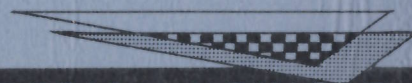


TESTING AND DEVELOPMENT

8 APRIL - 4 MAY 1964

# **G T AND SPORTS CAR PROJECT**

**A D V A N C E D  
P R O G R A M**



**ADVANCED CONCEPTS DEPT. - SPECIAL VEHICLE ACTIVITY**

**F O R D D I V I S I O N F O R D M O T O R C O M P A N Y**

FORD GT 40 PROJECT

TESTING AND DEVELOPMENT  
April 8 - May 4, 1964

Compiled By

Roy Lunn  
Advanced Concepts Manager  
Special Vehicles Activity  
FORD DIVISION - FORD MOTOR COMPANY

FORD GT 40 PROJECT  
TESTING & DEVELOPMENT  
APRIL 8 - MAY 4, 1964

FOREWORD - SUMMARY

CONFIDENTIAL

The first GT racing car prototype was completed on April 1, 1964. After shipping to press conferences in London and New York City, it was returned to Slough, England, on April 5.

Initial development started on April 6 in preparation for the Le Mans test week end on April 18-19. The second car was completed on April 15 and both cars were shipped to Le Mans on April 17.

Testing at Le Mans commenced under appallingly wet weather conditions on April 18. A high-speed instability condition was encountered which was largely responsible for one car becoming a total wreck in a crash on the Mulsanne straight. The second car suffered minor damage in a low-speed skid.

This report includes the specifications of the basic car, together with test reports on No. 1 and No. 2 vehicles between April 8 and May 4 when the No. 2 vehicle was stripped in preparation for the Nurburgring race: The work sheet for preparing this vehicle for Nurburgring is included.

Summary of Test and Development

- . The instability problem encountered at Le Mans has been solved by the addition of a rear end spoiler -- this has not only increased rear end adhesion but also has given the effect of adding feathers to an arrow.
- . Excessive clutch wear was found to be mainly due to restrictions in the hydraulic operating system -- this caused a sluggish return.
- . Front brakes have been overheating under heavy braking -- modifications are being made to increase air flow to the brakes and a complete review of the hydraulic system is being made by the Girling Company.
- . Alternators have been failing at very low mileages -- new units are now being installed with improved connectors and a lower speed range.
- . Engine cooling system overheating was cured by the addition of small slots in the nose area -- this brought the running temperature down to 70°F on a 60° ambient day.

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APRIL 8 - MAY 4, 1964

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Summary of Test and Development - (Cont'd)

- . There is insufficient air entering the plenum chamber for interior ventilation -- small scoops are being added to improve this condition.
- . Initial tailoring of the vehicle's handling was successfully accomplished after the stability problem was cured -- the car has a tendency of slight understeer with the present settings.
- . The power-to-weight ratio is not acceptable and a weight reduction program is underway: The No. 2 vehicle weighs 2002 pounds without driver and fuel: It is hoped to reduce this to 1950 pounds for the Nurburgring race.
- . Other development problems were of a minor and routine nature.

The No. 2 vehicle is being prepared for the Nurburgring race on May 31. This is the first race that the Ford GT will enter: This race is being considered as part of the development program prior to the Le Mans event on June 20.

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TEST REPORTS

CONFIDENTIAL

Date 8 April 1964

Purpose Initial settling down test of 1st prototype.

Track M. I. R. A. Proving Ground - England  
Contacts - Dr. A. Fogg - Director  
M. A. Dalby - Manager Nuneaton 3664

Personnel Richard Attwood - Driver  
Len Bailey  
Eric Broadley  
Bill Creswick  
John Etheridge  
Terry Hadley  
Roy Lunn  
Bill Pink  
John Wyer  
Bob Houston - Ford Birmingham Research - Northern 7521

Test Conditions

Weather Air Temp 55<sup>o</sup>F  
Humidity 50%  
Wind Velocity varying 9-12 m. p. h. South West  
Barometer 29.2  
Height above sea level 340 ft.

