ADA003278

430

NEVADA AUTOMOTIVE TEST CENTER

Carson City

A DIVISION OF

HODGES TRANSPORTATION INC.

N.A.T.C.

TECHNICAL REPORT NO. 11969

FINAL REPORT

COMPARATIVE EVALUATION OF VEHICLE STABILITY AND HANDLING CHARACTERISTICS AS AFFECTED BY "GENERIC" TIRE MIXTURES

PREPARED FOR

TACOM

MOBILITY SYSTEMS LABORATORY

U.S. ARMY TANK AUTOMOTIVE COMMAND Warren, Michigan

Contract DAAE07-73-C-0293

NATC Project 20-17-34

October 1974

20020726081

AD A003 278

TECHNICAL REPORT NO. 11969

COMPARATIVE EVALUATION OF VEHICLE STABILITY AND HANDLING CHARACTERISTICS AS AFFECTED BY "GENERIC" TIRE MIXTURES

U.S. ARMY TANK-AUTOMOTIVE COMMAND LABORATORIES

by C. L. Barnett

HODGES TRANSPORTATION INC.

Date: October 1974

Contract: DAAE07-73-C-0293

TACOM

MOBILITY SYSTEMS LABORATORY

U.S. ARMY TANK AUTOMOTIVE COMMAND Warren, Michigan

Final Report

NATC Project 20-17-34

Contract DAAE07-73-C-0293

Table of Contents

Final Report

NATC Project 20-17-34

Contract DAAE07-73-C-0293

Table of Contents (Contd.)

Final Report

NATC Project 20-17-34

Contract DAAE07-73-C-0293

Table of Contents (Contd.)

Final Report

NATC Project 20-17-34

Contract DAAE07-73-C-0293

Table of Contents (Contd.)

ABSTRACT

Generic tire combinations were tested and evaluated on four basic vehicles; two military tactical types and two commercial types. The military vehicles were the M151, 1/4 ton, 4x4, Utility Truck, and the M35, 2 1/2 ton, 6x6, Cargo Truck. Because of the difference in the suspensions, axle structures and stability characteristics between the A-1 and A-2 series of the M151, a vehicle of each series was tested with combinations of two different radial ply tires and the standard bias ply non-directional cross-country (NDCC) tire. The M35 was tested with combinations of one radial ply tire type and the standard bias ply NDCC tire.

The commercial vehicles used to test the tire mixtures included a 2-axle School Bus of 66 children or 44 adult passenger capacity and a 5 ton Tractor-Trailer. Again, because the U. S. Army uses both 2-axle and 3-axle tractors, and both single axle and tandem axle trailers, two 5 ton tractor-trailer combinations were used.

It was definitely established that neither of the M151's could safely tolerate any mixtures of bias and radial ply tires. The other four vehicles, being heavier, more stable, and of considerably longer wheel base, could, however, perform with safety and with various degrees of steering ease when equipped with certain combinations of the generically different tire constructions.

FOREWORD

Radial ply tires have become the most discussed development in the tire industry since the introduction of the tubeless tire. As one domestic tire producer has claimed for the last several years, this is "The Radial Age."

The success and widespread use of radials in Europe prompted some of our domestic firms, some of whom were actually manufacturing radials in their European facilities, to start making them here in the United States. The installation of new building drums and accessory equipment, plus the training of personnel to make radials, was just the beginning of a tremendous outlay of money by the major U.S. tire makers. The almost immediate acceptance of the new (to this country) type tires dictated the necessity to construct entire new buildings.

At first the concentration was, and actually still is, on the manufacture of radials for passenger cars. A great many new automobiles now come with radials as original equipment or as an option. Truck-bus tires are now being made in the radial construction by the majors, but the demand for them from the commercial users is so great that the supply cannot currently meet the demand.

The U.S. Army Tank-Automotive Command tested radials versus bias ply tires in the 16-20 size on 2-1/2 ton 6x6 and 5-ton 8x8 trucks at both Army and independent test sites, and found the radials to be cost effective. For this reason, interest has been generated in bringing radials into the system in other sizes, especially the popular 7.00-16, 9.00-20 and 11.00-20 sizes for the 1/4 ton M151, the 2-1/2 ton M35, and the 5 ton M809 series trucks respectively. The Air Force tested radials on buses and certain ground support vehicles, such as refuelers, and found them very cost effective, - particularly on buses which are principally over-the-road, high mileage type vehicles.

Radial ply tires are coming into the Military system, especially by way of new buy vehicles, such as the commercial 5-ton tractors recently bought by the Army, and certain Product Improvement Programs (PIP's). The question now arises, what happens if a radial ply tire equipped vehicle needs one or more replacement tires and the only ones of the correct size and ply rating available are of the older bias ply tires? Can they be used, or would they constitute an untenable handling situation and/or a distinct safety hazard? Many warnings have been issued to the effect that radials and bias tires should not be mixed on the same vehicle, or that, if a mixture is unavoidable or is tried for any reason, the radials, being more aggressive, be placed on the rear or drive axles and the bias tires placed on the front or steering axle. In no case is a mixture on the same axle to be made.

The Army decided to test such generic tire mixes on a cross section of typical tactical and commercial vehicles. Hence this project, sponsored by the Army Tank-Automotive Command and executed by the Nevada Automotive Test Center, a division of Hodges Transportation, Inc., out of Carson City, Nevada.

ROGER KIRK
Radial Ply Tire Project Engineer
U.S. Army Tank-Automotive Command

ACKNOWLEDGEMENTS

The work reported herein was performed for the Vehicular Components and Materials Laboratory of the U. S. Army Tank Automotive Command (TACOM), Warren, Michigan under the general supervision of Mr. Roger Kirk, Radial Ply Tire Project Engineer. His help and valuable suggestions in carrying out this study is gratefully acknowledged.

The major part of the program reported herein was performed under the direction and technical monitoring of Mr. Henry C. Hodges, President and Col. John H. Davis (Ret.), Executive Vice President of Hodges Transportation Inc.

Photographic coverage, both still and motion pictures, was performed by Mr. John Nellenbach of TACOM.

AUTHOR'S BACKGROUND

The author has been involved in ride, handling, and stability studies of vehicles as affected by tires since the initiation of the two ply bias tire. Comparative studies, primarily subjective, of bias, bias-belted, and radial construction tires have been completed with many vehicles and vehicle suspension types in both heavy and light commercial service as well as off-road vehicles.

The studies have included diverse driving environments including snow, ice, wet, and dry pavement and many driving modes such as hill and curve, straight-a-way, tight cornering maneuvers, and so forth.

Comparison studies of vehicle handling characteristics as affected by tire structural methods, structural materials and rubber compounding have been performed.

DEFINITIONS OF KEY WORDS

"Generic" Tire Mixture	The concurrent mixing of radial ply and bias ply tires on the same vehicle.
Tire Combinations	Mixtures of radial ply and bias ply tires on the same vehicle.
Steering Effort	Operators force required to turn the steering wheel.
Steering Response	Tire response to operators steering input.
Vehicle Roll	Lateral roll - displacement of vehicle body.
Vehicle Pitch	Vertical movement of front and rear of vehicle body.
Vehicle Yaw	Lateral displacement of vehicle body from normal line of travel.
Cyclic Yaw	Cycling side to side lateral displacement of vehicle body.
Tire Nibble	Rate at which a tire will traverse a longitudinal pavement surface rut.
Dual Tires	Application of paired tires on axle ends.
Tandem Axles	Tandem axle means any group of two or more axles, any of which may be powered, and/or steering, whose extreme centers are spaced more than 40 in (1016 mm) apart, and which are attached one behind the other to the same vehicle and associated through a mechanism designed to provide a specific relationship between their loading.
Bogie	The driving wheel assembly consisting of the rear four wheels of a six wheel truck.
OEM	Original Equipment Manufacturer.

DEFINITIONS OF KEY WORDS (Contd.)

Vehicle Imbalance	This is a condition when transient forces felt by the driver lead to a sensation of incipient instability or handling uncertainty without actual loss of control.

1.0 BACKGROUND

It is recognized that tires of fundamentally different self-aligning torque and cornering stiffness potential cause unfavorable vehicle handling characteristics if the mismatch adversely alters the designed steering response and the designed jounce and rebound rates of the vehicle suspension system.

It is also recognized that introduction of radial ply tires to a large existing transportation system utilizing bias ply tires presents awesome logistical problems unless tires of different constructions can be combined on the same vehicle until such time as the obsolete tire supply reaches an insignificant proportion.

It is, therefore, essential to qualify the safety of combining different tire constructions on vehicles by evaluating vehicle stability (pitch, roll and yaw), vehicle handling (oversteer, understeer or neutral steer) and mode of directional recovery, as well as potential damage to the drive train; to determine whether radial ply tires can in fact, replace current bias ply tire stock orders on a one-for-one basis without serious safety and/or technical problems; or whether radial tires must make their introduction on a new line of vehicle yet to come.

2.0 OBJECTIVE

The purpose of this test was to determine whether "Generic" tire mixtures are safe under the four fundamental over-the-road operational conditions.

The term "Generic" tire mixture refers to the concurrent mixing of radial-bias and bias-radial tires on the same vehicle.

The four fundamental modes of vehicle over-the-road operation are:

(1) Lane change.

(2) "J" turns.

(3) Straight-a-way.

(4) Hill and curve.

These operations were undertaken using a selected cross-section of vehicles used by the Army, as well as other Department of Defense Agencies. Every meaningful representative inter and intra axle combination of generically different tires were tried to determine the effect on vehicle stability and handling, the mode of directional recovery, and the potential effect on drive trains. As a result of these tests, those tire mixes which were safe and those which are not for specific type vehicles were established.

3.0 SUMMARY OF TEST RESULTS

3.1 M151 Series Vehicles

Twenty-four of the forty-eight possible mixtures, including full complements of tires as listed in Summary Table No. 1, were run in this test.

Only full tire complements, or four tires of the same construction type, are safe applications on the M151A1 and M151A2 vehicles.

ımary Table No. 1

ı1 and M151A2 Vehicles

No. 1, of which 50% were utilized in this study (identified by "O" in center bold squares.

VEHICLE AXLE END

L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R
B	R_1	R_1	B	R_2	B	B	R_2	R_1	R_2	R_2	R_1	B	B	R_1	R_1	R_2	R_2
O						O						O					
B	B	R_1	R_1	R_2	R_2	B	B	R_1	R_1	R_2	R_2	R_1	B	B	R_1	B	R_2
R_1	R_1	R_1	R_1	R_2	R_2	B	B	R_1	R_1	R_2	R_2	B	B	R_1	R_1	R_2	R_2
		O				O		O		O		O					
R_1	R_2	R_1	R_1	R_2	R_1	R_1	R_1	B	B	B	B	R_2	R_2	R_2	R_2	R_1	R_1
R_1	B	R_2	B	B	R_2	R_1	R_2	R_2	R_1	B	R_1	B	R_2	R_1	B	R_2	R_2
O										O		O				O	
B	R_1	B	R_2	R_2	B	R_2	R_1	R_1	R_2	R_2	B	B	R_1	B	R_2	R_2	R_2

:ire
ɔn Tire
ɔn Tire

3.0 SUMMARY OF TEST RESULTS (Contd.)

3.2 M35 Vehicle

Five of the twelve tire mixtures including full tire complements as listed in Summary Table No. 2 are safe applications on the M35 vehicle.

One of the five tire mixtures, considered as a safe mixture, would result in drive train and/or tire damage.

Summary Table No. 2

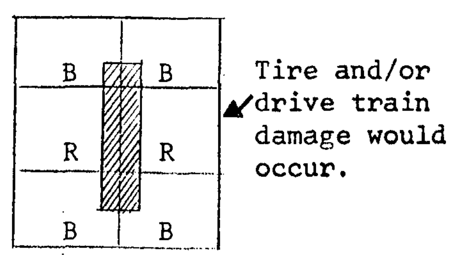
M35 Vehicle

Table No. 2 is an overall summary of the M35 vehicle - tire matrix utilized in this study. Safe bias/radial tire mixes are identified by bold squares.

VEHICLE AXLE ENDS

VEHICLE AXLE POSITION	L	R	L	R	L	R	L	R
F	B	B	B	B	R	B	B	R
C	B	B	R	R	B	B	B	B
R	B	B	B	B	B	B	B	B
F	B	B	R	R	B	B	R	B
C	B	B	B	B	R	R	B	B
R	R	B	B	B	R	R	B	R
F	B	B	R	B	B	B	R	R
C	B	B	R	R	B	B	R	R
R	B	R	R	R	R	R	R	R

F - Front Axle, steering
C - Center Axle, driving
R - Rear Axle, driving
L - Left axle end
R - Right axle end
B - Bias construction tires
R - Radial construction tires



Dual tire application center and rear drive axles.

3.0 SUMMARY OF TEST RESULTS (Contd.)

3.3 School Bus

Four of the twelve tire mixtures including full tire complements as listed in Summary Table No. 3 are safe applications on the School Bus.

Summary Table No. 3

School Bus

Table No. 3 is an overall summary of the School Bus vehicle - tire matrix, utilized in this study. Safe bias/radial tire mixes are identified by bold squares.

VEHICLE AXLE END

VEHICLE AXLE POSITION	LEFT		RIGHT		LEFT		RIGHT		LEFT		RIGHT		LEFT		RIGHT	
	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In
F	B		B		R		B		B		R		B		B	
R	B	B	B	B	B	B	B	B	B	B	B	B	R	B	B	B
F	B		B		R		R		B		B		B		B	
R	B	B	R	B	B	B	B	B	R	R	R	R	R	R	B	B
F	B		B		R		B		R		B		R		R	
R	B	B	R	R	B	B	R	R	R	R	R	R	R	R	R	R

F - Front axle
R - Rear axle

Out - Outer tire of duals
In - Inner tire of duals

B - Bias construction tire
R - Radial construction tire

3.0 SUMMARY OF TEST RESULTS (Contd.)

3.4 Tractor-Trailer Unit

Five of the twelve tire mixtures including full tire complements as listed in Summary Table No. 4 are safe applications on the Tractor-Trailer Unit.

Summary Table No. 4

Tractor-Trailer Unit

Table No. 4 is an overall summary of the tractor-trailer tire matrix utilized in this study. Safe bias/radial tire mixes are identified by bold squares.

VEHICLE AXLE ENDS

VEHICLE AXLE POSITIONS	L	R	L	R	L	R	L	R
F	B	B	B	B	R	B	B	R
C	B	B	B	B	B	B	B	B
R	B	B	R	R	B	B	B	B
F	B	B	R	R	B	B	B	B
C	R	B	B	B	R	R	B	R
R	B	B	B	B	R	R	B	B
F	R	B	B	B	B	B	R	R
C	B	R	B	B	B	B	R	R
R	B	B	R	B	B	R	R	R

F - Front axle, steering
C - Center axle, driving
R - Rear axle, trailer
L - Left axle end
R - Right axle end

B - Bias construction tires.
R - Radial construction tires.

Dual tire application, (center) drive and trailer (rear) axles.

3.0 SUMMARY OF TEST RESULTS (Contd.)

3.5 Three Axle Tractor, Tandem Axle Trailer

Seven of the eight tire mixtures including full tire complements as listed in Summary Table No. 5 are safe applications by axle positions on the Three Axle Tractor, Tandem Axle Trailer Unit.

The full complement of radial construction type tires was run with fifth wheel-king pin position two and six inches forward of drive bogie center and at 75 and 95 psig cold starting tire inflation pressures but did not affect safe handling characteristics of the vehicle.

Summary Table No. 5

Three Axle Tractor, Tandem Axle Trailer

Table No. 5 is an overall summary of the tractor-trailer tire matrix utilized in this study. Safe bias/radial tire mixtures by axle and bogies are identified by bold squares.

VEHICLE AXLE ENDS

VEHICLE AXLE/BOGIES	L	R	L	R	L	R	L	R
F	B	B	R	R	B	B	B	B
D	B	B	R	R	B	B	R	R
T	B	B	B	B	R	R	R	R
F	R	R	B	B	R	R	R	R
D	B	B	R	R	R	R	B	B
T	B	B	B	B	R	R	R	R

F - Front Axle
D - Tractor Drive Bogies
T - Trailer Bogies
L - Left Axle End
R - Right Axle End

B - Bias construction tires
R - Radial construction tires

Dual tire application, all axles except tractor front axle.

4.0 CONCLUSIONS

It is concluded that:

Bias and radial tires cannot be safely mixed on the M151A1 vehicle.

Bias and radial tires cannot be safely mixed on the M151A2 vehicle.

Bias and radial tires can be safely mixed by axles on the M35 vehicle.

Damage to the tires and/or drive train will occur with mixed tires on the drive axles of the M35 vehicle.

Bias and radial tires can be safely mixed by axles on the school bus.

Bias and radial tires can be safely mixed by axles on the commercial two axle/single axle trailer vehicle.

Bias and radial tires can be safely mixed by bogie axles on the commercial three axle tractor, tandem axle trailer vehicle.

Increased tire inflation affects handling and stability characteristics but does not affect safety on the three axle tractor, tandem axle trailer vehicle.

Trailer king pin position (location of king pin and fifth wheel in relation to centerline of drive axle or rear bogie) provides better handling and vehicle stability when two inches ahead of centerline as compared to a six inch forward location on the three axle tractor, tandem axle trailer vehicle.

Bias and radial tires cannot be safely mixed on vehicle axle ends.

Bias and radial tires cannot be safely mixed as dual application on vehicle axle ends.

Radial tires of different constructions and materials, i.e., Radial I and Radial II constructions, cannot be mixed on the M151A1 and M151A2 vehicle.

5.0 RECOMMENDATIONS

It is recommended that:

A handling and stability characteristics study be performed with the school bus and tractor-trailer vehicles with partial load configurations to determine the affect of load distribution.

A study of steering input time, comparing bias and radial tires in high speed cornering maneuvers be performed.

A study of steering input force requirement, comparing bias and radial tires in high speed cornering maneuvers be performed.

A study of bias and radial tire lateral roll displacement and rate of lateral displacement be performed.

A further study of vehicle handling and stability characteristics as affected by radial tire structural materials be performed (common tread design on differing carcass construction materials).

A study of vehicle handling characteristics be performed in pliable soils with the safe tire combinations as identified in this report.

A study of forces generated at trailer king pin of articulating vehicles be performed for better understanding of handling and stability characteristics.

6.0 SCOPE OF WORK

6.1 Lane Change Maneuver

The lane change (passing simulation) and return maneuvers were run with each loaded test vehicle and each tire combination over a level paved asphalt skid pad located at the Nevada Automotive Test Center Proving Grounds.

The test course was outlined with pylons to maintain a predetermined 10 foot width, 100 foot recovery lane after simulated pull out through an opening at 45 degrees angle and a simulated pull back through an opening at 45 degrees angle with another recovery lane 50 feet in length. The lane change 10 foot width was adjusted for wheel counters which increased overall vehicle width, and the lane change openings were enlarged for each of the larger vehicles, generally to 197 percent of wheelbase or the minimum opening requirement which would allow lane change negotiations at a vehicle speed of 5 miles per hour. A diagram of the lane change is found in Appendix I.

Visual read-out data, vehicle speed, steering angle and lateral accelerations as well as yaw measurements, were recorded for each pass through the lane change course. Initial test speed of 5 miles per hour with all vehicles and tire combinations was increased by 5 mile per hour increments until near control limit, at which time speed was increased by 2 mile per hour increments until control loss was confirmed. Recorded lane change data is in Appendix II.

Safe tire combinations for each vehicle were subjectively determined with the aid of instrument data and were run through the lane change course over wet pavement and at vehicle curb weight.

6.0 SCOPE OF WORK (Contd.)

6.2 "J" Turn Maneuver

The "J" turn and recovery was run with each loaded test vehicle and each tire combination over a level paved asphalt skid pad located at the Nevada Automotive Test Center Proving Grounds. The 120 degree "J" turn with an 80 foot radius and recovery area was identified with a paint mark on the pavement surface. A diagram of the "J" turn test course appears in Appendix I.

Visual read-out data, vehicle speed, steering angle and lateral accelerations as well as yaw measurements, were recorded for each pass through the "J" turn course. Initial test speed of 5 miles per hour with all vehicles and tire combinations was increased by 5 mile per hour increments until near control limit, at which time speed was increased by 2 mile per hour increments until control loss was confirmed. Recorded "J" turn test data is found in Appendix II.

Safe tire combinations for each vehicle were subjectively determined with the aid of instrument data and were run through the "J" turn test course with the vehicle at curb weight.

6.0 SCOPE OF WORK (Contd.)

6.3 Straight-a-way Driving Mode

A majority of the safe tire combinations, as determined by the lane change and "J" turn maneuvers were subjected to straight-a-way and hill and curve driving modes to verify that handling and stability characteristics were satisfactory during such vehicle operations.

The straight-a-way driving mode test course, located on U. S. Highway 50 east of Carson City, Nevada, was a 14 foot wide crowned paved surface highway with approximately 2° slope from centerline to pavement edge, minor surface undulations, and shallow longitudinal ruts.

Visual read-out data, steering degrees, wheel revolutions, vehicle speed, time, steering force required to make correction and number of steering corrections were recorded over two 3 mile sections of the course. Recorded straight-a-way driving mode data is found in Appendix II.

On a paved test course a subjective analysis was made by comparison between tire combinations of each vehicle as to tire nibble, vehicle roll, pitch and yaw and general handling and stability characteristics. Vehicle speed was increased to 60/65 miles per hour for a short period of time and a lane change was executed to confirm vehicle stability at the higher speed.

6.0 SCOPE OF WORK (Contd.)

6.4 Hill and Curve Course

The hill and curve course, located on State Highway No. 17 east of Carson City, Nevada, was run with a majority of the safe tire combinations as determined by the lane change and "J" turn maneuvers. The course was a 12 foot wide paved surface highway, 8 miles in length, with variable radius curves and grades to 8%. Visual read-out data, maximum steering degrees, wheel revolutions, vehicle speed and time were recorded over a 5.2 mile section of the course both up and down hill. Recorded hill and curve data is found in Appendix II.

Speed over the course was limited by vehicle load and/or engine horsepower up hill and by vehicle engine and service brake capabilities down hill.

A subjective analysis was made by comparison between tire combinations of each vehicle as to general handling characteristics with emphasis on any handling anomaly which would alter safe operation.

6.0 SCOPE OF WORK (Contd.)

6.5 Tire Combinations (Mixtures)

Vehicle/tire type/position matrices of the tire mixtures were given combination numbers for quick references. (See following page.)

6.0 SCOPE OF WORK (Contd.)

6.5 Tire Combinations (Mixtures) (Contd.)

6.5.1 Tire Matrix of M151A1 and M151A2 Vehicles

Comb. No.	Vehicle Wheel Positions			
	Left Front	Right Front	Left Rear	Right Rear
1	Bias	Bias	Bias	Bias
2	Radial #I	Radial #I	Radial #I	Radial #I
3	Radial #II	Radial #II	Radial #II	Radial #II
4	Radial #I	Bias	Bias	Bias
5	Bias	Radial #I	Bias	Bias
6	Bias	Bias	Radial #I	Bias
7	Bias	Bias	Bias	Radial #I
8	Radial #I	Radial #I	Bias	Bias
9	Bias	Bias	Radial #I	Radial #I
10	Radial #I	Bias	Bias	Radial #I
11	Bias	Radial #I	Radial #I	Bias
12	Radial #I	Bias	Radial #I	Bias
13	Radial #I	Radial #I	Radial #I	Bias
14	Radial #II	Bias	Bias	Bias
15	Bias	Radial #II	Bias	Bias
16	Bias	Bias	Radial #II	Bias
17	Bias	Bias	Bias	Radial #II
18	Radial #I	Radial #II	Bias	Bias
19	Bias	Radial #I	Radial #II	Bias
20	Bias	Bias	Radial #I	Radial #II
21	Bias	Radial #II	Bias	Radial #I
22	Radial #II	Radial #II	Bias	Bias
23	Bias	Bias	Radial #II	Radial #II
24	Radial #II	Bias	Radial #II	Bias

6.0 SCOPE OF WORK (Contd.)

6.5 Tire Combinations (Mixtures) (Contd.)

6.5.2 Tire Matrix of M35 Vehicle

Comb. No.	Vehicle Wheel Positions: Left Front	Right Front	Left Center	Right Center	Left Rear	Right Rear
1	(R)	B	BB	BB	BB	BB
2	B	(R)	BB	BB	BB	BB
3	(R)	(R)	BB	BB	BB	BB
4	B	B	BB	BB	(RR)	BB
5	B	B	BB	BB	BB	(RR)
6	B	B	BB	BB	(RR)	(RR)
7	B	B	(RR)	(RR)	BB	BB
8	(R)	B	BB	BB	BB	(RR)
9	B	B	(RR)	(RR)	(RR)	(RR)
10	B	B	BB	BB	BB	BB
11	(R)	(R)	(RR)	(RR)	(RR)	(RR)
12	(R)	B	(RR)	(RR)	(RR)	(RR)

B - Bias construction tires.
(R) - Radial construction tires.
BB/(RR) - Dual tire application.

6.0 SCOPE OF WORK (Contd.)

6.5 Tire Combinations (Mixtures) (Contd.)

6.5.3 Tire Matrix of School Bus

Comb. No.	Vehicle Wheel Positions					
	Left Front	Right Front	Left Rear		Right Rear	
			Out	In	Out	In
1	(R)	B	B	B	B	B
2	B	(R)	B	B	B	B
3	B	B	(R)	B	B	B
4	B	B	B	B	(R)	B
5	B	B	(R)	(R)	B	B
6	B	B	(R)	(R)	(R)	(R)
7	B	B	B	B	(R)	(R)
8	(R)	(R)	B	B	B	B
9	(R)	B	B	B	(R)	(R)
10	B	B	B	B	B	B
11	(R)	(R)	(R)	(R)	(R)	(R)
12	(R)	B	(R)	(R)	(R)	(R)

B - Bias construction tires.
(R) - Radial construction tires.

6.0 SCOPE OF WORK (Contd.)

6.5 Tire Combinations (Mixtures) (Contd.)

6.5.4 Tire Matrix of Two Axle Tractor/Single Axle Trailer Unit

	Vehicle Wheel Positions									
	Left Front	Right Front	Left Drive		Right Drive		Left Trailer		Right Trailer	
Comb. No.			Out	In	Out	In	Out	In	Out	In
1	(R)	B	B	B	B	B	B	B	B	B
2	B	(R)	B	B	B	B	B	B	B	B
3	(R)	(R)	B	B	B	B	B	B	B	B
4	B	B	(R)	(R)	B	B	B	B	B	B
5	B	B	B	B	(R)	(R)	B	B	B	B
6	(R)	B	B	B	(R)	(R)	B	B	B	B
7	B	B	B	B	B	B	(R)	(R)	B	B
8	B	B	B	B	B	B	B	B	(R)	(R)
9	B	B	B	B	B	B	(R)	(R)	(R)	(R)
10	B	B	(R)	(R)	(R)	(R)	(R)	(R)	(R)	(R)
11	B	B	B	B	B	B	B	B	B	B
12	(R)	(R)	(R)	(R)	(R)	(R)	(R)	(R)	(R)	(R)

B - Bias construction tires.
(R) - Radial construction tires.

6.0 SCOPE OF WORK (Contd.)

6.5 Tire Combinations (Mixtures) (Contd.)

6.5.5 Tire Matrix of Three Axle Tractor, Tandem Axle Trailer

Comb. No.	Front Axle	Drive Axle Bogie	Trailer Tandem Axle	Vehicle	King Pin Position	Infl. Press. psig
1	Bias	Bias	Bias	--	--	--
2	Radial	Bias	Bias	--	--	--
3	Radial	Radial	Bias	--	--	--
4	Bias	Radial	Bias	--	--	--
5	Bias	Bias	Radial	--	--	--
6	Radial	Radial	Radial	--	--	--
7	Bias	Radial	Radial	--	--	--
8	Radial	Bias	Radial	--	--	--
6A	Radial	Radial	Radial	Loaded	6 inches	75
6B	Radial	Radial	Radial	Loaded	2 inches	95
6C	Radial	Radial	Radial	Loaded	6 inches	95
6D	Radial	Radial	Radial	Empty	2 inches	95
6E	Radial	Radial	Radial	Empty	6 inches	95
6F	Radial	Radial	Radial	Empty	2 inches	75
6G	Radial	Radial	Radial	Empty	6 inches	75

All tires mounted as duals.

6.0 SCOPE OF WORK (Contd.)

6.6 Test Preparation, Tires

Tires were received, mounted on appropriate rims and the outside diameter at tread center measured and recorded 24 hours after mounting and inflation. Outside diameter measurements are located in Appendix II.

Tires were letter coded for ready identification as to tire construction and numbered in numerical sequence to assure that the tires maintained the same vehicle wheel position throughout the test duration during the many tire changes required for the mixture matrix.

Predetermined wheel positions by tire numbers were maintained as follows:

M151A1 and M151A2 Vehicles

Wheel Pos.:	Left Front	Right Front	Left Rear	Right Rear
Tire Nos.:	1	2	3	4

M35 Vehicle

	Front Axle		Center Axle				Rear Axle			
			Left		Right		Left		Right	
Wheel Pos:	Left	Right	In	Out	In	Out	In	Out	In	Out
Tire Nos.:	1	2	3	4	5	6	7	8	9	10

School Bus

	Front Axle		Rear Axle			
			Left		Right	
Wheel Pos.:	Left	Right	In	Out	In	Out
Tire Nos.:	1	2	3	4	5	6

6.0 SCOPE OF WORK (Contd.)

6.6 Test Preparation, Tires (Contd.)

Two Axle Tractor, Single Axle Trailer

	Front Axle		Drive Axle				Trailer Axle			
			Left		Right		Left		Right	
Wheel Pos.:	Left	Right	In	Out	In	Out	In	Out	In	Out
Tire Nos.:	1	2	3	4	5	6	7	8	9	10

Three Axle Tractor, Tandem Axle Trailer

	Tractor									
			Front Drive Axle				Rear Axle Drive			
	Front Axle		Left		Right		Left		Right	
Wheel Pos.:	Left	Right	In	Out	In	Out	In	Out	In	Out
Tire Nos.:	1	2	3	4	5	6	7	8	9	10

	Trailer							
	Front Axle				Rear Axle			
	Left		Right		Left		Right	
Wheel Pos.	In	Out	In	Out	In	Out	In	Out
Tire Nos.:	11	12	13	14	15	16	17	18

7.0 DESCRIPTION OF MATERIELS AND EQUIPMENT

7.1 Tires

7.1.1 M151A1 and M151A2 Vehicles

7.1.1.1 Bias construction, nylon reinforcing material, 6 ply rated, 12 each, military NDCC tread design, tube type, Mohawk Chief Brand, 7.00-16.

