State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-308
Relating to Exemptions Under Section 27156
of the Vehicle Code

FORD MOTOR COMPANY SPECIAL VEHICLE OPERATIONS
"HI-FLOW SHORTY HEADERS, HI-FLOW THROTTLE BODY, HI-FLOW EGR SPACER, INTAKE MANIFOLD KIT, GT-40 CYLINDER HEAD ASSEMBLY, HEAVY-DUTY T-5 TRANSMISSION, UNDERDRIVE PULLEY KIT, AND HI-FLOW EFI 5.0L MUSTANG FUEL PUMP"

Pursuant to the authority vested in the Air Resources Board by Section 27156 of the Vehicle Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-45-5;

IT IS ORDERED AND RESOLVED: That the Hi-Flow Shorty Headers, Hi-Flow Throttle Body, Hi-Flow EGR Spacer, Intake Manifold Kit, GT-40 Cylinder Head Assembly, Heavy-duty T-5 Transmission, Underdrive Pulley Kit, and Hi-Flow EFI 5.0L Mustang Fuel Pump manufactured by Ford Motor Company Special Vehicle Operations (Ford SVO) of 17000 Southfield Road, Allen Park, Michigan 48101, have been found not to reduce the effectiveness of required motor vehicle pollution control systems and, therefore, are exempt from the prohibitions in Vehicle Code Sections 27156 and 38391 for installation on the following Ford Mustang vehicles equipped with a 5.0L EFI gasoline engine:

Device	Veh. Model-year	Part Number
Hi-Flow Shorty Headers	1986-1992	M-9430-SSC/M-9430-C50
Hi-Flow Throttle Body	1988-1992	M-9E926-A302/M-9926-A302
Hi-Flow EGR Spacer	1988-1992	M-9H474-A50/M-9474-A50
Intake Manifold Kit	1988-1992	M-60001-A50
-Upper Intake Casting		M-9424-A5[illegible]
-Lower Intake Casting		M-9461-A5[illegible]
GT-40 Cyl. Hd. Assembly	1988-1992	M-6049-L[illegible]
-Machined Casting		M-6049-L[illegible]
-Valve Train Kit		M-6090-L[illegible]
Heavy-duty T-5 Transmission	1979/82-1992	M-7003-A [illegible] Ft Lbs Rating)
		M-7003-X [illegible] Ft Lbs Rating)
-Input Gear		M-7017-B
-1st Speed Gear		M-7100-D
-2nd Speed Gear		M-7102-B [illegible] Ft Lbs Rating)
		M-7102-X [illegible] Ft Lbs Rating)
-Countershaft Cluster Gear		M-7113-A [illegible] Ft Lbs Rating)
		M-7113-X [illegible] Ft Lbs Rating)
-3rd Speed Gear		M-7340-A [illegible] Ft Lbs Rating)
		M-7340-X [illegible] Ft Lbs Rating)
Underdrive Pulley Kit	1986-1992	M-8509-A5[illegible]
Hi-Flow EFI 5.0L Mustang Fuel Pump	1986-1992	M-9A407-A5[illegible]/M-9407-A50

This exemption shall not apply to any device, apparatus, or mechanism advertised, offered for sale or sold with, or installed on, a motor vehicle prior to or concurrent with transfer to an ultimate purchaser.

This Executive Order is valid provided that installation instructions for the devices listed above will not recommend tuning the vehicle to specifications different from those submitted by the system manufacturer.

Changes made to the design or operating conditions of any of the devices as exempted by the Air Resources Board (ARB), that adversely affect the performance of a vehicle's pollution control system shall invalidate this Executive Order.

Marketing of the devices using identifications other than those shown in this Executive Order or marketing of the devices for applications other than those listed in the exemption application, and on this Executive Order, shall be prohibited unless prior approval is obtained from the Air Resources Board. Exemption of the devices shall not be construed as exemption to sell, offer for sale, or advertise any component of each kit as an individual device.

This Executive Order does not constitute any opinion as to the effect the use of the devices may have on any warranty either expressed or implied by the vehicle manufacturer.

