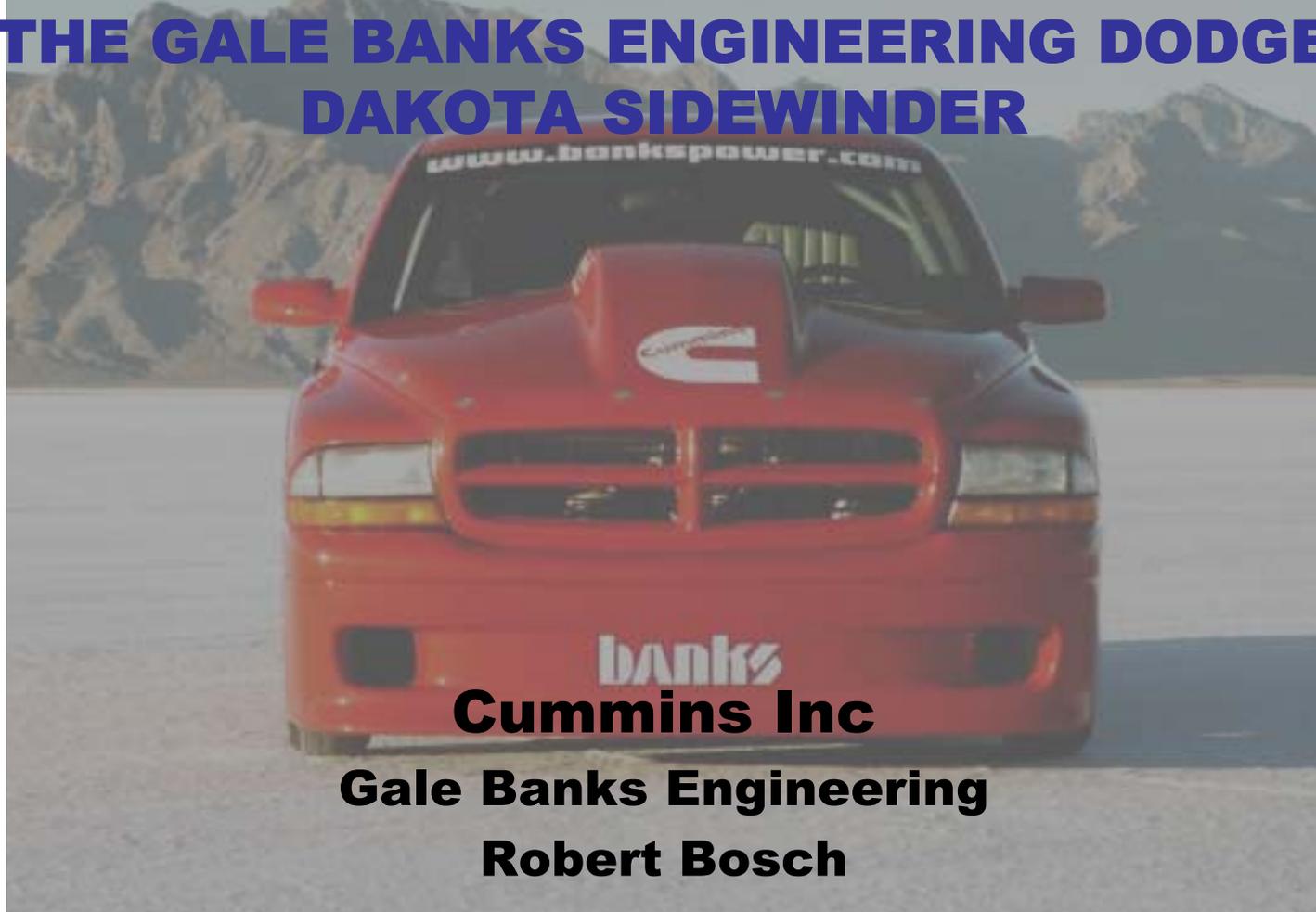




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# **DEVELOPMENT OF THE CUMMINS 5.9 L FOR THE GALE BANKS ENGINEERING DODGE DAKOTA SIDEWINDER**



**Cummins Inc**

**Gale Banks Engineering**

**Robert Bosch**

**2003 DEER - Newport, RI**

# Introduction

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- Two year collaboration between Gale Banks Engineering and Cummins Inc, to showcase diesel power in a “sporting light”.

