

1021K
4-3-75

SUMMARY OF CONCLUSIONS FROM 2,80-4

LATERAL FORCE DATA

RAW DATA FROM THE TIRE MACHINE FOR THE GOODYEAR 2,80-4, 35° CORD ANGLE, GROUND SMOOTH TIRE WAS CONVERTED TO CARPET PLOT FORM FOR 50LB, 100LB, AND 150LB LOAD AND 16 PSI AND 24 PSI CONDITIONS. MANY COMBINATIONS OF PLOTS ARE POSSIBLE FOR THESE DATA, CONSTANT LOAD SURFACES FOR SLIP ANGLE AND CAMBER ANGLE VARIABLES ARE EASY TO INTERPRET IF WEIGHT DISTRIBUTION CAN BE ASSUMED CONSTANT WITH LATERAL ACCELERATION. THE RAW DATA WERE VERY ROUGH WHEN PLOTTED IN THIS FORM AND MUCH SMOOTHING WAS REQUIRED TO PRODUCE REGULAR SURFACES REPRESENTING THE SENSE OF THE RAW DATA.

FOR A GIVEN WEIGHT DISTRIBUTION AND LATERAL ACCELERATION, IT IS POSSIBLE TO INTERPOLATE DIRECTLY FROM THESE PLOTS THE FRONT AND REAR SLIP ANGLES REQUIRED FOR STEADY STATE TURNING. FROM THIS INFORMATION, STEER ANGLE CAN BE CALCULATED FROM THE FUNDAMENTAL TURNING GEOMETRY RELATIONSHIP

$$\delta = 57.3 \frac{l}{R} + \alpha_f - \alpha_r$$

THE FOLLOWING CONCLUSIONS ARE EVIDENT FROM A BRIEF REVIEW OF THESE DATA,

1. THERE IS NO SIGNIFICANT DIFFERENCE BETWEEN 16 PSI AND 24 PSI DATA FOR LOADS OF 100 LB OR LESS, 24 PSI PROVIDES SOMEWHAT HIGHER LATERAL FORCE CAPABILITY AT 150 LB LOAD.
2. MAXIMUM LATERAL FRICTION FOR HIGH CAMBER AND SLIP ANGLE WAS:

1.36 @ 50 LB LOAD

1.26 @ 100 LB LOAD

1.17 @ 150 LB LOAD

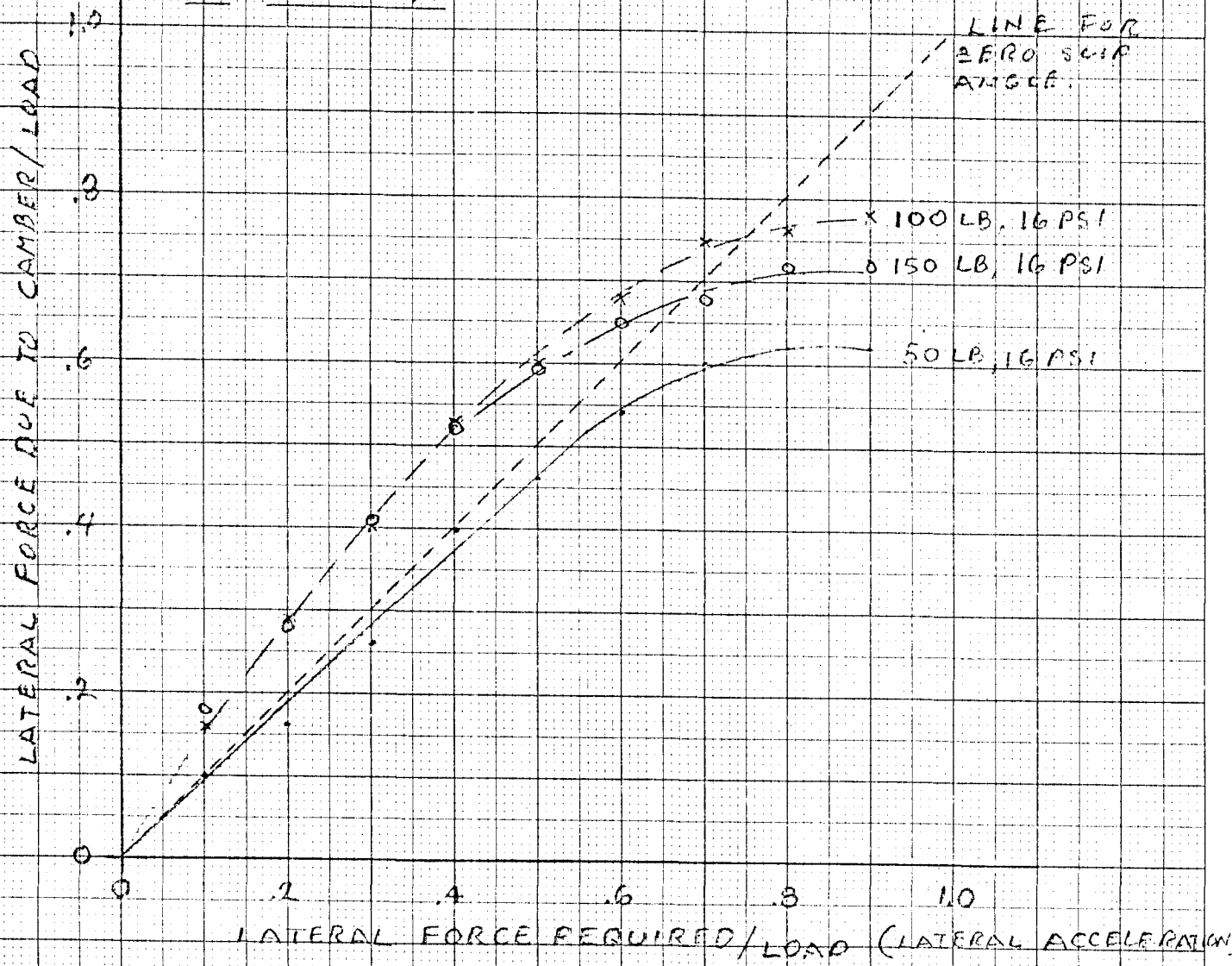
THIS IS SIMILAR TO THE VALUES FOR BRAKING TRACTION.