7.1.1.2 Radial I construction, radial ply, polyester carcass and steel belt reinforcing material, 8 ply rated, 12 each, off-road tread design (deeply notched center rib with rectangular shaped lugs positioned diagonally at tread shoulders), tube type, Goodyear Traction Flexsteel Brand, 7.00R16.

7.1.1.3 Radial II construction, steel radial ply and belt reinforcing material, 10 ply rated, 12 each, 4 rib highway tread design, tube type, Michelin XC Brand, 7.00R-16.

7.1.2 M35 Vehicle

7.1.2.1 Bias construction, nylon reinforcing material, 8 ply rated, 20 each, military NDCC tread design, tube type, Cooper Brand, 9.00-20.

7.1.2.2 Radial construction, steel radial ply and belt reinforcing material, 12 ply rated, 20 each, off-road tread design (deeply notched center rib with rectangular shaped lugs positioned at tread shoulders), tube type, Goodyear Traction Unisteel Brand, 9.00R20.

7.0 DESCRIPTION OF MATERIELS AND EQUIPMENT (Contd.)

7.1 Tires (Contd.)

7.1.3 School Bus

7.1.3.1 Bias construction, nylon reinforcing material, 12 ply rated, 12 each, 3 rib commercial highway tread design, tube type, Firestone Transport I brand, 8.25-20.

7.1.3.2 Radial construction, steel radial ply and belt reinforcing material, 12 ply rated, 12 each, 5 rib (3 primary ribs), commercial highway tread design, tube type, Firestone Transteel brand, 8.25R20.

7.1.4 Two Axle/Single Axle Trailer and Three Axle/Tandem Axle Trailer Vehicles

7.1.4.1 Bias construction, nylon reinforcing material, 14 ply rated, 20 each, 3 rib commerical highway tread design, tube type, Firestone Transport brand, 10.00-20.

7.1.4.2 Radial construction, steel radial ply and belt reinforcing material, 14 ply rated, 20 each, 5 rib (3 primary ribs) commercial highway tread design, tube type, Firestone Transteel brand, 10.00R20.

7.0 DESCRIPTION OF MATERIELS AND EQUIPMENT (Contd.)

7.2 Vehicles

7.2.1 Truck, Utility, 4x4, 1/4 Ton, M151A1

7.00-16 OEM tires, 16 inch by 4 1/2 inch rims, 3600 pounds gross vehicle weight, highway rated load, 2400 pounds curb weight, 85 inch wheelbase.

7.2.2 Truck, Utility, 4x4, 1/4 Ton, M151A2

7.00-16 OEM tires, 16 inch by 4 1/2 inch rims, 3600 pounds gross vehicle weight, highway rated load, 2400 pounds curb weight, 85 inch wheelbase.

7.2.3 Truck, Cargo, 6x6, 2 1/2 Ton, M35

9.00-20 dual OEM tires, 20 inch by 7.5 rims, 23,380 pounds gross vehicle weight, highway rated load, 12,465 pounds curb weight, 178 inch wheelbase (130 inches front to center axle, 48 inches center to rear axle).

7.2.4 School Bus

Forty-four adult or 66 children occupants (plus operator) seating capacity, 4 by 2 commerical, 8.25-20 OEM tires, 20 inch by 7.5 inch rims, 20,000 pounds gross vehicle weight, highway rated load, 12,630 pounds curb weight, 247 inch wheelbase.

7.2.5 Tractor, 4x2 Commercial

10.00-20 dual OEM tires, 20 inch by 7.5 inch rims, 120 inch wheelbase with commercial 27 foot enclosed cargo body, single axle, semi-trailer, 10.00-20 dual OEM tires, 20 inch by 7.5 inch rims. Tractor/ trailer unit wheelbase 378 inches, rated 40,000 pounds gross vehicle weight, 19,040 pounds curb weight. Drive axle to trailer wheel base 258 inches with trailer king pin over drive axle.

7.0 DESCRIPTION OF MATERIELS AND EQUIPMENT (Contd.)

7.2 Vehicles (Contd.)

7.2.6 Tractor, 6x4 Commercial

10.00-20 dual OEM tires, 20 inch by 7.5 inch rims, 143 inch wheelbase (front axle to bogie center) with 40 foot cargo flat bed, tandem axle semi-trailer, 10.00-20 dual OEM tires, 20 inch by 7.5 inch rims. Tractor/trailer unit wheelbase 537 1/2 inches (tractor front axle to trailer bogie center) and 615 inches overall vehicle length, rated 76,800 pounds gross vehicle weight, 24,380 pounds curb weight. Trailer king pin to center of tandem 399 inches. Multiple trailer king pin positions were utilized in this study.

7.0 DESCRIPTION OF MATERIELS AND EQUIPMENT (Contd.)

7.3 Test Instrumentation

7.3.1 Fifth Wheel Assembly

HTI No. B04 generator connected to Simpson voltmeter for visual read-out of speed, calibrated daily in miles per hour.

7.3.2 Two Heber Stopwatches

Time increments in hours, minutes, seconds and tenths of seconds.

7.3.3 Marker System

HTI yaw displacement system No. 2.

7.3.4 Steering Degree System

Position transducer 19.07 mv/v/in positioned and connected to steering linkage with digital multimeter Model 7004 OHM meter for visual read-out. OHM to degree calibration by degree plates of Bear Teleliner.

7.3.5 Gauge, Steering Effort

Inch/pound increments.

7.0 DESCRIPTION OF MATERIELS AND EQUIPMENT (Contd.)

7.3 Test Instrumentation (Contd.)

7.3.6 Gauge, Free Zero Pressure

Calibrated Dill tire test gauge.

7.3.7 Loadometers

Two pairs for vehicle weight.

7.3.8 Calipers

HTI Rigid, for footprint length.

7.3.9 Wheel Revolution Counters, 2

One Lobe distributor, 110 volts, with HTI manifold. 110 volt portable generator, gasoline engine powered.

7.3.10 Accelerometer

No. MK25, .01 'g' increments positioned in vehicle for lateral force accelerations.

8.0 DISCUSSION

8.1 Vehicle Handling and Stability Characteristics

8.1.1 M151A1 Vehicle

The M151A1 vehicle handling characteristics are acceptable (subjectively rated) with full complements of Bias, Radial I, and Radial II tires applied. The vehicle is susceptible to body roll, pitch and yaw due to suspension design with any full complement of tires, but is made noticeable with the higher cornering force Radial II tires. By comparison, with a full complement of Radial I tires, body roll, pitch, and yaw is subjectively rated between the Bias and Radial II tires. The Project Director's subjective preference between Bias, Radial I or Radial II tire installations on the M151A1 vehicle is the bias construction.

Vehicle oversteer conditions exist when Radial I and Radial II tires are applied on the front axle with Bias tires on the rear axle. The condition is more pronounced with Radial II tires on the front axle.

Vehicle understeer conditions exist with Bias tires on the front axle and Radial I and Radial II tires on the rear axle. Differences in understeer condition are not noticeable between the Radial I and Radial II tires.

8.0 DISCUSSION (Contd.)

8.1 Vehicle Handling and Stability Characteristics (Contd.)

8.1.1 M151A1 Vehicle (Contd.)

Application of a single radial tire with three bias tires or a single bias tire with three radial tires on either end of either axle institutes a vehicle balance problem, i.e., differences to left and right steering input requirement, steering response time and different cornering capability. Also affecting vehicle balalnce with the afore mentioned tire mixtures is yaw displacement difference in tire constructions.

The afore mentioned handling and stability characteristics were noted in three of the four fundamental driving modes. The straight-a-way driving mode, with the one tire replacement or two tire replacement when on different axles and different axle ends generate a cyclic yaw condition which is not safe in the high speed lane change maneuver.

8.0 DISCUSSION (Contd.)

8.1 Vehicle Handling and Stability Characteristics (Contd.)

8.1.2 M151A2 Vehicle

The M151A2 vehicle handling characteristics are acceptable (subjectively rated safe) with full complements of Bias, Radial I, and Radial II tires applied. By comparison to the M151A1 vehicle, body roll, pitch, and yaw of the M151A2 vehicle is noticeably less with all three full complement tire combinations (Bias, Radial I, and Radial II). The Project Director's subjective preference as to Bias, Radial I or Radial II tire installations on the M151A2 vehicle is the Radial I corstruction. The higher disciplined and responsive Radial I construction tire as compared to the Bias tires allows more precise vehicle control but does not produce as much vehicle body roll as the Radial II tires, possibly due to tread design which may reduce cornering force.

Vehicle oversteer and understeer conditions, when tires of different constructions are applied by axles, are present with the M151A2 vehicle but the conditions are not so severe as with the M151A1 vehicle.

The same vehicle balance problem exists with the M151A2 vehicle as with the M151A1 vehicle when single or diagonal two tire replacements are applied on the vehicle, but to a lesser degree.

Handling and stability characteristics of the M151A2 vehicle are prevelent in the straight-away driving mode and high speed maneuver as with the M151A1 vehicle, but to a lesser amount.

8.0 DISCUSSION (Contd.)

8.1 Vehicle Handling and Stability Characteristics (Contd.)

8.1.3 M35 Vehicle

Five tire combinations are acceptable (subjectively rated safe) when applied on the M35 vehicle (reference Summary Table No. 2) but one of the five combinations will cause damage to the vehicle drive train and/or tires due to differences in the tire rolling radius with the bias and radial construction tires utilized in this study. Tire replacements, either bias or radial construction, can be applied to the front axle or drive bogie only.

Vehicle response to steering input, with either bias or radial tire mixes applied to either front axle or drive bogie is slow with the relatively short wheelbase vehicle. The vehicle is more responsive when operated at curb weight.

Application of a single replacement tire, either bias or radial construction, on either end of the front axle or as dual replacements within the four drive train axle ends causes a vehicle imbalance. It is believed the imbalance condition is caused by differences in cornering tractive effort of the tires, lack of vehicle response to steering, and the possible increase or decrease in steering effort (force required for steering input by the vehicle operator) requirement.

The same conditions as mentioned above exist in all four fundamental modes of vehicle operation.

8.0 DISCUSSION (Contd.)

8.1 Vehicle Handling and Stability Characteristics (Contd.)

8.1.4 School Bus

Four combinations are acceptable (subjectively rated safe) when applied on the school bus (reference Summary Table No. 3). Replacement tires, either bias or radial, can be applied by axles, either front or rear. A bias and a radial tire cannot be applied on the rear axle ends as dual application.

Understeer and oversteer of the vehicle as affected by different tire constructions is minor when tires of the same construction are applied in pairs on the front axle.

When the school bus is operated at curb weight or full load in the four basic modes of operation yaw displacement is high for any of the acceptable tire combinations. The radial tires allow more yaw displacement than the bias tires but it is still acceptable from a stability and control viewpoint. When making high speed lane changes with both radial and bias tires the yaw displacement is severe and causes an abnormal oversteer condition.

The Project Director's subjective preference as to tire combination is radial on front axle and bias on rear axle which allows quick vehicle response to the operator's steering input. Effect of partial loading, i.e., one half of load capacity behind rear axle, could change handling and stability characteristics to a marked degree.

Application of either bias or radial replacement tires to either front or rear axle ends produces an imbalance in vehicle stability and cyclic yaw. Mixtures of bias and radial tires as dual application on either end of the rear axle also produces an imblance and cyclic yaw.

8.1.5 Two Axle Tractor, Single Axle Trailer Unit

Five tire combinations of the twelve mixtures of bias and radial tire constructions utilized in this test are acceptable (subjectively rated safe) when applied on the two axle tractor/single axle trailer articulating vehicle. Replacment tires, either bias or radial construction must be applied by axles, i.e., both ends of any axle whether a single or dual tire application.

Application of steering axle bias tires with radial tires on all other axles and steering axle radial tires with bias tires on all other axles, changes vehicle handling characteristics but not vehicle stability. Steering input degrees and steering input response as affected by bias versus radial tire constructions does not affect safe handling characteristics, both are rated safe.

Application of bias or radial tire replacements on axle ends, either steering, drive or trailer axles causes steering, vehicle and yaw imbalance.

8.0 DISCUSSION (Contd.)

8.1 Vehicle Handling and Stability Characteristics (Contd.)

8.1.6 Three Axle Tractor, Tandem Axle Trailer Unit

It was determined in the handling and stability studies of the school bus, M35 and two axle tractor, single axle trailer vehicles that:

1) Bias and radial tires should not be mixed as dual applications.
2) Tires should not be mixed on axle ends.
3) Tires should not be mixed within bogie or tandem axles.
4) Tire generated imbalance of articulating vehicles tends to be more severe.

Therefore, tire mixtures were applied by front axle and tractor/trailer tandems on the relatively short wheelbase three axle tractor and relatively long wheelbase tandem axle trailer. The study was directed primarily at adverse handling characteristics as caused by radial tire inflation pressure changes and trailer king pin position of the articulating vehicle.

Prior to initiation of the handling study of this vehicle an air operated sliding fifth wheel was mounted on the tractor for quick trailer king pin positioning at two and six inches, i.e., position of trailer fifth wheel coupling in relation to tractor drive axle bogie centerline. A photograph with white stripes marking bogie center, trailer king pin position of two inches and a relative six inch position is in Appendix III.

The study was conducted with the vehicle at both loaded and curb weight in the dry pavement lane change and "J" turn maneuvers. Individual run data is located in Appendix II.

8.0 DISCUSSION (Contd.)

8.1 Vehicle Handling and Stability Characteristics (Contd.)

8.1.6 Three Axle Tractor, Tandem Axle Trailer Unit (Contd.)

Seven of the eight tire combinations utilized in this test are acceptable (subjectively rated safe) when applied on the three axle tractor, tandem axle trailer unit at 75 psi and 95 psi radial tire inflation pressures and at two and six inch trailer king pin position settings.

The eighth tire combination, bias construction mounted on the tractor drive bogie with radial construction tires mounted on the tractor steering axle and trailer tandem axles causes oversteer and excessive yaw of the tractor drive bogie.

Increased tire inflation pressure, from 75 to 95 psi (cold starting) and a full complement of radial construction tires, with a loaded and curb weight vehicle, reduces steering input effort (subjectively rated), which allows faster lane change maneuvers, and the trailer king pin position in relation to tractor drive axle bogie center affects handling and stability characteristics but are considered acceptable (subjectively rated safe).

8.0 DISCUSSION (Contd.)

8.1 Vehicle Handling and Stability Characteristics (Contd.)

8.1.6 Three Axle Tractor, Tandem Axle Trailer Unit (Contd.)

During the trailer king pin position study, with different tire inflation pressures and with vehicle loaded and curb weights, vehicle control loss consistently occurred at lower speeds with a six inch king pin position. One condition, 95 psi tire pressure and 6 inch forward king pin position caused minor handling difficulties at 20 miles per hour vehicle speed through the lane change course.

The Project Director, through subjective analysis, is of the opinion that multiple forces generated at the tractor/trailer articulating point (trailer king pin position in relation to tractor drive axle bogie center) causes differences in vehicle handling and stability characteristics. Measurement of the forces at the trailer king pin would aid in the proper selection of a trailer king pin to tractor position.

8.0 DISCUSSION (Contd.)

8.2 General Test Procedures

Tire combinations were applied to each vehicle per a predetermined tire/type matrix and run through the lane change and "J" turn maneuvers after "base line" runs with the bias construction tires. Acceptable tire combinations as determined by the lane change and "J" turn maneuvers were run through the straight-a-way driving mode and hill and curve test courses to test for adverse handling characteristics which could develop in different driving modes. Toward the end of each vehicle test acceptable tire combinations were run through the lane change maneuver on wet pavement surface with vehicle at curb weight.

8.0 DISCUSSION (Contd.)

8.3 Tire Inflation Pressure Changes

8.3.1 The M151A2 with 7.00-16 Radial II tire inflation pressure was increased over recommended Tire and Rim Association pressure to attain tire tread footprint equal to that of the bias construction tire. The tire combination with different tire constructions and equal footprint length on both rear axle ends were run through the lane change maneuver where vehicle handling and stability deteriorated as compared to tires of different constructions with the same inflation pressure.

8.3.2 The full complement of radial tires were tested on the three axle tractor, tandem axle trailer combination in the lane change and "J" turn maneuvers at Tire and Rim Association recommended pressures for bias tires for comparative studies. An additional study was conducted with inflation pressure increased to 95 psi. Handling characteristics as affected by pressure increase are discussed in section 8.1.6.

8.0 DISCUSSION (Contd.)

8.4 Tire Rolling Radius, M35 Vehicle

Vehicle drag or resistance to free rolling was noticeable during test runs with bias and radial tires mixed within the drive axles of the M35, 2 1/2 ton, cargo vehicle. The drag was also slightly noticeable when the manual front axle drive was engaged with radial tires applied on the front axle and bias tires on the drive axles.

Tire rolling distance difference of a radial tire mounted as single on the front axle and of a bias tire mounted as dual on the drive axle was measured at slow vehicle speed by measuring tire distance traveled per revolution. The following data was recorded.

Tire Type/Position	Rolling Distance Per Revolutions, inches	Percent
Radial - front axle	122.5	100
Bias - drive axle	126.0	103

Wheel revolutions per mile with mixed tires on the drive axles were recorded with test combinations throughout the study but were not consistent due to replacement tire positions within drive axles. To alleviate the erratic data bias tires were applied on left ends and radial tires on the right ends of the drive axles utilizing the differential to attain natural rolling distance differences between the bias and radial tires. The loaded vehicle was run through a six mile pavement test course at 40.6 miles per hour average speed while the wheel revolutions were recorded. The data was as follows:

Tire Type	Wheel Revolutions Per Mile	Percent
Radial	1044	104
Bias	1005	100

APPENDICES

Appendix I

Graphic Supplement

Nevada Automotive Test Center

Project: 20-17-34

GRAPH NO. 1

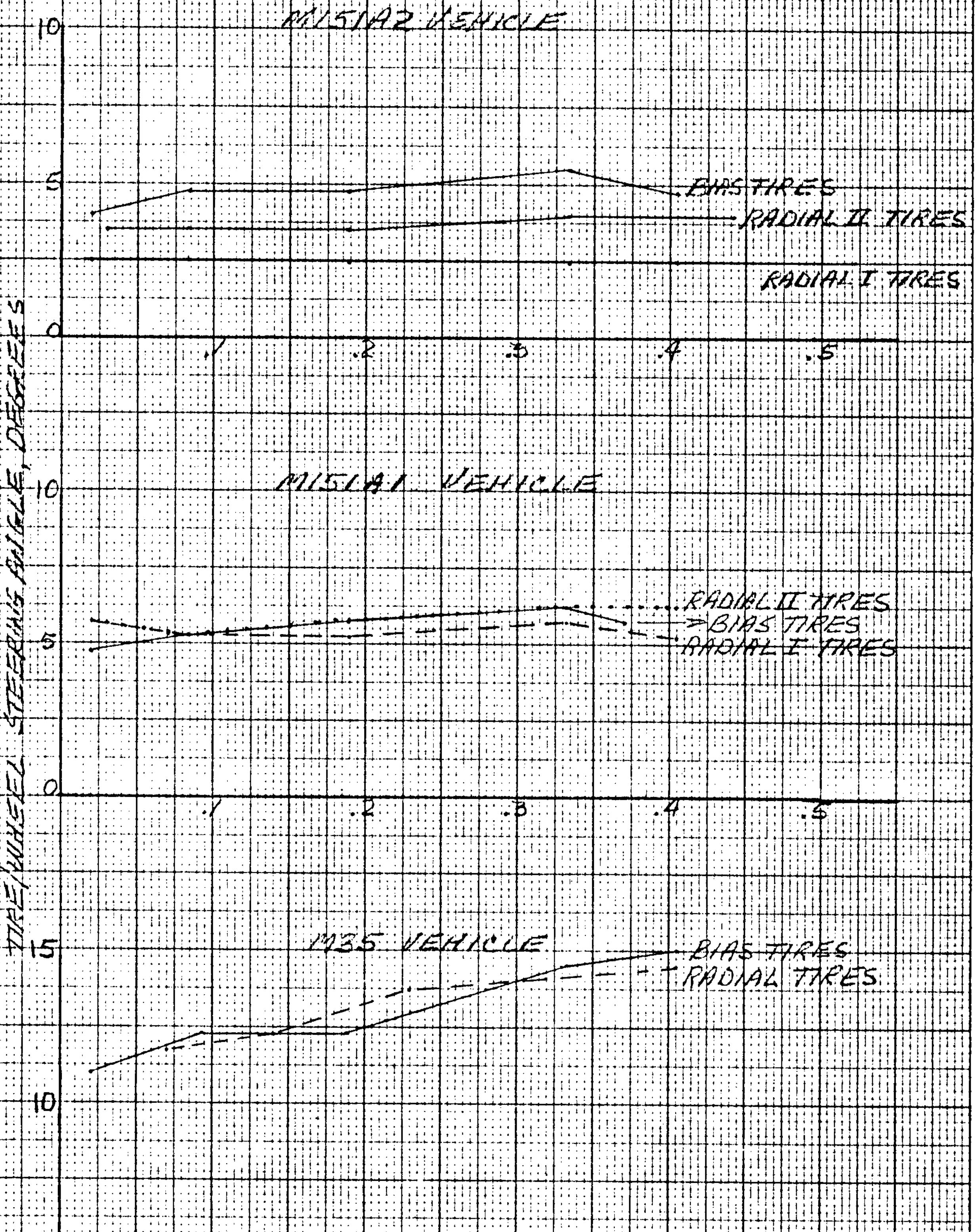
Location: PROVING GROUNDS

Date: 1974

Test By: NATC

Data By: CLB

STEADY STATE LATERAL ACCELERATION
J TURN RIGHT, 80 FT. RADIUS



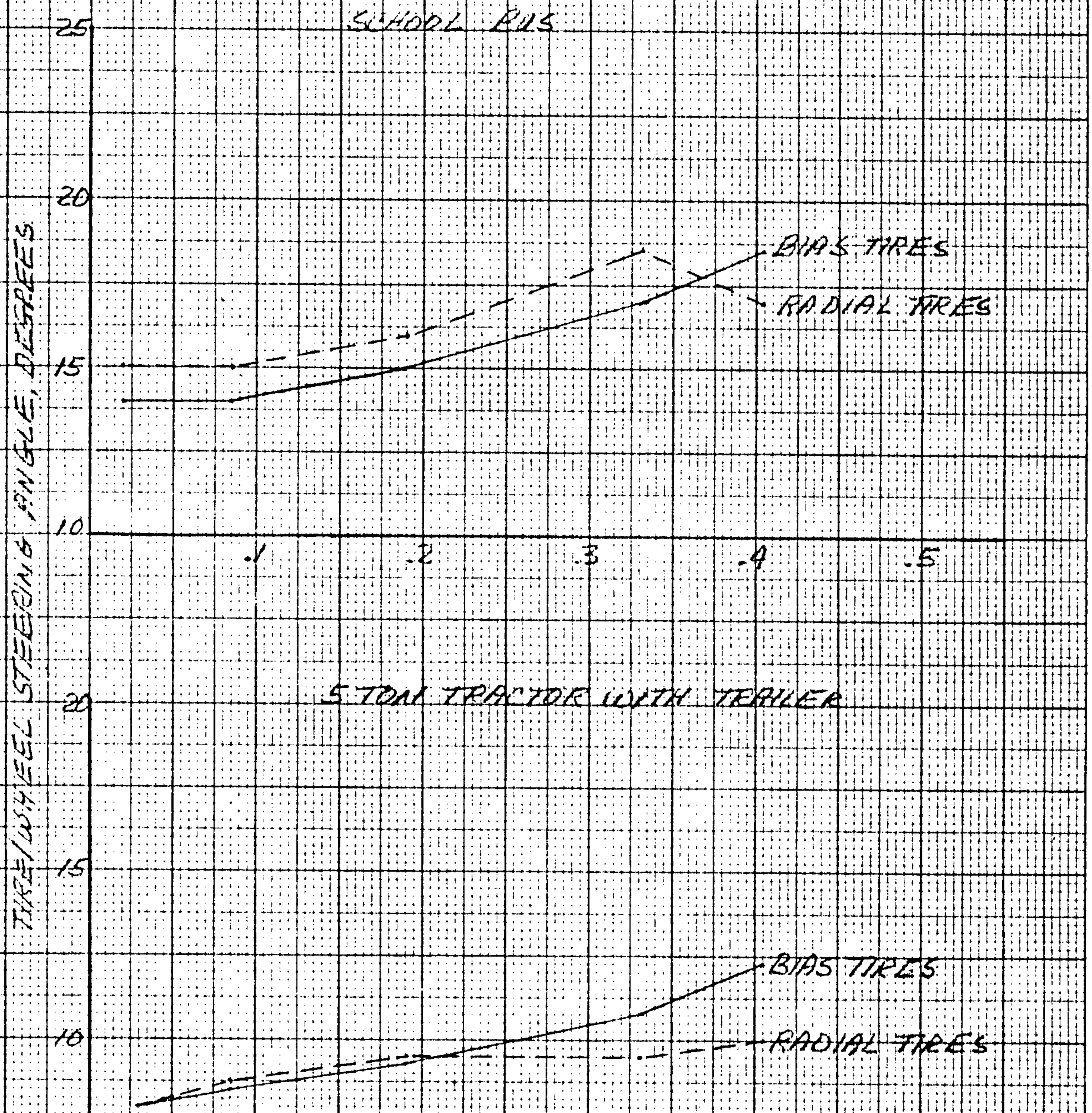
NATC FORM 200 BV 9-68

Nevada Automotive Test Center — GRAPH NO. 2 — Location: PROVING GROUNDS

Project: 20-17-34 — Date: 1974 — Test By: NATC

Data By: CLB

STEADY STATE LATERAL ACCELERATION
J TURN RIGHT, 80 FT. RADIUS



NATC FORM 200 BV 9-68

Nevada Automotive Test Center

GRAPH NO. 2 A

Location: PROVING GROUNDS

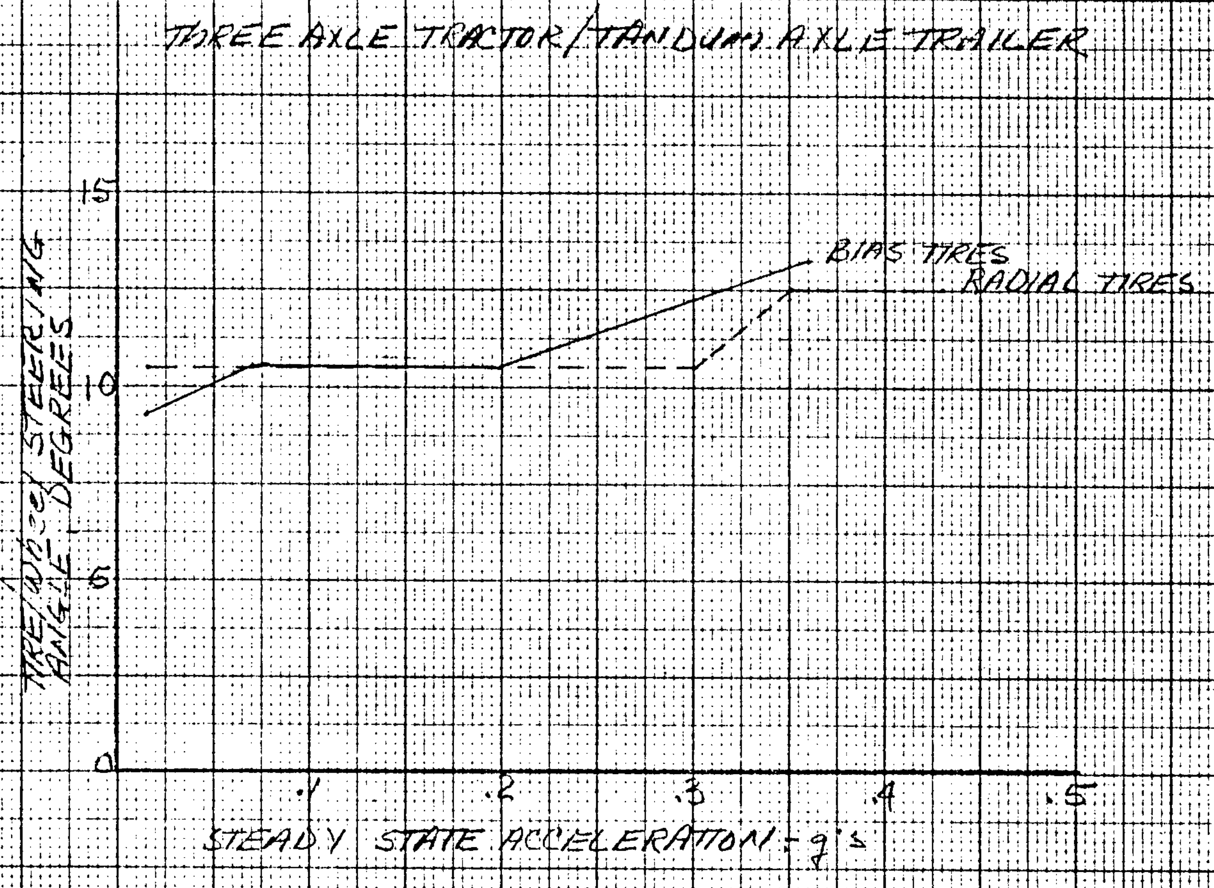
Project: 20-17-34

Date: 1974

Test By: NATC

Data By: CLB

STEADY STATE LATERAL ACCELERATION
J TURN RIGHT, 80 FT. RADIUS



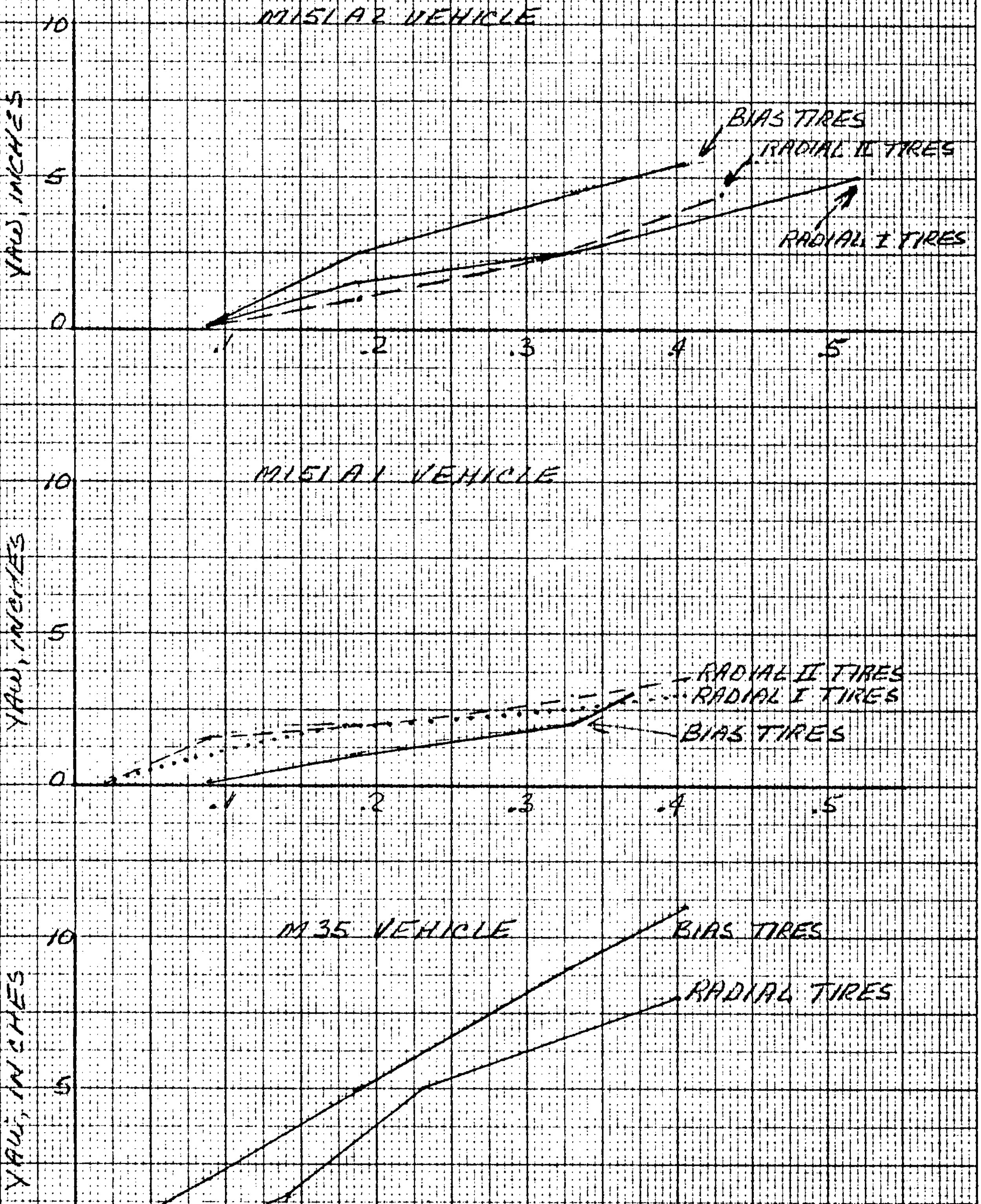
NATC FORM 200 BV 9-68

Nevada Automotive Test Center — GRAPH NO. 3 — Location: PROVING GROUNDS

Project: 20-17-34 — Date: 1974 — Test By: NATC — Data By: CLB

STEADY STATE LATERAL ACCELERATION

J TURN RIGHT, 80 FT. RADIUS



NATC FORM 200 BV 9-68

Nevada Automotive Test Center

Project: 20-17-34

GRAPH NO. 4

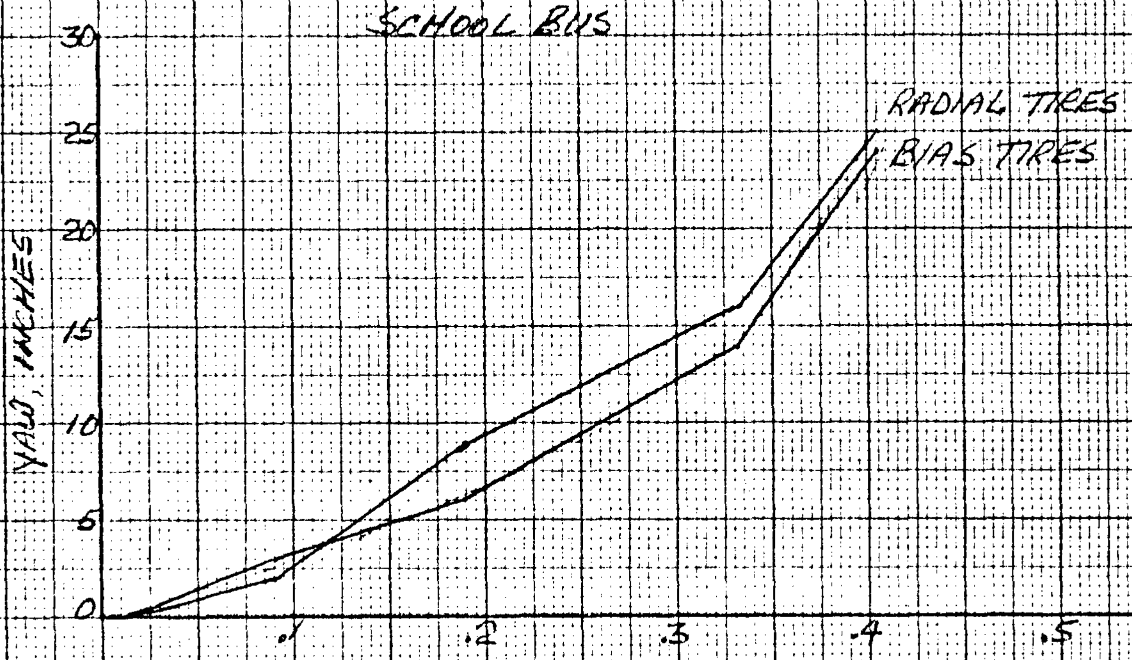
Location: PROVING GROUNDS

Date: 1979

Test By: NATC

Data By: CLB

STEADY STATE LATERAL ACCELERATION
J TURN RIGHT, 80 FT. RADIUS



NATC FORM 200 BV 9-68

Nevada Automotive Test Center

GRAPH 4 A

Location: PROVING GROUNDS

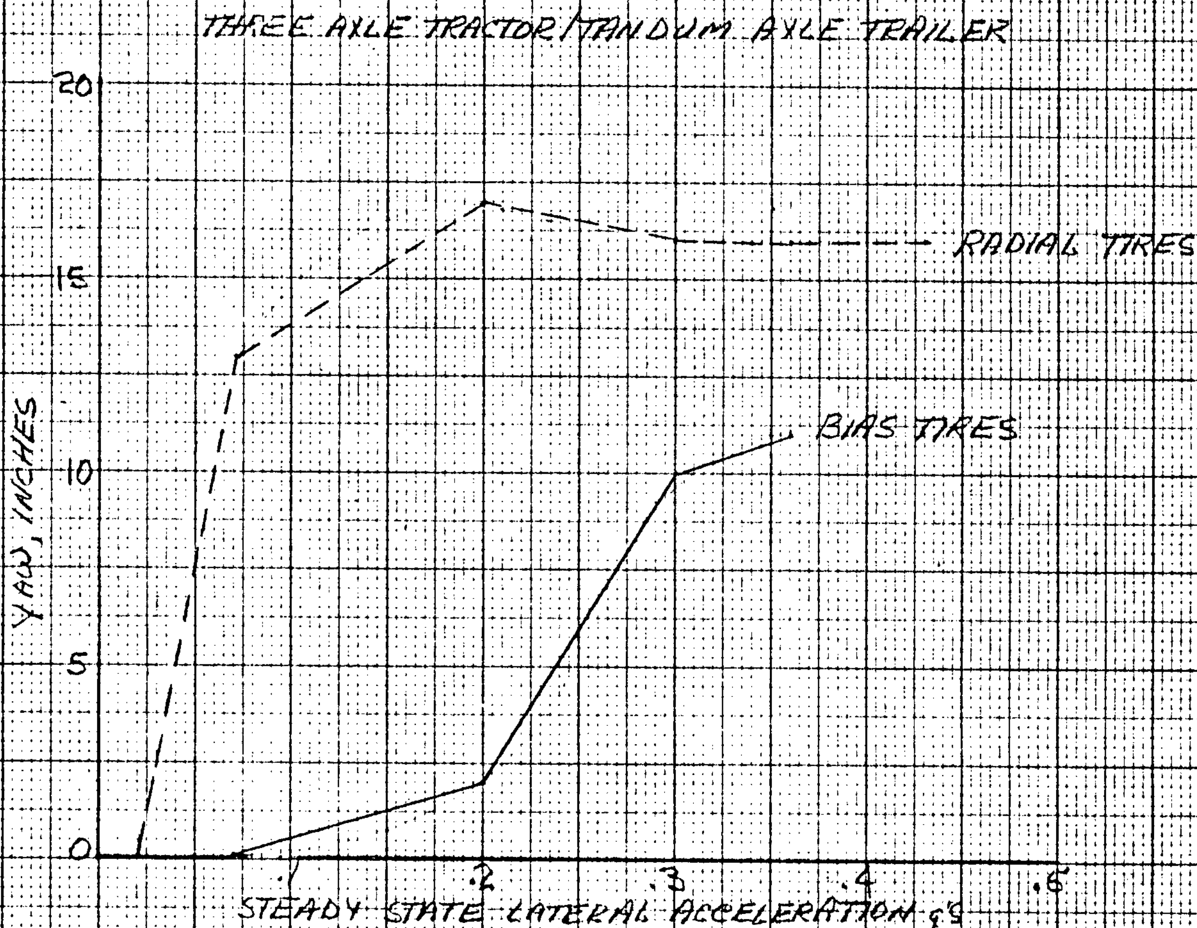
Project 20-17-34

Date: 1974

Test By: NATC

Data By: CLB

STEADY STATE LATERAL ACCELERATION
J TURN RIGHT, 80 FT. RADIUS



NATC FORM 200 BV 9-68

Nevada Automotive Test Center

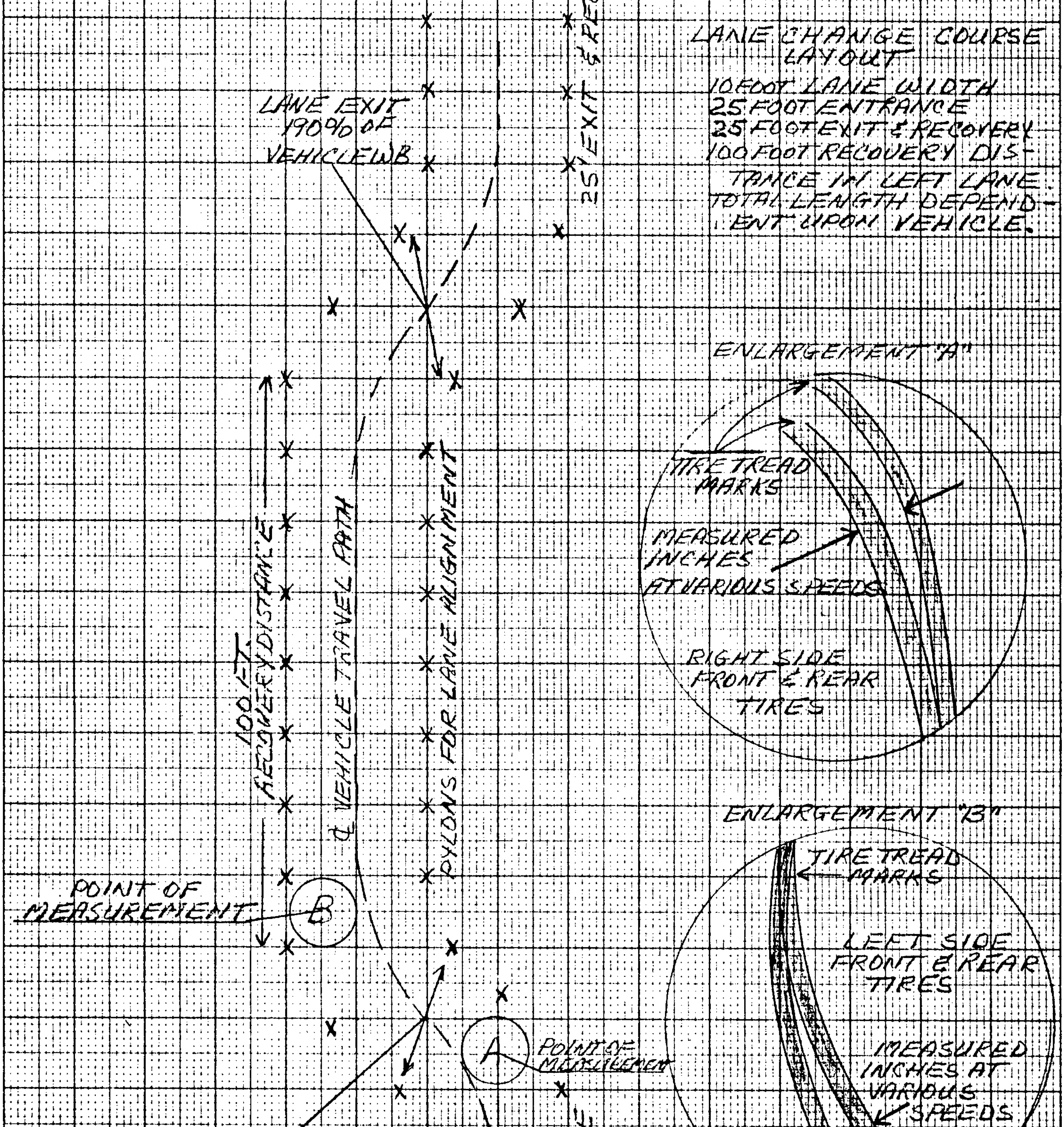
DIAGRAM NO. 1

Location: PROVING GROUNDS

Project: 20-17-34

Date: 5-28-74 Test By:

Data By: CLB



NATC FORM 200 BV 9-68

Nevada Automotive Test Center

DIAGRAM NO. 2

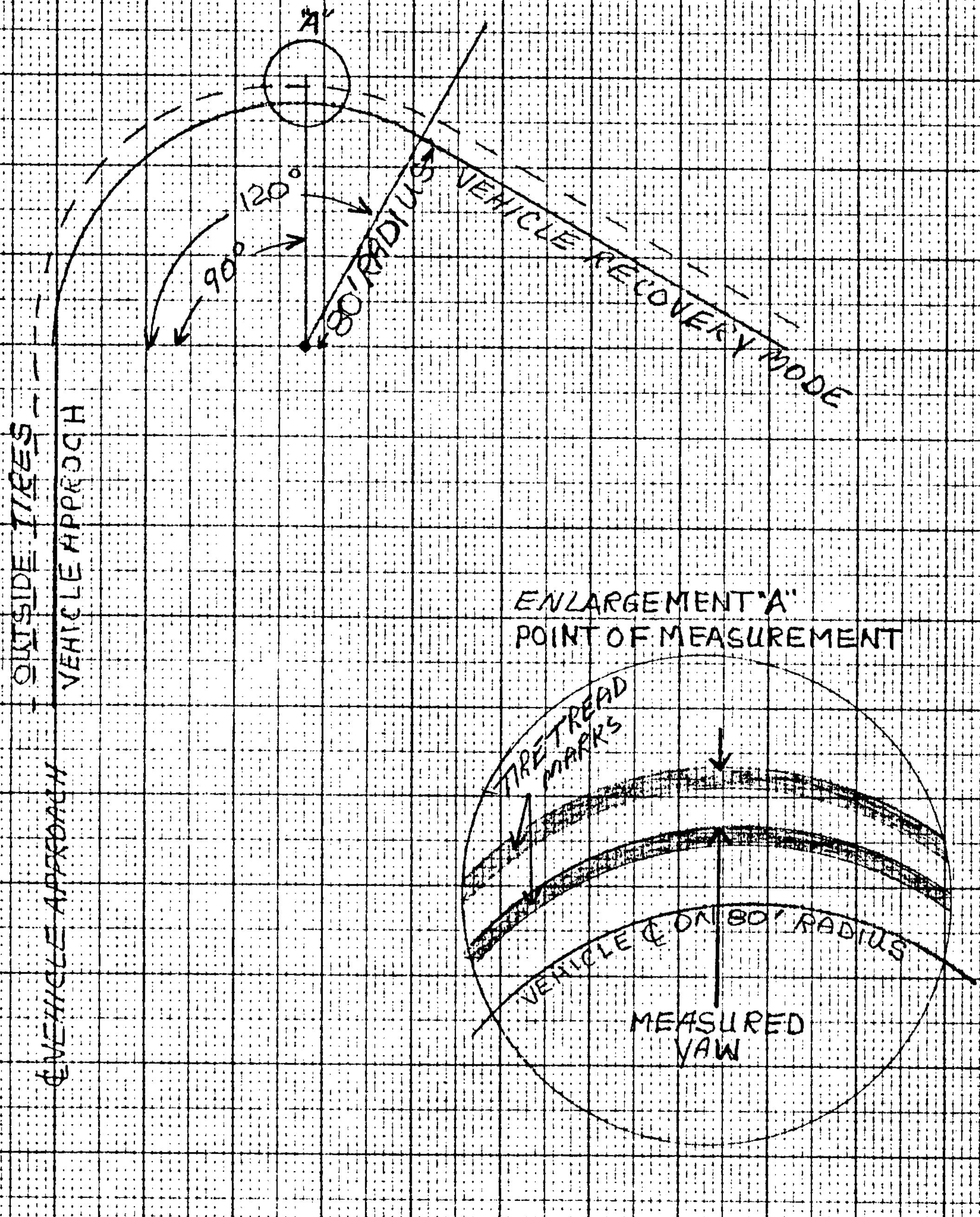
Location: PROVING GROUNDS

Project: 20-17-34

Date: 5-28-74 Test By:

Data By: CLB

J TURN & RECOVERY
120° ON 80' RADIUS
YAW MEASURED AT 90°



NATC FORM 200 BV 9-68

Appendix II

Test Data

Appendix II

Tire Outside Diameter Measurements

Goodyear Flexsteel, 7.000R-16, Radial Tires

Tire Code:	A-1	A-2	A-3	A-4	A-5		Infla. Press., psig
Outside Diameter:	30.76"	30.78"	30.77"	30.79"	30.78"		24

Michelin XC, 7.00R-16, Radial Tires

Tire Code:	B-1	B-2	B-3	B-4	B-5		
Outside Diameter:	30.84"	30.83"	30.83"	30.83"	30.83"		24

Military NDCC, 7.00-16, Bias Tires

Tire Code:	C-1	C-2	C-3	C-4	C-5	C-6	
Outside Diameter:	30.35"	30.22"	30.22"	30.35"	30.18"	30.22"	24

Appendix II

Tire Outside Diameter Measurements

Goodyear Unisteel, 9.00R-20, Radial Tires

						Infla. Press., psig
Tire Code:	A-1	A-2	A-3	A-4	A-5	
Outside Diameter:	40.30"	40.30"	40.31"	40.30"	40.30"	50
Tire Code:	A-6	A-7	A-8	A-9	A-10	
Outside Diameter:	40.30"	40.30"	40.30"	40.30"	40.31"	50

Military NDCC, 9.00-20, Bias Tires

Tire Code:	C-1	C-2	C-3	C-4	C-5	
Outside Diameter:	41.20"	41.32"	41.29"	41.25"	41.23"	50
Tire Code:	C-6	C-7	C-8	C-9	C-10	
Outside Diameter:	41.31"	41.22"	41.30"	41.13"	41.19"	50

Appendix II

Tire Outside Diameter Measurements

Firestone Transteel, 8.25R-20, Radial Tires

Tire Code:	A-1	A-2	A-3	A-4	A-5	A-6	Infla. Press., psig
Outside Diameter:	38.12"	38.12"	38.16"	38.13"	38.15"	38.14"	75

Firestone Transport I, 8.25-20, Bias Tires

Tire Code:	C-1	C-2	C-3	C-4	C-5	C-6	
Outside Diameter:	38.27"	38.09"	38.60"	38.12"	38.52"	38.42"	75

Appendix II

Tire Outside Diameter Measurements

Firestone Transteel, 10.00R-20, Radial Tires

Tire Code:	A-1	A-2	A-3	A-4	A-5	A-6	Infla. Press., psig
Outside Diameter:	41.13"	41.13"	41.13"	41.14"	41.12"	41.13"	55
Tire Code:	A-7	A-8	A-9	A-10	A-11	A-12	
Outside Diameter:	41.13"	41.13"	41.12"	41.12"	41.18"	41.15"	55
Tire Code:	A-13	A-14	A-15	A-16	A-17	A-18	
Outside Diameter:	41.18"	41.16"	41.16"	41.17"	41.16"	41.18"	55

Firestone Transport, 10.00-20, Bias Tires

Tire Code:	C-1	C-2	C-3	C-4	C-5	C-6	
Outside Diameter:	40.83"	40.96"	40.76"	40.95"	40.93"	40.80"	55
Tire Code:	C-7	C-8	C-9	C-10	C-11	C-12	
Outside Diameter:	40.97"	40.82"	40.90"	41.02"	40.98"	40.45"	55
Tire Code:	C-13	C-14	C-15	C-16	C-17	C-18	
Outside Diameter:	40.95"	40.95"	40.95"	40.99"	40.96"	40.98"	55

MISIAI VEHICLE

Cond #	DATE	Tire Combination LF	RF	LR	RR	SPEED MPH	PASSING MANEUVER: Curve #1 Left Lat G 1/10	Steer °	Yaw inch	Curve #2 Right Lat G 1/10	Steer °	Yaw inch	Curve #2 Right Lat G 1/10	Steer °	Curve #2 Left Lat G 1/10	Steer °	TURN - RIGHT: SPEED MPH	LATERAL FORCE 1/10 G	STEERING DEGREES	YAW INCHES
1	2/21	Bias	Bias	Bias	Bias	5	3/4	15 1/2	0	3/4	13	0	3/4	14 1/4	3/4	10 1/2	5	3/4	4 3/4	0
						10	1 1/4	10 3/4	4 1/2	1 1/4	10 3/4	3 1/2	1 1/4	10 3/4	1 1/4	9 1/2	10	1 1/4	5 1/4	0
						15	3	9 1/2	7 1/2	3	10 1/4	5 1/2	3	10 1/4	3	10 1/2	15	2 1/2	5 3/4	1
						20	4 1/4	8 1/2	8 1/2	4 1/4	10 3/4	6	4 1/4	10 1/4	4 1/4	9 1/2	20	4	6 1/4	2
						22	5	7 1/4	10 1/2	5	9 1/4	6 1/2	5	9	5	6 3/4	21	5	5 3/4	3
3	2/21	Rad II	Rad II	Rad II	Rad II	5	1/2	16 1/2	0	1/2	15	0	1/2	16 1/2	1/2	13	5	1/2	5 3/4	0
						10	1 1/4	12 1/2	3 1/2	1 1/4	10 3/4	1	1 1/4	11	1 1/4	10 1/2	10	1	5 1/4	1
						15	3	7 1/2	7 1/2	3	6 1/4	4 1/2	3	4 3/4	3	6 3/4	15	3	5 3/4	2
						20	4	6 1/2	9	4	7	5 1/2	4	8	4	7 1/4	20	4 1/4	6 1/4	2 1/2
						22	5	6 1/2	8 1/2	5	9 3/4	6	5	8 1/2	5	6 3/4	22	5 1/2	6 1/4	3
2	2/21	Rad I	Rad I	Rad I	Rad I	5	3/4	15 1/4	0	3/4	12	0	3/4	12 1/2	3/4	10 1/2	5	3/4	5 3/4	0
						10	1 1/4	11 3/4	4	1 1/4	10 1/4	1 1/2	1 1/4	11	1 1/4	10 1/2	10	1 3/4	5 1/4	1 1/2
						15	3	8 1/2	6 1/2	3	9 1/4	4	3	6 3/4	3	8	15	3	5 1/4	2
						20	4 1/4	7 1/4	9 1/2	4 1/4	10 1/4	4 1/2	4 1/4	9	4 1/4	7 1/2	20	4 1/4	5 3/4	3
						22	5	6 1/2	10	5	11 1/2	4 1/2	5	6 1/4	5	6	22	5	5 1/4	3 1/2
4	2/21	Rad I	Bias	Bias	Bias	5	3/4	15 1/2	0	3/4	12 1/2	0	3/4	12 1/2	3/4	11 1/2	5	3/4	4 3/4	0
						10	1 1/2	15 1/4	1 1/2	1 1/2	13 1/2	2	1 1/2	10 1/4	1 1/2	10 1/2	10	1 1/2	5 1/4	1
						15	3	9	6	3	12	5	3	11	3	12 1/4	15	3	5 3/4	2 1/2
						20	4	7 1/4	9 1/2	4	11 1/2	4 1/2	4	9 1/4	4	11 1/2	20	4 1/2	5 3/4	3 1/2
5	2/22	Bias	Rad I	Bias	Bias	5	3/4	17	0	3/4	13 3/4	0	3/4	14 1/4	3/4	12 1/2	5	3/4	5 3/4	0
						10	1 3/4	11 1/2	3	1 3/4	10 3/4	1 1/2	1 3/4	11	1 3/4	10 3/4	10	1 1/2	6 1/4	1/2
						15	3 1/4	9	6	3 1/4	12	3 1/2	3 1/4	10 1/4	3 1/4	8	15	3	6 1/4	1 1/2
						20	4 1/2	9	9 1/4	4 1/2	12	4 1/4	4 1/2	9 1/4	4 1/2	7 1/2	20	4	6 1/2	3
6	2/22	Bias	Bias	Rad I	Bias	5	3/4	14 1/2	0	3/4	13	0	3/4	15	3/4	11 1/2	5	3/4	5 3/4	0
						10	1 1/2	11 3/4	3	1 1/2	11 1/2	2 1/2	1 1/2	11 1/2	1 1/2	7 1/4	10	1 1/2	5 3/4	1/2
						15	3	10	6	3	10 1/4	4 1/2	3	10 3/4	3	9	15	3	6 1/4	1 1/2
						20	5	9 1/2	8	5	9 3/4	5 1/4	5	5 3/4	5	7 1/4	20	4 1/2	7 1/4	2
7	2/23	Bias	Bias	Bias	Rad I	5	3/4	13	0	3/4	14 1/4	0	3/4	14 3/4	3/4	10 3/4	5	1	5 3/4	0
						10	1 3/4	10	2	1 3/4	10 1/4	2	1 3/4	13	1 3/4	9 1/2	10	2	6 1/4	1/2
						15	3 1/4	9	4 1/2	3 1/4	11	3 1/2	3 1/4	11 1/2	3 1/4	9	15	3	6 3/4	1 1/2
						20	4 1/2	7 1/2	6	4 1/2	10 1/4	4 1/2	4 1/2	9	4 1/2	7 1/4	20	4 1/4	7	2
8	2/22	Rad I	Rad I	Bias	Bias	5	3/4	12 1/2	0	3/4	13 3/4	0	3/4	12 1/2	3/4	9	5	1	5 3/4	0
						10	1	12 1/2	1 1/2	1	11 1/2	1 1/2	1	11 1/2	1	9	10	1 1/4	5 1/4	1
						15	2 3/4	10 1/2	5 1/2	2 3/4	9 3/4	3 1/2	2 3/4	8	2 3/4	7 1/4	15	3	5 3/4	2 1/2
						20	3 1/2	8 1/2	8 1/2	3 1/2	11	4 3/4	3 1/2	10 1/4	3 1/2	9	20	4 1/2	5 3/4	3 1/4
9	2/22	Bias	Bias	Rad I	Rad I	5	1/2	11 3/4	0	1/2	12	0	1/2	12 1/2	1/2	10	5	1/2	5 3/4	0
						10	1 3/4	10 1/2	1/2	1 3/4	11 1/2	2	1 3/4	12 1/2	1 3/4	8 1/2	10	1 3/4	6 1/4	1
						15	3 1/4	9 1/2	3 1/2	3 1/4	9 3/4	3	3 1/4	11 1/2	3 1/4	9	15	3 1/2	7	2
						20	4 1/4	8	5	4 1/4	12	4	4 1/4	12	4 1/4	8 1/2	20	4 1/2	7 1/4	2 1/2