## Major Contributors



Systems integration, VGT controls, Cylinder head Mods, Vehicle Engineering



Engine system performance

Engine management system



Fuel Injection Equipment



TURBOCHARGERS

Turbocharging Equipment



## Project Goals - Power to the Fifth

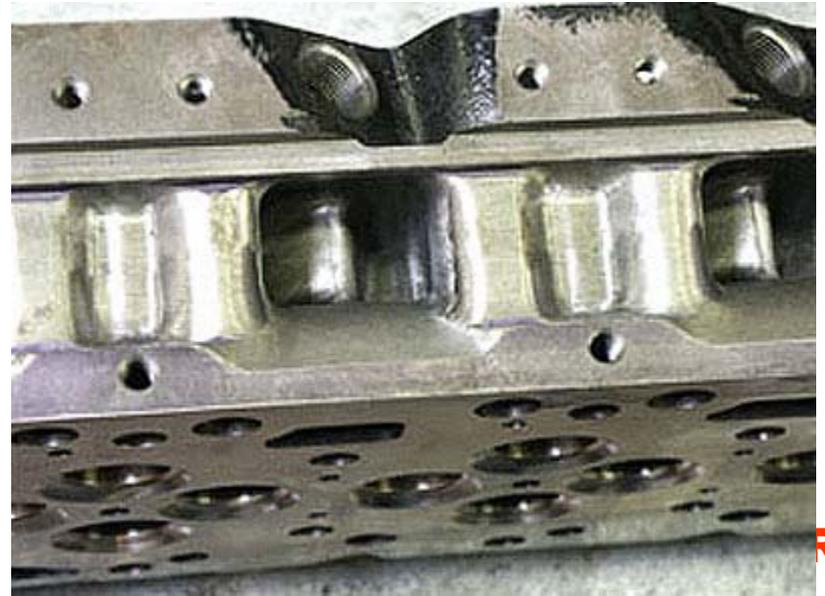
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- Street legal sport pickup truck with all the creature comforts of a production vehicle (air conditioning, stereo, power accessories).
- Advanced technology (HPCR and Electronically controlled VGT).
- 600+ HP and 1000+ ft-lb of torque.
- Fuel economy greater than 20 mpg.
- Capable of towing race equipment to events.
- Quiet and low visible emissions.
- Power to the fifth: *Gale Banks*
- Street legal
- Street legal + 200 mph capable
- Street legal + 200 mph capable + Land Speed Record holder
- Street legal + 200 mph capable + Land Speed Record holder + Tow Capable
- Street legal + 200 mph capable + Land Speed Record holder + Tow capable + **DIESEL POWER**

