= .56231

Unit No	Susp No	Axle No	Brake Force(Lbs)	Vertical Load(Lbs)	Friction Utilization
1	1	1	422.50	10618.76	.0398
1	2	1	2272.00	5860.44	.3877
1	2	2	2272.00	4497.24	.5052
2	1	1	1993.75	4899.91	.4069
2	1	2	1993.75	3703.66	.5383


BRAKING EFFCY & DECELR (gs) vs PRESS(psi)
A:USA-EM.BRK
.6
.5
.4
.3
.2
.1
EFFCY
DECEL
0
5
10
15
20
25
30
DECEL = .0000gs
PRESS = .0psi


FRICTION UTILIZATION vs PRESSURE(psi)
A:USA-EM.BRK
.9
.8
.7
.6
.5
.4
.3
.2
.1
AXLE# 5
AXLE# 4
AXLE# 3
AXLE# 2
AXLE# 1
0
5
10
15
20
25
30
AXLE# 1 = .0000
PRESS = .0psi

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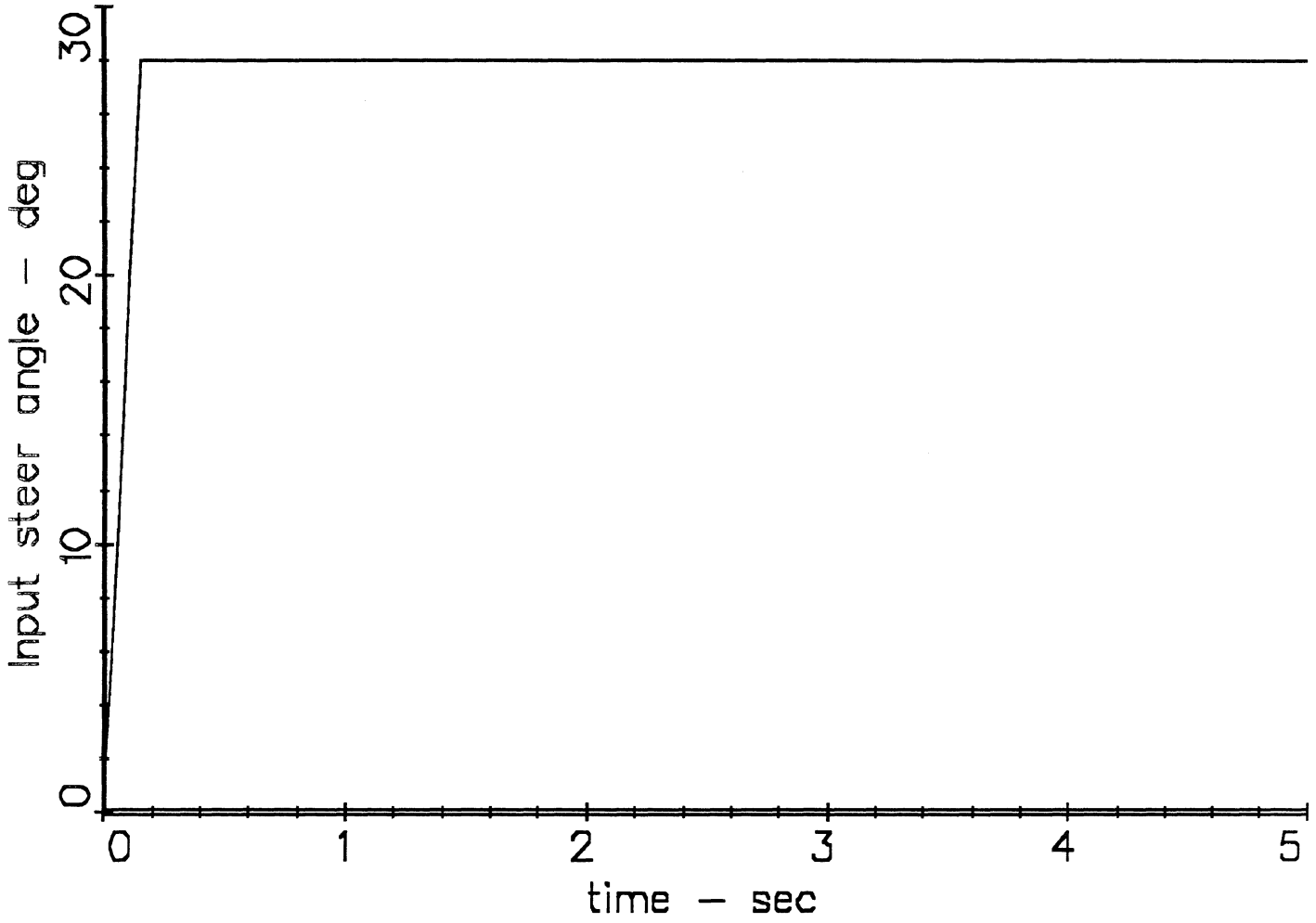
Appendix G

Yaw/Roll Data Sets and Simulations Results



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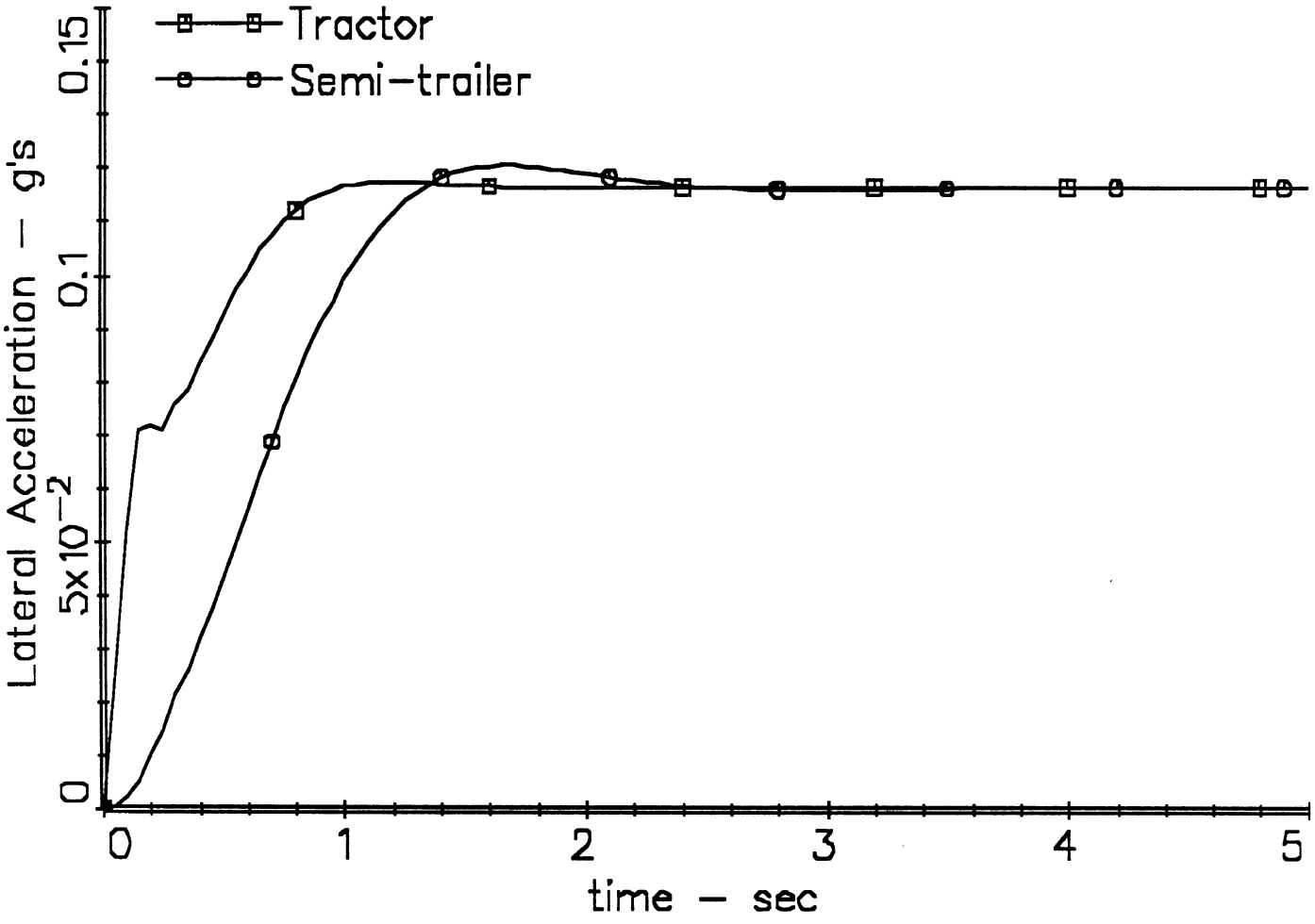

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File Name=In.USEmpty

AXLE # 5
****

TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
4.10	-0.061	0.001	-0.72	2589.1	335.2	-26.07	1698.1	-0.72	1901.2	247.2	-19.22	1291.7	-0.010
4.20	-0.061	0.001	-0.72	2588.9	335.1	-26.07	1698.1	-0.72	1901.0	247.1	-19.22	1291.5	-0.010
4.30	-0.061	0.001	-0.72	2589.1	335.2	-26.07	1698.2	-0.72	1901.2	247.1	-19.22	1291.7	-0.010
4.40	-0.061	0.001	-0.72	2588.9	335.1	-26.07	1698.0	-0.72	1901.0	247.1	-19.22	1291.5	-0.010
4.50	-0.061	0.001	-0.72	2588.9	335.1	-26.06	1698.1	-0.72	1901.1	247.1	-19.22	1291.5	-0.010
4.60	-0.061	0.001	-0.72	2589.1	335.1	-26.07	1698.2	-0.72	1901.3	247.1	-19.22	1291.8	-0.010
4.70	-0.061	0.001	-0.72	2588.7	335.1	-26.06	1697.9	-0.72	1900.9	247.1	-19.22	1291.4	-0.010
4.80	-0.061	0.001	-0.72	2589.2	335.1	-26.07	1698.2	-0.72	1901.3	247.1	-19.22	1291.7	-0.010
4.90	-0.061	0.001	-0.72	2588.8	335.1	-26.06	1698.0	-0.72	1901.0	247.1	-19.22	1291.5	-0.010
5.00	-0.061	0.001	-0.72	2589.1	335.1	-26.06	1698.2	-0.72	1901.3	247.1	-19.22	1291.7	-0.010

File Name=In.USEmpty

AXLE # 4
****

TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
4.10	-0.054	0.001	-0.55	2553.2	254.2	-19.77	1707.9	-0.56	1941.2	194.1	-15.09	1286.2	-0.010
4.20	-0.054	0.001	-0.55	2553.0	254.2	-19.77	1707.8	-0.56	1941.1	194.1	-15.09	1286.1	-0.010
4.30	-0.054	0.001	-0.55	2553.2	254.2	-19.77	1707.9	-0.56	1941.2	194.1	-15.09	1286.2	-0.010
4.40	-0.054	0.001	-0.55	2553.1	254.1	-19.77	1707.8	-0.56	1941.1	194.1	-15.09	1286.1	-0.010
4.50	-0.054	0.001	-0.55	2553.1	254.1	-19.77	1707.9	-0.56	1941.1	194.1	-15.09	1286.1	-0.010
4.60	-0.054	0.001	-0.55	2553.3	254.2	-19.77	1708.0	-0.56	1941.3	194.1	-15.09	1286.3	-0.010
4.70	-0.054	0.001	-0.55	2552.9	254.1	-19.76	1707.8	-0.56	1941.0	194.0	-15.09	1286.1	-0.010
4.80	-0.054	0.001	-0.55	2553.3	254.1	-19.77	1708.0	-0.56	1941.4	194.1	-15.09	1286.3	-0.010
4.90	-0.054	0.001	-0.55	2553.1	254.1	-19.76	1707.8	-0.56	1941.2	194.0	-15.09	1286.2	-0.010
5.00	-0.054	0.001	-0.55	2553.1	254.1	-19.76	1707.9	-0.56	1941.2	194.0	-15.09	1286.2	-0.010

File Name=In.USEmpty

AXLE # 3
****

TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
4.10	-0.066	-0.000	-0.71	3071.8	391.4	-30.44	1649.0	-0.71	2330.2	298.2	-23.19	1252.5	-0.003
4.20	-0.066	-0.000	-0.71	3071.9	391.4	-30.44	1649.1	-0.71	2330.3	298.2	-23.19	1252.6	-0.003
4.30	-0.066	-0.000	-0.71	3071.7	391.4	-30.44	1649.0	-0.71	2330.2	298.2	-23.19	1252.5	-0.003
4.40	-0.066	-0.000	-0.71	3071.8	391.4	-30.44	1649.1	-0.71	2330.3	298.2	-23.19	1252.6	-0.003
4.50	-0.066	-0.000	-0.71	3071.8	391.4	-30.44	1649.1	-0.71	2330.2	298.2	-23.19	1252.5	-0.003
4.60	-0.066	-0.000	-0.71	3071.8	391.4	-30.44	1649.1	-0.71	2330.2	298.2	-23.19	1252.5	-0.003
4.70	-0.066	-0.000	-0.71	3072.0	391.4	-30.44	1649.1	-0.71	2330.4	298.2	-23.19	1252.6	-0.003
4.80	-0.066	-0.000	-0.71	3071.7	391.4	-30.44	1649.0	-0.71	2330.2	298.1	-23.19	1252.5	-0.003
4.90	-0.066	-0.000	-0.71	3072.1	391.4	-30.44	1649.2	-0.71	2330.5	298.2	-23.19	1252.7	-0.003
5.00	-0.066	-0.000	-0.71	3071.6	391.4	-30.44	1648.9	-0.71	2330.1	298.1	-23.19	1252.4	-0.003

File Name=In.USEmpty

AXLE # 2
****

TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
4.10	-0.056	0.000	-0.54	3015.4	290.6	-22.60	1662.0	-0.54	2384.8	230.8	-17.95	1238.1	-0.003
4.20	-0.056	0.000	-0.54	3015.7	290.6	-22.60	1662.2	-0.54	2385.0	230.8	-17.95	1238.3	-0.003
4.30	-0.056	0.000	-0.54	3015.5	290.6	-22.60	1662.0	-0.54	2384.8	230.8	-17.95	1238.1	-0.003
4.40	-0.056	0.000	-0.54	3015.5	290.6	-22.60	1662.1	-0.54	2384.9	230.8	-17.95	1238.2	-0.003
4.50	-0.056	0.000	-0.54	3015.6	290.6	-22.60	1662.1	-0.54	2384.9	230.8	-17.95	1238.2	-0.003
4.60	-0.056	0.000	-0.54	3015.7	290.6	-22.60	1662.1	-0.54	2385.0	230.8	-17.95	1238.3	-0.003
4.70	-0.056	0.000	-0.54	3015.7	290.6	-22.60	1662.1	-0.54	2385.0	230.8	-17.95	1238.2	-0.003
4.80	-0.056	0.000	-0.54	3015.5	290.6	-22.60	1662.1	-0.54	2384.9	230.8	-17.95	1238.2	-0.003
4.90	-0.056	0.000	-0.54	3015.7	290.6	-22.60	1662.1	-0.54	2385.0	230.8	-17.95	1238.3	-0.003
5.00	-0.056	0.000	-0.54	3015.5	290.6	-22.60	1662.1	-0.54	2384.9	230.8	-17.95	1238.2	-0.003

File Name=In.USEmpty

AXLE # 1
****

TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
4.10	-0.100	0.001	-0.89	5211.9	659.7	-109.30	4329.3	-0.80	4580.9	533.1	-82.65	4261.7	
4.20	-0.100	0.001	-0.89	5211.9	659.7	-109.30	4329.3	-0.80	4580.9	533.1	-82.66	4261.7	
4.30	-0.100	0.001	-0.89	5211.9	659.7	-109.30	4329.2	-0.80	4580.9	533.1	-82.65	4261.7	
4.40	-0.100	0.001	-0.89	5211.9	659.7	-109.30	4329.3	-0.80	4580.9	533.1	-82.65	4261.7	
4.50	-0.100	0.001	-0.89	5211.9	659.7	-109.30	4329.3	-0.80	4580.9	533.1	-82.65	4261.7	
4.60	-0.100	0.001	-0.89	5211.9	659.7	-109.30	4329.2	-0.80	4580.9	533.1	-82.65	4261.7	
4.70	-0.100	0.001	-0.89	5211.8	659.7	-109.30	4329.2	-0.80	4580.9	533.1	-82.65	4261.6	
4.80	-0.100	0.001	-0.89	5211.9	659.7	-109.31	4329.3	-0.80	4581.0	533.1	-82.66	4261.7	
4.90	-0.100	0.001	-0.89	5211.9	659.7	-109.30	4329.3	-0.80	4580.9	533.1	-82.66	4261.7	
5.00	-0.100	0.001	-0.89	5211.9	659.7	-109.30	4329.2	-0.80	4580.9	533.1	-82.65	4261.7	

File Name=In.USEmpty

CONSTRAINT FORCES
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NOTE: LATERAL FORCE ALONE IS PRINTED FOR PINTLE HOOK TYPE CONSTRAINT.
LOCATE FORCES & MOMENTS BASED ON CONSTRAINT TYPE

TIME	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
4.10	-443.2	3593.7	9591.0	0.0						
4.20	-443.2	3594.0	9592.2	0.0						
4.30	-443.2	3593.8	9591.4	0.0						
4.40	-443.2	3593.9	9593.1	0.0						
4.50	-443.2	3593.9	9595.4	0.0						
4.60	-443.2	3593.9	9594.5	0.0						
4.70	-443.2	3594.0	9595.6	0.0						
4.80	-443.2	3593.8	9591.4	0.0						
4.90	-443.2	3594.1	9595.3	0.0						
5.00	-443.2	3593.7	9591.0	0.0						

File Name=In.USEmpty

SPRUNG MASS # 2
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TIME (SEC)	FORWARD POSITION (IN)	LATERAL POSITION (IN)	VERTICAL POSITION (IN)	ROLL ANGLE (DEG)	YAW ANGLE (DEG)	PITCH ANGLE (DEG)	FORWARD VEL IN/SEC	LATERAL VEL IN/SEC	ROLL RATE DEG/SEC	YAW RATE DEG/SEC	PITCH RATE DEG/SEC	LATERAL ACCN. IN/SEC**2	ARTIC ANGLE DEG
4.10	3272.69	274.39	-0.001	-0.20	10.41	-0.000	880.09	-3.26	0.00	2.92	-0.01	44.88	1.09
4.20	3359.25	290.21	-0.001	-0.20	10.71	-0.000	880.09	-3.26	-0.00	2.92	-0.01	44.88	1.09
4.30	3445.73	306.46	-0.001	-0.20	11.00	-0.000	880.09	-3.26	-0.00	2.92	-0.01	44.88	1.09
4.40	3532.13	323.15	-0.001	-0.20	11.29	-0.000	880.09	-3.26	-0.00	2.92	-0.01	44.88	1.09
4.50	3618.44	340.29	-0.001	-0.20	11.58	-0.000	880.09	-3.26	0.00	2.92	-0.01	44.88	1.09
4.60	3704.66	357.86	-0.000	-0.20	11.87	-0.000	880.09	-3.26	-0.00	2.92	-0.01	44.88	1.09
4.70	3790.79	375.87	-0.001	-0.20	12.16	-0.000	880.09	-3.26	0.00	2.92	-0.01	44.87	1.09
4.80	3876.83	394.32	-0.000	-0.20	12.46	-0.000	880.09	-3.26	-0.00	2.92	-0.01	44.88	1.09
4.90	3962.77	413.21	-0.001	-0.20	12.75	-0.000	880.09	-3.26	0.00	2.92	-0.01	44.87	1.09
5.00	4048.62	432.53	-0.001	-0.20	13.04	-0.000	880.09	-3.26	-0.00	2.92	-0.01	44.87	1.09

File Name=In.USEmpty

SPRUNG MASS # 1
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TIME (SEC)	FORWARD POSITION (IN)	LATERAL POSITION (IN)	VERTICAL POSITION (IN)	ROLL ANGLE (DEG)	YAW ANGLE (DEG)	PITCH ANGLE (DEG)	FORWARD VEL IN/SEC	LATERAL VEL IN/SEC	ROLL RATE DEG/SEC	YAW RATE DEG/SEC	PITCH RATE DEG/SEC	LATERAL ACCN. IN/SEC**2	STEER ANGLE DEG
4.10	3586.05	333.93	-0.000	-0.21	11.50	0.000	880.08	-3.67	-0.00	2.92	-0.01	44.87	28.00
4.20	3672.31	351.34	-0.000	-0.21	11.79	0.000	880.08	-3.67	-0.00	2.92	-0.01	44.88	28.00
4.30	3758.47	369.18	-0.000	-0.21	12.08	0.000	880.08	-3.67	-0.00	2.92	-0.01	44.87	28.00
4.40	3844.55	387.47	-0.000	-0.21	12.38	0.000	880.08	-3.67	0.00	2.92	-0.01	44.88	28.00
4.50	3930.53	406.19	-0.000	-0.21	12.67	0.000	880.08	-3.67	0.00	2.92	-0.01	44.88	28.00
4.60	4016.41	425.35	-0.000	-0.21	12.96	0.000	880.08	-3.67	0.00	2.92	-0.01	44.88	28.00
4.70	4102.19	444.95	-0.000	-0.21	13.25	0.000	880.08	-3.67	-0.00	2.92	-0.01	44.88	28.00
4.80	4187.87	464.99	-0.000	-0.21	13.54	0.000	880.08	-3.67	-0.00	2.92	-0.01	44.87	28.00
4.90	4273.45	485.46	-0.000	-0.21	13.83	0.000	880.08	-3.67	-0.00	2.92	-0.01	44.88	28.00
5.00	4358.93	506.36	-0.000	-0.21	14.13	0.000	880.08	-3.67	-0.00	2.92	-0.01	44.87	28.00

File Name=In.USEmpty

AXLE # 5
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TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
0.0	0.0	0.0	0.0	2246.3	0.0	0.0	1496.2	0.0	2246.3	0.0	0.0	1496.2	0.0
0.10	-0.002	-0.000	0.00	2259.9	-1.7	0.13	1523.2	0.00	2232.6	-1.6	0.13	1469.3	-0.000
0.20	-0.012	-0.000	-0.00	2313.3	1.9	-0.15	1594.5	-0.00	2178.9	1.8	-0.14	1397.7	-0.003
0.30	-0.017	-0.000	-0.04	2344.4	15.3	-1.19	1616.3	-0.04	2147.9	14.1	-1.09	1376.0	-0.005
0.40	-0.019	-0.000	-0.08	2355.8	35.2	-2.74	1609.4	-0.08	2136.7	32.0	-2.49	1383.0	-0.005
0.50	-0.023	-0.000	-0.14	2373.6	61.3	-4.77	1613.2	-0.14	2118.4	54.8	-4.26	1378.8	-0.005
0.60	-0.029	-0.000	-0.22	2408.3	94.8	-7.37	1635.8	-0.22	2083.7	82.2	-6.39	1356.2	-0.006
0.70	-0.036	-0.000	-0.31	2450.2	134.8	-10.48	1661.6	-0.31	2041.9	112.6	-8.76	1330.3	-0.007
0.80	-0.043	-0.000	-0.40	2487.4	177.6	-13.82	1677.9	-0.40	2004.4	143.6	-11.17	1313.8	-0.008
0.90	-0.048	-0.000	-0.48	2516.9	219.2	-17.05	1685.2	-0.49	1975.3	172.7	-13.43	1306.6	-0.008
1.00	-0.052	-0.000	-0.56	2540.4	256.7	-19.96	1689.2	-0.56	1951.7	198.0	-15.40	1302.2	-0.009
1.10	-0.056	0.000	-0.63	2560.0	288.3	-22.43	1693.8	-0.63	1930.6	218.4	-16.99	1296.5	-0.009
1.20	-0.059	0.000	-0.68	2576.7	313.7	-24.40	1698.1	-0.68	1913.9	234.1	-18.21	1292.0	-0.009
1.30	-0.061	0.001	-0.71	2588.6	332.5	-25.86	1700.6	-0.72	1901.3	245.3	-19.08	1289.0	-0.010
1.40	-0.062	0.001	-0.74	2596.4	345.1	-26.84	1701.6	-0.74	1893.6	252.8	-19.66	1287.9	-0.010
1.50	-0.063	0.001	-0.75	2600.4	352.3	-27.40	1701.5	-0.76	1889.5	257.2	-20.00	1287.9	-0.010
1.60	-0.063	0.001	-0.76	2601.9	355.4	-27.64	1701.2	-0.76	1888.0	259.1	-20.15	1288.3	-0.010
1.70	-0.063	0.001	-0.76	2601.7	355.5	-27.65	1700.8	-0.76	1888.2	259.2	-20.16	1288.7	-0.010
1.80	-0.063	0.001	-0.76	2600.5	353.8	-27.52	1700.4	-0.76	1889.3	258.2	-20.08	1289.0	-0.010
1.90	-0.063	0.001	-0.75	2598.7	350.9	-27.30	1700.0	-0.75	1891.1	256.5	-19.95	1289.5	-0.010
2.00	-0.062	0.001	-0.74	2596.7	347.7	-27.04	1699.5	-0.75	1893.1	254.6	-19.80	1290.0	-0.010
2.10	-0.062	0.001	-0.74	2594.9	344.5	-26.79	1699.2	-0.74	1895.4	252.7	-19.66	1290.6	-0.010
2.20	-0.062	0.001	-0.73	2593.0	341.6	-26.57	1698.8	-0.73	1897.2	251.0	-19.52	1291.0	-0.010
2.30	-0.061	0.001	-0.73	2591.4	339.1	-26.38	1698.4	-0.73	1898.6	249.5	-19.41	1291.2	-0.010
2.40	-0.061	0.001	-0.72	2590.3	337.2	-26.23	1698.2	-0.73	1899.8	248.4	-19.32	1291.5	-0.010
2.50	-0.061	0.001	-0.72	2589.5	335.8	-26.12	1698.1	-0.72	1900.7	247.6	-19.25	1291.6	-0.010
2.60	-0.061	0.001	-0.72	2588.9	334.9	-26.05	1698.0	-0.72	1901.4	247.0	-19.21	1291.8	-0.010
2.70	-0.061	0.001	-0.72	2588.4	334.3	-26.00	1697.9	-0.72	1901.6	246.6	-19.18	1291.7	-0.010
2.80	-0.061	0.001	-0.72	2588.3	334.0	-25.98	1697.9	-0.72	1901.9	246.5	-19.17	1291.8	-0.010
2.90	-0.061	0.001	-0.72	2588.4	334.0	-25.97	1698.0	-0.72	1902.0	246.4	-19.17	1291.9	-0.010
3.00	-0.061	0.001	-0.72	2588.3	334.0	-25.98	1697.9	-0.72	1901.8	246.5	-19.17	1291.8	-0.010
3.10	-0.061	0.001	-0.72	2588.5	334.1	-25.99	1698.0	-0.72	1901.9	246.5	-19.18	1291.8	-0.010
3.20	-0.061	0.001	-0.72	2588.4	334.3	-26.00	1698.0	-0.72	1901.6	246.6	-19.18	1291.7	-0.010
3.30	-0.061	0.001	-0.72	2588.7	334.5	-26.02	1698.1	-0.72	1901.7	246.8	-19.19	1291.7	-0.010
3.40	-0.061	0.001	-0.72	2588.5	334.6	-26.03	1698.0	-0.72	1901.3	246.8	-19.20	1291.6	-0.010
3.50	-0.061	0.001	-0.72	2588.9	334.8	-26.04	1698.1	-0.72	1901.4	246.9	-19.21	1291.7	-0.010
3.60	-0.061	0.001	-0.72	2588.9	334.9	-26.05	1698.1	-0.72	1901.3	247.0	-19.21	1291.6	-0.010
3.70	-0.061	0.001	-0.72	2588.8	335.0	-26.05	1698.0	-0.72	1901.1	247.0	-19.21	1291.5	-0.010
3.80	-0.061	0.001	-0.72	2589.1	335.1	-26.06	1698.2	-0.72	1901.3	247.1	-19.22	1291.7	-0.010
3.90	-0.061	0.001	-0.72	2588.8	335.1	-26.06	1698.0	-0.72	1901.0	247.1	-19.22	1291.5	-0.010
4.00	-0.061	0.001	-0.72	2589.1	335.1	-26.07	1698.2	-0.72	1901.2	247.1	-19.22	1291.6	-0.010

File Name=In.USEmpty

AXLE # 4
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TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
0.0	0.0	0.0	0.0	2246.3	0.0	0.0	1496.2	0.0	2246.3	0.0	0.0	1496.2	0.0
0.10	-0.002	-0.000	0.01	2259.8	-2.4	0.19	1524.3	0.01	2232.7	-2.4	0.19	1468.1	-0.000
0.20	-0.012	-0.000	0.00	2312.1	-1.9	0.15	1597.6	0.00	2180.0	-1.8	0.14	1394.6	-0.003
0.30	-0.017	-0.000	-0.02	2340.0	6.4	-0.50	1619.3	-0.02	2152.2	-5.9	-0.46	1372.9	-0.005
0.40	-0.018	-0.000	-0.04	2346.9	18.6	-1.45	1612.7	-0.04	2145.4	17.0	-1.33	1379.5	-0.005
0.50	-0.020	-0.000	-0.08	2359.9	35.0	-2.72	1618.1	-0.08	2132.1	31.6	-2.46	1373.9	-0.005
0.60	-0.025	-0.000	-0.13	2389.3	57.3	-4.46	1642.6	-0.13	2102.6	50.5	-3.93	1349.3	-0.006
0.70	-0.032	-0.000	-0.20	2426.0	85.7	-6.66	1669.9	-0.20	2065.9	73.2	-5.69	1321.9	-0.007
0.80	-0.038	-0.000	-0.27	2458.3	117.6	-9.15	1687.2	-0.27	2033.3	97.6	-7.59	1304.4	-0.008
0.90	-0.042	-0.000	-0.34	2483.8	149.9	-11.66	1695.2	-0.34	2008.4	121.7	-9.46	1296.8	-0.009
1.00	-0.046	-0.000	-0.40	2504.2	180.0	-14.00	1699.5	-0.40	1988.2	143.5	-11.16	1292.6	-0.009
1.10	-0.049	0.000	-0.45	2522.3	206.3	-16.04	1703.9	-0.46	1971.0	161.9	-12.59	1289.2	-0.010
1.20	-0.051	0.000	-0.50	2538.1	228.1	-17.74	1708.5	-0.50	1956.3	176.6	-13.74	1285.6	-0.010
1.30	-0.054	0.001	-0.53	2549.6	245.0	-19.05	1711.2	-0.54	1944.5	187.7	-14.60	1282.8	-0.010
1.40	-0.055	0.001	-0.56	2557.4	256.9	-19.98	1712.2	-0.56	1937.0	195.5	-15.20	1282.0	-0.010
1.50	-0.056	0.001	-0.57	2561.7	264.4	-20.56	1712.0	-0.58	1932.6	200.4	-15.59	1282.1	-0.010
1.60	-0.056	0.001	-0.58	2563.6	268.3	-20.87	1711.6	-0.58	1930.8	203.0	-15.79	1282.6	-0.010
1.70	-0.056	0.001	-0.58	2563.9	269.5	-20.96	1711.0	-0.59	1930.3	203.8	-15.85	1283.0	-0.010
1.80	-0.056	0.001	-0.58	2563.4	269.0	-20.92	1710.6	-0.59	1931.1	203.5	-15.83	1283.6	-0.010
1.90	-0.056	0.001	-0.58	2562.1	267.2	-20.79	1710.1	-0.58	1932.4	202.4	-15.75	1284.1	-0.010
2.00	-0.055	0.001	-0.57	2560.4	264.9	-20.61	1709.5	-0.58	1934.0	201.0	-15.63	1284.6	-0.010
2.10	-0.055	0.001	-0.57	2558.6	262.5	-20.41	1708.9	-0.57	1935.7	199.4	-15.51	1285.2	-0.010
2.20	-0.055	0.001	-0.57	2557.1	260.1	-20.23	1708.5	-0.57	1937.4	197.9	-15.40	1285.6	-0.010
2.30	-0.055	0.001	-0.56	2555.7	258.1	-20.08	1708.2	-0.56	1938.7	196.6	-15.29	1285.9	-0.010
2.40	-0.054	0.001	-0.56	2554.6	256.5	-19.95	1708.0	-0.56	1939.8	195.6	-15.21	1286.1	-0.010
2.50	-0.054	0.001	-0.56	2553.8	255.2	-19.85	1707.9	-0.56	1940.6	194.8	-15.15	1286.3	-0.010
2.60	-0.054	0.001	-0.55	2553.2	254.3	-19.78	1707.7	-0.56	1941.2	194.2	-15.10	1286.4	-0.010
2.70	-0.054	0.001	-0.55	2552.7	253.7	-19.74	1707.6	-0.55	1941.5	193.8	-15.07	1286.4	-0.010
2.80	-0.054	0.001	-0.55	2552.6	253.4	-19.71	1707.6	-0.55	1941.7	193.6	-15.06	1286.4	-0.010
2.90	-0.054	0.001	-0.55	2552.6	253.3	-19.70	1707.7	-0.55	1941.9	193.5	-15.05	1286.4	-0.010
3.00	-0.054	0.001	-0.55	2552.5	253.3	-19.70	1707.7	-0.55	1941.8	193.5	-15.05	1286.3	-0.010
3.10	-0.054	0.001	-0.55	2552.6	253.3	-19.70	1707.8	-0.55	1941.8	193.5	-15.05	1286.4	-0.010
3.20	-0.054	0.001	-0.55	2552.6	253.4	-19.71	1707.7	-0.55	1941.6	193.6	-15.06	1286.2	-0.010
3.30	-0.054	0.001	-0.55	2552.8	253.6	-19.72	1707.9	-0.55	1941.6	193.7	-15.07	1286.3	-0.010
3.40	-0.054	0.001	-0.55	2552.7	253.7	-19.73	1707.7	-0.55	1941.3	193.8	-15.07	1286.2	-0.010
3.50	-0.054	0.001	-0.55	2553.0	253.8	-19.74	1707.9	-0.55	1941.4	193.9	-15.08	1286.2	-0.010
3.60	-0.054	0.001	-0.55	2553.0	253.9	-19.75	1707.8	-0.55	1941.3	193.9	-15.08	1286.2	-0.010
3.70	-0.054	0.001	-0.55	2552.9	254.0	-19.76	1707.8	-0.56	1941.1	194.0	-15.09	1286.2	-0.010
3.80	-0.054	0.001	-0.55	2553.4	254.1	-19.76	1708.1	-0.56	1941.5	194.0	-15.09	1286.4	-0.010
3.90	-0.054	0.001	-0.55	2552.9	254.1	-19.76	1707.8	-0.56	1941.0	194.0	-15.09	1286.1	-0.010
4.00	-0.054	0.001	-0.55	2553.2	254.2	-19.77	1708.0	-0.56	1941.3	194.1	-15.09	1286.2	-0.010

