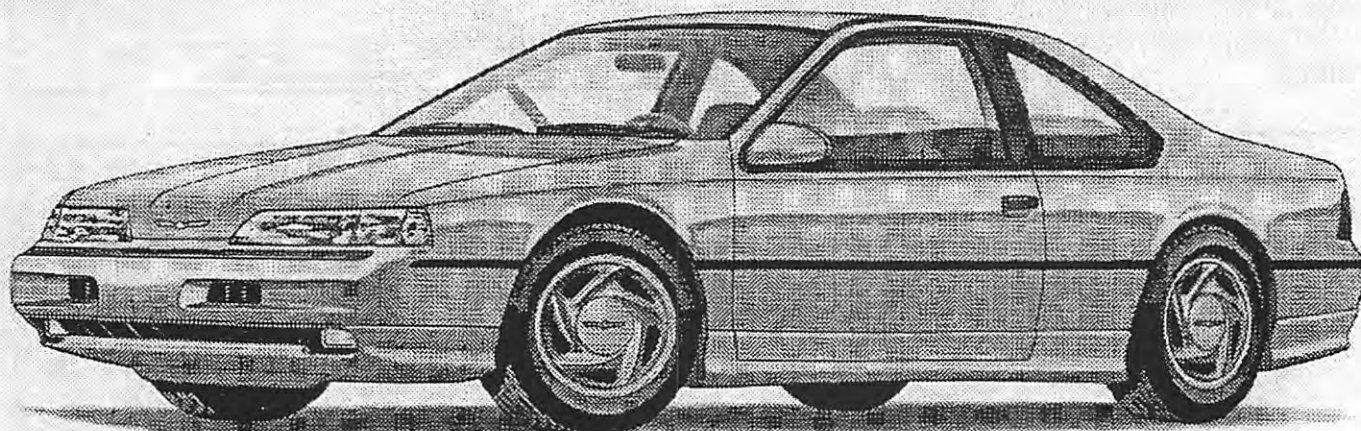


CHARGIN' THUNDER

VOLUME II

MARCH 1997

THE OFFICIAL NEWSLETTER OF THE SUPER COUPE CLUB OF AMERICA



*Dedicated to the Preservation and Performance
of the Thunderbird Super Coupe
1989 - 1995*

Bill Hull
President & Editor

*"Even a child is known by his doings,
whether his work be pure, and whether it be right."*

- Proverbs 20:11

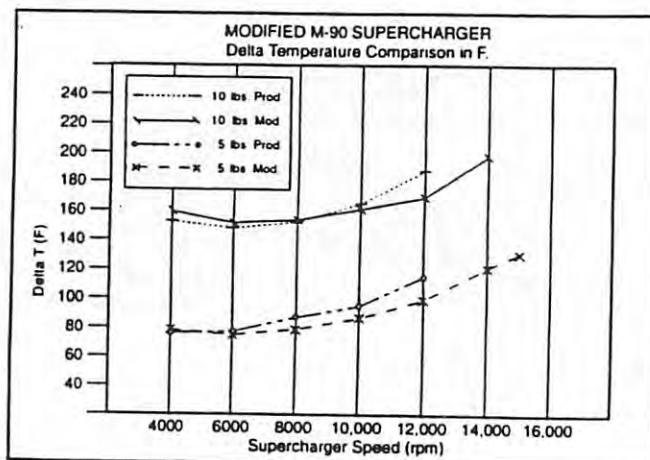
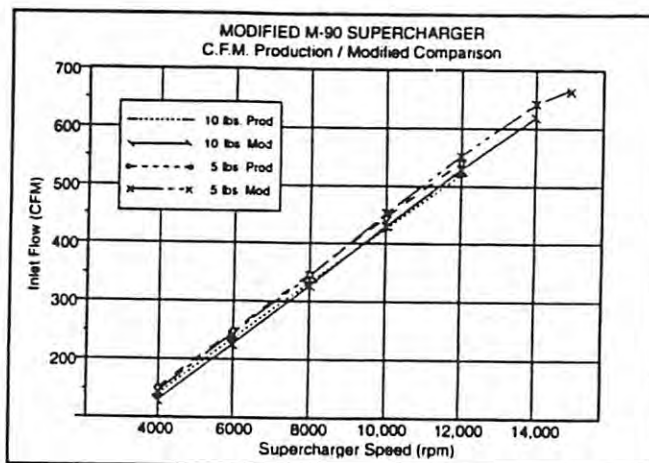
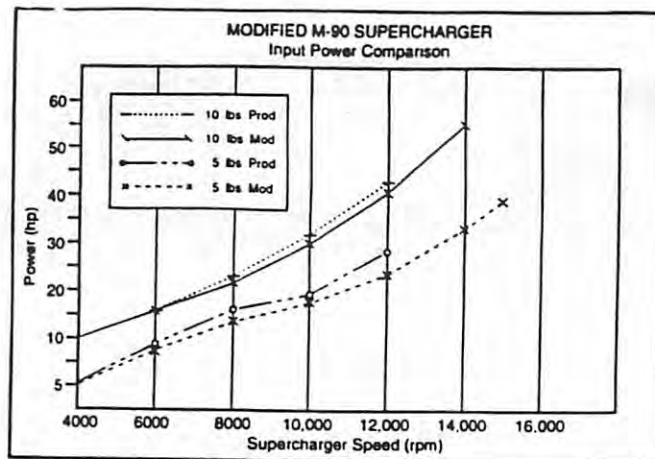
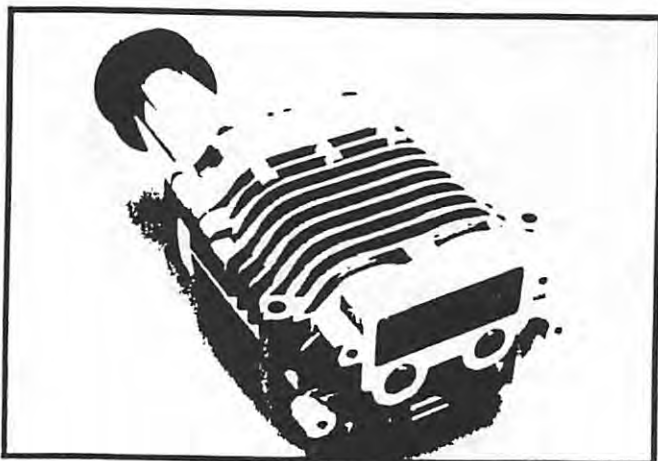
"S" MODEL SUPERCHARGERS

**FOR THE PERFORMANCE MINDED
ENTHUSIAST**

Try our high flow case with super modifications that gives better flow and higher output. For Ford product we take a '94-'95 high flow housing, massage all the flow areas of the inlet and outlet, and get more C.F.M. and blower speed than stock while the temperature and input horsepower come down. This all leads to better overall efficiency.

Ford and Mercury owners, with '89-'93 models wanting more power, may take advantage of upgrading their units by bolting on a '94-'95 high flow case and intake manifold. This gives about 18 h.p. Combine this with an "S" modification and you are looking at 25 to 30 h.p.

"S" modifications may be made to all Eaton Superchargers on the outlet side. Intake modifications are selected as to "type" on all others. Call for pricing on this super improvement.



WARRANTY

Magnuson Products warrants and will repair or replace, at our option and after inspection in our facility, any new Eaton manufactured product found defective by means of material and/or workmanship for a period of one year from invoice date. This warranty does not cover products which fail because of accident, alteration, misuse, neglect, racing, improper installation, abuse, or when used in applications for which they were not designed

or approved. Removal, installation, transportation, labor, inconvenience, damage of other components, personal damage or injury and/or any injury or liability to other persons or property are not covered under this warranty. Magnuson Products shall not be liable for any and all consequential damages occasioned by the breach of any written or implied warranty pertaining to this sale in excess of the purchase price of the product sold.

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MAGNUSON PRODUCTS (805) 642-8833
 FOR SERVICE • NEW SALES • NEW APPLICATION R & D

FROM THE BIRDS NEST.....By Bill Hull

Greetings from Super Coupe Club "Ground Zero"! The date is March 18, 1997. The time is 1:30 A.M ! - a time of day (or night) I have become quite accustomed to as of late! After approximately 140 hours behind this computer monitor over the past 3 weeks (yes, Clubbers, I am finally well on my way to becoming a true computer GEEK!), plus 30 to 40 hours reading, researching, and compiling info in preparation for this task, it appears this March 1997 issue of Chargin' Thunder is going to approach 150 pages! This is with no adds (except Magnuson Products), few pictures, smaller print than before, single spacing between paragraphs, re-typed, edited, and condensed (where possible) letters to the editor, and otherwise trying to cram as much as possible into these hallowed pages! I warned all of you back in the December issue that this newsletter was going to be a MONSTER, so put on some lounging clothes, unhook the telephone, find that quiet little nook in your castle, and get ready to (as Stan Barber puts it) become catatonic for an hour or two!

At this time, 433 people have joined the SCCoA in the past year, over 100 since the Dec 97 issue went to print! Over the past few weeks there has been a big rush of membership renewals , 324 total to be exact, so this number is our true membership total to date. Many of the 100 members who have joined since December (and who received the 4 1996 newsletters), don't realize that another \$40 is required to renew for this year, even though it is mentioned in the Dec issue, as well as in the Feb flyer that was mailed out. Anyway, as you all know by now, I am doing this full-time. Still, I can hardly keep up with all of the phone calls (30 - 40 per day), the paper work, the packing and shipping of parts, etc. My AVERAGE day begins at 4:00 A.M. - I go wide-open all day long until 10:00 or 11:00 at night - that's just an average day! I am not complaining, mind you, because it sure beats painting for a living! However, there still are just not enough hours in a day - I need a secretary, a nurse, a janitor, a shipping clerk, and a shrink, for starters. The only thing is, most people want to talk to me personally, particularly before ordering parts, so five secretaries would not help but just so much. I do have a solution to this dilemma, however. I am going to fly to Scotland, where I understand they are now cloning sheep, and I am going to have myself cloned three times. Just think, besides being able to help me carry the load, my other three "selves" will bless the world with not just one, but now, FOUR perfect, male specimens! And you all thought Daryl, and his brother Daryl, were a handful! WOW! Pity my poor wife!!

This rapid growth is, of course, very exciting and rewarding to me. I had no idea this Club would "take off" the way it has! It makes all the hard work worth while, knowing so many people are enjoying and benefiting from the information in Chargin' Thunder, as well as having fun with all of the parts which are now available (with no prolonged wait). The SCCoA's growing pains are now over, I am stocking most parts in inventory (EVEN HEADERS!), and as can be seen from this issue's parts list, new items are becoming available almost daily!

Without a doubt, the single most exciting new development in the past three months has been the association of the SCCoA with Coy Miller Race Engines. We now have a dynamite 3.8L SC engine building program underway, either on an exchange basis, a straight rebuild of members own engines, or 3.8L SC "crate motors". This was a long term dream of mine from the beginning, starting with high-performance heads, then gradually, complete engine packages being made available to SCCoA members. I have been talking to Coy over the past year - he showed a genuine interest in rebuilding 3.8L SC engines from the start. After receiving many phone calls from SC owners complaining about their problems finding a reputable engine builder in their "neck of the woods", and knowing many SC's are six, seven, even eight years old now, with way over 100,000 miles on the clock, I felt there was a genuine need for someone to become a real 3.8L SC engine Guru - well, Coy Miller is going to become this (soon to be famous) person! We already have 5 Club members who are lined up to have their engines maxed out (plus my spare engine) - billet

steel rods, forged pistons, big-valve, bench-flowed heads, balanced & blue-printed, - dyno-tested and tuned - all done the right way - the Coy Miller way!

Carlisle's All-Ford Nationals and the SCCoA's very first annual convention are less than 3 months away! Enclosed in this newsletter is a pre-registration form which must be filled out and mailed in before May 1, in order to park your SC on the show field near the SCCoA club tent. I truly expect over 100 Super Coupes to be present for this extravaganza! CAN'T WAIT!

Since December, I have become a dealer for Swain Technology, Baer Racing Brakes, Trans-go (absolutely the best shift kit on the market - bar none!), Competition Limited (high-performance lighting), Steeda, Addco, and even suprising to me, Amsoil! As big a fan as I have been of Mobil 1 products for the past 12 years, I never thought I would ever change allegiance to another brand of synthetic oil products. My UPS delivery man, after noticing the automotive products I receive on a daily basis, informed me he was an Amsoil dealer. I told him that I was "real happy for him", but I was a dyed-in-the-wool Mobil 1 user, and was not interested in changing to anything else unless I could be convinced that there was really something superior on the market. After "blowing him off" for months, I finally told him to bring some of his Amsoil products over, and we could test them, together, on my new Fallax Pin and Block machine. I had previously tested most of the other available synthetic oils and oil fortifier products on the market, and was convinced that Mobil 1 would blow his Amsoil away, just as Entech products do to all of the competition. Lo, and behold!, Amsoil products are actually better than Mobil 1. Before all of you start calling me a traitor, a gold-digger, (or whatever else comes to mind), let me remind you that I have previously stated that I am one of the worlds' most skeptical, hard-to-convince people when it comes to automotive products (or anything else, for that matter!). But I also claim to have an open mind. After a thorough battery of tests, made as scientifically as possible, including my infamous freezer/pour and gas-grill tests (see March newsletter), I believe that Amsoil is superior in every way, not to mention more widely available (thru dealers) than Mobil 1. Although Mobil 1 OIL is widely distributed, their synthetic ATF, gear oil, and grease is not so easy to obtain.

I had actually used Amsoil over 12 years ago, even signed up as a dealer (which anyone can do) before I tried Mobil 1. My reasoning for switching to Mobil 1 was that I thought such a huge company had the financial resources to develop superior products, compared to a relatively small company such as Amsoil, even though Amsoil was the first company to market a full line of API classified synthetic oil products in the WORLD, as early as 1972, 4 full years before Mobil 1! Mobil 1 oil was also a little cheaper per quart than Amsoil. Amsoil has consistently subjected their products to independent performance tests, published the results, and challenged other synthetic oil manufacturers to do the same. Few, including Mobil 1, have been brave enough to do so! As a matter of fact, because Amsoil was the first to market a full synthetic line of lubricants, their motto was "First in Synthetics". Recently, the FTC challenged Amsoil's advertising motto: the government told Amsoil they could not advertise "First in Synthetics" UNLESS they could conclusively prove they were also the "BEST" - saying it was "implied" in their advertising (according to the FTC' thinking). It is a matter of record that Amsoil was first to market a full line of API rated synthetic lubricants CHRONOLOGICALLY - 1972. So Amsoil provided the FTC with independent test data (from the American Standard of Testing Materials or ASTM) on all of their products as well as test data on all of the other synthetic oil products on the market - proving they (Amsoil) WERE the best. The FTC was convinced - but this was still not sufficient! Amsoil had to send this test data to all of the other manufacturers; the FTC gave them all 90 days to challenge their findings - guess what?? None of them did. The others already knew Amsoil was the best! Amsoil won their case with the FTC (who were on a MISSION) by default! The FTC told Amsoil because they had indeed PROVED they were the BEST, they could again advertise "First in Synthetics"!

After reading "High-Performance Automotive Fuels & Fluids", by Jeff Hartman, published by Motorbooks International, and talking to two different Amsoil technical reps for two hours on the phone, I now realize that there is a BIG difference between different brands of synthetic oil products. I really was taken to school! Some conventional mineral-based oils are actually superior to some of the off-brand synthetic products! This is the main reason - **THERE ARE CURRENTLY NO LABELING GUIDELINES (GOVERNMENT OR OTHERWISE) CONTROLLING THE CONTENT OF MOTOR OILS!!** A company can label their oil fully synthetic, when in actuality it may contain only 50% synthetic base stock, and 50% mineral base stock! A company can label their oil semi-synthetic, when in actuality it may contain as little as 5% synthetic base stock, and 95 % mineral base stock! Talk about Buyer Beware!! Even more amazing is the fact that many (even major) oil companies don't even refine or produce their own oil - they are just **MARKETING COMPANIES** - they buy their oil from large oil "bottling companies" who label it with whatever label the marketing company tells them to! They don't even know or really care what is in the oil, so long as it meets the API rating. I talked to a person who was visiting one of these "bottling companies" - he was watching yellow (I'll mention no name here) plastic oil bottles coming down an assembly line, being filled with 10-40w oil. All of a sudden, the bottles coming down the line were green, had John Deere 15-50w labels on them, and were filled with the same oil that the yellow bottles labeled 10-40w had been filled with! Talk about MAGIC!