THIS EXECUTIVE ORDER DOES NOT CONSTITUTE A CERTIFICATION, ACCREDITATION, APPROVAL, OR ANY OTHER TYPE OF ENDORSEMENT BY THE AIR RESOURCES BOARD OF ANY CLAIMS OF THE APPLICANT CONCERNING ANTI-POLLUTION BENEFITS OR ANY ALLEGED BENEFITS OF FORD SVO'S HI-FLOW SHORTY HEADERS, HI-FLOW THROTTLE BODY, HI-FLOW EGR SPACER, INTAKE MANIFOLD KIT, GT-40 CYLINDER HEAD ASSEMBLY, HEAVY-DUTY T-5 TRANSMISSION, UNDERDRIVE PULLEY KIT, AND HI-FLOW EFI 5.0L MUSTANG FUEL PUMP.

No claim of any kind, such as "Approved by the Air Resources Board" may be made with respect to the action taken herein in any advertising or other oral or written communication.

Section 17500 of the Business and Professions Code makes untrue or misleading advertising unlawful, and Section 17534 makes violation punishable as a misdemeanor.

Section 43644 of the Health and Safety Code provides as follows:

> "43644, (a) No person shall install, sell, offer for sale, or advertise, or, except in an application to the state board for certification of a device, represent, any device as a motor vehicle pollution control device for use on any used motor vehicle unless that device has been certified by the state board. No person shall sell, offer for sale, advertise, or represent any motor vehicle pollution control device as a certified device which, in fact, is not a certified device. Any violation of this subdivision is a misdemeanor."

Any apparent violation of the conditions of this Executive Order will be submitted to the Attorney General of California for such action as he deems advisable.

Executed at El Monte, California, this 6th day of April, 1993.

R.B. Summerfield
Assistant Division Chief
Mobile Source Division

State of California
AIR RESOURCES BOARD

EVALUATION OF FORD MOTOR COMPANY SPECIAL VEHICLE OPERATIONS' HI-FLOW SHORTY HEADERS, HI-FLOW THROTTLE BODY, HI-FLOW EGR SPACER, INTAKE MANIFOLD KIT, GT-40 CYLINDER HEAD ASSEMBLY, HEAVY-DUTY T-5 TRANSMISSION, UNDERDRIVE PULLEY KIT, AND HI-FLOW EFI 5.0L MUSTANG FUEL PUMP, FOR EXEMPTION FROM THE PROHIBITIONS IN VEHICLE CODE SECTION 27156 AND TITLE 13, SECTION 2222, CALIFORNIA CODE OF REGULATIONS

April 1993

EVALUATION OF FORD MOTOR COMPANY SPECIAL VEHICLE OPERATIONS' HI-FLOW SHORTY HEADERS, HI-FLOW THROTTLE BODY, HI-FLOW EGR SPACER, INTAKE MANIFOLD KIT, GT-40 CYLINDER HEAD ASSEMBLY, HEAVY-DUTY T-5 TRANSMISSION, UNDERDRIVE PULLEY KIT, AND HI-FLOW EFI 5.0L MUSTANG FUEL PUMP, FOR EXEMPTION FROM THE PROHIBITIONS IN VEHICLE CODE SECTION 27156 AND TITLE 13, SECTION 2222, CALIFORNIA CODE OF REGULATIONS

by

Mobile Source Division

State of California
AIR RESOURCES BOARD
9528 Telstar Avenue
El Monte, CA 91731-2990

SUMMARY

Ford Motor Company Special Vehicle Operation (Ford SVO) of 17000 Southfield Road, Allen Park, Michigan 48101, has applied for an exemption from the prohibitions in Vehicle Code Sections 27156 and 38391 for installation of modified devices listed below on the following Ford Mustang vehicles equipped with a 5.0L EFI gasoline engine:

Device	Veh. Model-year	Part Number
Hi-Flow Shorty Headers	1986-1992	M-9430-SSC/M-9430-C50
Hi-Flow Throttle Body	1988-1992	M-9E926-A302/M-9926-A302
Hi-Flow EGR Spacer	1988-1992	M-9H474-A50/M-9474-A50
Intake Manifold Kit	1988-1992	M-60001-A50
-Upper Intake Casting		M-9424-A51
-Lower Intake Casting		M-9461-A50
GT-40 Cyl. Hd. Assembly	1988-1992	M-6049-L303
-Machined Casting		M-6049-L302
-Valve Train Kit		M-6090-L302
Heavy-duty T-5 Transmission	1979/82-1992	M-7003-A (305 Ft Lbs Rating)
		M-7003-X (325 Ft Lbs Rating)
-Input Gear		M-7017-B
-1st Speed Gear		M-7100-D
-2nd Speed Gear		M-7102-B (305 Ft Lbs Rating)
		M-7102-X (325 Ft Lbs Rating)
-Countershaft Cluster Gear		M-7113-A (305 Ft Lbs Rating)
		M-7113-X (325 Ft Lbs Rating)
-3rd Speed Gear		M-7340-A (305 Ft Lbs Rating)
		M-7340-X (325 Ft Lbs Rating)
Underdrive Pulley Kit	1986-1992	M-8509-A50
Hi-Flow EFI 5.0L Mustang Fuel Pump	1986-1992	M-9A407-A50/M-9407-A50

The applicant conducted comparative emissions tests of each device using a 1992 Ford Mustang powered by a 5.0L gasoline engine.

Test results from an independent laboratory and confirmatory tests conducted by the Air Resources Board (ARB) demonstrated the installation of the Ford SVO's devices would not reduce the effectiveness of the pollution control systems on applicable vehicles. Based on the data submitted by the applicant, and the ARB's confirmatory testing, staff recommends that the exemption be granted as requested and that Executive Order No. D-308 be issued.

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EVALUATION OF FORD MOTOR COMPANY SPECIAL VEHICLE OPERATIONS' HI-FLOW SHORTY HEADERS, HI-FLOW THROTTLE BODY, HI-FLOW EGR SPACER, INTAKE MANIFOLD KIT, GT-40 CYLINDER HEAD ASSEMBLY, HEAVY-DUTY T-5 TRANSMISSION, UNDERDRIVE PULLEY KIT, AND HI-FLOW EFI 5.0L MUSTANG FUEL PUMP, FOR EXEMPTION FROM THE PROHIBITIONS IN VEHICLE CODE SECTION 27156 AND TITLE 13, SECTION 2222, CALIFORNIA CODE OF REGULATIONS

I. INTRODUCTION

Ford Motor Company Special Vehicle Operations (Ford SVO) of 17000 Southfield Road, Allen Park, Michigan 48101, has applied for an exemption from the prohibitions in Vehicle Code Sections 27156 and 38391 for the following modified devices intended for installation on the following Ford Mustang vehicles equipped with a 5.0L EFI gasoline engine:

Device	Veh. Model-year	Part Number
Hi-Flow Shorty Headers	1986-1992	M-9430-SSC/M-9430-C50
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GT-40 Cyl. Hd. Assembly	1988-1992	M-6049-L303
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Underdrive Pulley Kit	1986-1992	M-8509-A50
Hi-Flow EFI 5.0L Mustang Fuel Pump	1986-1992	M-9A407-A50/M-9407-A50

II. CONCLUSION

Results from comparative emission tests conducted at Roush Technologies Laboratory, Livonia, Michigan 48150, and from Air Resources Board's confirmatory testing demonstrated emissions from the test vehicle

did not exceed the levels acceptable for exemption of add-on or modified parts under California Vehicle Code Sections 27156 and 38391.

Based on the test results, staff concludes that the installation of the Ford SVO's devices shown above will not reduce the effectiveness of the emission control systems of the applicable vehicles.

III. RECOMMENDATION

The staff recommends that the exemption be granted as requested and Executive Order No. D-308 be issued, permitting the advertisement, sale and installation of Ford SVO's Hi-Flow Shorty Headers, Hi-Flow Throttle Body, Hi-Flow EGR Spacer, Intake Manifold Kit, GT-40 Cylinder Head Assembly, Heavy-duty T-5 Transmission, Underdrive Pulley Kit, and Hi-Flow EFI 5.0L Mustang Fuel Pump, on vehicles shown above.