File Name=In.USEmpty

AXLE # 3
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TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
0.0	0.0	0.0	0.0	2700.7	0.0	0.0	1450.7	0.0	2700.7	0.0	0.0	1450.7	0.0
0.10	-0.006	-0.000	-0.02	2732.1	10.3	-0.80	1484.9	-0.02	2669.5	10.1	-0.79	1416.5	-0.000
0.20	-0.018	-0.000	-0.12	2801.7	61.5	-4.78	1533.9	-0.12	2600.0	57.2	-4.45	1367.6	-0.001
0.30	-0.030	-0.000	-0.27	2867.8	138.3	-10.76	1555.6	-0.27	2534.2	122.6	-9.54	1346.1	-0.001
0.40	-0.037	-0.000	-0.41	2909.4	213.9	-16.64	1548.9	-0.41	2492.4	184.0	-14.31	1352.7	-0.001
0.50	-0.043	-0.000	-0.52	2944.6	277.3	-21.57	1549.9	-0.53	2458.0	232.5	-18.08	1352.1	-0.001
0.60	-0.050	-0.000	-0.61	2981.3	326.3	-25.38	1568.4	-0.61	2420.4	266.1	-20.70	1333.1	-0.002
0.70	-0.056	-0.000	-0.67	3016.6	361.6	-28.12	1593.4	-0.67	2386.3	287.3	-22.35	1308.7	-0.002
0.80	-0.060	-0.000	-0.70	3041.3	383.8	-29.85	1612.0	-0.70	2360.7	299.3	-23.28	1289.6	-0.002
0.90	-0.063	-0.000	-0.72	3056.6	395.6	-30.77	1623.5	-0.72	2346.1	305.0	-23.72	1278.7	-0.002
1.00	-0.064	-0.000	-0.73	3064.7	400.1	-31.12	1631.1	-0.73	2337.5	306.5	-23.84	1270.7	-0.003
1.10	-0.065	-0.000	-0.73	3070.4	400.8	-31.17	1638.7	-0.73	2332.2	305.7	-23.78	1263.2	-0.003
1.20	-0.066	-0.000	-0.72	3073.9	399.6	-31.08	1645.6	-0.73	2328.3	304.0	-23.64	1256.2	-0.003
1.30	-0.066	-0.000	-0.72	3076.2	398.0	-30.95	1650.7	-0.72	2326.1	302.2	-23.50	1251.0	-0.003
1.40	-0.066	-0.000	-0.72	3076.9	396.3	-30.82	1653.4	-0.72	2325.2	300.7	-23.39	1248.2	-0.003
1.50	-0.066	-0.000	-0.71	3076.9	394.9	-30.71	1654.5	-0.72	2325.2	299.6	-23.31	1247.2	-0.003
1.60	-0.066	-0.000	-0.71	3076.7	393.8	-30.63	1654.7	-0.71	2325.7	298.9	-23.25	1247.2	-0.003
1.70	-0.066	-0.000	-0.71	3075.8	392.9	-30.56	1654.3	-0.71	2325.8	298.4	-23.21	1247.2	-0.003
1.80	-0.066	-0.000	-0.71	3076.0	392.5	-30.53	1654.0	-0.71	2326.8	298.1	-23.19	1248.0	-0.003
1.90	-0.066	-0.000	-0.71	3074.7	392.1	-30.49	1653.0	-0.71	2326.9	297.9	-23.17	1248.4	-0.003
2.00	-0.066	-0.000	-0.71	3074.4	391.9	-30.48	1652.3	-0.71	2328.0	298.0	-23.18	1249.5	-0.003
2.10	-0.066	-0.000	-0.71	3073.5	391.7	-30.46	1651.3	-0.71	2328.6	298.0	-23.18	1250.3	-0.003
2.20	-0.066	-0.000	-0.71	3073.0	391.6	-30.46	1650.6	-0.71	2329.1	298.0	-23.18	1251.1	-0.003
2.30	-0.066	-0.000	-0.71	3072.7	391.5	-30.45	1650.0	-0.71	2329.7	298.1	-23.19	1251.7	-0.003
2.40	-0.066	-0.000	-0.71	3072.1	391.4	-30.45	1649.6	-0.71	2329.9	298.1	-23.19	1252.1	-0.003
2.50	-0.066	-0.000	-0.71	3072.0	391.4	-30.44	1649.3	-0.71	2330.2	298.1	-23.19	1252.6	-0.003
2.60	-0.066	-0.000	-0.71	3071.6	391.3	-30.44	1648.9	-0.71	2330.1	298.1	-23.19	1252.6	-0.003
2.70	-0.066	-0.000	-0.71	3072.0	391.4	-30.44	1649.0	-0.71	2330.7	298.2	-23.19	1253.0	-0.003
2.80	-0.066	-0.000	-0.71	3071.5	391.3	-30.44	1648.7	-0.71	2330.4	298.1	-23.19	1252.7	-0.003
2.90	-0.066	-0.000	-0.71	3071.7	391.3	-30.44	1648.8	-0.71	2330.6	298.2	-23.19	1253.0	-0.003
3.00	-0.066	-0.000	-0.71	3071.6	391.3	-30.44	1648.8	-0.71	2330.5	298.2	-23.19	1252.8	-0.003
3.10	-0.066	-0.000	-0.71	3071.7	391.3	-30.44	1648.9	-0.71	2330.5	298.2	-23.19	1252.9	-0.003
3.20	-0.066	-0.000	-0.71	3071.7	391.4	-30.44	1648.8	-0.71	2330.5	298.2	-23.19	1252.8	-0.003
3.30	-0.066	-0.000	-0.71	3071.8	391.4	-30.44	1649.0	-0.71	2330.4	298.2	-23.19	1252.8	-0.003
3.40	-0.066	-0.000	-0.71	3071.8	391.4	-30.44	1649.0	-0.71	2330.5	298.2	-23.19	1252.7	-0.003
3.50	-0.066	-0.000	-0.71	3071.7	391.4	-30.44	1649.0	-0.71	2330.3	298.1	-23.19	1252.6	-0.003
3.60	-0.066	-0.000	-0.71	3072.0	391.4	-30.44	1649.1	-0.71	2330.5	298.2	-23.19	1252.7	-0.003
3.70	-0.066	-0.000	-0.71	3071.7	391.4	-30.44	1649.0	-0.71	2330.2	298.1	-23.19	1252.5	-0.003
3.80	-0.066	-0.000	-0.71	3072.0	391.4	-30.44	1649.1	-0.71	2330.4	298.2	-23.19	1252.7	-0.003
3.90	-0.066	-0.000	-0.71	3071.6	391.4	-30.44	1649.0	-0.71	2330.1	298.1	-23.19	1252.4	-0.003
4.00	-0.066	-0.000	-0.71	3072.2	391.5	-30.45	1649.2	-0.71	2330.6	298.2	-23.19	1252.7	-0.003

File Name=In.USEmpty

AXLE # 2
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TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
0.0	0.0	0.0	0.0	2700.7	0.0	0.0	1450.7	0.0	2700.7	0.0	0.0	1450.7	0.0
0.10	-0.004	-0.000	0.01	2722.6	-2.7	0.21	1495.1	0.01	2678.6	-2.6	0.21	1406.0	-0.000
0.20	-0.013	-0.000	-0.03	2771.7	16.0	-1.24	1550.9	-0.03	2629.4	15.2	-1.18	1350.2	-0.001
0.30	-0.022	-0.000	-0.13	2822.6	66.5	-5.17	1572.0	-0.13	2578.2	60.9	-4.74	1328.6	-0.001
0.40	-0.027	-0.000	-0.24	2854.0	124.5	-9.68	1563.1	-0.24	2546.5	111.5	-8.67	1337.4	-0.002
0.50	-0.033	-0.000	-0.34	2884.9	177.4	-13.80	1564.7	-0.34	2516.4	155.4	-12.09	1336.2	-0.002
0.60	-0.039	-0.000	-0.42	2921.2	221.1	-17.20	1585.1	-0.42	2479.3	188.5	-14.66	1315.4	-0.002
0.70	-0.045	-0.000	-0.48	2956.8	254.4	-19.78	1610.6	-0.48	2444.3	211.3	-16.43	1290.1	-0.002
0.80	-0.050	-0.000	-0.52	2982.4	276.8	-21.53	1628.5	-0.52	2418.2	225.4	-17.53	1271.9	-0.002
0.90	-0.053	-0.000	-0.54	2998.2	289.7	-22.53	1638.7	-0.54	2402.8	233.2	-18.13	1262.0	-0.003
1.00	-0.054	-0.000	-0.55	3007.1	295.6	-22.99	1645.6	-0.55	2393.4	236.3	-18.38	1254.8	-0.003
1.10	-0.055	-0.000	-0.55	3013.4	297.5	-23.14	1652.9	-0.55	2387.4	236.7	-18.41	1247.6	-0.003
1.20	-0.056	0.0	-0.55	3017.5	297.4	-23.13	1659.5	-0.55	2382.9	235.9	-18.34	1240.7	-0.003
1.30	-0.057	0.0	-0.55	3020.0	296.4	-23.05	1664.5	-0.55	2380.6	234.6	-18.25	1235.9	-0.003
1.40	-0.057	0.000	-0.54	3020.9	295.2	-22.96	1666.9	-0.55	2379.7	233.5	-18.16	1233.4	-0.003
1.50	-0.057	0.000	-0.54	3020.8	294.0	-22.87	1667.7	-0.54	2379.7	232.6	-18.09	1232.6	-0.003
1.60	-0.057	0.000	-0.54	3020.5	293.0	-22.79	1667.8	-0.54	2380.1	231.9	-18.03	1232.8	-0.003
1.70	-0.057	0.000	-0.54	3019.7	292.2	-22.73	1667.3	-0.54	2380.4	231.3	-17.99	1232.9	-0.003
1.80	-0.056	0.000	-0.54	3019.7	291.7	-22.69	1666.9	-0.54	2381.3	231.0	-17.97	1233.6	-0.003
1.90	-0.056	0.000	-0.54	3018.4	291.3	-22.66	1665.9	-0.54	2381.5	230.8	-17.95	1234.1	-0.003
2.00	-0.056	0.000	-0.54	3018.2	291.1	-22.64	1665.3	-0.54	2382.7	230.8	-17.95	1235.2	-0.003
2.10	-0.056	0.000	-0.54	3017.1	290.9	-22.62	1664.2	-0.54	2383.1	230.7	-17.95	1235.9	-0.003
2.20	-0.056	0.000	-0.54	3016.7	290.8	-22.62	1663.5	-0.54	2383.9	230.8	-17.95	1236.8	-0.003
2.30	-0.056	0.000	-0.54	3016.3	290.7	-22.61	1662.9	-0.54	2384.4	230.8	-17.95	1237.4	-0.003
2.40	-0.056	0.000	-0.54	3015.8	290.7	-22.61	1662.4	-0.54	2384.5	230.8	-17.95	1237.7	-0.003
2.50	-0.056	0.000	-0.54	3015.8	290.6	-22.61	1662.2	-0.54	2385.0	230.8	-17.95	1238.2	-0.003
2.60	-0.056	0.000	-0.54	3015.5	290.6	-22.60	1661.9	-0.54	2385.0	230.8	-17.95	1238.3	-0.003
2.70	-0.056	0.000	-0.54	3015.7	290.6	-22.60	1661.9	-0.54	2385.3	230.8	-17.95	1238.5	-0.003
2.80	-0.056	0.000	-0.54	3015.3	290.6	-22.60	1661.8	-0.54	2385.1	230.8	-17.95	1238.5	-0.003
2.90	-0.056	0.000	-0.54	3015.4	290.6	-22.60	1661.8	-0.54	2385.2	230.8	-17.95	1238.5	-0.003
3.00	-0.056	0.000	-0.54	3015.3	290.6	-22.60	1661.7	-0.54	2385.1	230.8	-17.95	1238.4	-0.003
3.10	-0.056	0.000	-0.54	3015.5	290.6	-22.60	1661.9	-0.54	2385.2	230.8	-17.95	1238.5	-0.003
3.20	-0.056	0.000	-0.54	3015.4	290.6	-22.60	1661.9	-0.54	2385.1	230.8	-17.95	1238.4	-0.003
3.30	-0.056	0.000	-0.54	3015.6	290.6	-22.60	1661.9	-0.54	2385.2	230.8	-17.95	1238.3	-0.003
3.40	-0.056	0.000	-0.54	3015.5	290.6	-22.60	1662.0	-0.54	2385.1	230.8	-17.95	1238.3	-0.003
3.50	-0.056	0.000	-0.54	3015.5	290.6	-22.60	1662.1	-0.54	2385.0	230.8	-17.95	1238.3	-0.003
3.60	-0.056	0.000	-0.54	3015.6	290.6	-22.60	1662.0	-0.54	2385.0	230.8	-17.95	1238.2	-0.003
3.70	-0.056	0.000	-0.54	3015.5	290.6	-22.60	1662.1	-0.54	2384.9	230.8	-17.95	1238.2	-0.003
3.80	-0.056	0.000	-0.54	3015.8	290.6	-22.61	1662.2	-0.54	2385.1	230.8	-17.95	1238.3	-0.003
3.90	-0.056	0.000	-0.54	3015.5	290.6	-22.60	1662.1	-0.54	2384.8	230.8	-17.95	1238.2	-0.003
4.00	-0.056	0.000	-0.54	3015.8	290.6	-22.61	1662.2	-0.54	2385.1	230.8	-17.95	1238.3	-0.003

File Name=In.USEmpty

AXLE # 1
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TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
0.0	0.0	0.0	0.0	4896.3	0.0	0.0	4296.2	0.0	4896.3	0.0	0.0	4296.2	
0.10	-0.051	0.000	-0.52	5056.7	375.7	-61.35	4274.0	-0.46	4735.9	317.7	-50.17	4318.1	
0.20	-0.074	0.000	-0.68	5130.1	497.3	-81.77	4332.4	-0.61	4662.8	411.9	-64.49	4259.4	
0.30	-0.073	0.000	-0.66	5126.7	485.0	-79.71	4319.1	-0.59	4665.5	401.7	-62.92	4272.2	
0.40	-0.075	0.000	-0.69	5132.2	507.1	-83.40	4308.1	-0.62	4660.4	419.4	-65.65	4283.4	
0.50	-0.079	0.000	-0.73	5145.9	541.1	-89.11	4308.7	-0.66	4647.0	445.8	-69.67	4282.9	
0.60	-0.085	0.000	-0.78	5164.1	576.1	-95.03	4317.0	-0.70	4628.6	472.1	-73.62	4274.3	
0.70	-0.091	0.001	-0.82	5181.5	606.9	-100.27	4324.3	-0.74	4611.2	494.8	-77.00	4266.9	
0.80	-0.095	0.001	-0.85	5194.6	630.8	-104.35	4326.9	-0.76	4598.3	512.3	-79.61	4264.3	
0.90	-0.098	0.001	-0.87	5203.1	647.1	-107.13	4327.0	-0.78	4589.7	524.2	-81.37	4264.0	
1.00	-0.099	0.001	-0.88	5208.5	656.7	-108.77	4327.6	-0.79	4584.3	531.2	-82.40	4263.4	
1.10	-0.100	0.001	-0.89	5211.9	661.6	-109.61	4329.2	-0.80	4580.9	534.5	-82.88	4261.7	
1.20	-0.101	0.001	-0.89	5213.8	663.5	-109.95	4330.8	-0.80	4579.0	535.8	-83.06	4260.1	
1.30	-0.101	0.001	-0.89	5214.5	663.9	-110.02	4331.5	-0.80	4578.3	536.0	-83.08	4259.4	
1.40	-0.101	0.001	-0.89	5214.5	663.5	-109.96	4331.4	-0.80	4578.3	535.7	-83.04	4259.5	
1.50	-0.101	0.001	-0.89	5214.1	662.8	-109.84	4331.0	-0.80	4578.7	535.2	-82.96	4259.9	
1.60	-0.101	0.001	-0.89	5213.8	662.1	-109.71	4330.7	-0.80	4579.1	534.6	-82.88	4260.3	
1.70	-0.101	0.001	-0.89	5213.5	661.4	-109.59	4330.5	-0.80	4579.3	534.1	-82.80	4260.5	
1.80	-0.101	0.001	-0.89	5213.2	660.8	-109.49	4330.3	-0.80	4579.6	533.7	-82.74	4260.7	
1.90	-0.101	0.001	-0.89	5212.9	660.4	-109.42	4330.0	-0.80	4579.9	533.4	-82.70	4260.9	
2.00	-0.101	0.001	-0.89	5212.6	660.1	-109.38	4329.8	-0.80	4580.3	533.3	-82.68	4261.2	
2.10	-0.101	0.001	-0.89	5212.3	660.0	-109.35	4329.5	-0.80	4580.5	533.2	-82.67	4261.4	
2.20	-0.100	0.001	-0.89	5212.2	659.9	-109.33	4329.4	-0.80	4580.7	533.1	-82.66	4261.6	
2.30	-0.100	0.001	-0.89	5212.0	659.8	-109.32	4329.3	-0.80	4580.8	533.1	-82.66	4261.7	
2.40	-0.100	0.001	-0.89	5211.9	659.8	-109.31	4329.2	-0.80	4580.8	533.1	-82.66	4261.7	
2.50	-0.100	0.001	-0.89	5211.9	659.8	-109.31	4329.2	-0.80	4581.0	533.1	-82.66	4261.8	
2.60	-0.100	0.001	-0.89	5211.9	659.7	-109.31	4329.2	-0.80	4581.0	533.1	-82.66	4261.8	
2.70	-0.100	0.001	-0.89	5211.8	659.7	-109.30	4329.2	-0.80	4581.0	533.1	-82.66	4261.8	
2.80	-0.100	0.001	-0.89	5211.8	659.7	-109.30	4329.1	-0.80	4581.0	533.0	-82.65	4261.8	
2.90	-0.100	0.001	-0.89	5211.8	659.7	-109.30	4329.2	-0.80	4581.0	533.0	-82.65	4261.8	
3.00	-0.100	0.001	-0.89	5211.8	659.7	-109.30	4329.2	-0.80	4581.0	533.0	-82.65	4261.7	
3.10	-0.100	0.001	-0.89	5211.9	659.7	-109.30	4329.2	-0.80	4581.0	533.0	-82.65	4261.8	
3.20	-0.100	0.001	-0.89	5211.9	659.7	-109.30	4329.2	-0.80	4581.0	533.0	-82.65	4261.7	
3.30	-0.100	0.001	-0.89	5211.8	659.7	-109.30	4329.2	-0.80	4580.9	533.0	-82.65	4261.7	
3.40	-0.100	0.001	-0.89	5211.9	659.7	-109.30	4329.3	-0.80	4581.0	533.0	-82.65	4261.7	
3.50	-0.100	0.001	-0.89	5211.9	659.7	-109.30	4329.3	-0.80	4581.0	533.0	-82.65	4261.7	
3.60	-0.100	0.001	-0.89	5211.8	659.7	-109.30	4329.2	-0.80	4580.9	533.0	-82.65	4261.6	
3.70	-0.100	0.001	-0.89	5211.8	659.7	-109.30	4329.2	-0.80	4580.9	533.1	-82.65	4261.6	
3.80	-0.100	0.001	-0.89	5211.9	659.7	-109.30	4329.3	-0.80	4580.9	533.1	-82.65	4261.7	
3.90	-0.100	0.001	-0.89	5211.9	659.7	-109.30	4329.2	-0.80	4580.9	533.1	-82.65	4261.7	
4.00	-0.100	0.001	-0.89	5211.9	659.7	-109.30	4329.3	-0.80	4580.9	533.1	-82.65	4261.7	

File Name=In.USEmpty

CONSTRAINT FORCES
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NOTE: LATERAL FORCE ALONE IS PRINTED FOR PINTLE HOOK TYPE CONSTRAINT.
LOCATE FORCES & MOMENTS BASED ON CONSTRAINT TYPE

TIME	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
0.0	0.0	3595.3	0.0	0.0						
0.10	-40.0	3595.2	9679.6	0.0						
0.20	-100.2	3595.3	9264.3	0.0						
0.30	-177.9	3595.2	10367.8	0.0						
0.40	-246.8	3595.0	12443.2	0.0						
0.50	-304.3	3595.4	13367.1	0.0						
0.60	-353.1	3594.8	13044.2	0.0						
0.70	-392.7	3595.2	12479.4	0.0						
0.80	-420.8	3594.6	12259.1	0.0						
0.90	-437.9	3594.8	12221.5	0.0						
1.00	-446.5	3594.4	11950.1	0.0						
1.10	-449.9	3594.4	11312.4	0.0						
1.20	-450.5	3594.0	10507.9	0.0						
1.30	-449.8	3594.0	9804.7	0.0						
1.40	-448.7	3593.8	9352.4	0.0						
1.50	-447.7	3593.9	9141.9	0.0						
1.60	-446.8	3594.1	9094.4	0.0						
1.70	-446.1	3593.7	9113.8	0.0						
1.80	-445.6	3594.1	9168.5	0.0						
1.90	-444.9	3593.5	9220.6	0.0						
2.00	-444.4	3594.1	9284.5	0.0						
2.10	-444.0	3593.7	9350.3	0.0						
2.20	-443.7	3593.9	9417.3	0.0						
2.30	-443.4	3594.0	9482.7	0.0						
2.40	-443.3	3593.9	9534.3	0.0						
2.50	-443.2	3594.1	9577.8	0.0						
2.60	-443.1	3593.8	9600.9	0.0						
2.70	-443.1	3594.1	9619.2	0.0						
2.80	-443.0	3593.8	9620.1	0.0						
2.90	-443.0	3594.0	9621.1	0.0						
3.00	-443.0	3593.8	9619.0	0.0						
3.10	-443.1	3594.0	9617.1	0.0						
3.20	-443.1	3593.9	9613.9	0.0						
3.30	-443.1	3594.0	9608.2	0.0						
3.40	-443.1	3594.0	9605.6	0.0						
3.50	-443.1	3593.9	9599.1	0.0						
3.60	-443.2	3594.0	9597.9	0.0						
3.70	-443.2	3593.8	9594.1	0.0						
3.80	-443.2	3594.1	9595.8	0.0						
3.90	-443.2	3593.7	9593.3	0.0						
4.00	-443.2	3594.2	9594.4	0.0						

File Name=In.USEmpty

SPRUNG MASS # 2
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TIME (SEC)	FORWARD POSITION (IN)	LATERAL POSITION (IN)	VERTICAL POSITION (IN)	ROLL ANGLE (DEG)	YAW ANGLE (DEG)	PITCH ANGLE (DEG)	FORWARD VEL IN/SEC	LATERAL VEL IN/SEC	ROLL RATE DEG/SEC	YAW RATE DEG/SEC	PITCH RATE DEG/SEC	LATERAL ACCN. IN/SEC**2	ARTIC ANGLE DEG
0.0	-318.98	0.0	0.0	0.0	0.0	0.0	880.08	0.0	0.0	0.0	0.0	0.0	0.0
0.10	-230.97	0.00	0.000	-0.01	0.00	0.000	880.08	0.01	-0.26	0.03	-0.00	0.99	0.02
0.20	-142.96	0.02	0.000	-0.05	0.01	0.000	880.08	0.10	-0.50	0.16	-0.00	4.00	0.11
0.30	-54.96	0.08	0.000	-0.08	0.04	0.000	880.08	0.29	-0.22	0.37	-0.00	8.28	0.28
0.40	33.05	0.22	0.000	-0.09	0.09	0.000	880.08	0.50	-0.02	0.69	-0.00	12.52	0.48
0.50	121.06	0.48	0.000	-0.10	0.18	0.000	880.09	0.61	-0.06	1.08	-0.00	16.89	0.69
0.60	209.07	0.91	0.000	-0.11	0.31	0.000	880.09	0.55	-0.19	1.51	-0.00	21.62	0.88
0.70	297.07	1.55	0.000	-0.13	0.48	-0.000	880.08	0.33	-0.23	1.93	-0.00	26.49	1.02
0.80	385.08	2.47	0.000	-0.15	0.69	0.000	880.08	-0.04	-0.18	2.30	-0.01	31.06	1.13
0.90	473.07	3.69	0.000	-0.17	0.94	-0.000	880.07	-0.52	-0.11	2.62	-0.01	35.05	1.19
1.00	561.07	5.26	0.000	-0.18	1.21	0.000	880.07	-1.05	-0.08	2.85	-0.01	38.36	1.23
1.10	649.04	7.22	0.000	-0.18	1.50	-0.000	880.07	-1.60	-0.07	3.02	-0.01	41.03	1.23
1.20	737.00	9.58	-0.000	-0.19	1.81	-0.000	880.07	-2.10	-0.06	3.12	-0.01	43.11	1.22
1.30	824.95	12.38	-0.000	-0.20	2.12	-0.000	880.07	-2.54	-0.05	3.16	-0.01	44.62	1.20
1.40	912.88	15.62	-0.000	-0.20	2.44	-0.000	880.08	-2.89	-0.03	3.17	-0.01	45.63	1.18
1.50	1000.80	19.31	-0.001	-0.20	2.76	-0.000	880.08	-3.15	-0.01	3.15	-0.01	46.22	1.16
1.60	1088.69	23.47	-0.001	-0.20	3.07	-0.000	880.08	-3.34	-0.00	3.12	-0.01	46.48	1.13
1.70	1176.56	28.09	-0.001	-0.20	3.38	-0.000	880.08	-3.45	0.00	3.08	-0.01	46.51	1.11
1.80	1264.41	33.17	-0.001	-0.20	3.69	-0.000	880.09	-3.50	0.00	3.04	-0.01	46.39	1.10
1.90	1352.23	38.72	-0.001	-0.20	3.99	-0.000	880.09	-3.51	0.01	3.00	-0.01	46.17	1.09
2.00	1440.02	44.73	-0.001	-0.20	4.29	-0.000	880.09	-3.50	0.01	2.97	-0.01	45.92	1.08
2.10	1527.78	51.20	-0.001	-0.20	4.58	-0.000	880.09	-3.47	0.01	2.95	-0.01	45.66	1.08
2.20	1615.50	58.12	-0.001	-0.20	4.88	-0.000	880.09	-3.43	0.01	2.93	-0.01	45.43	1.08
2.30	1703.18	65.49	-0.001	-0.20	5.17	-0.000	880.09	-3.39	0.01	2.92	-0.01	45.23	1.08
2.40	1790.83	73.31	-0.001	-0.20	5.46	-0.000	880.09	-3.35	0.00	2.91	-0.01	45.07	1.08
2.50	1878.44	81.59	-0.001	-0.20	5.75	-0.000	880.09	-3.32	0.00	2.91	-0.01	44.95	1.08
2.60	1966.00	90.30	-0.001	-0.20	6.04	-0.000	880.09	-3.29	0.00	2.91	-0.01	44.87	1.08
2.70	2053.51	99.47	-0.001	-0.20	6.33	-0.000	880.09	-3.27	0.00	2.91	-0.01	44.82	1.08
2.80	2140.98	109.08	-0.001	-0.20	6.63	-0.000	880.09	-3.26	0.00	2.91	-0.01	44.79	1.08
2.90	2228.40	119.14	-0.001	-0.20	6.92	-0.000	880.09	-3.25	0.00	2.91	-0.01	44.79	1.08
3.00	2315.76	129.64	-0.001	-0.20	7.21	-0.000	880.09	-3.25	-0.00	2.91	-0.01	44.79	1.08
3.10	2403.08	140.58	-0.001	-0.20	7.50	-0.000	880.09	-3.24	-0.00	2.92	-0.01	44.80	1.08
3.20	2490.33	151.97	-0.001	-0.20	7.79	-0.000	880.09	-3.24	-0.00	2.92	-0.01	44.81	1.08
3.30	2577.53	163.80	-0.001	-0.20	8.08	-0.000	880.09	-3.25	-0.00	2.92	-0.01	44.82	1.08
3.40	2664.66	176.07	-0.001	-0.20	8.37	-0.000	880.09	-3.25	-0.00	2.92	-0.01	44.84	1.09
3.50	2751.73	188.79	-0.001	-0.20	8.66	-0.000	880.09	-3.25	-0.00	2.92	-0.01	44.85	1.09
3.60	2838.73	201.95	-0.001	-0.20	8.96	-0.000	880.09	-3.25	-0.00	2.92	-0.01	44.86	1.09
3.70	2925.67	215.56	-0.001	-0.20	9.25	-0.000	880.09	-3.25	-0.00	2.92	-0.01	44.86	1.09
3.80	3012.54	229.60	-0.000	-0.20	9.54	-0.000	880.09	-3.26	-0.00	2.92	-0.01	44.87	1.09
3.90	3099.33	244.09	-0.001	-0.20	9.83	-0.000	880.09	-3.26	-0.00	2.92	-0.01	44.87	1.09
4.00	3186.05	259.02	-0.000	-0.20	10.12	-0.000	880.09	-3.26	-0.00	2.92	-0.01	44.88	1.09

File Name=In.USEmpty

SPRUNG MASS # 1
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TIME (SEC)	FORWARD POSITION (IN)	LATERAL POSITION (IN)	VERTICAL POSITION (IN)	ROLL ANGLE (DEG)	YAW ANGLE (DEG)	PITCH ANGLE (DEG)	FORWARD VEL IN/SEC	LATERAL VEL IN/SEC	ROLL RATE DEG/SEC	YAW RATE DEG/SEC	PITCH RATE DEG/SEC	LATERAL ACCN. IN/SEC**2	STEER ANGLE DEG
0.0	0.00	0.0	0.0	0.0	0.0	0.0	880.08	0.0	0.0	0.0	0.0	0.0	0.0
0.10	88.01	0.03	-0.000	-0.02	0.02	0.000	880.08	0.76	-0.25	0.47	0.00	20.13	20.00
0.20	176.02	0.26	-0.000	-0.06	0.12	0.000	880.08	1.83	-0.38	1.54	-0.00	27.62	28.00
0.30	264.02	0.77	-0.000	-0.09	0.31	0.000	880.08	1.59	-0.22	2.33	-0.00	29.14	28.00
0.40	352.03	1.56	-0.000	-0.11	0.57	0.000	880.08	0.65	-0.09	2.82	-0.01	32.33	28.00
0.50	440.03	2.67	-0.000	-0.11	0.87	0.000	880.08	-0.50	-0.14	3.08	-0.01	35.76	28.00
0.60	528.02	4.15	-0.000	-0.13	1.18	0.000	880.08	-1.57	-0.22	3.18	-0.01	38.88	28.00
0.70	616.01	6.01	-0.000	-0.15	1.50	0.000	880.08	-2.43	-0.23	3.18	-0.01	41.43	28.00
0.80	703.99	8.29	-0.000	-0.17	1.82	0.000	880.08	-3.05	-0.16	3.14	-0.01	43.29	28.00
0.90	791.96	11.00	-0.000	-0.18	2.13	0.000	880.08	-3.44	-0.09	3.09	-0.01	44.46	28.00
1.00	879.91	14.15	-0.000	-0.19	2.44	0.000	880.08	-3.67	-0.06	3.04	-0.01	45.07	28.00
1.10	967.83	17.76	-0.000	-0.20	2.74	0.000	880.08	-3.78	-0.06	2.99	-0.01	45.30	28.00
1.20	1055.73	21.81	-0.000	-0.20	3.03	0.000	880.08	-3.81	-0.06	2.96	-0.01	45.33	28.00
1.30	1143.61	26.32	-0.000	-0.21	3.33	0.000	880.08	-3.81	-0.05	2.94	-0.01	45.27	28.00
1.40	1231.46	31.28	-0.000	-0.21	3.62	0.000	880.08	-3.79	-0.03	2.93	-0.01	45.18	28.00
1.50	1319.29	36.69	-0.000	-0.21	3.91	0.000	880.08	-3.76	-0.01	2.92	-0.01	45.09	28.00
1.60	1407.09	42.55	-0.000	-0.21	4.21	0.000	880.08	-3.74	0.00	2.92	-0.01	45.02	28.00
1.70	1494.85	48.86	-0.000	-0.21	4.50	0.000	880.08	-3.71	0.00	2.92	-0.01	44.97	28.00
1.80	1582.59	55.62	-0.000	-0.21	4.79	0.000	880.08	-3.70	0.01	2.92	-0.01	44.93	28.00
1.90	1670.29	62.83	-0.000	-0.21	5.08	0.000	880.08	-3.69	0.01	2.92	-0.01	44.90	28.00
2.00	1757.95	70.48	-0.000	-0.21	5.37	0.000	880.08	-3.68	0.01	2.92	-0.01	44.89	28.00
2.10	1845.57	78.58	-0.000	-0.21	5.66	0.000	880.08	-3.68	0.01	2.92	-0.01	44.88	28.00
2.20	1933.14	87.13	-0.000	-0.21	5.96	0.000	880.08	-3.68	0.01	2.92	-0.01	44.88	28.00
2.30	2020.68	96.12	-0.000	-0.21	6.25	0.000	880.08	-3.67	0.01	2.92	-0.01	44.88	28.00
2.40	2108.16	105.56	-0.000	-0.21	6.54	0.000	880.08	-3.67	0.00	2.92	-0.01	44.87	28.00
2.50	2195.60	115.45	-0.000	-0.21	6.83	0.000	880.08	-3.67	0.00	2.92	-0.01	44.88	28.00
2.60	2282.99	125.78	-0.000	-0.21	7.12	0.000	880.08	-3.67	0.00	2.92	-0.01	44.88	28.00
2.70	2370.32	136.55	-0.000	-0.21	7.41	0.000	880.08	-3.67	0.00	2.92	-0.01	44.88	28.00
2.80	2457.59	147.77	-0.000	-0.21	7.71	0.000	880.08	-3.67	0.00	2.92	-0.01	44.87	28.00
2.90	2544.81	159.43	-0.000	-0.21	8.00	0.000	880.08	-3.67	0.00	2.92	-0.01	44.87	28.00
3.00	2631.97	171.54	-0.000	-0.21	8.29	0.000	880.08	-3.67	-0.00	2.92	-0.01	44.87	28.00
3.10	2719.06	184.09	-0.000	-0.21	8.58	0.000	880.08	-3.67	-0.00	2.92	-0.01	44.87	28.00
3.20	2806.09	197.09	-0.000	-0.21	8.87	0.000	880.08	-3.67	-0.00	2.92	-0.01	44.87	28.00
3.30	2893.05	210.52	-0.000	-0.21	9.17	0.000	880.08	-3.67	-0.00	2.92	-0.01	44.87	28.00
3.40	2979.94	224.40	-0.000	-0.21	9.46	0.000	880.08	-3.67	-0.00	2.92	-0.01	44.87	28.00
3.50	3066.77	238.73	-0.000	-0.21	9.75	0.000	880.08	-3.67	-0.00	2.92	-0.01	44.87	28.00
3.60	3153.51	253.49	-0.000	-0.21	10.04	0.000	880.08	-3.67	-0.00	2.92	-0.01	44.87	28.00
3.70	3240.18	268.70	-0.000	-0.21	10.33	0.000	880.08	-3.67	-0.00	2.92	-0.01	44.87	28.00
3.80	3326.77	284.34	-0.000	-0.21	10.62	0.000	880.08	-3.67	-0.00	2.92	-0.01	44.88	28.00
3.90	3413.28	300.43	-0.000	-0.21	10.92	0.000	880.08	-3.67	-0.00	2.92	-0.01	44.87	28.00
4.00	3499.71	316.96	-0.000	-0.21	11.21	0.000	880.08	-3.67	-0.00	2.92	-0.01	44.88	28.00

ALIGNING TORQUE TABLE # 1
******** ****** *********

ALIGNING TORQUE VS. SLIP ANGLE

0.0	1.00	2.00	4.00	8.00	12.00
2000.00	336.00	528.00	660.00	444.00	252.00
3980.00	1020.00	1716.00	2256.00	1728.00	1092.00
5970.00	1764.00	3156.00	4344.00	3240.00	2184.00
7950.00	2484.00	4608.00	6720.00	5304.00	3576.00
9440.00	3000.00	5616.00	8604.00	7104.00	4620.00

CORNERING FORCE TABLE # 1
********* ***** *********

LATERAL FORCE VS. SLIP ANGLL

0.0	1.00	2.00	4.00	8.00	12.00
1983.00	356.94	634.56	1070.82	1526.91	1804.53
5967.00	835.38	1611.09	2804.49	3938.22	4355.91
9441.00	944.10	1793.79	3398.76	5192.55	5759.01

SPRING TABLE # 3
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FORCE LB	DEFLECTION INCHES
-34112.50	-20.00
-350.00	-1.75
125.00	0.0
1300.00	0.50
3575.00	1.00
6500.00	1.50
28971.87	5.00

SPRING TABLE # 2
****** *******

FORCE LB	DEFLECTION INCHES
-38575.00	-20.00
-18575.00	-10.00
-75.00	-0.75
-75.00	0.0
1925.00	0.50
4125.00	1.00
8899.47	2.00
26969.47	5.00
31486.97	6.00

SPRING TABLE # 1
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FORCE LB	DEFLECTION INCHES
-19075.00	-20.00
-787.50	-0.75
-75.00	0.0
825.00	1.00
1775.00	2.00
2200.00	2.50
3230.00	3.50
4250.00	4.50
20253.57	20.00

File Name=In.USEmpty

UNIT # 2

OF AXLES ON THIS UNIT = 2

WEIGHT OF SPRUNG MASS = 9580.00 LB.

ROLL MOMENT OF INERTIA OF SPRUNG MASS = 82144.00 LB.IN.SEC**2

PITCH MOMENT OF INERTIA OF SPRUNG MASS = 643534.00 LB.IN.SEC**2

YAW MOMENT OF INERTIA OF SPRUNG MASS = 643534.00 LB.IN.SEC**2

HEIGHT OF SPRUNG MASS CG ABOVE GROUND = 46.76 INCHES

	AXLE # 4	AXLE # 5	AXLE #					
LOAD ON EACH AXLE (LB.)	4492.36	4492.36						
AXLE WEIGHT (LB.)	1500.00	1500.00						
AXLE ROLL M.I (LB.IN.SEC**2)	3979.00	3979.00						
X DIST FROM SP MASS CG (IN)	-106.07	-156.07						
HEIGHT OF AXLE C.G. ABOVE GROUND (INCHES)	20.50	20.50						
HEIGHT OF ROLL CENTER ABOVE GROUND (INCHES)	24.61	24.61						
HALF SPRING SPACING (IN)	19.00	19.00						
HALF TRACK - INNER TIRES (IN)	29.50	29.50						
DUAL TIRE SPACING (IN)	13.00	13.00						
STIFFNESS OF EACH TIRE (LB/IN)	4500.00	4500.00						
ROLL STEER COEFFICIENT	0.07	0.07						
AUX ROLL STIFFNESS (IN.LB/DEG)	30000.00	30000.00						
SPRING COULOMB FRICTION - PER SPRING (LB)	750.00	750.00						
VISCOUS DAMPING PER SPRING (LB.SEC/IN)	0.0	0.0						
SPRING TABLE #	3	3						
CORNERING FORCE TABLE #	1	1						
ALIGNING TORQUE TABLE #	1	1						

File Name=In.USEmpty

UNIT # 1
****

OF AXLES ON THIS UNIT = 3

WEIGHT OF SPRUNG MASS = 10800.00 LB.