M151A1 Vehicle

[illegible]	Date	Tire Combination LF	Bias RF	LR	RR	Speed, MPH	Passing Maneuver: Curve #1 Left Lat G 1/10	Steer °	Yaw inches	Curve #2 Right Lat G 1/10	Steer °	Yaw inches	Curve #2 Right Lat G 1/10	Steer °	Curve #2 Left Lat G 1/10	Steer °	Turn Right: Speed MPH	Lateral Force G 1/10	Steering Degrees	Yaw Inches
10	2/25	Rad I	Bias	Bias	Rad I	5	1/2	13 1/2	0	1/2	14	0	1/2	13 1/4	1/2	8 3/4	5	1/2	6	0
						10	1 1/2	9 1/2	3	1 1/2	12 1/4	3	1 1/2	11 1/2	1 1/2	6 3/4	10	1 3/4	6	1/2
						15	2 1/4	8 3/4	5	2 1/4	9 3/4	4	2 1/4	11	2 1/4	6	15	2 1/2	6 1/2	1 1/2
						20	4 1/4	8 3/4	7 3/4	4 1/4	9 3/4	5 1/2	4 1/4	9 3/4	4 1/4	6 3/4	20	4	6	2 1/2
11	2/26	Bias	Rad I	Rad I	Bias	5	1/2	13 1/2	0	1/2	12 3/4	0	1/2	12 3/4	1/2	8 3/4	5	3/4	6	0
						10	1 1/2	10	3 1/2	1 1/2	11	3	1 1/2	11 1/2	1 1/2	9	10	1 3/4	6	1
						15	2 3/4	8 3/4	6	2 3/4	10	3 1/2	2 3/4	11 1/2	2 3/4	9	15	3	6 1/2	2
12	2/25	Rad I	Bias	Rad I	Bias	5	1/2	11 1/4	0	1/2	12	0	1/2	16	1/2	10 1/2	5	1/2	6	0
						10	1 1/2	10	2 1/2	1 1/2	10	1	1 1/2	12 3/4	1 1/2	8 3/4	10	1 1/2	5 1/2	1
						15	3 1/4	9 1/2	5 1/2	3 1/4	9 1/4	3	3 1/4	8 1/4	3 1/4	7 3/4	15	3	6 1/2	2
						20	4 1/2	9 1/2	9 1/2	4 1/2	12	3 1/2	4 1/2	8 3/4	4 1/2	7 1/4	20	4 1/4	6 1/2	2 1/2
13	2/25	Rad I	Rad I	Rad I	Bias	5	1/2	13	0	1/2	12	0	1/2	15	1/2	10 3/4	5	1/2	6	0
						10	1 3/4	10 1/2	3 1/2	1 3/4	10 1/2	2	1 3/4	11	1 3/4	7 1/4	10	1 3/4	5 1/2	1/2
						15	3 1/4	10	6	3 1/4	12 1/4	3 1/2	3 1/4	10	3 1/4	7 3/4	15	3	6	1 1/2
						20	4	9	7 3/4	4	11	4 1/2	4	13 1/4	4	7 3/4	20	4 1/2	6 1/2	2 1/2
14	2/25	Rad I	Bias	Bias	Bias	5	1/2	12 1/4	0	1/2	11 1/2	0	1/2	14 1/2	1/2	10 1/2	5	1/2	6	0
						10	1 3/4	9	3	1 3/4	9 3/4	2	1 3/4	11	1 3/4	9	10	1 3/4	6	1
						15	3 1/4	9 1/2	5	3 1/4	11	3	3 1/4	10	3 1/4	10	15	3	6	2
						20	4	8 3/4	8	4	11 1/2	3 1/2	4	8 1/4	4	6 3/4	20	4 1/4	6	3
15	2/25	Bias	Rad II	Bias	Bias	5	1/2	10 3/4	0	1/2	12 1/4	0	1/2	14 1/2	1/2	9 1/2	5	3/4	6	0
						10	1 3/4	9 1/2	2 1/2	1 3/4	9 3/4	1 1/2	1 3/4	12 3/4	1 3/4	9 1/2	10	1 3/4	6	1
						15	3 1/4	8 3/4	5	3 1/4	9 3/4	3 1/2	3 1/4	8 1/4	3 1/4	7 3/4	15	3	6	2 1/2
						20	4 1/4	7 1/4	6 1/2	4 1/4	9 3/4	4	4 1/4	9 3/4	4 1/4	7 3/4	20	4 1/4	6 1/2	2 1/2
16	2/23	Bias	Bias	Rad II	Bias	5	3/4	14 1/2	0	3/4	11 1/2	0	3/4	14 3/4	3/4	11 3/4	5	1/2	5 3/4	0
						10	1 3/4	10 3/4	4	1 3/4	10 3/4	2 1/2	1 3/4	11 1/2	1 3/4	9 1/2	10	1 3/4	6 1/4	1 1/2
						15	3 1/4	10	5	3 1/4	12	5 1/2	3 1/4	11 1/2	3 1/4	10 3/4	15	3	6 3/4	2 1/2
						20	4 1/4	10	8 1/2	4 1/4	11	4 1/2	4 1/4	9 3/4	4 1/4	8	20	4 1/2	7	2 1/2
17	2/23	Bias	Bias	Bias	Rad II	5	1/2	12 1/2	0	1/2	13 1/2	0	1/2	14 1/4	1/2	9	5	1/2	6 1/4	0
						10	1 3/4	12 1/2	2	1 3/4	13	2	1 3/4	11	1 3/4	9	10	1 3/4	6 1/4	1
						15	3	9	5	3	9 1/4	4	3	9 3/4	3	7 1/2	15	3	6 1/4	2
						20	4 1/4	9	7 1/4	4 1/4	7 1/2	4 1/2	4 1/4	9 1/4	4 1/4	8 1/2	20	4 1/2	7	2 3/4
18	2/23	Rad I	Rad II	Bias	Bias	5	3/4	13	0	3/4	11 1/2	0	3/4	13 1/2	3/4	10 3/4	5	1	5 1/4	0
						10	1 3/4	10 1/2	3	1 3/4	9 1/4	3	1 3/4	12	1 3/4	10 3/4	10	1 3/4	5 1/4	1
						15	3 1/4	10	5	3 1/4	9 3/4	3 1/2	3 1/4	8 1/2	3 1/4	7 1/2	15	3	5 1/4	2
						20	4	8 1/2	8	4	13	4 1/2	4	9 1/4	4	6 3/4	20	4 1/2	5 1/4	3

M151A1 Vehicle

[illegible]	Date	Tire Combination 35: LF	RF	LR	RR	Speed, MPH	Passing Maneuver: Curve #1 Left, Lat. G 1/10	Curve #1 Left, Steer °	Curve #1 Left, Yaw inches	Curve #2 Right, Lat. G 1/10	Curve #2 Right, Steer °	Curve #2 Right, Yaw inches	Curve #2 Right, Lat. G 1/10	Curve #2 Right, Steer °	Curve #2 Left, Lat. G 1/10	Curve #2 Left, Steer °	J Turn, Right: Speed, MPH	Lateral Force G 1/10	Steering Degrees	Yaw, Inches
19	2/23	Bias	RadI	RadII	Bias	5	1/2	13	0	1/2	13 3/4	0	1/2	13	1/2	10 1/2	5	1/2	6 1/4	0
						10	1 1/2	11 1/2	0	1 1/2	10 1/4	0	1 1/2	11	1 1/2	8 1/2	10	1 1/2	6 1/4	1
						15	3 1/4	10 1/2	6	3 1/4	10 3/4	3	3 1/4	10 3/4	3 1/4	6	15	3	6 3/4	2
						20	4 1/4	8	8	4 1/4	11	4	4 1/4	9	4 1/4	7 1/2	20	4 1/2	7 1/4	2 1/2
20	2/22	Bias	Bias	RadI	RadII	5	1/2	12 1/4	0	1/2	13 3/4	0	1/2	14 1/4	1/2	10	5	3/4	5 3/4	0
						10	1 1/2	11 1/2	2 1/2	1 1/2	12	2 1/2	1 1/2	13	1 1/2	10 1/2	10	1 3/4	6 1/4	1/2
						15	3 1/4	10 3/4	6	3 1/4	10 1/4	4 1/2	3 1/4	12	3 1/4	11 1/2	15	3 1/4	6 3/4	2
						20	4 1/2	9 3/4	7 3/4	4 1/2	11	4	4 1/2	11 1/2	4 1/2	6 3/4	20	4 1/2	7 1/2	2
21	2/22	Bias	RadII	Bias	RadI	5	3/4	13 1/2	0	3/4	11	0	3/4	14 3/4	3/4	14	5	1/2	5 3/4	0
						10	1 1/2	12 3/4	3 1/2	1 1/2	10 1/4	1	1 1/2	12 1/2	1 1/2	10	10	1 3/4	5 3/4	1/2
						15	3 1/4	10 3/4	6	3 1/4	11	3	3 1/4	11	3 1/4	9 1/2	15	3	6 1/4	2
						20	4 1/2	6 3/4	8	4 1/2	9 3/4	4	4 1/2	8 1/2	4 1/2	7 1/2	20	4 1/2	6 3/4	3
22	2/22	RadII	RadII	Bias	Bias	5	1	14 3/4	0	1	12 1/2	0	1	13	1	7 1/4	5	1	5 1/4	0
						10	1 3/4	11 3/4	3 1/2	1 3/4	12	2	1 3/4	10 3/4	1 3/4	10	10	1 3/4	5 3/4	1/2
						15	3 1/4	9 1/2	6	3 1/4	9 1/4	4	3 1/4	9 1/4	3 1/4	11 3/4	15	3	5 3/4	1 1/2
						20	4 1/4	7 1/4	11	4 1/4	9 3/4	5	4 1/4	7 1/2	4 1/4	8	20	4	5 3/4	2 1/2
23	2/22	Bias	Bias	RadII	RadII	5	1	13 1/2	0	1	11 1/2	0	1	12 1/2	1	8 1/2	5	3/4	6 1/4	0
						10	1 1/2	11 1/2	2	1 1/2	9 3/4	1 1/2	1 1/2	12	1 1/2	9	10	1 3/4	6 1/4	1
						15	3 1/4	9 1/2	3	3 1/4	10 1/4	3	3 1/4	11	3 1/4	10	15	3	6 3/4	2
						20	4 1/2	9	5 3/4	4 1/2	9 1/4	4	4 1/2	11	4 1/2	10 1/2	20	4 1/2	7 1/2	2 1/2
24	2/22	RadII	Bias	RadII	Bias	5	3/4	14 1/2	0	3/4	14 1/4	0	3/4	13	3/4	12 1/2	5	3/4	5 3/4	0
						10	1 3/4	12 1/2	2	1 3/4	10 1/4	1 1/2	1 3/4	11	1 3/4	10 1/2	10	1 1/2	5 3/4	1/2
						15	3 1/4	10 3/4	6	3 1/4	9 1/4	3 1/2	3 1/4	9 1/4	3 1/4	8 1/2	15	3	6 1/4	1 1/2
						20	4 1/4	8	9	4 1/4	9 3/4	4	4 1/4	7 1/2	4 1/4	6 3/4	20	4 1/2	6 1/4	2
[illegible]	2/23	RadII	RadI	Bias	Bias	5	1/2	14	0	1/2	11 1/2	0	1/2	13	1/2	11 1/2	5	1	5 1/4	0
		Reversed Radial Front Tires.				10	1 3/4	12 1/4	1	1 3/4	12	1/2	1 3/4	9 3/4	1 3/4	7 1/2	10	1 3/4	5 1/4	1/2
						15	3 1/4	10	5	3 1/4	12 1/2	3 1/2	3 1/4	11 1/2	3 1/4	8	15	3	5 3/4	1/2
						20	4 1/2	8 1/2	8 1/2	4 1/2	10 3/4	4 1/2	4 1/2	8	4 1/2	7 1/2	20	4 1/4	5 3/4	2 1/2
2	2/25	RadI	RadI	RadI	RadI	5	1/2	7 3/4	0	1/2	14 1/2	0	1/2	15 1/2	1/2	10 1/2	5	3/4	6	0
		Re-Run				10	1 3/4	9 1/2	2 1/2	1 3/4	11	2	1 3/4	12	1 3/4	8 3/4	10	1 3/4	6 1/2	1/2
						15	3 1/4	8 3/4	4 1/2	3 1/4	10 1/2	4	3 1/4	10	3 1/4	7 3/4	15	3	6 1/2	1 1/2
						20	4 1/2	6 3/4	6 1/2	4 1/2	10	5	4 1/2	12 3/4	4 1/2	6 1/2	20	4 3/4	6	2 1/2
						22	4 3/4	4 1/2	8	4 3/4	8 3/4	3 1/2	4 3/4	12 3/4	4 3/4	5	22	5 1/2	6 1/2	3

M151A1 Vehicle

Hill & Curve Course / Control Curve

Combination No.	Time, Min. Sec. Up Hill	Time, Min. Sec. Down Hill	Average Speed MPH	Max. Steering Degrees Up Hill	Max. Steering Degrees Down Hill	Max. "G" Force 1/10 Up Hill	Max. "G" Force 1/10 Down Hill	Wheel Revolutions Up Hill	Wheel Revolutions Down Hill	Control Curve Speed MPH	Steering Degrees Up Hill	Steering Degrees Down Hill	Steering Force Up Hill	Steering Force Down Hill
2	7 35	7 46	33.3/32.4	4 / 2½	3 / 3	4 / 4	4 / 4	2994/2911	2973/2951	20	2	1½	1	1
										30	2½	1½	2	2
										35	2½	1½	3	3
3	7 40	8 00	32.9/31.5	2½ / 1½	2½ / 3	4¼ / 3½	3 / 3½	2970/2970	2964/2964	20	1½	1	½	½
										30	2½	1½	2	2
										35	2½	1½	3	3
1	7 36	7 45	33.1/32.9	3½ / 2½	3¼ / 3¼	4 / 3¾	3¾ / 4	3114/3086	3070/2961	20	2	1	1	1
										30	2	1	2	1¾
										35	3	2	3	3

Straightaway Control Maneuver

Comb. No.	Date	Speed, MPH	Time, Min.	Time, Sec.	No. Steer Correct/Sec Left	No. Steer Correct/Sec Right	No. Wheel Rev. Left	No. Wheel Rev. Right	Steer. Force Lb. Left	Steer. Force Lb. Right	Steering Degrees Left	Steering Degrees Right	Tire Combination LF	RF	LR	RR
1	2/21	54.5	1	06	.24	.29	718	721	10	5	0	½	B	B	B	B
2	2/26	50.0	1	12	.24	.11	699	679	9	9	0	½	RI	RI	RI	RI
3	2/26	46.8	1	17	.16	.13	696	697	10	10	0	½	RII	RII	RII	RII

M151A2 Vehicle

Comb. No.	Date	Tire Combination Pos. LF	RF	LR	RR	Passing Maneuver Speed MPH	Curve #1 Left Lat. 6"	Curve #1 Left Steer. °	Curve #1 Left Yaw	Curve #1 Right Lat. 6"	Curve #1 Right Steer. °	Curve #1 Right Yaw	Curve #2 Right Lat. 6"	Curve #2 Right Steer °	Curve #2 Left Lat. 6"	Curve #2 Left Steer °	Turn - Light Speed MPH	Lateral Feet	Steering Degrees	Yaw
1	2/18	Bias	Bias	Bias	Bias	5	1/2	12 1/2	0	1/2	9 1/2	0	1/2	12	1/2	9 1/2	5	1/2	4	0
						10	1	12 1/2	2	1	9 1/2	1/2	1	11	1	10	10	1	4 3/4	0
						15	2 1/4	9 1/2	6	2 1/4	7 3/4	2 1/2	2 1/4	8 1/2	2 1/4	9 1/2	15	2 1/2	4 3/4	2 1/2
						20	4	7 1/2	10	4	7	2	4	7	4	7	20	4	5 1/2	4 1/2
						22	5	7	12	5	7	1	5	6 1/2	5	6	22	5	4 3/4	5 1/2
2	2/4	RadI	RadI	RadI	RadI	5	—	9	0	—	11	0	—	13	—	10 1/2	5	1/4	2 1/2	0
						10	1 1/2	—	1	1 1/2	—	1 1/2	1 1/2	—	1	—	10	1 1/4	2 1/2	0
						15	1 1/2	8 1/2	1 1/2	2	9	3	2 1/4	6	2	7 1/2	15	2 1/2	2 1/2	1 1/2
						20	—	7	2 1/2	—	6	4	—	6	—	6	20	4	2 1/2	2 1/2
						22	3 1/2	6	4	3	5 1/2	4 3/4	4	4	4	6	22	5 1/2	2 1/2	5
						24	4	5 1/4	—	4	5 1/2	—	3 1/2	5	3	4 1/2	25	6	2 1/2	6 1/4
3	2/11	RadII	RadII	RadII	RadII	5	—	15 1/2	0	—	12 1/2	0	—	6 1/2	—	11 1/2	6	1/2	3 1/2	0
						10	1 1/2	12 1/2	2 1/4	1 1/2	7	1/4	1 1/2	7	1	10 1/4	10	1 1/2	3 1/2	0
						15	2 1/4	9 1/2	3 1/2	2	4 3/4	—	2 1/4	4	2 1/4	8 1/2	15	2 1/4	3 1/2	1
						20	3	8 1/2	6 1/2	2 1/4	3 1/2	4 1/2	3	4	3	7	20	4 1/4	4	2 1/2
						22 1/2	3 1/2	7 1/2	6	3 1/2	4	4 3/4	4	3	3 1/2	4	23	5 1/4	4	4 1/2
4	2/12	RadI	Bias	Bias	Bias	15	2	11	1	2	7 1/2	2	2	7 1/2	2	7 1/2	15	2	5	0
						20	3 1/4	8 1/2	8	3 1/4	6	8 1/2	3 1/4	7	3 1/2	8 1/2	20	4	4 1/2	3 1/4
5	2/12	Bias	RadI	Bias	Bias	15	1	12	4	1	8 1/2	5	1	8	1	12	15	2	4 1/2	1 1/2
						20	3 1/4	8 1/2	8 1/2	3 1/4	7 1/2	7 1/2	3 1/4	6 1/2	3 1/4	11	20	4	4 1/2	3
6	2/12	Bias	Bias	RadI	Bias	6	1/4	15	0	1/4	11 1/2	0	1/4	14	1/4	15 1/4	6	1/4	4 1/2	0
						15	2	10	3	2	6 1/2	3 1/2	2	7 1/2	2	10	15	1 3/4	4 1/2	3 3/4
						20	3 3/4	8 1/2	7 1/2	3 3/4	9	7 1/2	3 3/4	2 1/2	3 3/4	11	20	2 1/4	4 1/2	5 1/2
						22	4	10 1/2	10	4	3 1/2	8 1/2	4	3 1/2	4	9 1/2	22	3	4 1/2	7
7	2/12	Bias	Bias	Bias	RadI	15	2 1/4	11 1/2	2 1/2	2 1/4	9 1/2	4	2 1/4	9	2 1/4	13 1/2	15	2 1/4	5	4
						20	3 1/2	10 1/2	5	3 1/2	9 1/2	8	3 1/2	9 1/2	3 1/2	11 1/2	20	3 3/4	4 1/2	6
						22	4	9	10	4	10 1/2	16	4	11	4	10 1/2	22	4	5	6
8	2/14	RadI	RadI	Bias	Bias	5	1/2	14 1/2	0	1/2	9	0	1/2	9	1/2	9 1/2	5	1/2	3	0
						10	3/4	12 1/2	2 1/2	3/4	8	0	3/4	8	3/4	9	10	1	3	1 1/2
						15	2	11	6	2	6	2 1/2	2	6 1/2	2	9	15	2	3	2
						20	3 3/4	8	9 1/2	3 3/4	5	5 1/2	3 3/4	3 1/2	3 3/4	7 1/2	20	3 1/2	3	3 1/2
						22	6	8 1/2	10	6	5 1/2	5 1/2	6	4 1/2	6	8 1/2	22	5	2 3/4	5
9	2/14	Bias	Bias	RadI	RadI	5	1/4	14 1/2	0	1/4	10 1/2	0	1/4	10 1/2	1/4	8	5	1/4	3 1/2	0
						10	3/4	11 1/2	2	3/4	8	2 1/2	3/4	6 1/2	3/4	8 1/2	10	1	3 1/2	1
						15	2	8 1/2	6	2	4 3/4	3	2	6 1/2	2	9 1/2	15	2	3 1/2	2
						20	3 3/4	8 1/2	8	3 3/4	8 1/2	5	3 3/4	7 1/2	3 3/4	8	20	3 3/4	4 1/4	3 1/2
						23	4	11	9	4	7 1/2	6	4	6	4	10	23	5	4 1/4	4 1/2
10	2/12	RadI	Bias	Bias	RadI	5	1/4	13	0	1/4	11	0	1/4	11 1/2	1/4	12	5	1/4	4 1/4	0
						15	2	13	3	2	8	3	2	7 1/2	2	7 1/2	15	2	4 1/4	1 1/2
						20	3 3/4	9 1/2	7 1/2	3 3/4	6	6	3 3/4	8 1/2	3 3/4	10	20	3 3/4	3 1/2	3 1/2
						22	4	11	8 1/2	4	8	6	4	8 1/2	4	11 1/2	22	4	3 1/2	4
11	2/13	Bias	RadI	RadI	Bias	16	2	9 1/2	4	2	6	3 1/2	2	7 1/2	2	7 1/2	15	2	4 1/4	3 1/2
						20	3 1/2	9 1/2	3 1/2	3 1/2	7 1/2	4	3 1/2	8	3 1/2	11	20	3 3/4	4 3/4	5
						22	4	8 1/2	8 1/2	4	6 1/2	7 1/2	4	6	4	8 1/2	22	5	5 1/4	5 1/2
12	2/13	RadI	Bias	RadI	Bias	15	2 1/4	10	3	2 1/4	6 1/2	3 1/2	2 1/4	7 1/2	2 1/4	10 1/4	15	2	4 1/4	4
						19	3 1/2	10	3 1/2	3 1/2	6 1/2	4	3 1/2	4 3/4	3 1/2	11	20	3 1/2	4 1/4	5
						22	4	9 1/2	8	4	6	8	4	6	4	9 1/2	22	4	3 1/2	6

M151A2 Vehicle

[illegible]	Date	Tire Combination Pos. LF	RF	LR	RR	Speed MPH	Passing Maneuver: Curve #1 Left Lat. "G"	Steer °	Yaw inches	Curve #1 Right Lat. "G"	Steer °	Yaw inches	Curve #2 Right Lat. "G"	Steer °	Curve #2 Left Lat. "G"	Steer °	J Turn-Right: Speed MPH	Lateral Force "G"	Steering Degrees	Yaw inches
13	2/18	Rad.I	Rad.I	Rad.I	Bias	16	2¼	9½	3	2¼	4¼	4	2¼	4¾	2¼	11	16	2	3½	3½
						20	4	9½	2½	4	7½	3½	4	6½	4	10	20	4	3	5½
						22	4¼	9½	8½	4¼	4¼	9	4¼	4¼	4¼	9½	22	4½	3½	5½
14	2/15	Rad.II	Bias	Bias	Bias	5	¼	13½	0	¼	10½	0	¼	9¼	¼	11½	5	½	5	0
						10	¾	9¾	4	¾	8	1½	¾	8½	¾	8	10	1½	4½	1
						15	2	8	6½	2	6¼	3½	2	6¾	2	6½	15	2¼	4½	2
						20	3¾	5½	5	3¾	6¾	4	3¾	5½	3¾	6½	20	4	4½	3¾
						22	5	6	3	5	5½	4½	5	5	5	6½	22	6	3¾	5
15	2/15	Bias	Rad.II	Bias	Bias	5	¼	12½	0	¼	9¼	0	¼	10	¼	9¾	5	½	4½	0
						10	¾	10½	2	¾	8½	0	¾	10	¾	9¾	10	1¼	4½	1
						15	2	9	4½	2	7½	2½	2	8	2	8	15	2½	4½	2
						20	3¾	8½	8½	3¾	8	2	3¾	8	3¾	8	20	4	4½	3½
						22	4½	7¼	11½	4½	6¼	2½	4½	6¼	4½	7¼	22	5½	4½	6
16	2/15	Bias	Bias	Rad.II	Bias	5	¼	13½	0	¼	8	0	¼	11¾	¼	9	5	¼	5	0
						10	¾	9¾	1½	¾	9¼	1½	¾	9¼	¾	8½	10	1	5	0
						15	1¾	9	3½	1¾	6¾	1	1¾	6¾	1¾	7¼	15	2¼	5	½
						20	3¾	8½	7½	3¾	10	3	3¾	10	3¾	7¼	20	4	6	2¾
						22	4	7¼	5½	4	6¾	4	4	6¾	4	9¾	22	5½	6¼	3
17	2/15	Bias	Bias	Bias	Rad.II	5	¼	11½	0	¼	10½	0	¼	11	¼	8½	5	½	5	0
						10	1	11	3	1	9¼	1½	1	8	1	6½	10	1½	5	1
						15	2¼	9¾	4½	2¼	9¼	2½	2¼	8½	2¼	8	15	2¼	5	2
						20	3¾	8½	6½	3¾	8½	3¾	3¾	7½	3¾	6½	20	4	5½	3½
						22	4½	9	8½	4½	9¾	4	4½	8½	4½	9¾	22	5	5	2½
18	2/15	Rad.I	Rad.II	Bias	Bias	5	¼	12½	0	¼	8	0	¼	10½	¼	10½	5	½	3¾	0
						10	2	11½	1½	2	9¼	1½	2	9¼	2	8	10	1¼	3¾	1
						15	2¾	9¾	5	2¾	9¼	2½	2¾	9½	2¾	6½	15	2¼	3¾	2½
						20	3½	8½	7¾	3½	8	2¾	3½	9½	3½	6½	20	4	3¼	3½
						21	4	8	7	4	5½	2	4	3¼	4	8	22	5	3¼	2
19	2/18	Bias	Rad.I	Rad.II	Bias	5	¾	10	0	¾	10¼	0	¾	10¼	¾	11½	5	1	5½	0
						10	1½	11	½	1½	10¼	0	1½	11½	1½	10	10	1	5½	0
						15	2½	9½	3½	2½	8½	1½	2½	9	2½	8½	15	2¼	4¾	1
						20	4	7½	5	4	10¼	1½	4	8½	4	7½	20	4¼	6	2½
						22	5¼	6	7	5¼	9	1½	5¼	8½	5¼	9½	22	5	6½	3½
20	2/15	Bias	Bias	Rad.I	Rad.I	5	½	8	0	½	10	0	½	10½	½	8	5	½	5	0
						10	1½	9	3½	1½	9¼	1½	1½	8½	1½	8	10	1¾	5	1
						15	2	11	5	2	8½	3½	2	7½	2	8	15	2¼	5	2
						20	3¾	9	8¼	3¾	12¾	4¼	3¾	7½	3¾	8½	20	4	5½	3¾
						22	4	8½	9	4	14	5	4	6¼	4	8	22	5½	6¼	4½
21	2/18	Bias	Rad.II	Bias	Rad.I	5	¾	11½	0	¾	11	0	¾	12½	¾	10	5	¾	5½	0
						10	1¾	10	2½	1¾	7¾	2	1¾	8½	1¾	10	10	1¾	4¾	1
						15	3	10½	4	3	9	2½	3	7	3	8	15	3	5½	2
						20	4¼	7½	6½	4¼	9	3½	4¼	7¾	4¼	8	20	4	4¾	4½
						22	5	6	7	5	10¼	3½	5	6	5	4	22	5	4	3

M151A2 Vehicle

		Tire Combination Pos.				Passing Maneuver											J Turn-Right			
						Speed	Curve #1 Left			Curve #1 Right			Curve #2 Right		Curve #2 Left		Speed	Lateral	Steering	Yaw
Card No	Date	LF	RF	LR	RR	MPH	Lat. "G"	Steer °	Yaw inches	Lat. "G"	Steer °	Yaw in.	Lat. "G"	Steer °	Lat. "G"	Steer °	MPH	Accel "G"	Degrees	inches
22	2/14	Rad.II	RadII	Bias	Bias	5	1/4	13 1/2	0	1/4	8 1/2	0	1/4	9 3/4	3/4	11 1/2	5	1/2	3	0
						10	1 3/4	11	2 1/2	1 3/4	8	6	1 3/4	6	1 3/4	8 1/2	10	1 1/2	3	1
						15	3	10	5	3	6	6	3	4 3/4	3	10 1/4	15	2 1/2	3	2
						20	4 1/2	8 1/2	8	4 1/2	6	6	4 1/2	5 1/4	4 1/2	9 1/2	20	4	2 3/4	4
						22	5 1/2	8 1/2	9 1/2	5 1/2	4 3/4	4 1/2	5 1/2	3 1/2	5 1/2	8	22	5 1/2	1 3/4	5
23	2/14	Bias	Bias	RadII	RadII	6	1/4	13 1/2	0	1/4	10 1/4	0	1/4	11 1/2	1/4	10 1/4	6	1/4	3 1/2	0
						10	1 1/2	12	2	1 1/2	10 1/4	1 1/2	1 1/2	7 1/2	1 1/2	11	10	1 1/2	3 1/2	1
						15	3	8	4	3	7 1/2	3	3	8 1/2	3	10	15	2 1/4	4 1/2	2
						20	4 1/2	11	6 1/2	4 1/2	7 1/2	5	4 1/2	8	4 1/2	10 1/4	20	4	4 3/4	2 1/2
						22	5	11	7	5	7 1/2	5	5	5 1/4	5	10 1/4	22	4 1/2	4 3/4	3 1/2
24	2/14	RadII	Bias	Rad.II	Bias	5	1/4	15	0	1/4	10 1/4	0	1/4	8 1/2	1/4	11	5	1/2	3 1/2	0
						10	1 1/4	13	3	1 1/4	8 1/2	2	1 1/4	6 1/2	1 1/4	10	10	1 1/4	3	0
						15	3 1/4	11 1/2	6	3 1/4	6	2 1/2	3 1/4	6	3 1/4	9 1/2	15	3	3 1/2	2
						20	4 1/2	9 1/2	8 3/4	4 1/2	7 1/2	6 1/4	4 1/2	8	4 1/2	10	20	4	3 1/2	3
						23	5	10	10 1/2	5	8	6 1/2	5	9	5	10 1/4	23	5	3	3 1/2
7/8	2/18	Bias	Bias	RadII	RadII	5	3/4	14	0	3/4	13 3/4	0	3/4	12 1/2	3/4	11	5	3/4	4 3/4	0
	PSI	20	20	32	32	10	1 1/4	11	1 1/2	1 1/4	11	1	1 1/4	9 1/2	1 1/4	8 1/2	10	1	5 1/2	1/2
						15	3 1/4	9 1/2	5	3 1/4	8 1/2	3	3 1/4	7	3 1/4	7	15	3	6	1 1/2
						20	4 1/4	8 1/2	7	4 1/4	7 3/4	4	4 1/4	9	4 1/4	7 1/2	20	4	6 1/2	3
						22	5	8	7 1/2	5	7	4	5	8 1/2	5	7 1/2	22	5	7	3 1/2
3/8	2/18	RadII	Bias	RadII	Bias	5	3/4	13 1/2	0	3/4	12	0	3/4	12 1/2	3/4	10 1/2	5	1/2	4 3/4	0
	PSI	20	20	32	26	10	1 1/2	11	2	1 1/2	10 1/4	1	1 1/2	8 1/2	1 1/2	8	10	1	4 3/4	1/2
						15	2 1/2	10	5	2 1/2	9 1/2	2	2 1/2	7 3/4	2 1/2	7 1/2	15	2 1/4	4 3/4	2
						20	4 1/4	7	8 1/2	4 1/4	7 3/4	2 1/2	4 1/4	6 1/2	4 1/4	7 1/2	20	4	5 1/2	3
						22	5	7 1/2	8 1/2	5	9	4 1/2	5	7	5	7 1/2	22	5	4 3/4	3 1/2
9/8	2/18	Bias	Bias	RadI	RadI	5	3/4	12 1/2	0	3/4	10 1/4	0	3/4	10 1/4	3/4	8 1/2	5	3/4	4 3/4	0
	PSI	20	20	27	27	10	1 1/2	10	2 1/2	1 1/2	8 1/2	2	1 1/2	10 1/4	1 1/2	8 1/2	10	1 1/4	4 3/4	1/2
						15	3	9 1/2	4	3	7 3/4	3 1/2	3	8 1/2	3	9 1/2	15	2 1/2	5 1/2	1 1/2
						20	4	7	6 1/2	4	9	4	4	9	4	7 1/2	20	4	6	3
						22	5	7	7 1/2	5	9 1/2	3	5	8 1/2	5	7 1/2	22	4 1/2	5 1/2	3 1/2
12/8	2/18	RadI	Bias	RadI	Bias	5	3/4	11 1/2	0	3/4	11 1/2	0	3/4	12	3/4	10 1/2	5	1/2	4 3/4	0
	PSI	20	20	27	25	10	1 1/4	11	2 1/2	1 1/4	11	1 1/2	1 1/4	9 1/2	1 1/4	9 1/2	10	1	4 3/4	1/2
						15	3 1/4	9 1/2	6	3 1/4	7	3	3 1/4	7	3 1/4	9 1/2	15	2 1/4	4	2
						20	4	7 1/2	10	4	7	2	4	7 3/4	4	7	20	4	4 3/4	3 1/2
						22	5	7 1/2	10	5	9	2	5	9	5	7 1/2	22	4 1/2	4 3/4	3
18/8	2/18	Bias	RadI	RadII	Bias	5	1/2	12 1/2	0	1/2	9	0	1/2	11	1/2	11	5	1/2	5 1/2	0
	PSI	20	20	32	25	10	1 1/4	11 1/2	1/2	1 1/4	9	0	1 1/4	10 1/4	1 1/4	10 1/2	10	1	4 3/4	1
						15	3	10	5	3	8 1/2	1 1/2	3	9	3	10	15	2 1/2	4 3/4	2
						20	4	8	9	4	9 1/2	1 3/4	4	9	4	7 1/2	20	4 1/4	5 1/2	3
						22	5	7 1/2	10	5	6 1/2	1 1/2	5	6 1/2	5	7 1/2	22	5 3/4	6 1/2	3 1/2
20/8	2/18	Bias	Bias	RadI	RadII	5	3/4	12 1/2	0	3/4	13 3/4	0	3/4	12 1/2	3/4	8	5	3/4	4 3/4	0
	PSI	20	20	27	32	10	1 1/4	10 1/2	2	1 1/4	9 1/2	1 1/2	1 1/4	10 1/4	1 1/4	9 1/2	10	1	4 3/4	1
						15	2 1/2	10	4	2 1/2	8 1/2	2 1/2	2 1/2	9	2 1/2	10 1/2	15	2 3/4	5 1/2	2
						20	4	7	6 1/2	4	7 3/4	4	4	8 1/2	4	9 1/2	20	4	6	3
						22	5	7	7	5	7	4	5	6 1/2	5	8 1/2	22	5	6	3 1/2