3. FORCES DUE TO CAMBER ANGLE ARE VERY LARGE FOR TAPER TUBES AS SHOWN BY THE FOLLOWING PLOT. FOR THE 100 LB AND 150 LB LOAD CONDITIONS, FORCES DUE TO CAMBER EXCEED REQUIREMENTS FOR CORNERING SO THAT SLIP ANGLES OPPOSITE TO THOSE OF THE USUAL SENSE ARE REQUIRED FOR EQUILIBRIUM. SOME ESTIMATES OF SKID PAD PERFORMANCE WERE MADE FOR A 50 LB FRONT LOAD AND 200 LB REAR LOAD. STEER ANGLE CHANGES WITH LATERAL ACCELERATION FROM 0-.9 G WERE LESS THAN 1°. THUS THE DIFFERENCE IN STEADY STATE GAIN BETWEEN A 50 LB-FRONT, 200 LB-REAR AND A 100 LB-FRONT, 200 LB-REAR NEUTRAL STEER VEHICLE ARE VERY SMALL. THE ACKERMAN ANGLE ASSOCIATED WITH WHEELBASE AND TURN RADIUS IS DOMINANT.

4. SINCE CAMBER FORCES EXCEED THOSE FOR $\tan \phi$ CORNERING, IT IS IMPORTANT TO OBTAIN DATA FOR BOTH SIGNALS OF SLP ANGLE IN FUTURE TESTS.

2.80-4 GOODYEAR
35° CORD ANGLE
16 PSI

PORTION OF LATERAL FORCE DUE
TO CAMBER



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STEADY STATE STEER ANGLE DATA