ROLL MOMENT OF INERTIA OF SPRUNG MASS = 23522.00 LB.IN.SEC**2

PITCH MOMENT OF INERTIA OF SPRUNG MASS = 140000.00 LB.IN.SEC**2

YAW MOMENT OF INERTIA OF SPRUNG MASS = 140000.00 LB.IN.SEC**2

HEIGHT OF SPRUNG MASS CG ABOVE GROUND = 38.60 INCHES

	AXLE # 1	AXLE # 2	AXLE # 3	AXLE #				
	*********	*********	*********	*********	*********	*********	*********	*********
LOAD ON EACH AXLE (LB.)	9792.46	5401.41	5401.41					
AXLE WEIGHT (LB.)	1200.00	2500.00	2500.00					
AXLE ROLL M.I (LB.IN.SEC**2)	4142.00	5780.00	5780.00					
X DIST FROM SP MASS CG (IN)	36.50	-90.50	-142.50					
HEIGHT OF AXLE C.G. ABOVE GROUND (INCHES)	20.50	20.50	20.50					
HEIGHT OF ROLL CENTER ABOVE GROUND (INCHES)	19.00	28.50	28.50					
HALF SPRING SPACING (IN)	17.50	20.00	20.00					
HALF TRACK - INNER TIRES (IN)	40.00	29.50	29.50					
DUAL TIRE SPACING (IN)	0.0	13.00	13.00					
STIFFNESS OF EACH TIRE (LB/IN)	4500.00	4500.00	4500.00					
ROLL STEER COEFFICIENT	0.10	0.02	0.02					
AUX ROLL STIFFNESS (IN.LB/DEG)	8000.00	15000.00	15000.00					
SPRING COULOMB FRICTION - PER SPRING (LB)	400.00	775.00	775.00					
VISCOUS DAMPING PER SPRING (LB.SEC/IN)	0.0	0.0	0.0					
SPRING TABLE #	1	2	2					
CORNERING FORCE TABLE #	1	1	1					
ALIGNING TORQUE TABLE #	1	1	1					

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*    RTAC  STUDY     *
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*DIRECTIONAL RESPONSE SIMULATION*
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File Name=In.USEmpty

# OF SPRUNG MASSES       =  2

TOTAL # OF AXLES         =  5

GROSS VEHICLE WEIGHT     =   29580.00  LB.

FORWARD VELOCITY         =      50.01  M.P.H


PEAK FRICTIONAL COEFFICIENT   = 0.79
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	DISTANCE AHEAD OF SPRUNG MASS C.G. (INCHES)	HEIGHT BELOW SPRUNG MASS C.G. (INCHES)	ROLL STIFFNESS (IN.LB/DEG)	TYPE OF CONSTRAINT
ON UNIT # 1				
ARTICULATION PT # 1	-100.80	-10.40	999999.88	1
ON UNIT # 2	218.18	-2.24		

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TYPE OF CONSTRAINT :  01  CONVENTIONAL 5TH WHEEL
                      02  INVERTED 5TH WHEEL
                      03  PINTLE HOOK
                      04  KING PIN(RIGID IN ROLL & PITCH)

OPEN LOOP STEER INPUT
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STEERING GEAR RATIO  =      25.00

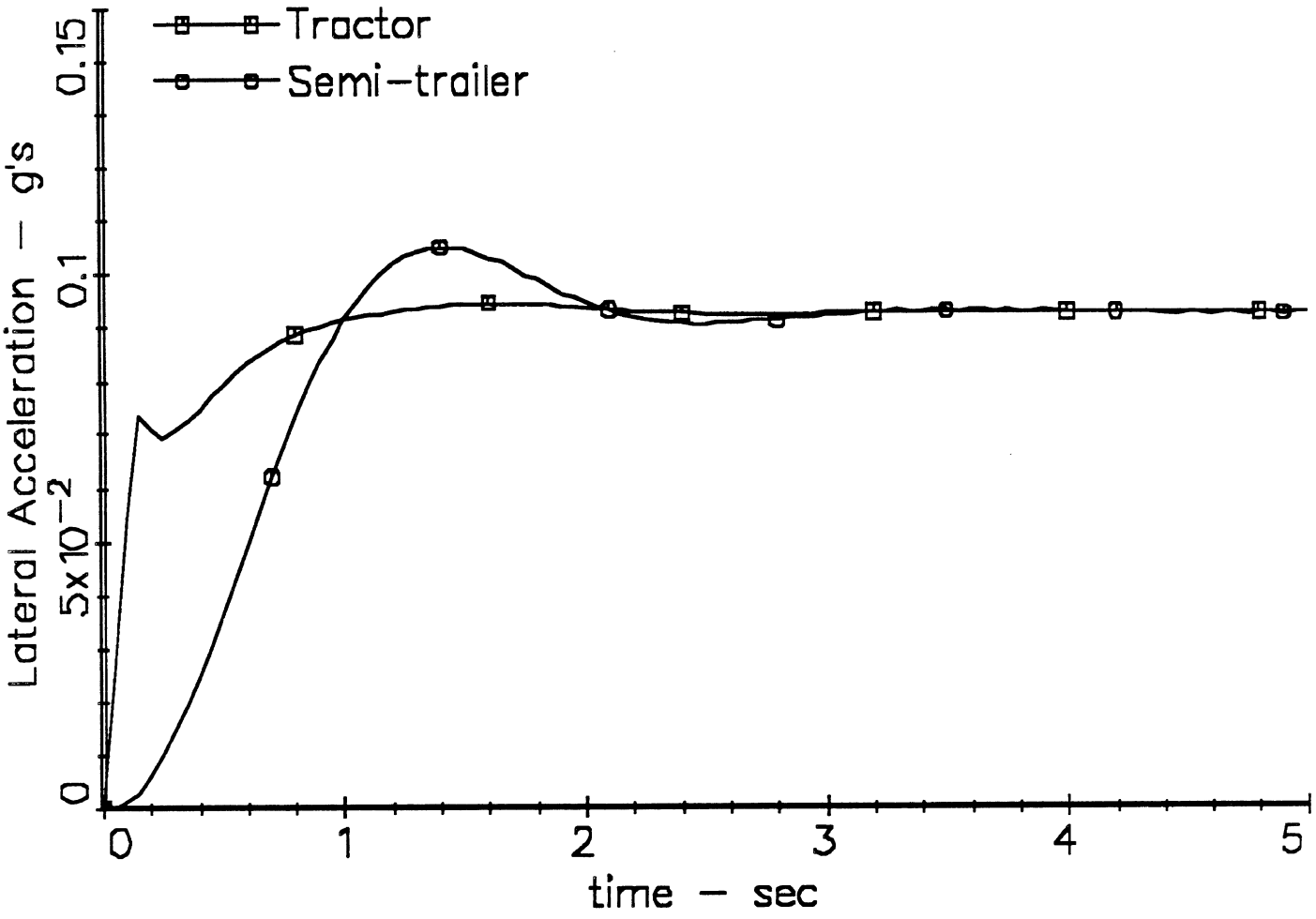
STEERING STIFFNESS (IN.LB/DEG)       =   12000.00