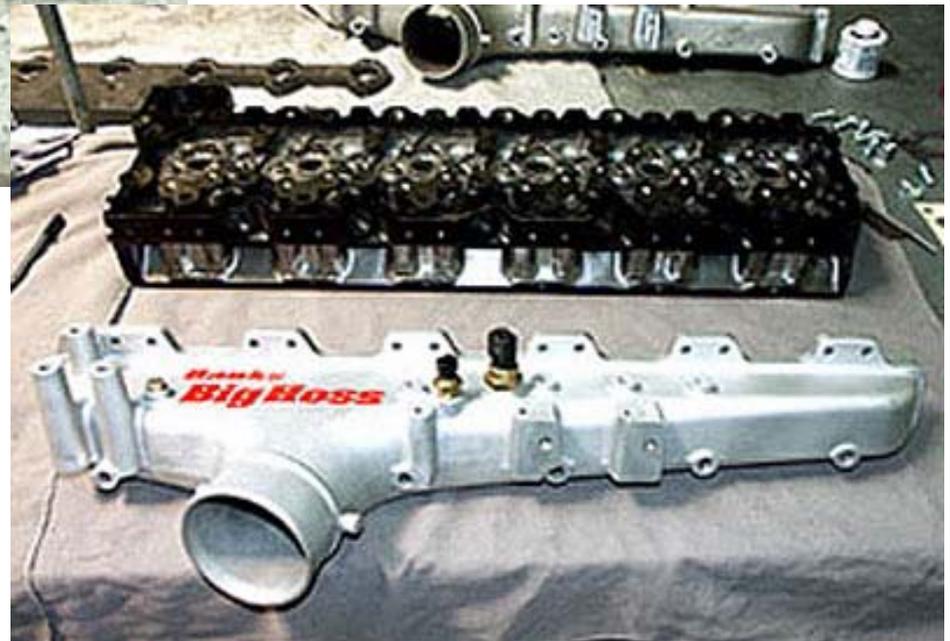
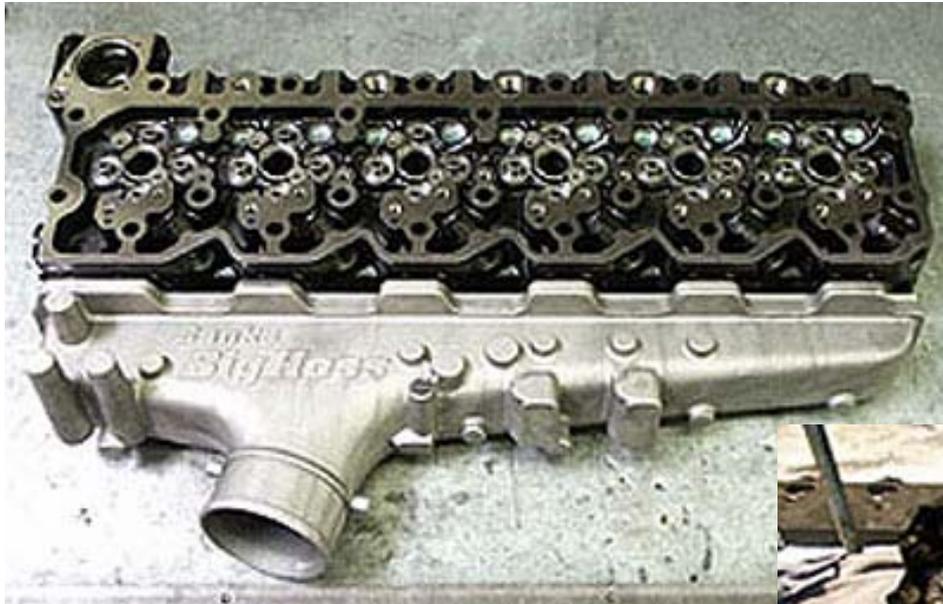