30 FT RADIUS

2.80-4

35° CORO ANGLE

16 PSI

STEER ANGLE - DEGREES

10.0

8.0

4.0

2.0

0

0

.2

.4

.6

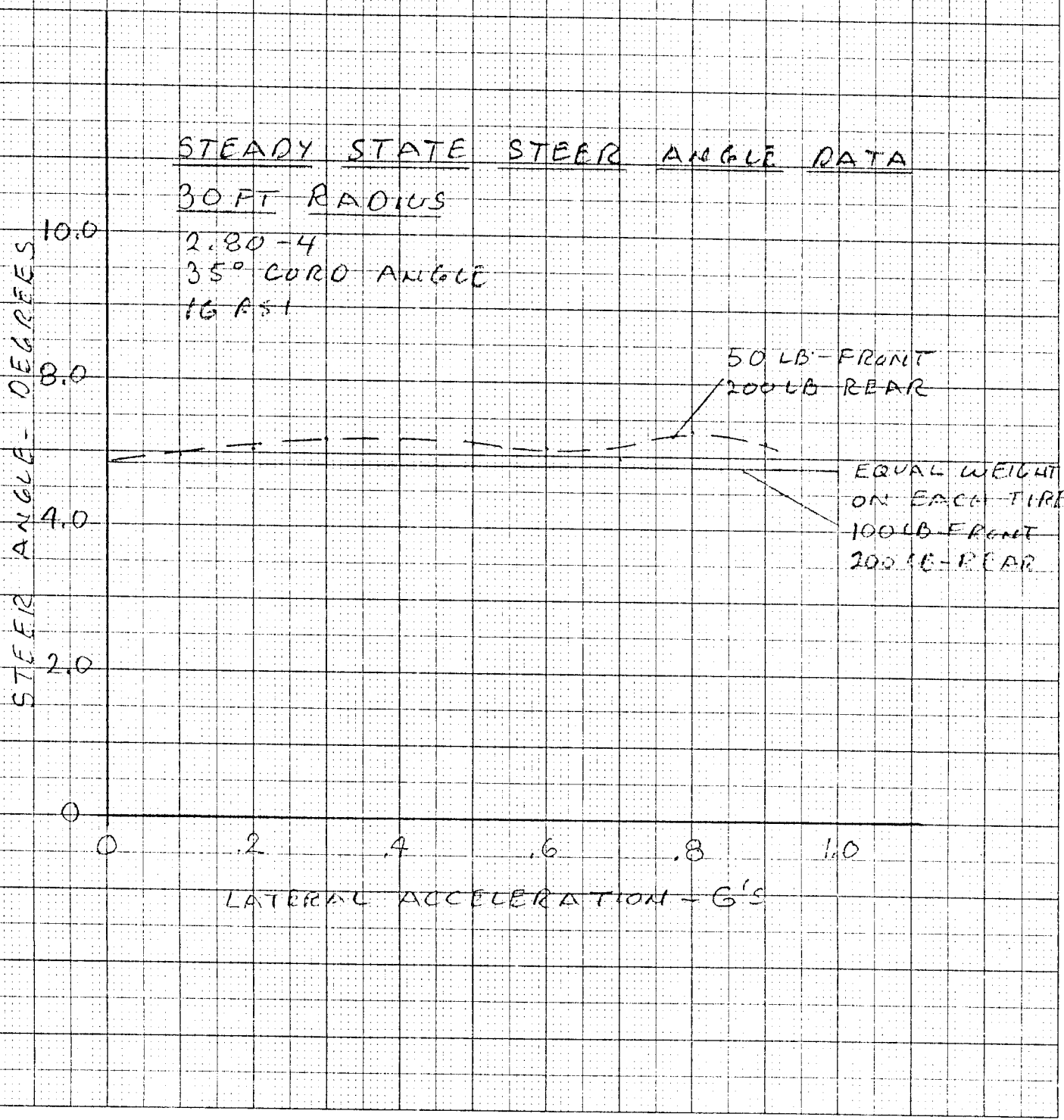
.8

1.0

LATERAL ACCELERATION - G'S

50 LB - FRONT
200 LB - REAR

EQUAL WEIGHT
ON EACH TIRE
100 LB - FRONT
200 LB - REAR



BRAKING TRACTION DATA SUMMARY

		LOAD-LB	
		50	150
INFLATION PSI	DRY WET		
	16	1.30 1.11	1.29 1.03
24		1.27 1.06	1.25 1.06

DATA TAKEN AT 5 MPH WITH A NON ROTATING 2.80-4, 35° CORD ANGLE, MODIFIED GOODYEAR TIRE. GROUND SMOOTH. NUMBERS REPRESENT TRACTIVE FORCE/LOAD. BELT SKID NUMBER IS SUPPOSED TO BE 75.

CONCLUSIONS:

1. BOTH DRY AND WET TRACTION ON THE TIRE BELT UNDER THESE CONDITIONS IS VERY HIGH.
2. TRACTION AT THE LOWER INFLATION PRESSURE IS SLIGHTLY HIGHER.
3. TRACTION IS LARGELY INSENSITIVE TO LOAD.
4. REDUCTION IN TRACTION DUE TO 0.010 INCHES OF WATER IS ABOUT 17%.