TIE ROD STIFFNESS (IN.LB/DEG)        =   20000.00

MECHANICAL TRAIL (IN)        =       1.50

# OF POINTS IN STEER TABLE   = 5
```

TIME SEC	STEERING WHEEL DEGREES
0.0	0.0
0.05	10.00
0.10	20.00
0.14	28.00
10.00	28.00



File Name=In.USLoaded

File Name=In.USLoaded

AXLE # 5
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TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
4.10	-0.363	0.009	-0.68	10627.4	1026.3	-171.59	9883.0	-0.68	6526.4	695.0	-87.59	5719.5	-0.070
4.20	-0.362	0.010	-0.68	10632.5	1026.0	-171.57	10032.2	-0.68	6534.4	695.1	-87.68	5871.6	-0.070
4.30	-0.362	0.009	-0.68	10621.1	1024.1	-171.18	9744.9	-0.68	6525.2	693.7	-87.43	5585.8	-0.070
4.40	-0.362	0.009	-0.68	10624.2	1023.9	-171.17	9880.3	-0.68	6529.9	693.8	-87.48	5722.3	-0.070
4.50	-0.362	0.010	-0.68	10630.1	1024.2	-171.26	10030.4	-0.68	6536.9	694.2	-87.60	5873.3	-0.070
4.60	-0.362	0.009	-0.68	10619.6	1022.9	-170.96	9744.1	-0.68	6526.9	693.1	-87.36	5586.8	-0.070
4.70	-0.362	0.009	-0.68	10623.4	1023.2	-171.04	9880.0	-0.68	6530.7	693.5	-87.44	5722.6	-0.070
4.80	-0.362	0.010	-0.68	10630.1	1023.9	-171.21	10030.7	-0.68	6537.1	694.1	-87.58	5873.1	-0.070
4.90	-0.362	0.009	-0.68	10619.9	1022.9	-170.97	9744.7	-0.68	6526.5	693.1	-87.36	5586.1	-0.070
5.00	-0.362	0.009	-0.68	10624.1	1023.5	-171.10	9880.9	-0.68	6530.1	693.6	-87.45	5721.8	-0.070

File Name=In.USLoaded

AXLE # 4
****

TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
4.10	-0.347	0.009	-0.54	10542.5	818.3	-136.30	9919.3	-0.55	6618.2	563.9	-71.76	5692.1	-0.071
4.20	-0.347	0.010	-0.54	10547.5	818.0	-136.28	10068.5	-0.55	6626.0	564.0	-71.83	5844.3	-0.071
4.30	-0.347	0.008	-0.54	10536.1	816.4	-135.95	9781.5	-0.55	6616.8	562.8	-71.61	5558.5	-0.071
4.40	-0.346	0.009	-0.54	10539.2	816.2	-135.94	9916.8	-0.55	6621.5	562.9	-71.65	5695.0	-0.071
4.50	-0.346	0.010	-0.54	10545.2	816.3	-135.99	10066.8	-0.54	6628.5	563.2	-71.74	5846.1	-0.071
4.60	-0.346	0.008	-0.54	10534.7	815.3	-135.75	9780.7	-0.54	6618.5	562.2	-71.55	5559.5	-0.071
4.70	-0.346	0.009	-0.54	10538.4	815.5	-135.81	9916.6	-0.54	6622.2	562.5	-71.60	5695.4	-0.071
4.80	-0.346	0.010	-0.54	10545.0	816.0	-135.93	10067.4	-0.54	6628.7	562.9	-71.71	5846.0	-0.071
4.90	-0.346	0.008	-0.54	10534.9	815.2	-135.74	9781.3	-0.54	6618.1	562.2	-71.54	5558.7	-0.071
5.00	-0.346	0.009	-0.54	10539.2	815.7	-135.84	9917.5	-0.54	6621.8	562.5	-71.61	5694.5	-0.071

File Name=In.USLoaded

AXLE # 3
****

TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
4.10	-0.304	0.003	-0.69	10292.0	1012.1	-166.66	8948.8	-0.69	6852.1	730.8	-95.18	5687.6	-0.020
4.20	-0.304	0.002	-0.69	10290.9	1011.7	-166.58	8943.8	-0.69	6853.0	730.7	-95.17	5684.8	-0.020
4.30	-0.304	0.002	-0.69	10290.1	1011.4	-166.53	8949.5	-0.69	6853.8	730.6	-95.16	5692.6	-0.019
4.40	-0.304	0.002	-0.69	10289.6	1011.2	-166.50	8946.1	-0.69	6854.3	730.6	-95.16	5690.4	-0.019
4.50	-0.304	0.002	-0.69	10289.2	1011.1	-166.49	8941.8	-0.69	6854.5	730.6	-95.16	5686.8	-0.019
4.60	-0.304	0.002	-0.69	10289.4	1011.2	-166.49	8948.5	-0.69	6854.9	730.6	-95.17	5693.9	-0.019
4.70	-0.304	0.002	-0.69	10289.3	1011.2	-166.49	8945.5	-0.69	6854.7	730.6	-95.17	5690.8	-0.019
4.80	-0.304	0.002	-0.69	10289.3	1011.3	-166.51	8941.8	-0.69	6854.5	730.6	-95.17	5686.8	-0.019
4.90	-0.304	0.002	-0.69	10289.7	1011.4	-166.53	8948.9	-0.69	6854.5	730.7	-95.18	5693.5	-0.019
5.00	-0.304	0.002	-0.69	10289.8	1011.5	-166.54	8946.1	-0.69	6854.2	730.7	-95.18	5690.2	-0.019

File Name=In.USLoaded

AXLE # 2
****

TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
4.10	-0.285	0.003	-0.55	10188.2	801.6	-131.35	8988.0	-0.55	6961.3	591.0	-77.76	5656.2	-0.020
4.20	-0.285	0.002	-0.55	10187.1	801.2	-131.28	8982.8	-0.55	6962.2	590.8	-77.74	5653.3	-0.020
4.30	-0.285	0.003	-0.55	10186.4	800.9	-131.23	8988.8	-0.55	6963.1	590.7	-77.73	5661.3	-0.020
4.40	-0.285	0.002	-0.55	10185.9	800.7	-131.19	8985.3	-0.55	6963.6	590.6	-77.73	5658.9	-0.020
4.50	-0.285	0.002	-0.55	10185.4	800.6	-131.17	8980.9	-0.55	6963.7	590.6	-77.72	5655.1	-0.020
4.60	-0.285	0.002	-0.55	10185.5	800.6	-131.17	8987.7	-0.55	6964.0	590.6	-77.72	5662.3	-0.020
4.70	-0.285	0.002	-0.55	10185.5	800.6	-131.17	8984.8	-0.55	6964.0	590.6	-77.72	5659.2	-0.020
4.80	-0.285	0.002	-0.55	10185.6	800.7	-131.18	8981.1	-0.55	6963.7	590.6	-77.73	5655.0	-0.020
4.90	-0.285	0.002	-0.55	10185.8	800.7	-131.20	8986.2	-0.55	6963.6	590.7	-77.73	5661.8	-0.020
5.00	-0.285	0.002	-0.55	10186.0	800.8	-131.21	8985.5	-0.55	6963.3	590.7	-77.73	5658.6	-0.020

File Name=In.USLoaded

AXLE # 1
****

TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
4.10	-0.185	0.003	-0.83	6820.0	719.7	-144.22	5981.0	-0.73	5657.0	584.0	-100.42	5292.1	
4.20	-0.185	0.003	-0.83	6819.9	719.5	-144.19	5980.7	-0.73	5657.2	583.9	-100.40	5292.1	
4.30	-0.185	0.003	-0.83	6819.8	719.5	-144.17	5981.0	-0.73	5657.4	583.8	-100.39	5292.6	
4.40	-0.185	0.003	-0.83	6819.6	719.4	-144.16	5980.9	-0.73	5657.4	583.8	-100.38	5292.4	
4.50	-0.185	0.003	-0.83	6819.6	719.3	-144.14	5980.7	-0.73	5657.5	583.7	-100.38	5292.1	
4.60	-0.185	0.003	-0.83	6819.6	719.3	-144.14	5981.1	-0.73	5657.5	583.7	-100.38	5292.4	
4.70	-0.185	0.003	-0.83	6819.7	719.3	-144.14	5981.1	-0.73	5657.5	583.7	-100.37	5292.2	
4.80	-0.185	0.003	-0.83	6819.7	719.3	-144.14	5981.0	-0.73	5657.4	583.7	-100.37	5291.8	
4.90	-0.185	0.003	-0.83	6819.8	719.3	-144.15	5981.4	-0.73	5657.3	583.7	-100.37	5292.2	
5.00	-0.185	0.003	-0.83	6819.8	719.3	-144.15	5981.3	-0.73	5657.3	583.7	-100.38	5291.9	

File Name=In.USLoaded

CONSTRAINT FORCES
****

NOTE: LATERAL FORCE ALONE IS PRINTED FOR PINTLE HOOK TYPE CONSTRAINT.
LOCATE FORCES & MOMENTS BASED ON CONSTRAINT TYPE

TIME	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
4.10	-3524.1	29704.8	-78719.4	0.0						
4.20	-3521.5	29703.8	-78637.5	0.0						
4.30	-3522.2	29703.4	-78566.9	0.0						
4.40	-3520.7	29705.1	-78518.4	0.0						
4.50	-3519.2	29704.0	-78495.1	0.0						
4.60	-3521.0	29703.8	-78479 1	0.0						
4.70	-3520.2	29704.9	-78479.6	0.0						
4.80	-3519.4	29703.9	-78492.6	0.0						
4.90	-3521.7	29703.7	-78506.3	0.0						
5.00	-3521.2	29704.9	-78525.4	0.0						

File Name=In.USLoaded

SPRUNG MASS # 2
****

TIME (SEC)	FORWARD POSITION (IN)	LATERAL POSITION (IN)	VERTICAL POSITION (IN)	ROLL ANGLE (DEG)	YAW ANGLE (DEG)	PITCH ANGLE (DEG)	FORWARD VEL IN/SEC	LATERAL VEL IN/SEC	ROLL RATE DEG/SEC	YAW RATE DEG/SEC	PITCH RATE DEG/SEC	LATERAL ACCN. IN/SEC**2	ARTIC ANGLE DEG
4.10	3316.83	232.28	0.009	-1.36	8.64	-0.001	880.12	-3.53	0.01	2.34	-0.06	35.94	0.84
4.20	3403.86	245.33	0.009	-1.36	8.88	-0.001	880.12	-3.52	0.01	2.34	-0.05	35.98	0.84
4.30	3490.82	258.74	0.009	-1.36	9.11	-0.001	880.12	-3.52	0.01	2.34	-0.06	35.84	0.84
4.40	3577.74	272.51	0.009	-1.36	9.34	-0.001	880.12	-3.52	0.00	2.34	-0.06	35.89	0.84
4.50	3664.60	286.63	0.009	-1.36	9.58	-0.001	880.12	-3.52	0.00	2.34	-0.05	35.94	0.84
4.60	3751.40	301.10	0.009	-1.36	9.81	-0.001	880.12	-3.51	0.00	2.34	-0.06	35.82	0.84
4.70	3838.14	315.92	0.009	-1.36	10.04	-0.001	880.12	-3.51	-0.00	2.34	-0.06	35.87	0.84
4.80	3924.81	331.10	0.009	-1.36	10.27	-0.001	880.12	-3.51	-0.00	2.34	-0.05	35.94	0.84
4.90	4011.43	346.63	0.009	-1.36	10.51	-0.001	880.12	-3.51	-0.00	2.34	-0.06	35.82	0.84
5.00	4097.98	362.51	0.009	-1.36	10.74	-0.001	880.12	-3.51	-0.00	2.34	-0.06	35.88	0.84

File Name=In.USLoaded

SPRUNG MASS # 1
****

TIME (SEC)	FORWARD POSITION (IN)	LATERAL POSITION (IN)	VERTICAL POSITION (IN)	ROLL ANGLE (DEG)	YAW ANGLE (DEG)	PITCH ANGLE (DEG)	FORWARD VEL IN/SEC	LATERAL VEL IN/SEC	ROLL RATE DEG/SEC	YAW RATE DEG/SEC	PITCH RATE DEG/SEC	LATERAL ACCN. IN/SEC**2	STEER ANGLE DEG
4.10	3593.25	275.79	0.001	-1.28	9.48	-0.000	880.08	-5.05	0.01	2.34	-0.05	35.92	28.00
4.20	3680.10	289.97	0.001	-1.28	9.72	-0.000	880.08	-5.05	0.01	2.34	-0.05	35.92	28.00
4.30	3766.88	304.50	0.001	-1.28	9.95	-0.000	880.08	-5.05	0.01	2.34	-0.05	35.90	28.00
4.40	3853.61	319.39	0.001	-1.28	10.18	-0.000	880.08	-5.05	0.00	2.34	-0.05	35.91	28.00
4.50	3940.27	334.63	0.001	-1.28	10.42	-0.000	880.08	-5.05	0.00	2.34	-0.05	35.91	28.00
4.60	4026.87	350.22	0.001	-1.28	10 65	-0.000	880.08	-5.05	0.00	2.34	-0.05	35.89	28.00
4.70	4113.41	366.17	0.001	-1.28	10.88	-0.000	880.08	-5.05	-0.00	2.34	-0.05	35.90	28.00
4.80	4199.88	382.47	0.001	-1.28	11.12	-0.000	880.08	-5.05	-0.00	2.34	-0.05	35.91	28.00
4.90	4286.29	399.12	0.001	-1.28	11.35	-0.000	880.08	-5.05	-0.00	2.34	-0.05	35.89	28.00
5.00	4372.63	416.12	0.001	-1.28	11.58	-0.000	880.08	-5.05	-0.00	2.34	-0.05	35.90	28.00

File Name=In.USLoaded

AXLE # 5
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TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
0.0	0.0	0.0	0.0	8580.0	0.0	0.0	7830.0	0.0	8580.0	0.0	0.0	7830.0	0.0
0.10	-0.001	-0.000	0.01	8585.6	-7.3	1.09	7850.8	0.01	8574.2	-7.3	1.09	7808.1	-0.000
0.20	-0.011	-0.000	0.01	8641.2	-13.7	2.06	7948.0	0.01	8519.5	-13.6	2.02	7708.3	-0.001
0.30	-0.032	-0.000	-0.01	8759.3	7.6	-1.14	8112.3	-0.01	8400.3	7.3	-1.08	7542.2	-0.005
0.40	-0.065	0.0	-0.05	8948.6	64.1	-9.81	8382.6	-0.05	8211.2	59.8	-8.70	7310.9	-0.010
0.50	-0.111	-0.002	-0.12	9195.3	161.5	-25.10	8549.5	-0.12	7945.4	143.7	-20.46	6858.3	-0.018
0.60	-0.165	-0.002	-0.22	9522.5	297.4	-47.09	8991.0	-0.22	7655.8	249.8	-34.81	6674.6	-0.028
0.70	-0.222	0.001	-0.33	9840.7	465.5	-74.96	9426.9	-0.33	7328.7	367.7	-49.94	6437.2	-0.038
0.80	-0.275	0.002	-0.44	10125.3	638.4	-104.29	9632.4	-0.44	7009.6	475.8	-62.87	6094.7	-0.048
0.90	-0.322	0.001	-0.54	10406.2	807.4	-133.66	9735.2	-0.55	6768.4	572.5	-73.96	5706.9	-0.057
1.00	-0.360	0.003	-0.63	10622.6	950.5	-158.89	9919.2	-0.63	6556.3	646.5	-81.74	5543.1	-0.065
1.10	-0.387	0.006	-0.70	10751.4	1064.6	-178.95	10249.3	-0.70	6370.5	701.2	-86.89	5618.3	-0.072
1.20	-0.406	0.007	-0.75	10892.9	1151.6	-194.74	10356.6	-0.75	6305.9	744.5	-91.58	5573.8	-0.076
1.30	-0.416	0.007	-0.77	10937.4	1198.8	-203.09	10092.3	-0.78	6234.1	765.5	-93.39	5256.3	-0.079
1.40	-0.418	0.010	-0.79	10928.2	1218.0	-206.26	10204.7	-0.79	6198.9	775.0	-94.15	5405.3	-0.080
1.50	-0.415	0.012	-0.79	10933.8	1218.0	-206.30	10312.1	-0.79	6241.0	778.5	-95.05	5596.4	-0.080
1.60	-0.408	0.010	-0.77	10883.6	1195.9	-202.14	9970.9	-0.78	6273.2	770.3	-94.40	5366.0	-0.079
1.70	-0.398	0.011	-0.76	10824.7	1166.0	-196.60	10044.5	-0.76	6322.4	758.9	-93.53	5553.6	-0.077
1.80	-0.388	0.012	-0.74	10777.0	1131.6	-190.42	10133.7	-0.74	6390.9	745.3	-92.57	5769.8	-0.075
1.90	-0.378	0.010	-0.72	10712.0	1095.1	-183.76	9793.9	-0.72	6436.9	728.9	-90.98	5538.0	-0.073
2.00	-0.369	0.010	-0.70	10664.9	1064.2	-178.21	9887.4	-0.70	6486.9	715.1	-89.75	5708.7	-0.072
2.10	-0.362	0.011	-0.69	10633.2	1037.8	-173.55	10006.5	-0.69	6533.8	703.0	-88.67	5897.5	-0.070
2.20	-0.357	0.009	-0.67	10594.5	1016.1	-169.64	9698.9	-0.68	6552.3	691.9	-87.44	5632.3	-0.069
2.30	-0.354	0.009	-0.66	10579.6	1002.6	-167.28	9824.0	-0.67	6573.8	685.2	-86.80	5775.3	-0.068
2.40	-0.353	0.010	-0.66	10577.0	994.8	-165.95	9972.7	-0.66	6589.6	681.3	-86.44	5931.4	-0.068
2.50	-0.352	0.009	-0.66	10565.4	990.5	-165.15	9690.3	-0.66	6581.3	678.3	-85.99	5641.2	-0.068
2.60	-0.353	0.009	-0.66	10573.1	991.5	-165.37	9833.2	-0.66	6581.0	678.6	-86.02	5769.1	-0.068
2.70	-0.354	0.010	-0.66	10587.3	995.6	-166.16	9994.4	-0.66	6579.8	680.5	-86.26	5909.9	-0.068
2.80	-0.356	0.008	-0.66	10586.6	999.8	-166.86	9719.2	-0.66	6559.9	681.9	-86.25	5612.1	-0.068
2.90	-0.358	0.009	-0.67	10600.7	1006.0	-168.01	9865.1	-0.67	6553.8	684.9	-86.57	5739.2	-0.069
3.00	-0.360	0.010	-0.67	10616.7	1012.8	-169.25	10024.4	-0.67	6550.4	688.3	-86.98	5879.5	-0.069
3.10	-0.361	0.009	-0.67	10614.8	1017.2	-169.98	9745.8	-0.68	6531.9	690.0	-87.01	5585.5	-0.069
3.20	-0.362	0.009	-0.68	10625.3	1022.1	-170.88	9886.7	-0.68	6529.1	692.5	-87.31	5717.1	-0.070
3.30	-0.363	0.010	-0.68	10636.7	1026.4	-171.67	10040.4	-0.68	6530.8	694.9	-87.62	5863.5	-0.070
3.40	-0.364	0.009	-0.68	10629.3	1027.7	-171.85	9755.9	-0.68	6517.3	695.1	-87.53	5575.0	-0.070
3.50	-0.364	0.009	-0.68	10634.5	1029.5	-172.18	9892.0	-0.68	6519.6	696.2	-87.69	5710.8	-0.070
3.60	-0.364	0.010	-0.68	10641.3	1030.7	-172.43	10041.5	-0.68	6526.0	697.2	-87.87	5861.9	-0.070
3.70	-0.364	0.009	-0.68	10630.3	1029.5	-172.15	9754.1	-0.68	6516.4	696.2	-87.65	5576.9	-0.070
3.80	-0.364	0.009	-0.68	10632.7	1029.3	-172.13	9888.4	-0.68	6521.5	696.3	-87.72	5714.6	-0.070
3.90	-0.363	0.010	-0.68	10637.5	1029.0	-172.12	10036.6	-0.68	6529.6	696.5	-87.82	5867.0	-0.070
4.00	-0.363	0.009	-0.68	10625.4	1026.9	-171.67	9748.6	-0.68	6521.1	695.0	-87.55	5582.2	-0.070

File Name=In.USLoaded

AXLE # 4
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TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
0.0	0.0	0.0	0.0	8580.0	0.0	0.0	7830.0	0.0	8580.0	0.0	0.0	7830.0	0.0
0.10	-0.001	-0.000	0.01	8585.4	-8.3	1.25	7851.6	0.01	8574.5	-8.3	1.24	7807.1	-0.000
0.20	-0.010	-0.000	0.02	8638.0	-22.4	3.36	7952.7	0.02	8522.7	-22.2	3.29	7703.7	-0.002
0.30	-0.030	-0.000	0.01	8748.8	-17.9	2.70	8122.9	0.01	8410.9	-17.3	2.55	7531.6	-0.005
0.40	-0.061	0.000	-0.01	8925.9	12.0	-1.83	8399.9	-0.01	8233.9	11.3	-1.64	7292.3	-0.011
0.50	-0.104	-0.002	-0.06	9156.6	75.7	-11.74	8576.2	-0.06	7982.1	67.9	-9.69	6833.1	-0.019
0.60	-0.156	-0.001	-0.13	9466.2	174.2	-27.50	9022.6	-0.13	7707.1	147.9	-20.68	6641.0	-0.028
0.70	-0.210	0.001	-0.22	9772.0	305.9	-49.09	9464.5	-0.22	7397.7	244.9	-33.45	6398.2	-0.039
0.80	-0.261	0.001	-0.31	10044.4	446.7	-72.69	9673.5	-0.31	7092.4	338.3	-45.04	6056.0	-0.049
0.90	-0.305	0.001	-0.40	10312.0	589.5	-97.17	9777.4	-0.40	6858.2	425.6	-55.46	5665.2	-0.058
1.00	-0.342	0.003	-0.48	10525.2	714.6	-118.93	9964.9	-0.48	6655.9	495.6	-63.31	5504.8	-0.067
1.10	-0.369	0.006	-0.54	10653.8	818.4	-136.98	10295.1	-0.54	6476.7	550.2	-68.98	5582.0	-0.073
1.20	-0.387	0.007	-0.59	10786.5	899.9	-151.50	10395.7	-0.59	6407.2	593.8	-73.89	5532.6	-0.078
1.30	-0.398	0.007	-0.62	10833.3	948.4	-159.98	10131.5	-0.62	6337.2	618.3	-76.33	5220.0	-0.080
1.40	-0.400	0.010	-0.63	10829.2	972.7	-164.05	10244.1	-0.64	6302.7	631.7	-77.68	5372.8	-0.081
1.50	-0.397	0.012	-0.64	10834.0	978.7	-165.09	10347.6	-0.64	6339.9	638.1	-78.80	5563.2	-0.081
1.60	-0.391	0.010	-0.63	10787.6	964.6	-162.40	10006.1	-0.63	6370.5	633.4	-78.49	5335.9	-0.080
1.70	-0.382	0.011	-0.62	10733.1	942.5	-158.31	10079.6	-0.62	6418.3	625.1	-77.87	5525.0	-0.078
1.80	-0.372	0.012	-0.60	10687.3	914.9	-153.36	10167.9	-0.60	6484.0	613.6	-76.99	5742.3	-0.077
1.90	-0.362	0.010	-0.58	10624.9	884.3	-147.84	9827.9	-0.59	6528.5	599.2	-75.53	5511.4	-0.075
2.00	-0.354	0.010	-0.57	10580.1	857.8	-143.13	9921.6	-0.57	6577.6	586.6	-74.34	5682.3	-0.073
2.10	-0.347	0.010	-0.55	10549.5	834.4	-139.02	10040.9	-0.56	6623.5	575.0	-73.21	5871.7	-0.071
2.20	-0.342	0.009	-0.54	10511.7	814.7	-135.51	9733.7	-0.55	6641.5	564.3	-71.98	5606.5	-0.070
2.30	-0.339	0.009	-0.54	10497.2	801.9	-133.29	9859.2	-0.54	6662.9	557.5	-71.26	5749.2	-0.069
2.40	-0.337	0.010	-0.53	10494.8	793.8	-131.94	10008.2	-0.53	6679.0	553.0	-70.81	5905.2	-0.069
2.50	-0.337	0.008	-0.53	10482.8	788.9	-131.06	9726.1	-0.53	6670.8	549.6	-70.32	5614.5	-0.069
2.60	-0.338	0.008	-0.53	10489.9	788.8	-131.07	9869.5	-0.53	6670.8	549.2	-70.26	5742.4	-0.069
2.70	-0.339	0.009	-0.53	10503.7	791.5	-131.61	10030.8	-0.53	6670.2	550.5	-70.42	5882.8	-0.069
2.80	-0.341	0.008	-0.53	10502.4	794.6	-132.12	9755.7	-0.53	6650.6	551.4	-70.40	5584.5	-0.069
2.90	-0.342	0.008	-0.53	10516.1	799.6	-133.03	9901.7	-0.53	6644.8	553.9	-70.68	5711.7	-0.070
3.00	-0.344	0.009	-0.54	10531.8	805.2	-134.06	10061.0	-0.54	6641.9	556.9	-71.04	5851.8	-0.070
3.10	-0.345	0.008	-0.54	10529.5	809.1	-134.69	9782.3	-0.54	6623.5	558.5	-71.11	5557.4	-0.070
3.20	-0.347	0.009	-0.54	10539.7	813.4	-135.46	9923.2	-0.54	6620.9	560.9	-71.39	5689.2	-0.071
3.30	-0.347	0.010	-0.54	10551.0	817.2	-136.17	10076.9	-0.55	6622.6	563.1	-71.69	5835.7	-0.071
3.40	-0.348	0.008	-0.54	10543.6	818.6	-136.36	9792.5	-0.55	6609.3	563.5	-71.65	5547.3	-0.071
3.50	-0.348	0.009	-0.55	10548.9	820.3	-136.68	9928.2	-0.55	6611.6	564.7	-71.80	5682.9	-0.071
3.60	-0.348	0.010	-0.55	10555.6	821.5	-136.92	10078.1	-0.55	6617.7	565.6	-71.97	5834.5	-0.071
3.70	-0.348	0.008	-0.55	10544.7	820.7	-136.72	9790.5	-0.55	6608.2	564.9	-71.81	5549.2	-0.071
3.80	-0.348	0.009	-0.55	10547.3	820.7	-136.73	9924.7	-0.55	6613.3	565.1	-71.87	5687.0	-0.071
3.90	-0.348	0.010	-0.55	10552.2	820.5	-136.73	10073.1	-0.55	6621.4	565.2	-71.95	5839.7	-0.071
4.00	-0.347	0.008	-0.54	10540.2	818.8	-136.37	9785.1	-0.55	6612.8	564.0	-71.73	5554.8	-0.071

File Name=In.USLoaded

AXLE # 3
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TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
0.0	0.0	0.0	0.0	8575.1	0.0	0.0	7325.0	0.0	8575.1	0.0	0.0	7325.0	0.0
0.10	-0.008	-0.000	-0.03	8619.5	32.3	-4.83	7354.3	-0.03	8530.4	32.0	-4.77	7295.7	-0.000
0.20	-0.029	-0.000	-0.14	8737.6	175.7	-26.52	7382.2	-0.14	8413.6	170.8	-25.20	7268.7	-0.000
0.30	-0.063	-0.000	-0.28	8928.9	363.4	-55.53	7486.5	-0.28	8221.8	341.0	-49.59	7163.4	-0.001
0.40	-0.101	-0.000	-0.40	9145.1	540.5	-83.72	7649.2	-0.41	8004.7	487.0	-69.65	6998.0	-0.002
0.50	-0.142	0.000	-0.50	9375.5	687.9	-108.01	7870.6	-0.51	7771.4	593.1	-83.37	6780.0	-0.005
0.60	-0.183	0.000	-0.58	9609.7	805.6	-128.17	8118.4	-0.58	7538.4	664.4	-91.77	6525.7	-0.007
0.70	-0.222	0.000	-0.63	9832.4	898.3	-144.61	8370.9	-0.64	7319.6	710.1	-96.38	6269.2	-0.010
0.80	-0.257	0.001	-0.67	10024.1	970.1	-157.70	8603.8	-0.68	7118.6	738.2	-98.50	6030.2	-0.013
0.90	-0.286	0.001	-0.70	10189.2	1024.6	-167.89	8810.0	-0.70	6952.8	754.9	-99.24	5829.9	-0.016
1.00	-0.310	0.001	-0.72	10329.6	1064.4	-175.59	8980.1	-0.72	6828.7	764.5	-99.34	5672.1	-0.018
1.10	-0.327	0.001	-0.73	10425.7	1090.4	-180.68	9098.1	-0.73	6727.3	768.1	-98.82	5539.7	-0.020
1.20	-0.338	0.004	-0.74	10481.4	1105.3	-183.61	9173.5	-0.74	6653.3	768.4	-98.14	5446.3	-0.021
1.30	-0.344	0.007	-0.74	10520.3	1110.2	-184.74	9226.7	-0.74	6626.8	767.0	-97.69	5415.5	-0.022
1.40	-0.345	0.008	-0.74	10519.2	1105.8	-184.00	9224.5	-0.74	6619.6	763.4	-97.15	5403.9	-0.022
1.50	-0.341	0.009	-0.73	10492.8	1093.8	-181.79	9191.6	-0.73	6633.5	757.9	-96.59	5419.3	-0.022
1.60	-0.335	0.009	-0.72	10468.1	1078.2	-179.00	9164.9	-0.72	6675.0	752.2	-96.27	5474.1	-0.022
1.70	-0.328	0.008	-0.71	10426.5	1059.8	-175.61	9112.6	-0.71	6715.4	745.2	-95.77	5520.4	-0.022
1.80	-0.320	0.007	-0.70	10379.8	1041.6	-172.22	9053.9	-0.70	6755.3	738.6	-95.29	5565.9	-0.021
1.90	-0.313	0.006	-0.69	10343.7	1025.9	-169.34	9015.4	-0.70	6798.9	733.2	-95.00	5624.5	-0.021
2.00	-0.307	0.005	-0.69	10310.2	1012.8	-166.93	8972.4	-0.69	6833.6	728.7	-94.74	5663.8	-0.020
2.10	-0.303	0.004	-0.68	10282.5	1003.2	-165.12	8935.5	-0.68	6859.5	725.5	-94.55	5691.7	-0.020
2.20	-0.299	0.003	-0.68	10265.2	997.1	-163.99	8920.4	-0.68	6879.5	723.8	-94.51	5722.6	-0.019
2.30	-0.297	0.002	-0.68	10254.3	994.0	-163.39	8904.1	-0.68	6891.1	723.2	-94.53	5733.9	-0.019
2.40	-0.297	0.002	-0.68	10249.2	993.4	-163.25	8894.1	-0.68	6895.6	723.4	-94.60	5735.9	-0.019
2.50	-0.297	0.001	-0.68	10250.0	994.7	-163.47	8901.2	-0.68	6895.4	724.3	-94.71	5742.7	-0.019
2.60	-0.297	0.001	-0.68	10254.1	997.2	-163.92	8903.1	-0.68	6891.3	725.6	-94.84	5735.1	-0.019
2.70	-0.298	0.001	-0.68	10260.2	1000.3	-164.48	8906.5	-0.68	6884.6	726.9	-94.96	5723.4	-0.019
2.80	-0.300	0.001	-0.68	10267.7	1003.7	-165.09	8922.1	-0.68	6877.2	728.3	-95.08	5721.3	-0.019
2.90	-0.301	0.002	-0.68	10275.2	1006.9	-165.67	8928.1	-0.69	6869.6	729.6	-95.17	5709.1	-0.019
3.00	-0.302	0.002	-0.69	10281.8	1009.6	-166.17	8932.4	-0.69	6862.3	730.5	-95.23	5696.6	-0.019
3.10	-0.303	0.002	-0.69	10287.8	1011.8	-166.58	8946.2	-0.69	6856.7	731.3	-95.28	5696.4	-0.019
3.20	-0.304	0.002	-0.69	10292.0	1013.4	-166.87	8948.6	-0.69	6851.9	731.8	-95.30	5687.8	-0.019
3.30	-0.305	0.002	-0.69	10294.9	1014.3	-167.05	8948.4	-0.69	6848.7	732.0	-95.30	5680.0	-0.020
3.40	-0.305	0.003	-0.69	10296.9	1014.8	-167.15	8957.5	-0.69	6847.0	732.1	-95.30	5684.6	-0.020
3.50	-0.305	0.003	-0.69	10297.7	1014.9	-167.16	8955.5	-0.69	6846.3	732.1	-95.28	5680.7	-0.020
3.60	-0.305	0.003	-0.69	10297.3	1014.6	-167.12	8951.5	-0.69	6846.1	731.9	-95.26	5676.8	-0.020
3.70	-0.305	0.003	-0.69	10296.7	1014.2	-167.04	8957.4	-0.69	6847.1	731.7	-95.24	5684.5	-0.020
3.80	-0.305	0.003	-0.69	10295.6	1013.6	-166.94	8953.3	-0.69	6848.2	731.4	-95.22	5683.0	-0.020
3.90	-0.305	0.003	-0.69	10294.1	1013.0	-166.83	8947.9	-0.69	6849.3	731.2	-95.20	5680.6	-0.020
4.00	-0.304	0.003	-0.69	10293.0	1012.5	-166.74	6953.0	-0.69	6850.8	731.0	-95.18	5688.9	-0.020

File Name=In.USLoaded

AXLE # 2
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TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
0.0	0.0	0.0	0.0	8575.1	0.0	0.0	7325.0	0.0	8575.1	0.0	0.0	7325.0	0.0
0.10	-0.005	-0.000	0.00	8601.4	-3.6	0.54	7376.0	0.00	8548.0	-3.6	0.53	7273.5	-0.000
0.20	-0.016	-0.000	-0.04	8665.7	52.6	-7.90	7421.9	-0.04	8483.8	51.8	-7.69	7227.6	-0.001
0.30	-0.044	-0.000	-0.14	8825.2	177.2	-26.89	7538.8	-0.14	8323.6	169.5	-24.85	7109.7	-0.001
0.40	-0.080	0.000	-0.24	9028.4	319.7	-49.17	7712.0	-0.24	8118.9	294.4	-42.48	6933.9	-0.003
0.50	-0.121	0.000	-0.33	9258.3	451.6	-70.43	7942.4	-0.34	7886.8	398.2	-56.45	6707.8	-0.005
0.60	-0.163	0.001	-0.41	9496.0	564.7	-89.28	8195.2	-0.41	7649.5	475.8	-66.28	6448.1	-0.008
0.70	-0.203	0.000	-0.47	9723.1	658.1	-105.33	8448.7	-0.47	7426.1	531.1	-72.71	6190.5	-0.011
0.80	-0.238	0.001	-0.51	9919.5	733.2	-118.56	8680.3	-0.52	7222.9	569.3	-76.65	5955.4	-0.013
0.90	-0.268	0.001	-0.55	10086.2	791.7	-129.09	8881.1	-0.55	7054.9	595.1	-78.96	5760.2	-0.016
1.00	-0.292	0.001	-0.57	10225.8	835.7	-137.18	9043.6	-0.57	6929.0	612.2	-80.31	5608.1	-0.018
1.10	-0.309	0.001	-0.59	10327.6	866.2	-142.87	9160.8	-0.59	6830.8	622.3	-80.88	5484.8	-0.020
1.20	-0.321	0.004	-0.60	10386.2	885.0	-146.37	9232.1	-0.60	6761.3	627.8	-81.04	5402.5	-0.022
1.30	-0.326	0.006	-0.60	10423.5	893.2	-147.98	9278.9	-0.60	6735.6	629.8	-81.09	5378.7	-0.022
1.40	-0.326	0.007	-0.60	10424.3	892.1	-147.81	9273.0	-0.60	6732.7	628.8	-80.94	5376.0	-0.023
1.50	-0.323	0.008	-0.59	10397.8	883.0	-146.12	9236.2	-0.60	6748.4	624.8	-80.55	5396.7	-0.023
1.60	-0.317	0.008	-0.59	10369.6	869.3	-143.67	9204.0	-0.59	6788.4	619.3	-80.16	5452.6	-0.022
1.70	-0.309	0.007	-0.58	10327.6	852.5	-140.62	9149.7	-0.58	6829.7	612.3	-79.57	5501.0	-0.022
1.80	-0.302	0.006	-0.57	10280.1	835.2	-137.46	9089.8	-0.57	6869.4	604.9	-78.90	5546.5	-0.022
1.90	-0.294	0.005	-0.56	10241.3	819.7	-134.65	9049.4	-0.56	6910.9	598.3	-78.35	5602.8	-0.021
2.00	-0.288	0.004	-0.55	10207.1	806.4	-132.27	9006.3	-0.55	6945.2	592.6	-77.85	5640.5	-0.020
2.10	-0.284	0.003	-0.55	10178.9	796.2	-130.41	8969.9	-0.55	6970.4	588.1	-77.44	5666.4	-0.020
2.20	-0.280	0.003	-0.54	10160.3	789.4	-129.17	8955.3	-0.54	6989.2	585.1	-77.18	5694.9	-0.020
2.30	-0.278	0.002	-0.54	10149.1	785.4	-128.46	8940.0	-0.54	7000.2	583.5	-77.04	5704.3	-0.020
2.40	-0.278	0.002	-0.54	10144.0	784.0	-128.20	8930.9	-0.54	7004.3	583.0	-77.00	5704.6	-0.019
2.50	-0.278	0.002	-0.54	10144.7	784.6	-128.30	8939.0	-0.54	7003.8	583.4	-77.05	5710.4	-0.019
2.60	-0.278	0.002	-0.54	10149.0	786.6	-128.65	8941.6	-0.54	6999.6	584.3	-77.15	5701.8	-0.019
2.70	-0.280	0.002	-0.54	10155.3	789.3	-129.14	8945.7	-0.54	6992.9	585.6	-77.27	5689.6	-0.019
2.80	-0.281	0.002	-0.54	10163.1	792.4	-129.69	8961.9	-0.55	6985.5	587.1	-77.41	5687.5	-0.019
2.90	-0.282	0.002	-0.55	10170.9	795.5	-130.24	8968.2	-0.55	6978.1	588.5	-77.54	5675.5	-0.020
3.00	-0.284	0.002	-0.55	10177.8	798.2	-130.73	8972.6	-0.55	6971.0	589.7	-77.65	5663.2	-0.020
3.10	-0.285	0.002	-0.55	10183.9	800.4	-131.14	8986.5	-0.55	6965.5	590.7	-77.74	5663.5	-0.020
3.20	-0.285	0.002	-0.55	10188.4	802.1	-131.44	8988.8	-0.55	6961.0	591.4	-77.81	5655.2	-0.020
3.30	-0.286	0.002	-0.55	10191.4	803.2	-131.64	8988.4	-0.55	6957.8	591.9	-77.85	5647.6	-0.020
3.40	-0.286	0.003	-0.55	10193.4	803.9	-131.76	8997.4	-0.55	6956.2	592.1	-77.87	5652.7	-0.020
3.50	-0.286	0.003	-0.55	10194.2	804.1	-131.79	8995.3	-0.55	6955.6	592.2	-77.87	5649.0	-0.020
3.60	-0.286	0.003	-0.55	10193.8	803.9	-131.77	8990.9	-0.55	6955.5	592.1	-77.86	5645.2	-0.020
3.70	-0.286	0.003	-0.55	10193.2	803.6	-131.71	8997.0	-0.55	6956.5	591.9	-77.84	5653.3	-0.020
3.80	-0.286	0.003	-0.55	10192.1	803.1	-131.62	8992.5	-0.55	6957.6	591.7	-77.82	5651.6	-0.020
3.90	-0.286	0.003	-0.55	10190.7	802.5	-131.52	8987.1	-0.55	6958.9	591.4	-77.80	5649.3	-0.020
4.00	-0.286	0.003	-0.55	10189.4	802.0	-131.43	8992.3	-0.55	6960.2	591.2	-77.78	5657.6	-0.020

File Name=In.USLoaded

AXLE # 1
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TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
0.0	0.0	0.0	0.0	6240.0	0.0	0.0	5640.0	0.0	6240.0	0.0	0.0	5640.0	
0.10	-0.053	0.000	-0.48	6406.8	403.4	-76.13	5599.1	-0.41	6072.8	343.5	-61.48	5679.9	
0.20	-0.082	0.000	-0.63	6496.3	533.6	-102.06	5685.0	-0.54	5983.1	454.6	-80.17	5593.2	
0.30	-0.088	0.000	-0.61	6515.9	520.6	-99.86	5723.2	-0.53	5963.5	442.4	-77.78	5554.8	
0.40	-0.103	0.001	-0.64	6561.8	546.0	-105.45	5783.9	-0.56	5917.5	460.7	-80.74	5493.6	
0.50	-0.122	0.001	-0.68	6621.3	583.6	-113.69	5854.9	-0.59	5857.4	488.0	-85.17	5421.9	
0.60	-0.141	0.001	-0.72	6683.3	620.8	-122.04	5923.9	-0.63	5794.7	514.4	-89.36	5351.3	
0.70	-0.160	0.002	-0.76	6740.7	653.2	-129.45	5983.0	-0.66	5738.4	536.5	-92.82	5292.3	
0.80	-0.175	0.002	-0.79	6788.1	679.6	-135.58	6027.4	-0.69	5690.9	554.1	-95.53	5247.6	
0.90	-0.186	0.002	-0.81	6823.9	700.2	-140.40	6056.3	-0.71	5652.6	567.7	-97.58	5216.5	
1.00	-0.195	0.003	-0.83	6852.1	715.8	-144.09	6074.5	-0.73	5626.3	577.9	-99.14	5200.0	
1.10	-0.200	0.002	-0.84	6870.7	727.4	-146.79	6079.6	-0.74	5611.1	585.7	-100.36	5197.2	