Track Surface temp 58<sup>o</sup>F  
No. 2 handling circuit, 2.37 miles, black top  
No. 1 high speed, 2.8 miles, cement  
Timing strip, black top

Test Vehicle Vehicle No. X40 - 101  
Body type - Coupe

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TESTING & DEVELOPMENT

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Vehicle Specification

Weight	Front	945	
	Rear	1092	
	Total	<u>2037</u>	lbs. (less fuel and driver)
Engine No.			AX-230-2-6
Type			Push Rod "Indy"
Displacement			256
Comp. Ratio			11.55
BHP @ RPM			335 @ 6800
Torque @ RPM			278 @ 5750
Power Curve No.			23850
Carburetors			Lola spec. Weber 48 IDM
Bore			1.81
Air Horn			1.80
Vent			43 mm
M. M. J.			175 mm
H. S. B.			200
Emulsion			F 11
Ace Pump			50
Idle Holder			120
Idle Jet			60
Starter			Autolite - 4-1/2 OD Pre-engaged
Type No.			XF 157 203
Battery			Autolite - 42 Amp Rating
Type No.			2510 F
Alternator			Autolite - 42 Amp Rating
Type No.			C4MF 10300B
No.			TU 949 No. 4
Plugs			Autolite 703
Lubrication			Shell 30M Synthetic Castor

FORD GT 40 PROJECT  
TESTING & DEVELOPMENT

TEST REPORTS

CONFIDENTIAL

Vehicle Specification

Transaxle

Type	Colotti	Type 37
Number		T37/1027/5
Axle Ratio		3.5555 (9:32)
1		2.5 (12:30)
2		1.705 (17:29)
3		1.295 (17:22)
4		1.125 (16:18)
R		

Lubrication

Shell 50M Synthetic Castor

Driveshaft

Coupling

BRD  
Metalastic

Clutch -

Type  
No.  
Lining  
Spring Press  
Initial Setting  
Slave cyl. dia.  
Master cyl. dia.  
Fluid

7-1/4" 3 Plate Borg & Beck  
CP102 - BB 101  
525 to Release  
.14 at Slave Rod  
7/8  
.75  
Girling "Amber" Racing

FORD GT 40 PROJECT  
TESTING & DEVELOPMENT

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Vehicle Specification

Front Suspension

Wheel Travel	3.0 Jounce	3.0 Rebound
Jounce Camber 3° 15' N.	Toe	1°
Design Camber 0°	Toe	40'
Rebound Camber 2° 15' P	Toe	35'
Bearing Lubrication	Shell Retinax DX	
Springs		
Code color	Yellow	
Wheel rate	100	
Ride frequency	88	
Roll Bar		
Bar diam.	5/8 dia.	
Roll rate (total)	290 lbs. ft./deg.	

Rear Suspension

Wheel Travel	3.5 Jounce	3.0 Rebound
Jounce Camber 4° N	Toe	2° 5'
Design Camber 1° N	Toe	1° 40'
Rebound Camber 45' P	Toe	1° 40'
Bearing Lubrication	Shell Retinax DX	
Springs		
Code color	Yellow	
Wheel rate	158	
Ride frequency	104.5	
Roll Bar		
Bar diam.	5/8	
Roll rate (total)	405	



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TESTING & DEVELOPMENT

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Vehicle Specification

Brakes

Front

Caliper type	Girling C.R
Lining	DS 11
Batch No.	untested
Master cyl. dia.	.75
Ratio front/rear pedal	50/50
Fluid	Girling "Amber" Racing

Wear rate - see Chart No.

Rear

Caliper type	Girling BR
Lining	DS 11
Batch No.	untested
Master cyl. dia.	.75
Ratio front/rear	50/50
Fluid	Girling "Amber" Racing

Wear rate - see Chart No.

Shock Absorbers

Front

Type	Armstrong AT 10
Design length	12.5
Setting	10 from off

Rear

Type	AT 10
Design length	14.06
Setting	14 from off

FORD GT 40 PROJECT  
TESTING & DEVELOPMENT

TEST REPORTS

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Vehicle Specification

Wheels & Tires

Front wheels	6.50 L x 15 Borrani
Front tires	5.50 x 15 R. 4
Pressure	50 lb.
Balance	Dynamic
Rear wheels	8.00 L x 15 Borrani
Rear tires	7.25 x 15 R. 6
Pressure	50 lb.
R. P. M.	683
Balance	Dynamic

Steering

Type	Cam Gears
Number	D241 No. 2
Ratio	15:1
Turning circle (360°)	38' 8"
Damper	No

Fuel System

Fuel Cell	1st Batch
Fuel Pump type	Bendix
Numbers	11 - 2 - 9 - 10

Radiator

Type	No. 1 Serck combined
Front area	294 sq. in.