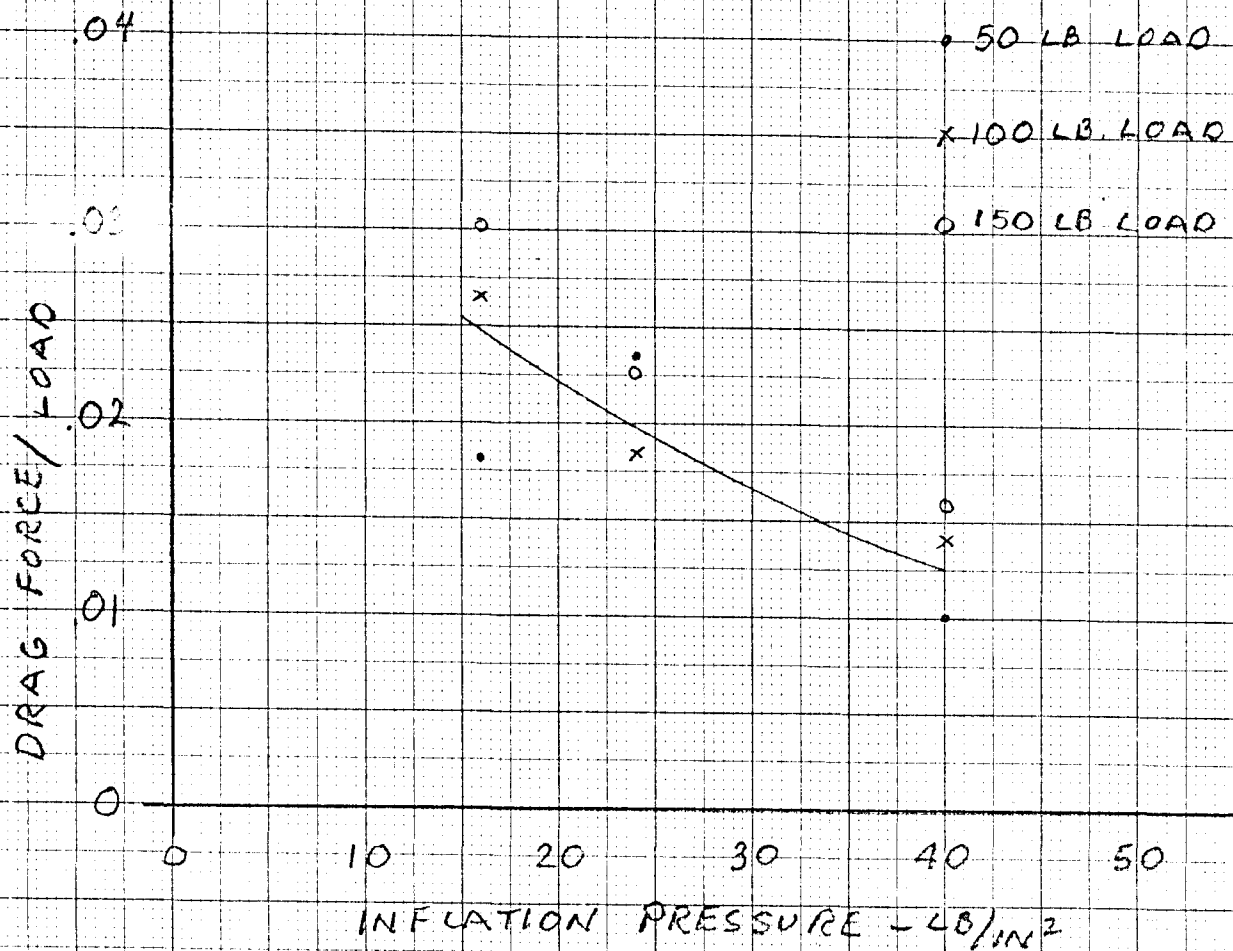
FREE ROLLING DRAG DATA SUMMARY

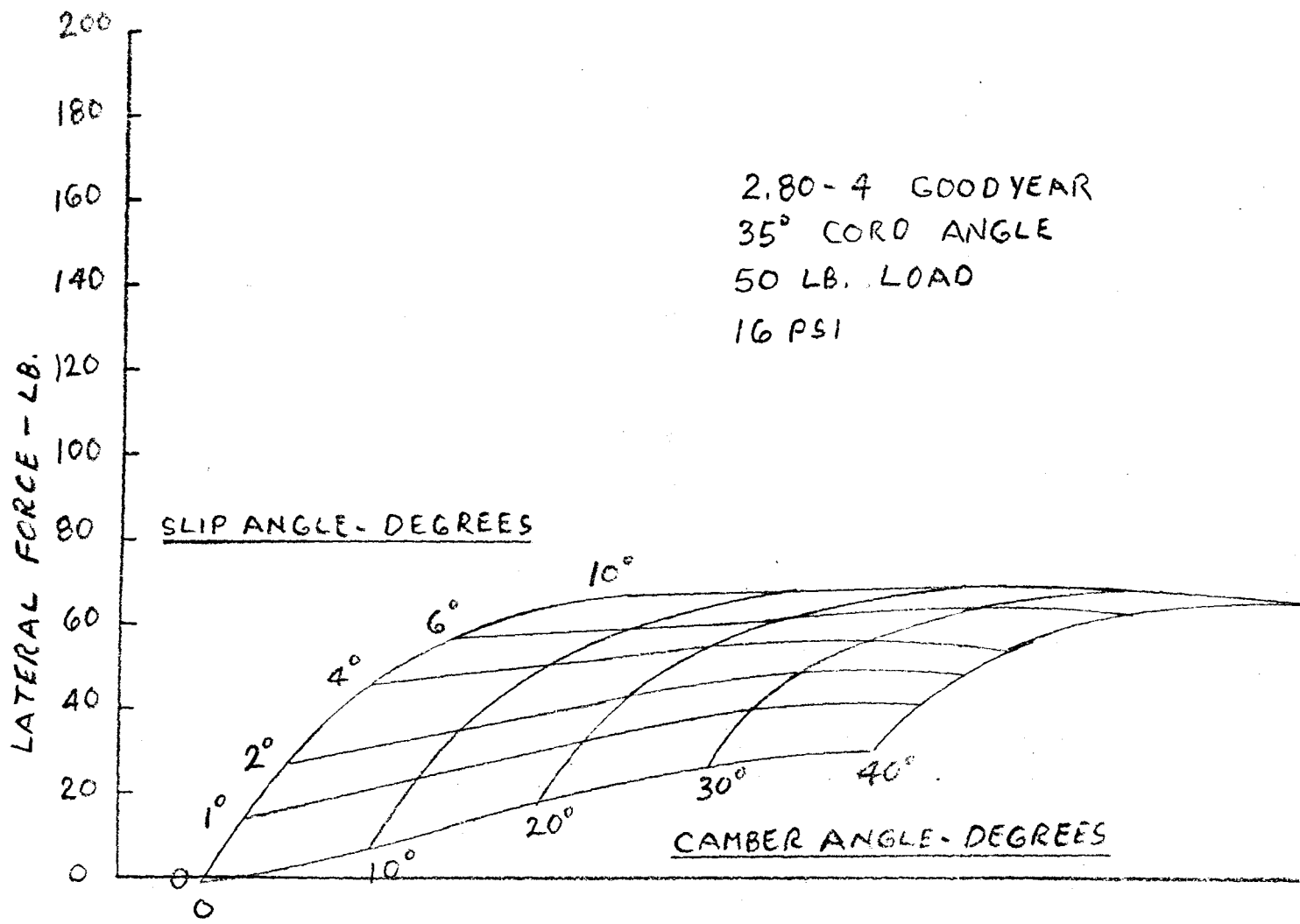
CONCLUSIONS:

1. THE FORMAL DATA RUNS CANNOT BE USED FOR POWER LOSS EVALUATION. DRAG DATA ARE PRINTED WITH ONE POUND RESOLUTION. THIS ROUNDING OFF IS SUFFICIENT TO SUPPRESS THE INFLUENCES OF LOAD, SPEED AND INFLATION PRESSURE. THE INFLUENCE OF TIRE CONSTRUCTION VARIABLES IS SUPP TO BE LESS THAN THAT OF INFLATION PRESSURE.
2. DATA FROM WARMUP RUNS WAS PRINTED WITH GREATER RESOLUTION. THESE DATA WERE SCANNED AND POINTS CONSIDERED TO BE TYPICAL PLOTTED ON THE ATTACHED GRAPH. SCATTER EXCEEDS THAT OF OUR OUTDOOR TRAILER TEST BUT THE LEVELS AND TRENDS ARE SIMILAR.
3. THE TIRE MACHINE MIGHT STILL BE USED FOR POWER LOSS EVALUATION BUT STATISTICAL TREATMENT OF DATA RECORDED TO .01 LB. RESOLUTION IS CLEARLY REQUIRED. THIS SHOULD INVOLVE A MINIMAL MODIFICATION TO EXISTING TIRE DATA PROCESSING SOFTWARE.