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# Engine Modifications



# Engine Modifications

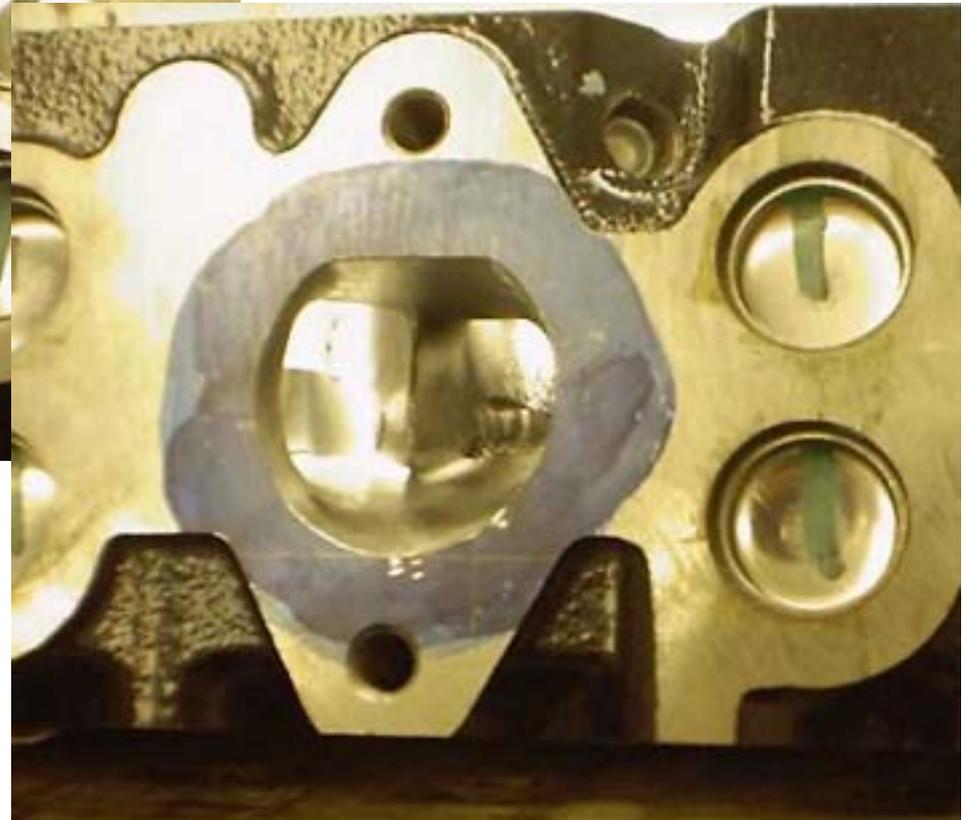
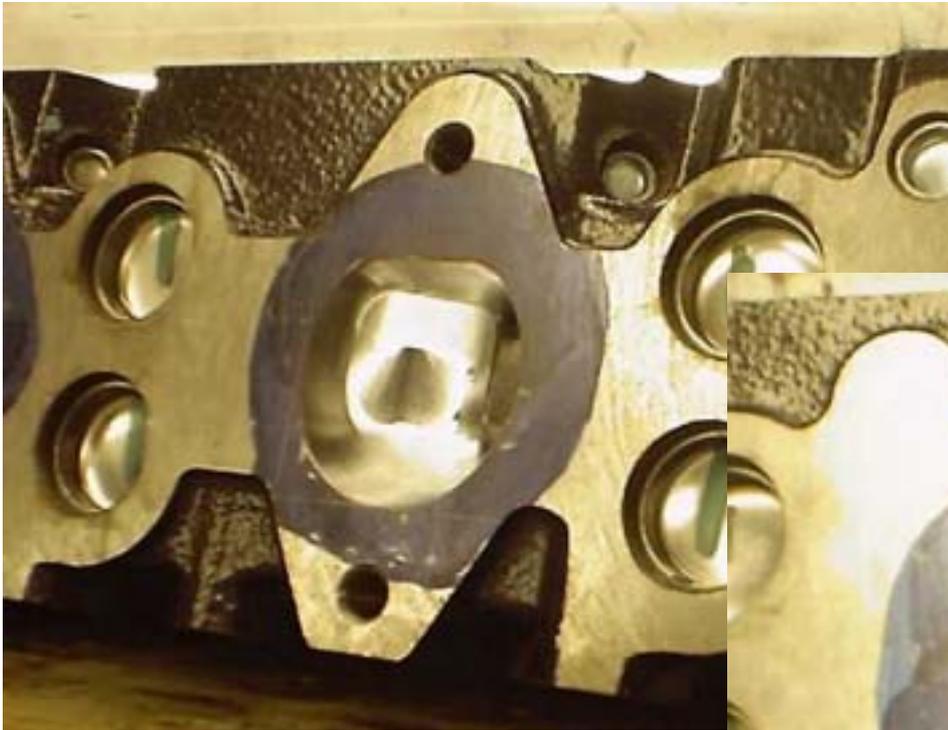