I had wondered for years just why quarts of Mobil 1, for instance, had an asterisk beside "Fully Synthetic" or "100% Synthetic," then lower down on the label in small print beside another asterisk it states "exclusivie of carrier oil." Now I know! It is not ALL synthetic base stock! The exact percentage of "carrier (conventional) oil" is known to no one except Mobil Oil Company! I have had several racers that I know tell me "I want REAL oil, not synthetic, in my race car"! Actually, all motor oils (full synthetic, semi-synthetic, or mineral based, contain an additive package (also synthetic: i.e. man-made). In the case of "REAL" (mineral based) oils, this synthetic additive package can exceed 25% of the total formula. Due to conventional oils' inferior molecular structure and instability, large doses of anti-oxidant, anti-foam, and anti-wear agents, as well as viscosity improvers (VIs) and detergents are necessary to allow them to meet ever stringent API standards (now SJ). Amsoil's additive package is only 5% - because their base stocks are so superior! In addition, there are great differences in additive packages! Amsoil pays \$12.50 per gallon for their additive package; other major companies (like Valvoline, Pennzoil, etc) only pay \$2.25 per gallon! Quality comes at a price, as it usually does! Amsoil is so good they still advertise 25,000 miles or one full year between oil changes, requiring only an oil filter change every 6 months! They guarantee it - with free repair or replacement for any engine failure attributed to using Amsoil products! In 25 years, Amsoil is yet to buy their first engine! Mobil 1 used to advertise 25,000 miles between changes, decided the additive package required to allow this was too expensive, switched to a cheaper additive package, and quit advertising this feature (besides, they are in the gas and oil **SELLING** business - they want you to buy oil every 3 or 4 months, not once a year!).

There are great differences between oil filters, also. Fram, K&N, and Motorcraft, among others market high-performance or "racing" oil filters, which promise 10gpm flow rates and stronger cases (higher burst strength). The stronger case is a good feature, in case of oil pump bypass spring failure, greatly increased oil pressure to the filter can cause ordinary filters to burst - it has happened not only to racers, but also some local police vehicles here in Virginia. These race filters, however, are by-pass filters like all standard oil filters are, and allow higher flow rates than are needed even under race conditions, by using a weaker oil filter by-pass spring. All this means is that more oil bypasses the filter element, and then goes directly to the main oil galleys,... unfiltered! Not a good trade-off, even for a race engine, which has a greater possibility for mechanical failure than a street engine. I don't want metal particles in my oil circulating thru my engine! Amsoil oil

filters are also by-pass filters, will flow 6-7 gpm (more than enough even for full-blown race cars) and have a burst-strength of 300psi, 2 times that of conventional oil filters, and the same as the Fram HP and the Motorcraft HP!

Unlike mineral oils, which have been distilled from the stew of various hydrocarbon molecules in crude oil, and still consist of dozens of varied hydrocarbons, synthetics are "designer" oils, chemically re-assembled or synthesized from homogeneous low-weight molecules into higher weight molecules tailored to a specific lubricative purpose (refer to Mar. Chargin' Thunder - Synthetic Lubricants - Stealth Performance at a Bargain Price). Synthetic oil production typically begins by producing ethylene from crude petroleum or natural gas. Ethylene is turned into alphaolefins (low-weight synthetic hydrocarbons) that are then polymerized into polyalphaolefins (PAO's) of heavier molecular weight. Synthetic base stocks also contain esters, di-esters, and polyesters (not to be confused with your 3-piece suit), which are essentially acid/alcohol compounds fully compatible with oil additives. They must be carefully blended with polyalphaolefins, which are thermally stable over a wide range but not particularly compatible with additives. Because some of these intermediate products are more expensive to produce than others, the exact mix can affect not only the price, but also the performance of different brands of oils, which is why some brands are definitely superior to others. This performance difference cannot be judged by price alone, as some less expensive oil products (Amsoil) can actually be better than higher priced ones (different companies have differing marketing strategies).

Synthetics have none of the wax (or paraffin) of which mineral oil, for economic reasons, cannot feasibly be 100 % free. Synthetic oils' pour point is -60 degrees F or below, while mineral oils only pour to about -40 F, but they are also formulated for improved high temperature stability. With their tightly coherent molecular structure, synthetics have inherently better resistance to thermal breakdown, and require less VI-improver (perhaps none) to maintain viscosity and integrity at high temperatures, instead of degrading into vapor and sludge. Synthetics not only maintain their thickness (lubricating film) better at high temperatures, but they are also more resistant to longer term breakdown and thickening by repeated "cooking" under loads. All top grade conventional oils meet API standards with some margin, but synthetics tend not only to meet but to exceed the highest standards for passenger car motor oils. Synthetic oils' customized molecules are formulated with structures optimal for reduction of internal friction: Synthetics are actually slipperier than ordinary mineral oils. The newest synthetics have produced dramatic results in test engines, logging 200,000 miles with no significant wear! The best synthetics are so good that virtually all race engine builders (and many car manufacturers) are now using synthetics.

Back to my reasoning that a large conglomerate such as Mobil Oil Company should have greater financial resources to research, develop, and market superior products (compared to smaller companies such as Amsoil), this does not necessarily translate into a superior product. Many of these big companies spend much more on advertising than they do on R&D! Large corporations have the mega-bucks to finance mass-advertising campaigns, as well large scale race sponsorship, which can effectively sway the thinking of most, if not all consumers. A case in point - oil additives.

Oil additives have been around forever. Some years back, the heavy advertising came from STP. Andy Granatelli used to claim that STP would reduce engine wear and improve gas mileage; eventually, the FTC restricted STP from making such wild and unsubstantiated claims. The latest oil treatment fad is additives based on Teflon - Du Pont's trade name for polytetrafluorethylene, or PTFE. Typical is Slick 50, which is PTFE powder in a carrier fluid of conventional or, optionally, of synthetic oil. Slick 50 is manufactured by Petrolon, which advertises heavily and is happy to provide expensive packages of PR materials. They even sponsor individual race teams, NASCAR, NHRA, and IHRA events! Petrolon claims great increases in horsepower, reduced engine wear,

quicker starting times, reduced engine operating temperatures, smoother running, and better fuel economy.

Independent testing by various organizations, including the U.S. Department of Defense, indicate these types of claims have no credibility. What is worse, there appear to be documented cases of PTFE actually **DAMAGING** engines. In one well-known case, PTFE additive had completely covered the engine's oil filter element and blocked the oil pump sump pickup, leading to oil starvation at the engine bearings, and significant wear damage. In addition, the piston tops had a liberal coating of PTFE flakes. There is also a documented case of an aircraft suffering engine failure in the mountains over Yellowstone National Park after a PTFE additive had completely blocked the oil pump sump. Oil analysis samples from other aircraft using PTFE additives showed a 10 to 20 percent increase in iron and aluminum in the oil. The theory about these catastrophes is that extreme cold weather causes the formation of wax crystals in the oil which caused the PTFE powder to congeal and plug the sump.

Forgetting for a moment about the possibility of a PTFE disaster, PTFE additives appear to lose 75% of the PTFE into the oil filter in fifteen minutes running (amazingly, Fram, among others, is marketing oil filters already containing large amounts of PTFE, claiming their filters contain **MORE PTFE** than the leading PTFE oil additives such as Slick 50!). Although gears and engine parts which have received a special factory Teflon treatment can show reduced wear, the Teflon coating must be chemically bonded with special methods at temperatures above 800 degrees in order to adhere. "Even if it were possible to make PTFE stick to the internal parts," says one research engineer for a major oil company, "it would be readily scraped off by the constant motion of the piston rings against the cylinder wall..." What is good for frying pans is not necessarily good for automotive engines!

Du Pont quit selling Teflon powder for use as an oil additive around 1980, citing lack of ANY evidence that it was of ANY use as an oil additive. Controlled studies by BMW of the effect of PTFE-resin additives found a significant **INCREASE** in wear metal in the oil of the PTFE-treated engines, compared to a control group, and tear-down revealed **ACCELERATED WEAR** of the cylinder walls, pistons, camshafts, and lifters.

The Army agrees: "The claims made for these (PTFE) products are supported by technically unsound data. When technically competent information is available, the claims cannot be satisfactorily substantiated. Based on these findings, it does not appear that significant benefits can be derived from the use of PTFE-containing engine oils or engine oil additives..." The Army report mentions that claims for PTFE gear and grease products are also not supported by data. "Until such information is furnished," says the Army, "it is **STRONGLY** recommended that PTFE containing lubricants **NOT** be used in either the Military administrative or combat/tactical fleets."

The automotive newsletter "Nutz and Boltz" offers various tips for getting PTFE sludge **OUT** of your engine, for those unlucky enough to fall victim to this false advertising! It is a rather expensive and time-consuming process - much more easily avoided (by not using such products in the first place) than corrected **AFTER** their ill-advised use!

About one year ago Quaker State bought Petrolon. I am sure they are now sorry they did. Want to know why?? Because the Federal Trade Commission presently has Quaker State and Petrolon in federal court, challenging their outrageous claims. The FTC is forcing Petrolon to produce independent test data substantiating these claims. Unlike Amsoil, Petron can't produce this data, and they know that they can't. I'm sure we will soon see big changes in their advertising, maybe no more Slick 50 at all! What a Pity!! By the way, Entech Corp's Energy Release contains no PTFE, no zinc (or any other metals), no moly, no powdered anything. I don't know exactly what it consists of, but it is like nothing else I have ever tried!

How good is high-quality synthetic ATF? I have learned that BMW has produced a new high-performance automatic transmission (a 5-speed, I believe) factory filled with synthetic ATF, and **FACTORY SEALED** - no dip-stick, no drain plug, with a 100,000 mile warranty!

As previously mentioned, I have become a dealer for Swain Technology. Their only business is high performance coatings for aero-space, industrial, as well as automotive applications. I first became very interested in internal/external engine coatings three years ago; sent for and received information from 5 different companies who specialize in these processes, and after much reading and research, decided Swain Technology was the best choice for me - they have been doing it longer and better than anyone else in the field. See inclosed information on coatings.

I have also become a dealer for Baer Racing brakes. They have the most comprehensive brake packages for most American and foreign cars, with fully five different performance levels for 89-97 T-birds alone, either cross-drilled or non-cross-drilled! Brakes on late model T-Birds, even SCs' with 4-wheel discs, are a definite weakness, especially for any type of competition. I want to run several Car Guys Inc. events this year, if I have time - what a blast it must be to drive one's own SC on a real race course! What is Car Guys Inc., you ask? See enclosed flyer in this newsletter. At least two SCCoA members have run Car Guys events, Rich Thomson, tel: 703-802-4681, and Steve McCollom, tel: 703-204-3429. If any of you are interested, give them a call - they'll be more than glad to tell you about their experiences with Car Guys. There are other high-performance driving schools in other areas of the country, which allow you to drive your own car. Lets turn these 'Birds loose all over this great country of ours and give these fine automobiles the recognition they deserve!

New products - unfortunately, the ultimate two-into-one-into-two mandrel bent exhaust system for late model T-Birds that Charles Warner was going to have produced is not going to be available. Charles tried to get it done for the Club, invested \$1000 of his own money up front for R&D (even though he already had a prototype system for them to follow). He also had to order a minimum of 5 sets at a time to get any kind of a price. Not only did no one in the SCCoA show much interest, the company who was going to make this system never really got going - the whole deal fell thru resulting in Charles losing his \$1000 up-front money. Fortunately, an almost identical 2-into-1-into-2 mostly mandrel-bent exhaust system will be available thru your national SCCoA warehouse in both 2 1/4 - 3 - 2 1/4, or 2 1/2 - 3 1/2 - 2 1/2, hopefully by the time you all receive this newsletter. See enclosed exhaust capacity chart from Dynamax (Flowmaster & Hot Rod magazine figures are the same).

I presently have three, brand-new-in-the-box Griffin all-aluminum, race-quality radiators in stock. They are a full one inch thicker front to back than stock, but are a direct bolt in for Super Coupes, including the bracket for the intercooler inlet bellows. I also have in stock (20) Robert Shaw high performance thermostats, in both 180 and 192 degree - see enclosed flyer on Robert Shaw (I have used them for years, and found them to be superior to any others I have tried). Another very critical piece is the pressure-release radiator caps, also 20 in stock.

The Super Coupe has limited cooling capacity to begin with. When pumping them up to over 300 HP levels, engine cooling becomes even more critical. Remember, the greater the quantity of air/fuel an engine takes in, the greater the VE; heat energy and cylinder pressures increase, (resulting in more power), and head coolant temperatures also go up. The SC is famous for building up steam pockets around the water jackets in the heads, causing localized hot spots. It is easy for large quantities of air to become trapped in the SC cooling system after replacing or changing coolant. This can easily cause over-heating problems. Ford included a spout coming off the thermostat housing, with a removable cap. Ford recommends taking this cap off before draining your cooling system, then replacing it after re-filling your system with new coolant. This method does not cure the problem of trapped air, however. I know! Five years ago, in the dead of summer, my SC over-heated in traffic one day. I had just changed the coolant, and had not "burped" the

system, not realizing I needed to. Well, after discovering the problem was trapped air (a bunch!), I purchased a pressure-release radiator cap. Now I can "burp" my "baby" any time I fool around with the cooling system. A "killer" part for sure, and cheap insurance for only \$9.95, plus shipping.

On this same subject, I have found a great product, identical to Red Line WaterWetter. It is called Cool Tec 2, is manufactured by the PenRay Corp., and is available for much less than the "name brand". They also manufacture a great cooling system cleaner called Cool Prep, priced less than competitive brands. I have two cases of both products in stock for those of you who cannot locate them at your local parts store

Red Line's WaterWetter is designed to improve metal wetting along with corrosion protection as an additive to plain water (distilled, preferably) or glycol coolants. Corrosion protection is especially critical for high-performance engines, which often include aluminum heads and/or blocks. Aluminum has a very high corrosion potential which is only abated by the fact that aluminum can form a protective film of oxidation, which prevents further corrosion. Poor aluminum corrosion protection allows dissolution of aluminum heat rejection surfaces, according to Red Line, weakening cooling system walls, water pump casings, and head gasket mating surfaces. The products of corrosion typically form deposits on lower temperature surfaces like radiator fins and core walls, decreasing effective flow area. The deposits also have poor heat transfer capabilities, which dramatically reduce the efficiency of the cooling system.

Plain water has twice the heat transfer capability of a 50 % water- glycol mixture, and most street vehicles have sufficient cooling capacity using such a solution. Products like WaterWetter in racing vehicles may allow a smaller radiator, with lower drag, or give a greater safety margin in cars like the SC whose cooling system capacity is marginal at best, particularly when on steroids, or during the summer months in hot climates. These products reduce head temperatures, even compared to water alone, by doubling the wetting ability of water by breaking down surface tension. By improving coolant efficiency, head temperatures are reduced, reducing the possibility of DETONATION (critical in SCs') and allowing more spark advance (before the knock sensor kicks in) for increased torque. Inlet system temperatures can also be reduced in some engines, for reduced detonation and improved volumetric efficiency. In addition to surface-tension reducers, water wetters also contain additives to inhibit rust, corrosion, and metal electrolysis, to clean and lubricate water pump seals, prevent foaming, reduce cavitation corrosion, and water scaling.

By reducing the surface tension of water, a product like WaterWetter or Cool Tec 2, allows water vapor to release more easily from metal surfaces. This can be important, since under heavy loading conditions much of the combustion heat in a cylinder head (especially aluminum) is transferred into the cooling system causing boiling at localized hot spots, even though most of the coolant may be below the boiling point (because it is controlled by the thermostat).

While on this subject, one more product needs to be discussed - the new generation antifreeze/coolants. General Motors has begun using, exclusively now, on all of their new cars and trucks a product called Dex-Cool. Havaline and Prestone, among others, market a similiar product. They advertise these new-generation coolants to have an extended life-span (5 years or 100,000 miles between changes), unsurpassed freeze-up and boil-over protection, extended rust and corrosion protection, compatability with older-style coolants, and silicate and phosphate free formulas. Phosphates are supposedly harmful to the environment, while silicates (sand and glass are silicates) are responsible for much of the scaly build-up on cooling system surfaces, including radiator fins, and water jacket surfaces in the block and heads. Silicates can also have a scouring action (like sand paper) causing increased wear throughout the cooling system. Prestone's product is called "Extended Life" antifreeze/coolant, not to be confused with their "Low-Tox" product (it contains propylene, instead of ethylene, glycol, is not sweet tasting, and therefore safer around pets and children). I have been using this new Prestone product (Extended Life) since it was introduced,

am satisfied it is superior to earlier type coolants, and highly recommend it you Club members - Hey! if you can't trust Prestone, WHO CAN YOU TRUST??! Ex-Chief Engineer Jamie Turvey??! RIGHT!!

Concluding my little discussion on cooling system improvements (don't forget summer is just around the corner) let me just say this. As marginal as the SC's cooling system is from the factory - don't forget the radiator on the SC is only 2/3 width because of the intercooler inlet - I can practically guarantee if one were to maximize his system, as I have done - that is, using the high-capacity Griffin radiator, Robert Shaw thermostat, the pressure-release radiator cap, Cool Tec 2 water wetter (after a thorough cleaning with Cool Prep, or similar product), a 20-80 solution of Prestone "Extended Life" coolant/distilled water (summer only), a temperature-controlled adjustable thermostat for the factory fan (available from Perma-Cool - I can get them), and lastly, a rigid front air dam (in place of the flimsy factory piece) which forces a greater quantity of air up to the radiator (and intercooler inlet) from beneath the car, cooling system problems will become a thing of the past, even with the 400 HP Torque Monsters which will soon be leaving the engine shop of Coy Miller..