1.20	-0.203	0.002	-0.85	6876.5	735.3	-148.51	6071.3	-0.75	5600.8	591.3	-101.23	5201.2	
1.30	-0.204	0.003	-0.86	6876.3	740.0	-149.46	6058.5	-0.75	5597.4	594.8	-101.81	5211.4	
1.40	-0.202	0.003	-0.86	6873.1	742.3	-149.85	6042.3	-0.75	5603.4	597.2	-102.26	5229.6	
1.50	-0.199	0.004	-0.86	6863.6	742.1	-149.62	6022.5	-0.75	5610.5	597.8	-102.43	5246.8	
1.60	-0.196	0.004	-0.86	6852.6	740.1	-148.98	6005.0	-0.75	5619.3	597.1	-102.37	5263.4	
1.70	-0.193	0.004	-0.85	6844.3	736.7	-148.14	5991.9	-0.75	5632.2	595.5	-102.20	5280.3	
1.80	-0.190	0.004	-0.85	6834.1	732.6	-147.10	5979.6	-0.74	5642.1	593.1	-101.87	5292.1	
1.90	-0.187	0.004	-0.84	6824.4	728.4	-146.06	5970.5	-0.74	5649.7	590.5	-101.48	5300.1	
2.00	-0.185	0.004	-0.84	6818.8	724.5	-145.16	5966.1	-0.74	5657.8	587.9	-101.11	5306.4	
2.10	-0.183	0.004	-0.84	6814.3	721.1	-144.38	5964.0	-0.73	5663.2	585.7	-100.76	5309.2	
2.20	-0.182	0.004	-0.83	6810.9	718.4	-143.79	5963.8	-0.73	5665.8	583.8	-100.45	5309.4	
2.30	-0.182	0.004	-0.83	6809.8	716.6	-143.41	5965.4	-0.73	5667.5	582.4	-100.24	5308.1	
2.40	-0.182	0.004	-0.83	6810.0	715.5	-143.19	5968.0	-0.73	5667.8	581.6	-100.09	5305.5	
2.50	-0.182	0.003	-0.83	6810.8	715.1	-143.13	5971.4	-0.73	5666.8	581.2	-100.01	5302.7	
2.60	-0.183	0.003	-0.83	6812.3	715.2	-143.18	5974.5	-0.73	5665.2	581.1	-99.99	5299.3	
2.70	-0.183	0.003	-0.83	6814.2	715.7	-143.31	5977.3	-0.73	5663.5	581.3	-100.01	5296.1	
2.80	-0.184	0.003	-0.83	6816.0	716.4	-143.48	5980.1	-0.73	5661.5	581.7	-100.06	5293.9	
2.90	-0.184	0.003	-0.83	6817.7	717.2	-143.67	5981.9	-0.73	5659.7	582.2	-100.13	5291.6	
3.00	-0.185	0.003	-0.83	6819.1	717.9	-143.85	5983.1	-0.73	5658.2	582.6	-100.20	5289.9	
3.10	-0.185	0.003	-0.83	6820.2	718.6	-144.02	5984.2	-0.73	5657.0	583.1	-100.27	5289.4	
3.20	-0.185	0.003	-0.83	6821.0	719.2	-144.15	5984.4	-0.73	5656.1	583.5	-100.33	5288.8	
3.30	-0.186	0.003	-0.83	6821.5	719.6	-144.25	5984.2	-0.73	5655.6	583.8	-100.38	5288.6	
3.40	-0.186	0.003	-0.84	6821.7	720.0	-144.31	5984.2	-0.73	5655.4	584.0	-100.41	5289.2	
3.50	-0.186	0.003	-0.84	6821.7	720.1	-144.34	5983.6	-0.73	5655.3	584.2	-100.44	5289.5	
3.60	-0.186	0.003	-0.84	6821.5	720.2	-144.35	5982.9	-0.73	5655.5	584.2	-100.45	5289.8	
3.70	-0.185	0.003	-0.84	6821.2	720.2	-144.34	5982.7	-0.73	5655.8	584.2	-100.45	5290.8	
3.80	-0.185	0.003	-0.84	6820.9	720.1	-144.32	5982.0	-0.73	5656.1	584.2	-100.45	5291.1	
3.90	-0.185	0.003	-0.84	6820.6	719.9	-144.28	5981.4	-0.73	5656 4	584.1	-100.44	5291.3	
4.00	-0.185	0.003	-0.83	6820.3	719.8	-144.25	5981.4	-0.73	5656.7	584.0	-100.43	5292.1	

File Name=In.USLoaded

CONSTRAINT FORCES
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NOTE: LATERAL FORCE ALONE IS PRINTED FOR PINTLE HOOK TYPE CONSTRAINT.
LOCATE FORCES & MOMENTS BASED ON CONSTRAINT TYPE

TIME	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
0.0	0.0	29779.3	0.0	0.0						
0.10	-139.1	29778.8	14002.9	0.0						
0.20	-485.5	29779.7	17591.0	0.0						
0.30	-997.5	29776.9	17210.7	0.0						
0.40	-1534.3	29771.1	11017.9	0.0						
0.50	-2041.1	29760.5	-595.1	0.0						
0.60	-2491.3	29752.7	-16097.1	0.0						
0.70	-2878.9	29745.6	-33500.7	0.0						
0.80	-3195.5	29720.3	-50749.1	0.0						
0.90	-3449.0	29708.6	-66259.4	0.0						
1.00	-3642.7	29723.2	-78876.8	0.0						
1.10	-3777.7	29715.1	-88615.6	0.0						
1.20	-3858.1	29684.1	-95292.3	0.0						
1.30	-3897.9	29697.6	-98487.6	0.0						
1.40	-3891.6	29687.0	-98852.4	0.0						
1.50	-3850.9	29669.0	-97213.8	0.0						
1.60	-3797.2	29694.2	-94225.1	0.0						
1.70	-3728.6	29697.6	-90662.9	0.0						
1.80	-3656.7	29688.0	-86966.9	0.0						
1.90	-3595.8	29698.7	-83471.6	0.0						
2.00	-3542.2	29704.8	-80511.3	0.0						
2.10	-3499.8	29702.3	-78193.8	0.0						
2.20	-3474.2	29705.4	-76532.9	0.0						
2.30	-3458.0	29708.5	-75524.0	0.0						
2.40	-3451.6	29707.1	-75073.4	0.0						
2.50	-3456.1	29707.1	-75062.8	0.0						
2.60	-3463.5	29708.3	-75380.6	0.0						
2.70	-3473.8	29706.6	-75910.9	0.0						
2.80	-3488.3	29705.6	-76533.4	0.0						
2.90	-3499.7	29706.5	-77175.8	0.0						
3.00	-3509.7	29704.6	-77773.3	0.0						
3.10	-3520.7	29704.1	-78276.1	0.0						
3.20	-3526.5	29704.9	-78675.5	0.0						
3.30	-3530.0	29703.4	-78956.2	0.0						
3.40	-3534.3	29703.1	-79119.0	0.0						
3.50	-3534.2	29704.5	-79195.3	0.0						
3.60	-3532.6	29703.1	-79194.6	0.0						
3.70	-3533.0	29702.9	-79130.6	0.0						
3.80	-3530.2	29704.6	-79042.4	0.0						
3.90	-3527.0	29703.6	-78936.3	0.0						
4.00	-3526.7	29702.9	-78823.0	0.0						

File Name=In.USLoaded

SPRUNG MASS # 2
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TIME (SEC)	FORWARD POSITION (IN)	LATERAL POSITION (IN)	VERTICAL POSITION (IN)	ROLL ANGLE (DEG)	YAW ANGLE (DEG)	PITCH ANGLE (DEG)	FORWARD VEL IN/SEC	LATERAL VEL IN/SEC	ROLL RATE DEG/SEC	YAW RATE DEG/SEC	PITCH RATE DEG/SEC	LATERAL ACCN. IN/SEC**2	ARTIC ANGLE DEG
0.0	-279.83	0.0	0.0	0.0	0.0	0.0	880.08	0.0	0.0	0.0	0.0	0.0	0.0
0.10	-191.82	0.01	0.000	-0.00	0.00	0.000	880.08	0.01	-0.12	0.02	0.00	0.54	0.02
0.20	-103.81	0.03	0.000	-0.03	0.01	0.000	880.08	0.04	-0.48	0.12	-0.00	2.40	0.12
0.30	-15.81	0.11	0.000	-0.10	0.03	0.000	880.08	0.08	-0.89	0.35	-0.00	5.73	0.30
0.40	72.20	0.28	0.000	-0.21	0.08	0.000	880.09	0.05	-1.35	0.70	-0.00	9.77	0.51
0.50	160.21	0.57	0.001	-0.37	0.17	0.000	880.09	-0.15	-1.76	1.13	-0.01	14.28	0.70
0.60	248.22	1.03	0.003	-0.56	0.31	0.001	880.10	-0.55	-2.00	1.56	-0.02	19.08	0.86
0.70	336.22	1.69	0.004	-0.76	0.48	0.000	880.10	-1.11	-2.04	1.96	-0.03	23.94	0.96
0.80	424.23	2.59	0.005	-0.96	0.70	-0.000	880.11	-1.76	-1.91	2.28	-0.03	28.35	1.02
0.90	512.23	3.75	0.009	-1.14	0.94	0.000	880.11	-2.42	-1.68	2.52	-0.05	32.21	1.05
1.00	600.23	5.22	0.012	-1.29	1.20	0.000	880.12	-3.02	-1.36	2.67	-0.07	35.35	1.05
1.10	688.21	7.03	0.011	-1.41	1.47	-0.001	880.12	-3.53	-1.01	2.75	-0.06	37.79	1.03
1.20	776.18	9.18	0.013	-1.50	1.74	0.000	880.12	-3.90	-0.65	2.76	-0.06	39.50	0.99
1.30	864.14	11.70	0.013	-1.54	2.02	0.000	880.13	-4.13	-0.34	2.73	-0.09	40.26	0.96
1.40	952.09	14.61	0.010	-1.56	2.29	-0.000	880.13	-4.24	-0.06	2.68	-0.07	40.58	0.92
1.50	1040.03	17.91	0.009	-1.56	2.55	-0.000	880.13	-4.26	0.15	2.61	-0.06	40.46	0.89
1.60	1127.95	21.59	0.009	-1.54	2.81	-0.000	880.13	-4.19	0.29	2.53	-0.08	39.75	0.86
1.70	1215.86	25.67	0.009	-1.50	3.06	-0.001	880.12	-4.08	0.36	2.46	-0.07	39.04	0.84
1.80	1303.74	30.14	0.008	-1.46	3.30	-0.001	880.12	-3.95	0.38	2.40	-0.06	38.24	0.82
1.90	1391.61	34.98	0.008	-1.43	3.54	-0.001	880.12	-3.82	0.36	2.35	-0.06	37.28	0.81
2.00	1479.45	40.21	0.008	-1.39	3.77	-0.001	880.12	-3.69	0.31	2.31	-0.06	36.60	0.81
2.10	1567.27	45.80	0.008	-1.37	4.00	-0.001	880.12	-3.59	0.25	2.28	-0.05	36.06	0.81
2.20	1655.07	51.75	0.008	-1.34	4.23	-0.001	880.12	-3.50	0.18	2.27	-0.06	35.49	0.81
2.30	1742.84	58.07	0.008	-1.33	4.46	-0.001	880.12	-3.45	0.11	2.27	-0.05	35.26	0.82
2.40	1830.58	64.74	0.008	-1.32	4.68	-0.001	880.12	-3.41	0.05	2.27	-0.05	35.16	0.82
2.50	1918.30	71.76	0.009	-1.32	4.91	-0.001	880.12	-3.39	0.00	2.28	-0.06	35.01	0.83
2.60	2005.99	79.14	0.009	-1.32	5.14	-0.001	880.12	-3.39	-0.03	2.29	-0.05	35.11	0.83
2.70	2093.64	86.87	0.009	-1.33	5.37	-0.001	880.12	-3.41	-0.05	2.30	-0.05	35.28	0.84
2.80	2181.27	94.94	0.009	-1.33	5.60	-0.001	880.12	-3.42	-0.07	2.32	-0.06	35.30	0.84
2.90	2268.86	103.38	0.009	-1.34	5.83	-0.001	880.12	-3.45	-0.07	2.33	-0.05	35.51	0.85
3.00	2356.42	112.16	0.009	-1.35	6.07	-0.001	880.12	-3.47	-0.06	2.34	-0.05	35.72	0.85
3.10	2443.94	121.30	0.009	-1.35	6.30	-0.001	880.12	-3.49	-0.05	2.34	-0.06	35.73	0.85
3.20	2531.42	130.80	0.009	-1.36	6.53	-0.001	880.12	-3.51	-0.04	2.35	-0.06	35.89	0.85
3.30	2618.87	140.65	0.009	-1.36	6.77	-0.001	880.12	-3.52	-0.03	2.35	-0.05	36.03	0.85
3.40	2706.27	150.85	0.009	-1.36	7.00	-0.001	880.12	-3.53	-0.02	2.35	-0.06	35.95	0.85
3.50	2793.63	161.42	0.009	-1.36	7.24	-0.001	880.12	-3.54	-0.01	2.35	-0.06	36.04	0.85
3.60	2880.95	172.34	0.009	-1.36	7.47	-0.001	880.12	-3.54	0.00	2.35	-0.05	36.11	0.84
3.70	2968.22	183.61	0.009	-1.36	7.71	-0.001	880.12	-3.54	0.01	2.35	-0.06	35.98	0.84
3.80	3055.45	195.24	0.009	-1.36	7.94	-0.001	880.12	-3.54	0.01	2.34	-0.06	36.01	0.84
3.90	3142.63	207.23	0.009	-1.36	8.18	-0.001	880.12	-3.53	0.01	2.34	-0.05	36.06	0.84
4.00	3229.76	219.58	0.009	-1.36	8.41	-0.001	880.12	-3.53	0.01	2.34	-0.06	35.91	0.84

File Name=In.USLoaded

SPRUNG MASS # 1

TIME (SEC)	FORWARD POSITION (IN)	LATERAL POSITION (IN)	VERTICAL POSITION (IN)	ROLL ANGLE (DEG)	YAW ANGLE (DEG)	PITCH ANGLE (DEG)	FORWARD VEL IN/SEC	LATERAL VEL IN/SEC	ROLL RATE DEG/SEC	YAW RATE DEG/SEC	PITCH RATE DEG/SEC	LATERAL ACCN. IN/SEC**2	STEER ANGLE DEG
0.0	0.00	0.0	0.0	0.0	0.0	0.0	880.08	0.0	0.0	0.0	0.0	0.0	0.0
0.10	88.01	0.04	-0.000	-0.02	0.02	0.000	880.08	0.80	-0.22	0.52	0.00	20.86	20.00
0.20	176.02	0.28	-0.000	-0.05	0.13	0.000	880.08	1.80	-0.42	1.66	-0.00	27.55	28.00
0.30	264.02	0.79	-0.000	-0.12	0.33	0.000	880.08	1.33	-0.88	2.40	-0.00	27.27	28.00
0.40	352.03	1.58	-0.000	-0.22	0.59	0.000	880.08	0.13	-1.29	2.76	-0.01	28.83	28.00
0.50	440.03	2.65	-0.001	-0.37	0.88	0.000	880.08	-1.22	-1.62	2.87	-0.02	30.67	28.00
0.60	528.02	4.04	-0.001	-0.54	1.16	0.000	880.08	-2.47	-1.82	2.86	-0.03	32.27	28.00
0.70	616.02	5.75	0.000	-0.73	1.45	0.000	880.08	-3.52	-1.86	2.79	-0.04	33.42	28.00
0.80	704.00	7.79	0.001	-0.91	1.72	-0.000	880.08	-4.34	-1.75	2.70	-0.05	34.28	28.00
0.90	791.98	10.18	0.001	-1.07	1.99	-0.000	880.08	-4.96	-1.53	2.62	-0.04	34.86	28.00
1.00	879.94	12.91	0.002	-1.21	2.24	0.000	880.08	-5.40	-1.25	2.54	-0.05	35.31	28.00
1.10	967.89	16.00	0.003	-1.32	2.49	-0.000	880.08	-5.69	-0.93	2.47	-0.07	35.67	28.00
1.20	1055.81	19.44	0.002	-1.40	2.74	-0.001	880.08	-5.85	-0.60	2.41	-0.07	35.94	28.00
1.30	1143.73	23.25	0.001	-1.45	2.98	-0.002	880.08	-5.91	-0.32	2.37	-0.06	36.14	28.00
1.40	1231.62	27.41	0.001	-1.46	3.21	-0.002	880.08	-5.89	-0.06	2.33	-0.07	36.37	28.00
1.50	1319.50	31.94	0.000	-1.46	3.44	-0.003	880.08	-5.80	0.13	2.30	-0.06	36.51	28.00
1.60	1407.36	36.83	-0.000	-1.44	3.67	-0.002	880.08	-5.67	0.25	2.28	-0.05	36.54	28.00
1.70	1495.20	42.09	-0.000	-1.41	3.90	-0.002	880.08	-5.52	0.32	2.27	-0.06	36.52	28.00
1.80	1583.01	47.71	-0.000	-1.38	4.13	-0.002	880.08	-5.37	0.34	2.27	-0.05	36.46	28.00
1.90	1670.80	53.70	-0.000	-1.34	4.36	-0.001	880.08	-5.22	0.33	2.28	-0.05	36.34	28.00
2.00	1758.57	60.05	-0.000	-1.31	4.58	-0.001	880.08	-5.10	0.28	2.29	-0.05	36.22	28.00
2.10	1846.31	66.75	0.000	-1.29	4.81	-0.001	880.08	-5.01	0.23	2.30	-0.05	36.11	28.00
2.20	1934.02	73.82	0.000	-1.27	5.04	-0.000	880.08	-4.94	0.16	2.31	-0.05	35.98	28.00
2.30	2021.70	81.25	0.001	-1.25	5.27	-0.000	880.08	-4.91	0.10	2.32	-0.05	35.90	28.00
2.40	2109.35	89.03	0.001	-1.25	5.51	0.000	880.08	-4.89	0.05	2.33	-0.05	35.85	28.00
2.50	2196.96	97.17	0.001	-1.24	5.74	0.000	880.08	-4.90	0.00	2.34	-0.05	35.79	28.00
2.60	2284.55	105.67	0.001	-1.25	5.97	0.000	880.08	-4.91	-0.03	2.34	-0.05	35.78	28.00
2.70	2372.10	114.52	0.001	-1.25	6.21	0.000	880.08	-4.94	-0.05	2.35	-0.05	35.79	28.00
2.80	2459.61	123.73	0.001	-1.26	6.44	-0.000	880.08	-4.97	-0.06	2.35	-0.05	35.78	28.00
2.90	2547.08	133.29	0.001	-1.26	6.68	-0.000	880.08	-5.00	-0.06	2.35	-0.05	35.81	28.00
3.00	2634.51	143.21	0.001	-1.27	6.91	-0.000	880.08	-5.02	-0.06	2.35	-0.05	35.84	28.00
3.10	2721.91	153.49	0.001	-1.27	7.15	-0.000	880.08	-5.04	-0.05	2.35	-0.05	35.85	28.00
3.20	2809.26	164.12	0.001	-1.28	7.38	-0.000	880.08	-5.06	-0.04	2.34	-0.05	35.88	28.00
3.30	2896.56	175.11	0.001	-1.28	7.62	-0.000	880.08	-5.07	-0.03	2.34	-0.05	35.90	28.00
3.40	2983.82	186.45	0.001	-1.28	7.85	-0.000	880.08	-5.08	-0.02	2.34	-0.05	35.90	28.00
3.50	3071.04	198.15	0.001	-1.28	8.08	-0.000	880.08	-5.08	-0.01	2.34	-0.05	35.92	28.00
3.60	3158.20	210.20	0.001	-1.28	8.32	-0.000	880.08	-5.08	-0.00	2.34	-0.05	35.93	28.00
3.70	3245.32	222.61	0.001	-1.28	8.55	-0.000	880.08	-5.07	0.00	2.34	-0.05	35.92	28.00
3.80	3332.38	235.37	0.001	-1.28	8.78	-0.000	880.08	-5.07	0.01	2.34	-0.05	35.93	28.00
3.90	3419.39	248.49	0.001	-1.28	9.02	-0.000	880.08	-5.06	0.01	2.34	-0.05	35.93	28.00
4.00	3506.35	261.96	0.001	-1.28	9.25	-0.000	880.08	-5.06	0.01	2.34	-0.05	35.91	28.00

ALIGNING TORQUE TABLE # 1
******** ****** *********

ALIGNING TORQUE VS. SLIP ANGLE

0.0	1.00	2.00	4.00	8.00	12.00
2000.00	336.00	528.00	660.00	444.00	252.00
3980.00	1020.00	1716.00	2256.00	1728.00	1092.00
5970.00	1764.00	3156.00	4344.00	3240.00	2184.00
7950.00	2484.00	4608.00	6720.00	5304.00	3576.00
9440.00	3000.00	5616.00	8604.00	7104.00	4620.00

CORNERING FORCE TABLE # 1
********* ***** *********

LATERAL FORCE VS. SLIP ANGLL

0.0	1.00	2.00	4.00	8.00	12.00
1983.00	356.94	634.56	1070.82	1526.91	1804.53
5967.00	835.38	1611.09	2804.49	3938.22	4355.91
9441.00	944.10	1793.79	3398.76	5192.55	5759.01

SPRING TABLE # 3
****** *******

FORCE LB	DEFLECTION INCHES
-34112.50	-20.00
-350.00	-1.75
125.00	0.0
1300.00	0.50
3575.00	1.00
6500.00	1.50
28971.87	5.00

SPRING TABLE # 2
****** *******

FORCE LB	DEFLECTION INCHES
-38575.00	-20.00
-18575.00	-10.00
-75.00	-0.75
-75.00	0.0
1925.00	0.50
4125.00	1.00
8899.47	2.00
26969.47	5.00
31486.97	6.00

SPRING TABLE # 1
****** *******

FORCE LB	DEFLECTION INCHES
-19075.00	-20.00
-787.50	-0.75
-75.00	0.0
825.00	1.00
1775.00	2.00
2200.00	2.50
3230.00	3.50
4250.00	4.50
20253.57	20.00

File Name=In.USLoaded

UNIT # 2

OF AXLES ON THIS UNIT = 2

WEIGHT OF SPRUNG MASS = 61100.00 LB.

ROLL MOMENT OF INERTIA OF SPRUNG MASS = 253041.44 LB.IN.SEC**2

PITCH MOMENT OF INERTIA OF SPRUNG MASS = 3294028.00 LB.IN.SEC**2

YAW MOMENT OF INERTIA OF SPRUNG MASS = 3324900.00 LB.IN.SEC**2

HEIGHT OF SPRUNG MASS CG ABOVE GROUND = 78.35 INCHES

	AXLE # 4	AXLE # 5	AXLE #					
LOAD ON EACH AXLE (LB.)	17160.00	17160.00						
AXLE WEIGHT (LB.)	1500.00	1500.00						
AXLE ROLL M.I (LB.IN.SEC**2)	3979.00	3979.00						
X DIST FROM SP MASS CG (IN)	-145.22	-195.22						
HEIGHT OF AXLE C.G. ABOVE GROUND (INCHES)	20.50	20.50						
HEIGHT OF ROLL CENTER ABOVE GROUND (INCHES)	24.00	24.00						
HALF SPRING SPACING (IN)	19.00	19.00						
HALF TRACK - INNER TIRES (IN)	29.50	29.50						
DUAL TIRE SPACING (IN)	13.00	13.00						
STIFFNESS OF EACH TIRE (LB/IN)	4500.00	4500.00						
ROLL STEER COEFFICIENT	0.07	0.07						
AUX ROLL STIFFNESS (IN.LB/DEG)	30000.00	30000.00						
SPRING COULOMB FRICTION - PER SPRING (LB)	750.00	750.00						
VISCOUS DAMPING PER SPRING (LB.SEC/IN)	0.0	0.0						
SPRING TABLE #	3	3						
CORNERING FORCE TABLE #	1	1						
ALIGNING TORQUE TABLE #	1	1						

File Name=In.USLoaded

UNIT # 1
****

OF AXLES ON THIS UNIT = 3

WEIGHT OF SPRUNG MASS = 10800.00 LB.

ROLL MOMENT OF INERTIA OF SPRUNG MASS = 23522.00 LB.IN.SEC**2

PITCH MOMENT OF INERTIA OF SPRUNG MASS = 140000.00 LB.IN.SEC**2

YAW MOMENT OF INERTIA OF SPRUNG MASS = 140000.00 LB.IN.SEC**2

HEIGHT OF SPRUNG MASS CG ABOVE GROUND = 38.60 INCHES

	AXLE # 1	AXLE # 2	AXLE # 3	AXLE #				
	*********	*********	*********	*********	*********	*********	*********	*********
LOAD ON EACH AXLE (LB.)	12480.00	17150.00	17150.00					
AXLE WEIGHT (LB.)	1200.00	2500.00	2500.00					
AXLE ROLL M.I (LB.IN.SEC**2)	4142.00	5780.00	5780.00					
X DIST FROM SP MASS CG (IN)	36.50	-90.50	-142.50					
HEIGHT OF AXLE C.G. ABOVE GROUND (INCHES)	20.50	20.50	20.50					
HEIGHT OF ROLL CENTER ABOVE GROUND (INCHES)	19.00	27.00	27.00					
HALF SPRING SPACING (IN)	17.50	20.00	20.00					
HALF TRACK - INNER TIRES (IN)	40.00	29.50	29.50					
DUAL TIRE SPACING (IN)	0.0	13.00	13.00					
STIFFNESS OF EACH TIRE (LB/IN)	4500.00	4500.00	4500.00					
ROLL STEER COEFFICIENT	0.10	0.02	0.02					
AUX ROLL STIFFNESS (IN.LB/DEG)	8000.00	15000.00	15000.00					
SPRING COULOMB FRICTION - PER SPRING (LB)	400.00	775.00	775.00					
VISCOUS DAMPING PER SPRING (LB.SEC/IN)	0.0	0.0	0.0					
SPRING TABLE #	1	2	2					
CORNERING FORCE TABLE #	1	1	1					
ALIGNING TORQUE TABLE #	1	1	1					

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*    RTAC  STUDY     *
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************************************
*DIRECTIONAL RESPONSE SIMULATION*
************************************

File Name=In.USLoaded

# OF SPRUNG MASSES       =  2

TOTAL # OF AXLES         =  5

GROSS VEHICLE WEIGHT     =   81100.00  LB.

FORWARD VELOCITY         =      50.01  M.P.H


PEAK FRICTIONAL COEFFICIENT    = 0.79
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		DISTANCE AHEAD OF SPRUNG MASS C.G. (INCHES)	HEIGHT BELOW SPRUNG MASS C.G. (INCHES)	ROLL STIFFNESS (IN.LB/DEG)	TYPE OF CONSTRAINT
ARTICULATION PT # 1	ON UNIT # 1	-100.80	-10.40	999999.88	1
	ON UNIT # 2	179.03	29.35		

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TYPE OF CONSTRAINT :  01  CONVENTIONAL 5TH WHEEL
                      02  INVERTED 5TH WHEEL
                      03  PINTLE HOOK
                      04  KING PIN(RIGID IN ROLL & PITCH)

OPEN LOOP STEER INPUT
**********************

STEERING GEAR RATIO  =      25.00

STEERING STIFFNESS (IN.LB/DEG)        =   12000.00

TIE ROD STIFFNESS (IN.LB/DEG)         =  20000.00

MECHANICAL TRAIL (IN)        =       1.50

# OF POINTS IN STEER TABLE   = 5
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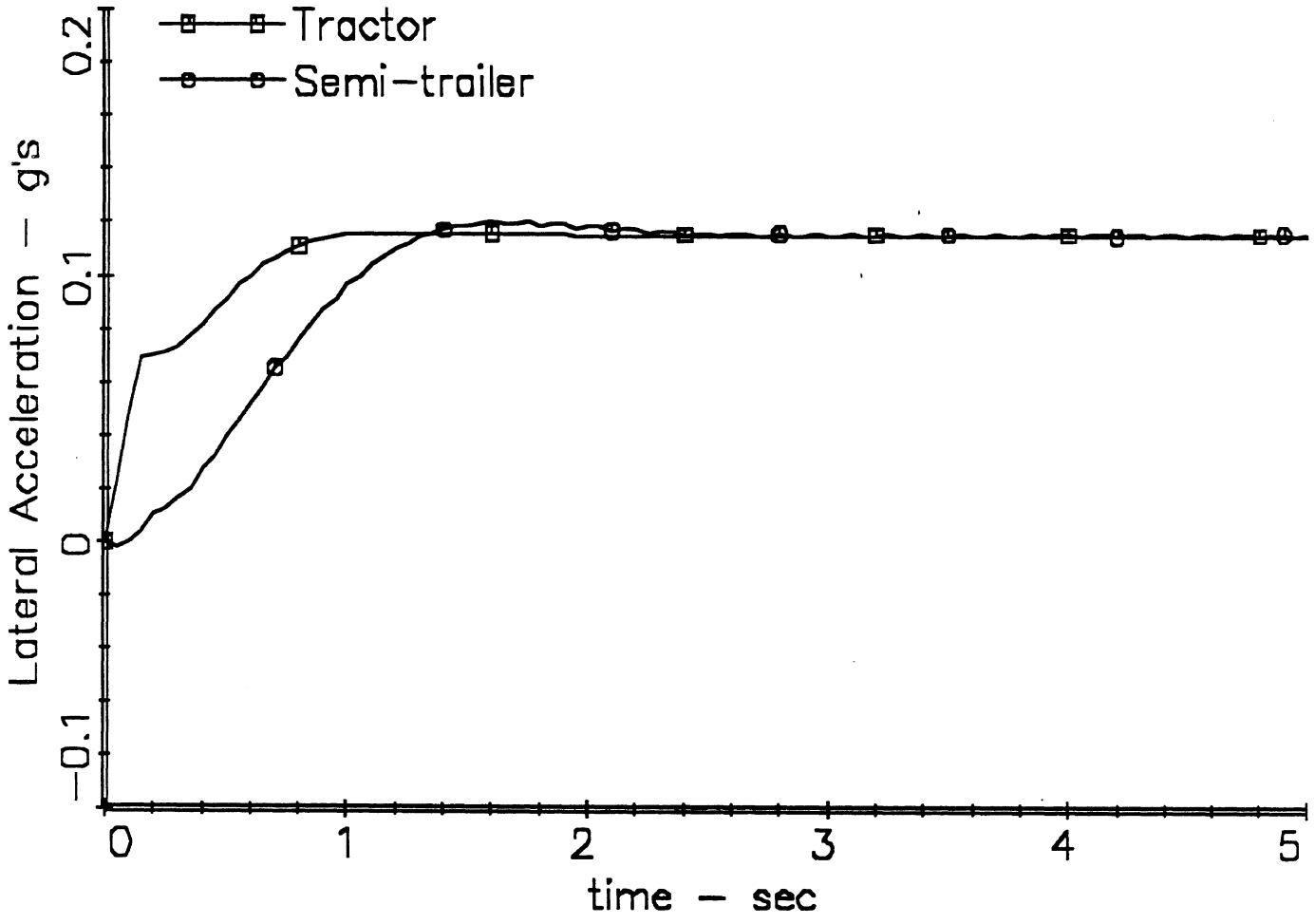
TIME SEC	STEERING WHEEL DEGREES
0.0	0.0
0.05	10.00
0.10	20.00
0.14	28.00
10.00	28.00



File Name=In.VolvoEmpt

File Name=In.VolvoEmpt

AXLE # 5
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TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
4.10	-0.070	-0.005	-0.72	2804.7	362.1	-28.17	1832.3	-0.72	2017.3	261.5	-20.34	1340.2	-0.015
4.20	-0.070	-0.008	-0.72	2787.4	359.8	-27.99	1344.1	-0.72	1999.8	259.2	-20.16	843.4	-0.015
4.30	-0.070	-0.003	-0.72	2814.5	363.4	-28.27	2265.4	-0.72	2027.1	262.9	-20.44	1778.8	-0.015
4.40	-0.070	-0.005	-0.72	2804.9	362.1	-28.17	1832.3	-0.72	2017.5	261.6	-20.34	1340.1	-0.015
4.50	-0.070	-0.008	-0.72	2787.3	359.8	-27.99	1344.0	-0.72	1999.9	259.2	-20.16	843.3	-0.015
4.60	-0.070	-0.003	-0.72	2814.4	363.4	-28.26	2265.3	-0.72	2027.0	262.8	-20.44	1778.7	-0.015
4.70	-0.070	-0.005	-0.72	2805.3	362.2	-28.17	1832.3	-0.72	2017.9	261.6	-20.35	1340.3	-0.015
4.80	-0.070	-0.008	-0.72	2786.6	359.7	-27.98	1343.5	-0.72	1999.3	259.1	-20.16	842.8	-0.015
4.90	-0.070	-0.003	-0.72	2814.9	363.4	-28.27	2265.6	-0.72	2027.5	262.9	-20.45	1779.0	-0.015
5.00	-0.070	-0.005	-0.72	2804.9	362.1	-28.16	1832.4	-0.72	2017.6	261.6	-20.34	1340.5	-0.015

File Name=In.VolvoEmpt

AXLE # 4
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TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
4.10	-0.061	-0.004	-0.54	2752.1	267.7	-20.82	1847.4	-0.54	2070.9	202.3	-15.74	1324.1	-0.014
4.20	-0.061	-0.007	-0.54	2735.0	266.0	-20.69	1359.7	-0.54	2053.6	200.6	-15.60	827.9	-0.014
4.30	-0.061	-0.002	-0.54	2762.2	268.7	-20.90	2281.6	-0.54	2081.0	203.3	-15.81	1763.9	-0.014
4.40	-0.061	-0.004	-0.54	2752.5	267.8	-20.83	1847.3	-0.54	2071.2	202.3	-15.74	1324.0	-0.014
4.50	-0.061	-0.007	-0.54	2734.9	266.0	-20.69	1359.6	-0.54	2053.5	200.6	-15.60	828.0	-0.014
4.60	-0.061	-0.002	-0.54	2762.1	268.7	-20.90	2281.5	-0.54	2080.9	203.3	-15.81	1763.8	-0.014
4.70	-0.061	-0.004	-0.54	2752.8	267.8	-20.83	1847.5	-0.54	2071.5	202.4	-15.74	1324.2	-0.014
4.80	-0.061	-0.007	-0.54	2734.5	266.0	-20.69	1359.4	-0.54	2053.2	200.5	-15.60	827.8	-0.014
4.90	-0.061	-0.002	-0.54	2762.6	268.8	-20.90	2281.8	-0.54	2081.3	203.3	-15.81	1764.1	-0.014
5.00	-0.061	-0.004	-0.54	2752.6	267.8	-20.83	1847.5	-0.54	2071.4	202.3	-15.74	1324.3	-0.014

File Name=In.VolvoEmpt

AXLE # 3
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TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
4.10	-0.077	-0.001	-0.70	3283.7	412.0	-32.04	1849.5	-0.70	2417.0	304.5	-23.68	1335.4	-0.009
4.20	-0.077	-0.001	-0.70	3285.0	412.1	-32.05	1898.9	-0.70	2418.2	304.7	-23.70	1384.5	-0.009
4.30	-0.077	-0.001	-0.70	3283.2	411.9	-32.04	1823.7	-0.70	2416.4	304.4	-23.68	1309.7	-0.009
4.40	-0.077	-0.001	-0.70	3283.8	412.0	-32.04	1849.6	-0.70	2417.0	304.5	-23.68	1335.4	-0.009
4.50	-0.077	-0.001	-0.70	3285.0	412.1	-32.05	1898.9	-0.70	2418.2	304.7	-23.70	1384.5	-0.009
4.60	-0.077	-0.001	-0.70	3283.3	411.9	-32.04	1823.6	-0.70	2416.5	304.4	-23.68	1309.7	-0.009
4.70	-0.077	-0.001	-0.70	3283.6	412.0	-32.04	1849.5	-0.70	2416.9	304.5	-23.68	1335.4	-0.009
4.80	-0.077	-0.001	-0.70	3285.0	412.1	-32.06	1898.9	-0.70	2418.3	304.7	-23.70	1384.5	-0.009
4.90	-0.077	-0.001	-0.70	3283.1	411.9	-32.04	1823.6	-0.70	2416.4	304.4	-23.68	1309.6	-0.009
5.00	-0.077	-0.001	-0.70	3283.6	412.0	-32.04	1849.5	-0.70	2416.9	304.5	-23.68	1335.5	-0.009

File Name=In.VolvoEmpt

AXLE # 2

TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
4.10	-0.065	-0.000	-0.54	3214.5	309.7	-24.08	1774.4	-0.54	2484.7	240.3	-18.69	1208.3	0.006
4.20	-0.065	-0.000	-0.54	3215.6	309.8	-24.09	1825.4	-0.54	2485.9	240.5	-18.70	1259.1	0.006
4.30	-0.065	-0.000	-0.54	3214.0	309.6	-24.08	1748.4	-0.54	2484.3	240.3	-18.69	1182.4	0.006
4.40	-0.065	-0.000	-0.54	3214.4	309.7	-24.08	1774.5	-0.54	2484.7	240.3	-18.69	1208.4	0.006
4.50	-0.065	-0.000	-0.54	3215.5	309.8	-24.09	1825.4	-0.54	2485.8	240.5	-18.70	1259.1	0.006
4.60	-0.065	-0.000	-0.54	3214.0	309.6	-24.08	1748.4	-0.54	2484.3	240.3	-18.69	1182.4	0.006
4.70	-0.065	-0.000	-0.54	3214.4	309.7	-24.08	1774.5	-0.54	2484.7	240.3	-18.69	1208.4	0.006
4.80	-0.065	-0.000	-0.54	3215.7	309.8	-24.09	1825.4	-0.54	2486.0	240.5	-18.70	1259.1	0.006
4.90	-0.065	-0.000	-0.54	3213.9	309.6	-24.08	1748.4	-0.54	2484.2	240.3	-18.69	1182.4	0.006
5.00	-0.065	-0.000	-0.54	3214.4	309.7	-24.08	1774.4	-0.54	2484.7	240.3	-18.69	1208.4	0.006

File Name=In.VolvoEmpt

AXLE # 1
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TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
4.10	-0.116	0.001	-0.88	5989.4	734.5	-129.66	4905.6	-0.82	5274.2	620.4	-103.36	4854.6	
4.20	-0.116	0.001	-0.88	5989.5	734.5	-129.66	4908.8	-0.82	5274.3	620.4	-103.36	4857.8	
4.30	-0.116	0.001	-0.88	5989.4	734.5	-129.66	4904.0	-0.82	5274.2	620.4	-103.36	4853.1	
4.40	-0.116	0.001	-0.88	5989.5	734.5	-129.66	4905.6	-0.82	5274.2	620.4	-103.36	4854.6	
4.50	-0.116	0.001	-0.88	5989.5	734.5	-129.66	4908.8	-0.82	5274.3	620.4	-103.36	4857.8	
4.60	-0.116	0.001	-0.88	5989.4	734.5	-129.66	4904.0	-0.82	5274.2	620.4	-103.36	4853.1	
4.70	-0.116	0.001	-0.88	5989.5	734.5	-129.66	4905.5	-0.82	5274.2	620.4	-103.36	4854.5	
4.80	-0.116	0.001	-0.88	5989.6	734.5	-129.66	4908.8	-0.82	5274.3	620.4	-103.37	4857.8	
4.90	-0.116	0.001	-0.88	5989.4	734.5	-129.66	4904.1	-0.82	5274.2	620.4	-103.36	4853.1	
5.00	-0.116	0.001	-0.88	5989.4	734.5	-129.66	4905.5	-0.82	5274.2	620.4	-103.36	4854.6	

File Name=In.VolvoEmpt

CONSTRAINT FORCES

NOTE: LATERAL FORCE ALONE IS PRINTED FOR PINTLE HOOK TYPE CONSTRAINT.
LOCATE FORCES & MOMENTS BASED ON CONSTRAINT TYPE

TIME	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
4.10	-364.8	2939.4	9822.4	0.0						
4.20	-365.6	2962.2	9833.5	0.0						
4.30	-364.3	2948.9	9814.0	0.0						
4.40	-364.8	2939.5	9820.5	0.0						
4.50	-365.6	2962.2	9832.7	0.0						
4.60	-364.3	2948.9	9814.2	0.0						
4.70	-364.8	2939.4	9816.0	0.0						
4.80	-365.6	2962.1	9837.5	0.0						
4.90	-364.3	2948.8	9812.5	0.0						
5.00	-364.8	2939.5	9817.3	0.0						

File Name=In.VolvoEmpt

SPRUNG MASS # 2
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TIME (SEC)	FORWARD POSITION (IN)	LATERAL POSITION (IN)	VERTICAL POSITION (IN)	ROLL ANGLE (DEG)	YAW ANGLE (DEG)	PITCH ANGLE (DEG)	FORWARD VEL IN/SEC	LATERAL VEL IN/SEC	ROLL RATE DEG/SEC	YAW RATE DEG/SEC	PITCH RATE DEG/SEC	LATERAL ACCN. IN/SEC**2	ARTIC ANGLE DEG
4.10	3249.44	266.77	0.004	-0.20	10.28	0.001	880.09	-4.12	0.00	2.89	-0.01	44.48	1.11
4.20	3336.06	282.30	0.004	-0.20	10.57	0.001	880.09	-4.12	-0.00	2.89	-0.07	44.25	1.11
4.30	3422.59	298.26	0.003	-0.20	10.86	0.000	880.09	-4.12	0.00	2.89	0.05	44.65	1.11
4.40	3509.05	314.65	0.004	-0.20	11.15	0.001	880.09	-4.12	0.00	2.89	-0.01	44.48	1.11
4.50	3595.42	331.49	0.004	-0.20	11.44	0.001	880.09	-4.12	-0.00	2.89	-0.07	44.25	1.11
4.60	3681.70	348.76	0.003	-0.20	11.73	0.000	880.09	-4.12	0.00	2.89	0.05	44.65	1.11
4.70	3767.89	366.46	0.004	-0.20	12.01	0.001	880.09	-4.12	0.00	2.89	-0.01	44.49	1.11
4.80	3854.00	384.60	0.004	-0.20	12.30	0.001	880.09	-4.12	-0.00	2.89	-0.07	44.24	1.11
4.90	3940.01	403.17	0.003	-0.20	12.59	0.000	880.09	-4.12	0.00	2.89	0.05	44.65	1.11
5.00	4025.93	422.18	0.004	-0.20	12.88	0.001	880.09	-4.12	0.00	2.89	-0.01	44.48	1.11

File Name=In.VolvoEmpt

SPRUNG MASS # 1
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TIME (SEC)	FORWARD POSITION (IN)	LATERAL POSITION (IN)	VERTICAL POSITION (IN)	ROLL ANGLE (DEG)	YAW ANGLE (DEG)	PITCH ANGLE (DEG)	FORWARD VEL IN/SEC	LATERAL VEL IN/SEC	ROLL RATE DEG/SEC	YAW RATE DEG/SEC	PITCH RATE DEG/SEC	LATERAL ACCN IN/SEC**2	STEER ANGLE DEG
4.10	3586.54	330.04	-0.001	-0.21	11.39	0.001	880.08	-3.79	-0.00	2.89	-0.01	44.44	28.00
4.20	3672.83	347.26	-0.001	-0.21	11.68	0.001	880.08	-3.79	-0.00	2.89	0.01	44.45	28.00
4.30	3759.04	364.92	-0.001	-0.21	11.96	0.001	880.08	-3.79	0.00	2.89	-0.02	44.45	28.00
4.40	3845.15	383.02	-0.001	-0.21	12.25	0.001	880.08	-3.79	-0.00	2.89	-0.01	44.44	28.00
4.50	3931.17	401.54	-0.001	-0.21	12.54	0.001	880.08	-3.79	-0.00	2.89	0.01	44.44	28.00
4.60	4017.10	420.50	-0.001	-0.21	12.83	0.001	880.08	-3.79	0.00	2.89	-0.02	44.45	28.00
4.70	4102.93	439.90	-0.001	-0.21	13.12	0.001	880.08	-3.79	-0.00	2.89	-0.01	44.44	28.00
4.80	4188.66	459.72	-0.001	-0.21	13.41	0.001	880.08	-3.79	0.00	2.89	0.01	44.45	28.00
4.90	4274.29	479.98	-0.001	-0.21	13.70	0.001	880.08	-3.79	-0.00	2.89	-0.02	44.45	28.00
5.00	4359.82	500.67	-0.001	-0.21	13.99	0.001	880.08	-3.79	0.00	2.89	-0.01	44.44	28.00