FORD GT 40 PROJECT  
TESTING & DEVELOPMENT

TEST REPORTS

CONFIDENTIAL

Test Record

<u>Lap</u>	<u>Elapsed Time</u>	<u>Unit Lap Time</u>	<u>Remarks</u>
1		2.59.2	No. 2 circuit. Attwood.
2	5.20.0	2.24.8	
3	7.37.0	2.13.0	
4	9.39.6	2.02.6	
5	11.57.0	2.17.4	Stop
6	5.50.0	5.50.0	Stop - Caliper bridge pipe fouling rightfront wheel.
7		2.23.0	Brake Temperatures: Front 200 Rear 260
8	4.22.0	1.59.0	
9	6.07.6	1.45.6	
10	7.55.8	1.48.2	
11	9.38.6	1.43.8	
12	11.27.6	1.49.0	
13	13.15.8	1.48.3	
14	14.58.8	1.43.0	
15	16.22.6	1.43.8	
16	18.41.6	2.19.0	Stop - Water 91° Oil 72° OP 80 p. s. i. Brake Temp. F 40 R 50 @ 5000
1		1.48.2	H. S. circuit.
2	3.12.4	1.24.2	
3	4.33.6	1.21.2	7000 r. p. m. on timing straight.
4	6.12.6	1.39.0	Stop
5		1.46.0	H. S. circuit. Rear shocks 4 harder.
6	3.12.0	1.26.0	
7	4.37.0	1.25.0	
8	5.57.0	1.20.0	7000 r. p. m. on timing straight.
9	7.34.2	1.37.2	Stop - Water 90° Oil 70° OP 85 p. s. i. Brake Temp. Front 40 Rear 50

The car completed 6 spike stops from 20 m. p. h and two grid starts on the timing strip.

The turning circle, wall-to-wall was also checked at 38.8 ft.

FORD GT 40 PROJECT  
TESTING & DEVELOPMENT

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Driver's Comments

- . Gear box noisy particularly on overrun.
- . Brake pedal needs to move forward, or accelerator backward, to allow toe and heel operation.
- . Steering feels tight.
- . Flat spot in carburetion when pedal is lifted and re-applied.
- . Engine missing badly on sharp corners.
- . Interior warm -- ventilation system not functioning correctly.

Conclusions

The car performed satisfactorily for a first outing. Only two problems of significance were uncovered.

- . The water temperature of 91° was far above acceptable level for the 55°F ambient. New radiators with greater end tank capacity are now being constructed and attention is being given to air ducting.
- . When the car was stripped it was found the near outer end driveshaft spline had twisted considerably as a result of the two grid starts. The shaft manufacturers are now making replacements with a smaller hole in the center and better heat treatment, taking the strength from 60 tons to 80 tons.

All other problems were of a relatively minor nature. The following is a list of items which were corrected for the next test on Sunday, 12th April.

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Work List

1. Drain fuel tanks.
2. Weigh car with oil and water
  - a.) Front
  - b.) Rear
  - c.) Total
3. Check geometry.
4. Seal fuel pump flanges.
5. Fit headlamp rear shields.
6. Clearance front calipers from wheels.
7. Fit rubber blocks under caliper bridge pins.
8. Replace right-hand front caliper bridge pins.
9. Depress spoiler behind bottom of radiator, and seal around core.
10. Fit duct behind radiator.
11. Inspect for oil and water leaks.
12. Replace all water hoses with reinforced hose.
13. Fit latest type carburetors and manifolds.
14. Fit heat shield at back of engine.
15. Clip up plug leads.
16. Clean lower wishbones and check clearances.
17. Bleed brakes.
18. Bleed clutch.
19. Change transmission and fit Le Mans ratio.
20. Clearance transmission from rear undertray.

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Work List

21. Fit pressure gauge in fuel line.
22. Record brake pad thickness.
23. Make fuel tank dip-sticks.
24. Vents on tanks.
25. Change alternator No. 4 to No. 3.
26. Change roll bars to 11/16 front and 9/16 rear.
27. Change spark plugs to 603.
28. Fit brake thermocouples and mount instruments.
29. Fit air temperature thermocouples to radiator.

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TESTING & DEVELOPMENT

TEST REPORTS

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Date 18 April 1964

Purpose Le Mans Practice

Track Le Mans, France

Personnel R. Salvadori ) Drivers  
J. Schlessler )  
L. Bailey  
L. Bray  
E. Broadley  
A. Creswick  
J. Etheridge  
T. Hadley  
J. Sopp  
S. Woods  
J. Wyer  
F. Zimmerman

Test Conditions Weather Raining hard -- Puddles on Track  
Air temp 56°  
Humidity 88%  
Wind Velocity 3 m. p. h. South-West  
Barometer 29.50