Other new products which I am presently stocking are the Air-Lift Air Bags (not to be confused with your mother-in-law - the OLD HOT-AIR BAG!), a cheap \$40 solution to 5-speed wheel-hop problems, two types of HD U-joints, Haynes Shop Manuals for 89-96 T-Birds, (including SCs), Fel Pro upper and lower engine gasket sets, complete engine gasket sets, or just late-model head gaskets alone.

Also, 21T and 23T speedo gears, Steeda or Addco 1 1/8" rear sway-bars (Kenny Brown and some of you Club members have used these bars and swear by them), and Competition Limited high-performance head light assemblies with blue ionized halogen bulbs (similar to the new Mark VIII) for increased visibility at night under all weather conditions. Bill Schlabach turned me on to this company's light packages at our Columbus meet last September. Call Bill if you want to know more tel: 313-981-1495

The SC adapter air-outlets are all now priced at \$395 - no core. BUT, are they ever beautiful now! - as well as a very effective power adder. They are now all being produced in the "Stealth" version, the weld bead is being CNC-machined off, PLUS, in addition to the super porting and polishing job being done to the inside of the enlarged throat, the outside of the throat, where the extra metal is welded on, is now being polished smooth, so there are no visible external modifications, except for the neat SCCoA letters which I am now having the machine shop CNC onto the side of the base. DY-NO-MITE!! I STILL GOT IT!! (as J.J. used to say!)

I am also stocking Performance Friction high performance brake pads (front only, all years), high-performance, cadmium plated, cross-drilled rotors (factory replacement, front and rear), Dynamax Super Turbo and Ultra Flo (stainless-steel, straight-thru design) mufflers, and just about everything that is in great demand by you SCCoA members. Don't forget, I am also a Ford Motorsport SVO dealer for your other Ford high-performance vehicles, including trucks. We have at least three SCCoA members who are lucky enough to own both a Super Coupe AND a Lightning pick-up!! Some guys have ALL THE LUCK!!

Among the many letters I have received and included in this March issue of Chargin' Thunder, (45 pages of "Bird's of a Feather", alone!) two in particular really stand out. Clifford Jolley, Jr., a Ford Motor Company Dynamometer Engineer, had his own STOCK 94 5-speed tested on a chassis dyno. Check out his letter and accompanying dyno chart! Just as interesting, and even more astounding is the 3 page dyno sheet sent to me from Bobby Caldwell, member #363. Bobby recently purchased a True-Dual exhaust system, a modified SC adapter top, a 190lph fuel pump, and an intercooler fan, (which his engine man, Roger Vinci, of Vinci's High Performance Speed Shop in Orlando Fla. installed to run all the time, with the engine on). After baselining Bobby's 93 AOD SC, Roger got 231 ft-lbs of rear wheel torque, and only 156.9 rear wheel HP. After cleaning

the entire fuel system using his Motorvac Carbon Cleaning System (cleans all the fuel lines, from the tank-back-to-the-tank, including the fuel rails, fuel regulator, injectors, intake manifold, intake valves, and combustion chambers), and changing the worn out spark plugs, Roger picked up 9 additional rear wheel horsepower! After installing the True Duals, modified SC top, and the intercooler fan, Roger again dyno'ed the 3.8L SC. He picked up an additional 47 rear wheel HP and an additional 59 ft-lbs of torque! Roger was astounded! Factoring in 25% drive-line losses for the AOD, Roger ended up with corrected flywheel figures of 251.25 HP at 4500 rpm and 356.25 lb-ft of torque at 3200 rpm. Both of these dyno-tests were done in 2nd gear. Out of curiosity, Roger decided to do an additional dyno pull in 3rd gear, knowing from his past experience with blown engines that usually, these engines will make considerably more power in high gear, when the blower is under full load (no gear-multiplication factor). In 3rd gear, Bobby's SC really put out! 313.6 ft-lb of torque & 217.6 hp, both at the rear-wheels. Again, factoring in 25% drive-train losses for the AOD, Roger got corrected flywheel torque of 392 ft-lb, and 272 hp, an additional 35.75 lb-ft of torque & an additional 20.75 hp over the already impressive 2nd gear run! Total improvement on Bobby's 92 SC - 103.75 ft-lb of torque & 76 hp over his baseline 2nd gear run!! I have always felt my SC made much more power in 3rd gear - this dyno test confirms it! With my 4:10's, 1st & 2nd are gear assisted big time! In 3rd gear, the gage pegs a rock-solid 14lbs of boost, and it's "Katy bar the door"! Yippee!! Again, Bobby Caldwell's 92 SC is basically stock with the old-style blower (with 10% OD pulley - all tests), with only a K&N, True Duals, a modified SC top, and an I/C fan added.! You 94-95 SC owners can expect 20 more hp because of the more efficient 2nd generation Eaton supercharger. Of course, S-modifications will add another 10-12 hp on top of that! Already impressed with these results, Roger tried to talk Bobby into buying the headers & matching 2 1/2" down-tubes - Bobby wanted to but could not afford them at this time. They are next on his list, however: as he realizes, as effective as the true-Duals are they are limited by how little the factory cast-iron manifolds flow. The factory manifolds also limit how effective the modified SC adapter top can be. Again, a free-flowing exhaust is THE KEY on the SC.

These parts really do work! These dyno tests also show the effectiveness of keeping the injectors and over-all fuel system clean, and keeping up with normal maintenance items like spark plugs. Roger told me that when he took Bobby's SC out for an "after" test drive, it was so much more fun to drive, he just HAD to take it out for a second test drive! Of course, we SCCoA members already know "once you drive of of these BADD BIRDS, you are hooked!"

Now for all of you after-market computer-chip lovers out there - you all don't have to raise your hand - you know who you are - I have some real BADD NEWS. Roger Vinci is a 55 year old automotive engine specialist, who has spent his entire adult life perfecting his engineering and mechanical skills on many different engine systems, including Dodge Vipers and Dodge V-10 trucks, Chevrolets (his specialty), Buick GN's, and even many different foreign makes including Porsche, BMW, Nissan Turbo's etc. He uses a lap-top computer to tie into the stock factory computer processor with his Dynojet model 248E single-drum roller, inertia-type chassis dyno (same as NASCAR shops use). He told me he can usually fine tune many engine systems on the dyno by modifying the spark advance and fuel delivery tables in the factory ROM's, freeing up a few more horsepower, while the cars are actually running on the chassis dyno. He charges \$295 for this service, so neither he nor his customers approach this procedure lightly. Anyway, on Bobby Caldwell's '93 AOD SC, whenever he tried to dial in ANY additional spark advance - ANY!! - he got noticeable detonation, and the power on the dyno sheet went down IMMEDIATELY!! ANY SPEED, ANY LOAD (especially heavy load), he got detonation on 93 octane pump gas whenever he tried to dial in more spark advance! IN ADDITION, Roger told me the SC had a fat stock fuel delivery curve, and when he dialed in a richer fuel delivery curve, POWER WENT DOWN IMMEDIATELY! ALL SPEEDS, ALL ENGINE LOADS, EVEN WIDE OPEN THROTTLE UNDER FULL BOOST!

POP QUIZ TIME! ...What are the two main things that after-market computer-chip module manufacturers CLAIM their products are capable of doing????.....SPEAK UP CLASS.....I CAN'T HEAR YOU!!!.....That's much better.....That's right class - they advertise 1. "INCREASED SPARK ADVANCE" and 2. "ENRICHED FUEL DELIVERY". And, of course, for your \$200 -300 hard earned bucks, they promise you BEAUCOUP HP AND TORQUE INCREASES!!

Roger Vinci understands all engine systems, including, and especially, turbo and supercharged applications like the SC 3.8L. Roger personally told me on the phone, that the 3.8L SC engine control system, as designed by Ford Motor Company, was very sophisticated, all-encompassing, comprehensive, and more-than-adequate for any driving conditions, high-performance or otherwise, and could not tolerate ANY MORE SPARK ADVANCE, OR ANY MORE FUEL ENRICHMENT, - TO DO SO WOULD ONLY HURT PERFORMANCE AND COULD SEVERELY DAMAGE THE ENGINE! He flat stated that the T-Bird 3.8L SC DID NOT NEED AN AFTER-MARKET COMPUTER-CHIP! I REST MY CASE!!

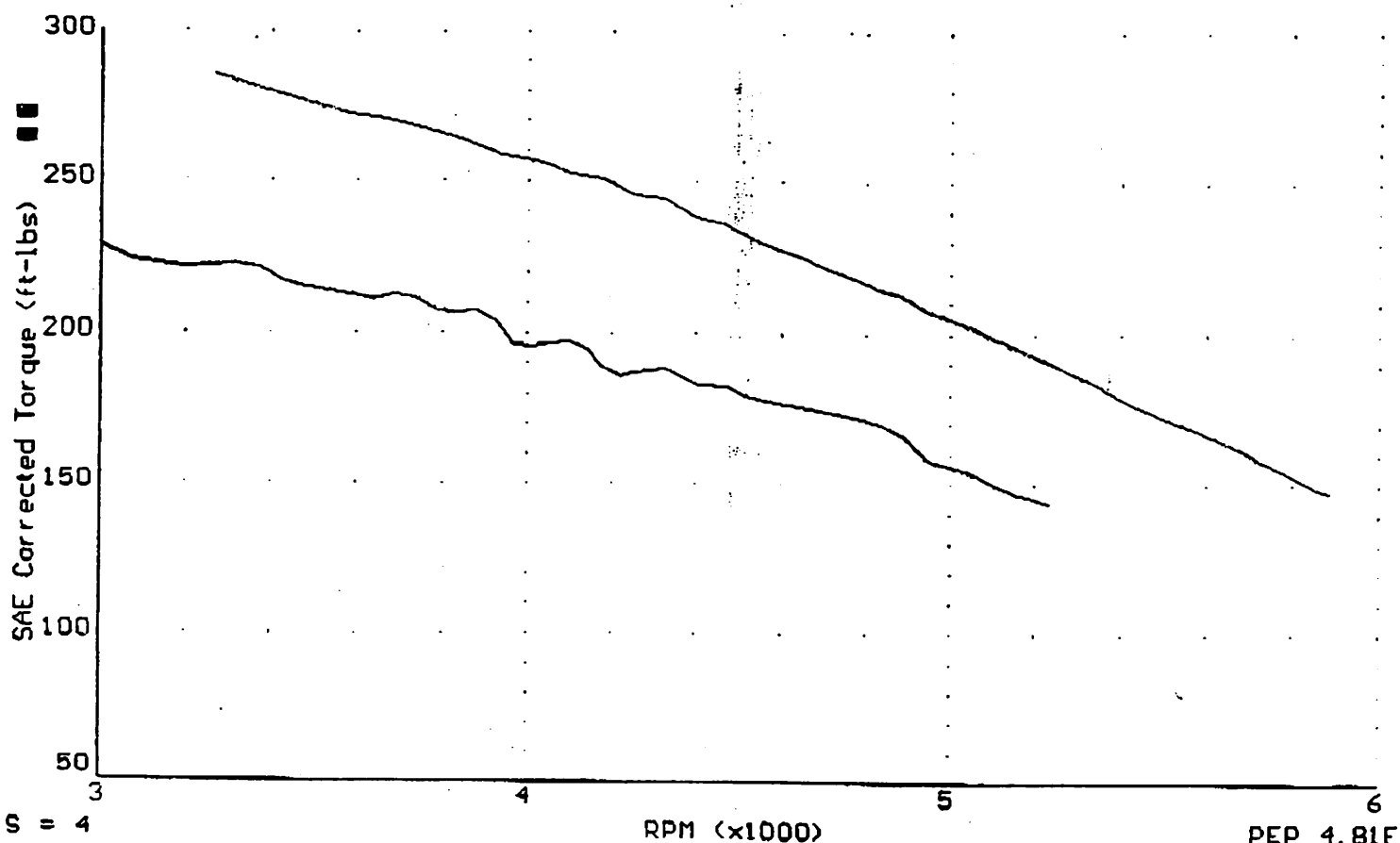
Roger Vinci's phone number, in case you die-hard chip fans don't believe me is: 407-292-4500. By the way, some of Roger's results on the SC will become part of an article on SC's in Super Ford magazine in the near future

Before I take this "book" to the printers, I want to apologize to all of you who have not received your parts this week. In order to finish this project (remember, I claim to be neither a writer, an editor, or a journalist- HECK! I barely made "D's" in both high school and college English!), I essentially have been in seclusion for the past 3 days - haven't even taken time to shave or shower! No wonder it's FUNKY in here! Every time I do one of these newsletters, I blow a few more precious brain cells, surely I don't have many left! I am a week behind shipping out parts, two weeks behind answering my E-mail, and my own SC has been up on ramps for 8 weeks. I literally have not had a spare two hours to get my own "baby" back on the street in two months. The battery has been dead for I don't know how long, etc... Talk about DEDICATION! Well, this opening salvo is long enough

Your humble and dedicated editor, CYBERMAN!

E-Mail address....SCCoA@Juno.com FAX # 804-974-9965 SCCoA Web Page coming soon!

SUCOUPE.002 - BOBBY'S 93 AUTO SUPER COUPE BASELINE R0
SUCOUPE.009 - BOBBY'S 93 AUTO SUPER COUPE MAXED OUT R0



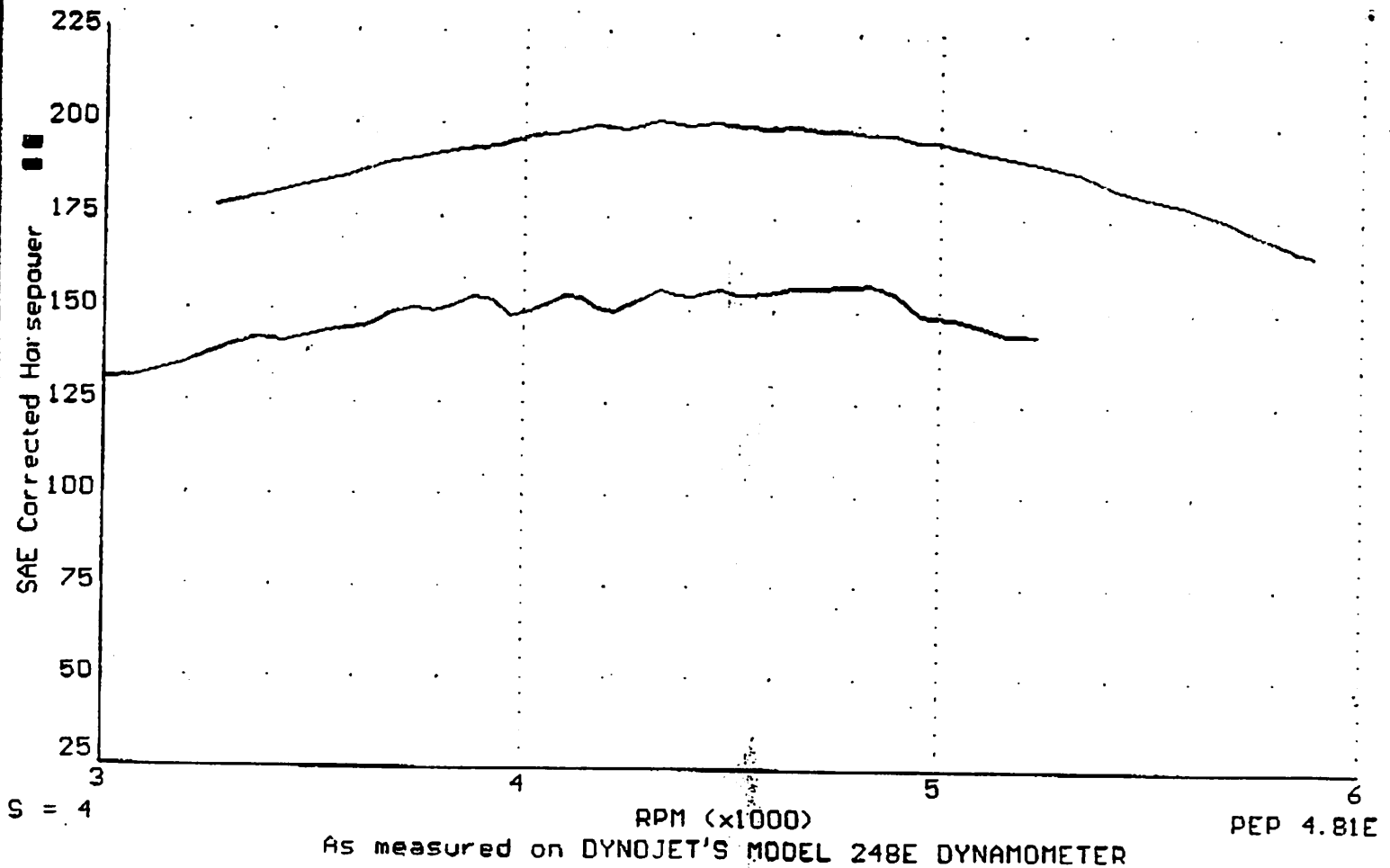
SUCOUPE.002 74.8 °F 30.12-0.52 in.Hg. 96 ft. CF=0.98 RPM/MPH=68
Max TORQUE = 231.0
2ND GEAR ROLL ON, RH 68.7%
BASELINE