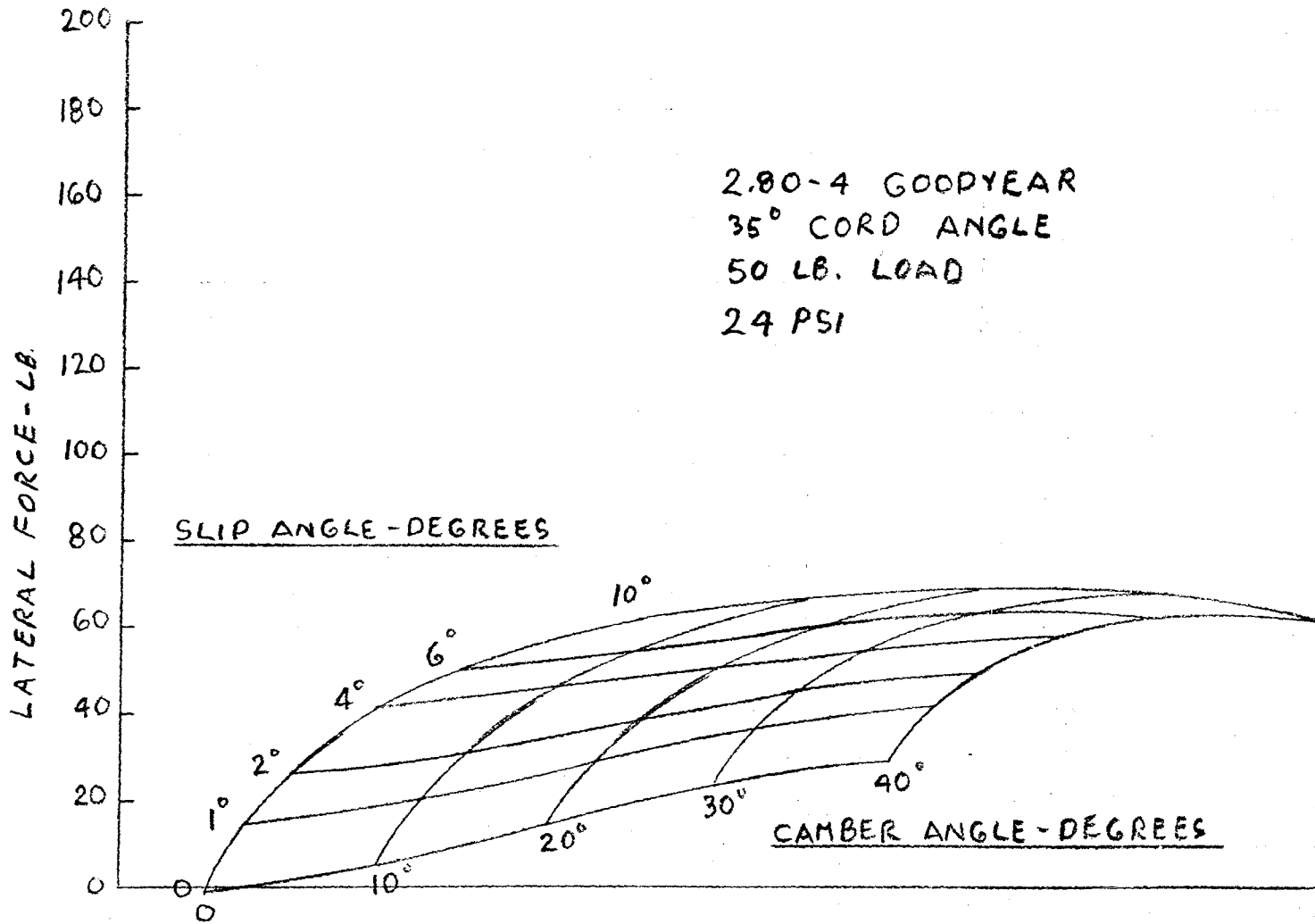
FREE ROLLING DRAG DATA FROM
CALSPAN SHAKE DOWN TEST

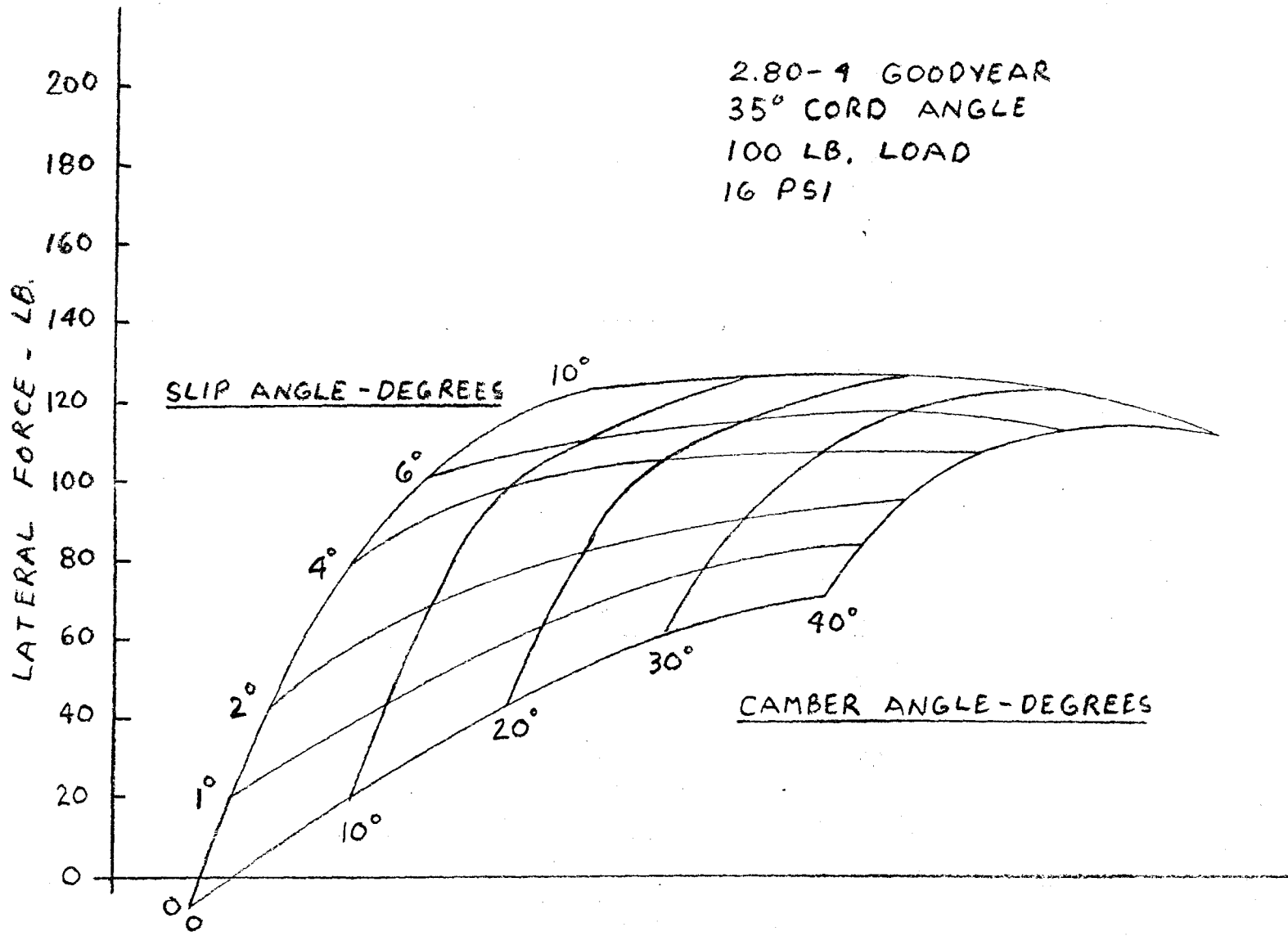
2.80-4, 35° CORD ANGLE, GROUND SMOOTH