IV. DEVICE DESCRIPTION

Ford SVO's devices function identically to those on the production vehicles, except for the following modifications:

1. The Hi-Flow Shorty Headers (HFSH) is made of stainless steel or ceramic coated stainless steel. It bolts directly to stock exhaust pipes. The headers receive exhaust gases from the cylinder head and transmit them to a common collector tube, and then to the "H" pipe/catalytic converter assembly. The diameter of the Ford SVO headers is 8.3 percent larger than the original equipment manufacturer (OEM) cast iron headers. The applicant claims that the increase in diameter of the headers provides for better airflow capability, and results in better engine performance.
2. The Ford SVO Hi-Flow Throttle Body (HFTB) is a butterfly type control valve that provides the vehicle with a mechanical means

to control airflow into the engine when linked to the accelerator pedal with cable. It also incorporates a throttle position sensor which sends throttle angle information to the on-board computer as well as the idle speed control motor to regulate engine idle airflow. The diameter of the Ford SVO HFTB is 8.3 percent larger than the stock throttle body. The applicant claims that their design improves the engine airflow and results in better engine performance than the stock throttle body.

3. The Hi-Flow EGR Spacer (HFES) is mounted at the upper intake manifold on the downstream side of the throttle body. It provides a mounting surface for the EGR valve as well as passage to supply exhaust gases to the EGR valve and the intake airstream. Its diameter is 7.7 percent larger than the stock spacer. The manufacturer claims that the Hi-Flow EGR Spacer increases engine airflow capacity by 10 percent due to its larger and less restrictive bore diameter.

4. The Intake Manifold Kit (IMK) directly replaces the OEM upper and lower intake manifolds and incorporates all OEM attachment surfaces. The upper manifold runners are constructed of tubular aluminum opposed to the production cast iron. The upper manifold runner diameter is increased to 1.65 inches and the throttle opening diameter is increased to 2.75 inches. The lower manifold is cast from aluminum opposed to the production cast iron. The port size is increased and more precisely contoured. The applicant claims this kit provides increased engine airflow by reducing restriction in the air inlet system. The applicant will market the upper and lower manifolds as a kit

or separately, though the applicant claims neither can operate separately.

5. The GT-40 Cylinder Head Assembly (GT-40 CHA) directly replaces the OEM cylinder head. The cylinder head uses 1.84 inch intake valve gauge diameter and 1.54 inch exhaust valve gauge diameter. The exhaust valve seats are fitted with inserts to prevent seat recession. The combustion chamber volume is approximately 65.5cc. The applicant claims it is designed to increase the airflow through improved intake and exhaust runner configuration and increased valve diameters. The applicant will market the bare cylinder head casting separately from the valvetrain kit, though the applicant claims neither can operate separately.

6. The Underdrive Pulley Kit (UPK) replaces the OEM crankshaft, alternator and water pump pulleys. The crankshaft pulley diameter is reduced to slow the fead belt speed. The overall result is to reduce water pump speed by 14 percent and alternator speed by 22 percent versus the stock pulley ratios. The applicant claims this kit increases rear wheel horsepower by reducing parasitic horsepower loss due to the engine driven accessories.

7. The Heavy-Duty T-5 Transmissions (HDT-5T) are direct replacements for T-5 equipped Mustangs and as an upgrade on earlier S.R.O.D. transmission equipped Mustangs. The transmissions are applicable only for vehicles equipped with manual transmission. There are two versions of the transmission, M-7003-A and M-7003-X. The difference between the M-7003-A and M-7003-X is the use of improved material for the cluster, 2nd and 3rd speed gears on the M-7003-X allowing a greater torque rating -- 325 ft. lbs. vs. 305 ft. lbs. Both

transmissions have identical ratios: 2.95 - 1st, 1.94 - 2nd, 1.34 - 3rd, 1.00 - 4th and 0.63 - 5th. These are the same ratios used in all 1984 5.0L Mustangs with T-5 transmissions and differ from the 1985-1992 model-year transmissions which use the following ratios: 3.35 - 1st, 1.99 - 2nd, 1.33 - 3rd, 1.00 - 4th and 0.68 - 5th. The applicant claims the major advantage of these transmissions is an increase of a minimum of 10 percent in torque capacity over the production transmission. The applicant will market the complete transmission and the separate components. The applicant claims the gear set will upgrade the production T-5 transmission to the HDT-5T specifications. Although the gears will be marketed separately, the applicant claims they cannot be used separately.