SUCOUPE.009 83.4 °F 29.86-0.46 in.Hg. 96 ft. CF=1.00 RPM/MPH=78
Max TORQUE = 285.5
2ND GEAR ROLL ON, RH 48.2%
INSTALL POWERSTAT; TRUE DUAL EXHAUST; SC ADAPTER TOP; SPARK PLUGS AND
WIRES; INSTALL INTERCOOLER FAN; MOTORVAC CARBON CLEAN SYSTEM; AND
CALIBRATE FUEL AND TIMING MAPS. INSTALL ZOOM 3.73 GAER SET.
COMPLETE DYNAMIC TUNAL COORDINATION

PRECISION DYNO/TUNING by ROGER VINCI HI-PERFORMANCE

BOBBY CALDWELL'S '93 SC "WORKING WITH SUPER COUPE CLUB AND ROGER VINCI" (3/10/97)

SC171337 1.50PM FROM MARK MICHAELS INT 487 629 0910
SLCOUPE.002 - BOBBY'S '93 AUTO SUPER COUPE BASELINE# RD
SUCOUPE.009 - BOBBY'S '93 AUTO SUPER COUPE MAXED OUT RD



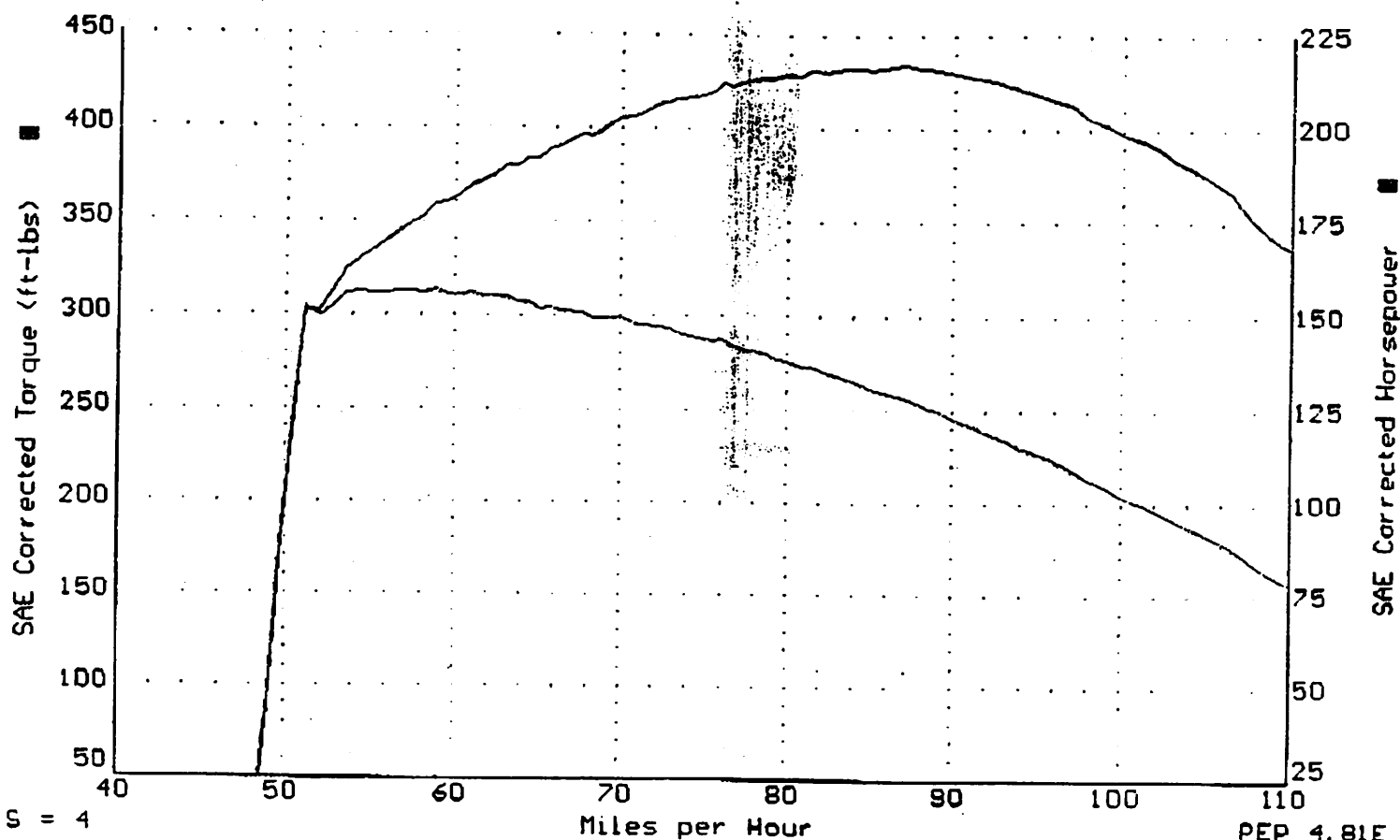
SUCOUPE.002 74.8 °F 30.12-0.52 in.Hg. 96 ft. CF=0.98 RPM/MPH=68
Max POWER = 156.9
2ND GEAR ROLL ON, RH 68.7%
BASELINE

SUCOUPE.009 83.4 °F 29.86-0.46 in.Hg. 96 ft. CF=1.00 RPM/MPH=78
Max POWER = 201.1
2ND GEAR ROLL ON, RH 48.7%
INSTALL POWERSTAT; TRUE DUAL EXHAUST; SC ADAPTER TOP; SPARK PLUGS AND
WIRES; INSTALL INTERCOOLER FAN; MOTORVAC CARBON CLEAN SYSTEM; AND
CALIBRATE FUEL AND TIMING MAPS. INSTALL ZOOM 3.73 GAER SET.
COMPLETE DYNAMIC TUNAL COORDINATION

PRECISION DYNO/TUNING by ROGER VINCI HI-PERFORMANCE

BOBBY CALDWELL'S '93 SC "WORKING WITH SUPER COUPE CLUB AND ROGER VINCI" (3/10/97)

SUCOUPE.012 - BOBBY'S 93 AUTO SUPER COUPE THIRDOGEAR RO



As measured on DYNOJET'S MODEL 248E DYNAMOMETER

SUCOUPE.012 87.4 °F 29.71-0.44 in.Hg. 96 ft. CF=1.01
 Max TORQUE = 313.6 Max POWER = 217.6
 3RD GEAR ROLL ON, RH 38.2% 107464T0111468T0105462

TRYING NEG GRAPH

PRECISION DYNO/TUNING by ROGER VINCI HI-PERFORMANCE

BOBBY CALDWELL'S '93 SC "WORKING WITH SUPER COUPE CLUB AND ROGER VINCI" (3/10/97)

HOW ENGINES MAKE POWER - The Relationship between

Compression Ratio, Cylinder Pressure, Air/Fuel Ratio, Spark Timing, Temperature, Octane Requirements, and the effect of Boost (as applied to the 3.8L SC engine control system)

Judging from the many phone calls and letters I receive every day from Super Coupe owners I feel there is an urgent need to discuss some basic engine theory, and then to apply this information specifically to the 3.8L engine system. Much of this following information has already been discussed in previous issues of "Chargin' Thunder" but I will try to consolidate and further elaborate on these subjects, as there is obviously much false information floating around, which has lead to some confusion and mis-understanding about what makes the Super Coupe "tick". Before I get "wound -up" I want to stress, as I have mentioned in previous newsletters, I DON'T consider myself an expert on ANYTHING. I have, however, accumulated a certain amount of knowledge over the past 35 years by constantly reading and collecting hundreds of "hot rod" books and magazines. I have also tested and confirmed (at least to myself) that the following information holds true - there is really no "mystery" or "black magic" involved - ALL ENGINE FUNCTIONS ARE CONTROLLED BY BASIC LAWS OF PHYSICS. Much of the following is gleaned from my extensive library of magazines and books, and I will attempt to combine all of this into an easily read and understood article which I hope will benefit you Club members. I am assuming all who read this already understand the basic functioning principles of the "Otto" four-cycle engine. If not, I strongly suggest you stop by your local library or book store and pick up a book on basic engine theory.

Engines don't make horsepower - they convert fuel into torque. $HP = RPM \times TORQUE$ divided by 5252. In simple terms, the internal combustion engine is a mechanical device for converting heat energy into mechanical energy. The heat energy is derived from the burning of air and vaporized fuel that have been mixed in certain well-defined proportions. Generally, the greater the quantity of this mixture the engine can be made to burn in a given time, the more power it will develop. The more efficiently it turns this heat energy into mechanical energy, the more powerful and economical it will be.

Although this view of engine operation is indeed simplistic, it is applied to a device which functionally is anything but simple. An engine can best be viewed as a large collection of small components, each of which must functionally complement all of the others, in order for the whole to do what is required of it in the best possible manner. This functional harmony sounds disarmingly simple to achieve but, in actual practice, building a "totally efficient" (power+economy+reliability) engine is a very demanding task.

If we are seeking high performance with a reasonable degree of economy, two factors must always be considered. First, it is necessary to build a mechanically efficient engine that will operate as effectively as possible in the most appropriate rpm range for the specific application. Second, it is desirable to draw in the very minimum amount of fuel necessary to answer the demand placed on the engine at any specific time. It is currently understood that a great many of the alterations formerly accepted as strictly performance modifications also help fuel economy.

Now that the SCCoA is offering a complete engine re-building service, I want to briefly discuss a very misunderstood term. "Blueprinting" is without question the most used-and most abused-term in engine building. In a very strict sense, every engine is blueprinted. By that we simply mean that before an automaker introduces a new powerplant, the design engineers must first transfer their ideas into elaborate drawings that will guide the pattern makers and tooling specialists. But not every component that falls off the end of the assembly line meets the engineers exact specifications. There are tolerance differences which can "stack up", resulting in the final parts to be far out of spec. The most basic form of blueprinting, then, is simply making sure that all of the tolerances fall within factory specifications. At this level, there is no attempt to "optimize" clearances between

components - the performance of the engine is simply a matter of luck - the result of the random selection of the parts from a bin. This explains why two seemingly identical automobiles can vary greatly in their performance. In the eyes of most knowledgeable enthusiasts, blueprinting an engine means not only CHECKING clearances and tolerances, but CORRECTING them as well. The cardinal rule of engine blueprinting is really simple: NEVER ASSUME ANYTHING!

Most knowledgeable engine builders don't look at a six or eight cylinder engine as ONLY this. They consider them to be an assembly or combination of six or eight INDIVIDUAL cylinders, all of which need to be standardized to the same identical dimensions and tolerances. Only by doing this can each individual cylinder produce the same output as all the others in the combination. Then, and only then, will the engine be a truly "balanced" assembly.

COMPRESSION RATIO - The thermal efficiency - and, therefore the efficiency with which fuel is harnessed to do usable work- is directly linked to the compression ratio. The higher the compression ratio, the less fuel the engine will use to produce the same horsepower. The typical 18:1 to 22:1 ratios used in diesel engines partially explain why they operate so efficiently. There's no doubt that high compression ratios build horsepower. However, increasing compression ratio does not ALWAYS result in more horsepower. If STATIC or MECHANICAL (determined by mathematical calculation from a fixed volume) compression is already near the detonation limit for the fuel being used, further increases in the static compression may hurt engine output and/or reliability. If we make modifications to improve airflow into and out of an engine system, we can improve the volumetric efficiency (VE) of an engine. As the VE of the engine increases, the DYNAMIC compression also increases, since the cylinder is being "packed" with more fuel/air mixture. In racing engines, and especially in supercharged applications, like the SC, dynamic (or effective) compression can greatly exceed static or mechanical compression ratios. As a rule of thumb, for every 3.5psi increase in boost, there is a corresponding increase in dynamic compression of one full point!

Increasing compression ratio usually increases horsepower, but it can have an even greater improvement on fuel economy. This is because the dynamic compression ratio at part throttle is substantially lower than the static compression. Increasing the static compression will add efficiency where it is needed most, at part throttle, where most street engines live 90% of the time. On the 3.8L Super Coupe engine system, static compression (8.2-8.5:1) is a compromise between good part-throttle performance and economy on the one hand, and the avoidance of detonation (with available street gasolines) when under full boost conditions, on the other.

IGNITION TIMING-CYLINDER PRESSURE- and-DETONATION- Normal combustion in a spark ignition engine occurs after the spark plug ignites the compressed air-fuel mixture, starting a flame front which spreads out in a wave from the plug in all directions. It takes time for the flame to spread in the combustion chamber, depending on the air-fuel ratio, density, compression ratio, turbulence among the charge gases, and combustion chamber/piston design (among other things). The slower the flame speed, the greater the chance of abnormal combustion. High-compression engines make more power because they are more efficient at getting energy from the air-fuel charge mixture. Normally, combustion chamber pressure rise is 3.5 to 4 times the initial compression pressure. The difference in pressure gain in an 8.5:1 compression engine versus a 10:1 compression engine can easily be 50 percent. Cylinder pressures are highest at wide open throttle, lowest at idle and light cruise when intake manifold vacuum is very high and engine VE very low. Combustion proceeds faster under higher compression.

Turbulence is carefully designed into combustion chambers. Some swirl will produce greater flame speed and more efficient combustion, and even help resist knock by spreading the flame front more quickly. Too much swirl will produce undesirable disturbance of the quench layer around the combustion chamber and increase heat loss into the cylinder walls.

When an engine knocks or detonates, combustion begins normally with the flame front burning smoothly through the air-fuel mixture, but as pressure and temperatures rise as combustion proceeds, at a certain point the remaining "end" gases explode violently all at once, rather than burning evenly. The resulting high-pressure shock waves in the combustion chamber can accelerate wear or even cause catastrophic failure.

Pre-ignition is another form of abnormal combustion in which the air-fuel mixture is ignited by something other than the spark plug, such as glowing combustion chamber deposits, sharp edges or burrs on the head or block, or an over-heated spark plug electrode. Pre-ignition causes ignition timing to be advanced by some in-exact amount, so the upward movement of the piston on the compression stroke is opposed by the too-early high combustion pressures, resulting in power loss and severe heating (or even melting) of the piston crown.

A FUEL'S OCTANE RATING represents its burn rate or its ability to resist DETONATION. Apparently identical vehicles coming off the same assembly line can have octane requirements that vary by as much as ten octane numbers. Factors influencing an engine's octane requirements are effective compression ratio, atmospheric pressure, absolute humidity, air temperature, air-fuel ratio, variations in mixture distribution among the engine's cylinders, oil characteristics, spark timing, timing variations between individual cylinders, intake manifold temperature, coolant temperature, coolant characteristics, and combustion chamber hot spots.

The single most important engine characteristic demanding specific fuel characteristics is compression ratio. High compression ratios squash the inlet air/fuel mixture into a more compact, dense mass, resulting in a faster burn rate, more heating (yet less heat loss into the combustion chamber surfaces), and consequent higher cylinder pressure. Superchargers, as in the 3.8L SC, produce effective compression ratios far above the nominal compression ratio by pumping additional mixture into the cylinder under pressure. The result is a more dense charge that burns faster and produces more pressure against the piston and an increased tendency to knock or detonate.

AIR-FUEL RATIO has a major impact on engine octane requirement. The chemically ideal, or stoichiometric, air-gasoline mixture, at which all air and fuel are consumed in combustion, occurs with about 14.6 parts air and 1 part fuel, by weight. At high loading and wide-open throttle, richer mixtures give better power by making sure that all air molecules in the combustion chamber have fuel available to burn. At WOT, where the objective is maximum power, all four-cycle gasoline engines require mixtures that fall between lean and rich best torque, in the 11.5-13.3 range. Since this best torque mixture spread narrows at higher speeds, a good goal for naturally aspirated engines is 12-12.5 to 1, and even richer if excess fuel is being used for cooling in a supercharged engine, as in the 3.8L SC.

A major advantage of computer-controlled engines is that variations in speed, load, and other parameters translate into spark advance and fuel-air ratio values that can be completely independent of those values under other operating conditions (and can be changed very quickly, if necessary), something that is impossible with older mechanical control systems. Contrary to popular belief, because of the precision engine monitoring and instantaneous reaction time of today's computer-controlled engines, optimal spark & fuel delivery figures are dialed in at the factory, with actually less "safety margin" than with early carbureted/distributor ignition systems. Today's cars, I believe, come from the factory designed to SAFELY "run on the ragged edge" (without after market chips). Multi-port injection-as distinct from throttle body injection-has the further advantage of eliminating the problems of inconsistent distribution and wet mixture in the intake manifold that are associated with TBI and carbureted systems. This results in improved cold running, improved throttle response under all conditions, and improved fuel economy without drivability problems.