File Name=In.VolvoEmpt

AXLE # 5
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TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
0.0	0.0	0.0	0.0	2409.0	0.0	0.0	1509.0	0.0	2409.0	0.0	0.0	1509.0	0.0
0.10	-0.007	-0.000	0.01	2450.5	-4.6	0.36	1588.9	0.01	2367.6	-4.4	0.35	1428.7	-0.001
0.20	-0.020	-0.000	-0.00	2519.7	1.7	-0.13	1677.6	-0.00	2298.6	1.6	-0.12	1342.4	-0.006
0.30	-0.018	0.001	-0.03	2508.9	12.6	-0.98	1671.5	-0.03	2308.5	11.6	-0.90	1402.0	-0.007
0.40	-0.022	0.003	-0.07	2543.0	30.8	-2.40	1994.9	-0.07	2292.3	27.8	-2.16	1693.2	-0.008
0.50	-0.029	-0.005	-0.13	2586.2	59.6	-4.63	1764.9	-0.13	2267.1	52.3	-4.07	1406.3	-0.009
0.60	-0.035	-0.010	-0.21	2570.7	95.4	-7.42	1284.7	-0.21	2176.8	80.9	-6.29	875.8	-0.010
0.70	-0.042	-0.005	-0.29	2678.0	142.0	-11.05	2246.2	-0.30	2205.0	117.3	-9.12	1824.6	-0.011
0.80	-0.049	-0.006	-0.39	2673.3	186.3	-14.49	1812.3	-0.39	2128.9	148.9	-11.58	1364.8	-0.012
0.90	-0.055	-0.010	-0.48	2704.3	231.4	-18.00	1332.9	-0.48	2088.4	179.4	-13.95	856.5	-0.013
1.00	-0.060	-0.004	-0.56	2761.8	275.9	-21.46	2260.7	-0.56	2089.3	209.6	-16.30	1791.5	-0.013
1.10	-0.064	-0.006	-0.62	2765.1	309.2	-24.05	1830.0	-0.62	2044.6	229.7	-17.86	1344.0	-0.014
1.20	-0.068	-0.009	-0.67	2779.4	336.8	-26.20	1347.0	-0.68	2020.2	245.9	-19.13	848.5	-0.014
1.30	-0.070	-0.003	-0.71	2809.2	359.8	-27.98	2264.5	-0.71	2025.7	260.6	-20.27	1776.2	-0.014
1.40	-0.072	-0.005	-0.74	2813.5	373.0	-29.01	1835.5	-0.74	2010.7	267.8	-20.83	1338.7	-0.015
1.50	-0.073	-0.008	-0.75	2800.7	378.6	-29.45	1347.0	-0.75	1988.8	270.1	-21.00	842.1	-0.015
1.60	-0.073	-0.003	-0.76	2826.9	385.4	-29.98	2267.2	-0.76	2010.8	275.4	-21.42	1774.5	-0.015
1.70	-0.073	-0.005	-0.76	2821.7	384.9	-29.93	1835.6	-0.76	2004.9	274.7	-21.36	1338.6	-0.015
1.80	-0.073	-0.008	-0.75	2798.9	379.9	-29.55	1345.4	-0.76	1985.4	270.7	-21.05	840.2	-0.015
1.90	-0.072	-0.003	-0.75	2826.7	380.9	-29.63	2267.9	-0.75	2016.5	272.9	-21.23	1777.2	-0.015
2.00	-0.072	-0.005	-0.74	2814.2	376.0	-29.24	1834.0	-0.75	2009.0	269.5	-20.96	1339.1	-0.015
2.10	-0.072	-0.008	-0.74	2793.1	369.9	-28.77	1344.7	-0.74	1992.3	265.0	-20.61	841.4	-0.015
2.20	-0.071	-0.003	-0.73	2820.3	370.7	-28.83	2267.0	-0.73	2023.5	267.1	-20.77	1778.8	-0.015
2.30	-0.071	-0.005	-0.73	2807.4	366.5	-28.51	1832.9	-0.73	2014.2	264.1	-20.54	1339.7	-0.015
2.40	-0.071	-0.008	-0.72	2789.1	362.2	-28.17	1344.6	-0.72	1998.3	260.6	-20.27	843.1	-0.015
2.50	-0.070	-0.003	-0.72	2815.4	364.3	-28.34	2265.8	-0.72	2026.9	263.4	-20.49	1779.1	-0.015
2.60	-0.070	-0.005	-0.72	2804.7	362.0	-28.15	1832.2	-0.72	2017.4	261.4	-20.33	1340.0	-0.015
2.70	-0.070	-0.008	-0.72	2787.1	359.1	-27.93	1344.1	-0.72	2000.5	258.8	-20.13	843.5	-0.015
2.80	-0.070	-0.003	-0.72	2813.8	362.3	-28.18	2265.4	-0.72	2027.9	262.2	-20.39	1779.0	-0.015
2.90	-0.070	-0.005	-0.72	2804.3	361.0	-28.07	1832.3	-0.72	2018.4	260.9	-20.29	1340.4	-0.015
3.00	-0.070	-0.008	-0.72	2786.4	358.6	-27.89	1343.8	-0.72	2000.5	258.5	-20.11	843.4	-0.015
3.10	-0.070	-0.003	-0.72	2814.0	362.4	-28.19	2265.4	-0.72	2028.0	262.3	-20.40	1779.0	-0.015
3.20	-0.070	-0.005	-0.72	2804.7	361.3	-28.10	1832.3	-0.72	2018.4	261.1	-20.31	1340.5	-0.015
3.30	-0.070	-0.008	-0.72	2786.4	359.1	-27.93	1343.5	-0.72	1999.9	258.8	-20.13	842.9	-0.015
3.40	-0.070	-0.003	-0.72	2814.6	363.0	-28.23	2265.6	-0.72	2027.8	262.6	-20.42	1779.1	-0.015
3.50	-0.070	-0.005	-0.72	2804.8	361.8	-28.14	1832.5	-0.72	2017.9	261.4	-20.33	1340.5	-0.015
3.60	-0.070	-0.008	-0.72	2786.7	359.5	-27.96	1343.7	-0.72	1999.6	259.0	-20.15	842.9	-0.015
3.70	-0.070	-0.003	-0.72	2814.9	363.3	-28.26	2265.7	-0.72	2027.7	262.8	-20.44	1779.2	-0.015
3.80	-0.070	-0.005	-0.72	2804.7	362.0	-28.16	1832.4	-0.72	2017.5	261.5	-20.34	1340.3	-0.015
3.90	-0.070	-0.008	-0.72	2787.2	359.8	-27.98	1343.9	-0.72	1999.7	259.2	-20.16	843.2	-0.015
4.00	-0.070	-0.003	-0.72	2814.9	363.5	-28.27	2265.5	-0.72	2027.5	262.9	-20.45	1779.0	-0.015

File Name=In.VolvoEmpt

AXLE # 4
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TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
0.0	0.0	0.0	0.0	2409.0	0.0	0.0	1509.0	0.0	2409.0	0.0	0.0	1509.0	0.0
0.10	-0.008	-0.000	0.01	2451.4	-5.2	0.40	1592.0	0.01	2366.9	-5.0	0.39	1425.7	-0.001
0.20	-0.020	-0.000	0.00	2519.6	-1.3	0.10	1683.4	0.00	2298.6	-1.2	0.09	1336.4	-0.005
0.30	-0.017	0.001	-0.01	2504.0	4.3	-0.34	1676.6	-0.01	2315.1	4.0	-0.31	1398.6	-0.007
0.40	-0.020	0.003	-0.03	2532.7	13.9	-1.08	2004.3	-0.03	2304.7	12.6	-0.98	1688.7	-0.007
0.50	-0.025	-0.005	-0.07	2562.4	30.9	-2.40	1769.3	-0.07	2281.6	27.5	-2.14	1391.7	-0.009
0.60	-0.030	-0.009	-0.12	2544.5	54.2	-4.22	1295.6	-0.12	2201.8	47.1	-3.66	864.6	-0.010
0.70	-0.036	-0.005	-0.18	2637.9	85.9	-6.68	2256.3	-0.18	2236.1	73.0	-5.68	1806.8	-0.011
0.80	-0.041	-0.006	-0.25	2631.2	118.2	-9.20	1825.8	-0.25	2170.7	97.9	-7.61	1348.0	-0.012
0.90	-0.046	-0.009	-0.32	2655.3	152.1	-11.83	1347.6	-0.32	2136.0	122.8	-9.55	839.5	-0.013
1.00	-0.051	-0.003	-0.38	2708.2	186.6	-14.52	2276.6	-0.38	2140.2	148.1	-11.52	1772.6	-0.013
1.10	-0.055	-0.005	-0.44	2711.0	214.1	-16.65	1846.4	-0.44	2100.7	166.6	-12.96	1326.7	-0.014
1.20	-0.058	-0.008	-0.48	2721.3	237.3	-18.46	1363.2	-0.49	2076.4	181.9	-14.15	830.0	-0.014
1.30	-0.060	-0.002	-0.52	2752.7	257.5	-20.03	2282.3	-0.52	2084.1	195.9	-15.23	1759.6	-0.014
1.40	-0.061	-0.004	-0.54	2756.1	270.0	-21.00	1851.6	-0.55	2069.0	203.6	-15.84	1321.2	-0.014
1.50	-0.062	-0.007	-0.56	2743.7	276.5	-21.51	1363.5	-0.56	2046.3	207.2	-16.11	825.2	-0.014
1.60	-0.063	-0.002	-0.57	2771.2	283.5	-22.05	2284.2	-0.57	2068.4	212.6	-16.53	1759.0	-0.014
1.70	-0.063	-0.004	-0.57	2765.9	284.3	-22.11	1850.9	-0.57	2061.1	212.8	-16.55	1321.4	-0.014
1.80	-0.063	-0.007	-0.57	2744.5	281.6	-21.90	1361.4	-0.57	2041.2	210.4	-16.36	824.5	-0.014
1.90	-0.063	-0.002	-0.57	2772.6	282.9	-22.00	2284.0	-0.57	2071.6	212.3	-16.51	1761.9	-0.014
2.00	-0.062	-0.004	-0.56	2760.7	279.4	-21.73	1849.1	-0.56	2063.5	209.7	-16.31	1322.8	-0.014
2.10	-0.062	-0.007	-0.56	2740.2	274.8	-21.38	1360.2	-0.56	2046.5	206.1	-16.03	826.0	-0.014
2.20	-0.062	-0.002	-0.55	2767.5	275.3	-21.42	2282.7	-0.56	2077.2	207.5	-16.14	1763.6	-0.014
2.30	-0.061	-0.004	-0.55	2754.8	272.1	-21.16	1847.7	-0.55	2067.7	205.1	-15.95	1323.6	-0.014
2.40	-0.061	-0.007	-0.55	2736.7	268.6	-20.89	1359.8	-0.55	2051.7	202.2	-15.73	827.6	-0.014
2.50	-0.061	-0.002	-0.54	2763.0	270.0	-21.00	2281.5	-0.55	2080.1	204.1	-15.88	1763.9	-0.014
2.60	-0.061	-0.004	-0.54	2752.3	268.0	-20.85	1847.1	-0.54	2070.7	202.5	-15.75	1323.9	-0.014
2.70	-0.061	-0.007	-0.54	2734.7	265.7	-20.67	1359.5	-0.54	2053.9	200.4	-15.59	828.2	-0.014
2.80	-0.061	-0.002	-0.54	2761.4	268.0	-20.85	2281.2	-0.54	2081.2	202.9	-15.78	1763.9	-0.014
2.90	-0.061	-0.004	-0.54	2751.8	266.9	-20.76	1847.0	-0.54	2071.8	201.8	-15.69	1324.1	-0.014
3.00	-0.061	-0.007	-0.54	2734.0	265.1	-20.62	1359.4	-0.54	2053.9	200.0	-15.56	828.1	-0.014
3.10	-0.061	-0.002	-0.54	2761.5	267.9	-20.84	2281.4	-0.54	2081.5	202.8	-15.77	1764.0	-0.014
3.20	-0.061	-0.004	-0.54	2752.1	267.1	-20.77	1847.3	-0.54	2071.9	201.9	-15.70	1324.4	-0.014
3.30	-0.061	-0.007	-0.54	2734.0	265.4	-20.64	1359.2	-0.54	2053.5	200.2	-15.57	827.7	-0.014
3.40	-0.061	-0.002	-0.54	2762.2	268.3	-20.87	2281.7	-0.54	2081.6	203.0	-15.79	1764.2	-0.014
3.50	-0.061	-0.004	-0.54	2752.2	267.4	-20.80	1847.4	-0.54	2071.4	202.1	-15.72	1324.3	-0.014
3.60	-0.061	-0.007	-0.54	2734.2	265.7	-20.67	1359.2	-0.54	2053.3	200.4	-15.59	827.5	-0.014
3.70	-0.061	-0.002	-0.54	2762.4	268.6	-20.89	2281.7	-0.54	2081.4	203.2	-15.81	1764.1	-0.014
3.80	-0.061	-0.004	-0.54	2752.2	267.7	-20.82	1847.4	-0.54	2071.1	202.3	-15.73	1324.2	-0.014
3.90	-0.061	-0.007	-0.54	2734.8	266.0	-20.69	1359.5	-0.54	2053.5	200.5	-15.60	827.8	-0.014
4.00	-0.061	-0.002	-0.54	2762.4	268.7	-20.90	2281.7	-0.54	2081.2	203.3	-15.81	1764.2	-0.014

File Name=In.VolvoEmpt

AXLE # 3
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TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
0.0	0.0	0.0	0.0	2850.3	0.0	0.0	1600.2	0.0	2850.3	0.0	0.0	1600.2	0.0
0.10	-0.010	-0.000	-0.02	2908.6	8.3	-0.65	1689.2	-0.02	2792.0	8.0	-0.62	1511.5	-0.001
0.20	-0.026	-0.000	-0.12	2995.5	64.9	-5.05	1754.4	-0.12	2705.2	58.7	-4.57	1446.2	-0.004
0.30	-0.032	-0.000	-0.26	3029.0	142.8	-11.10	1717.8	-0.26	2672.6	126.4	-9.83	1480.1	-0.004
0.40	-0.043	-0.000	-0.40	3090.7	223.0	-17.35	1713.4	-0.40	2609.3	189.1	-14.70	1450.6	-0.005
0.50	-0.053	-0.000	-0.52	3147.7	292.8	-22.77	1744.1	-0.52	2552.4	238.4	-18.55	1441.8	-0.005
0.60	-0.061	0.0	-0.60	3196.4	346.2	-26.93	1813.8	-0.60	2509.9	273.1	-21.24	1470.8	-0.006
0.70	-0.067	-0.000	-0.66	3226.1	382.0	-29.71	1757.7	-0.66	2472.5	294.1	-22.88	1375.2	-0.006
0.80	-0.071	-0.001	-0.69	3250.7	404.3	-31.44	1801.2	-0.69	2449.2	306.0	-23.80	1382.4	-0.007
0.90	-0.074	-0.000	-0.71	3270.4	416.4	-32.39	1867.4	-0.71	2436.5	311.6	-24.24	1417.8	-0.008
1.00	-0.075	-0.001	-0.71	3273.2	420.3	-32.69	1802.1	-0.72	2421.2	312.2	-24.28	1328.6	-0.008
1.10	-0.077	-0.001	-0.71	3285.9	421.9	-32.82	1839.9	-0.72	2420.0	312.1	-24.27	1347.3	-0.009
1.20	-0.077	-0.000	-0.71	3285.0	420.1	-32.68	1894.0	-0.71	2414.0	310.0	-24.11	1387.3	-0.009
1.30	-0.077	-0.001	-0.71	3288.4	418.5	-32.55	1825.1	-0.71	2413.4	308.5	-23.99	1309.8	-0.009
1.40	-0.077	-0.001	-0.70	3288.3	416.6	-32.40	1853.1	-0.71	2412.1	306.9	-23.87	1331.5	-0.010
1.50	-0.077	-0.001	-0.70	3289.3	415.2	-32.30	1903.9	-0.70	2413.3	305.9	-23.80	1379.4	-0.010
1.60	-0.077	-0.001	-0.70	3288.3	414.1	-32.21	1829.6	-0.70	2412.5	305.1	-23.73	1304.4	-0.010
1.70	-0.077	-0.001	-0.70	3287.0	413.3	-32.14	1854.7	-0.70	2412.5	304.6	-23.69	1329.6	-0.010
1.80	-0.077	-0.001	-0.70	3288.9	413.2	-32.13	1904.0	-0.70	2415.3	304.7	-23.70	1380.1	-0.010
1.90	-0.077	-0.001	-0.70	3285.7	412.6	-32.09	1827.6	-0.70	2413.4	304.3	-23.67	1305.4	-0.010
2.00	-0.077	-0.001	-0.70	3285.9	412.5	-32.08	1852.7	-0.70	2414.9	304.4	-23.68	1332.3	-0.010
2.10	-0.077	-0.001	-0.70	3286.6	412.5	-32.09	1901.3	-0.70	2416.5	304.6	-23.69	1382.1	-0.010
2.20	-0.077	-0.001	-0.70	3284.3	412.2	-32.06	1825.3	-0.70	2415.3	304.4	-23.68	1308.1	-0.010
2.30	-0.077	-0.001	-0.70	3284.4	412.2	-32.06	1850.5	-0.70	2416.2	304.5	-23.68	1334.5	-0.010
2.40	-0.077	-0.001	-0.70	3285.4	412.3	-32.07	1899.5	-0.70	2417.7	304.7	-23.70	1384.0	-0.010
2.50	-0.077	-0.001	-0.70	3283.4	412.0	-32.04	1823.8	-0.70	2416.3	304.5	-23.68	1309.5	-0.010
2.60	-0.077	-0.001	-0.70	3283.8	412.0	-32.04	1849.5	-0.70	2417.0	304.5	-23.68	1335.5	-0.009
2.70	-0.077	-0.001	-0.70	3284.9	412.1	-32.05	1898.7	-0.70	2418.4	304.7	-23.70	1384.7	-0.009
2.80	-0.077	-0.001	-0.70	3283.0	411.8	-32.03	1823.4	-0.70	2416.6	304.4	-23.68	1309.9	-0.009
2.90	-0.077	-0.001	-0.70	3283.5	411.9	-32.04	1849.2	-0.70	2417.1	304.5	-23.68	1335.7	-0.009
3.00	-0.077	-0.001	-0.70	3284.7	412.1	-32.05	1898.6	-0.70	2418.4	304.6	-23.69	1384.8	-0.009
3.10	-0.077	-0.001	-0.70	3283.0	411.8	-32.03	1823.4	-0.70	2416.5	304.4	-23.68	1309.9	-0.009
3.20	-0.077	-0.001	-0.70	3283.6	411.9	-32.04	1849.3	-0.70	2417.2	304.5	-23.68	1335.7	-0.009
3.30	-0.077	-0.001	-0.70	3284.8	412.1	-32.05	1898.7	-0.70	2418.3	304.6	-23.69	1384.6	-0.009
3.40	-0.077	-0.001	-0.70	3283.1	411.9	-32.03	1823.6	-0.70	2416.5	304.4	-23.68	1309.8	-0.009
3.50	-0.077	-0.001	-0.70	3283.5	411.9	-32.04	1849.4	-0.70	2416.9	304.5	-23.68	1335.5	-0.009
3.60	-0.077	-0.001	-0.70	3285.1	412.1	-32.05	1898.9	-0.70	2418.3	304.7	-23.70	1384.6	-0.009
3.70	-0.077	-0.001	-0.70	3283.0	411.9	-32.03	1823.6	-0.70	2416.3	304.4	-23.68	1309.7	-0.009
3.80	-0.077	-0.001	-0.70	3283.8	412.0	-32.04	1849.5	-0.70	2417.1	304.5	-23.68	1335.5	-0.009
3.90	-0.077	-0.001	-0.70	3285.0	412.1	-32.05	1898.9	-0.70	2418.2	304.7	-23.70	1384.5	-0.009
4.00	-0.077	-0.001	-0.70	3283.2	411.9	-32.04	1823.6	-0.70	2416.4	304.4	-23.68	1309.7	-0.009

File Name=In.VolvoEmpt

AXLE # 2

TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
0.0	0.0	0.0	0.0	2850.3	0.0	0.0	1500.2	0.0	2850.3	0.0	0.0	1500.2	0.0
0.10	-0.009	-0.000	0.01	2898.2	-5.0	0.39	1613.3	0.01	2802.1	-4.8	0.38	1386.9	0.001
0.20	-0.019	-0.000	-0.04	2959.8	19.4	-1.51	1687.0	-0.04	2740.0	18.0	-1.40	1312.5	0.003
0.30	-0.021	-0.000	-0.13	2967.6	69.1	-5.38	1642.1	-0.13	2731.7	63.8	-4.97	1353.9	0.003
0.40	-0.030	-0.000	-0.24	3019.6	129.3	-10.06	1640.7	-0.24	2678.8	115.2	-8.96	1321.7	0.003
0.50	-0.039	-0.000	-0.34	3071.8	187.2	-14.56	1672.8	-0.34	2626.3	160.8	-12.50	1310.2	0.003
0.60	-0.047	0.000	-0.42	3118.6	234.9	-18.27	1744.2	-0.42	2584.8	195.6	-15.21	1340.3	0.004
0.70	-0.053	-0.000	-0.48	3149.8	269.4	-20.96	1686.9	-0.48	2547.2	218.9	-17.02	1243.2	0.004
0.80	-0.058	-0.000	-0.51	3176.3	292.7	-22.76	1730.4	-0.51	2522.5	233.5	-18.16	1251.3	0.005
0.90	-0.061	0.000	-0.53	3197.2	306.6	-23.85	1797.6	-0.54	2507.4	241.5	-18.78	1288.3	0.005
1.00	-0.063	-0.000	-0.54	3203.2	313.0	-24.34	1730.6	-0.55	2492.0	244.5	-19.02	1199.2	0.005
1.10	-0.064	-0.000	-0.55	3215.2	316.2	-24.59	1767.0	-0.55	2488.4	245.7	-19.11	1217.6	0.005
1.20	-0.065	0.000	-0.55	3216.2	316.1	-24.58	1822.6	-0.55	2482.6	245.0	-19.06	1260.7	0.006
1.30	-0.065	-0.000	-0.54	3219.0	315.3	-24.53	1750.8	-0.55	2481.0	244.0	-18.98	1181.3	0.006
1.40	-0.065	-0.000	-0.54	3219.4	314.1	-24.43	1778.7	-0.54	2479.5	242.9	-18.89	1203.8	0.006
1.50	-0.065	-0.000	-0.54	3220.4	313.0	-24.34	1830.8	-0.54	2480.8	242.1	-18.83	1253.7	0.006
1.60	-0.065	-0.000	-0.54	3219.1	312.0	-24.27	1754.3	-0.54	2479.8	241.3	-18.77	1176.8	0.006
1.70	-0.065	-0.000	-0.54	3218.2	311.2	-24.21	1779.7	-0.54	2480.1	240.8	-18.73	1202.7	0.006
1.80	-0.065	-0.000	-0.54	3219.5	311.0	-24.19	1830.2	-0.54	2482.7	240.8	-18.73	1254.6	0.006
1.90	-0.065	-0.000	-0.54	3216.7	310.5	-24.15	1752.2	-0.54	2481.1	240.4	-18.70	1178.3	0.006
2.00	-0.065	-0.000	-0.54	3216.7	310.3	-24.13	1777.5	-0.54	2482.7	240.5	-18.70	1205.5	0.006
2.10	-0.065	-0.000	-0.54	3217.3	310.3	-24.13	1827.7	-0.54	2484.3	240.6	-18.71	1256.9	0.006
2.20	-0.065	-0.000	-0.54	3215.1	310.0	-24.11	1749.8	-0.54	2483.1	240.4	-18.70	1180.9	0.006
2.30	-0.065	-0.000	-0.54	3215.1	309.9	-24.10	1775.3	-0.54	2484.0	240.4	-18.70	1207.5	0.006
2.40	-0.065	-0.000	-0.54	3216.1	310.0	-24.11	1825.8	-0.54	2485.5	240.5	-18.71	1258.5	0.006
2.50	-0.065	-0.000	-0.54	3214.0	309.7	-24.09	1748.4	-0.54	2484.1	240.3	-18.69	1182.3	0.006
2.60	-0.065	-0.000	-0.54	3214.5	309.7	-24.09	1774.3	-0.54	2484.8	240.4	-18.70	1208.4	0.006
2.70	-0.064	-0.000	-0.54	3215.5	309.8	-24.09	1825.2	-0.54	2486.0	240.5	-18.70	1259.3	0.006
2.80	-0.064	-0.000	-0.54	3213.7	309.6	-24.08	1748.1	-0.54	2484.4	240.3	-18.69	1182.7	0.006
2.90	-0.064	-0.000	-0.54	3214.3	309.6	-24.08	1774.1	-0.54	2485.0	240.3	-18.69	1208.6	0.006
3.00	-0.064	-0.000	-0.54	3215.5	309.7	-24.09	1825.1	-0.54	2486.2	240.5	-18.70	1259.4	0.006
3.10	-0.064	-0.000	-0.54	3213.8	309.5	-24.08	1748.2	-0.54	2484.4	240.3	-18.69	1182.7	0.006
3.20	-0.064	-0.000	-0.54	3214.2	309.6	-24.08	1774.3	-0.54	2484.9	240.3	-18.69	1208.6	0.006
3.30	-0.064	-0.000	-0.54	3215.6	309.7	-24.09	1825.3	-0.54	2486.1	240.5	-18.70	1259.3	0.006
3.40	-0.065	-0.000	-0.54	3213.9	309.6	-24.08	1748.3	-0.54	2484.4	240.3	-18.69	1182.6	0.006
3.50	-0.065	-0.000	-0.54	3214.3	309.6	-24.08	1774.3	-0.54	2484.8	240.3	-18.69	1208.4	0.006
3.60	-0.065	-0.000	-0.54	3215.7	309.8	-24.09	1825.4	-0.54	2486.1	240.5	-18.70	1259.1	0.006
3.70	-0.065	-0.000	-0.54	3213.8	309.6	-24.08	1748.3	-0.54	2484.2	240.3	-18.69	1182.4	0.006
3.80	-0.065	-0.000	-0.54	3214.4	309.7	-24.08	1774.4	-0.54	2484.7	240.3	-18.69	1208.3	0.006
3.90	-0.065	-0.000	-0.54	3215.7	309.8	-24.09	1825.4	-0.54	2486.0	240.5	-18.70	1259.0	0.006
4.00	-0.065	-0.000	-0.54	3213.9	309.6	-24.08	1748.3	-0.54	2484.3	240.3	-18.69	1182.4	0.006

File Name=In.VolvoEmpt

AXLE # 1
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TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
0.0	0.0	0.0	0.0	5631.7	0.0	0.0	4881.7	0.0	5631.7	0.0	0.0	4881.7	
0.10	-0.057	0.000	-0.51	5806.5	412.7	-71.77	4864.8	-0.47	5457.4	365.8	-61.92	4898.3	
0.20	-0.087	0.000	-0.68	5899.1	558.5	-97.76	4940.6	-0.63	5364.7	482.5	-81.04	4821.8	
0.30	-0.080	0.000	-0.66	5878.1	544.7	-95.20	4889.0	-0.62	5385.1	473.2	-79.60	4872.8	
0.40	-0.084	0.001	-0.69	5891.6	566.7	-99.14	4895.1	-0.64	5371.9	490.4	-82.40	4864.9	
0.50	-0.091	0.001	-0.73	5912.6	604.4	-105.89	4900.5	-0.68	5351.1	520.0	-87.23	4860.5	
0.60	-0.098	0.001	-0.77	5933.8	643.6	-112.92	4906.4	-0.73	5330.3	550.7	-92.20	4860.8	
0.70	-0.104	0.001	-0.81	5951.8	677.0	-118.94	4904.2	-0.76	5311.9	576.4	-96.36	4853.4	
0.80	-0.108	0.001	-0.84	5966.1	702.7	-123.57	4906.9	-0.79	5297.6	595.9	-99.50	4853.4	
0.90	-0.112	0.001	-0.86	5976.6	719.4	-126.73	4911.4	-0.81	5287.1	609.0	-101.59	4855.0	
1.00	-0.114	0.001	-0.87	5983.0	729.8	-128.69	4906.7	-0.82	5280.4	617.1	-102.87	4850.4	
1.10	-0.115	0.001	-0.88	5987.7	735.5	-129.79	4908.6	-0.83	5275.8	621.4	-103.54	4851.4	
1.20	-0.116	0.001	-0.88	5990.1	737.8	-130.26	4911.6	-0.83	5273.5	623.1	-103.81	4854.7	
1.30	-0.117	0.001	-0.88	5991.3	738.5	-130.41	4906.5	-0.83	5272.3	623.6	-103.87	4850.6	
1.40	-0.117	0.001	-0.88	5991.9	738.1	-130.35	4907.8	-0.83	5271.8	623.1	-103.80	4852.3	
1.50	-0.117	0.001	-0.88	5991.8	737.4	-130.22	4910.3	-0.83	5271.9	622.6	-103.71	4856.1	
1.60	-0.117	0.001	-0.88	5991.6	736.7	-130.09	4905.3	-0.83	5271.9	621.9	-103.60	4851.8	
1.70	-0.117	0.001	-0.88	5991.3	736.0	-129.96	4906.5	-0.83	5272.3	621.4	-103.52	4853.7	
1.80	-0.117	0.001	-0.88	5991.0	735.6	-129.88	4909.3	-0.83	5272.7	621.1	-103.47	4857.3	
1.90	-0.116	0.001	-0.88	5990.6	735.2	-129.81	4904.4	-0.83	5272.9	620.8	-103.42	4852.7	
2.00	-0.116	0.001	-0.88	5990.3	735.0	-129.76	4905.6	-0.83	5273.3	620.7	-103.40	4854 5	
2.10	-0.116	0.001	-0.88	5990.2	734.9	-129.74	4908.8	-0.83	5273.6	620.6	-103.39	4857.8	
2.20	-0.116	0.001	-0.88	5989.9	734.8	-129.71	4904.0	-0.83	5273.7	620.5	-103.38	4853.2	
2.30	-0.116	0.001	-0.88	5989.8	734.7	-129.70	4905.4	-0.82	5273.9	620.5	-103.38	4854.7	
2.40	-0.116	0.001	-0.88	5989.7	734.7	-129.69	4908.6	-0.82	5274.1	620.5	-103.38	4857.9	
2.50	-0.116	0.001	-0.88	5989.5	734.6	-129.68	4903.9	-0.82	5274.1	620.4	-103.37	4853.3	
2.60	-0.116	0.001	-0.88	5989.5	734.6	-129.67	4905.4	-0.82	5274.2	620.4	-103.37	4854.7	
2.70	-0.116	0.001	-0.88	5989.5	734.5	-129.67	4908.7	-0.82	5274.3	620.4	-103.37	4857.9	
2.80	-0.116	0.001	-0.88	5989.3	734.5	-129.66	4903.9	-0.82	5274.2	620.4	-103.36	4853.2	
2.90	-0.116	0.001	-0.88	5989.4	734.5	-129.65	4905.5	-0.82	5274.3	620.4	-103.36	4854.6	
3.00	-0.116	0.001	-0.88	5989.4	734.5	-129.66	4908.7	-0.82	5274.4	620.4	-103.36	4857.9	
3.10	-0.116	0.001	-0.88	5989.3	734.5	-129.65	4904.0	-0.82	5274.2	620.3	-103.36	4853.1	
3.20	-0.116	0.001	-0.88	5989.3	734.5	-129.65	4905.5	-0.82	5274.2	620.3	-103.35	4854.6	
3.30	-0.116	0.001	-0.88	5989.5	734.5	-129.66	4908.8	-0.82	5274.3	620.4	-103.36	4857.8	
3.40	-0.116	0.001	-0.88	5989.4	734.5	-129.65	4904.1	-0.82	5274.3	620.3	-103.36	4853.1	
3.50	-0.116	0.001	-0,88	5989.4	734.5	-129.65	4905.5	-0.82	5274.2	620.3	-103.36	4854.5	
3.60	-0.116	0.001	-0.88	5989.5	734.5	-129.66	4908.8	-0.82	5274.3	620.4	-103.36	4857.8	
3.70	-0.116	0.001	-0.88	5989.4	734.5	-129.65	4904.1	-0.82	5274.2	620.4	-103.36	4853.1	
3.80	-0.116	0.001	-0.88	5989.4	734.5	-129.66	4905.6	-0.82	5274.2	620.4	-103.36	4854.6	
3.90	-0.116	0.001	-0.88	5989.5	734.5	-129.66	4908.8	-0.82	5274.3	620.4	-103.36	4857.8	
4.00	-0.116	0.001	-0.88	5989.4	734.5	-129.66	4904.1	-0.82	5274.2	620.4	-103.36	4853.1	

File Name=In.VolvoEmpt

CONSTRAINT FORCES
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NOTE: LATERAL FORCE ALONE IS PRINTED FOR PINTLE HOOK TYPE CONSTRAINT.
LOCATE FORCES & MOMENTS BASED ON CONSTRAINT TYPE

TIME	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
0.0	0.0	2944.0	0.0	0.0						
0.10	-14.8	2944.1	7985.4	0.0						
0.20	-74.3	2944.1	11156.0	0.0						
0.30	-124.7	2944.8	11209.2	0.0						
0.40	-187.8	2953.6	11997.5	0.0						
0.50	-246.0	2940.7	12835.5	0.0						
0.60	-291.9	2961.8	13409.0	0.0						
0.70	-323.0	2950.7	13275.0	0.0						
0.80	-344.8	2939.2	13008.4	0.0						
0.90	-359.2	2964.0	12444.3	0.0						
1.00	-364.6	2948.1	11660.3	0.0						
1.10	-369.1	2941.3	11128.9	0.0						
1.20	-370.7	2961.4	10458.2	0.0						
1.30	-369.7	2949.9	10044.4	0.0						
1.40	-369.6	2939.3	9718.7	0.0						
1.50	-369.6	2962.3	9499.9	0.0						
1.60	-367.7	2949.1	9424.9	0.0						
1.70	-367.4	2939.1	9362.7	0.0						
1.80	-367.7	2962.5	9431.8	0.0						
1.90	-365.9	2948.7	9458.0	0.0						
2.00	-366.0	2939.6	9528.0	0.0						
2.10	-366.5	2962.1	9630.2	0.0						
2.20	-364.9	2948.9	9657.7	0.0						
2.30	-365.2	2939.5	9730.7	0.0						
2.40	-365.8	2962.2	9787.5	0.0						
2.50	-364.4	2948.9	9794.9	0.0						
2.60	-364.8	2939.4	9827.9	0.0						
2.70	-365.5	2962.3	9850.3	0.0						
2.80	-364.2	2948.9	9838.6	0.0						
2.90	-364.7	2939.4	9845.1	0.0						
3.00	-365.4	2962.2	9860.0	0.0						
3.10	-364.2	2948.9	9836.2	0.0						
3.20	-364.7	2939.5	9834.5	0.0						
3.30	-365.5	2962.1	9852.3	0.0						
3.40	-364.2	2949.0	9823.0	0.0						
3.50	-364.7	2939.4	9825.9	0.0						
3.60	-365.6	2962.2	9843.3	0.0						
3.70	-364.3	2948.9	9812.6	0.0						
3.80	-364.8	2939.5	9821.9	0.0						
3.90	-365.6	2962.2	9836.3	0.0						
4.00	-364.3	2948.9	9811.0	0.0						

File Name=In.VolvoEmpt

SPRUNG MASS # 2
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TIME (SEC)	FORWARD POSITION (IN)	LATERAL POSITION (IN)	VERTICAL POSITION (IN)	ROLL ANGLE (DEG)	YAW ANGLE (DEG)	PITCH ANGLE (DEG)	FORWARD VEL IN/SEC	LATERAL VEL IN/SEC	ROLL RATE DEG/SEC	YAW RATE DEG/SEC	PITCH RATE DEG/SEC	LATERAL ACCN. IN/SEC**2	ARTIC ANGLE DEG
0.0	-343.00	0.0	0.0	0.0	0.0	0.0	880.08	0.0	0.0	0.0	0.0	0.0	0.0
0.10	-254.99	-0.00	0.000	-0.02	0.00	0.000	880.08	-0.07	-0.51	0.02	-0.00	-0.20	0.02
0.20	-166.98	0.00	0.000	-0.07	0.01	-0.000	880.08	-0.01	-0.41	0.12	-0.00	4.07	0.11
0.30	-78.98	0.04	-0.001	-0.08	0.03	-0.000	880.03	0.16	-0.10	0.31	0.00	6.32	0.28
0.40	9.03	0.14	-0.001	-0.10	0.07	-0.000	880.09	0.27	-0.17	0.62	0.04	10.50	0.49
0.50	97.04	0.34	0.004	-0.11	0.15	0.001	880.09	0.29	-0.18	1.01	0.02	15.23	0.71
0.60	185.05	0.70	0.004	-0.13	0.28	0.001	880.09	0.15	-0.17	1.44	-0.07	19.95	0.89
0.70	273.06	1.25	0.006	-0.14	0.44	0.001	880.09	-0.17	-0.16	1.87	0.05	25.10	1.04
0.80	361.06	2.05	0.004	-0.16	0.65	0.001	880.08	-0.64	-0.13	2.26	0.01	29.43	1.15
0.90	449.06	3.14	0.006	-0.17	0.89	0.001	880.08	-1.22	-0.12	2.58	-0.08	33.52	1.22
1.00	537.06	4.57	0.004	-0.18	1.16	0.001	880.08	-1.84	-0.09	2.82	0.06	37.38	1.25
1.10	625.03	6.37	0.004	-0.19	1.45	0.001	880.08	-2.44	-0.07	2.99	-0.01	40.11	1.26
1.20	713.00	8.57	0.005	-0.20	1.76	0.001	880.08	-2.98	-0.05	3.09	-0.07	42.29	1.24
1.30	800.95	11.19	0.003	-0.20	2.07	0.001	880.08	-3.45	-0.03	3.14	0.05	44.23	1.22
1.40	888.89	14.25	0.004	-0.20	2.38	0.001	880.08	-3.81	-0.02	3.14	-0.01	45.24	1.20
1.50	976.82	17.76	0.004	-0.21	2.70	0.001	880.09	-4.07	-0.01	3.13	-0.07	45.65	1.18
1.60	1064.72	21.73	0.003	-0.21	3.01	0.000	880.09	-4.25	-0.00	3.09	0.05	46.33	1.15
1.70	1152.61	26.16	0.003	-0.21	3.32	0.001	880.09	-4.35	0.00	3.05	-0.01	46.25	1.14
1.80	1240.47	31.05	0.004	-0.21	3.62	0.001	880.09	-4.39	0.00	3.01	-0.07	45.84	1.12
1.90	1328.30	36.40	0.003	-0.21	3.92	0.001	880.09	-4.40	0.01	2.98	0.05	46.05	1.11
2.00	1416.10	42.21	0.003	-0.21	4.21	0.001	880.09	-4.37	0.01	2.95	-0.01	45.61	1.10
2.10	1503.87	48.47	0.004	-0.20	4.51	0.001	880.10	-4.33	0.00	2.92	-0.07	45.08	1.10
2.20	1591.61	55.19	0.003	-0.20	4.80	0.001	880.10	-4.29	0.01	2.90	0.05	45.26	1.10
2.30	1679.32	62.35	0.003	-0.20	5.09	0.001	880.10	-4.24	0.00	2.89	-0.01	44.86	1.10
2.40	1766.98	69.96	0.004	-0.20	5.38	0.001	880.10	-4.20	0.00	2.88	-0.07	44.47	1.10
2.50	1854.61	78.01	0.003	-0.20	5.66	0.001	880.10	-4.17	0.01	2.88	0.05	44.74	1.10
2.60	1942.19	86.51	0.003	-0.20	5.95	0.001	880.10	-4.15	0.00	2.88	-0.01	44.48	1.10
2.70	2029.73	95.45	0.004	-0.20	6.24	0.001	880.09	-4.13	-0.00	2.88	-0.07	44.20	1.10
2.80	2117.23	104.83	0.003	-0.20	6.53	0.000	880.09	-4.12	0.00	2.88	0.05	44.56	1.10
2.90	2204.67	114.65	0.003	-0.20	6.82	0.001	880.09	-4.11	0.00	2.88	-0.01	44.39	1.10
3.00	2292.07	124.91	0.004	-0.20	7.10	0.001	880.09	-4.10	-0.00	2.89	-0.07	44.15	1.10
3.10	2379.41	135.61	0.003	-0.20	7.39	0.000	880.09	-4.10	0.00	2.89	0.05	44.56	1.10
3.20	2466.70	146.76	0.003	-0.20	7.68	0.001	880.09	-4.10	-0.00	2.89	-0.01	44.41	1.10
3.30	2553.93	158.34	0.004	-0.20	7.97	0.001	880.09	-4.10	-0.00	2.89	-0.07	44.19	1.10
3.40	2641.10	170.36	0.003	-0.20	8.26	0.000	880.09	-4.11	0.00	2.89	0.05	44.61	1.11
3.50	2728.21	182.81	0.003	-0.20	8.55	0.001	880.09	-4.11	-0.00	2.89	-0.01	44.45	1.11
3.60	2815.25	195.71	0.004	-0.20	8.84	0.001	880.09	-4.11	-0.00	2.89	-0.07	44.22	1.11
3.70	2902.23	209.05	0.003	-0.20	9.13	0.000	880.09	-4.11	0.00	2.89	0.05	44.64	1.11
3.80	2989.14	222.82	0.003	-0.20	9.41	0.001	880.09	-4.11	0.00	2.89	-0.01	44.47	1.11
3.90	3075.98	237.03	0.004	-0.20	9.70	0.001	880.09	-4.11	0.00	2.89	-0.07	44.24	1.11
4.00	3162.75	251.68	0.003	-0.20	9.99	0.000	880.09	-4.12	0.00	2.89	0.05	44.65	1.11

File Name=In.VolvoEmpt

SPRUNG MASS # 1

TIME (SEC)	FORWARD POSITION (IN)	LATERAL POSITION (IN)	VERTICAL POSITION (IN)	ROLL ANGLE (DEG)	YAW ANGLE (DEG)	PITCH ANGLE (DEG)	FORWARD VEL IN/SEC	LATERAL VEL IN/SEC	ROLL RATE DEG/SEC	YAW RATE DEG/SEC	PITCH RATE DEG/SEC	LATERAL ACCN. IN/SEC**2	STEER ANGLE DEG
0.0	0.00	0.0	0.0	0.0	0.0	0.0	880.08	0.0	0.0	0.0	0.0	0.0	0.0
0.10	88.01	0.03	0.000	-0.03	0.02	0.000	880.08	0.69	-0.54	0.46	0.00	18.83	20.00
0.20	176.02	0.25	-0.000	-0.08	0.11	0.000	880.08	1.71	-0.31	1.51	-0.00	27.15	28.00
0.30	264.02	0.74	-0.000	-0.10	0.31	0.000	880.08	1.49	-0.04	2.30	-0.00	28.17	28.00
0.40	352.03	1.51	-0.000	-0.11	0.57	0.000	880.08	0.53	-0.14	2.79	-0.01	31.51	28.00