GOODYEAR TIRE



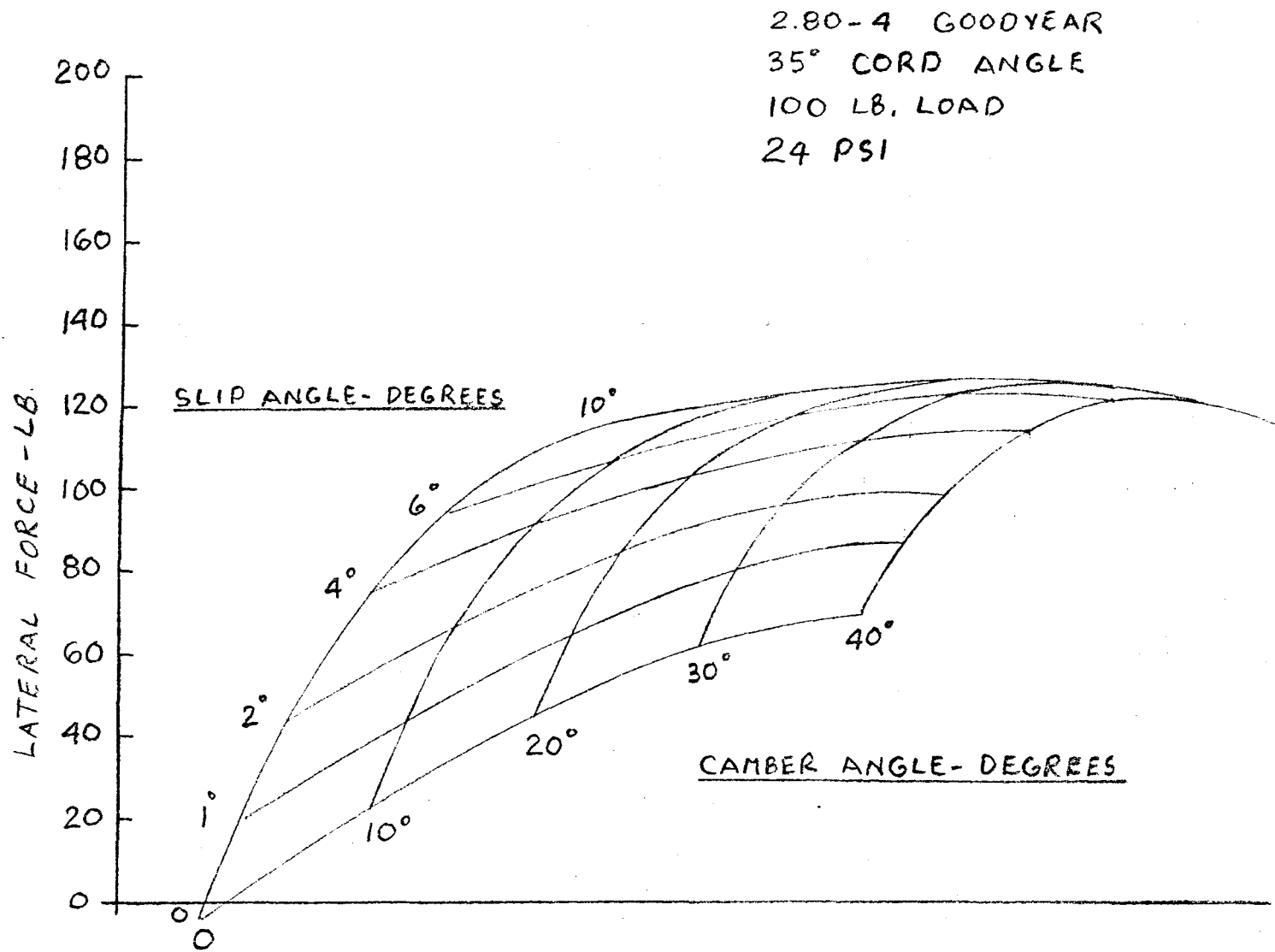


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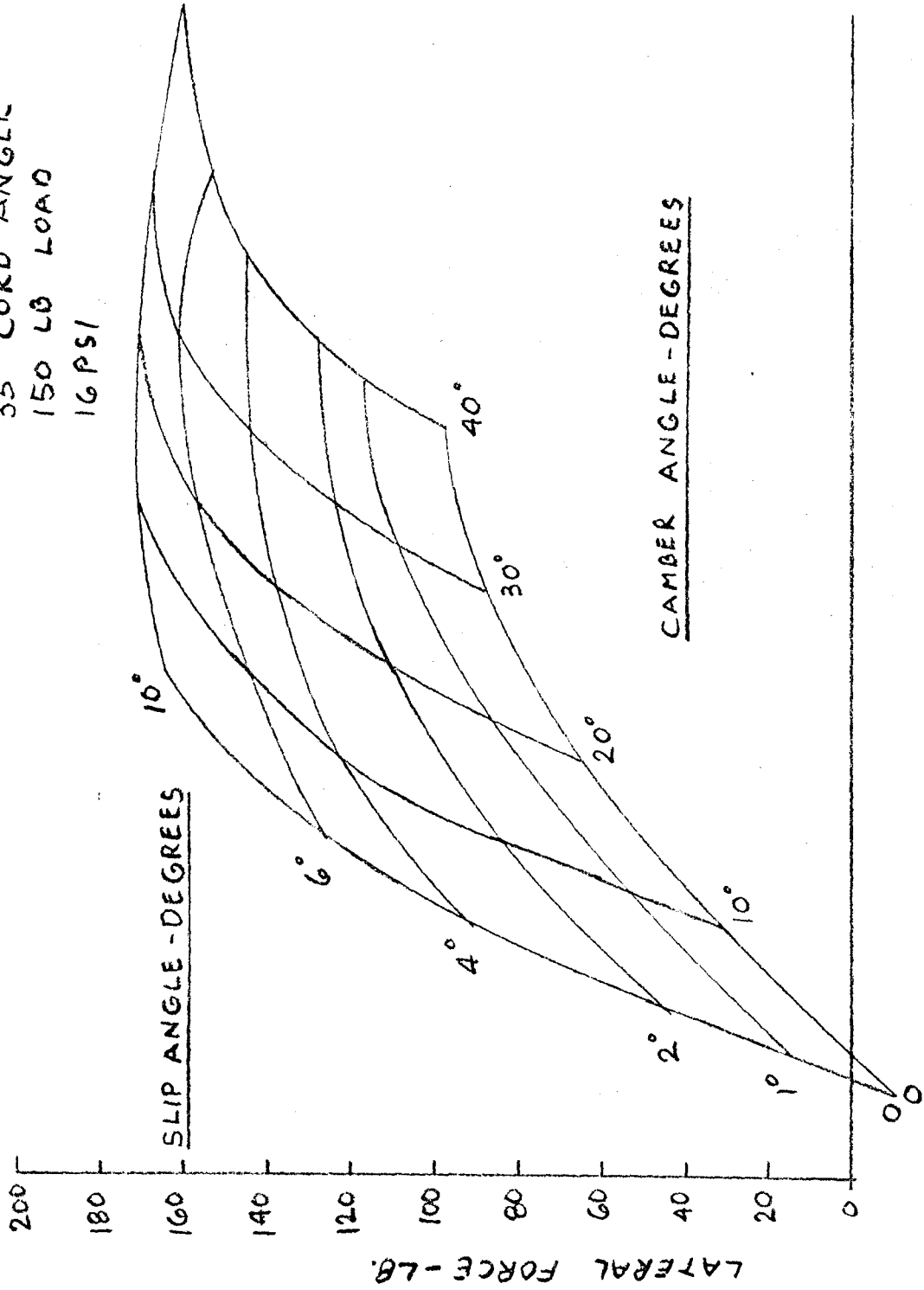