SPARK ADVANCE, which is optimally timed to achieve best torque by producing peak cylinder pressure at about 15 degrees ATDC, increases octane requirements by $\frac{1}{2}$ to $\frac{3}{4}$ of an octane number per degree of advance. Spark advance increases cylinder pressure and allows more time for detonation to occur. Engine speed and fuel burn characteristics affect ignition timing requirements. As an engine turns faster, the spark plug must fire sooner in order to allow time for the air-fuel mixture to ignite and achieve a high burn rate and maximum cylinder pressure by the time the piston is positioned to produce best torque. The amount of additional advance depends not only on engine speed but also on fuel-air flame speed, which in turn depends not only on the type of fuel but also on operating conditions which change dynamically, such as air-fuel mixture, air-inlet temperature, combustion chamber pressures and temperatures, and levels of boost, in the 3.8L SC. Ford engineers wisely designed the 3.8L SC engine system to **RETARD** spark timing 10 degrees under boost conditions, or when the knock sensor detects detonation. This factory safeguard can be over-ridden under extreme conditions or when using after-market chip modules, however, which can cause severe engine damage.

Other variables which can greatly affect spark-timing and octane requirements are 1. **Water-Jacket Coolant Temperature** - increases in coolant temperatures increase octane requirements by roughly one octane number per 10 degree increase from 160 to 220 degrees F. 2. **Ambient Air Temperature** - inlet air temperature increases octane requirements by .5 octane number per 10 degree increase. Temperature affects fuel performance in several ways. Colder air is more dense than hotter air, affecting cylinder pressure. Cold air inhibits fuel vaporization. Hotter air directly raises combustion temperatures, which increases the possibility of detonation. Engines will make noticeably more power on a cold day because the cold dense air increases engine volumetric efficiency, filling the cylinders with more molecules of air. Every 10 degree increase in inlet air temperature reduces air density (thus horsepower), 1 percent. 3. **Humidity**, which increases the amount of water vapor in the combustion chamber, decreases octane requirement by $\frac{1}{3}$ octane number per 10 grains increase per pound of air. 4. **Altitude** - increasing altitude reduces octane number requirements by about 1.5 octane number per 1,000 feet above sea level. (power levels also go down accordingly, because of the less dense air). 5. **Combustion Chamber Deposits** - depending on engine design, fuel, lubricant, and operating conditions, combustion chamber deposits can increase octane requirements by 1 to 13 numbers.

There are many other variables that can affect both spark-timing, fuel octane requirements, A/F ratios, inlet air temperature, cylinder pressure (all very closely associated) in any engine system. The 3.8L SC supercharged engine system, as can be determined from all of the above, puts a great premium on all of these variables coming together optimally. Poor performance and severe engine damage will result if even one of these variables is allowed to get far out of line. The 3.8L SC engine has great potential to make abundant power- this does not come for free, however. The Eaton supercharger takes 50-60 HP off the crankshaft at 5000 rpm to create 12-13 lbs of boost, plus greatly increased levels of both inlet-air, combustion chamber, and head-coolant temperatures. Greatly increased power levels stresses these engines-sometimes to the point of breaking-especially head-gasket failures! With the bolt-on parts now available for the SC, 100 horsepower increases are relatively easy to obtain-retaining reliability is not as easy. However, as has been stated since the March 1996 issue of "Chargin' Thunder" start with the exhaust, add a little ARP, two parts of Fel-Pro, a half bottle of 104 Octane Boost, two dashes of common-sense, and let it rip!

The above discussion does reaffirm, at least for me, the dangers associated with over-drive blower pulleys (with stock exhausts), and the lack of need for computer-chip modules: but it also explains the effectiveness of improving the inlet system (including larger mass-air meters, throttle-bodies, S-model blowers, modified SC adapter tops), and exhaust systems. All of these after-market parts increase the volumetric efficiency of the 3.8L engine system (and in the case of the improved exhaust system, modified SC adapter, and I/C fan, also thermally unload the system,

helping to reduce the chance of detonation). Remember, Vortex, who themselves market computer-chip modules for Mustangs, flatly state that because of the many variables that can affect an engine system, NOT to use an after-market chip module with their superchargers. The Mustang engine systems (5.0L or 4.6L) are very different from the 3.8L SC system. Many of the after-market products that may be fine for the Mustang are either not needed or downright dangerous when applied to the 3.8L SC.

FORD ELECTRONIC ENGINE CONTROL - as applied to the 3.8L SC engine system.- The 3.8L engine control system can seem complicated, and in fact, is complicated. It controls not only air-fuel ratio, ignition timing, idle-rpm, and emissions, but also can control automatic transmission function, engine-cooling fan (and engine temperature), air-conditioner operation, engine diagnostics (remember any fault codes), and constantly sends information to the keep alive memory (KAM), malfunction indicator light (MIL) "check engine", and the trip computer. It also can make "short-term" corrections and adapt the engine control on a "long-term" basis. (In addition, on the SC the "computer" controls the Automatic Ride Control and ABS circuits based on inputs from the throttle-position sensor, vehicle speed, changes in acceleration/deceleration, engine rpm, brake pedal pressure, and other sensors).

The Central Processing Unit (CPU) is the heart of the engine control system. The computer control module contains three kinds of memories. 1. Read Only Memory (ROM) - Long Term: the main body of data the engineers want the control module to remember about how the engine control operates. 2. Random Access Memory (RAM) - Short Term: data to be used and then forgotten. Some RAM lasts until you turn off the key, when all RAM is erased. 3. Keep-Alive Memory (KAM) - Mid Term: data to be remembered for a while, then forgotten or erased. For example, diagnostic trouble codes remain in memory even with the key off. Disconnecting the battery erases the KAM.

There are at least nine basic "strategies" designed into the SC engine-control system: 1. Normal (warm) cruise, 2. Engine crank, 3. Cold start, 4. Cold driveaway, 5. Warm driveaway, 6. Part throttle acceleration, warm, 7. Full throttle acceleration, warm, 8. Deceleration, closed throttle, and 9. Warm Idle. The SC uses sequential electronic fuel injection (SEFI) (port fuel injection triggered off ignition timing that fires each injector separately), a Mass Air Flow Sensor (MAF) which accurately measures the amount (mass) of air entering the engine, and a Distributorless Ignition System (DIS) using both a crankshaft position sensor, or CPS (to trigger the ignition system), and a cam position sensor, or more correctly, a Cylinder Identification sensor, or CID (which allows the engine to fire and fuel each individual cylinder in the proper order).

The SC EEC-1V and V engine control systems even have what Ford calls "Adaptive Strategy". Since 1986, all Ford engine controls are adaptive. The control module is adaptive when it stores in memory how "this" driver is driving "this" car. Every 10 minutes or so, the adaptive system "learns" those modifications to the control. **THE ENGINE SYSTEMS ACTUALLY ADJUST TO EACH ENGINE'S OWN NEEDS AND TO THE DRIVER'S NEED!** Adaptive strategy continually shifts the base calibration to compensate for changes in barometric pressure, intake air temperature, fuel composition, and small drifts in sensors or actuators. Adaptive strategy looks at how "this" engine is currently responding- and further, **HOW THIS ENGINE IS RESPONDING TO HOW "THIS" DRIVER DRIVES!**

Adaptive strategy is a long-term correction based on repeated short-term corrections. KAM stores Adaptive Strategies. That means the EEC adapts to your engine and your driving- but only as long as no one disconnects the battery. If the car is serviced, or loses battery power, you can expect the system to lose the Adaptive KAM, along with the settings for the electronic radio and the clock. If the car drives strangely after being serviced electrically, the engine has lost its adaptive memory in KAM. Adaptive strategy needs time to work after replacement of any part of the EEC system, and when the car is new. For normal conditions, Adaptive systems should get

itself to normal in about 10 minutes of driving. Drivers who drive their SC's to the drag strip are often puzzled about their high elapsed times. **THE SYSTEM ADAPTS TO STREET DRIVING!** When they run the strip a few times, the control module re-adapts to the strip, and their E.T.'s improve. This could explain why, some people, after installing an after-market chip, claim to notice an increase in performance. It may not be the chip at all, but instead, the adaptive strategy, or KAM, adjusting to "run fast" In other words "Drive 'em hard and they'll run hard"! I have always made it a habit to arrive at the drag strip early, not only to give my SC time to cool off, but also to give me time to make a few "Banzai" runs on the open road in order to refresh my engine control's memory (that I want to go FAST!).

The SC engine control system is vital to maintaining an acceptable balance of power, fuel economy, emission control, and driveability. By responding to measured inputs and precisely metering the appropriate amount of fuel for ever changing conditions, the SC control system offers both accuracy and adaptability to this sophisticated automobile.

Control systems may operate one-way or "open-loop." Under limited engine operating conditions (full-throttle, for instance), they take the information about operation conditions received from various sensors, or from computer memories and then use that information to determine signals to the actuators to change injector pulse time, spark advance or retard, and idle-air bypass opening. Accuracy of this control depends mainly on how well the system can "predict" the engine's needs based on its "knowledge" of operating conditions. Most of the time, the SC engine-control systems operate "closed-loop." While they still try to predict the engine needs based on operating conditions, they also measure the results of their fuel metering and use that information as an input to achieve ever more precise control. During closed-loop, information about whatever is being controlled is continuously fed back to the system as an input.

Some systems operate both closed-loop and open-loop. The Mass-Air Flow System (a central component of the SC engine control) works any time the engine is running - open and closed loop. Air-fuel ratio control operates closed-loop, comparing the actual air-fuel ratio to the desired. Measurement is indirect, based on the oxygen sensors' signal to the control module. The control module varies injector pulse time to maintain the target air-fuel ratio (oxygen content). When open loop, injector pulse times (and fuel-rail pressures on the SC) are independent of oxygen sensor input. Knock control operates closed-loop, sensing knock-sensor signals. When signals are sensed, spark timing is retarded and injectors are cut off until knock signals stop. Then the actuators return to normal - gradually - until knock signals are sensed again. To prevent engine damage, knock sensors are never operated open-loop. The EEC-1V and V have the computing power for individual-cylinder knock control, retarding the spark only for the knocking cylinder(s).

On the 3.8L SC, the supercharger compresses air with two rotors. It is driven by the engine crankshaft through a poly V-belt at 2.6 times crankshaft speed, up to a rotor speed of about 15,000 rpm. Stock boost pressures of 12 psi are reached at about 4,000 engine rpm, increasing low-speed torque dramatically! The ordinary engine throttle controls boost pressure, controlling inlet to the supercharger so no waste-gate control is needed (as with turbo's). As previously stated, on the 3.8L SC, static compression ratios are between 8.2-8.5 to 1, but dynamic or real compression ratios are much higher because of the extra air packed into the cylinders by the supercharger. The compression of ramming the intake air heats it, making knock sensing and timing retard critical..

The 3.8L SC is easily capable of exceeding rpm limitations for the engine. To prevent engine destruction, rpm limitation (about 6200 rpm on 89-93's, 5200 rpm on 94-95 AODE's) operates from crank sensor signals to reduce fuel injection gradually to limit engine rpm. The engine controls also cut back fuel injection if the coolant temperature or the oil temperature signals overheat when running above 100 mph (stock gears) for extended periods or time. If the engine rpm is too high for third gear, the dash will illuminate the Shift Indicator Light and sound a chime. This warns the driver to upshift or slow down, otherwise fuel will be cut back.

I hope the above information will help all of you "Super-Coupers" to better understand what makes the SC such a fine performance automobile, why they can sometimes seem tempermental, and why I believe after-market computer-chip modules are not needed. As always, Club members comments, opinions, (or corrections, if necessary), are welcome!

Your editor.....

P.S. Charles Warner informed me of a fact that I have wondered about for years. The supercharger spins anytime the engine is running (it must, as it is connected to the crankshaft pulley by belts). Engine air is drawn in thru the supercharger and circulated thru the inter-cooler system and into the intake manifold at all times. The engine air by-pass valve (or vacuum-unloader valve, as Jerry Magnuson refers to it) allows just enough air to flow thru this system to "balance" vacuum pressures between the supercharger and the engine air by-pass system. This balance allows the supercharger to spin freely under light-load conditions, so there is little fuel mileage penalty (1/2 HP) when driving normally. Under boost conditions, manifold vacuum drops and positive manifold pressure builds, closing the vacuum controlled flapper valve on the engine air by-pass port, resulting in all engine air going thru the supercharger/intercooler system, creating our be-loved boost!

Source books:

Ford Fuel Injection & Electronic Engine Control, by Charles O. Probst, Robert Bentley, Publisher

Automotive Supercharging and Turbocharging Systems, by John D. Humphries, Motorbooks International, Publisher

How to Build Horsepower, Vol.1 & 2, by David Vizard, S-A Design Books, Publisher

Street Supercharging, by Pat Ganahl, S-A Design Books, Publisher

Engine Blueprinting, by Rick Voegelin, S-A Design Books, Publisher

High-Performance Automotive Fuels & Fluids, by Jeff Hartman, Motorbooks International, Publisher

Also,

35 years attending the "School of Hard Knocks"

COY MILLER RACE ENGINES

1046 Moore Street
Harrisonburg, VA 22801
Phone 540-433-0545 800-889-0545

COY MILLER RACE ENGINES is dedicated to providing you with the highest quality competition machine shop service and precision engine preparation. Originally established in 1987, CMRE has and will continue to provide cutting-edge technology to the performance oriented customer. CMRE achieves this objective by combining excellence in automotive craftsmanship with state of the art machine shop equipment, and one of the most advanced research & development programs in the engine building industry. CMRE is a small company by today's standard in this age of mega-giant companies that have grown out of the automotive after-market, and we feel that this is what makes us far superior because we stay focused on engine building and quality control.

The equipment found inside our shop is what you would find in a modern NASCAR type engine shop. The shop is supported by milling machines, a lathe, boring machine, honing machine, rod re-sizing machine, sophisticated computer-equipped engine balancer, a new Winona CMC 30 cylinder head machining center, a Superflow 400 flow bench, and one of the most advanced engine dynamometer systems in the industry - plus all of the other equipment you would find in a competition engine shop.

Coy Miller is one of the hardest working men in the engine building business. The average work week for Coy is 80 hours, sometimes more. Coy doesn't have time for hobbies such as golf, fishing, or hunting because of the demand of his race engine business. Coy's personal race car has also set idle for the past two seasons, due to the expansion of the business. As Coy put it "It got to the point that we had to have the dyno and R&D program to move our engine program to the next level, and if it meant giving up my personal racing for a while, than that would be a sacrifice I would make." One might say he eats, sleeps, and drinks race engines. Although Coy has had no formal engine building education, he has spent his entire adult life pursuing the perfection of the internal combustion engine, and his engines show it. Coy spends alot of his "off" time reading trade publications and text papers and various books pertaining to engine theory. There is a 900 plus page copy of "Internal Combustion Engine Fundamentals", with it's well worn pages, that he keeps on his desk for reference. He also tries to attend all of the seminars that he can to keep abreast of ever-changing and improving engine building methods and machinery/tooling.

Coy has very little patience for the B.S. type engine building practice and theory. There are alot of numbers being thrown around these days - adds that show cylinder heads flowing like gang-busters, dyno numbers that would make the ground shake thru three states. If you see numbers that are too good to be true, more than likely they aren't true. Remember, you should always look at the average numbers, because these are the numbers that tell the real story. A real high peak number is useless in the real world, if you don't have a good average number to go with it.

To those who personally know Coy, he is what one would classify as the serious type. Coy himself, will be the first to tell you that he doesn't know it all, and even if he did, he could not remember it all. If he doesn't have the answer, he will tell you he doesn't know, and then try to find the answer. Coy's engine practice is results thru "science - NOT SCIENCE FICTION!" Coy is currently in the process of fine tuning his new computer aided engine design program (CAD), which will give him yet another tool to perfect his engines, and also save many hours of research and development time versus trying to find things out thru trial and error. All CMRE engines are designed, honed, assembled, and dynoed by Coy himself, and most of the cylinder head work is also performed personally by Coy. He feels that these procedures are critical to precision engine performance. These are some of the reasons that a smaller operation like CMRE can deliver a better end-product. Each engine is custom built, ONE AT A TIME.

ENGINES DONE RIGHT - THE CMRE WAY - Engines arrive at CMRE by air freight or truck. Each engine is then disassembled carefully, paying close attention for any signs that might show problems that would need to be dealt with to make the end-product superior. If an engine comes in broken, we want to know WHAT broke and WHY it broke, so that we can improve that component. Engine disassembly is often taken lightly, but it is a very important operation at CMRE.