M151A2 Vehicle

Combination No	Hill & Curve Course: Time, min. sec. UpHill	Time, min. sec. DownHill	Average Speed mph	Max. Steering UpHill	Max. Steering DownHill	Max. Force lb. UpHill	Max. Force lb. DownHill	Wheel Revolutions UpHill	Wheel Revolutions DownHill	Critical Curve: Speed, MPH	Steering Degrees UpHill	Steering Degrees DownHill	Lateral Excursion UpHill	Lateral Excursion DownHill
3	7 44	7 53	32.6/32.0	3/3	2½/2½	4/3½	3¼/4	2971/-	2967/2967	20	2½	½	½	½
										31	1½	½	2½	2
										38	3	1	4	4
2	7 37	7 48	33.1/32.3	1/1	1/1	3½/4	4/4	3008/3003	2962/2962	37	1½	1½	3¼	3
1	7 39	7 52	32.9/32.0	2/2	1¾/2¼	3½/3	3/3	3135/3133	3092/-	20	½	2	½	½
										30	½	1½	2	1½
										37	½	1½	4	4½

STRAIGHTAWAY CONTROL MANEUVER

Condition	Date	Speed MPH	Time min. sec.	No Steer Correction Left	No Steer Correction Right	No. Wheel Rev. Left	No. Wheel Rev. Right	Steer. Force lbs. Left	Steer. Force lbs. Right	Steering Degrees Left	Steering Degrees Right	Tire Combination LF	RF	LR	RR
1	2/8	22	2 49	.11	.06	730	730	17.5	10	+¼	½	B	B	B	B
		30.0	2 07	.12	.05	730	731	15.0	10	+¼	1½				
		40.0	1 34	.16	.07	744	744	13.5	10	+¼	1½				
		50.0	1 15	.19	.06	726	726	10.0	7.5	+½	1½				
		65.	1 05	.19	.08	722	722	11.0	6.25	+½	1½				
									8.5	+1	1½	RI	RI	RI	RI
2	2/8	55	1 07	.16	.13	702	702	10.0	5.0	0	0	RII	RII	RII	RII
3	2/11	55	1 07	.15	.09	NA	NA	10.0	7.5	0	0	RI	B	B	B
4	2/12	53	1 14	.35	.35	769	719	7.5	7.5	0	¼	B	RI	B	B
5	2/12	52.3	1 10	.46	.34	724	725	12.5	5.0	1	0	RI	RI	B	B
8	2/14	55	1 07	.31	.43	721	721	5.0	6.25	1	0	B	B	RI	RI
9	2/14	55	1 08.5	.34	.27	701	700	14.0	5.0	0	2½	RI	B	B	RI
10	2/12	55	1 07	.48	.45	722	687	10.0	5.0	½	¾	B	RI	RI	B
11	2/13	55	1 07	.46	.45	701	709	20.0	5.0	1	0	RI	B	RI	B
12	2/13	55	1 07	.26	.26	702	722	10.0	5.0	½	½	RI	RI	RI	B
13	2/13	55	1 07	.33	.22	701	697	8.25	6.25						

M35 6X6 Vehicle

Comb. No.	Date	Tire Combination (Wheel Positions): Steering Front Axle LF	RF	Front Drive Axle Left LCI	LCO	Right RCI	RCO	Rear Drive Axle Left LRI	LRO	Right RRI	RRO	Speed MPH	Passing Maneuver: Curve #1 Left Turn Lat. G 1/10	Steer.°	Yaw, in.	Curve #1 Rt. Turn Lat. G 1/10	Steer.°	Yaw, in.	Curve #2 Right Lat. G 1/10	Steer.°	Curve #3 Left Lat. G 1/10	Steer.°	Comments
1	4/2	(R)	B	B	B	B	B	B	B	B	B	5	1/4	13 3/4	0	1/4	11	0	1/4	15	1/4	10	Understeer to Left
												10	1	11	1	1	9 1/2	1	1	13 3/4	1	11	
												15	1 3/4	9 1/2	5	1 3/4	8	3	1 3/4	10 1/4	1 3/4	9 1/2	
												20	2 1/4	8 3/4	10	2 1/4	6	7	2 1/4	10 1/4	2 1/4	7 1/2	
												22	2 1/4	8 3/4	8	2 1/4	8	8	2 1/4	8 3/4	2 1/4	7 1/2	
2	4/2	B	(R)	B	B	B	B	B	B	B	B	5	1/2	11 1/2	0	1/2	11	0	1/2	13 3/4	1/2	12 1/2	Understeer to Right
												10	1	10	2	1	8 3/4	0	1	10 1/4	1	8 1/4	
												15	1 3/4	8 3/4	6	1 3/4	8 3/4	3	1 3/4	10 1/4	1 3/4	9 1/2	
												20	2 3/4	8 1/4	9	2 3/4	8 3/4	6	2 3/4	11	2 3/4	8 3/4	
												22	2 3/4	8 3/4	8	2 3/4	8	6	2 3/4	10 1/4	2 3/4	10	
3	4/3	(R)	(R)	B	B	B	B	B	B	B	B	5	1/4	12 1/2	0	1/4	13 3/4	0	1/4	14 1/2	1/4	13 1/4	
												10	1	11 1/2	8	1	9 1/2	4	1	11 3/4	1	11	
												15	1 1/2	8 3/4	6	1 1/2	8 3/4	7	1 1/2	10 1/4	1 1/2	8 3/4	
												20	2	6 3/4	9	2	8 3/4	9	2	8 3/4	2	8 3/4	
												22	2 1/4	7 1/2	9	2 1/4	8	9	2 1/4	8 3/4	2 1/4	6 3/4	
												24	2 1/2	6 3/4	9	2 1/2	8	8	2 1/2	9 1/2	2 1/2	7 1/2	
												26	2 1/4	6	8	2 1/4	8	8	2 1/4	7 1/2	2 1/4	6	
4	4/1	B	B	B	B	B	B	(R)	(R)	B	B	5	1/4	11	0	1/4	12 1/4	0	1/4	14 1/2	1/4	11	Under steer to Right
												10	1/2	9 1/2	2	1/2	8 3/4	0	1/2	11	1/2	9 1/2	
												15	1	8 1/4	2	1	7 1/2	2	1	10 1/4	1	9 1/2	
												20	2	8 1/4	5	2	9 1/2	6	2	11	2	6 3/4	
												22	3	7 1/2	7	3	8 3/4	7	3	8 3/4	3	7 1/2	
												24	2 1/2	8 1/4	7	2 1/2	8	7	2 1/2	8 3/4	2 1/2	5 1/2	
5	4/2	B	B	B	B	B	B	B	B	(R)	(R)	5	1/2	14 3/4	0	1/2	10 1/4	0	1/2	14 1/2	1/2	11 1/2	Under steer to Left
												10	1	12 1/2	2	1	8 3/4	1	1	12 1/2	1	7 1/2	
												15	1 3/4	10	6	1 3/4	8 3/4	4	1 3/4	8	1 3/4	11 1/2	
												20	2	8 1/4	6	2	10 1/4	7	2	8 3/4	2	8 1/4	
												22	2	8 3/4	8	2	7 1/2	8	2	9 1/2	2	7 1/2	
6	4/1	B	B	B	B	B	B	(R)	(R)	(R)	(R)	5	3/4	16	0	3/4	11	0	3/4	17	3/4	12 1/2	Erratic steering input
												10	1	12 1/2	0	1	12 1/4	1	1	13 3/4	1	11 1/2	
												15	2	8 3/4	3	2	10 1/4	2	2	11	2	8 3/4	
												20	2	9 1/2	4	2	11	5	2	9 1/2	2	6 3/4	
												22	2	8 1/4	6	2	9 1/2	6	2	11	2	4 3/4	
												24	3	6 3/4	6	3	11	7	3	11	3	4 3/4	

M35 6x6 Vehicle

Check No.	Date	Tire Combination Wheel Positions: Steering Front Axle LF	RF	Front Drive Axle Left LCI	LCO	Front Drive Axle Right RCI	RCO	Rear Drive Axle Left LRI	LRO	Rear Drive Axle Right RRI	RRO	Speed MPH	Passing Maneuver: Curve #1 Left Turn Lat. G" 1/10	Steer.°	Yaw deg.	Curve #1 Right Turn Lat. G" 1/10	Steer.°	Yaw deg.	Curve #2 Right Lat. G" 1/10	Steer.°	Curve #2 Left Lat. G" 1/10	Steer.°	Comments
7	4/1	B	B	(R)	(R)	(R)	(R)	B	B	B	B	5	1/4	8 1/4	0	1/4	11 3/4	0	1/4	15 3/4	1/4	11 1/2	
												10	3/4	8 3/4	0	3/4	8 3/4	0	3/4	11 3/4	3/4	8 3/4	
												15	1 1/4	8 3/4	2	1 1/4	8	3	1 1/4	10 1/4	1 1/4	8 3/4	
												20	2 1/4	6 3/4	2	2 1/4	8	3	2 1/4	11	2 1/4	9 1/2	
												22	2 1/4	7 1/2	4 1/2	2 1/4	8 3/4	6 1/2	2 1/4	8 3/4	2 1/4	6	Control Loss
												24	2 1/4	6 3/4	4	2 1/4	9 1/4	8	2 1/4	10 3/4	2 1/4	4 3/4	" "
8		(R)	B	B	B	B	B	B	B	(R)	(R)	5	1/2	13 1/4	0	1/2	11 3/4	0	1/2	13	1/2	10	
												10	3/4	11	2	3/4	10 3/4	1	3/4	12 1/4	3/4	8 1/4	
												15	1 1/4	8 3/4	7	1 1/4	8	5	1 1/4	10 1/4	1 1/4	9 1/2	
												20	2	8 1/4	8	2	8 3/4	6	2	11	2	6 3/4	Control Loss
												22	2	5 1/2	9	2	8	6	2	8 3/4	2	4 3/4	" "
9	3/22	B	B	(R)	(R)	(R)	(R)	(R)	(R)	(R)	(R)	5	1/2	10	0	1/2	9 1/2	0	1/2	15	1/2	8 1/4	
												10	1	9 1/2	+1	1	8	0	1	12 1/4	1	9 1/2	
												15	1 1/2	8 1/4	6	1 1/2	9 1/2	4	1 1/2	12 1/4	1 1/2	8 1/4	
												20	2	6 3/4	7	2	9 1/2	9	2	11 3/4	2	6 3/4	Less understeer
												22	3	6	6 1/2	3	8	9 1/2	3	11	3	8 3/4	" "
10	3/20	B	B	B	B	B	B	B	B	B	B	5	1/4	12 1/2	0	1/4	13	0	1/4	15	1/4	9 1/2	
												10	1	10	0	1	11	2	1	12 1/2	1	10	
												15	2	8 3/4	1	2	11	4	2	11 3/4	2	11	Less understeer
												18	2 3/4	8 1/4	1	2 3/4	12 1/4	4 1/2	2 3/4	10 1/4	2 3/4	4 3/4	" "
												20	2 1/2	6	1	2 1/2	8 3/4	5	2 1/2	9 1/2	2 1/2	6 3/4	" "
												22	2 1/2	6 3/4	2	2 1/2	9 1/2	6	2 1/2	9 1/2	2 1/2	7 1/2	" "
11	3/21	(R)	(R)	(R)	(R)	(R)	(R)	(R)	(R)	(R)	(R)	7	3/4	11 1/2	0	3/4	11	0	3/4	13 3/4	3/4	8 3/4	
												13	1 1/4	9 1/2	1	1 1/4	9 1/2	2	1 1/4	12 1/4	1 1/4	11	
												16.5	2	8 1/4	1	2	8	8	2	10 1/4	2	11 1/2	
												20	2 1/2	8 1/4	1	2 1/2	8	10	2 1/2	9 1/2	2 1/2	8 3/4	
												22	3	7 1/2	0	3	8 3/4	12	3	9 1/2	3	6 3/4	Control Loss
												24	3	5 1/2	1	3	8	12	3	9 1/2	3	6	" "
												26	3 1/2	4 3/4	—	3 1/2	8	—	3 1/2	9 1/2	3 1/2	6	" "
12	4/1	(R)	B	(R)	(R)	(R)	(R)	(R)	(R)	(R)	(R)	5	1/4	7 1/2	0	1/4	11 3/4	0	1/4	14 1/2	1/4	7 1/2	Made left
												10	1/2	11	0	1/2	8 3/4	1	1/2	12 1/4	1/2	8 3/4	over. Right
												15	1	8 1/4	1	1	9 1/2	2	1	11 3/4	1	7 1/2	
												20	1 1/2	7 1/2	0	1 1/2	9 1/2	3	1 1/2	10 1/4	1 1/2	6 3/4	Control Loss
												22	2 1/4	7 1/2	2	2 1/4	8 3/4	3 1/2	2 1/4	8 3/4	2 1/4	5 1/2	"

M35 6x6 Vehicle

Combination No.	Date	Tire Combination – Wheel Positions: Steering Front Axle LF	RF	Front Drive Axle Left LCI	LCO	Right RCI	RCO	Rear Drive Axle Left LRI	LRO	Right RRI	RRO	Passing Maneuver: Speed MPH	Curve #1, Left Turn: Lat. G's %	Steer°	Yaw, ind.	Curve #1, Right Turn: Lat. G's %	Steer°	Yaw, ind.	Curve #2, Right: Lat. G's %	Steer°	Curve #2, Left: Lat. G's %	Steer°	Comments
3		(R)	(R)	B	B	B	B	B	B	B	B	5	3/4	14	0	3/4	12 1/4	0	3/4	13	3/4	10	
												10	1	14	2	1	10 1/4	3	1	13 3/4	1	9 1/2	
		WET										15	1 1/4	8 3/4	5	1 1/4	8	4	1 1/4	9 1/2	1 1/4	7 1/2	
												20	2 1/2	8 3/4	5	2 1/2	8 3/4	5	2 1/2	8 3/4	2 1/2	8 1/4	
												22	2	8 1/4	6	2	8	5	2	8	2	7 1/2	
												24	2	7 1/2	9	2	8	7	2	8 3/4	2	6 3/4	
7	4/6	B	B	(R)	(R)	(R)	(R)	B	B	B	B	5	0	13 1/4	0	0	11 3/4	0	0	8	0	8 3/4	
												10	3/4	8 3/4	2	3/4	8 3/4	0	3/4	11 3/4	3/4	7 1/2	
		WET										15	2	9 1/2	2	2	8 3/4	3	2	8	2	7 1/2	
												20	2	7 1/2	3	2	10 1/4	3	2	11	2	7 1/2	
												24	1 3/4	6	6	1 3/4	8 3/4	4	1 3/4	9 1/2	1 3/4	8 1/4	
9	4/5	B	B	(R)	(R)	(R)	(R)	(R)	(R)	(R)	(R)	5	1/2	13 1/4	0	1/2	13 3/4	0	1/2	12 1/4	1/2	9 1/2	
												10	1	11 1/2	6	1	11 3/4	3	1	14 1/2	1	8 1/4	
		WET										15	2	9 1/2	7	2	11 3/4	5	2	13	2	7 1/2	
												20	3	6 3/4	7	3	14 1/2	6	3	13 3/4	3	6	
												22	2 3/4	8 1/4	8	2 3/4	11	6	2 3/4	11	2 3/4	8 1/4	

M 35 6 X 6 Vehicle

Turn Right

Evaluation No.	Date	Speed MPH	Lateral Force %	Steering Degrees	Yaw Inches	Comments
1	4/2	5	1/4	11	0	
		10	1/2	11 3/4	1	
		15	2	12 1/4	4	
		20	3	11 3/4	7	
		22	4 1/4	12 1/4	7	
2	4/2	5	0	10 1/4	0	
		10	1	11	1	
		15	1 3/4	11 3/4	5	
		20	3	12 1/4	7	
		22	4 1/4	13	9	
3	4/3	5	0	11	0	
		10	3/4	11	2	
		15	2	11 3/4	7	
		20	3 3/4	12 1/4	8	
		22	5	12 1/4	9	
		24	5 3/4	12 1/4	9	
		26	6 1/4	14 1/2	12	Control Loss - Vehicle Drift
4	4/1	5	3/4	11	0	
		10	1 1/2	11 3/4	2	
		15	2	12 1/4	5	
		20	5 1/4	13 3/4	9	
5	4/2	5	1/4	11	0	Less steering than Comb. HA
		10	3/4	11 3/4	1	
		15	2	12 1/4	5	
		20	3	12 1/4	8	
		22	4 1/2	13	8	
6	4/1	5	1/2	11 3/4	0	
		10	1 1/4	11 3/4	2	
		15	2 1/2	12 1/4	6	
		20	3 3/4	13	7	
		22	5	13 3/4	9	

M35 6x6 Vehicle

Hill & Curve Course / **Control Curve**

Combination No.	Time, Min. Sec. Up Hill	Time, Min. Sec. Down Hill	Average Speed	Max. Steering Degrees Up Hill	Max. Steering Degrees Down Hill	Max "G" Force 1/10 Up Hill	Max "G" Force 1/10 Down Hill	Wheel Revolutions Up Hill	Wheel Revolutions Down Hill	Speed Up Race	Max. Steering Degrees Up Hill	Max. Steering Degrees Down Hill	Max. Lat. Force 1/10 G Up Hill	Max. Lat. Force 1/10 G Down Hill
10	18 33	21 43	13.5/7.9	4 3/4 / 8	2 1/4 / 6 3/4	1 / 1	1 / 1	2237/2235	2214/2199	24/24	3 1/2	6	1 3/4	1
11	17 40	22 04	14.3/11.4	5 1/2 / 7 1/2	4 / 6	2 / 1	3/4 / 1	2279/2275	2253/2254	26/26	3	5	1 3/4	1
9	19 03	22 37	13.2/11.1	5 1/2 / 6	— —	1 1/2 / 1	1 / 1 1/2	2279/2276	2253/2254	26/26	3 1/2	4 1/2	1 1/2	1/2
3	19 39	21 43	12.8/11.6	6 / 4 1/2	4 3/4 / 3	1 / 1 1/4	1 / 1	2217/2227	2185/2195	29/28	3 1/2	3	1	1
7	19 51	21 36	12.7/11.7	5 1/2 / 6	3 / 6 3/4	1 1/4 / 1	1 1/2 / 1 1/4	2258/2259	2226/2226	28/28	3	5	1 3/4	1 1/4

Straightaway Control Maneuver

Combination No.	Date	Speed MPH	Time, Min. Sec.	No. Steer. Correct./Sec. Left	No. Steer. Correct./Sec. Right	No. Wheel Rev. Left	No. Wheel Rev. Right	Steer. Force, in. lbs. Left	Steer. Force, in. lbs. Right	Steering Degrees Left	Steering Degrees Right	
10	3/20	45.6	1 19	.22	.13	515	497	40	17.5	1/2	3	Bias
11	3/22	43.4	1 23	.20	.11	529	524	35	25	0	3 3/4	Radial
9	3/22	45.0	1 20	.15	.12	529	529	27.5	22.5	0	3	Bias/Radial
3	4/3	45.6	1 19	.16	.10	507	502	42.5	30	1/2	3	Radial/Bias
8	4/2	43.9	1 22	.17	.17	403	527	50	35	1/2	2	1 Radial/Bias/1 Radial
7	4/4	46.2	1 18	.14	.05	509	510	35	25	1/2	3	Radials Front Drive

SCHOOL BUS

Comb. No.	Date	Tire Combination Wheel Positions: Steering Front Axle LE	RE	Drive Axle Left LRO	LRI	Right RRO	RRI	Speed MPH	Passing Maneuver: Curve #1 Left Turn Lat. "1/10	Steer.°	Yaw (in.)	Curve #1 Right Turn Lat. "1/10	Steer.°	Yaw (in.)	Curve #2 Right Lat. "1/10	Steer.°	Curve #2 Left Lat. "1/10	Steer.°	Comments
1	4-23	(R)	B	B	B	B	B	6.5	0	13	0	1/2	8 1/2	0	0	12	0	10 3/4	
								12	1/2	11 3/4	5	1	7 3/4	6	1	10 1/2	1	7	
								18.5	1	10	8	1 1/2	7	12	1	7 3/4	1	8 1/4	
								24.5	1	10	12	2	7	14	2	9 1/4	2	7 1/2	
								31	2	8 3/4	21	2 1/2	7 3/4	17	2	5 3/4	2	6 1/2	Control loss. Understeer and
								33	2	7 1/2	18	3	7	18	2	7	1 1/2	13	Control loss. oversteer
2		B	(R)	B	B	B	B	5	0	14 3/4	0	0	8 1/2	0	0	16	0	10	
								10	0	13	1	1	7	5	1/2	10 1/2	1	6 1/2	
								15	1	13 1/2	2	1	-	9	1	5 3/4	1	4 3/4	
								20	1	13 1/2	6	2	7 3/4	13	1 1/2	8 1/2	1	9 1/2	Understeer
								25	1	13 1/2	10	2	9 1/4	15	1	9 3/4	2	8 3/4	Control Loss to right & over-
								27	2	7 1/2	14	2	8 1/2	18	2	8 1/2	2	7 1/2	Control Loss steer to left.
3		B	B	(R)	B	B	B	5	0	14 1/4	0	0	8 1/2	0	0	13	0	11 1/4	
								10	1/2	12 1/2	2	1	9 1/4	4	1/2	12 1/4	1	9 1/2	
								15	1	12 1/2	4	1 1/2	5	10	1	9 3/4	1	7 1/2	
								20	1 1/2	10 3/4	8	2	6 1/2	14	2	9 3/4	2	8 1/4	
								25	2	8 3/4	11	2 1/2	5	16	2	5 3/4	2	7	Cyclic yaw in lane change
								27	2	9 1/2	14	2 1/2	8 1/2	17	2	8 1/2	2	8 1/4	
4		B	B	B	B	(R)	B	5	0	14 1/2	0	0	7	0	0	15	0	9 1/2	
								10	1/2	13	4	1	6 1/2	3	1/2	11 1/2	1	8 3/4	
								15	1	11 1/4	3	1	5 3/4	7	1	9 3/4	1	7 1/2	
								20	1	10	10	2	8 1/2	11	1 1/2	7 3/4	2	7 1/2	
								25	2	8 1/4	14	2	8 1/2	12	2	9 1/4	2	8 1/4	Cyclic yaw in lane change
								27	2	8 1/4	19	2	7 3/4	13	2	7	2	2 3/4	→ Control loss w/o steering correction.
5	4-20	B	B	(R)	(R)	B	B	5	0	14 1/4	0	0	8 1/2	0	0	15	0	11 1/4	
								10	1/2	11 3/4	2	1	7	6	0	10 1/2	1	9 1/2	
								15	1	8 3/4	6	1	5	11	1	9 3/4	1 1/2	8 1/4	
								20	1	10 3/4	9	2	7 3/4	12	1	9 1/4	2	8 1/4	
								25	2	8 3/4	15	2	8 1/2	18	2	9 3/4	2	7 1/2	Control loss: understeer and
								27	2	7	17	2 1/2	8 1/2	16	2	8 1/2	2	7 1/2	Control loss cyclic yaw. Under left.
6	4-20	B	B	(R)	(R)	(R)	(R)	5	0	12 1/2	0	0	7	0	0	14	0	11 1/4	
								10	1	9 1/2	2	1	6 1/2	5	1	9 3/4	1	8 1/4	
								15	1 1/2	10	3	2	7 3/4	5	1	9 3/4	1 1/2	8 3/4	
								20	1 1/2	10	6	2	7 3/4	10	1	9 1/4	2	7 1/2	
								25	2	8 1/4	12	2	4 1/2	13	1 1/2	7 3/4	2	5 1/4	Control loss: lane change
								27	2	8 1/4	14	2	4 1/2	14	2	7	2	8 1/4	Control loss: return straight

School Bus

Comb. No.	Date	Tire Combination Wheel Positions: Steering Front Axle LF	RF	Drive Axle Left LRO	LRI	Right RRO	RRI	Speed MPH	Curve #1 Left Turn Lat. G's 1/10	Steer. °	Yaw Inches	Curve #1 Right Turn Lat. G's 1/10	Steer. °	Yaw Inch	Curve #2 Right Lat. G's 1/10	Steer. °	Curve #2 Left Lat. G's 1/10	Steer. °	Comments
7	4-20	B	B	B	B	(R)	(R)	5	0	13½	0	0	8½	0	0	14	0	8¼	
								10	1	13½	4	1	8½	3	0	13	1	8¾	
								15	1	13½	9	2	6½	9	1	9¾	2	7½	
								20	2	9½	13	2	9¼	10	2	5¾	2	7½	
								25	2	8¼	18	2	7	14	2	6½	1½	7	
								27	1½	6½	19	2	4½	14	1	7¾	2	7	
8	4-25	(R)	(R)	B	B	B	B	5	0	13½	0	0	7	0	0	13	0	10	
								10	0	13	3	½	7	1	0	9¼	0	9½	
								15	½	10¾	0	1	5¾	5	1	9¾	1	8¾	
								20	1	11¾	6	2	7	9	1	8½	1	9½	
								25	2	9½	10	2	7	11	2	8½	2	9½	
								27	2	7½	13	2½	8½	13	2	5¾	2	7	EXTRA STEERING EFFORT
9	4-23	(R)	B	B	B	(R)	(R)	6.5	0	11¾	0	0	7¾	0	0	12¼	0	8¾	
								12	0	10¾	3	1	7¾	2	0	14	0	8¾	
								18.5	½	10¾	8	1	8½	9	½	9¾	1	8¾	
								24	1	8¾	15	2	9¼	12	1	7¾	2	5¾	
								31	2	7	18	2	7¾	14	2	8½	2	8¼	CONTROL LOSS - UNDER OVER STEER
10	4-26	B	B	B	B	B	B	5	0	14½	0	0	7¾	0	0	15	0	10¾	
								10	0	13	1	½	6½	5	0	11½	½	10	
								15	½	10¾	3	1	7	7	1	8½	1	6½	
								20	2	10	9	2	6½	12	2	8½	2	10	
								25	2	9½	12	2	7	14	2	8½	2	9½	
								27	2	8¼	17	2½	5¾	15	2	7	2	8¾	CONTROL LOSS - UNDER STEER
11	4-19	(R)	(R)	(R)	(R)	(R)	(R)	5	0	13	0	0	7	0	0	13	0	11¾	
								10	¾	11¾	2	1	7¾	1	¾	10½	1	9½	
								15	1	7½	7	1	5¾	7	1	5¾	1	7½	
								20	2	8¼	11	2½	7¾	11	1	—	2	7½	
								25	2½	8¾	17	3	—	12	2	7	3	6½	
								27	2	8¼	19	3	7¾	12	3	7	2	7½	
12	4-19	(R)	B	(R)	(R)	(R)	(R)	5	0	12½	0	0	8½	0	0	13	0	9½	
								10	½	9½	4	1	7¾	4	½	9¾	1	6½	
								15	1¼	7½	6	2	5¾	7	1	—	2	4	
								20	2	7½	9	2	—	11	2	4	2	7	STEERING IMBALANCE
								25	2	8¾	17	2¼	5¾	20	2	3½	2	6½	
								27	2	—	21	2	—	15	2¾	2¾	2	7	CONTROL LOSS