# Engine Modifications



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# Engine Modifications



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# Engine Modifications

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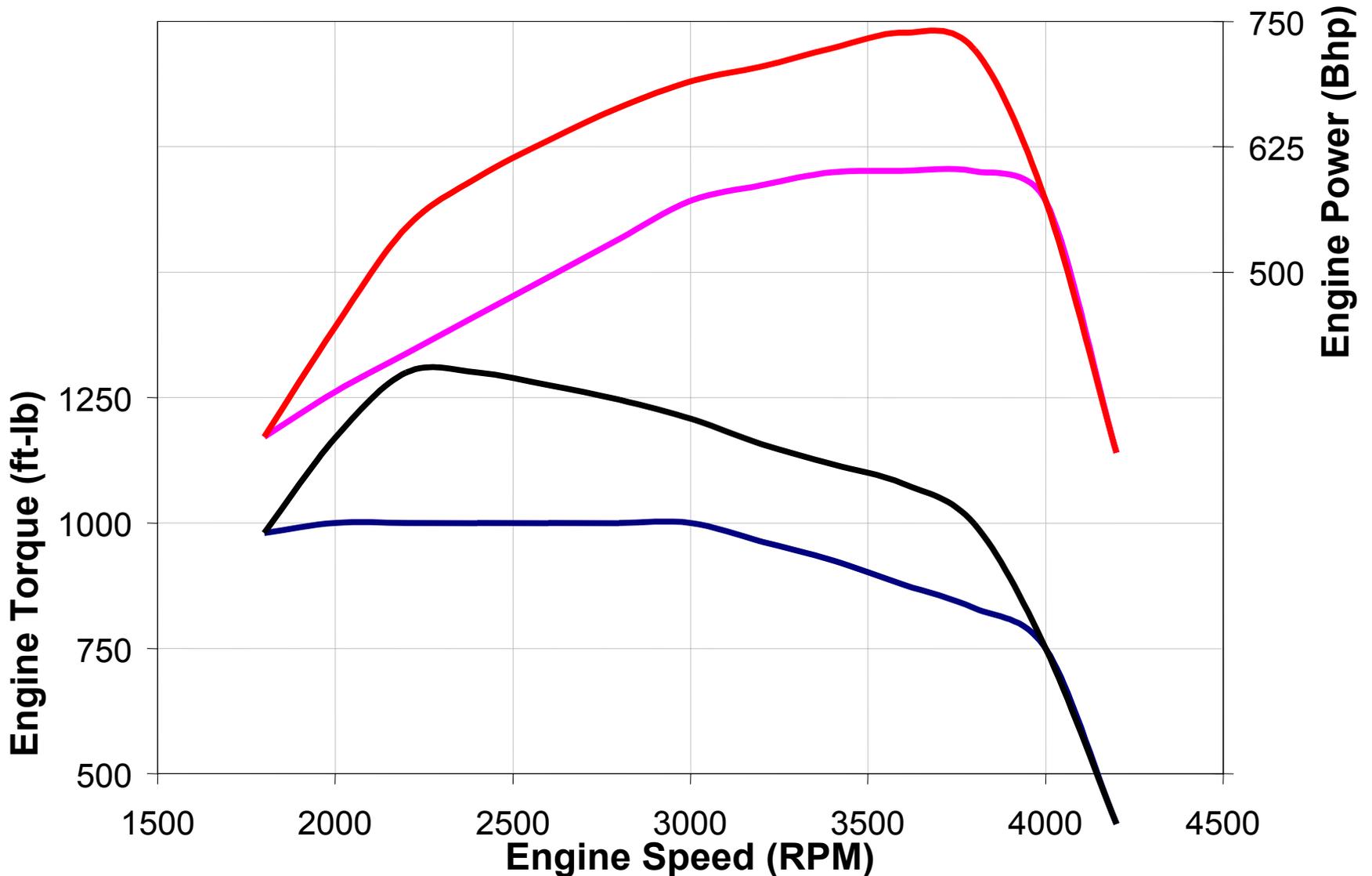
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# Engine Specifications



	<b>Baseline DCX MY03</b>	<b>Sidewinder (street/race)</b>
<b>Rated (HP @ RPM)</b>	<b>305 @ 2900</b>	<b>600 @ 3800 / 730 @ 3800</b>
<b>Torque Peak (HP @ RPM)</b>	<b>555 @ 1400</b>	<b>1000 @ 1800 / 1300 @ 2200</b>
<b>Compression Ratio</b>	<b>17.2:1</b>	<b>15:1</b>
<b>Maximum Fueling (mm<sup>3</sup>/st)</b>	<b>120</b>	<b>220 / 280</b>
<b>Injection Nozzle flow (cc @ 100 bar/30 s)</b>	<b>500</b>	<b>600 / 750</b>
<b>Maximum injection pressure (bar)</b>	<b>1600</b>	<b>1800</b>
<b>Fuel Economy (combined – mpg)</b>	<b>21</b>	<b>21</b>