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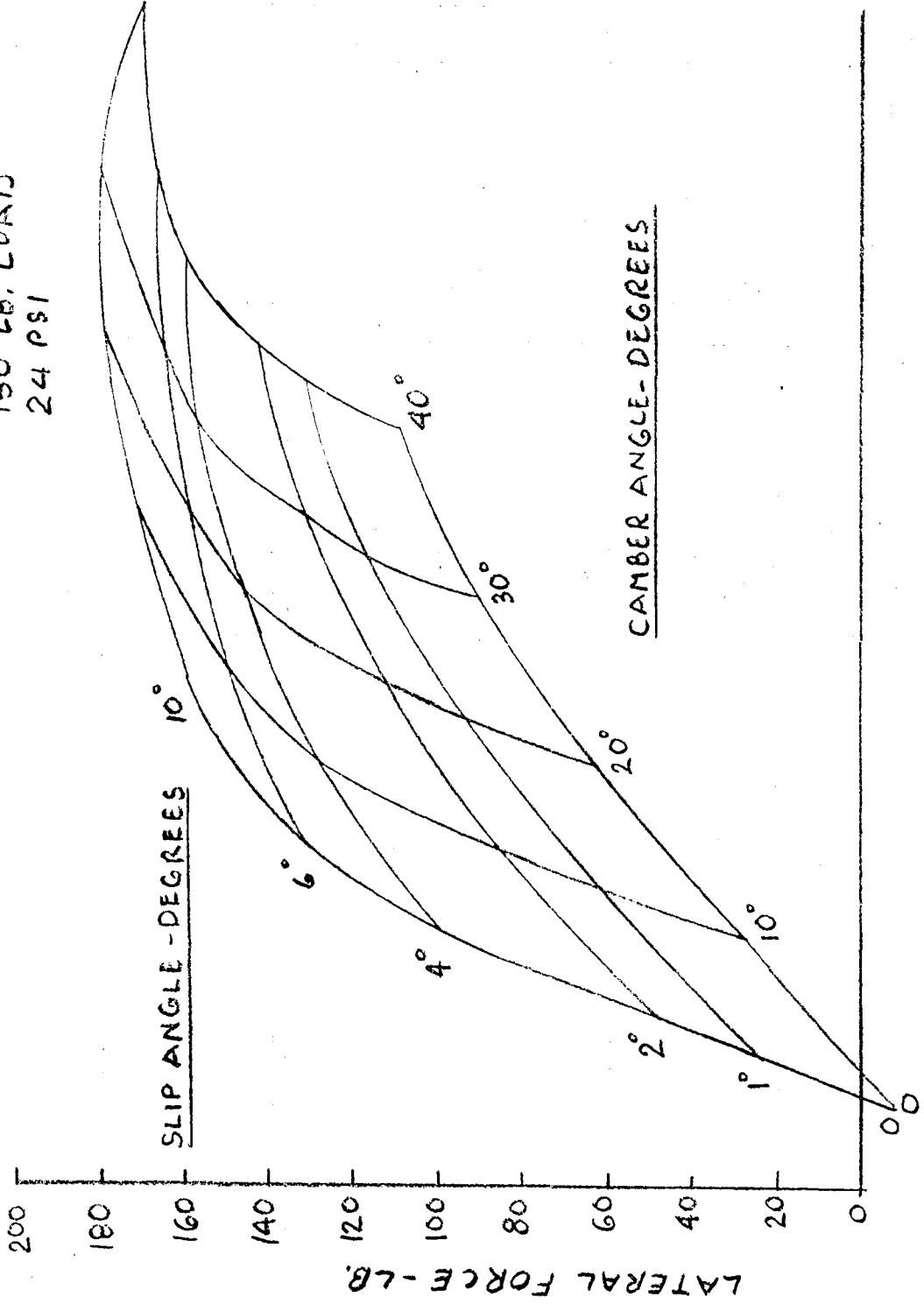
RESEARCH LABORATORIES	TITLE	DATE	CHK.	REVISIONS WAS	REV.	DATE	BY
GENERAL MOTORS CORPORATION							

2.80-4 GOODYEAR
 35° CORD ANGLE
 150 LB LOAD
 16 PSI



NAME	DATE	FILE	REVISIONS - N/A	CHK	DATE	TITLE	MO. SY. -
						RESEARCH LABORATORIES	GENERAL MOTORS CORPORATION

2.80-4 GOODYEAR
 35° CORD ANGLE
 150 LB. LOAD
 24 PSI



NO. 2	DATE	REV.	REVISIONS-MAN	CHK	DATE	TITLE	PROJECT
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