School Bus

Comb. No.	Date	Tire Combination Wheel Positions — Steering Front Axle LF	RF	Drive Axle Left LRO	LRI	Right RRO	RRT	Speed MPH	Curve #1 Left Turn Lat. "G" 1/10	Steer. °	Yaw Veloc.	Curve #1 Right Turn Lat. "G" 1/10	Steer. °	Yaw Veloc.	Curve #2 Right Lat. "G" 1/10	Steer. °	Curve #2 Left Lat. "G" 1/10	Steer. °	Comments
8 A	4-26	(R)	(R)	B	B	B	B	5	0	13	0	0	7 3/4	0	0	16	0	4 1/2	
		Curb Weight - Dry						10	0	10 3/4	1	1/2	6 1/2	4	0	9 3/4	1/2	8 1/4	
								15	1/2	10	3	1	6 1/2	6	1	9 1/4	1	8 1/4	
								20	1	10	8	2	6 1/2	9	2	7 3/4	1	8 3/4	Well Balanced
								25	2	9 1/2	11	2 1/4	7	12	2	8 1/2	2	8 1/4	
								27	2	8 1/4	15	2 1/2	6 1/2	14	2 1/2	5 3/4	2	8 3/4	Control Loss
								29	2	7 1/2	15	2 1/2	7	14	2 1/2	8 1/2	2	8 3/4	Control Loss
6 A	4-27	B	B	(R)	(R)	(R)	(R)	5	0	13	0	0	7	0	0	14	0	10	
		Curb Weight - Dry						10	0	11 3/4	5	1/2	8 1/2	0	0	10 1/2	1/2	7 1/2	
								15	1	10	7	1 1/2	6 1/2	5	1 1/2	8 1/2	1	5 3/4	
								20	2	7 1/2	12	2	6 1/2	9	2	8 1/2	2	7	
								25	2	8 1/4	15	2	6 1/2	11	2	8 1/2	2	6 1/2	Under-steer
								29	2	7 1/2	19	2 1/2	6 1/2	14	2	7 3/4	2	6 1/2	Control Loss
8 B	4-27	Curb Weight - Wet						5	0	13 1/2	0	0	7 3/4	0	0	14	0	10 1/4	
								10	0	12	1	1	7 1/4	1	1/2	11 1/2	1	8	
								15	1	9 3/4	3	1	7 1/4	6	1	10 3/4	1	7 1/2	
								20	2	9 3/4	5	2	8 1/2	9	2	9 1/4	2	—	Rear Traction Loss
								25	2	9	8	2 1/2	8 1/2	13	2 1/2	9 1/4	2	8 1/2	
								27	2	10 1/2	11	2	7 1/4	12	2	6 1/2	2	8 1/2	Control Loss
6 B	4-27	Curb Weight - Wet						5	0	13 1/2	0	0	7 1/2	0	0	14	0	9	
								10	0	12 1/4	4	1/2	7	2	0	12 1/2	1/2	7 1/2	
								15	1/2	10 1/4	8	1	5 3/4	10	1	9 1/4	1	5 3/4	
								20	1 1/2	8	9	2	7	11	2	9 1/4	2	6 3/4	
								25	2	10 3/4	-	2	7	13	2	9 1/4	2	8	Under Steer
								27	2	6 3/4	10	2 1/2	7 1/2	13	2	8 1/2	2	5 3/4	Control Loss

School Bus

J TURN RIGHT

[illegible] No.	DATE	SPEED MPH	LATERAL Force g 1/10	STEERING DEGREES	YAW inches	COMMENTS
1	4-23-74	6.5	1	15	0	
		12	1 1/2	16	4	
		18.5	4	17	14	
		24.5	6	17	33	
		27.	6	17	34	
2	4-23-74	5	0	14	0	
		10	1	14	3	
		15	2 1/2	16	8	
		20	4 1/2	16	17	
		22	5 1/2	17	24	
3	4-24-74	5	1/2	14	0	
		10	1	15	2	
		15	3	15	8	
		20	5	16	9	
		22	5	16	14	
4	4-24-74	5	1/2	14	0	
		10	1	14	1	
		15	2 3/4	16	6	
		20	3 1/4	16	17	
		22	5 3/4	17	23	
5	4-20-74	5	0	14	0	
		10	1	15	3	
		15	3 1/4	16	9	
		20	5	16	20	
		22	5 3/4	17	24	Vehicle drift
6	4-20-74	5	0	14	0	
		10	1	14	3	
		15	2 1/2	16	7	
		20	5	16	16	
		22	6	17	24	Vehicle drift

School Bus

TURN RIGHT

Configuration No.	DATE	SPEED MPH	LATERAL Force 1/10	STEERING DEGREES	YAW inches	COMMENTS
7	4-20-74	5	0	14	0	
		10	1	14	2	
		15	2½	15	8	
		20	5	17	17	
		22	5¾	17	27	drift
8	4-25-74	5	½	14	0	
		10	1	14	2	
		15	2	16	6	
		20	4¼	17	14	
		22	5	18½	23	Extra steering effort
9	4-23-74	6.5	½	14	0	
		12.0	2	15	5	
		18.5	3½	16	11	
		24.5	6	17	19	Very unstable
10	4-25-74	5	¼	14	0	
		10	1	14	3	
		15	2¼	15	6	
		20	5	17	14	
		22	5¾	18½	24	
11	4-19-74	5	½	15	0	
		10	1¼	15	2	
		15	3	16	9	
		20	5	18½	16	
		22	6	17	25	
12	4-19-74	5	0	15	0	
		10	1	15	3	
		15	3	17	8	
		20	5	18½	19	
		22	6¼	18½	22	

School Bus

Combination No.	DATE	SPEED MPH	LATERAL Force "G"s	Turn Right STEERING Degrees	YAW inches	Comments
8A Cab-Day	4-26-74	5	1/2	13	0	
		10	1	14	2	
		15	2 1/4	15	5	
		20	5	16	12	
		22	5 3/4	17	17	
		24	6 1/4	18 1/2	22	
6A Web Day	4-27-74	5	1/4	14	0	
		10	1	15	2	
		15	2 1/4	15	6	
		20	5	17	11	
		24	6	18 1/2	21	

Bus

Hill & Curve Course

Combination No.	Time, min & Seconds Up Hill		Down Hill		Average Speed up/down	Max. Steering Degrees Up Hill		Down Hill		Max. "G" Force, 1/10 Up Hill		Down Hill		Wheel Revolutions Up Hill	Down Hill	Speed MPH Up/Down	Control Curve: Max. Steering Degrees Up Hill	Down Hill	Max. Lat. Force "G" 1/10 Up Hill	Down Hill
10	12	10	11	8	20.7/22.6	14¾	6½	8½	14¾	1	1	1	2	2389/2384	2350/2346	34/34	10	8½	2¼	2¼
11	11	21	10	44	22.2/23.4	17½	8	8	19.4	2	1	1	2	2394/2395	2371/2372	34/34	—	—	3	2½
8	11	26	11	04	22.0/22.8	16½	6½	7	19	1½	1	2	2	2387/2382	2354/2386	34/34	8¾	7	2½	2
6	12	20	11	53	20.4/21.2	17	7¾	11½	16¼	1¾	2	2	1¾	2396/2396	2377/2377	34/34	13½	10½	3	3

Straightaway Control Maneuver

Combination No.	Date	Speed, MPH	Time min.	Sec.	Ave. Steering Correct./Sec. Left	Right	No. Wheel Rev. Left	Right	Steering Force, lbs Left	Right	Steering Degrees Left	Right
10	4-22-74	52.6	68	30	.18	.15	551	562	16	15	1½	0
11	4-19-74	52.2	69	00	.14	.16	558	559	20	15	0	1
6	4-20-74	52.2	69	00	.13	.07	558	557	22.5	5	¼	0
8	4-25-74	52.1	69	05	.14	.10	549	553	20	20	½	0

TRACTOR-TRAILER UNIT

Card No.	Date	Tire Combination Wheel Positions: Tractor Front Axle LF	RF	Drive Axle Left Out	Left In	Right Out	Right In	Trailer Axle Left Out	Left In	Right Out	Right In	Passing Maneuver: Speed MPH	Curve #1 Left Lat. Z" 1/10	Steer.°	Yaw incl.	Curve #1 Right Lat. Z" 1/10	Steer.°	Yaw incl.	Curve #2 Right Lat. Z" 1/10	Steer.°	Curve #2 Left Lat. Z" 1/10	Steer.°	Comments
1	3/12	(R)	B	(R)	(R)	(R)	(R)	(R)	(R)	(R)	(R)	5	1/4	7 1/4	0	1/4	3 3/4	0	1/4	9 1/4	1/4	5	
												10	1/2	5 1/4	4	1/2	5 1/2	1	1/2	7 1/2	1/2	5 1/2	
												15	1	4 1/2	6	1	4 1/4	4	1	7 1/2	1	6	Steering
												20	1 1/4	4 1/2	9	1 1/4	6 3/4	6	1 1/4	6 3/4	1 1/4	4 3/4	imbalance
												22	1 3/4	4 1/2	11	1 3/4	6 1/2	7	1 3/4	6 3/4	1 3/4	5 1/4	
												26	1 3/4	4 1/2	12	1 3/4	6 3/4	10	1 3/4	6 3/4	1 3/4	6 3/4	Control Loss
												28	2 1/4	4 3/4	13	2 1/4	7 1/4	9	2 1/4	6 3/4	2 1/4	6 1/2	Control Loss
2	3/9	B	(R)	B	B	B	B	B	B	B	B	5	1/4	8 1/2	0	1/4	7 3/4	0	1/4	7 1/2	1/4	6 1/4	
												10	3/4	5 1/2	7	3/4	4 3/4	0	3/4	4 1/2	3/4	6 1/2	
												15	1	6 1/4	6	1	5 3/4	0	1	6 3/4	1	5 3/4	
												20	2 1/2	6	9	2 1/2	5 1/4	2	2 1/2	5 3/4	2 1/2	5 1/2	Steering
												22	3	6 3/4	13	3	6 1/4	5	3	6 1/4	3	6 3/4	imbalance
												24	2 3/4	5 1/2	13	2 3/4	6	5	2 3/4	6	2 3/4	6 1/4	
												26	2 1/2	6 3/4	14	2 1/2	6 3/4	6	2 1/2	6 3/4	2 1/2	6 1/4	Control Loss
												28	2 1/2	7	14	2 1/2	6 1/2	5	2 1/2	6 1/2	2 1/2	7 1/4	Control Loss
3	3/9	(R)	(R)	B	B	B	B	B	B	B	B	5	1/4	7 1/4	0	1/4	5 1/4	0	1/4	9 1/4	1/4	6	
												10	1/2	6 3/4	2	1/2	6 1/4	+1	1/2	6 3/4	1/2	4 3/4	
												15	1	6 1/2	3	1	6	1	1	6 3/4	1	5 1/2	
												20	3	4 1/4	7	3	5 3/4	3	3	6 1/2	3	5 1/4	
												22	2	5	9	2	5 1/2	5	2	7	2	6	
												24	2	5 3/4	11	2	6 3/4	5	2	6 3/4	2	5 3/4	
												26	2 1/4	6 1/4	11	2 1/4	8 1/4	7	2 1/4	6 3/4	2 1/4	4 1/2	
												28	2 1/4	6 3/4	12	2 1/4	8	7	2 1/4	5 3/4	2 1/4	5 1/2	
4	3/12	(R)	(R)	(R)	(R)	(R)	(R)	B	B	B	B	5	1/4	8	0	1/4	5 1/4	0	1/4	8	1/4	2 1/4	
												10	1/2	6 1/2	2	1/2	5 1/2	1	1/2	7 1/2	1/2	6	
												15	1 3/4	5	6	1 3/4	5 1/4	3	1 3/4	7	1 3/4	5 1/4	
												20	2 1/4	5 3/4	8	2 1/4	6 1/4	3	2 1/4	6 3/4	2 1/4	5	
												24	2 1/4	4 1/4	10	2 1/4	5 1/4	7	2 1/4	5 3/4	2 1/4	5 1/4	
												26	2 1/4	5	12	2 1/4	6 1/4	10	2 1/4	6 1/2	2 1/4	5 1/2	Excessive trailer
												28	2 1/2	4 1/2	12	2 1/2	5 3/4	9	2 1/2	5 3/4	2 1/2	5 1/2	yaw tractor push by trailer
5	3/8	B	B	B	B	(R)	(R)	B	B	B	B	5	1/4	7 1/4	0	1/4	4 1/2	0	1/4	9 3/4	1/4	6	
												10	1/2	6 1/2	0	1/2	5 1/2	1	1/2	8 1/2	1/2	6 1/4	
												15	1 1/2	5 1/4	4	1 1/2	6 1/4	2	1 1/2	7 1/2	1 1/2	5 3/4	
												20	2	5	6	2	6 1/4	3	2	6 3/4	2	6 1/4	Steering
												24	3	4 3/4	7	3	6 1/4	4	3	5 3/4	3	6 1/4	imbalance
												26	3 1/4	4 3/4	8	3 1/4	6 1/4	5	3 1/4	7 1/4	3 1/4	6 1/4	
												28	3 1/2	4 1/4	10	3 1/2	6 1/4	5	3 1/2	6 3/4	3 1/2	5 1/2	Control Loss

TRACTOR TRAILER UNIT

Comb. No.	Date	Tractor Front Axle LF	Tractor Front Axle RF	Drive Axle Left OUT	Drive Axle Left IN	Drive Axle Right OUT	Drive Axle Right IN	Trailer Axle Left OUT	Trailer Axle Left IN	Trailer Axle Right OUT	Trailer Axle Right IN	Speed MPH	Curve #1 Left Lat. "g"	Curve #1 Left Steer °	Curve #1 Left Yaw (in.)	Curve #1 Right Lat. "g"	Curve #1 Right Steer °	Curve #1 Right Yaw (in.)	Curve #2 Right Lat. "g"	Curve #2 Right Steer °	Curve #2 Right Lat. "g"	Curve #2 Right Steer °	Comments
6	3/12	(R)	B	B	B	(R)	(R)	B	B	B	B	5	1/4	8 1/2	0	1/4	8	0	1/4	8 1/2	1/4	7 1/4	
												10	3/4	4 3/4	3	3/4	7 1/4	2	3/4	7 1/2	3/4	6 1/2	Steering
												15	1 1/4	6 3/4	4	1 1/4	7	3	1 1/4	7	1 1/4	5 3/4	Imbalance
												20	1 3/4	6 1/4	5	1 3/4	6 3/4	8	1 3/4	6 3/4	1 3/4	5 3/4	
												24	2	4 3/4	7	2	5 3/4	10	2	6 1/4	2	6 1/4	Control Loss
												26	3	5 1/2	7	3	2 1/4	10	3	5 3/4	3	5 1/2	Control Loss
7	3/13	B	(R)	(R)	(R)	B	B	(R)	(R)	(R)	(R)	5	1/4	9 1/4	0	1/4	6 1/4	0	1/4	8	1/4	6	
												10	1/2	7	3	1/2	6 1/4	1	1/2	7 3/4	1/2	6	Steering
												15	1 3/4	6 1/2	4	1 3/4	6	3	1 3/4	7 1/4	1 3/4	6 3/4	Imbalance
												20	2 1/4	5 1/2	5	2 1/4	6 1/4	6	2 1/4	7 3/4	2 1/4	6 1/4	Control Loss
												24	2 1/4	5	6	2 1/4	5 3/4	8	2 1/4	7 1/2	2 1/4	4 1/2	Control Loss
8	3/8	B	B	B	B	B	B	B	B	(R)	(R)	5	1/4	8 3/4	0	1/4	7	0	1/4	7 1/4	1/4	5 3/4	Trailer
												10	3/4	6 1/2	3	3/4	6 1/4	+4	3/4	6 3/4	3/4	3	Imbalance
												15	1	6 1/4	6	1	5 3/4	0	1	6 1/4	1	4 1/2	
												20	2 1/4	6 1/4	10	2 1/4	4 1/4	3	2 1/4	7 1/4	2 1/4	4 1/2	
												24	2 1/2	5 1/2	12	2 1/2	3 3/4	6	2 1/2	5 3/4	2 1/2	5	
												26	2 3/4	4 3/4	14	2 3/4	4	6	2 3/4	5 3/4	2 3/4	4 3/4	
9	3/7	B	B	B	B	B	B	(R)	(R)	(R)	(R)	5	1/4	8 3/4	0	1/4	6	0	1/4	5 3/4	1/4	6	
												10	1/2	7 1/4	3	1/2	7	+3	1/2	8 3/4	1/2	6	
												16	1 1/4	6 3/4	7	1 1/4	6	+1	1 1/4	7	1 1/4	7	
												20	2 1/4	6	10	2 1/4	6 1/4	2	2 1/4	6 1/4	2 1/4	6	
												24	2 1/4	5 3/4	11	2 1/4	5 3/4	0	2 1/4	5 3/4	2 1/4	6	
												26	2 1/4	5 1/2	10	2 1/4	5 3/4	5	2 1/4	5 3/4	2 1/4	6	
												28	2 1/4	5 1/2	18	2 1/2	5 3/4	7	2 1/2	5 3/4	2 1/2	6	
10	3/7	B	B	(R)	(R)	(R)	(R)	(R)	(R)	(R)	(R)	5	1/4	8 1/4	0	1/4	6 3/4	0	1/4	8	1/4	6	
												10	1/2	6	1	1/2	6 3/4	+2	1/2	6 3/4	1/2	4 3/4	
												15	1	6 1/2	6	1	6 3/4	+1	1	6 3/4	1	4 1/2	
												20	2	4 3/4	11	2	6 3/4	3	2	6 3/4	2	4	
												24	2	5 1/4	12	2	6 3/4	3	2	6 1/2	2	4	
												26	2	5 1/2	14	2	5 1/2	5	2	5 3/4	2	4 1/2	

Tractor Trailer Unit

Comb. No.	Date	Tire Combination Wheel Positions: Tractor Front Axle LF	Tractor Front Axle RF	Drive Axle Left Out	Drive Axle Left In	Drive Axle Right Out	Drive Axle Right In	Trailer Axle Left Out	Trailer Axle Left In	Trailer Axle Right Out	Trailer Axle Right In	Passing Maneuver: Speed MPH	Curve #1 Left Lat. ''/10	Curve #1 Left Steer °	Curve #1 Left Yaw Inch	Curve #1 Right Lat. ''/10	Curve #1 Right Steer °	Curve #1 Right Yaw Inch	Curve #2 Right Lat. ''/10	Curve #2 Right Steer °	Curve #2 Left Lat. ''/10	Curve #2 Left Steer °	Comments
11	3/5	B	B	B	B	B	B	B	B	B	B	6	1	4	0	1	5 3/4	0	1	9 3/4	1	7 1/2	
												10	2	6 3/4	+1	2	6	1	2	8 1/2	2	5 1/4	
												15	3	6 3/4	0	3	7	1	3	7 3/4	3	6	
												20	3 1/2	6 3/4	0	3 1/2	6 1/2	2	3 1/2	7 1/4	3 1/2	6 3/4	
												22	3	6 1/2	0	3	5 3/4	2	3	7 1/2	3	6	
												25	3	5 1/2	+1	3	6 1/2	+7	3	6 3/4	3	5 3/4	
												27	3 1/4	6	+4	3 1/4	6 3/4	10	3 1/4	7 3/4	3 1/4	6 1/2	Control Loss
12	3/5	(R)	(R)	(R)	(R)	(R)	(R)	(R)	(R)	(R)	(R)	6	1/2	8 1/2	0	1/2	5 3/4	0	1/2	8 1/4	1/2	4 3/4	
												10	3/4	6 3/4	0	3/4	7 1/4	0	3/4	8	3/4	6 1/4	
												15	1	5 3/4	8	1	6	0	1	7 1/2	1	6 1/2	
												20	2 1/2	5 1/2	10	2 1/2	5 1/2	3	2 1/2	6 3/4	2 1/2	6 1/2	
												22	3	4 3/4	12	3	4 1/4	6	3	5 3/4	3	5 1/4	
												25	2 1/2	4 1/2	14	2 1/2	6 1/4	6	2 1/2	6 1/4	2 1/2	6	
												27	3 1/4	5 1/2	14	3 1/4	—	6	3 1/4	6	3 1/4	5 3/4	Control Loss
12A	3/6	All Radial - 80 PSIG Inflation Pressure										3 1/2	1/2	7	0	1/2	7 1/2	0	1/2	10 1/2	1/2	5 3/4	
												7	3/4	6 1/2	4	3/4	6 1/4	2	3/4	8 3/4	3/4	3 3/4	
												9 1/2	1	6 1/2	6	1	6 3/4	2	1	7 3/4	1	6 1/2	
												13	2 1/4	7	6	2 1/4	7 1/4	0	2 1/4	7 1/2	2 1/4	6 1/2	
												15 1/2	3	6 3/4	9	3	8	3	3	7 1/4	3	6 3/4	
												18 1/4	2 3/4	5 1/2	9	2 3/4	5 1/2	5	2 3/4	6 3/4	2 3/4	4 1/2	
												22	3 1/4	5 3/4	12	3 1/4	6 1/4	6	3 1/4	6 3/4	3 1/4	6	
												24	3 1/4	5 3/4	12	3 1/4	6 1/4	7	3 1/4	6 1/4	3 1/4	6 1/2	
												27	3 1/2	5 3/4	14	3 1/2	6	8	3 1/2	6 1/2	3 1/2	6 1/4	
												29	2 3/4	6 1/4	16	2 3/4	5 3/4	10	2 3/4	6	2 3/4	5 3/4	Control Loss
13		(R)	(R)	B	B	B	B	(R)	(R)	(R)	(R)	5	1/4	9 3/4	0	1/4	7 1/4	0	1/4	9	1/4	5 3/4	
												10	1	6 1/2	0	1	6 3/4	0	1	7 1/4	1	6 1/2	
												15	1	7	2	1	7	3	1	7 1/2	1	6 3/4	Drive Tire
												20	2 1/4	6	4	2 1/4	6 1/2	6	2 1/4	6 3/4	2 1/4	6 1/4	Yaw -
												22	2	6 3/4	5	2	7 1/4	7	2	6 3/4	2	7	
												24	2 1/4	6	5	2 1/4	6 1/2	8	2 1/4	6 1/2	2 1/4	6	Control Loss
												26	2 1/2	6 3/4	6	2 1/2	6 1/4	9	2 1/2	6 1/4	2 1/2	6 1/2	" "
												28	2 1/2	6 1/4	7	2 1/2	6 1/2	10	2 1/2	6 1/4	2 1/2	6 3/4	" "
14		B	B	(R)	(R)	(R)	(R)	B	B	B	B	5	1/4	6	0	1/4	5	0	1/4	7 3/4	1/4	4 1/2	
												10	1/2	6	0	1/2	4 1/2	1	1/2	7 1/2	1/2	5	
												15	1 1/4	5 1/4	3	1 1/4	5 1/4	4	1 1/4	6 3/4	1 1/4	5 3/4	
												20	2 1/2	4 1/2	7	2 1/2	6 3/4	7	2 1/2	6 3/4	2 1/2	5 1/2	
												24	2 1/4	6	9	2 1/4	6 1/4	8	2 1/4	6 1/4	2 1/4	5 1/2	Over Steer - Push
												28	3	4 1/2	10	3	6 1/2	10	3	6 1/2	3	4 1/4	From Trailer

Tractor Trailer Unit

Comb. No.	Date	Tire Combination (Wheel Positions): Tractor Front Axle LE	RE	Drive Axle Left out	Drive Axle Left in	Drive Axle Right out	Drive Axle Right in	Trailer Axle Left out	Trailer Axle Left in	Trailer Axle Right out	Trailer Axle Right in	Speed MPH	Wheel #1 Left Lat. 6" 1/10	Steer °	Yaw	Wheel #[illegible] Lat. 6" 1/10	Steer °	Yaw	Wheel #[illegible] Right Lat. 6" 1/10	Steer °	Wheel #[illegible] Left Lat. 6" 1/10	Steer °
9A	3/14	B	B	B	B	B	B	(R)	(R)	(R)	(R)	5	1/4	11	0	1/4	10	0	1/4	12	1/4	8 1/2
		CURB Weight										10	3/4	8 1/2	+1	3/4	7	5	3/4	7 3/4	3/4	7 1/2
												15	1 1/2	6 3/4	0	1 1/2	6 1/2	8	1 1/2	6 3/4	1 1/2	7 1/4
												20	2	6	1	2	6 3/4	9	2	7	2	6 3/4
												24	2 1/2	6	2	2 1/2	7 1/4	10	2 1/2	7 1/4	2 1/2	6 3/4
												28	3	6	-3	3	5 1/2	11	3	6	3	5 3/4
13A	3/14	B	B	(R)	(R)	(R)	(R)	(R)	(R)	(R)	(R)	5	1/4	11	0	1/4	7 1/2	0	1/4	11 3/4	1/4	8
		Curb Weight										10	1/2	8 1/4	+1	1/2	7 1/4	0	1/2	7 3/4	1/2	6 1/2
												15	1 3/4	7 1/4	0	1 3/4	7	4	1 3/4	7 1/4	1 3/4	6
												20	2 1/4	6	0	2 1/4	6 1/4	7	2 1/4	6 1/4	2 1/4	5 1/2
												24	2 3/4	7 1/4	0	3 1/4	6 3/4	8	3 1/4	7 1/4	3 1/4	6 3/4
												28	3	6	2	3	6 3/4	8	3	6 1/2	3	5 3/4
3A	3/15	(R)	(R)	B	B	B	B	B	B	B	B	5	1/4	9 1/4	0	1/4	7 1/2	0	1/4	8 1/4	1/4	6 1/4
		Curb Weight										10	3/4	9 1/4	0	3/4	8 1/4	+1	3/4	7 1/2	3/4	6
												15	1 1/2	7 1/4	+2	1 1/2	7	1	1 1/2	7 1/2	1 1/2	7 1/4
												20	2 1/4	6 3/4	+2	2 1/4	7	3	2 1/4	7	2 1/4	6 1/4
												24	2 1/2	6 3/4	1	2 1/2	7	5	2 1/2	7 1/4	2 1/2	6 3/4
												28	2 1/4	6	1	2 1/4	6	8	2 1/4	7	2 1/4	7
3B	3/15	(R)	(R)	B	B	B	B	B	B	B	B	5	1/4	10	0	1/4	7 1/2	0	1/4	7	1/4	6 1/4
		Curb Weight Wet Pavement										10	3/4	8 1/2	+1	3/4	6 3/4	+2	3/4	6 3/4	3/4	5 3/4
												15	1 1/4	7	0	1 1/4	6 3/4	1	1 1/4	7 1/4	1 1/4	6
												20	1 3/4	8	1	1 3/4	7 1/4	1	1 3/4	8 3/4	1 3/4	3 1/2
												20	2	6	5	2	7 3/4	2	2	8	2	6
												22	2	5	3	2	9 3/4	4	2	9 1/4	2	5 1/4
												22	2	5 1/2	1	2	9 1/4	3	2	9 1/4	2	5 3/4
9B	3/15	B	B	B	B	B	B	(R)	(R)	(R)	(R)	5	1/4	10 1/2	0	1/4	9 1/4	0	1/4	10 3/4	1/4	7
		Curb Weight Wet Pavement										10	1/2	9 3/4	+2	1/2	7 1/4	1	1/2	7 1/2	1/2	6 3/4
												15	1	5 1/4	+2	1	6 3/4	5	1	8 1/4	1	8
												20	1 3/4	6 3/4	+2	1 3/4	6 1/4	10	1 3/4	7 3/4	1 3/4	8
												22	2	6	+2	2	6 1/4	9	2	7 3/4	2	7
												24	2 1/4	6 3/4	0	2 1/4	6 1/2	10	2 1/4	7 1/4	2 1/4	6 1/2
												26	2 1/2	6 3/4	1	2 1/2	7	10	2 1/2	7 1/2	2 1/2	6 3/4
10B	3/15	B	B	(R)	(R)	(R)	(R)	(R)	(R)	(R)	(R)	5	1/4	10 1/4	0	1/4	10 1/4	0	1/4	6 1/4	1/4	6 1/2
		Curb Weight Wet Pavement										10	3/4	8 1/4	+3	3/4	7 1/2	5	3/4	8 1/2	3/4	6 1/4
												15	1 1/2	5 3/4	+2	1 1/2	7 3/4	9	1 1/2	8	1 1/2	6 3/4
												20	2 1/4	6 3/4	+1	2 1/4	8	12	2 1/4	8	2 1/4	7 1/4
												22	2 1/2	6 1/2	0	2 1/2	6 3/4	12	2 1/2	6 3/4	2 1/2	6 3/4
												24	2 1/4	6 1/4		2 1/4		14	2 1/4	7 3/4	2 1/4	5 3/4
												26	2 1/4	5 1/2	2	2 1/4	7 3/4	12	2 1/4	7 1/2	2 1/4	5 1/2

TRACTOR TRAILER UNIT

J TURN, RIGHT

Combination No.	DATE	SPEED MPH	LATERAL FORCE G's	STEERING DEGREES	YAW [illegible]	COMMENTS
1	3/12	5	¼	8½	0	
		10	1½	9¼	3	
		15	2½	9½	8	
		20	5	10¼	17	
		22	5¾	10¾	24	
						STRAIGHTAWAY STEERING 238/242 OHMS
2	3/9	5	0	8	0	
		10	1	8½	3	
		15	2¼	9¼	7	
		20	4¼	10¾	15	
		22	5¼	11¼	19	
						STRAIGHTAWAY STEERING 234/237 OHMS - 2/3 [illegible] OFFSET
3	3/9	5	½	8	0	
		10	1½	8½	3	
		15	3	9½	7	
		20	5	10	20	[illegible] HOP AT 20 MPH
		22	6	11	19	
		22	6	11¼	19	
4	3/12	5	¼	7¾	0	
		10	1½	9	1	
		15	3	9¾	6	
		20	4¼	10	15	
		22	5¾	10¾	20	
5	3/8	5	¼	8¼	0	
		10	1½	8¾	3	
		15	2½	9¼	7	
		20	4½	10½	13	
		22	5	10¾	19	

TRACTOR TRAILER UNIT

I TURN RIGHT

Combination No.	Date	Speed MPH	Lateral from "C" ft.	Steering Degrees	Yaw Inches	Comments
6	3/12	5	1/4	8	0	
		10	1	5 1/4	3	
		15	3	9	8	
		20	4	10	15	
		22	5	10 3/4	21	Vehicle drift with Hop at 20 and 22 mph.
7	3/13	5	1/4	8	0	
		10	1 1/2	8 1/2	3	
		15	3	9	9	
		20	5	10 1/4	19	
		22	5 3/4	10 1/2	20	Vehicle drift without Hop.
8	3/8	5	1/2	8 1/4	0	
		10	1 1/4	8 1/2	1	
		15	2 1/4	9	5	
		20	4	9 1/4	14	
		22	5	10 3/4	21	
9	3/7	5	1/4	8	0	
		10	1	8 1/2	3	
		15	2	8 3/4	7	
		20	4	10 1/4	12	
		22	5	11	17	
10	3/7	5	1/4	8 1/2	0	
		10	1	8 1/2	2	
		15	2	9 3/4	5	
		20	5	10 1/2	14	
		22	5	11	19	High steering degrees & yaw, vehicle drift apart with Hop.