The next step is cleaning and inspection. Blocks and their related components will usually spend 3 or 4 days in a cleaning vat @ 180 degrees and then pressure washed. Even though it's more work for us we feel that the hot vat method does a better job cleaning the oil galleries on blocks. Blocks are then pressure tested to make sure there are no hidden cracks. All cylinder heads receive this cleaning and pressure testing, as well as Magnafluxing, even new ones. Line bore and cam bores are also checked at this time.

The next order of business is checking the block's deck heights and milling them square with the crankshaft centerline. We do this operation on a Winona VN 2000 vertical milling machine that uses a bar that the main saddles set on as a register to align the deck with crankshaft centerline. At this time, our main objective is to get the deck square so that we can reference off it to bore out the cylinders. The engine block is then bored to within .005 of it's final bore dimension.

Now we are ready to get down to business - cylinder honing. The block now goes into our custom-built power hone and gets its head bolt-holes thread-chased. Next, one of our many BHJ race model honing plates with a head gasket that is the same as to be used on the finished engine is installed. Bolts are torqued in the same sequence and to the proper torque as they will be in final assembly. Blocks are rough-honed .002 with a 70 grit Sunnen stone set, .0015 more with the next stone set, and .0015 with a finer stone set. Next a special stone set is used to give the final plateau finish that is free of folded, torn material and burnishes. Cylinder bores are held to .003 taper top to bottom and .0005 out of round - that's a half of a thousandth - the hair on your head is 3 thousandths. Proper honing is truly an art - that is why all blocks are honed by Coy personally. It is a very time-consuming task - but critical to proper ring seal. We have had reports from race customers of zero leak down after many passes and that is what makes it worth every minute of the time required to do this job right.

Next, we will take a look at connecting rods. Most competition engines normally will use new after-market aluminum or steel rods. We are equipped to rework stock-type OEM

rods for limited engines or engines that run in a class that doesn't permit aftermarket rods. The rods are magnafluxed, shot peened, and then are resized on a Sunnen rod honing machine AFTER ARP rod bolts are installed. The pin ends are machined for bronze bushings and the center-to-center lengths are corrected at this time on a Becker vertical milling machine. Rods are balanced to within one gram on both ends.

The next component that we look at will be the crankshaft, and as with the rods, most competition engines will normally use after-market crankshafts. When stock-type crankshafts are used they are vat cleaned and the oil galleys are rifle-brushed. They are then magnafluxed and checked for straightness. Cranks are then set up in a Winona CG 280 crankshaft grinder for indexing and regrinding (if needed). Tolerances are held tight for proper bearing clearances, most cranks are cross-drilled, the oil holes are chamfered, then micro-polished, bolt holes thread-chased, and we're done for now. We also offer an off-set crank grinding service, for special rod combinations, or for stroker-crank.

Now we are ready to balance the rotating and reciprocating assembly. All of the pistons and pins are weighed on a Toledo precision computer scale that will weigh to within one-tenth of a gram. We normally get the pistons within half a gram from the heaviest to the lightest. Pistons are machined on a vertical mill under the pin boss area so as not to take away from the strength of the piston. Rods are weighed and corrected in the same manner on both ends and again we try to hold them to within a half a gram. The rings, bearings, piston pins and pins locks are also weighed. Now we will make up bobweights to place on the crankshaft to simulate these components and spin the crank on our Winona XL 2000 computer balancer. This machine is capable of balancing to one-tenth of a gram, we normally go for one gram. NASCAR standards are three grams. We also can install Mallory metal in the counter weights to internal balance engines that were factory balanced externally - we highly recommend this for high rpm engines and for durability.

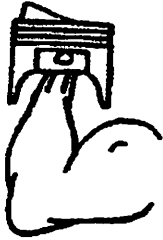
The cylinder heads are where we spend more time than any other component involved with the average engine program. Competition engines will normally use new after-market type racing heads. When factory type head cores are used they are disassembled and cleaned, and then pressure tested to make sure there are no hidden cracks. New heads are also pressure tested. Now for the next operation- the heads are set up in a Winona CMC 30 cylinder head machining center where the valve seats are formed with Serdi-type mutable angle & radius cutters, seat depths are equalized to one-thousandth of an inch and the bowl area is machined to compliment the valve seat configuration. The runner and chambers are also rough shaped by machine. At this time we prefer to hand finish the chambers, bowls, and runners. This hand work takes a lot of time but we feel this is the best way to do the job right. Yes, we know that the buzz word right now is CNC. Coy has looked at a lot of CNC programs and has found very few that are truly ready to run, and they are very expensive - NASCAR-team type money. Bronze valve guides or liners are installed before any seat work is done, used heads are also flat milled on a Winona VM 2000 before any seat work is done because we reference off of the guides for the valve seat centerlines and the deck for valve heights. Spring seats can also be machined if larger springs are to be used. We also machine the guides for teflon seals, because we want to keep the combustion chamber as clean as possible, as oil contamination won't make good power, and can contribute to detonation. We also spend countless hours on the SuperFlow 400, flow testing to find the valve and seat configuration, and chamber, bowl, and runner

design that will make the engine achieve both maximum flow and velocity for optimum torque and horsepower.

After all machine work is complete, the engine is ready for pre-assembly. This consists of checking and correcting piston to deck clearance, setting ring-end gaps, checking and correcting bearing clearances, degreasing the camshaft, checking piston to valve clearances, and any other clearances. After all of these important tasks are done, the block and components are cleaned for final assembly. All engines are assembled by Coy in the CLEAN ROOM, and there is no hurry at this point. After assembly, engines go to the CMRE state-of-the-art dyno cell, and onto a new custom built 2000 HP SuperFlow computerized engine dyno for testing and tuning.

This is the general procedure, but there is much more involved in building a superior engine which will be both durable, powerful, and efficient. It would take a whole book to cover this topic in detail. We at CMRE have spent many years perfecting our engine building skills, and purchasing the latest hi-tech equipment. We believe we offer the highest quality service - at a fair price - and WE STAND BEHIND OUR WORK!

Coy Miller, President
CMRE



Coy Miller Race Engines

1046 Moore Street
Harrisonburg VA. 22801
540-433-0545

3/6/97

Greetings; from Coy Miller Race Engines

Thanks for your interest in CMRE power for your racing program. CMRE is dedicated to providing you with the highest quality competition machine shop service and precision engine preparation. Originally established in 1987, CMRE has and will continue to provide cutting-edge technology to the performance oriented customer. CMRE achieves this objective by combining excellence in automotive craftsmanship with state of the art machine shop equipment, and one of the most advanced research & development programs in the industry.

The following parts & labor are what we feel would be required to build the most competitive 234 Ford S.C. engine per dollar invested.

Engine parts:

* Block, Customer supplied	\$ NC
*Crankshaft, Customer supplied 3.39 stroke	NC
*Pistons, BRC or Wiseco, custom reverse dome, 3.831 bore, 1.5595 comp ht.	599.00
*Ring package, plasma top, zero gap sec, SS 50 U oil	229.00
*Rods, Eagle 3D 4340 steel 5.956" with 8740 cap screw, 705 grams	579.00
*Main bearings, Cleveite 77	42.00
*Rod bearings, Cleveite 77	32.00
*Cam bearings, Sealed Power	34.00
*Oil pump, Melling rebuild kit	79.00
*Oil pan, Customer supplied or CMRE custom fabricated	000.00
*Oil pick up, Customer supplied	00.00
*Camshaft, CMRE custom grind - computer compatible, hyd. roller, customer supplied core.	165.00
*Lifters, CMRE hyd roller	169.00
*Timing set, CMRE wide link	54.00
*Heads, Customer supplied core	000.00
*Valve guides, phosphor bronze	36.00
*Valves int., Manley pro flow 1.84, NK 842 material	149.00
*Valves ex., Manley pro flow. 1.6, XH 426 material	149.00
*Springs, Comp.	145.00
*Retainers, Comp. Titanium	119.00
*Locks, Comp. 10 degree	25.00
*Valve seals, positive type, teflon	22.00
*Rocker arms, customer supplied, SCCoA	000.00
*Pushrods, custom CMRE 4130 seamless chromemoly	129.00
*Rocker arm studs, CMRE	79.00
*Guide plates, CMRE custom	49.00
*Fasteners, ARP (Supplied thorough SCCoA)	240.00
* Gaskets, Felpro	199.00
Parts total	\$3,323.00

XH428 & NK844 valves can be substituted for approximately \$267.50 more for NOS applications.

(Continued from page 1)

Labor:

*Disassemble core engine	85.00
*Clean core engine	45.00
*Check line bore (Align hone if needed \$100.00)	25.00
*Pressure test block	65.00
* Mill block & set deck clearance	75.00
*Bore & power hone block with torque plate	105.00
*Crossdrill crankshaft	110.00
*Chamfer oil holes	30.00
*Polish crankshaft, (Regrind crankshaft if needed \$65.00)	35.00
*Balance assy.	175.00
*Disassemble heads	30.00
*Clean heads	24.00
*Pressure test heads	40.00
*Install valve guides	75.00
*Machine & install seats for oversize valves	175.00
*Competition valve job	115.00
*Port work & flow testing	550.00
*Flat mill heads	45.00
*Machine & install screw in studs	85.00
*Install cam bearings	30.00
*Check piston to valve clearance	60.00
*Check piston to deck height	40.00
*Degree camshaft	50.00
*Set piston ring gap	60.00
*Check & set bearing clearance	85.00
*Clean block for final assembly	45.00
*Assemble engine	350.00
*Dyno test & tune engine	450.00
Labor total	\$ 3,059.00
Total estimate for for engine (less accessories)	\$6,382.00

Due to the unique nature of this type of engine small additions in labor or additional parts may be necessary. You will be advised of any major unexpected charges as the project progresses.

This proposal provides the engine we have discussed but you may have additional preferences we would want to incorporate into it.

Again, thank you for your interest, fell free to call with any questions or changes.

Coy Miller

The engine described above should dyno about 400 horsepower @ 5500 RPM (15 psi boost), 6000 shift point. Approximate torque 425 ft/lbs @ 3000 RPM! This bullet-proof assembly will be durable enough to support a properly applied 100 HP nitrous system if desired (O-ringed block recommened). More importantly, this engine will "live" at this power level, and remain perfectly streetable, and will still provide excellent fuel economy (depending on driving habits).

BIRDS OF A FEATHER.....LETTERS TO THE EDITOR

Bill Hull, President - SCCoA

Feb. 22, 1997

Enclosed is payment for this year's SC Club dues. I'll also send you a check in one week for headers.

Just thought I'd let you know the SC adapter top I purchased along with the C&L mass air meter, K&N air filter, Magnecor wires, and Flowmaster exhaust system have increased the horsepower on my '90 SC substantially. I can't thank you enough for having the vision to start this SC Club. I've learned so much about my car in the last year. Also, I have learned from other Club members of modifications to make their SC's run better. My advice to other members who are thinking about modifications: it's time to get off the fence and GO! Except for the exhaust system, which I had done at a muffler shop, these other modifications only took about three hours total to do myself, and were relatively inexpensive. For the extra horsepower, it was well worth it. I can't wait to install headers! YIPPEE!

Thanks again, Bill, for all your help and dedication to making this Club become a big success! I hope you can make it down here for our Ford meet in May. Remember, you already have a place to stay with us.

So, come on Club members and Renew! Let's put some more thunder in our SC's and GO!
Sincerely,

Rick Cunningham - Devoted SC Club Member
2495 Pasadena Place
Smyrna, GA 30080
770-436-6034

Bill Hull,

Feb 23, 1997

I am so glad to hear that you now have an internet address SCCoA@Juno.com so I can send you questions and comments on a daily basis while I am installing all my new SCCoA parts! I just wanted to tell you that I have just installed my new SC adapter air outlet top on my 95 SC and aside from having to buy a :spanner nut wrench from you so I could remove the collar nut on the adapter top I am very excited with it. The new top has lowered my peak boost by 1/2 psi and allowed my engine to develop boost quicker! Throttle response is awesome - right from the get-go! It also pulls harder over 4000 rpm, where it used to kind of lay down. I realize headers would help me a lot and let the modified top work even better - I'm saving my money!

I have been using my bottle of Entech (ER) oil additive metal conditioner and G-200 synthetic grease that I recently bought from you. I put 2 oz in my power steering and the pump noise I had been hearing on cold mornings went away! I also just recently replaced my brake pads and repacked my wheel bearings with ER G-200 and have been very happy with the product. Could you send me a complete list of ER products? I am also including my \$40 for my 97 membership dues, I can't wait to get the next newsletters. I will be sending you my next e-mail after I get my Griffin radiator and install it.

Rick Thomson
Fairfax, VA
1995 SC AODE
Thomson.Richard@mfst.com Tel-703-968-6271

Bill Hull, SCCoA

Feb. 28, 1997

Dear Bill,

The headers and dual system were worth the wait. The installation was a little more difficult than I had expected, but the parts fit very well. I tried to install the drivers side header without removing the intercooler tubes and found this to be impossible. After removing the upper and lower intercooler tubes it went much smoother. The boss for the oxygen sensor on the drivers side was also a problem on my car. The flange on my 5-speed bell housing had considerable interference. Please feed back to Watson Engineering this concern, it can be easily fixed during header fabrication by rotating the boss fitting outboard about 10 degrees. The performance gain is incredible! I almost put the car in the ditch during full throttle accelerations. Also, my car used to blow out oil during heavy acceleration. Not any more! I guess the extra boost my overdrive pulley was making started back at the mufflers and worked its way forward! The gas mileage has increased from an average of 20 mpg to 22.5 mpg. The only down side to the Walker Super Turbo's is the drone when cruising. There seems to be a booming resonance at around 2000 rpm. I guess I'm getting too old; I find the noise a little annoying. I don't mind the roar when I step on it, but I also want it to be quiet while taking it easy. I talked it over with the folks at Dynomax and they suggested I install a dual inlet/outlet Ultra-Flo muffler where the original resonator used to be. As soon as I get a little time, I'll try it and let you know.

I can't wait to install the raised SC outlet. It's sitting on the work bench ready to go. All I need is a day off to get around to installing it. I hope to get it installed in the next week or two. I'll get the core back to you as soon as the new part goes on. Please apply the core charge credit to my 1997 SCCoA dues and we'll call it even. Do you have the ARP main stud kits in stock yet? Keep up the good work. Talk to you soon.

Sincerely,

Jon Thibodeau
Readyville, TN
615-563-6144

Ed. Jon - thanks for taking the time to write and give me feed-back on the headers. I have notified Watson and they have made several changes to the headers and downtubes. Remember, Watson copied my headers (made by JBA 5 years ago), so they are not responsible for minor snags - they were DESIGNED by JBA! Anyway, Watson has been very cooperative and quickly made all necessary changes so the headers and down-tubes are true bolt-ons. I have always removed/installed my headers from underneath my car, without having to remove my IC tubes - 94-95 SC's have much easier access from the driver's side top than do 89-93 SC's - without removing the I/C tubes. The Walker Super Turbos are one of the quietest and definitely best sounding mufflers for the SC I have ever tried. I know you are not running cats, which I am sure makes your car louder (also makes it run better). The Ultra Flo muffler sounds like a good idea - keep me posted! ARP keeps me in stock with head studs and rod bolts but still (after 6 months) have not made any main studs - they promise me they will soon, but making millions of small-block Chevy parts pays their bills, so Bowties get priority over custom orders like the SCCoA. I also have in stock some killer ARP rocker studs for adjustable roller rockers (Crane/SVO), available nowhere else but thru your friendly SCCoA distributor. Also, I keep in stock bolt-on non-adjustable roller rockers (Crane/SVO) - race-quality extruded-aluminum - again, available nowhere else in the world but at your dedicated SCCoA warehouse! Thanks again, Jon!

Bill Hull, President
SCCoA

Feb. 25, 1997

Dear Bill,

The True Dual exhaust kit with Dynamax mufflers installed on my 35th Anniv. SC is awesome, the sound and performance is greatly improved, but the greatest gift of all was when I installed the improved supercharger air outlet - my body was covered with goosebumps when I mashed the pedal down. Before I installed the top I timed a 30 - 60 mph 2nd gear run, the best I got was 4.2 sec. - after the top was installed my best time improved to 3.8 sec. Thank God for Bill Hull! Thanks for the great parts and your time!

Todd Breher
W2939N CO TRK A
Sheboygan Falls, WI 53085
414-565-2166

Dear SCCoA Members

Feb. 9, 1997

I have been a member of the Club since June 96 where I met Bill and other Club members at Carlisle. My SC is a 1989 5-speed, silver w/grey cloth and 132K miles. I fell in love with the car about 3 years ago when a friend took me for a ride in one. I had never gone around a highway exit ramp at 70 mph before in a stock car, one ride and I was hooked! I have made the following mods: Air intake silencer removed, 180 thermostat, 1994 SC 110lph fuel pump, removed rear mufflers and punched out cats, 3.55 rear end gears.