# Demonstrated Power



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# Vehicle Systems



	Street	Race
Charge air Cooling	Air – Air	Iced Water – Air
Engine Cooling	Air – Coolant, Electric Fan	Air – Coolant
Turbocharger Control	Pneumatic – Electronic, PRc feedback	Pneumatic – Electronic, PRc feedback
Final Drive	3.30 : 1	1.97 : 1
Tires	Yokohama 295 / 45 R 20	Eagle Speed 800x820x15

# Vehicle Installation



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# Vehicle Class and Competition

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## October 2002 Entry

Banks Sidewinder:	Entry #212
BNI Class:	C/Diesel Truck (C/DT)
BNI C/DT Record:	159.647 MPH
BNI Record (any pickup):	205.208 MPH (Banks Cyclone)
FIA Class:	Category B (Production Vehicle) Group 3 (Diesel, Supercharged) Class 17 (Engine Size: 5.5–6.0L)
FIA Record:	Open

# Records



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	Mile (MPH)	Kilo (KPH)	Exit (MPH)
<b>Friday, October 18:</b> (7-mile course)			
Run 1 (limited to 175 MPH maximum)	172.617	278.517	—
Run 2 (limited to 200 MPH maximum)	192.608	309.584	—
<b>Record Set: 4</b> (FIA Mile & Kilo + BNI Int'l. Mile & Kilo)	<b>182.613</b>	<b>294.050</b>	
<b>Saturday, October 19:</b> (7-mile course)			
Run 1	216.034	347.843	—
Run 2	218.593	350.877	—
<b>Record Set: 4</b> (FIA Mile & Kilo + BNI Int'l. Mile & Kilo)	<b>217.314</b>	<b>350.012</b>	
<b>Saturday, October 19:</b> (5-mile course)			
Run 1 (clocks malfunctioned)	—	—	220.422
Run 2	217.212	—	222.139
<b>Sunday, October 20:</b> (5-mile course)			
Run 1 (pinion failure)	209.954	—	—
<b>Record Set: 1</b> (SCTA/BNI Nat'l.)	<b>213.583</b>		

**Totals: 7 runs, 9 records**

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# Comparison with Ferrari Enzo



Ferrari Enzo



Banks Sidewinder

Country of origin	Italy	USA
Type	2-door, 2-pass. coupe	Two-door, two-pass. sport truck
Introduction	2002 Paris Motor show	2002 Bonneville World Finals
Engine		
Displacement	6.0 liter (366 cid)	5.9 liter (359 cid)
No. of cylinders	12	6
Fuel system	Bosch fuel injection	Bosch common rail direct injection
Induction	Naturally aspirated	Holset VGT with Banks controller
Valvetrain	4 valves/cyl, DOHC	4 valves/cyl, cam-in-block
Comp. ratio	11.2:1	15.1:1
Horsepower (Bhp)	660	735
Torque (ft-lb)	485	1300
Max RPM	8200	4000
Transmission	6-speed manual	6-speed manual
Specific output	110 hp/liter (1.8 hp/in <sup>3</sup> )	125 hp/liter (2.0 hp/in <sup>3</sup> )

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# Comparison with Ferrari Enzo



Ferrari Enzo



Banks Sidewinder

## Performance

Top speed 217.5 mph (estimated)

222.139 mph (measured)

**Fuel economy 8-12 MPG**

**21.2 MPG**

## Standard Equipment

Air conditioning Yes

Yes

Stereo No

Yes

Trailer hitch No

Yes

Automatic trans. No

Optional

Available colors Red, yellow

Red

## Pricing and Availability

Price \$650,000

**Priceless**

Availability Sold out

Sold out



# Project Goals - Power to the Fifth

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# PM Emissions



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# PM Emissions

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# Thanks

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## **Cummins:**

**Rob Smith, Lyle Kocher, Ken King, Matt Meek, Will Harvey  
Greg Franks, Jason Mackey, and John Stang**

## **Gale Banks Engineering**

**Gale Banks, John Espino, Sheldon Tackett, and  
Andy Johnston**