Track Surface temp 58°  
8.3 miles black top

Test Vehicle Vehicle No. X40 - 101  
Body type - Coupe

FORD GT 40 PROJECT  
TESTING & DEVELOPMENT

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Vehicle Specification

Weight	Front	945	
	Rear	1092	
	Total	<u>2037</u>	lbs. (less fuel and driver)
Engine No.		AX-230-2-6	
Type		Push Rod "Indy"	
Displacement		256	
Comp. Ratio		11.55	
BHP @ RPM		350 - 7000	
Torque @ RPM		285 - 5750	
Power curve No.			
Carburetors		Weber 48. IDA	
Bore		1.89 inch	
Air Horn		1.80	
Vent		42 mm	
M. M. J.		170 mm - Vented to air entry	
H. S. B.		140	
Emulsion		F2	
Acc Pump		50	
Idle Holder		120	
Idle Jet		60	
Air		365 c.f.m.	
Fuel		223	
Starter		Autolite - 4-1/2 OD Pre-engaged	
Battery		Autolite - 42 Amp Rating	
Number		2510F	
Alternator		Autolite - 42 Amp Rating	
Number			
Plugs		Autolite 603	
Lubrication		Shell Synthetic Castor 30 M	



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Vehicle Specification

Transaxle

Type	Colotti	Type 37
Number		1028
Axle Ratio		3.0909 (11:34)
1		2.5 (12:30)
2		1.705 (17:29)
3		1.234 (21:26)
4		1.1 (20:20)
R		

Lubrication

Spirax 90 EP

Driveshaft

Coupling

BRD  
Metalastic

Clutch

Type	7-1/4" 3 Plate Borg & Beck
No.	CP102 - BB 103
Lining	
Spring Press	525 to Release
Initial Setting	.14 at Throwout Min.
M/cyl. dia.	.75
Slave cyl. dia.	7/8
Fluid	Girling Racing Amber

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Vehicle Specification

Front Suspension

Wheel Travel	3.0 Jounce 3.0 Rebound
Design Camber	0° Toe 40'
Springs - color	Silver
Wheel rate	141
Roll bar	11/16 dia.

Rear Suspension

Wheel travel	3.5 Jounce 3.0 Rebound
Design Camber	1°N Toe 1°40'
Springs - color	Yellow
Wheel rate	158
Roll bar	5/8 dia.
Lubrication	Shell Retinax DX

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Vehicle Specification

Brakes

Front

Caliper type	Girling CR
Lining	DS 11
Batch No.	untested
Master cyl. dia.	.75
Ratio front/rear pedal	50/50
Fluid	Girling Racing Amber

Wear Rate - see Chart No.

Rear

Caliper type	Girling BR
Lining	DS 11
Batch No.	Untested
Master cyl. dia.	.75
Ratio front/rear	50/50
Fluid	Girling Racing Amber

Wear rate - see Chart No.

Shock Absorbers

Front

Type	Armstrong AT 10
Design length	12.5
Setting	10 from off

Rear

Type	AT 10
Design length	14.06
Setting	14 from off

FORD GT 40 PROJECT  
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Vehicle Specification

Wheels & Tires

Front wheels	6.50 L x 15 Borrani
Front tires	5.50 x 15 R. 6 w. t.
Pressure	50 lb.
Balance	Dynamic
Rear wheels	8.00 L x 15 Borrani
Rear tires	7.25 x 15 R. 6
Pressure	50 lb.
R. P. M.	683
Balance	Dynamic

Steering

Type	Cam Gears
Number	No. 1
Ratio	15:1
Turning circle (360°)	38' 8"
Damper	No

Fuel System

Fuel Cell	1st Batch
Fuel Pump type	Bendix
Numbers	11 - 2 - 9 - 10

Radiator

Type	No. 1 Serck combined
Front area	294 sq. in.

FORD GT 40 PROJECT  
TESTING & DEVELOPMENT

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Test Record

<u>Lap</u>	<u>Unit Lap Time</u>	<u>Remarks</u>
1	-	
2	4.33.1	
3	4.27.9	
4	4.23.4	
5	4.22.0	
6	4.33.5	Stop - Car unstable on straight at 6000. Rear toe in adjusted to zero. Shocks 12 off soft.
7	4.50.8	
8		Crashed on straight. Heavy rain.

Conclusions

The car demonstrated instability at high speeds on the circuit. This problem was exaggerated in its effect by the wet road surface. The driver stated that "The suspension was hammering on the rebound stops."

Investigation into the cause of this condition will follow this program:

1. Analysis of forces in suspension linkage.
2. Wind tunnel and high speed testing for body lift. The effect of adding spoilers of 3-6 inches height at rear top surface of tail.
3. Test combination of springs and shockers allowing an increase in rebound control with lower wheel rates than 158.
4. Test tires with standard and wide tread profiles.
5. Investigate possible water planeing.