I have hardly done anything to this car in terms of mods but the results have been amazing. I can blow the doors of my buddies 91 stock 5-speed 5.0L I have heard alot of people asking about rear gears - I personally feel every 5-speed should have left the factory with 3.55's and every 89-93 AOD should have had 4.10's It seems like a lot of gear but these cars are heavy and they need the extra push. As far as driveability goes, the car is much more fun to drive and my gas mileage has not suffered at all! I totally agree with Bill that this should be the first mod.

I am planning on installing Eibach lowering springs with 245-50's all around - also new shocks. I also plan on an off-road pipe to bypass the converters and the center restrictor (oops!, I mean resonator) with stock rear pipe and Dynamax Super Turbo's. Next, after a pay raise, an enlarged SC top.

I am glad to be a part of the SCCoA. When I first got the car no one knew anything about them, now I am learning what really should have been taught in school - How to make your SC fast! Thanks to Bill we can run our V-6's with anyones V-8. My only gripes are about the 5-speed trans - seems to have alot of problems. My only other complaint is varying performance - one day the car will spin the tires thru third and other days it will hardly chirp second. I believe this has to do with the knock sensors retarding the timing. Hypothetically, with little or no exhaust back pressure, low temp thermostat, intercooler fan, and 94 octane gas is there any to bypass the knock sensors so the engine will go optimum timing all the time? With no overdrive pulley and these mods, detonation should almost never happen and optimum timing could be run all the time. Just some food for thought. If anyone has any information on this topic I would love to hear it. Keep your Birds flying high! Sincerely.

David Glista

Alexandria, Va.
703-354-7797

P.S. Bill, you are my hero!

Ed. David - thanks for your letter. Concerning the knock sensor - refer to the "How Engines Make Power" article in this issue. The knock sensor does not itself retard timing - it detects detonation and relays this info to the CPU which then pulls timing to keep the engine from self-destructing! It is a safeguard which Ford wisely provided in the 3.8l SC engine system. Your varying performance could be caused by many different factors, again refer to above mentioned article.

Bill Hull, President
SCCoA

Dec. 23, 1996

Dear Bill,

Thank you for founding this company. To put it mildly, you have answered my prayers. When I found a picture of the Columbus Expo '96 on the back of the Chargin' Thunder newsletter, I was hooked. And don't get me wrong, because I think the information inside the newsletter was excellent. Needless to say, I have enclosed the \$40 membership fee along with the survey.

I am the original owner of my red on black 90 SC, which 134,000 miles. I LOVE THIS CAR! I drove it once, and I was hooked. In the past, when I've gotten the "new car" bug, I thought about trading it in. But I realized that there is no car out there for the price that would measure up to my SC. In my opinion, it is the ultimate car. It is my week-end car, because I have a company car (Taurus) that I drive during the week. But when I take it out on the week-ends, I still get tons of second looks and compliments from people. So far, I have made the following mods: SC pulley, K&N air filter, 3.55 rear gears, shift kit w/higher stall converter, head&tail light covers, custom chrome wheels (Progressive 3-bars), Pirelli 225-50-ZR16 tires, Kenwood CD player.

As I get the money, I plan to do much more. I haven't had to have the cats replaced yet, but when I do, I am going to get the True Dual high performance exhaust. I haven't had the engine rebuilt yet, but when I do, I want to make some high performance mods (any suggestions?)

Could you please let me know when and where the next SC meeting will be so I can be there? I would love to meet other SC owners who are as enthusiastic as I am about my SC. Thanks for everything! Sincerely,

Aneshia Smith
Houston, TX
281-587-8161
e-mail:Super Coupe@aol.com

Bill Hull, SCCoA

Feb. 24, 1997

Dear Bill,

Thanks for the additional information on the exhaust, SC tops, etc. I've got a couple of questions and I've enclosed a stamped envelop for you to send me the answers. First off...am I paid up for 1997? How long do you go between Mobil 1 changes? What in the world is the tool used to open up the supercharger oil filler?

What's the maximum wheel and tire combo you've seen on a '91? I'm thinking of 18" custom wheels with, maybe a 35 profile...can I go to 275 or 295 widths? What's the best muffler for use with that monster 3 1/2 inch system that Chuck Warner is working on? If I get headers and downpipes from you, do you send them directly to Jet Hot or to me and then I send them to Jet Hot? Thanks for the help guy! Why don't you mention in the newsletter/book that I'm willing to start up a Sunset Coast chapter of the SCCoA...maybe we can get the ball rolling that way.

Sincerely,

Skip Cooper
Woodinville, WA
206-486-4769, 206-662-7537

Ed. Dear Skip - thanks for the letter - I change my oil every 3,000 miles, sometimes less. The SC oil sight plug requires a standard 3/16 allen wrench. The largest wheel/tire combo I have personally seen is 17X9 1/2 w 275-45-17's - this with Eibach lowering springs, too! I don't know what the max combo is - Kenny Brown is offering 18 and 20 inch packages as options on his 97 blown Bird. The best mufflers to use are the Dynamax Ultra-Flo's - straight thru design, 100% stainless-steel inside and polished outside - expensive - about \$150 ea - but very effective - sound good too! If you order headers and downtubes I send Watson a check with instructions. They in turn send them directly to Jet Hot. Jet Hot sends them to me - then I add the Fel Pro header gaskets and new bolts, and send them to you. I think a West Coast chapter of the SCCoA would be a great idea! You all could even take up a donation and send my wife and me round-trip plane tickets - I think your first meet should be held in Honolulu, Hawaii! Can't wait to see you there!

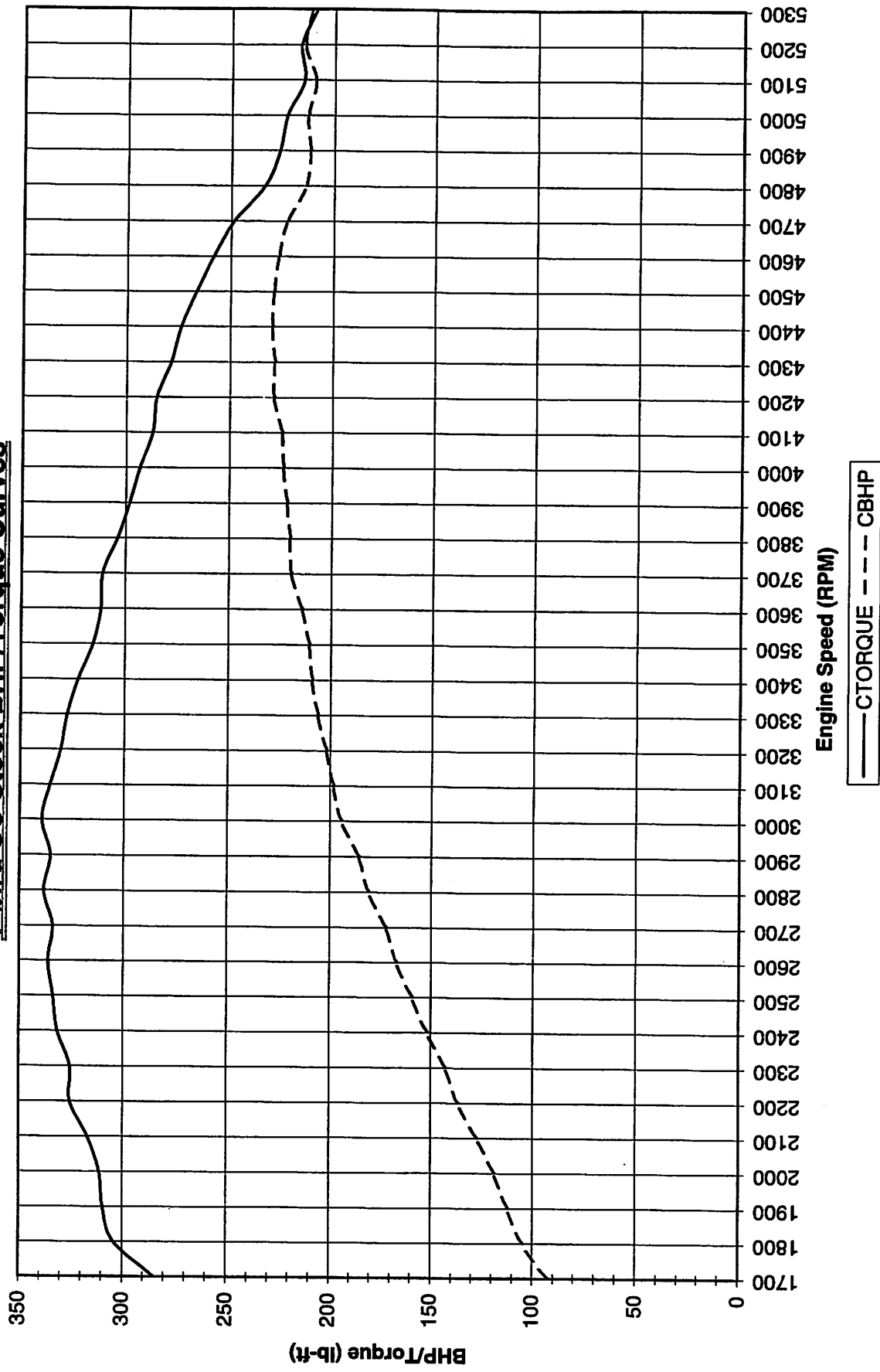
Hi Bill!

Enclosed you will find \$40 for my 97 dues. Since last year, I have installed 3.27 gears and improved the exhaust on my 94 5-speed SC. The mods made a real difference in the performance feel and sound of the car but I have not been able to document the differences on the track yet. I had the car tested on a Dynojet chassis roll as a baseline before the mods. The results: a best of 184.3 BHP @ 4400 RPM and 272.0 lb/ft @ 3000 RPM at the rear wheels. Accounting for a 20% drivetrain loss to the wheels, you get 229 BHP & 339 lb/ft of torque at the flywheel, pretty much what Ford advertises for these babies! Even more important, the shape of the torque curve is the same as those I've seen on the engines run here at the lab! You have better than 300 lb/ft from 1800 to 3800 RPM! A solid performer! Enclosed is a copy of the Dyno tests - confidentially rules prevent me from sharing the results of test engines I've seen run in our lab but Ford can't stop me from sharing data from my own car - I can even confirm that my data matches the Ford test data almost completely!

This year, I'd like to make a few more mods to the car. This spring, I hope to purchase Jet-Hot-coated headers and downtubes w/hi-flow cats from you as well as the raised SC outlet adapter. I also hope to install a 70MM throttle body and port the intake to match. If money allows, I'll also have Magnuson make the S-mods to my supercharger and maybe Extrude-Hone the intake & I/C tubes. Appearance-wise, I would like to install lowering springs, a rear spoiler w/LED CHMSL and painted door handles, both from the '96 Bird. I don't know how much of this stuff I'll get done this year but I'll work on it. Performance-wise, I'll document the effect of the changes both on the track and on the Dynojet and keep you up-dated. That's all for now! See ya!

Clifford Jolley, Jr.

T-bird SC Stock BHP/Torque Curves



This data was taken from my '94 T-bird SC on 8/24/96, using a Dynojet chassis dynamometer and accounting for the driveline losses to arrive at flywheel BHP.
Clifford Jolley, Jr.

Test Development Engineer, Ford Motor Co.
Dynamometer Laboratory
Research & Engineering Center
Dearborn, MI
313-390-1671

Ed - Clifford - thanks for the Dyno chart! I have wanted to see one for a long time! I'm sure the Club members will also find it interesting and informing! These cars obviously make gobs of **TORK** and make it early! With the proper mods, 400 lb/ft should be easy to obtain - also 400 BHP with a properly prepped bottom-end! **AWESOME!**

Dear Bill,

Jan. 1, 1997

I would like to take this opportunity to renew my membership to the greatest car club on the planet! Enclosed is a check for \$50. I included a 25% gratuity as a small token of appreciation for your perseverance in producing a technical newsletter about the world's finest, affordable automobile! In 1996, my two most rewarding events were: 1. Making a career move (to a higher level of computer geekness), and 2. Joining the SCCoA. The evidence supporting item 2. is demonstrated by the fact that my wife says: "OH NO!" every time I receive a new issue of **Chargin' Thunder!** She knows I will be "catatonic" for the next few hours reading in some quiet corner of the house!

As you have pointed out in the excellent December newsletter, I will do my part to help reduce your phone call load. I will just start writing you more letters that you can read when kicking back and relaxing! Also, I agree this is not "your" Club, rather, is collectively "our" Club. But there is no denying it Bill, you are "our" fearless leader. You have led Super Coupe owners out of their dark garages and swiftly past the quarter mile mark! **YOU ARE THE SUPER COUPE GOD!!!!** Which means by the way, that you wife Kay is the **SUPER COUPE GODDESS** for allowing this Bird Club to Fly! Thank you both!

Sincerely,

Stan and Kelly Barber
Ridgecrest, CA
619-375-1620

P.S. I'll let you know what I think about ER (not the TV show!)

ED. Stan - Glad you enjoy the newsletters. I appreciate your high praise, but because of my religious beliefs am not comfortable with being called "God" of anything. "Your Majesty, King of Super Coupes" would have been quite sufficient! Thanks anyway!

Bill Hull, President
SCCoA

Feb. 21, 1997

Bill, I recently found out about the SCCoA. I own a 1992 SC with 70,000km (43,750 mi) on it. I would like to join the club; what are the enrollment requirements?

I live in Monterrey, Mexico., (northern Mexico) about 230 km from the Texas border. I have made the following mods to my SC: Bilstein shocks, Goodyear GSC 245/50-16 tires, K&N air

filter, custom dual exhausts (2" aluminized steel). I look forward to adding: Eibach springs, Superchips' Chip, 17" wheels and tires.

Unfortunately, tragedy struck my Bird recently. I was driving on a highway at about 150-160 km, when suddenly the radiator blew. Engine temperature increased in seconds, By the time I could pull over, it was too late. The cylinder heads melted and cylinders became damaged. It was repaired with a new 3/4 engine (block & heads), water pump, oil pump, plug wires, radiator, etc. Belt tensioners were also replaced because the bearings were whining and rattling. Maybe they were damaged when they got wet with the coolant from the radiator. The future enhancements I was looking at will have to wait. My e-mail account is "fatrevin@academ01.mty.itesm.mx". Best regards.

Francisco A. Trevino

ED. Francisco - thanks for your enquiry about the SCCoA. You will make our second new member from Mexico, along with with approximately 20 members from Canada! Maybe we should change our Club name to SCCoNA, Super Coupe Club of North America, or even ISCC, International Super Coupe Club!

Mr. Bill Hull

Feb. 24, 1997

Dear Bill,

I have really enjoyed reading the newsletters of the previous year and have enclosed a check to continue my membership in the SCCoA. I feel really fortunate to have found an organization like this one, the wealth of knowledge that you and all of the other members of the SCCoA is a real asset to all SC owners. I have never seen an organization where all of the people involved are so willing to share the knowledge that they have gained in their own efforts; this makes it easy for the rest of us. All of the members of this Club are lucky that a man such as yourself has stepped forward to start a Club for us. I know that I don't have the time or motivation to do what you have done over the past year. I look forward to another year of the Club newsletter and the information that they will contain. Thanks again for everything that you have done to inform all SC owners! Sincerely,

Craig Hamilton
Lafayette, IN
317-477-6596

Mr. Bill Hull, SCCoA

Jan. 22, 1997

Dear Bill,

I would first like to start by saying, keep up the incredible work! It's great to see and hear your enthusiasm about these cars, but what about the Cougar XR7? I just became a member (Thank God!) and I love the newsletter, but I read alot of members saying they're glad to see the T-Bird get the recognition it deserves, and by all means it deserves it, even though they are like twins. I would love to hear (and I'm probably not alone) more talk about the XR7.

As you know, before this Club all I found was overdrive blower pulleys--filters, chips, etc...Of course, I wanted all of those with their claims or "false claims". My first mod was exhaust (Flowmaster) and pulley. I noticed some difference in power, some deeper tone and my boost went

from 11 to 15 psi. That was enough for me until it ended up in the shop with a blown head gasket! You told us members about the exhaust restrictions, which S&S Enterprises failed to tell me! The point is, don't do overdrive pulleys and such until you open up the exhaust. I plan on buying everything it takes with your and your clubs help. Moral of this story - Don't believe everything these companies claim to give. If I had heard about this Club earlier, Bill Hull would have saved me about \$1300. But all's fair in power and performance. Actually, I figured while they had the SC off the road I would do Jacobs plug wires. Mine were original '89's. Stock wires are Junk!

Mods include: Magnuson S-model blower, SVO pulley, K&N, C&L/Vortex 73MM MAF, BBK 70MM throttle body, Flowmaster cat-back exhaust, Zoom Kevlar 11" racing clutch, Jacobs plug wires, white gauges, Cobra snake on panels, SVT emblem on trunk.

Future mods include: Spearco hi-flo intercooler, modified SC top, 10" intercooler fan, Chip (NOT! - you saved me \$300 more!), SCCoA stainless headers, SCCoA True Dual system, Crane cam, a Cervini hood, like yours, Bill. Thanks again!