TRACTOR TRAILER UNIT

J - TURN RIGHT

Combination No.	Date	Speed MPH	Lateral [illegible] g's	Steering Degrees	[illegible] Inches	Comments
11	3/5	6	1/2	9	0	
		10	1	9 1/2	2	
		15	2 1/2	9 1/4	5	
		20	4	10 3/4	14	
		22	4 1/2	11 1/4	19	Vehicle drift with Hop
12	3/5	6	1/2	8	0	
		10	1 3/4	8 3/4	4	
		15	3	9 1/2	9	
		20	4 1/2	9 1/2	14	
		22	4 1/2	10	18	Vehicle drift with Hop
12A	3/6	3 1/2	1/4	8	0	
		9 1/2	1	8 1/4	5	
		15 1/2	2	8 1/2	13	
		19 1/4	4	9 1/2	18	
		21 3/4	5	10	20 1/2	Vehicle drift with Hop
13	3/13	5	1/4	7 3/4	0	
		10	1 3/4	8 1/4	2	
		15	3	9	5	
		20	5 1/2	10 1/2	16	
		22	5 3/4	10 3/4	18	Vehicle drift
14	3/12	5	1/2	8 1/2	0	
		10	1 1/4	8 1/2	3	
		15	2 3/4	9 3/4	8	
		20	5	10 1/2	18	
		22	5 1/4	10 3/4	23	Vehicle drift

TRACTOR TRAILER UNIT

J-Turn Right

Combination Number	DATE	SPEED MPH	LATERAL "G" 1/10	STEERING DEGREES	YAW inches	COMMENTS
4 A	3/14	5	1/2	8	0	
Curb		10	1 1/2	8 1/2	2	
weight.		15	2 1/2	9 1/2	6	
		20	4	11 1/2	11	
		22	5 1/2	11 1/2	13	
10 A.	3/14	5	1/4	8 1/4	0	
Curb		10	1	8 1/2	5	
weight		15	2 1/2	9 1/4	9	
		20	4 1/2	10 3/4	15	
		22	5 1/2	12	15	
3A	3/15	5	1/4	8	0	
Curb		10	1	8 1/2	3	
weight		15	2 1/4	8 3/4	7	
		20	5	10 1/2	13	
		22	5	11 1/4	13	
		22	5 1/2	11 1/2	12	

TRACTOR TRAILER UNIT

HILL [illegible]

Combination No.	Time min. sec. Up Hill		Time min. sec. Down Hill		[illegible] Speed	[illegible] Up	[illegible] Down	[illegible] Up	[illegible] Down Hill	[illegible]	[illegible]	Speed MPH	[illegible]	[illegible]	[illegible]	[illegible]
12	10	4	10	41	25.4/23.6	5½/3¾	4½/6¼	1¼/2	2/2¼	2263/2242	2116/2105	35/34	3	4½	2½	2¼
11	9	50	11	51	25.4/21.3	5¾/5¾	4/5¼	2¼/2	2/2½	2272/2261	2222/2197	35/34	1½	4½	2	2½
10	10	02	10	34	25.1/23.8	5½/6	3¾/6¾	3/2	3/2¼	2232/2232	2203/2200	35/35	2½	4½	3	3
9	10	10	9	56	24.8/25.4	5¾/7	3¾/6	3/2¼	-/3	2245/2217	2196/2193	35/35	5	3½	3	2¾
3	10	21	10	7	24.3/24.9	5½/4¾	4¼/7	3/2	2/2	2234/2235	2192/2195	35/35	3¼	6¾	3	2¼

STRAIGHTAWAY CONTROL MANEUVER

Combination No.	Date	Speed MPH	Time min.	Time sec.	No. Steer. Correct./sec. Left	No. Steer. Correct./sec. Right	No. Wheel Rev. Left	No. Wheel Rev. Right	Steer. Force in lbs. Left	Steer. Force in lbs. Right	Steering Degrees Left	Steering Degrees Right
12	3/5	53.3	1	7.5	.24	.10	524	519	22.5	10	0	1
11	3/5	53.7	1	7	.21	.07	523	522	35.0	10	0	¾
10	3/6	53.7	1	7	.22	.11	515	519	30.0	10	0	1
9	3/6	54.5	1	6	.27	.12	517	517	35	10	0	1¼
3	3/9	55.0	1	5.5	.21	.09	518	518	22.5	10	0	1

3 AXLE TRACTOR/TANDEM AXLE TRAILER UNIT

Sample No.	Date	Steering Front Axle	Drive Axle Bogie	Trailer Axle Bogie	Speed MPH	Curve #1 Left Turn Lat. "G" %	Curve #1 Left Turn Steer. °	Curve #1 Left Turn Yaw Inches	Curve #1 Right Turn Lat. "G" %	Curve #1 Right Turn Steer. °	Curve #1 Right Turn Yaw Inches	Curve #2 Right Lat. "G" %	Curve #2 Right Steer. °	Curve #2 Left Lat. "G" %	Curve #2 Left Steer. °	Comments
1	8-28	BIAS	BIAS	BIAS	5	.02	10	0	.02	9 1/4	0	.02	9 1/4	.02	9	
					10	.06	9	0	.06	8	1	.06	7	.06	7	
					15	.10	9	0	.10	8	4	.10	8	.10	9	
					20	.16	8	6	.16	8	5	.16	8	.16	9	
					25	.18	7	8	.18	7	10	.18	6	.18	6	UNDERSTEER - CONTROL LOSS
					27	.20	6	14	.20	5	13	.20	6	.20	7	UNDERSTEER - CONTROL LOSS
2	8-30	RADIAL	BIAS	BIAS	5	.01	11 1/4	0	.01	10 1/2	0	.01	8	.01	8	
					10	.10	8	3	.10	8	5	.10	7	.10	6	
					15	.16	7	3	.16	7	0	.16	7	.16	5	
					20	.20	6	7	.20	6	6	.20	6	.20	4	
					25	.30	5	13	.30	8	10	.30	7	.30	5	
					27	.30	5	18	.30	4	13	.30	3	.30	5	CONTROL LOSS TO STRAIGHT
3	8-30	RADIAL	RADIAL	BIAS	5	.01	11 1/4	0	.01	6	0	.01	7	.01	9	
					10	.08	9	4	.08	7	2	.08	6	.08	6	
					15	.20	7	5	.20	5	2	.20	5	.20	6	
					20	.24	6	8	.24	5	7	.24	5	.24	5	
					25	.30	6	13	.30	6	10	.30	4	.30	5	
					27	.30	5	15	.30	4	15	.30	6	.30	7	CONTROL LOSS TO STRAIGHT
4	8-30	BIAS	RADIAL	BIAS	5	.02	11 1/4	0	.02	8	0	.02	8	.02	8	
					10	.10	9	0	.10	7	2	.10	7	.10	7	
					15	.15	8	7	.15	7	0	.15	5	.15	7	
					20	.20	7	9	.20	5	1	.20	4	.20	6	
					25	.26	8	16	.26	7	15	.26	6	.26	7	CONTROL LOSS
					27	.30	5	14	.30	7	15	.30	9 1/4	.30	6	CONTROL LOSS
5	8-30	BIAS	BIAS	RADIAL	5	.01	11 1/4	0	.01	7	0	.01	8	.01	9	
					10	.10	8	1	.10	6	3	.10	6	.10	8	
					15	.18	7	5	.18	6	6	.18	5	.18	7	
					20	.20	6	9	.20	7	13	.20	4	.20	5	
					25	.22	6	13	.22	7	16	.22	4	.22	8	CONTROL LOSS
					27	.22	6	14	.22	7	12	.22	4	.22	7	CONTROL LOSS
6	9-3	RADIAL	RADIAL	RADIAL	5	.01	10	0	.01	9 1/4	0	.01	9 1/4	.01	7	
					10	.10	7	0	.10	7	1	.10	8	.10	7	
					15	.12	6	0	.12	5	5	.12	6	.12	8	
					20	.20	5	5	.20	6	7	.20	7	.20	4	
					26	.22	5	8	.22	5	11	.22	4	.22	5	
					27	.22	4	10	.22	6	13	.22	5	.22	7	CONTROL LOSS
					29	.22	5	11	.22	5	12	.22	5	.22	7	CONTROL LOSS

3 Axle Tractor/Tandem Axle Trailer Unit

Vehicle No.	Date	Steering Front Axle	Drive Axle Bogie	Trailer Axle Bogie	Speed MPH	Curve #1, Left Turn Lat. "G" 1/10	Curve #1, Left Turn Steer.°	Curve #1, Left Turn Yaw inches	Curve #1, Right Turn Lat. "G" 1/10	Curve #1, Right Turn Steer.°	Curve #1, Right Turn Yaw inches	Curve #2, Right Lat. "G" 1/10	Curve #2, Right Steer.°	Curve #2, Left Lat. "G" 1/10	Curve #2, Left Steer.°	Comments
7	8-30	Bias	Radial	Radial	5	.01	10	0	.01	5	0	.01	7	.01	9	
					10	.10	9	4	.10	7	0	.10	8	.10	7	
					15	.15	8	8	.15	6	2	.15	5	.15	7	
					20	.18	7	8	.18	6	2	.18	5	.18	7	
					25	.25	3	15	.25	5	9	.25	6	.25	5	
					27	.30	6	19	.30	5	10	.30	4	.30	6	Control Loss to Straight.
8	8-30	Radial	Bias	Radial	5	.01	9	0	.01	6	0	.01	7	.01	6	
					10	.08	9	3	.08	6	4	.08	5	.08	7	
					15	.12	8	4	.12	5	4	.12	6	.12	5	
					20	.20	7	10	.20	5	7	.20	4	.20	5	
					25	.22	6	15	.22	8	12	.22	4	.22	7	Control Loss to Straight
					27	.24	6	16	.24	6	7	.24	5	.24	6	Control Loss to Straight
6 A	9-4	Radial Loaded, 75 PSIG, 6" Pintle Position	Radial	Radial	5	.01	8	0	.01	8	0	.01	7	.01	7	
					10	.10	8	1	.10	8	3	.10	6	.10	6	
					15	.12	5	4	.12	7	5	.12	5	.12	6	
					20	.18	7	11	.18	7	11	.18	6	.18	5	Control Loss to Straight
					22	.20	6	12	.20	6	11	.20	7	.20	7	
					24	.22	4	12	.22	7	11	.22	6	.22	5	
					27	.24	5	14	.24	8	15	.24	6	.24	6	Control Loss to Straight
6 B	9-6	Radial Loaded, 95 PSIG, 2" Pintle Position	Radial	Radial	5	.02	9	0	.02	9 1/4	0	.02	6	.02	7	
					10	.08	8	0	.08	6	2	.08	7	.08	7	
					15	.12	7	2	.12	5	5	.12	7	.12	6	
					20	.18	5	6	.18	5	9	.18	6	.18	7	
					25	.20	6	9	.20	4	11	.20	5	.20	7	
					29	.22	5	11	.22	6	13	.22	6	.22	5	No Control Loss
6 C	9-6	Radial Loaded, 96 PSIG, 6" Pintle Position	Radial	Radial	5	.02	8	0	.02	8	0	.02	8	.02	6	
					10	.08	7	4	.08	7	5	.08	6	.08	6	
					15	.12	5	6	.12	5	6	.12	6	.12	6	
					20	.20	5	9	.24	5	10	.20	6	.20	7	
					25	.22	5	13	.22	8	13	.22	5	.22	5	Control Loss to Straight
					27	.22	5	12	.22	7	12	.22	3	.22	7	Control Loss to Straight
6 D	9-7	Radial Empty, 95 PSIG, 2" Pintle Position	Radial	Radial	5	.01	9	0	.01	7	0	.01	7	.01	6	
					10	.08	7	7	.08	8	1	.08	6	.08	7	
					15	.18	7	11	.18	8	2	.18	6	.18	7	
					20	.20	6	8	.20	6	7	.20	6	.20	6	
					25	.22	6	12	.22	6	12	.22	8	.22	6	
					29	.28	4	18	.29	7	18	.28	5	.28	6	Control Loss

3 AXLE TRACTOR/TANDEM AXLE TRAILER UNIT

DATE	STEERING FRONT AXLE	DRIVE AXLE BOGIE	TRAILER AXLE BOGIE	SPEED MPH	CURVE #1 LEFT TURN LAT. G 1/10	CURVE #1 LEFT TURN STEER.°	CURVE #1 LEFT TURN YAW INCHES	CURVE #1 RIGHT TURN LAT. G 1/10	CURVE #1 RIGHT TURN STEER.°	CURVE #1 RIGHT TURN YAW INCHES	CURVE #2 RIGHT LAT. G 1/10	CURVE #2 RIGHT STEER.°	CURVE #2 LEFT LAT. G 1/10	CURVE #2 LEFT STEER.°	COMMENTS
9-7	Radial	Radial	Radial	5	.01	7	0	.01	10½	0	.01	8	.01	7	
	Empty, 75 PSIG, 6" Pintle		Position	10	.08	8	0	.08	8	5	.08	7	.08	6	
				15	.13	6	2	.15	6	8	.18	6	.18	7	
				20	.18	7	0	.18	6	10	.15	6	.18	6	
				25	.20	6	4	.20	6	15	.20	4	.20	6	
				27	.22	6	5	.22	4	14	.22	6	.22	4	Control Loss.
				29	DATA NOT AVAILABLE - OFF COURSE COMPLETELY.										Complete Loss of Control
9-7	Radial	Radial	Radial	5	.01	10	0	.01	7	0	.01	8	.01	9	
	Empty, 75 PSIG, 2" Pintle		Position	10	.08	7	5	.08	6	3	.08	6	.08	7	
				15	.12	5	4	.12	5	6	.12	7	.12	6	
				20	.18	4	8	.18	5	11	.18	6	.18	6	
				25	.20	5	12	.20	5	15	.20	5	.20	5	
				27	.22	5	10	.22	6	11	.22	4	.22	7	Control Loss
9-7	Radial	Radial	Radial	5	.01	11¼	0	.01	6	0	.01	9¼	.01	8	
	Empty, 75 PSIG, 6" Pintle		Position	10	.08	7	7	.08	7	1	.08	7	.08	6	
				15	.12	6	11	.12	6	3	.12	6	.12	6	
				20	.18	5	9	.18	6	5	.18	5	.18	6	
				25	.20	3	10	.20	4	11	.20	5	.20	4	
				27	.22	5	14	.22	6	10	.22	6	.22	4	Control Loss
				29	.30	5	13	.30	6	10	.30	4	.30	6	Control Loss

3 Axle Tractor / Tandem Axle Trailer Unit

J Turn, Right

Combination No.	Date	Speed MPH	Lateral Force "G" K.	Steering Degrees	Yaw Inches	Comments
1	8-28-74	5	.01	9 1/4	0	
		10	.10	10 1/2	0	
		15	.22	10 1/2	1	
		20	.40	12 1/2	10	
		22	.54	13 1/4	11	Control Loss
2	8-30-74	5	.02	10 1/2	0	
		10	.16	11 1/2	4	
		15	.24	11 1/2	8	
		20	.40	11 1/2	6	
		22	.50	12 1/2	5	
		24	.60	12 1/2	5	Control Loss
3	8-30-74	5	.01	9 1/4	0	
		10	.12	10 1/2	0	
		15	.26	10 1/2	2	
		20	.42	11 1/2	2	
		22	.50	11 1/2	5	
		24	.60	12 1/2	6	Control Loss
4	8-30-74	5	.02	9 1/4	0	
		10	.12	10 1/2	3	
		15	.30	10 1/2	8	
		20	.40	11 1/2	8	
		22	.52	12 1/2	9	Control Loss
5	8-30-74	5	.02	10 1/2	0	
		10	.10	10 1/2	3	
		15	.22	10 1/2	10	
		20	.42	12 1/2	12	
		22	.50	13 3/4	10	Control Loss
6	9-3-74	5	.02	10 1/2	0	
		10	.10	10 1/2	3	
		15	.22	10 1/2	7	
		20	.40	10 1/2	6	
		22	.50	12 1/2	6	
		24	.54	12 1/2	6	Control Loss

3 AXLE TRACTOR, TANDEM AXLE TRAILER UNIT

J TURN, RIGHT

SIMULATION No.	DATE	SPEED MPH	LATERAL FORCE G's	STEERING DEGREES	YAW ANGLE	COMMENTS
7	8-30-74	5	.01	9 1/4	0	
		10	.10	10 1/2	2	
		15	.22	11 1/2	6	
		20	.40	11 1/2	6	
		22	.50	12 1/2	6	CONTROL LOSS
8	8-30-74	5	.02	9 1/4	0	
		10	.10	9 1/4	1	
		15	.25	10 1/2	5	
		20	.40	11 1/2	4	
		22	.50	12 1/2	5	CONTROL LOSS
6A	9-4-74	5	.02	10 1/2	0	
		10	.10	10 1/2	4	
		15	.24	NA	5	
		20	.40	10 1/2	8	
		22	.58	13 3/4	8	CONTROL LOSS
6B	9-6-74	5	.02	9 1/4	0	
		10	.10	10 1/2	6	
		15	.22	10 1/2	7	
		20	.40	11 1/2	7	
		22	.50	11 1/2	7	
		24	.58	12 1/2	7	DRIFT CONTROL
6C	9-6-74	5	.02	10 1/2	0	
		10	.10	10 1/2	3	
		15	.20	10 1/2	8	
		20	.40	11 1/2	7	
		22	.50	11 1/2	7	
		24	.60	13 3/4	7	CONTROL LOSS
6D	9-7-74	5	.01	9 1/4	0	
		10	.10	9 1/4	8	
		15	.25	9 1/4	13	
		20	.45	11 1/2	12	
		22	.55	11 1/2	12	
		24	.60	12 1/2	12	CONTROL LOSS

3 AXLE TRACTOR / TANDEM AXLE TRAILER UNIT

5 TURN RIGHT

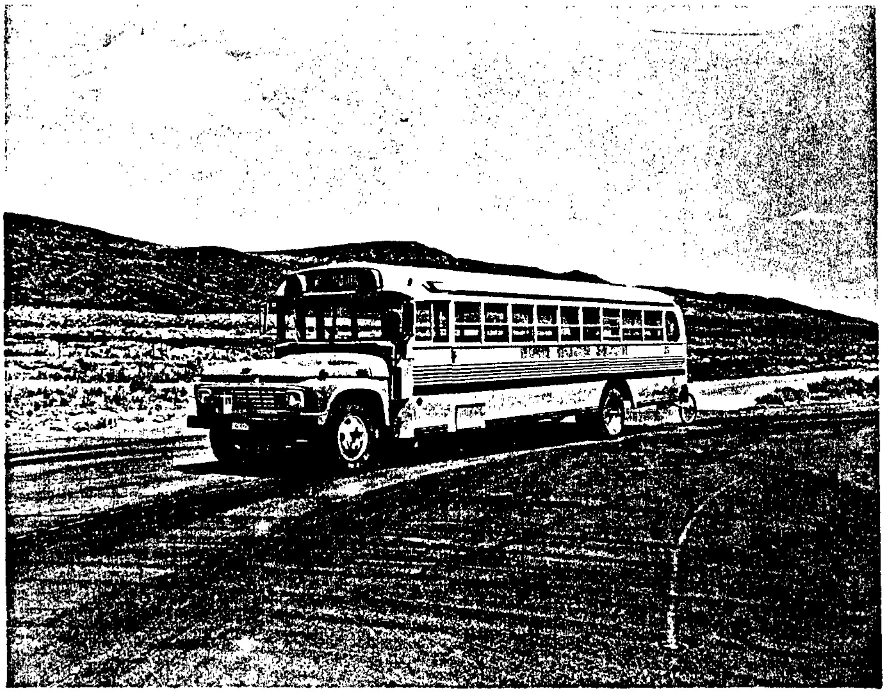
Combination No.	DATE	SPEED MPH	LATERAL Force "G" %	STEERING DEGREES	YAW inches	COMMENTS
6E	9-7-74	5	.02	9 1/4	0	
		10	.10	9 1/4	8	
		15	.25	9 1/4	12	
		20	.40	10 1/2	12	
		22	.55	12 1/2	11	
		24	.58	11 1/2	12	CONTROL LOSS - DRIFT
6F	9-7-74	5	.01	9 1/4	0	
		10	.10	9 1/4	5	
		15	.25	10 1/2	9	
		20	.42	10 1/2	10	
		22	.56	12 1/2	10	
		24	.62	12 1/2	9	CONTROL LOSS
6G	9-7-74	5	.01	10 1/2	0	
		10	.10	10 1/2	3	
		15	.25	10 1/2	7	
		20	.40	11 1/2	7	
		22	.60	12 1/2	7	
		24	.62	12 1/2	7	CONTROL LOSS - DRIFT