0.50	440.03	2.60	-0.000	-0.12	0.86	0.000	880.08	-0.64	0.17	3.05	-0.01	35.24	28.00
0.60	528.02	4.04	-0.000	-0.14	1.17	0.000	880.08	-1.70	-0.17	3.15	0.01	38.54	28.00
0.70	616.01	5.87	-0.001	-0.16	1.49	0.000	880.08	-2.56	-0.16	3.15	-0.02	41.06	28.00
0.80	703.99	8.11	-0.001	-0.17	1.80	0.000	880.08	-3.16	-0.13	3.11	-0.02	42.84	28.00
0.90	791.96	10.78	-0.001	-0.18	2.11	0.000	880.08	-3.55	-0.11	3.06	0.01	43.93	28.00
1.00	879.91	13.89	-0.001	-0.19	2.41	0.000	880.08	-3.77	-0.09	3.00	-0.03	44.49	28.00
1.10	967.84	17.44	-0.001	-0.20	2.71	0.001	880.08	-3.88	-0.07	2.96	-0.01	44.80	28.00
1.20	1055.74	21.44	-0.001	-0.21	3.00	0.000	880.08	-3.92	-0.05	2.93	0.01	44.82	28.00
1.30	1143.62	25.89	-0.001	-0.21	3.29	0.001	880.08	-3.91	-0.03	2.91	-0.03	44.81	28.00
1.40	1231.48	30.78	-0.001	-0.21	3.58	0.001	880.08	-3.89	-0.02	2.90	-0.01	44.72	28.00
1.50	1319.31	36.12	-0.001	-0.21	3.87	0.001	880.08	-3.87	-0.01	2.89	0.00	44.64	28.00
1.60	1407.11	41.91	-0.001	-0.22	4.16	0.001	880.08	-3.84	-0.00	2.89	-0.02	44.59	28.00
1.70	1494.89	48.14	-0.001	-0.22	4.45	0.001	880.08	-3.82	-0.00	2.89	-0.01	44.52	28.00
1.80	1582.63	54.81	-0.001	-0.22	4.74	0.001	880.08	-3.81	0.00	2.89	0.00	44.50	28.00
1.90	1670.33	61.93	-0.001	-0.22	5.03	0.001	880.08	-3.80	0.00	2.89	-0.02	44.48	28.00
2.00	1758.00	69.49	-0.001	-0.21	5.32	0.001	880.08	-3.80	0.01	2.89	-0.01	44.47	28.00
2.10	1845.63	77.50	-0.001	-0.21	5.61	0.001	880.08	-3.79	0.01	2.89	0.01	44.46	28.00
2.20	1933.22	85.94	-0.001	-0.21	5.90	0.001	880.08	-3.79	0.00	2.89	-0.02	44.46	28.00
2.30	2020.76	94.83	-0.001	-0.21	6.19	0.001	880.08	-3.79	0.00	2.89	-0.01	44.46	28.00
2.40	2108.26	104.16	-0.001	-0.21	6.47	0.001	880.08	-3.79	0.00	2.89	0.01	44.45	28.00
2.50	2195.71	113.93	-0.001	-0.21	6.76	0.001	880.08	-3.79	0.00	2.89	-0.02	44.45	28.00
2.60	2283.11	124.15	-0.001	-0.21	7.05	0.001	880.08	-3.79	0.00	2.89	-0.01	44.45	28.00
2.70	2370.45	134.80	-0.001	-0.21	7.34	0.001	880.08	-3.79	0.00	2.89	0.01	44.45	28.00
2.80	2457.75	145.89	-0.001	-0.21	7.63	0.001	880.08	-3.79	0.00	2.89	-0.02	44.45	28.00
2.90	2544.98	157.43	-0.001	-0.21	7.92	0.001	880.08	-3.79	0.00	2.89	-0.01	44.44	28.00
3.00	2632.16	169.40	-0.001	-0.21	8.21	0.001	880.08	-3.79	0.00	2.89	0.01	44.44	28.00
3.10	2719.27	181.82	-0.001	-0.21	8.50	0.001	880.08	-3.79	-0.00	2.89	-0.02	44.44	28.00
3.20	2806.32	194.67	-0.001	-0.21	8.79	0.001	880.08	-3.79	-0.00	2.89	-0.01	44.44	28.00
3.30	2893.31	207.96	-0.001	-0.21	9.07	0.001	880.08	-3.79	-0.00	2.89	0.01	44.44	28.00
3.40	2980.22	221.69	-0.001	-0.21	9.36	0.001	880.08	-3.79	-0.00	2.89	-0.02	44.44	28.00
3.50	3067.07	235.86	-0.001	-0.21	9.65	0.001	880.08	-3.79	-0.00	2.89	-0.01	44.44	28.00
3.60	3153.84	250.46	-0.001	-0.21	9.94	0.001	880.08	-3.79	-0.00	2.89	0.01	44.45	28.00
3.70	3240.54	265.50	-0.001	-0.21	10.23	0.001	880.08	-3.79	-0.00	2.89	-0.02	44.44	28.00
3.80	3327.16	280.98	-0.001	-0.21	10.52	0.001	880.08	-3.79	-0.00	2.89	-0.01	44.44	28.00
3.90	3413.70	296.90	-0.001	-0.21	10.81	0.001	880.08	-3.79	-0.00	2.89	0.01	44.45	28.00
4.00	3500.16	313.25	-0.001	-0.21	11.10	0.001	880.08	-3.79	0.00	2.89	-0.02	44.45	28.00

ALIGNING TORQUE TABLE # 1
******** ****** *********

ALIGNING TORQUE VS. SLIP ANGLE

0.0	1.00	2.00	4.00	8.00	12.00
2000.00	336.00	528.00	660.00	444.00	252.00
3980.00	1020.00	1716.00	2256.00	1728.00	1092.00
5970.00	1764.00	3156.00	4344.00	3240.00	2184.00
7950.00	2484.00	4608.00	6720.00	5304.00	3576.00
9440.00	3000.00	5616.00	8604.00	7104.00	4620.00

CORNERING FORCE TABLE # 1

LATERAL FORCE VS. SLIP ANGLL

0.0	1.00	2.00	4.00	8.00	12.00
1983.00	356.94	634.56	1070.82	1526.91	1804.53
5967.00	835.38	1611.09	2804.49	3938.22	4355.91
9441.00	944.10	1793.79	3398.76	5192.55	5759.01

SPRING TABLE # 3
++++++ +++++++

FORCE LB	DEFLECTION INCHES
-18890.20	-3.00
-361.10	2.30
-17.96	3.00
123.95	3.50
321.56	3.73
1423.34	4.00
4549.10	4.50
8166.00	5.00
10327.50	5.25
25458.00	7.00

SPRING TABLE # 2
****** *******

FORCE LB	DEFLECTION INCHES
-37553.00	-3.00
-1115.70	2.50
1750.00	3.00
4425.00	3.50
7762.50	4.00
11575.00	4.50
15387.50	5.00
38262.50	8.00

SPRING TABLE # 1
****** *******

FORCE LB	DEFLECTION INCHES
-13145.75	-3.00
101.54	1.40
699.83	1.80
2221.74	3.00
3489.31	4.20
4906.95	5.60
5850.19	6.50
7535.27	8.00
11880.05	10.90
13741.65	12.00

File Name=In.VolvoEmpt

UNIT # 2

OF AXLES ON THIS UNIT = 2

WEIGHT OF SPRUNG MASS = 8980.00 LB.

ROLL MOMENT OF INERTIA OF SPRUNG MASS = 17500.00 LB.IN.SEC**2

PITCH MOMENT OF INERTIA OF SPRUNG MASS = 536200.00 LB.IN.SEC**2

YAW MOMENT OF INERTIA OF SPRUNG MASS = 553700.00 LB.IN.SEC**2

HEIGHT OF SPRUNG MASS CG ABOVE GROUND = 48.80 INCHES

	AXLE # 4	AXLE # 5	AXLE #					
LOAD ON EACH AXLE (LB.)	4817.97	4817.97						
AXLE WEIGHT (LB.)	1800.00	1800.00						
AXLE ROLL M.I (LB.IN.SEC**2)	5250.00	5250.00						
X DIST FROM SP MASS CG (IN)	-87.50	-141.50						
HEIGHT OF AXLE C.G. ABOVE GROUND (INCHES)	20.00	20.00						
HEIGHT OF ROLL CENTER ABOVE GROUND (INCHES)	30.40	30 40						
HALF SPRING SPACING (IN)	19.00	19.00						
HALF TRACK - INNER TIRES (IN)	29.12	29.12						
DUAL TIRE SPACING (IN)	13.00	13.00						
STIFFNESS OF EACH TIRE (LB/IN)	4500.00	4500.00						
ROLL STEER COEFFICIENT	0.10	0.11						
AUX ROLL STIFFNESS (IN.LB/DEG)	20000.00	20000.00						
SPRING COULOMB FRICTION - PER SPRING (LB)	2395.20	2395.20						
VISCOUS DAMPING PER SPRING (LB.SEC/IN)	0.0	0.0						
SPRING TABLE #	3	3						
CORNERING FORCE TABLE #	1	1						
ALIGNING TORQUE TABLE #	1	1						

File Name=In.VolvoEmpt

UNIT # 1
****

OF AXLES ON THIS UNIT = 3

WEIGHT OF SPRUNG MASS = 13020.00 LB.

ROLL MOMENT OF INERTIA OF SPRUNG MASS = 29520.00 LB.IN.SEC**2

PITCH MOMENT OF INERTIA OF SPRUNG MASS = 182000.00 LB.IN.SEC**2

YAW MOMENT OF INERTIA OF SPRUNG MASS = 162700.00 LB.IN.SEC**2

HEIGHT OF SPRUNG MASS CG ABOVE GROUND = 43.10 INCHES

	AXLE # 1	AXLE # 2	AXLE # 3	AXLE #				
	*********	*********	*********	*********	*********	*********	*********	*********
LOAD ON EACH AXLE (LB.)	11263.34	5700.36	5700.36					
AXLE WEIGHT (LB.)	1500.00	2700.00	2500.00					
AXLE ROLL M.I (LB.IN.SEC**2)	5300.00	5850.00	5780.00					
X DIST FROM SP MASS CG (IN)	39.90	-86.35	-140.35					
HEIGHT OF AXLE C.G. ABOVE GROUND (INCHES)	20.50	20.00	20.00					
HEIGHT OF ROLL CENTER ABOVE GROUND (INCHES)	17.73	34.72	34.85					
HALF SPRING SPACING (IN)	15.00	19.25	19.25					
HALF TRACK - INNER TIRES (IN)	39.25	29.50	29.50					
DUAL TIRE SPACING (IN)	0.0	13.00	13.00					
STIFFNESS OF EACH TIRE (LB/IN)	4500.00	4500.00	4500.00					
ROLL STEER COEFFICIENT	0.06	-0.04	0.07					
AUX ROLL STIFFNESS (IN.LB/DEG)	25000.00	10000.00	10000.00					
SPRING COULOMB FRICTION - PER SPRING (LB)	428.57	831.25	831.25					
VISCOUS DAMPING PER SPRING (LB.SEC/IN)	0.0	0.0	0.0					
SPRING TABLE #	1	2	2					
CORNERING FORCE TABLE #	1	1	1					
ALIGNING TORQUE TABLE #	1	1	1					

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                    *    RTAC  STUDY   *
                    ********************

              **********************************
              *DIRECTIONAL RESPONSE SIMULATION*
              **********************************

File Name=In.VolvoEmpt

# OF SPRUNG MASSES        =  2

TOTAL # OF AXLES          =  5

GROSS VEHICLE WEIGHT      =   32300.00  LB.

FORWARD VELOCITY          =      50.01  M.P.H


PEAK FRICTIONAL COEFFICIENT    = 0.79


                                            DISTANCE AHEAD   HEIGHT BELOW   ROLL STIFFNESS    TYPE OF
                                            OF SPRUNG MASS   SPRUNG MASS   (IN.LB/DEG)        CONSTRAINT
                                            C.G. (INCHES)   C.G. (INCHES)

                 ON UNIT # 1                    -108.25            0.10     999999.88          1
ARTICULATION PT # 1
                 ON UNIT # 2                     234.75            5.80

TYPE OF CONSTRAINT :  01  CONVENTIONAL 5TH WHEEL
                      02  INVERTED 5TH WHEEL
                      03  PINTLE HOOK
                      04  KING PIN(RIGID IN ROLL & PITCH)

OPEN LOOP STEER INPUT
*********************

STEERING GEAR RATIO  =      24.35

STEERING STIFFNESS (IN.LB/DEG)        =  12635.00

TIE ROD STIFFNESS (IN.LB/DEG)        =  40000.00

MECHANICAL TRAIL (IN)        =       1.50

# OF POINTS IN STEER TABLE   = 5

     TIME         STEERING WHEEL
     SEC              DEGREES
      0.0          0.0
      0.05        10.00
      0.10        20.00
      0.14        28.00
     10.00        28.00
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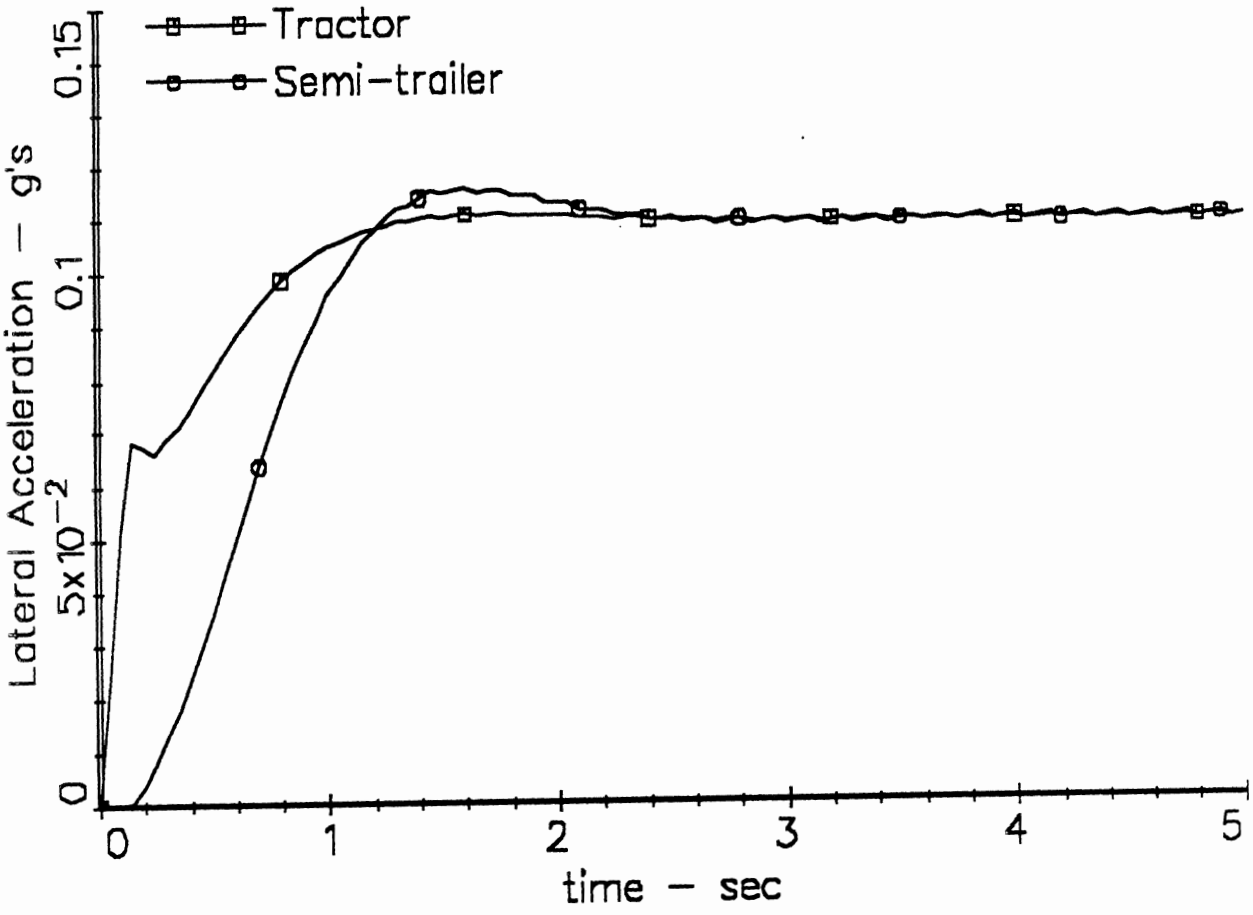

File Name=In.VolvoLoad

File Name=In.VolvoLoad

AXLE # 5
****

TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
4.10	-0.380	0.013	-0.79	10685.2	1198.3	-200.85	9879.4	-0.79	6433.7	799.3	-99.74	5568.0	-0.050
4.20	-0.380	0.010	-0.79	10668.0	1196.4	-200.38	9396.5	-0.79	6416.5	797.5	-99.32	5081.8	-0.050
4.30	-0.380	0.014	-0.79	10695.3	1199.5	-201.14	10309.3	-0.79	6443.8	800.4	-99.99	6000.1	-0.050
4.40	-0.380	0.013	-0.79	10685.1	1198.3	-200.85	9879.2	-0.79	6433.8	799.3	-99.74	5568.1	-0.050
4.50	-0.380	0.010	-0.79	10667.5	1196.2	-200.35	9396 3	-0.79	6416.4	797.4	-99.31	5082.0	-0.050
4.60	-0.380	0.014	-0.79	10695.0	1199.3	-201.11	10309.0	-0.79	6444.0	800.4	-99.98	6000.3	-0.050
4.70	-0.380	0.013	-0.79	10684.7	1198.1	-200.81	9879.0	-0.79	6433.9	799.2	-99.73	5568.4	-0.050
4.80	-0.380	0.010	-0.79	10667.2	1196.0	-200.32	9396.0	-0.79	6416.6	797.3	-99.31	5082.3	-0.050
4.90	-0.380	0.014	-0.79	10694.6	1199.1	-201.07	10308.6	-0.79	6444.1	800.3	-99.97	6000.4	-0.050
5.00	-0.380	0.013	-0.79	10684.4	1197.9	-200.78	9878.9	-0.79	6434.0	799.1	-99.72	5568.6	-0.050

File Name=In.VolvoLoad

AXLE # 4
****

TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
4.10	-0.363	0.013	-0.64	10592.5	972.3	-162.31	9927.1	-0.65	6530.3	660.8	-83.32	5526.7	-0.026
4.20	-0.363	0.010	-0.64	10575.2	970.8	-161.93	9444.1	-0.65	6512.9	659.3	-82.98	5040.3	-0.026
4.30	-0.363	0.014	-0.64	10602.7	973.4	-162.56	10357.4	-0.65	6540.4	661.7	-83.53	5959.4	-0.026
4.40	-0.363	0.013	-0.64	10592.7	972.4	-162.33	9927.3	-0.65	6530.5	660.8	-83.33	5527.2	-0.026
4.50	-0.363	0.010	-0.64	10575.1	970.7	-161.92	9444.0	-0.65	6513.2	659.3	-82.98	5040.7	-0.026
4.60	-0.363	0.014	-0.64	10602.6	973.3	-162.54	10357.3	-0.65	6540.8	661.7	-83.53	5959.9	-0.026
4.70	-0.363	0.013	-0.64	10592.4	972.2	-162.30	9927.0	-0.65	6530.8	660.8	-83.32	5527.5	-0.026
4.80	-0.363	0.010	-0.64	10575.0	970.6	-161.90	9443.9	-0.65	6513.5	659.2	-82.97	5041.1	-0.026
4.90	-0.363	0.014	-0.64	10602.5	973.1	-162.52	10357.2	-0.65	6541.1	661.6	-83.52	5960.2	-0.026
5.00	-0.363	0.013	-0.64	10592.2	972.1	-162.28	9927.0	-0.65	6531.0	660.7	-83.31	5527.8	-0.026

File Name=In.VolvoLoad

AXLE # 3
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TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
4.10	-0.348	0.015	-0.80	10613.9	1203.1	-201.03	9177.3	-0.80	6675.5	830.2	-106.26	5598.2	-0.030
4.20	-0.348	0.015	-0.80	10614.5	1203.1	-201.04	9194.3	-0.80	6675.9	830.2	-106.27	5615.2	-0.030
4.30	-0.348	0.015	-0.80	10613.9	1203.1	-201.03	9165.0	-0.80	6675.4	830.2	-106.26	5586.0	-0.030
4.40	-0.348	0.015	-0.80	10613.8	1203.0	-201.02	9177.2	-0.80	6675.5	830.2	-106.26	5598.3	-0.030
4.50	-0.348	0.015	-0.80	10614.3	1203.0	-201.03	9194.1	-0.80	6676.1	830.2	-106.27	5615.3	-0.030
4.60	-0.348	0.015	-0.80	10613.6	1203.0	-201.00	9164.8	-0.80	6675.5	830.1	-106.25	5586.2	-0.030
4.70	-0.348	0.015	-0.80	10613.6	1202.9	-201.00	9176.9	-0.80	6675.7	830.1	-106.25	5598.4	-0.030
4.80	-0.348	0.015	-0.80	10614.1	1203.0	-201.01	9193.9	-0.80	6676.3	830.2	-106.26	5615.5	-0.030
4.90	-0.348	0.015	-0.80	10613.4	1202.9	-200.99	9164.7	-0.80	6675.7	830.1	-106.25	5586.5	-0.030
5.00	-0.348	0.015	-0.80	10613.4	1202.9	-200.99	9176.7	-0.80	6675.7	830.1	-106.25	5598.6	-0.030

File Name=In.VolvoLoad

AXLE # 2

TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
4.10	-0.326	0.013	-0.67	10499.8	1008.5	-167.66	9139.3	-0.68	6815.3	713.4	-92.59	5464.2	0.016
4.20	-0.326	0.013	-0.67	10500.3	1008.5	-167.67	9157.0	-0.68	6815.7	713.5	-92.59	5481.8	0.016
4.30	-0.326	0.013	-0.67	10499.6	1008.5	-167.66	9126.8	-0.68	6815.1	713.4	-92.58	5451.8	0.016
4.40	-0.326	0.013	-0.67	10499.8	1008.5	-167.66	9139.2	-0.68	6815.4	713.4	-92.59	5464.2	0.016
4.50	-0.326	0.013	-0.67	10500.2	1008.5	-167.66	9156.8	-0.68	6815.9	713.5	-92.59	5481.9	0.016
4.60	-0.326	0.013	-0.67	10499.5	1008.4	-167.64	9126.6	-0.68	6815.4	713.4	-92.58	5452.0	0.016
4.70	-0.326	0.013	-0.67	10499.6	1008.4	-167.64	9138.9	-0.68	6815.6	713.4	-92.58	5464.4	0.016
4.80	-0.326	0.013	-0.67	10500.0	1008.4	-167.64	9156.6	-0.68	6816.1	713.4	-92.59	5482.2	0.016
4.90	-0.326	0.013	-0.67	10499.2	1008.3	-167.62	9126.5	-0.68	6815.4	713.3	-92.57	5452.3	0.016
5.00	-0.326	0.013	-0.67	10499.4	1008.3	-167.63	9138.7	-0.68	6815.7	713.4	-92.58	5464.5	0.016

File Name=In.VolvoLoad

AXLE # 1
****

TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
4.10	-0.233	0.005	-0.93	6745.5	801.7	-158.99	5514.9	-0.88	5310.1	662.3	-110.71	5035.2	
4.20	-0.233	0.005	-0.93	6745.5	801.7	-158.99	5515.9	-0.88	5310.1	662.4	-110.71	5036.3	
4.30	-0.233	0.005	-0.93	6745.4	801.7	-158.99	5514.1	-0.88	5310.1	662.4	-110.71	5034.4	
4.40	-0.233	0.005	-0.93	6745.5	801.7	-158.99	5514.9	-0.88	5310.2	662.4	-110.71	5035.3	
4.50	-0.233	0.005	-0.93	6745.5	801.7	-158.99	5515.9	-0.88	5310.2	662.4	-110.71	5036.4	
4.60	-0.233	0.005	-0.93	6745.4	801.7	-158.98	5514.0	-0.88	5310.2	662.3	-110.71	5034.5	
4.70	-0.233	0.005	-0.93	6745.4	801.7	-158.98	5514.8	-0.88	5310.2	662.3	-110.71	5035.3	
4.80	-0.233	0.005	-0.93	6745.4	801.7	-158.98	5515.9	-0.88	5310.3	662.4	-110.71	5036.4	
4.90	-0.233	0.005	-0.93	6745.4	801.7	-158.98	5514.0	-0.88	5310.2	662.3	-110.70	5034.5	
5.00	-0.233	0.005	-0.93	6745.4	801.7	-158.98	5514.8	-0.88	5310.3	662.3	-110.71	5035.3	

File Name=In.VolvoLoad

CONSTRAINT FORCES
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NOTE: LATERAL FORCE ALONE IS PRINTED FOR PINTLE HOOK TYPE CONSTRAINT.
LOCATE FORCES & MOMENTS BASED ON CONSTRAINT TYPE

TIME	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
4.10	-3582.2	26882.9	-113815.7	0.0						
4.20	-3587.5	26887.7	-113814.6	0.0						
4.30	-3577.8	26888.9	-113823.1	0.0						
4.40	-3582.0	26882.7	-113814.6	0.0						
4.50	-3587.2	26887.7	-113800.5	0.0						
4.60	-3577.5	26889.0	-113804.8	0.0						
4.70	-3581.7	26882.6	-113795.4	0.0						
4.80	-3586.9	26887.7	-113782.4	0.0						
4.90	-3577.3	26889.1	-113789.2	0.0						
5.00	-3581.5	26882.5	-113782.6	0.0						

File Name=In.VolvoLoad

SPRUNG MASS # 2

TIME (SEC)	FORWARD POSITION (IN)	LATERAL POSITION (IN)	VERTICAL POSITION (IN)	ROLL ANGLE (DEG)	YAW ANGLE (DEG)	PITCH ANGLE (DEG)	FORWARD VEL IN/SEC	LATERAL VEL IN/SEC	ROLL RATE DEG/SEC	YAW RATE DEG/SEC	PITCH RATE DEG/SEC	LATERAL ACCN. IN/SEC**2	ARTIC ANGLE DEG
4.10	3299.70	257.40	-0.001	-1.22	9.84	0.000	880.14	-3.75	-0.00	2.75	-0.06	42.30	1.06
4.20	3386.43	272.28	-0.001	-1.22	10.11	0.000	880.14	-3.75	-0.00	2.75	-0.07	42.13	1.06
4.30	3473.09	287.57	-0.001	-1.22	10.39	0.000	880.14	-3.75	0.00	2.75	-0.04	42.45	1.06
4.40	3559.68	303.29	-0.001	-1.22	10.66	0.000	880.14	-3.75	0.00	2.75	-0.06	42.30	1.06
4.50	3646.19	319.41	-0.001	-1.22	10.94	0.000	880.14	-3.75	-0.00	2.75	-0.07	42.12	1.06
4.60	3732.62	335.95	-0.001	-1.22	11.21	-0.000	880.14	-3.75	0.00	2.75	-0.04	42.44	1.06
4.70	3818.97	352.91	-0.001	-1.22	11.49	-0.000	880.14	-3.75	0.00	2.75	-0.06	42.30	1.06
4.80	3905.24	370.28	-0.001	-1.22	11.76	0.000	880.14	-3.75	-0.00	2.75	-0.07	42.12	1.06
4.90	3991.42	388.06	-0.001	-1.22	12.04	-0.000	880.14	-3.75	0.00	2.75	-0.04	42.44	1.06
5.00	4077.52	406.25	-0.001	-1.22	12.31	-0.000	880.14	-3.75	0.00	2.75	-0.06	42.29	1.06

File Name=In.VolvoLoad

SPRUNG MASS # 1
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TIME (SEC)	FORWARD POSITION (IN)	LATERAL POSITION (IN)	VERTICAL POSITION (IN)	ROLL ANGLE (DEG)	YAW ANGLE (DEG)	PITCH ANGLE (DEG)	FORWARD VEL IN/SEC	LATERAL VEL IN/SEC	ROLL RATE DEG/SEC	YAW RATE DEG/SEC	PITCH RATE DEG/SEC	LATERAL ACCN. IN/SEC**2	STEER ANGLE DEG
4.10	3589.07	309.62	-0.004	-1.11	10.90	-0.004	880.08	-5.97	-0.00	2.75	-0.05	42.27	28.00
4.20	3675.54	325.89	-0.004	-1.11	11.18	-0.004	880.08	-5.97	-0.00	2.75	-0.05	42.22	28.00
4.30	3761.94	342.57	-0.004	-1.11	11.45	-0.004	880.08	-5.97	-0.00	2.75	-0.06	42.31	28.00
4.40	3848.26	359.66	-0.004	-1.11	11.73	-0.004	880.08	-5.97	0.00	2.75	-0.05	42.27	28.00
4.50	3934.50	377.17	-0.004	-1.11	12.00	-0.004	880.08	-5.97	0.00	2.75	-0.05	42.22	28.00
4.60	4020.65	395.09	-0.004	-1.11	12.27	-0.004	880.08	-5.97	0.00	2.75	-0.06	42.31	28.00
4.70	4106.71	413.43	-0.004	-1.11	12.55	-0.004	880.08	-5.97	0.00	2.75	-0.05	42.27	28.00
4.80	4192.68	432.18	-0.004	-1.11	12.82	-0.004	880.08	-5.97	0.00	2.75	-0.05	42.22	28.00
4.90	4278.57	451.34	-0.004	-1.11	13.10	-0.004	880.08	-5.97	0.00	2.75	-0.06	42.31	28.00
5.00	4364.36	470.91	-0.004	-1.11	13.37	-0.004	880.08	-5.97	0.00	2.75	-0.05	42.27	28.00

File Name=In.VolvoLoad

AXLE # 5

TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
0.0	0.0	0.0	0.0	8557.5	0.0	0.0	7657.5	0.0	8557.5	0.0	0.0	7657.5	0.0
0.10	-0.001	-0.000	0.01	8565.2	-10.3	1.53	7691.5	0.01	8550.1	-10.3	1.53	7623.4	-0.000
0.20	-0.014	-0.000	0.02	8633.9	-19.5	2.92	7820.1	0.02	8482.2	-19.2	2.85	7498.0	-0.002
0.30	-0.035	-0.000	-0.00	8755.2	3.9	-0.60	8020.1	-0.00	8361.2	3.8	-0.56	7357.0	-0.004
0.40	-0.067	0.001	-0.05	8942.3	60.3	-9.23	8558.0	-0.05	8189.9	56.2	-8.16	7449.5	-0.009
0.50	-0.105	-0.002	-0.11	9136.5	150.7	-23.33	8534.0	-0.11	7962.4	135.0	-19.25	6876.4	-0.014
0.60	-0.155	-0.006	-0.21	9425.6	287.3	-45.24	8403.0	-0.21	7693.6	244.2	-34.13	6117.9	-0.020
0.70	-0.206	-0.002	-0.32	9724.9	452.2	-72.39	9578.9	-0.32	7424.1	364.3	-49.88	6738.7	-0.027
0.80	-0.253	-0.000	-0.43	9970.1	623.0	-101.00	9407.0	-0.44	7138.5	477.0	-63.76	6126.3	-0.033
0.90	-0.294	-0.000	-0.54	10196.2	790.0	-129.49	9094.3	-0.54	6902.2	578.4	-75.69	5398.2	-0.038
1.00	-0.329	0.006	-0.63	10412.8	940.0	-155.66	10162.5	-0.63	6733.0	663.6	-85.43	6155.4	-0.043
1.10	-0.356	0.008	-0.70	10548.5	1060.0	-176.61	9850.6	-0.71	6566.3	726.2	-91.91	5634.2	-0.046
1.20	-0.376	0.007	-0.76	10648.7	1154.3	-193.16	9436.8	-0.76	6440.4	773.0	-96.53	5044.5	-0.049
1.30	-0.390	0.012	-0.80	10752.2	1224.7	-205.86	10403.1	-0.80	6389.5	808.6	-100.41	5908.4	-0.051
1.40	-0.398	0.012	-0.83	10788.5	1265.9	-213.13	10004.3	-0.83	6330.9	827.7	-102.10	5458.6	-0.052
1.50	-0.403	0.011	-0.84	10796.0	1287.5	-216.82	9525.2	-0.84	6290.6	837.1	-102.80	4952.8	-0.053
1.60	-0.404	0.015	-0.84	10828.1	1298.6	-218.99	10434.3	-0.85	6311.4	844.3	-103.93	5873.9	-0.053
1.70	-0.402	0.014	-0.84	10811.1	1294.4	-218.12	9993.7	-0.85	6308.3	842.3	-103.65	5456.0	-0.053
1.80	-0.400	0.012	-0.84	10779.3	1282.3	-215.81	9491.7	-0.84	6306.2	836.3	-102.88	4986.3	-0.053
1.90	-0.396	0.015	-0.83	10787.3	1271.9	-214.12	10384.3	-0.83	6352.0	833.6	-103.08	5924.2	-0.053
2.00	-0.393	0.014	-0.82	10757.1	1255.9	-211.15	9935.5	-0.82	6362.2	826.0	-102.25	5509.5	-0.052
2.10	-0.389	0.011	-0.81	10720.6	1239.1	-208.01	9435.7	-0.82	6364.5	817.5	-101.23	5043.3	-0.052
2.20	-0.386	0.015	-0.81	10730.7	1229.1	-206.42	10332.9	-0.81	6408.8	814.5	-101.36	5976.5	-0.051
2.30	-0.384	0.013	-0.80	10706.5	1216.9	-204.15	9890.8	-0.80	6413.1	808.3	-100.64	5554.0	-0.051
2.40	-0.382	0.011	-0.79	10678.0	1205.9	-202.06	9400.2	-0.80	6407.2	802.3	-99.82	5079.3	-0.051
2.50	-0.380	0.014	-0.79	10697.0	1202.3	-201.63	10306.3	-0.79	6442.6	802.1	-100.19	6003.6	-0.051
2.60	-0.379	0.013	-0.79	10681.4	1196.5	-200.52	9872.3	-0.79	6438.3	798.8	-99.72	5574.4	-0.050
2.70	-0.379	0.010	-0.79	10660.5	1191.5	-199.50	9388.0	-0.79	6424.3	795.4	-99.15	5091.4	-0.050
2.80	-0.378	0.014	-0.78	10686.4	1193.0	-199.98	10300.0	-0.79	6453.6	797.6	-99.74	6010.3	-0.050
2.90	-0.378	0.013	-0.78	10675.8	1191.2	-199.59	9870.3	-0.79	6443.9	796.1	-99.45	5577.7	-0.050
3.00	-0.378	0.010	-0.78	10658.7	1189.4	-199.13	9388.3	-0.79	6425.8	794.3	-99.03	5090.6	-0.050
3.10	-0.378	0.014	-0.78	10687.3	1193.2	-200.01	10302.4	-0.79	6452.4	797.5	-99.72	6007.7	-0.050
3.20	-0.379	0.013	-0.78	10678.5	1192.9	-199.88	9873.9	-0.79	6441.1	796.8	-99.51	5574.4	-0.050
3.30	-0.379	0.010	-0.79	10662.4	1191.9	-199.58	9392.1	-0.79	6422.2	795.4	-99.13	5086.5	-0.050
3.40	-0.379	0.014	-0.79	10691.3	1196.0	-200.53	10306.3	-0.79	6448.4	798.8	-99.84	6003.7	-0.050
3.50	-0.379	0.013	-0.79	10682.3	1195.7	-200.39	9877.6	-0.79	6437.1	798.1	-99.63	5570.9	-0.050
3.60	-0.380	0.010	-0.79	10665.9	1194.5	-200.05	9395.2	-0.79	6418.7	796.6	-99.24	5083.6	-0.050
3.70	-0.380	0.014	-0.79	10694.1	1198.3	-200.93	10308.5	-0.79	6445.3	799.9	-99.94	6000.9	-0.050
3.80	-0.380	0.013	-0.79	10684.5	1197.6	-200.73	9879.3	-0.79	6434.6	799.0	-99.71	5568.9	-0.050
3.90	-0.380	0.010	-0.79	10667.5	1196.0	-200.31	9396.6	-0.79	6416.8	797.3	-99.30	5082.3	-0.050
4.00	-0.380	0.014	-0.79	10695.2	1199.3	-201.11	10309.2	-0.79	6444.0	800.3	-99.98	6000.0	-0.050

File Name=In.VolvoLoad

AXLE # 4

TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
0.0	0.0	0.0	0.0	8557.5	0.0	0.0	7657.5	0.0	8557.5	0.0	0.0	7657.5	0.0
0.10	-0.001	-0.000	0.01	8564.8	-10.7	1.59	7692.4	0.01	8550.1	-10.6	1.59	7622.0	-0.000
0.20	-0.013	-0.000	0.02	8631.3	-24.8	3.71	7825.1	0.02	8484.3	-24.4	3.63	7492.4	-0.001
0.30	-0.034	-0.000	0.01	8746.2	-14.6	2.21	8032.2	0.01	8370.1	-14.1	2.08	7345.0	-0.002
0.40	-0.064	0.001	-0.01	8921.4	18.6	-2.84	8578.8	-0.01	8210.4	17.4	-2.53	7429.1	-0.004
0.50	-0.098	-0.002	-0.06	9098.6	78.7	-12.15	8563.0	-0.06	7997.5	70.9	-10.14	6844.7	-0.007
0.60	-0.145	-0.005	-0.13	9368.1	180.4	-28.31	8437.2	-0.13	7741.8	154.9	-21.72	6073.2	-0.011
0.70	-0.194	-0.001	-0.22	9655.0	309.7	-49.38	9620.4	-0.22	7489.7	252.7	-34.78	6689.9	-0.014
0.80	-0.239	0.000	-0.31	9887.4	448.0	-72.32	9456.0	-0.32	7217.5	348.3	-46.88	6077.4	-0.017
0.90	-0.278	0.001	-0.41	10100.9	587.9	-95.92	9143.9	-0.41	6990.2	438.1	-57.79	5342.2	-0.020
1.00	-0.311	0.007	-0.49	10312.9	716.5	-118.10	10216.3	-0.49	6830.7	515.6	-67.01	6102.7	-0.022
1.10	-0.337	0.008	-0.55	10445.2	822.1	-136.34	9904.3	-0.55	6669.2	574.7	-73.51	5582.3	-0.024
1.20	-0.357	0.008	-0.60	10542.3	907.9	-151.23	9489.6	-0.61	6544.7	620.7	-78.39	4992.4	-0.025
1.30	-0.371	0.013	-0.64	10646.6	973.8	-162.96	10455.9	-0.65	6495.3	656.5	-82.47	5859.2	-0.026
1.40	-0.380	0.012	-0.67	10683.9	1014.9	-170.10	10056.4	-0.67	6436.3	677.4	-84.56	5411.4	-0.027
1.50	-0.384	0.011	-0.68	10692.6	1038.7	-174.15	9575.4	-0.69	6394.4	689.4	-85.65	4906.2	-0.027
1.60	-0.385	0.015	-0.69	10727.1	1052.5	-176.73	10483.8	-0.69	6414.2	698.2	-86.94	5829.6	-0.027
1.70	-0.384	0.014	-0.69	10711.9	1052.3	-176.58	10042.1	-0.69	6409.5	698.5	-86.93	5412.3	-0.027
1.80	-0.382	0.012	-0.69	10681.6	1044.5	-175.04	9539.3	-0.69	6405.8	694.6	-86.41	4943.3	-0.027
1.90	-0.379	0.015	-0.68	10691.2	1037.0	-173.86	10431.8	-0.68	6450.5	692.8	-86.61	5882.7	-0.027
2.00	-0.376	0.014	-0.67	10662.0	1024.2	-171.50	9981.8	-0.68	6459.5	686.5	-85.91	5467.3	-0.027
2.10	-0.372	0.012	-0.67	10626.5	1010.2	-168.89	9482.1	-0.67	6461.0	679.1	-85.00	5001.7	-0.026
2.20	-0.369	0.015	-0.66	10637.3	1001.5	-167.51	10379.5	-0.66	6504.8	676.2	-85.03	5935.6	-0.026
2.30	-0.367	0.013	-0.66	10613.3	990.8	-165.56	9937.0	-0.66	6508.6	670.6	-84.35	5512.6	-0.026
2.40	-0.365	0.011	-0.65	10585.0	981.1	-163.73	9446.3	-0.65	6502.4	665.0	-83.60	5037.6	-0.026
2.50	-0.363	0.014	-0.65	10604.3	977.5	-163.27	10353.0	-0.65	6537.9	664.3	-83.83	5962.7	-0.026
2.60	-0.362	0.013	-0.64	10588.7	972.2	-162.26	9918.5	-0.65	6533.6	661.1	-83.39	5532.7	-0.026
2.70	-0.362	0.011	-0.64	10567.8	967.6	-161.34	9434.5	-0.64	6519.6	658.0	-82.87	5049.6	-0.026
2.80	-0.361	0.014	-0.64	10593.5	968.4	-161.67	10347.1	-0.64	6548.9	659.5	-83.32	5969.2	-0.026
2.90	-0.361	0.013	-0.64	10583.0	966.7	-161.30	9917.2	-0.64	6539.4	658.1	-83.06	5536.1	-0.026
3.00	-0.361	0.010	-0.64	10565.8	965.0	-160.90	9435.2	-0.64	6521.5	656.5	-82.70	5048.7	-0.026
3.10	-0.362	0.014	-0.64	10594.4	967.9	-161.59	10349.7	-0.64	6548.2	659.1	-83.26	5966.4	-0.026
3.20	-0.362	0.013	-0.64	10585.5	967.6	-161.47	9920.9	-0.64	6536.9	658.4	-83.08	5532.6	-0.026
3.30	-0.362	0.010	-0.64	10569.4	966.8	-161.22	9439.3	-0.64	6518.2	657.3	-82.77	5044.6	-0.026
3.40	-0.362	0.014	-0.64	10598.3	970.2	-162.00	10354.0	-0.64	6544.6	660.1	-83.36	5962.7	-0.026
3.50	-0.362	0.013	-0.64	10589.3	970.0	-161.90	9924.8	-0.65	6533.3	659.6	-83.19	5529.3	-0.026
3.60	-0.363	0.010	-0.64	10573.0	969.0	-161.63	9442.6	-0.65	6515.1	658.4	-82.88	5041.8	-0.026
3.70	-0.363	0.014	-0.64	10601.2	972.2	-162.35	10356.3	-0.65	6541.8	661.1	-83.46	5960.0	-0.026
3.80	-0.363	0.013	-0.64	10591.6	971.6	-162.19	9926.9	-0.65	6531.0	660.4	-83.28	5527.5	-0.026
3.90	-0.363	0.010	-0.64	10574.8	970.4	-161.86	9444.0	-0.65	6513.4	659.1	-82.95	5040.6	-0.026
4.00	-0.363	0.014	-0.64	10602.5	973.2	-162.53	10357.1	-0.65	6540.6	661.6	-83.52	5959.1	-0.026

File Name=In.VolvoLoad

AXLE # 3
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TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
0.0	0.0	0.0	0.0	8652.6	0.0	0.0	7402.5	0.0	8652.6	0.0	0.0	7402.5	0.0
0.10	-0.009	0.0	-0.02	8705.3	23.8	-3.59	7449.7	-0.02	8598.6	23.6	-3.53	7354.3	-0.000
0.20	-0.031	-0.000	-0.11	8830.3	147.8	-22.45	7478.7	-0.11	8474.2	143.3	-21.23	7325.6	-0.001
0.30	-0.069	-0.000	-0.25	9043.1	336.6	-51.81	7572.9	-0.26	8262.2	313.8	-45.78	7229.8	-0.002
0.40	-0.111	-0.000	-0.39	9278.7	528.4	-82.51	7710.2	-0.39	8025.0	471.4	-67.53	7072.4	-0.004
0.50	-0.154	0.000	-0.50	9523.5	696.8	-110.33	7921.5	-0.51	7777.2	593.5	-83.45	6875.0	-0.007
0.60	-0.198	0.001	-0.59	9776.7	839.0	-134.67	8184.4	-0.60	7533.5	681.8	-94.14	6650.6	-0.011