8. Staff has determined, through engineering evaluation that Ford SVO's Hi-Flow EFI 5.0L Mustang Fuel Pump will have no adverse emission impact on applicable vehicles. This high pressure in-tank fuel pump is a direct replacement for the production pump. It increases the flow from 88 liters/hour to 110 liters/hour.

V. DEVICE EVALUATION

Ford SVO was required to test the Hi-Flow Shorty Headers, Hi-Flow Throttle Body, Hi-Flow EGR Spacer, Intake Manifold Kit, GT-40 Cylinder Head Assembly, Heavy-Duty T-5 Transmission and Underdrive Pulley Kit. The Hi-Flow EFI 5.0L Mustang Fuel Pump did not require testing since applicable vehicles are equipped with a fuel rail mounted fuel pressure regulator. This regulator returns excess fuel volume above the preset pressure to the tank. During periods of operation at high power levels, the stock fuel pump cannot supply adequate fuel volume to maintain fuel pressure. Therefore, the effect of this pump is to increase the volume of fuel available only

during high power levels. During normal driving conditions, fuel delivery remains the same as stock.

The applicant has submitted test results conducted at Roush Technologies Laboratory, an independent test laboratory located in Livonia, Michigan. Using the CVS-75 test procedure, the applicant conducted a baseline test on a 1992 Ford Mustang powered by a 5.0L gasoline EFI engine. The vehicle was then tested in modified configuration with each of the seven devices. The ARB's confirmatory testing consisted of one CVS-75 in unmodified (baseline) configuration, followed by one CVS-75 with each of the four devices installed, Hi-Flow Shorty Headers, Hi-Flow Throttle Body, Hi-Flow EGR Spacer and GT-40 Cylinder Head Assembly. The emissions impact of the Heavy-Duty T-5 Transmission, Intake Manifold Kit and Underdrive Pulley Kit was based on test data from independent laboratory which showed no significant increases. The test results are shown below:

CVS-75 Test Results
(Roush Technologies Laboratory)

Test Configuration	Emissions (gm/mi)			Change (gm/mi)			% Change		
	HC	CO	NOx	HC	CO	NOx	HC	CO	NOx
Baseline	0.136	0.700	0.961	-	-	-	-	-	-
HFSH	0.107	0.523	0.658	-0.029	-0.177	-0.323	-21.3	-25.8	-33.6
HFTB	0.117	0.640	0.632	-0.019	-0.060	-0.329	-14.0	-8.6	-34.2
HFES	0.083	0.660	0.762	-0.053	-0.040	-0.199	-39.0	-5.7	-20.7
IMK	0.145	0.530	0.633	+0.009	-0.170	-0.328	+ 6.6	-24.3	-34.1
GT-40 CHA	0.141	0.623	0.425	+0.005	-0.077	-0.536	+ 3.7	-11.0	-55.8
UPK	0.143	0.536	0.607	+0.007	-0.164	-0.354	+ 5.1	-23.4	-36.8
Baseline for the HDT-5T	0.171	0.574	0.614	-	-	-	-	-	-
HDT-5T	0.135	0.405	0.618	-0.036	-0.169	+0.004	-21.1	-29.4	+0.7

CVS-75 Test Results
(Air Resources Board)

Baseline	0.160	0.620	0.432	-	-	-	-	-	-
HFSH	0.129	0.518	0.502	-0.031	-0.102	+0.070	-19.4	-16.4	+16.2
HFTB	0.165	0.841	0.409	+0.005	+0.221	-0.023	+3.1	+35.6	-5.3
HFES	0.150	0.570	0.440	-0.010	-0.050	+0.008	-6.2	-8.1	+1.9
GT-40 CHA	0.212	0.830	0.420	+0.052	+0.210	-0.012	+32.5	+33.9	-2.7

Ford SVO did not test any combination of the above devices. The combined effect on emissions due to the installation of two or more of the above devices on any applicable vehicle is, therefore, not determined. The installation instructions of the devices do not recommend the alteration of vehicle manufacturer's tune-up specifications.

The California Exemption Procedures for Add-on and Modified Parts allows maximum emission increase of 0.1gm/mi or 10 percent for HC and NOx, and 1.0gm/mi or 15 percent for CO for add-on or modified part. Test results from the independent laboratory and the ARB show that all the emission increases are within the allowable limits specified in the exemption procedures.