Appendix III

Photographic Supplement

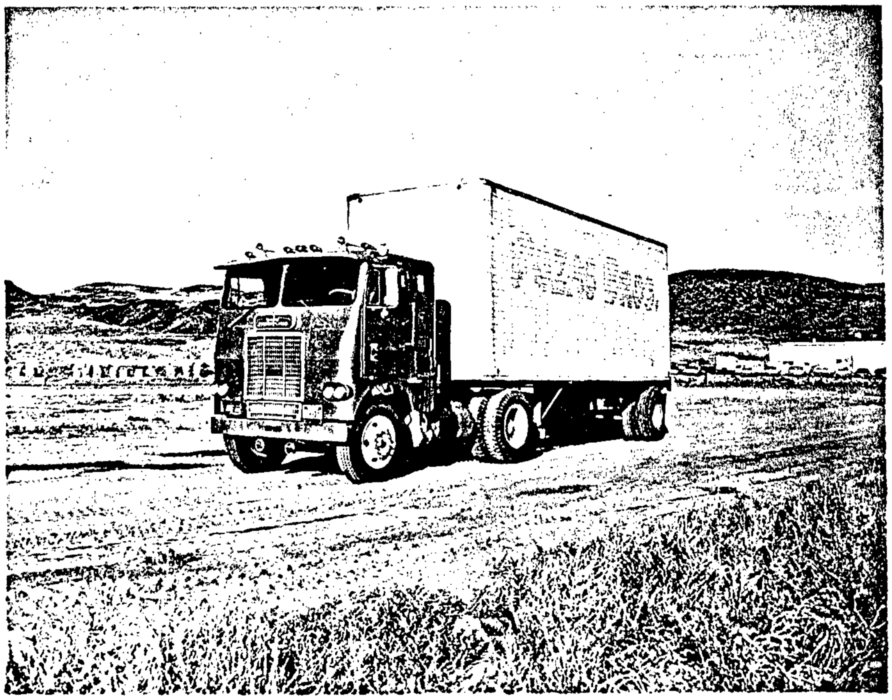
Photograph #201734-1

M151A2 Vehicle



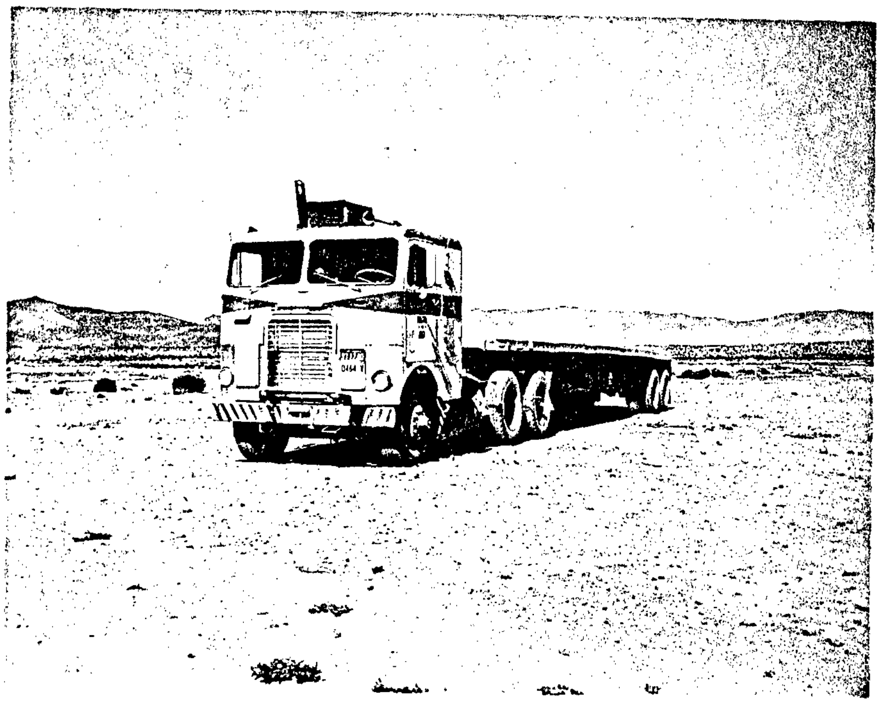
Photograph #201734-2

School Bus



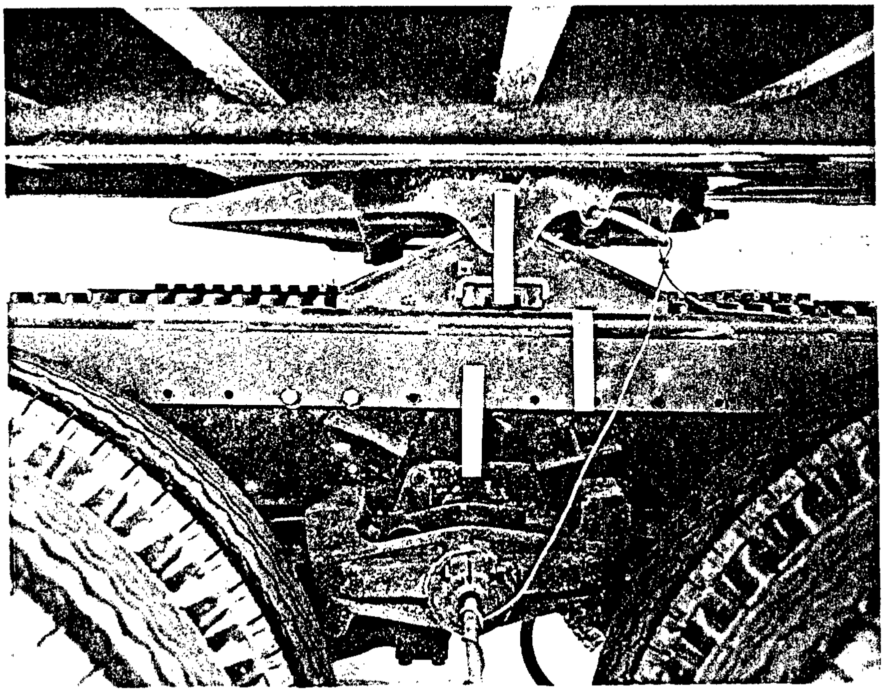
Photograph #201734-3

Tractor-Trailer Combination



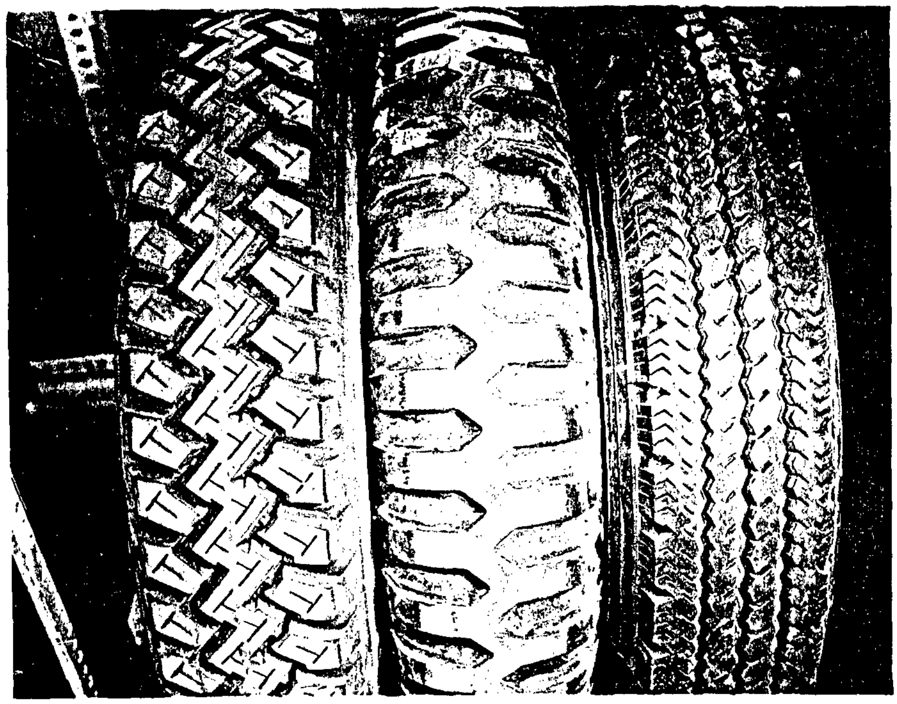
Photograph #201734-4

Three Axle Tractor, Tandem Axle Trailer



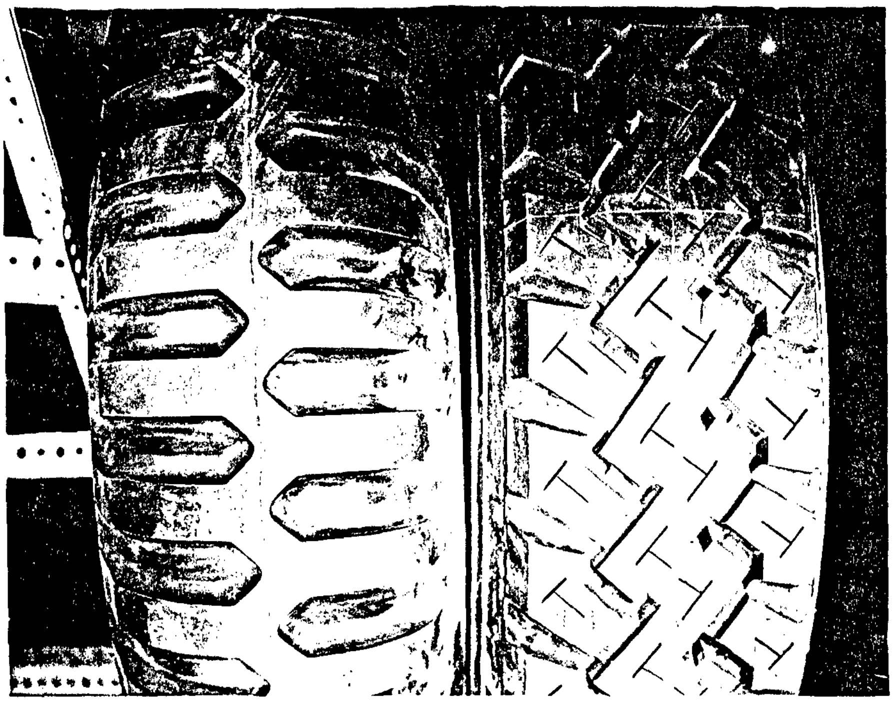
Photograph #201734-5

Trailer King Pin Positions



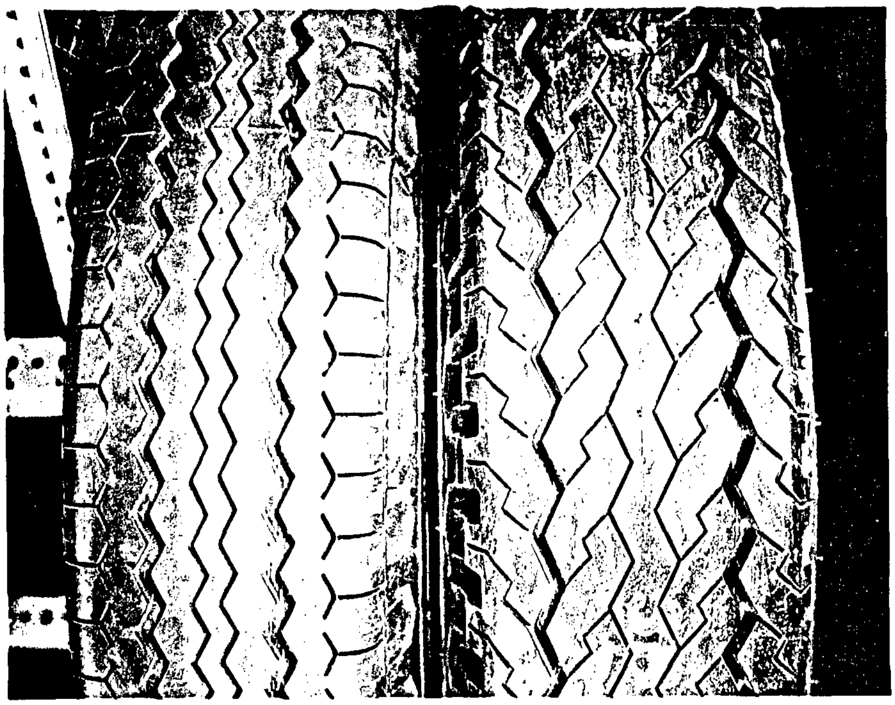
Photograph #201734-6

M151A1 and M151A2 Tires
Radial I, Bias and Radial II



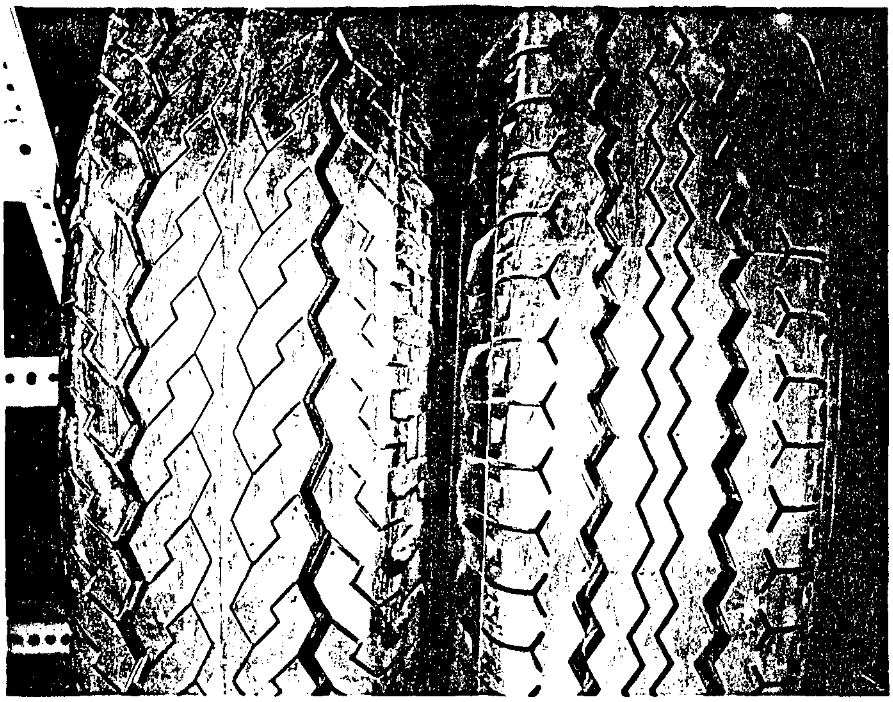
Photograph #201734-7

M35 Vehicle Tires
Bias and Radial



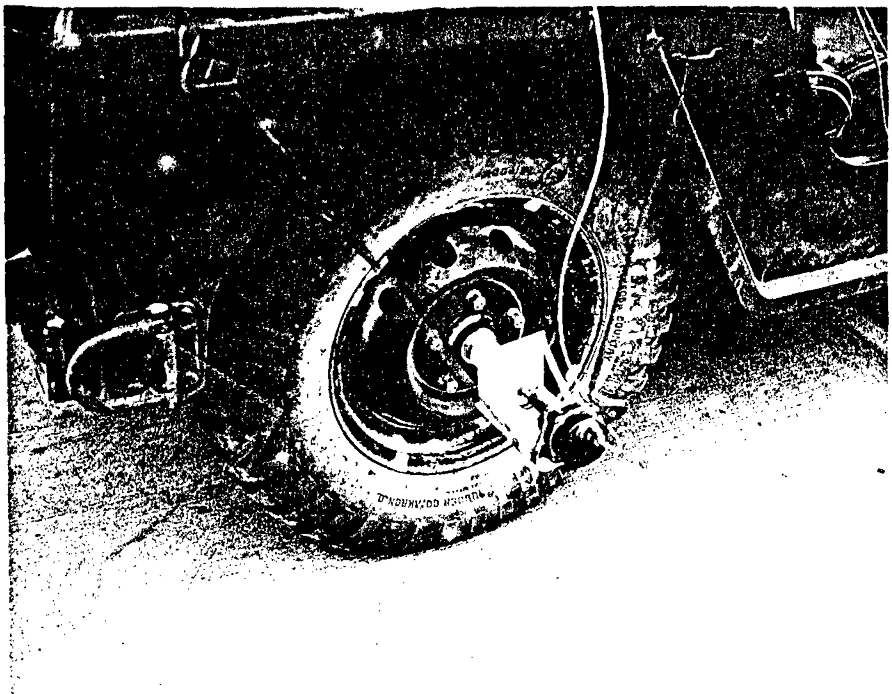
Photograph #201734-8

School Bus Tires
Radial and Bias



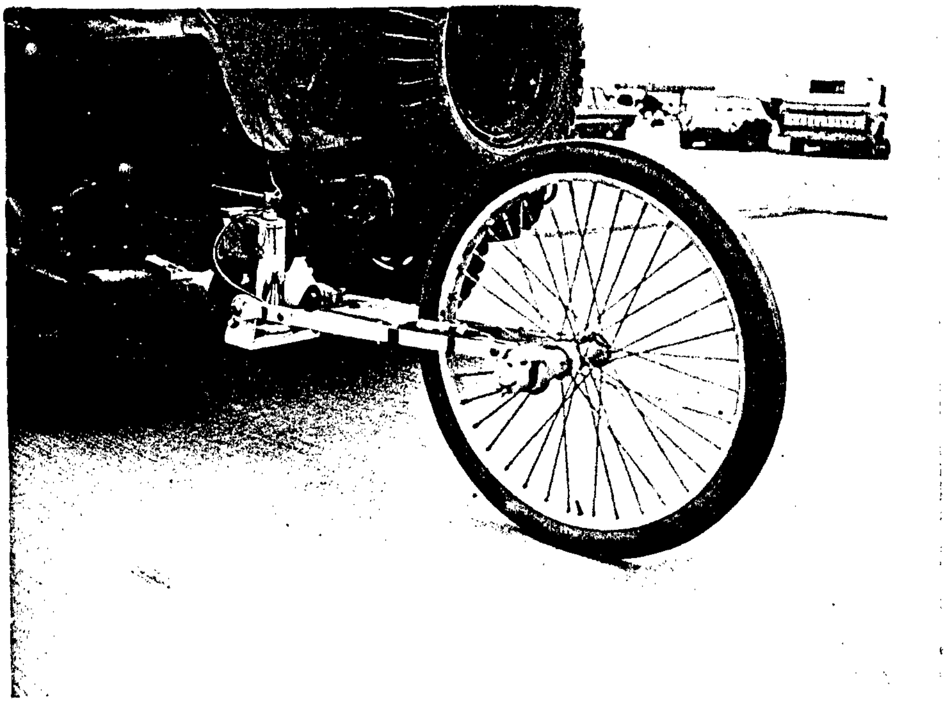
Photograph #201734-9

Tractor-Trailer Tires
Bias and Radial



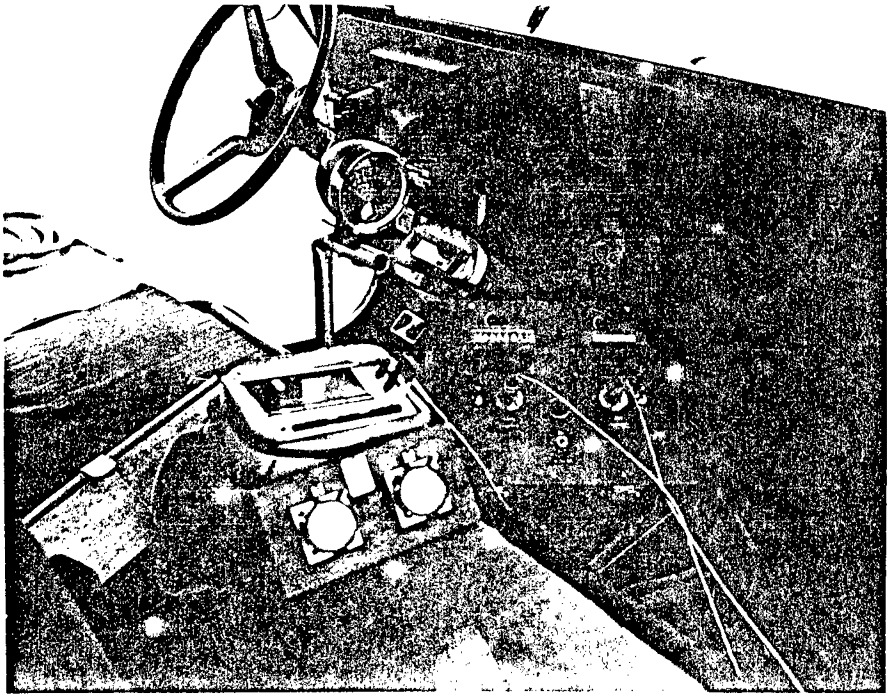
Photograph #201734-10

Instrumentation
Wheel Revolution Counter



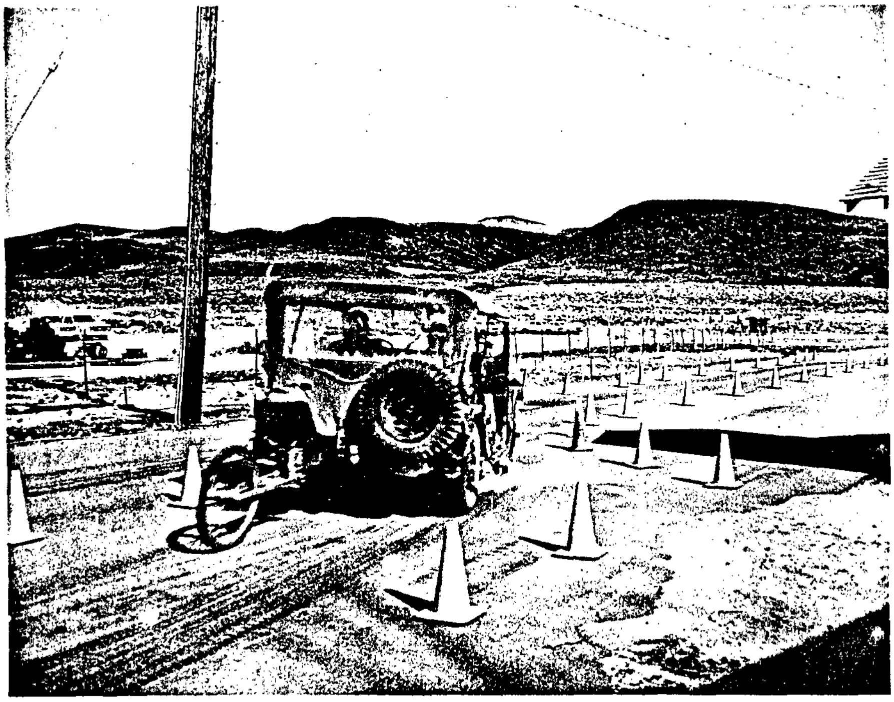
Photograph #201734-11

Instrumentation
Fifth Wheel, Speed Indicator



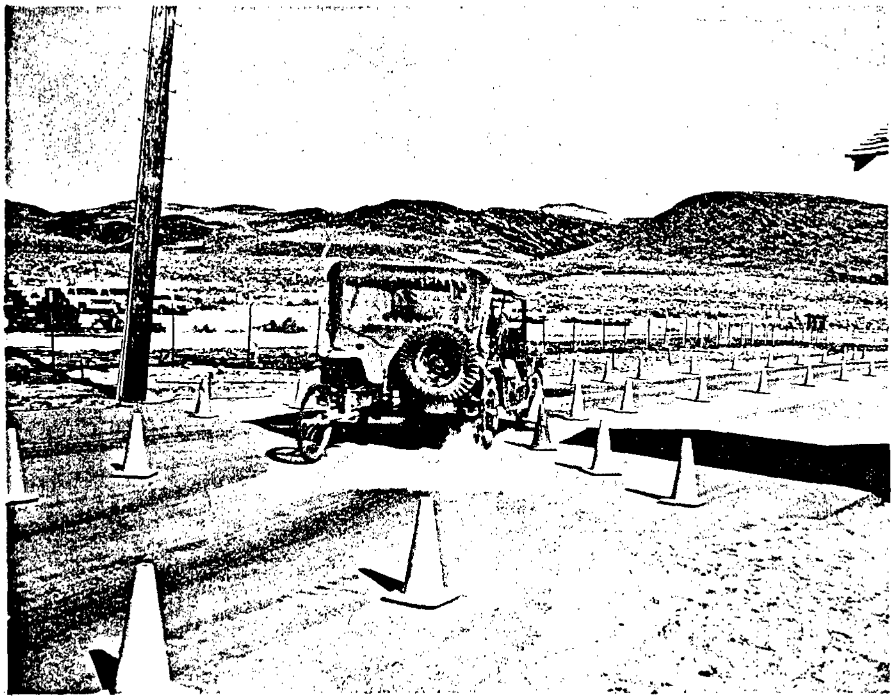
Photograph #201734-12

Instrument Read-Out
Speed, mph
Wheel Counter, Console
Steering Angle
Stop Watches



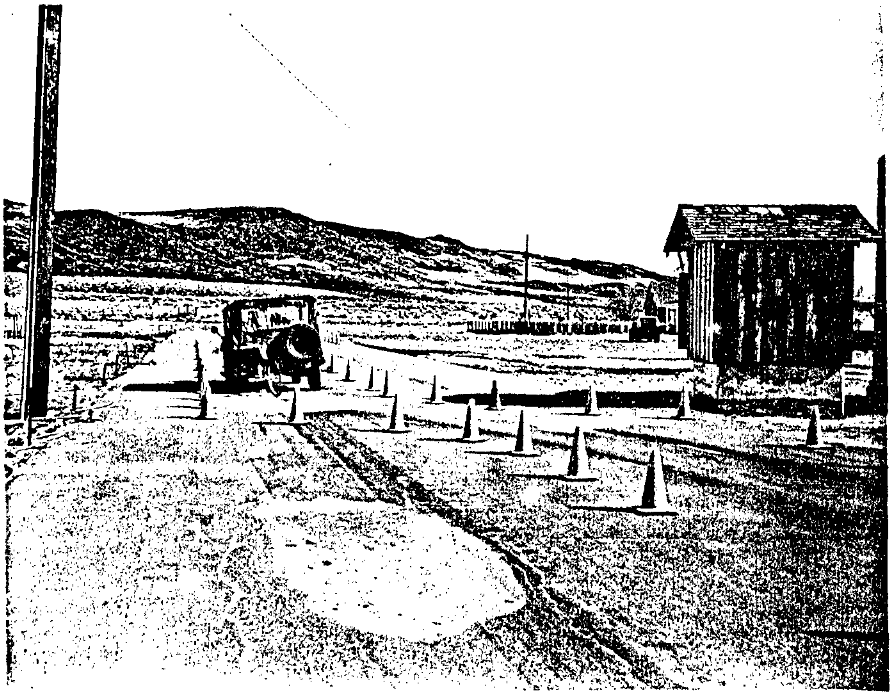
Photograph #201734-13

M151A2 Vehicle
Lane Change Maneuver



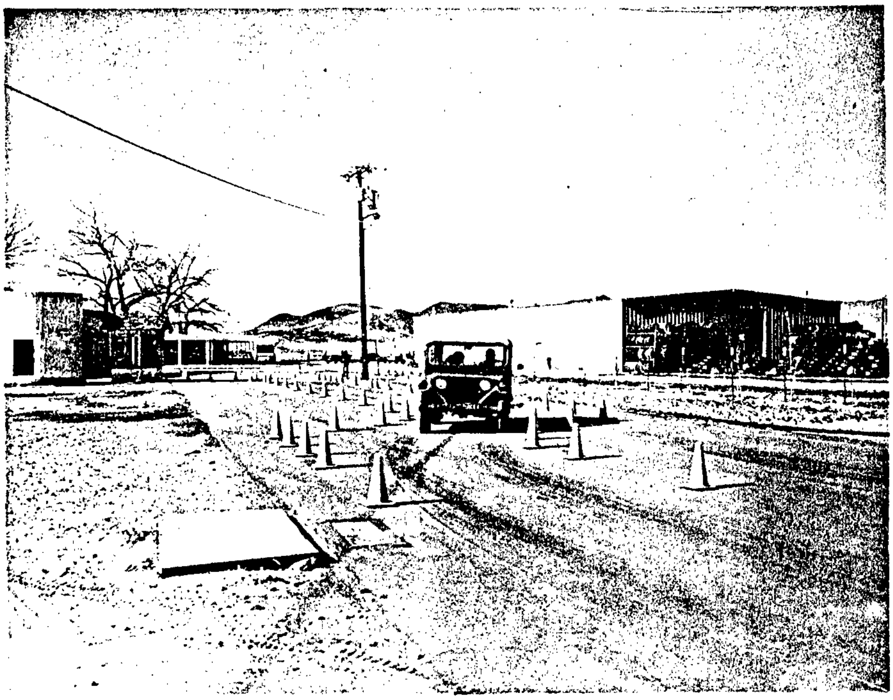
Photograph #201734-14

M151A2 Vehicle
Lane Transition



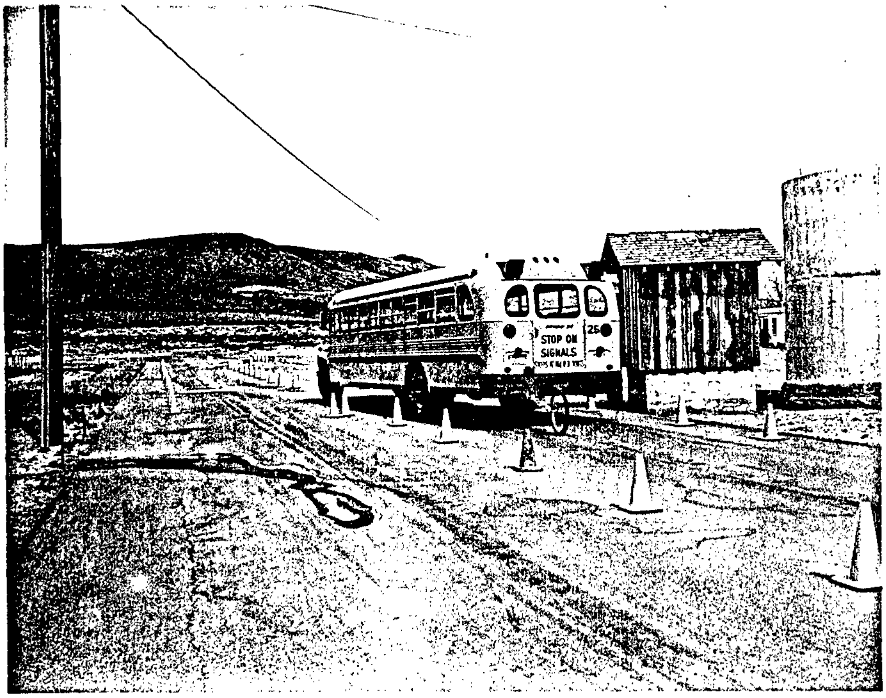
Photograph #201734-15

M151A1 Vehicle
Lane Change Recovery



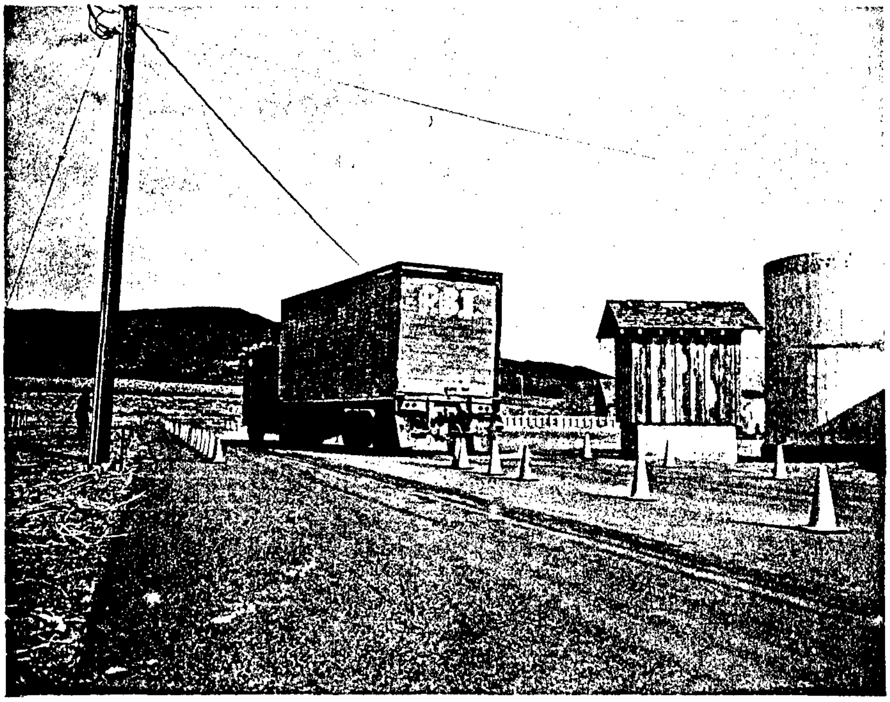
Photograph #201734-16

M151A1 Vehicle
Lane Return Maneuver



Photograph #201734-17

School Bus
Lane Change Maneuver



Photograph #201734-18

Tractor-Trailer
Lane Change Maneuver

Security Classification

DOCUMENT CONTROL DATA - R&D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author) Nevada Automotive Test Center A Division of Hodges Transportation Inc. P. O. Box 234 Carson City, Nevada 89701	2a. REPORT SECURITY CLASSIFICATION Unclassified 2b. GROUP

3. REPORT TITLE

COMPARATIVE EVALUATION OF VEHICLE STABILITY AND HANDLING CHARACTERISTICS AS AFFECTED BY "GENERIC" TIRE MIXTURES

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)

Final Report

5. AUTHOR(S) (Last name, first name, initial)

Barnett, C. L.

6. REPORT DATE October 1974	7a. TOTAL NO. OF PAGES 131	7b. NO. OF REFS Ø
8a. CONTRACT OR GRANT NO. DAAE07-73-C-0293 b. PROJECT NO. c. d.	9a. ORIGINATOR'S REPORT NUMBER(S) NATC Project 20-17-34 9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)	

10. AVAILABILITY/LIMITATION NOTICES

Approved for public release;
Distribution Unlimited

11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY U. S. Army Tank Automotive Command

13. ABSTRACT

Generic tire combinations were tested and evaluated on four basic vehicles; two military tactical types and two commercial types. The military vehicles were the M151, 1/4 ton, 4x4, Utility Truck, and the M35, 2 1/2 ton, 6x6, Cargo Truck. Because of the difference in suspensions, axle structures, and stability characteristics between the A-1 and A-2 series of the M151, a vehicle of each series was tested with combinations of two different radial ply tires and the standard bias ply non-directional cross-country (NDCC) tire. The M35 was tested with combinations of one radial ply tire type and the standard bias ply NDCC tire.

The commercial vehicles used to test the tire mixtures included a 2-axle School Bus of 66 children or 44 adult passenger capacity and a 5-ton Tractor-Trailer. Again, because the U. S. Army uses both 2-axle and 3-axle tractors, and both single axle and tandem axle trailers, two 5-ton tractor-trailer combinations were used.

It was definitely established that neither of the M151's could safely tolerate any mixture of bias and radial ply tires. The other four vehicles, being heavier, more stable, and of considerable longer wheelbase, could, however, perform with safety and with various degrees of steering ease when equipped with certain combinations of the generically different tire constructions.

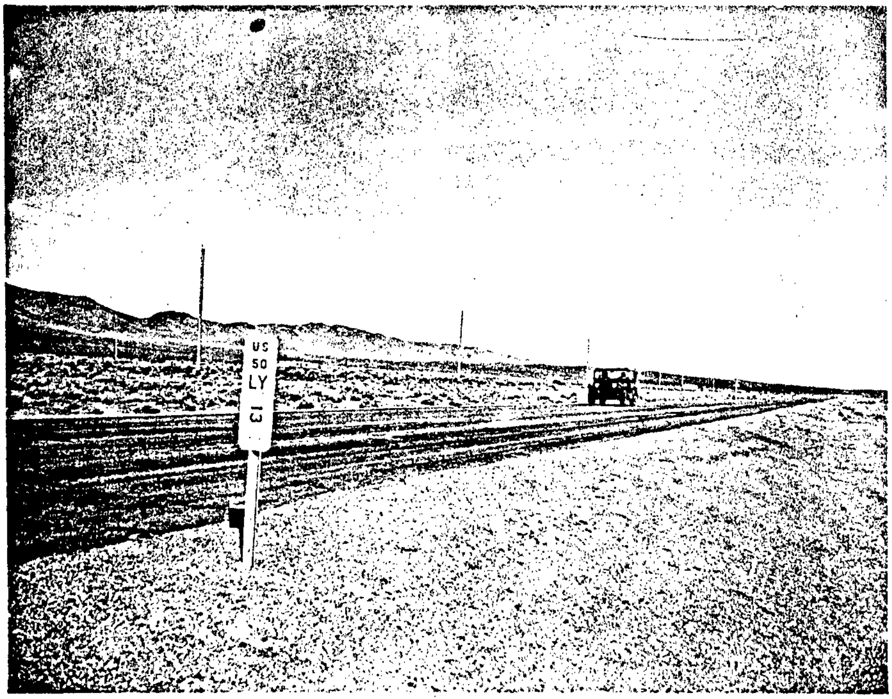
DD FORM 1 JAN 64 1473

Unclassified

Security Classification

Photograph #201734-19

School Bus
"J" Turn Maneuver



Photograph #201734-20

M151A2 Vehicle
Straight-a-way Course

DISTRIBUTION LIST

Commander, U. S. Army Tank-Automotive Command, Warren, Michigan 48090

ATTN:	AMSTA-CL, Chief Scientist	1
	AMSTA-R, Director, Research, Development and Engineering Directorate	1
	AMSTA-W, Special Items Mgmt Office	1
	AMSTA-WR, Tire Project Office	1
	AMSTA-RE, Systems Development Division	1
	AMSTA-REB, Transport Vehicle Branch	1
	AMSTA-REK, Tactical Truck Branch	1
	AMSTA-REL, Trailer Branch	1
	AMSTA-RH, Concept and Technology Division	1
	AMSTA-RU, Mobility Systems Division	1
	AMSTA-RK, Armor, Materials & Components Division	1
	AMSTA-RKM, Materials Function	1
	AMSTA-RKME, Tire and Rubber Sub-Function	6
	AMSTA-RPL, Research Library	2
	AMSTA-CZ, Safety Office	1
	USMC-LNO, Marine Corps Liaison Office	1
	CDLS-D, Canadian Army Liaison Office	1
	TRADOC-AMSTA-CD	1

Commander
US Army Materiel Command 1
ATTN: AMCRD
5001 Eisenhower Avenue
Alexandria, Virginia 22304

Commander
US Army Materiel Command 1
ATTN: AMCSO
5001 Eisenhower Avenue
Alexandria, Virginia 22304

Commander
US Army Test & Evaluation Command 2
ATTN: AMSTE
Aberdeen Proving Ground, Maryland 21005

DISTRIBUTION LIST

Commander Yuma Proving Ground ATTN: STEYP Yuma, Arizona 85364	1
Department of the Army Office, Chief of Research and Development Washington, D. C. 20310	1
Department of the Army ATTN: Deputy Chief of Staff for Logistics Washington, D. C. 20310	1
Department of the Army ATTN: Deputy Chief of Staff for Operations Washington, D. C. 20310	1
Commandant US Marine Corps ATTN: LME-3 Washington, D. C. 20380	1
Commandant US Marine Corps Development & Education Center ATTN: Development Center Quantico, Virginia 22134	1
Commander Robins Air Force Base ATTN: WRAMA/MMRTA, Technical Services Warner Robins, Georgia 31093	1
Commander Defense Documentation Center Cameron Station Alexandria, Virginia 22314	5

KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
"Generic" Tire Mixture						
Tire Combinations						
Steering Effort						
Steering Response						
Vehicle Roll						
Vehicle Pitch						
Vehicle Yaw						
Cyclic Yaw						
Tire Nibble						
Dual Tires						
Tandem Axles						
Bogie						
Original Equipment Manufacturer						
Vehicle Imbalance						