0.70	-0.238	0.003	-0.66	10003.4	954.4	-154.99	8400.4	-0.67	7309.9	743.2	-100.79	6378.5	-0.015
0.80	-0.272	0.006	-0.72	10182.6	1044.4	-171.08	8620.8	-0.72	7109.2	783.8	-104.51	6158.7	-0.018
0.90	-0.299	0.009	-0.75	10336.2	1112.8	-183.62	8824.4	-0.76	6952.0	810.5	-106.54	5986.1	-0.022
1.00	-0.321	0.010	-0.78	10466.9	1163.4	-193.13	8955.7	-0.78	6833.8	827.3	-107.56	5807.0	-0.025
1.10	-0.338	0.012	-0.80	10555.2	1198.3	-199.71	9083.2	-0.80	6735.7	836.7	-107.73	5693.2	-0.027
1.20	-0.349	0.014	-0.81	10617.9	1221.8	-204.19	9184.3	-0.81	6665.8	842.0	-107.66	5619.2	-0.029
1.30	-0.357	0.015	-0.81	10666.2	1237.2	-207.20	9217.9	-0.82	6624.1	845.2	-107.62	5533.5	-0.030
1.40	-0.362	0.015	-0.82	10692.4	1245.3	-208.79	9265.7	-0.82	6597.0	846.3	-107.46	5508.5	-0.031
1.50	-0.364	0.016	-0.82	10702.7	1248.0	-209.34	9298.2	-0.82	6583.2	846.1	-107.27	5506.1	-0.032
1.60	-0.365	0.016	-0.82	10704.8	1247.0	-209.19	9273.2	-0.82	6582.3	845.1	-107.15	5475.0	-0.032
1.70	-0.363	0.016	-0.82	10699.3	1243.1	-208.49	9279.2	-0.82	6589.1	843.5	-107.02	5494.1	-0.032
1.80	-0.361	0.016	-0.81	10688.0	1237.4	-207.43	9283.1	-0.82	6599.9	841.5	-106.88	5523.5	-0.032
1.90	-0.359	0.016	-0.81	10674.4	1230.9	-206.21	9238.2	-0.81	6613.0	839.2	-106.73	5510.6	-0.032
2.00	-0.357	0.016	-0.81	10660.9	1224.2	-204.98	9234.1	-0.81	6627.6	837.0	-106.61	5540.0	-0.031
2.10	-0.354	0.016	-0.80	10648.1	1218.0	-203.82	9235.4	-0.81	6641.4	834.9	-106.49	5572.9	-0.031
2.20	-0.352	0.016	-0.80	10636.0	1212.5	-202.80	9192.3	-0.80	6652.7	833.0	-106.38	5558.0	-0.031
2.30	-0.350	0.015	-0.80	10626.5	1208.0	-201.97	9193.1	-0.80	6662.5	831.5	-106.29	5581.9	-0.031
2.40	-0.349	0.015	-0.80	10619.5	1204.6	-201.34	9201.2	-0.80	6670.6	830.4	-106.24	5608.1	-0.031
2.50	-0.348	0.015	-0.79	10613.5	1202.2	-200.87	9165.4	-0.80	6675.6	829.6	-106.18	5585.6	-0.030
2.60	-0.348	0.015	-0.79	10610.2	1200.6	-200.59	9173.4	-0.80	6679.5	829.1	-106.17	5602.4	-0.030
2.70	-0.347	0.015	-0.79	10608.5	1199.8	-200.44	9187.7	-0.80	6682.0	828.9	-106.17	5622.0	-0.030
2.80	-0.347	0.015	-0.79	10606.9	1199.5	-200.36	9157.2	-0.80	6682.3	828.8	-106.16	5594.1	-0.030
2.90	-0.347	0.015	-0.79	10607.1	1199.6	-200.38	9169.3	-0.80	6682.7	828.9	-106.17	5606.6	-0.030
3.00	-0.347	0.015	-0.79	10608.0	1199.9	-200.45	9186.7	-0.80	6682.6	829.1	-106.19	5623.0	-0.030
3.10	-0.347	0.015	-0.79	10607.9	1200.3	-200.52	9158.2	-0.80	6681.0	829.2	-106.19	5592.8	-0.030
3.20	-0.347	0.015	-0.79	10609.4	1200.9	-200.62	9171.8	-0.80	6680.5	829.4	-106.22	5604.1	-0.030
3.30	-0.348	0.015	-0.79	10610.8	1201.4	-200.72	9189.8	-0.80	6679.8	829.7	-106.24	5619.9	-0.030
3.40	-0.348	0.015	-0.79	10610.7	1201.8	-200.78	9161.5	-0.80	6678.0	829.7	-106.23	5589.4	-0.030
3.50	-0.348	0.015	-0.80	10612.1	1202.2	-200.87	9174.9	-0.80	6677.7	829.9	-106.25	5600.9	-0.030
3.60	-0.348	0.015	-0.80	10613.0	1202.5	-200.93	9192.6	-0.80	6677.3	830.0	-106.26	5616.9	-0.030
3.70	-0.348	0.015	-0.80	10612.9	1202.7	-200.96	9163.9	-0.80	6676.2	830.1	-106.25	5587.1	-0.030
3.80	-0.348	0.015	-0.80	10613.6	1202.9	-201.00	9176.7	-0.80	6676.1	830.1	-106.26	5598.9	-0.030
3.90	-0.348	0.015	-0.80	10614.1	1203.0	-201.02	9193.9	-0.80	6676.1	830.2	-106.27	5615.4	-0.030
4.00	-0.348	0.015	-0.80	10613.7	1203.1	-201.02	9164.9	-0.80	6675.4	830.2	-106.26	5586.1	-0.030

File Name=In.VolvoLoad

AXLE # 2

TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
0.0	0.0	0.0	0.0	8652.6	0.0	0.0	7302.5	0.0	8652.6	0.0	0.0	7302.5	0.0
0.10	-0.006	-0.000	0.01	8683.9	-7.7	1.16	7381.1	0.01	8619.8	-7.7	1.15	7222.8	0.000
0.20	-0.016	-0.000	-0.03	8745.3	33.7	-5.09	7438.5	-0.03	8559.1	33.2	-4.95	7165.5	0.001
0.30	-0.046	-0.000	-0.12	8913.9	155.6	-23.76	7549.5	-0.12	8390.1	148.6	-21.89	7052.4	0.001
0.40	-0.084	-0.000	-0.23	9128.0	307.8	-47.63	7698.7	-0.23	8174.3	282.4	-40.93	6883.4	0.002
0.50	-0.127	0.000	-0.34	9368.0	457.6	-71.82	7915.9	-0.34	7932.1	401.3	-57.10	6679.6	0.004
0.60	-0.171	0.001	-0.43	9621.2	593.9	-94.55	8181.0	-0.43	7685.6	496.9	-69.41	6453.8	0.006
0.70	-0.212	0.002	-0.50	9855.0	711.7	-114.70	8396.5	-0.50	7458.8	570.0	-78.24	6184.9	0.008
0.80	-0.247	0.005	-0.56	10045.3	808.4	-131.55	8616.8	-0.56	7257.2	623.6	-84.20	5975.3	0.010
0.90	-0.275	0.007	-0.60	10206.7	885.1	-145.17	8817.1	-0.61	7097.0	662.0	-88.16	5812.5	0.011
1.00	-0.298	0.008	-0.64	10342.1	943.7	-155.76	8941.3	-0.64	6975.2	688.6	-90.71	5640.2	0.013
1.10	-0.315	0.010	-0.66	10437.2	985.9	-163.45	9065.4	-0.66	6877.1	706.1	-92.17	5536.5	0.014
1.20	-0.327	0.011	-0.68	10503.9	1015.5	-168.85	9163.3	-0.68	6806.8	717.5	-93.04	5471.0	0.015
1.30	-0.335	0.012	-0.69	10553.3	1035.4	-172.55	9190.8	-0.69	6763.8	725.1	-93.63	5389.4	0.016
1.40	-0.340	0.013	-0.69	10581.2	1047.0	-174.70	9235.4	-0.70	6736.8	729.4	-93.93	5369.7	0.016
1.50	-0.342	0.013	-0.70	10592.7	1052.2	-175.66	9266.2	-0.70	6723.5	731.2	-94.04	5372.2	0.016
1.60	-0.342	0.013	-0.70	10594.2	1052.9	-175.78	9237.4	-0.70	6722.1	731.4	-94.06	5342.1	0.016
1.70	-0.341	0.013	-0.70	10588.4	1050.1	-175.27	9241.7	-0.70	6728.9	730.4	-93.99	5363.1	0.017
1.80	-0.339	0.014	-0.69	10577.0	1045.1	-174.34	9245.1	-0.70	6740.0	728.5	-93.84	5394.1	0.016
1.90	-0.337	0.013	-0.69	10562.9	1038.8	-173.19	9198.6	-0.69	6753.2	726.0	-93.65	5380.7	0.016
2.00	-0.334	0.013	-0.69	10548.7	1032.1	-171.97	9194.2	-0.69	6767.4	723.4	-93.44	5410.0	0.016
2.10	-0.332	0.013	-0.68	10535.5	1025.7	-170.80	9195.9	-0.69	6781.2	720.8	-93.23	5443.2	0.016
2.20	-0.330	0.013	-0.68	10522.9	1020.0	-169.74	9152.2	-0.68	6792.5	718.3	-93.02	5426.9	0.016
2.30	-0.328	0.013	-0.68	10513.2	1015.2	-168.87	9153.4	-0.68	6802.4	716.3	-92.84	5450.4	0.016
2.40	-0.327	0.013	-0.67	10505.9	1011.4	-168.19	9162.5	-0.68	6810.5	714.7	-92.71	5476.6	0.016
2.50	-0.326	0.013	-0.67	10499.5	1008.6	-167.67	9126.1	-0.68	6815.3	713.5	-92.59	5452.6	0.016
2.60	-0.325	0.013	-0.67	10495.9	1006.7	-167.33	9134.4	-0.67	6819.1	712.7	-92.52	5469.0	0.016
2.70	-0.325	0.013	-0.67	10494.2	1005.6	-167.14	9149.7	-0.67	6821.8	712.3	-92.49	5489.0	0.016
2.80	-0.325	0.012	-0.67	10492.5	1005.1	-167.04	9118.7	-0.67	6822.0	712.0	-92.45	5460.0	0.016
2.90	-0.325	0.013	-0.67	10492.7	1005.0	-167.03	9131.1	-0.67	6822.5	712.0	-92.46	5472.4	0.016
3.00	-0.325	0.013	-0.67	10493.5	1005.3	-167.08	9149.3	-0.67	6822.3	712.1	-92.47	5489.4	0.016
3.10	-0.325	0.012	-0.67	10493.6	1005.6	-167.13	9120.0	-0.67	6820.8	712.2	-92.47	5458.3	0.016
3.20	-0.325	0.013	-0.67	10494.9	1006.1	-167.23	9133.7	-0.67	6820.2	712.4	-92.50	5469.7	0.016
3.30	-0.325	0.013	-0.67	10496.4	1006.6	-167.33	9152.6	-0.67	6819.6	712.7	-92.52	5486.2	0.016
3.40	-0.325	0.012	-0.67	10496.6	1007.0	-167.40	9123.5	-0.67	6817.9	712.8	-92.53	5455.0	0.016
3.50	-0.325	0.013	-0.67	10497.8	1007.5	-167.48	9137.0	-0.68	6817.5	713.0	-92.55	5466.6	0.016
3.60	-0.326	0.013	-0.67	10498.8	1007.8	-167.54	9155.4	-0.68	6817.1	713.2	-92.57	5483.4	0.016
3.70	-0.326	0.013	-0.67	10498.7	1008.0	-167.58	9125.9	-0.68	6815.9	713.2	-92.56	5452.8	0.016
3.80	-0.326	0.013	-0.67	10499.3	1008.2	-167.62	9138.7	-0.68	6815.7	713.3	-92.58	5464.6	0.016
3.90	-0.326	0.013	-0.67	10500.0	1008.4	-167.65	9156.6	-0.68	6816.0	713.4	-92.59	5482.0	0.016
4.00	-0.326	0.013	-0.67	10499.6	1008.5	-167.65	9126.8	-0.68	6815.2	713.4	-92.58	5451.9	0.016

File Name=In.VolvoLoad

AXLE # 1

TIME (SEC)	ROLL (DEG)	BOUNCE (IN)	LEFT SIDE SLIP ANGLE (DEG)	LEFT SIDE VERTICAL LOAD (LB.)	LEFT SIDE LATERAL FORCE (LB.)	LEFT SIDE ALIGNING TORQUE (FT.LB)	LEFT SIDE SPRING FORCE (LB.)	RIGHT SIDE SLIP ANGLE (DEG)	RIGHT SIDE VERTICAL LOAD (LB.)	RIGHT SIDE LATERAL FORCE (LB.)	RIGHT SIDE ALIGNING TORQUE (FT.LB)	RIGHT SIDE SPRING FORCE (LB.)	SPECIAL STEER (DEG)
0.0	0.0	0.0	0.0	6030.1	0.0	0.0	5280.0	0.0	6030.1	0.0	0.0	5280.0	
0.10	-0.056	0.000	-0.50	6203.3	420.7	-76.91	5241.6	-0.46	5857.4	381.4	-66.56	5318.4	
0.20	-0.084	0.000	-0.66	6290.3	556.4	-103.12	5333.5	-0.61	5770.9	497.7	-86.32	5226.2	
0.30	-0.091	0.000	-0.64	6309.3	540.2	-100.43	5353.8	-0.59	5750.8	481.3	-83.35	5204.7	
0.40	-0.106	0.001	-0.67	6356.2	564.5	-105.70	5394.8	-0.62	5703.8	498.9	-86.10	5162.2	
0.50	-0.127	0.001	-0.71	6421.5	603.9	-114.21	5443.0	-0.66	5638.6	527.9	-90.65	5114.4	
0.60	-0.150	0.001	-0.76	6493.1	646.0	-123.50	5487.0	-0.71	5567.0	558.0	-95.27	5072.0	
0.70	-0.172	0.001	-0.80	6560.1	684.8	-132.21	5516.9	-0.75	5500.7	584.8	-99.32	5038.3	
0.80	-0.190	0.001	-0.84	6616.2	718.3	-139.84	5536.6	-0.79	5443.3	607.4	-102.69	5018.2	
0.90	-0.205	0.002	-0.87	6661.8	745.8	-146.14	5548.1	-0.82	5394.9	625.4	-105.30	5006.1	
1.00	-0.218	0.003	-0.89	6699.4	767.0	-151.11	5552.2	-0.84	5356.9	638.9	-107.22	4997.4	
1.10	-0.227	0.003	-0.91	6728.3	782.7	-154.85	5554.5	-0.86	5329.0	648.8	-108.62	4996.9	
1.20	-0.233	0.003	-0.92	6747.6	794.2	-157.54	5553.0	-0.87	5308.2	655.9	-109.61	4999.3	
1.30	-0.238	0.004	-0.93	6760.2	802.2	-159.42	5546.6	-0.88	5294.2	660.9	-110.31	5000.6	
1.40	-0.240	0.004	-0.94	6768.6	807.5	-160.67	5542.5	-0.88	5286.9	664.4	-110.82	5006.9	
1.50	-0.241	0.004	-0.94	6772.0	810.7	-161.38	5537.9	-0.88	5283.3	666.6	-111.15	5013.7	
1.60	-0.242	0.005	-0.94	6771.9	812.3	-161.69	5530.1	-0.89	5282.6	667.8	-111.35	5017.1	
1.70	-0.241	0.005	-0.94	6770.1	812.7	-161.72	5525.7	-0.89	5284.6	668.4	-111.46	5023.2	
1.80	-0.240	0.005	-0.94	6767.1	812.1	-161.55	5522.5	-0.89	5288.1	668.3	-111.49	5029.0	
1.90	-0.239	0.005	-0.94	6763.0	811.0	-161.22	5517.1	-0.89	5292.0	667.9	-111.45	5030.6	
2.00	-0.237	0.005	-0.94	6759.0	809.5	-160.84	5515.2	-0.88	5296.2	667.1	-111.37	5034.2	
2.10	-0.236	0.005	-0.94	6755.3	807.9	-160.43	5514.6	-0.88	5300.1	666.3	-111.26	5037.3	
2.20	-0.235	0.005	-0.94	6751.9	806.2	-160.04	5511.6	-0.88	5303.5	665.3	-111.14	5036.5	
2.30	-0.234	0.005	-0.94	6749.2	804.8	-159.69	5511.9	-0.88	5306.4	664.5	-111.03	5037.9	
2.40	-0.233	0.005	-0.93	6747.0	803.6	-159.40	5512.9	-0.88	5308.6	663.7	-110.92	5039.3	
2.50	-0.233	0.005	-0.93	6745.4	802.6	-159.16	5511.2	-0.88	5310.1	663.1	-110.83	5037.2	
2.60	-0.232	0.005	-0.93	6744.4	801.8	-158.99	5512.3	-0.88	5311.2	662.6	-110.76	5037.7	
2.70	-0.232	0.005	-0.93	6743.8	801.3	-158.88	5513.8	-0.88	5311.9	662.3	-110.71	5038.4	
2.80	-0.232	0.005	-0.93	6743.6	801.0	-158.81	5512.5	-0.87	5312.2	662.0	-110.67	5036.2	
2.90	-0.232	0.005	-0.93	6743.5	800.9	-158.78	5513.6	-0.87	5312.2	661.9	-110.65	5036.4	
3.00	-0.232	0.005	-0.93	6743.6	800.8	-158.78	5515.1	-0.87	5312.1	661.9	-110.65	5037.2	
3.10	-0.232	0.005	-0.93	6743.9	800.9	-158.79	5513.6	-0.87	5311.8	661.9	-110.64	5035.1	
3.20	-0.232	0.005	-0.93	6744.1	801.0	-158.81	5514.5	-0.87	5311.5	661.9	-110.65	5035.5	
3.30	-0.232	0.005	-0.93	6744.5	801.1	-158.85	5515.8	-0.87	5311.3	662.0	-110.66	5036.5	
3.40	-0.233	0.005	-0.93	6744.7	801.2	-158.87	5514.1	-0.88	5311.0	662.0	-110.66	5034.5	
3.50	-0.233	0.005	-0.93	6744.9	801.3	-158.90	5514.9	-0.88	5310.7	662.1	-110.67	5035.1	
3.60	-0.233	0.005	-0.93	6745.1	801.4	-158.93	5516.0	-0.88	5310.6	662.2	-110.68	5036.2	
3.70	-0.233	0.005	-0.93	6745.3	801.5	-158.94	5514.3	-0.88	5310.4	662.2	-110.69	5034.4	
3.80	-0.233	0.005	-0.93	6745.3	801.6	-158.96	5514.9	-0.88	5310.3	662.3	-110.69	5035.1	
3.90	-0.233	0.005	-0.93	6745.4	801.6	-158.98	5516.0	-0.88	5310.2	662.3	-110.70	5036.2	
4.00	-0.233	0.005	-0.93	6745.5	801.7	-158.98	5514.2	-0.88	5310.2	662.3	-110.70	5034.4	

File Name=In.VolvoLoad

CONSTRAINT FORCES
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NOTE: LATERAL FORCE ALONE IS PRINTED FOR PINTLE HOOK TYPE CONSTRAINT.
LOCATE FORCES & MOMENTS BASED ON CONSTRAINT TYPE

TIME	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
0.0	0.0	26950.2	0.0	0.0						
0.10	-46.7	26948.4	16253.6	0.0						
0.20	-333.8	26948.9	15862.8	0.0						
0.30	-813.0	26948.5	9644.3	0.0						
0.40	-1341.1	26947.9	-1024.0	0.0						
0.50	-1847.2	26934.5	-15453.1	0.0						
0.60	-2305.1	26946.6	-32332.9	0.0						
0.70	-2684.3	26947.1	-50454.1	0.0						
0.80	-2987.7	26904.5	-67860.3	0.0						
0.90	-3230.2	26897.6	-83054.9	0.0						
1.00	-3404.6	26912.4	-95562.6	0.0						
1.10	-3532.8	26889.3	-105477.9	0.0						
1.20	-3625.9	26879.7	-112848.8	0.0						
1.30	-3676.5	26889.1	-117893.3	0.0						
1.40	-3711.6	26880.3	-120956.0	0.0						
1.50	-3729.9	26878.3	-122422.6	0.0						
1.60	-3719.1	26882.3	-122715.9	0.0						
1.70	-3712.2	26877.6	-122188.4	0.0						
1.80	-3699.7	26881.4	-121144.1	0.0						
1.90	-3669.0	26884.0	-119843.8	0.0						
2.00	-3652.2	26879.3	-118474.9	0.0						
2.10	-3637.2	26885.1	-117183.8	0.0						
2.20	-3609.7	26887.3	-116058.3	0.0						
2.30	-3599.7	26881.6	-115113.8	0.0						
2.40	-3593.7	26887.4	-114380.9	0.0						
2.50	-3576.0	26889.0	-113860.5	0.0						
2.60	-3575.1	26883.1	-113499.6	0.0						
2.70	-3577.4	26888.2	-113275.0	0.0						
2.80	-3566.7	26889.6	-113181.5	0.0						
2.90	-3571.1	26883.5	-113162.3	0.0						
3.00	-3577.2	26888.3	-113192.4	0.0						
3.10	-3569.0	26889.1	-113273.9	0.0						
3.20	-3574.9	26883.4	-113357.8	0.0						
3.30	-3581.8	26888.1	-113440.9	0.0						
3.40	-3573.6	26888.8	-113542.3	0.0						
3.50	-3579.2	26883.3	-113616.3	0.0						
3.60	-3585.5	26887.8	-113673.9	0.0						
3.70	-3576.7	26889.0	-113733.1	0.0						
3.80	-3581.5	26882.8	-113767.4	0.0						
3.90	-3587.1	26887.5	-113788.6	0.0						
4.00	-3577.8	26889.0	-113812.0	0.0						

File Name=In.VolvoLoad

SPRUNG MASS # 2
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TIME (SEC)	FORWARD POSITION (IN)	LATERAL POSITION (IN)	VERTICAL POSITION (IN)	ROLL ANGLE (DEG)	YAW ANGLE (DEG)	PITCH ANGLE (DEG)	FORWARD VEL IN/SEC	LATERAL VEL IN/SEC	ROLL RATE DEG/SEC	YAW RATE DEG/SEC	PITCH RATE DEG/SEC	LATERAL ACCN. IN/SEC**2	ARTIC ANGLE DEG
0.0	-294.05	0.0	0.0	0.0	0.0	0.0	880.08	0.0	0.0	0.0	0.0	0.0	0.0
0.10	-206.04	0.00	0.000	-0.00	0.00	0.000	880.08	-0.02	-0.16	0.01	0.00	-0.18	0.02
0.20	-118.03	0.02	0.000	-0.04	0.00	0.000	880.08	-0.04	-0.54	0.09	-0.00	1.44	0.11
0.30	-30.03	0.08	0.000	-0.11	0.02	0.000	880.08	-0.00	-0.84	0.29	0.00	4.91	0.29
0.40	57.98	0.20	0.000	-0.21	0.07	0.000	880.09	0.02	-1.16	0.61	0.01	9.31	0.50
0.50	145.99	0.44	0.001	-0.34	0.15	0.000	880.10	-0.06	-1.46	1.02	0.00	13.99	0.70
0.60	234.00	0.83	0.004	-0.50	0.27	0.001	880.10	-0.30	-1.59	1.46	-0.02	19.20	0.87
0.70	322.01	1.41	0.004	-0.65	0.44	0.001	880.11	-0.68	-1.55	1.88	-0.01	24.55	1.01
0.80	410.01	2.24	0.002	-0.80	0.65	0.001	880.11	-1.16	-1.39	2.24	-0.03	29.27	1.10
0.90	498.02	3.35	0.002	-0.93	0.88	0.001	880.11	-1.69	-1.20	2.53	-0.06	33.36	1.16
1.00	586.02	4.78	0.001	-1.04	1.15	0.001	880.12	-2.23	-0.98	2.75	-0.04	37.07	1.19
1.10	674.00	6.56	-0.000	-1.13	1.43	0.001	880.12	-2.73	-0.75	2.89	-0.06	39.67	1.19
1.20	761.97	8.73	-0.001	-1.19	1.72	0.001	880.13	-3.16	-0.55	2.97	-0.08	41.54	1.19
1.30	849.93	11.31	-0.001	-1.24	2.02	0.001	880.13	-3.50	-0.37	3.00	-0.05	43.29	1.17
1.40	937.88	14.31	-0.001	-1.27	2.32	0.000	880.13	-3.76	-0.23	3.00	-0.07	44.02	1.15
1.50	1025.81	17.73	-0.002	-1.28	2.62	0.001	880.14	-3.93	-0.11	2.98	-0.08	44.30	1.13
1.60	1113.72	21.60	-0.002	-1.29	2.92	0.000	880.14	-4.03	-0.02	2.95	-0.05	44.78	1.11
1.70	1201.62	25.91	-0.002	-1.29	3.21	0.000	880.14	-4.07	0.04	2.91	-0.06	44.53	1.10
1.80	1289.49	30.66	-0.002	-1.28	3.50	0.000	880.14	-4.07	0.08	2.87	-0.08	44.11	1.08
1.90	1377.34	35.85	-0.002	-1.27	3.79	0.000	880.14	-4.04	0.10	2.84	-0.05	44.12	1.07
2.00	1465.16	41.47	-0.002	-1.26	4.07	0.000	880.14	-4.00	0.11	2.81	-0.06	43.62	1.07
2.10	1552.95	47.53	-0.002	-1.25	4.35	0.000	880.14	-3.95	0.10	2.78	-0.08	43.09	1.06
2.20	1640.71	54.03	-0.002	-1.24	4.63	0.000	880.14	-3.90	0.09	2.76	-0.05	43.11	1.06
2.30	1728.43	60.95	-0.002	-1.23	4.90	0.000	880.14	-3.86	0.07	2.75	-0.06	42.71	1.06
2.40	1816.13	68.30	-0.002	-1.23	5.18	0.000	880.14	-3.82	0.06	2.74	-0.07	42.32	1.06
2.50	1903.78	76.07	-0.002	-1.22	5.45	0.000	880.14	-3.79	0.04	2.74	-0.04	42.49	1.06
2.60	1991.40	84.27	-0.002	-1.22	5.72	0.000	880.14	-3.77	0.03	2.74	-0.06	42.24	1.06
2.70	2078.98	92.88	-0.002	-1.22	6.00	0.000	880.14	-3.75	0.02	2.73	-0.07	42.00	1.06
2.80	2166.51	101.92	-0.002	-1.22	6.27	0.000	880.14	-3.74	0.01	2.74	-0.04	42.29	1.06
2.90	2254.00	111.37	-0.002	-1.22	6.54	0.000	880.14	-3.73	0.00	2.74	-0.06	42.13	1.06
3.00	2341.44	121.24	-0.002	-1.22	6.82	0.000	880.14	-3.73	-0.00	2.74	-0.07	41.96	1.06
3.10	2428.84	131.53	-0.002	-1.22	7.09	0.000	880.14	-3.73	-0.00	2.74	-0.04	42.30	1.06
3.20	2516.19	142.24	-0.002	-1.22	7.37	0.000	880.14	-3.73	-0.01	2.75	-0.06	42.17	1.06
3.30	2603.48	153.37	-0.002	-1.22	7.64	0.000	880.14	-3.74	-0.01	2.75	-0.07	42.02	1.06
3.40	2690.72	164.91	-0.002	-1.22	7.92	0.000	880.14	-3.74	-0.01	2.75	-0.04	42.37	1.06
3.50	2777.90	176.87	-0.002	-1.22	8.19	0.000	880.14	-3.74	-0.01	2.75	-0.06	42.24	1.06
3.60	2865.02	189.25	-0.001	-1.22	8.46	0.000	880.14	-3.74	-0.01	2.75	-0.07	42.09	1.06
3.70	2952.09	202.05	-0.002	-1.22	8.74	0.000	880.14	-3.75	-0.00	2.75	-0.04	42.42	1.06
3.80	3039.09	215.26	-0.001	-1.22	9.01	0.000	880.14	-3.75	-0.00	2.75	-0.06	42.29	1.06
3.90	3126.03	228.89	-0.001	-1.22	9.29	0.000	880.14	-3.75	-0.00	2.75	-0.07	42.12	1.06
4.00	3212.90	242.94	-0.001	-1.22	9.56	0.000	880.14	-3.75	-0.00	2.75	-0.04	42.45	1.06

File Name=In.VolvoLoad

SPRUNG MASS # 1

TIME (SEC)	FORWARD POSITION (IN)	LATERAL POSITION (IN)	VERTICAL POSITION (IN)	ROLL ANGLE (DEG)	YAW ANGLE (DEG)	PITCH ANGLE (DEG)	FORWARD VEL IN/SEC	LATERAL VEL IN/SEC	ROLL RATE DEG/SEC	YAW RATE DEG/SEC	PITCH RATE DEG/SEC	LATERAL ACCN. IN/SEC**2	STEER ANGLE DEG
0.0	0.00	0.0	0.0	0.0	0.0	0.0	880.08	0.0	0.0	0.0	0.0	0.0	0.0
0.10	88.01	0.03	0.000	-0.02	0.02	-0.000	880.08	0.73	-0.27	0.47	-0.00	19.87	20.00
0.20	176.02	0.26	-0.000	-0.06	0.12	-0.000	880.08	1.72	-0.44	1.52	-0.00	25.99	28.00
0.30	264.02	0.74	-0.000	-0.12	0.31	0.000	880.08	1.31	-0.80	2.30	-0.00	26.51	28.00
0.40	352.03	1.48	-0.000	-0.21	0.56	0.000	880.08	0.17	-1.08	2.73	-0.01	28.79	28.00
0.50	440.03	2.52	-0.000	-0.33	0.85	0.000	880.08	-1.16	-1.29	2.93	-0.02	31.48	28.00
0.60	528.03	3.87	-0.000	-0.46	1.14	-0.000	880.08	-2.42	-1.39	3.00	-0.02	34.11	28.00
0.70	616.02	5.57	-0.000	-0.60	1.45	-0.001	880.08	-3.50	-1.37	3.01	-0.05	36.37	28.00
0.80	704.00	7.63	-0.001	-0.73	1.75	-0.002	880.08	-4.36	-1.24	2.99	-0.05	38.15	28.00
0.90	791.98	10.07	-0.002	-0.85	2.04	-0.003	880.08	-5.01	-1.06	2.95	-0.04	39.44	28.00
1.00	879.94	12.91	-0.002	-0.94	2.34	-0.003	880.08	-5.49	-0.86	2.91	-0.06	40.57	28.00
1.10	967.88	16.16	-0.002	-1.02	2.62	-0.004	880.08	-5.82	-0.67	2.87	-0.06	41.32	28.00
1.20	1055.80	19.82	-0.002	-1.08	2.91	-0.004	880.08	-6.05	-0.49	2.84	-0.05	41.79	28.00
1.30	1143.70	23.90	-0.003	-1.12	3.19	-0.004	880.08	-6.19	-0.33	2.82	-0.06	42.27	28.00
1.40	1231.58	28.40	-0.003	-1.15	3.47	-0.005	880.08	-6.27	-0.20	2.80	-0.06	42.50	28.00
1.50	1319.43	33.33	-0.003	-1.16	3.75	-0.005	880.08	-6.30	-0.10	2.79	-0.05	42.61	28.00
1.60	1407.27	38.68	-0.003	-1.17	4.03	-0.005	880.08	-6.30	-0.02	2.78	-0.06	42.80	28.00
1.70	1495.07	44.46	-0.004	-1.17	4.31	-0.005	880.08	-6.27	0.03	2.76	-0.06	42.79	28.00
1.80	1582.85	50.66	-0.004	-1.16	4.59	-0.005	880.08	-6.24	0.07	2.76	-0.05	42.73	28.00
1.90	1670.59	57.29	-0.004	-1.15	4.86	-0.005	880.08	-6.19	0.09	2.75	-0.06	42.78	28.00
2.00	1758.30	64.35	-0.004	-1.14	5.14	-0.004	880.08	-6.14	0.09	2.75	-0.05	42.67	28.00
2.10	1845.98	71.83	-0.004	-1.13	5.41	-0.004	880.08	-6.10	0.09	2.74	-0.05	42.54	28.00
2.20	1933.62	79.73	-0.004	-1.13	5.68	-0.004	880.08	-6.06	0.08	2.74	-0.06	42.56	28.00
2.30	2021.22	88.06	-0.004	-1.12	5.96	-0.004	880.08	-6.02	0.07	2.74	-0.05	42.44	28.00
2.40	2108.78	96.81	-0.004	-1.11	6.23	-0.004	880.08	-5.99	0.05	2.74	-0.05	42.33	28.00
2.50	2196.30	105.99	-0.004	-1.11	6.51	-0.004	880.08	-5.97	0.04	2.74	-0.06	42.37	28.00
2.60	2283.77	115.58	-0.004	-1.11	6.78	-0.004	880.08	-5.96	0.03	2.75	-0.05	42.29	28.00
2.70	2371.19	125.59	-0.004	-1.10	7.05	-0.004	880.08	-5.95	0.02	2.75	-0.05	42.21	28.00
2.80	2458.56	136.02	-0.004	-1.10	7.33	-0.004	880.08	-5.95	0.01	2.75	-0.06	42.28	28.00
2.90	2545.89	146.87	-0.004	-1.10	7.60	-0.004	880.08	-5.94	0.00	2.75	-0.05	42.23	28.00
3.00	2633.16	158.14	-0.004	-1.10	7.88	-0.004	880.08	-5.95	-0.00	2.75	-0.05	42.18	28.00
3.10	2720.37	169.82	-0.004	-1.10	8.15	-0.004	880.08	-5.95	-0.01	2.75	-0.06	42.27	28.00
3.20	2807.53	181.93	-0.004	-1.10	8.43	-0.004	880.08	-5.95	-0.01	2.75	-0.05	42.24	28.00
3.30	2894.63	194.45	-0.004	-1.10	8.70	-0.004	880.08	-5.96	-0.01	2.75	-0.05	42.19	28.00
3.40	2981.67	207.39	-0.004	-1.10	8.98	-0.004	880.08	-5.96	-0.01	2.75	-0.06	42.29	28.00
3.50	3068.65	220.74	-0.004	-1.11	9.25	-0.004	880.08	-5.96	-0.01	2.75	-0.05	42.25	28.00
3.60	3155.56	234.52	-0.004	-1.11	9.53	-0.004	880.08	-5.97	-0.00	2.75	-0.05	42.21	28.00
3.70	3242.40	248.71	-0.004	-1.11	9.80	-0.004	880.08	-5.97	-0.00	2.75	-0.06	42.31	28.00
3.80	3329.18	263.31	-0.004	-1.11	10.08	-0.004	880.08	-5.97	-0.00	2.75	-0.05	42.27	28.00
3.90	3415.88	278.33	-0.004	-1.11	10.35	-0.004	880.08	-5.97	-0.00	2.75	-0.05	42.22	28.00
4.00	3502.51	293.77	-0.004	-1.11	10.63	-0.004	880.08	-5.97	-0.00	2.75	-0.06	42.31	28.00

ALIGNING TORQUE TABLE # 1
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ALIGNING TORQUE VS. SLIP ANGLE

0.0	1.00	2.00	4.00	8.00	12.00
2000.00	336.00	528.00	660.00	444.00	252.00
3980.00	1020.00	1716.00	2256.00	1728.00	1092.00
5970.00	1764.00	3156.00	4344.00	3240.00	2184.00
7950.00	2484.00	4608.00	6720.00	5304.00	3576.00
9440.00	3000.00	5616.00	8604.00	7104.00	4620.00

CORNERING FORCE TABLE # 1
********* ***** *********

LATERAL FORCE VS. SLIP ANGLL

0.0	1.00	2.00	4.00	8.00	12.00
1983.00	356.94	634.56	1070.82	1526.91	1804.53
5967.00	835.38	1611.09	2804.49	3938.22	4355.91
9441.00	944.10	1793.79	3398.76	5192.55	5759.01

SPRING TABLE # 3
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FORCE LB	DEFLECTION INCHES
-18890.20	-3.00
-361.10	2.30
-17.96	3.00
123.95	3.50
321.56	3.73
1423.34	4.00
4549.10	4.50
8166.00	5.00
10327.50	5.25
25458.00	7.00

SPRING TABLE # 2
****** *******

FORCE LB	DEFLECTION INCHES
-37553.00	-3.00
-1115.70	2.50
1750.00	3.00
4425.00	3.50
7762.50	4.00
11575.00	4.50
15387.50	5.00
38262.50	8.00

SPRING TABLE # 1
****** *******

FORCE LB	DEFLECTION INCHES
-13145.75	-3.00
101.54	1.40
699.83	1.80
2221.74	3.00
3489.31	4.20
4906.95	5.60
5850.19	6.50
7535.27	8.00
11880.05	10.90
13741.65	12.00

File Name=In.VolvoLoad

UNIT # 2

OF AXLES ON THIS UNIT = 2

WEIGHT OF SPRUNG MASS = 57580.00 LB.

ROLL MOMENT OF INERTIA OF SPRUNG MASS = 168647.88 LB.IN.SEC**2

PITCH MOMENT OF INERTIA OF SPRUNG MASS = 3069998.00 LB.IN.SEC**2

YAW MOMENT OF INERTIA OF SPRUNG MASS = 3126683.00 LB.IN.SEC**2

HEIGHT OF SPRUNG MASS CG ABOVE GROUND = 77.15 INCHES

	AXLE # 4	AXLE # 5	AXLE #					
LOAD ON EACH AXLE (LB.)	17115.00	17115.00						
AXLE WEIGHT (LB.)	1800.00	1800.00						
AXLE ROLL M.I (LB.IN.SEC**2)	5250.00	5250.00						
X DIST FROM SP MASS CG (IN)	-136.46	-190.46						
HEIGHT OF AXLE C.G. ABOVE GROUND (INCHES)	20.00	20.00						
HEIGHT OF ROLL CENTER ABOVE GROUND (INCHES)	29.00	28.10						
HALF SPRING SPACING (IN)	19.00	19.00						
HALF TRACK - INNER TIRES (IN)	29.12	29.12						
DUAL TIRE SPACING (IN)	13.00	13.00						
STIFFNESS OF EACH TIRE (LB/IN)	4500.00	4500.00						
ROLL STEER COEFFICIENT	0.03	0.06						
AUX ROLL STIFFNESS (IN.LB/DEG)	20000.00	20000.00						
SPRING COULOMB FRICTION - PER SPRING (LB)	2395.20	2395.20						
VISCOUS DAMPING PER SPRING (LB.SEC/IN)	0.0	0.0						
SPRING TABLE #	3	3						
CORNERING FORCE TABLE #	1	1						
ALIGNING TORQUE TABLE #	1	1						

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* RTAC STUDY *
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DIRECTIONAL RESPONSE SIMULATION
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File Name=In.Volvoload

OF SPRUNG MASSES = 2

TOTAL # OF AXLES = 5

GROSS VEHICLE WEIGHT = 80900.00 LB.

FORWARD VELOCITY = 50.01 M.P.H

PEAK FRICTIONAL COEFFICIENT = 0.79

		DISTANCE AHEAD OF SPRUNG MASS C.G. (INCHES)	HEIGHT BELOW SPRUNG MASS C.G. (INCHES)	ROLL STIFFNESS (IN.LB/DEG)	TYPE OF CONSTRAINT
ARTICULATION PT # 1	ON UNIT # 1	-108.26	0.10	999999.88	1
	ON UNIT # 2	185.79	34.15		

TYPE OF CONSTRAINT : 01 CONVENTIONAL 5TH WHEEL
02 INVERTED 5TH WHEEL
03 PINTLE HOOK
04 KING PIN(RIGID IN ROLL & PITCH)

OPEN LOOP STEER INPUT
****

STEERING GEAR RATIO = 24.35

STEERING STIFFNESS (IN.LB/DEG) = 12685.00

TIE ROD STIFFNESS (IN.LB/DEG) = 40000.00

MECHANICAL TRAIL (IN) = 1.50

OF POINTS IN STEER TABLE = 5

TIME SEC	STEERING WHEEL DEGREES
0.0	0.0
0.05	10.00
0.10	20.00
0.14	28.00
10.00	28.00

File Name=In.VolvoLoad

UNIT # 1

OF AXLES ON THIS UNIT = 3

WEIGHT OF SPRUNG MASS = 13020.00 LB.

ROLL MOMENT OF INERTIA OF SPRUNG MASS = 29520.00 LB.IN.SEC**2

PITCH MOMENT OF INERTIA OF SPRUNG MASS = 182000.00 LB.IN.SEC**2

YAW MOMENT OF INERTIA OF SPRUNG MASS = 162700.00 LB.IN.SEC**2

HEIGHT OF SPRUNG MASS CG ABOVE GROUND = 43.10 INCHES

	AXLE # 1	AXLE # 2	AXLE # 3	AXLE #				
LOAD ON EACH AXLE (LB.)	12060.00	17305.00	17305.00					
AXLE WEIGHT (LB.)	1500.00	2700.00	2500.00					
AXLE ROLL M.I (LB.IN.SEC**2)	5300.00	5850.00	5780.00					
X DIST FROM SP MASS CG (IN)	39.90	-86.35	-140.35					
HEIGHT OF AXLE C.G. ABOVE GROUND (INCHES)	20.50	20.00	20.00					
HEIGHT OF ROLL CENTER ABOVE GROUND (INCHES)	17.73	33.91	34.15					
HALF SPRING SPACING (IN)	15.00	19.25	19.25					
HALF TRACK - INNER TIRES (IN)	39.25	29.50	29.50					
DUAL TIRE SPACING (IN)	0.0	13.00	13.00					
STIFFNESS OF EACH TIRE (LB/IN)	4500.00	4500.00	4500.00					
ROLL STEER COEFFICIENT	0.06	-0.02	0.04					
AUX ROLL STIFFNESS (IN.LB/DEG)	25000.00	11000.00	11000.00					
SPRING COULOMB FRICTION - PER SPRING (LB)	428.57	831.25	831.25					
VISCOUS DAMPING PER SPRING (LB.SEC/IN)	0.0	0.0	0.0					
SPRING TABLE #	1	2	2					
CORNERING FORCE TABLE #	1	1	1					
ALIGNING TORQUE TABLE #	1	1	1					