Kyle Palmer
Waterford, CT
860-443-2572

Ed. Kyle - we have about 20 XR-7 owners in the SCCoA. Because they are powertrain and chassis twins, and the newsletter's slant is primarily about powertrain and chassis improvements, I don't know what exactly to discuss that is special about the XR-7, except the pretty wheels - which I liked enough to put on my SC!

Dear Bill,

Jan 18, 1996

The best wishes for the New Year! Enclosed please find membership fee for 1997 and keep up with the excellent work! Finally there is a publication exclusively about T-Bird SC's. I no longer have to browse through all the magazines at the newstand to find an article about ANY T-BIRD! I have everything right in my hand in an organized manner, well written with tons of priceless information. My suggestion: maybe more tips about basic repairs and maintenance like you already did about changing spark plugs?

My next question is : what do you think about installing the engine from the Mark VIII in a 94-97 LX 4.6L? We all know this idea is nothing new but unfortunately it's dead. Ford killed that concept for two reasons: first, the sport coupe RWD market is weak, second, Lincoln would have to cancel it's Mark VIII production line if there was a similar car, maybe even better, cheaper to maintain (because of simpler suspension set-up) and for about \$10,000 less. What problems would I run into with a swap such as this? Would the transmission from the 4.6L handle the torque produced by the 4-cam? Also, I believe the engine from the Mark VIII would be a better choice than one from a Mustang Cobra because of chassis similarities. Could you please answer these questions in the next newsletter? Thanks.

Marcin Ceglinski
(no address or phone upon request)

P.S. If I can use my civil engineering background to help the Club, let me know. I found in many newspapers including Ford sales brochures (don't they have engineers on staff?) mistakes in torque units. The correct notation is lb*ft (pound times foot), not lb/ft (pound divided by foot), which is a unit for linear load on a beam, for example. Hope you find my tips useful.

ED. Marcin - Thanks for your letter - glad you enjoy the newsletters! The cancellation of the SVT T-Bird was, I'm sure, a political decision as well as a marketing decision. The main problem with the 4.6L 4-valve engine swap would be money, as they are not inexpensive, even used: plus, the expense of changing over all of the electronics and wiring harnesses, etc. To my knowledge the Cobra and Mark VIII 4.6L engines are almost identical, save for some intake and valve train improvements on the Cobra - the blocks are dimensionally the same, I believe. The 4.6L 2-valve in both the 94-97 T-Bird and the 96-up Mustangs are both mated to the same auto transmission as the Mark VIII has used since '93, the 4R70W - see Bill Evanoff's excellent article on Ford auto transmissions in this newsletter.

I will try to pass on any unusual and pertinent maintenance tips that are specific to the SC. Their is no way anyone could cover all normal maintenance procedures for this or any other car in a newsletter such as this - our focus here is on after-market high-performance. I have already and strongly suggest again, that all SCCoA members purchase a Haynes or Chilton shop manual - I am stocking them for those who can't locate one - price \$15.95 plus shipping.

You may be right about the correct notation for torque, lb*ft., although I have never seen it printed this way. - lb/ft, ft/lb, ft-lbs, lbs-ft are all used in books & magazine articles. I don't think they mean lb divided by feet, I think they mean pound-slash-foot, or pound-space-foot (-), again, not meaning divided by. My shop manual uses the term pounds-force feet (lbf ft; or lb ft) in referring to measurement of torque (moment of force). I suppose we all just get lazy or nonchalant about common terms, assuming others will automatically follow our reasoning, thus becoming technically incorrect at times. Just like with the Kings English - there AIN'T supposed to be such a word, AREN'T THEY????!!

Bill Hull,

Feb. 5, 1997

Thanks for starting a great club, this is everything I have been looking for regarding my BABY. It's a 93 Red SC AOD. I have installed a full-blown Alpine stereo system, K&N filter, BFG 245-50-16's, synthetic fluids, and a BBK overdrive pulley. Unfortunately, I have just had a head gasket failure, I assume due to the overdrive pulley, so that throws off my next project for a few months - exhaust.

I'm not discounting anything I see in "Chargin' Thunder", because it's a great source of info, but I did see a couple things that I would like to check on so that I can be better informed when making changes to my car. In the June 96 issue of Chargin' Thunder, you show the "peak torque" is reached at 2700 RPM, but in the Super Ford article (on your SC) it shows the "peak torque" at 4000 RPM. This could mean a big difference to me in gear selection. I don't really race, and I do alot of highway dirving, so I don't want my engine revving too high at 70 mph. I do want to hurt the Crapmaros and Firechickens at the stoplights around town, which the 2.73 is too high for that. I'm leaning toward 3.55's because its right in the middle. Does that sound like a good coice?

Also, in December 96 issue of Chargin' Thunder you discount the use of a SuperChip, because the SC's chip already acts like a SuperChip; then you said to add it to Stage 1 to gain another 50-100 HP. Do you know of any differences in performance by using a different chip like JET or Hypertech? Would an SC owner really see a good improvement by any of these?

Thanks to this Club, I will be getting many parts for my car this year, starting with exhaust, air inlet adapter, rear gears, and a chip. Hopefully your answers will help me make the right decisions for my type of driving.

I also had an idea for Chargin' Thunder, if it's not too costly. Since so many of us send you photos and tech info on our cars, maybe in each issue, you could do a color photo and article/tech info on a members car...just a thought. Thanks again for a great club, and if any members would

like to contact my for Q&A or maybe a get together/cruise in the mid-west, I can be reached at the following: Jason Marsh

3509-D N. Nesbitt

OKC, OK 73112

Internet jmarsh@afs.net

Ed. Jason - Sorry to hear about the head gasket failure - don't feel alone - I get calls and letters literally every day from SCCoA members and non-members alike, all telling the same story. Occassionally, my devious mind conjures up a get-rich scheme such as: GIVE each new SCCoA member an S&S overdrive blower pulley in their membership package - then set back and get rich selling ARP head studs and Fel Pro gasket sets! Nahhh!..But I'm sure it would make Jamie Turvey proud of me! Ford rates the SC torque peak at 2600 rpm in their sales brochures: the article in Super Ford magazine, written by Rod Short, compares the HP and torque of the 3.8L vs. the 4.6L V-8 - thus the 4000 rpm figure, which I think he means the HP peak for the 4.6L.

3.27's or 3.55's should help you considerably, its your choice - depending on your driving style.

My reference to the SuperChips increasing HP 50-100 HP was actually meant to be a joke, Jason, as I have been on Jamie Turvey's case (and SuperChip's too) for allowing such outright lies and mis-information to be published in their own sales brochure. Personally, as I have stated on numerous occassions, I see no need for any aftermarket chip module for the 3.8L SC - but again, this is just MY opinion.

Color pages in Chargin' Thunder are EXPENSIVE. Each page is actually half of a folded 16X22 inch page, so I have to pay for a "double" color page - price \$1.70 per newsletter (extra) times (this issue) 500 copies - net cost - \$850.00. Unless everyone wants to raise dues to \$80 per year, I guess we'll just have to be content with B&W photos, and let members talk about their own SCs in this section of the newsletter "Birds of a Feather"

Dear Bill Hull,

Feb. 20, 1997

Enclosed is \$40 for the annual membership fee. I want to start off by saying you have done a hell of a job with the SCCoA I am hoping to start modifying my SC this year. The first stock item that will leave the car will be the exhaust. I am having a custom exhaust system make by a local shop. The next item will be the SC outlet - will the 1" top fit under a stock hood? I really enjoy the articles you have written. The one I really enjoyed was the "Chips and Dips" article. I was planning to use one of the so-called "Performance Chips" until I read your article and found out what they actually did.

I am planning on making it to Carlisle for the All-Ford Nationals in June. It think it will be cool to see what different people have done to their SCs as far as enhancing performance and looks. Well, before I go I want to say thanks for the informative articles and the research on performance parts.

Kenneth J. Seegers, Jr.
178 Azalea Circle
Limerick, PA 19468

Ed. Kenneth - thanks for your letter. I don't think the 1" SC tops will fit under all SC hoods - besides the throat on the 3/4" SC tops is enlarged to the point where it will flow all the stock I/C tubes can handle - a definite "killer" part !The "Chips and Dips" article was actually researched and written by Dr. Bill Evanoff, engineer at Ford, and SCCoA member. I wrote the following article, "More Chips and Dips"- glad you found them informative. Look forward to meeting you

and many other SCCoA members at Carlisle in June - should be a real "bash".

Dear Mr. Hull,

Mar. 5, 1997

Here are my dues for 1997. Sorry, but the Army decided not to pay me last month. Anyway, I'm glad that you decided to become the Supreme Commander of the SCCoA. I knew it would be a hand full with all of us 3.8L non-educated SC owners. I hope you can continue the good work that you have been doing for the club for years to come. I will be coming back to the states in Oct 98 and I will be able to help in any way that I can. Also I will be home on leave in July, so maybe I can catch a Ford show with the SCCoA. I have finally installed the headers, the 65MM TB, the Magnecor wires, enlarged SC top and the exhaust system. I did not get to purchase the True-Duals. I had my pipes bent to match up with a Flowmaster "Y" piece and then out the Dynamax system. It really sounds good when driving but, when I get into it, it sounds like I'm in a can. It's the "Y" piece! So when I get to the states, that will be the first thing I will change. The performance is UNREAL!! I do not have the facilities to time my quarter mile so I can't give you any numbers. I chickened out at 140 mh (est). These parts are the best thing since sliced bread!!! Oh yea, Santa did bring me some custom wheels (pictures to follow).

I just found out that Ford will stop producing the Thunderbird. What fools! I guess that it all boils down to one thing. MONEY! I really hate to see this. Oh well, maybe this will be great news for us SC owners. Our SC's should really go up in value now.

I'm looking forward to the next newsletters and all of the "education". Thanks again for all of the hard work.

Robert Griffin

Ed. - Robert - thanks for taking the time to write! Your letter (as well as many others) confirm that these SCCoA parts really work! The Flowmaster mufflers are really loud, particularly when removing the factory resonator. The SCCoA True-Dual system, using Dynamax Super Turbos, is much quieter, even though it too eliminates the very restrictive resonator. See you in July!

Super Coupe Club of America
Bill Hull, President

Jan. 30, 1997

Dear Bill:

I recently spoke to Tim Connor or CONCOR tool and machine, a recipient of your publication. Tim recommended your publication highly, and suggested that I contact you. If you could, I would appreciate it if you would send me the appropriate information on how to join your club, and begin receiving your publication as well. I currently am the proud owner of a 1990 35th Anniversary T-Bird SC. I have made performance modifications to the car but have become frustrated with the lack of availability of aftermarket products for the T-Bird. Tim said your publication would alleviate some or most of those frustrations. I look forward to hearing from you.

Sincerely,

Nicholas A. Piscioti
503 Marion Ave.
New Milford, NJ 07646
201-967-7542

SCCoA

Dear Mr. Hull,

While surfing the net, I came across the Thunderbird Nest; while reading the guest book I found a reference to your SC Club. All I could think about was how do I join? I am an avid T-Bird fan, having owned three including a 87 T-Bird, 88 Turbo Coupe, and presently a 92 Supercoupe (which I traded a Mustang GT for). I have made mainly cosmetic changes to my SC, including tint and a Cervini ram air hood, along with SC overdrive pulley and a K&N filter. Hopefully, this summer will bring many more performance oriented mods and some cash might help too. Please send me any information about your club, including costs and benefits. I am anxious to hear from you soon. Thank you for providing a SC Club for Bird enthusiasts like myself.

Sincerely,

Kevin Hillabolt
2460 N.E. 52 Court
Des Moines, IA 50317
email:a7fordy7@aol.com
internet:http://members.aol.com/a7fordy7

Hi Bill,

I just wanted to write you a note to let you know how much I, as a SC owner, appreciate you. I thought I was alone out here, until you started the SCCoA. Come to find out, that's a whole mess

of us. I have a titanium '90 with a 5-speed and overdrive pulley and 106K miles. I have Pirelli's now, but had two sets of Gatorbacks previously. I will go back to the Gatorbacks when I wear these Pirelli's out. I have never had a car that is so much fun to drive fast. I have to admit that I'm on a first name basis with every cop in town and on the road to Flagstaff, but GAWD, what a great road car! My dues for SCCoA are enclosed. Keep up the good work!

My sincere appreciation,

Richard Crilly
Scottsdale, AZ
602-483-2457

Dear Bill,

I'm writing to you to congratulate you on a great idea and to support the Club because from what I hear it can help me. I'm a 24 year old ex-east coaster gone military, now stationed on Mare Island near San Francisco, CA. I am a proud owner of a '90 25th Anniv. SC with what I call basic add-ons, including Flowmaster cat-backs, K&N, and Eibach and Tokico's at all four corners. I also added a supercharger pulley which might not have been a great idea according to other people I've talked to. Do you agree? Future additions include a Transgo shiftkit, 3.73's, headers (if somebody makes them), and anything that will help make that 3.8L breath a little better. Enclosed is \$40 for the membership fees and newsletter. I do have questions regarding changing the module and if a stuttering problem between 3/4 and full throttle is attributed to the pulley pushing too much air for the computer to compensate. Anyhow, I've been looking for a Club or somebody else who is knowledgeable about these cars because I'll be keeping it for awhile and am interested in making it bigger, faster, better. Best of luck to you and if you can point me in the direction of an answer for the above questions it would be much appreciated.

Thanks,

John Munger
Special Boat Unit Eleven
PO Box 2134 Mare Island
Vallejo, CA 94592

Ed.- John, thanks for your letter. Your stuttering problem could be caused by defective plug wires (often shows up under boost or high load conditions). Could also be inaudible detonation caused by the overdrive pulley, lean fuel condition due to inadequate fuel pump capacity, clogged fuel filter, or dirty/defective injectors

Dear Bill,

I own a 90 SC, 5 speed, Red with black leather and every option. I bought the car new and it now has 58,000 miles. It is stock except for a K&N filter. I installed an Air Lift air bag in the right rear spring and inflated it to 35 psi. The car can now be launched at 4000 rpm without wheel-hop!

The car sets slightly unlevel but is not noticeable and it does not hurt the ride. No air bag is used on the left side.

I am considering the modified SC top and SCCoA True Dual exhaust as first modifications. I have several concerns about the exhaust system. I had a 1988 5.0 Mustang with 3.55 gears and a Dynomax exhaust. The exhaust set up a resonance at 55-60 MPH and it was very annoying on the highway. I ended up putting the stock exhaust back on the car. I am also concerned that the V-6 will not sound as good as a V-8. I definitely want more power but not at the expense of an annoying exhaust.

Enclosed find my check for my 1997 membership. Keep up the good work. Sincerely,

Roger Gurney
823 Blue Spring Circle
Round Rock, TX 78681
512-388-7564

Ed. - Roger - thanks for taking the time to write! Your tip on the air bag confirms what I have been suggesting to 5-speed drivers for 3 years. You are the first 5-speed driver to actually let me know that it does work. We used to install air bags on solid axle cars (pre-loading the right rear to compensate for engine torque and chassis flex). This is a definite "Hot Tip" for you 5-speed guys - Gosh! us little AOD drivers don't stand a chance now, for sure! Concerning the True-Dual exhaust system - some members have remarked that it is TOO quiet; others say they object to a certain resonance at low engine speeds around town. Much depends on whether you retain the stock cats or not (they act like mufflers). Anyone wanting to quiet down this or any other exhaust can always substitute a Dynamax Ultra-Flo dual 2-1/4 inlet/outlet muffler in place of the factory resonator without adding much back pressure to the over-all system. □

Dear Bill Hull,

Feb. 20, 1997

I look forward to reading the mass of information that arrives in each issue of the Chargin' Thunder newsletter. You have done a great job with the SC Club and the newsletter.

I have a white '93 SC and love it. I bought the car used in '93 with 2300 miles and I got a great deal. I got it from a used car lot, but the man who bought it new, special ordered it fully loaded. I've done some minor modifications to it, which includes Auto Specialties 3lb overdrive blower pulley, underdrive pulleys on the crank, waterpump, and alternator. The car is automatic with a B&M shift kit (sometimes I wish it was a 5-speed). I plan next to change the rear end gear to a 3.73, K&N air filter, headers with the complete exhaust, using the single 3-1/2 system, the revised SC outlet, transmission wide-ratio upgrade, and much more. I am an Amsoil dealer and run synthetic in the engine and transmission.

My dad and I both have Supercoupes and are members of SCCoA. We have been to the past two All Ford Nationals in Carlisle, PA. I joined the Club there and then later on I got my dad to join after he bought his SC.

Bill, I need some more SCCoA business cards to hand out. There are alot of Supercoupes in my area. Enclosed is my check for my 1997 membership. Thanks again for the great job your're doing. Keep chargin'!

G. William Burke III
1101 Salem Lake Rd.
Winston-Salem, NC 27107
910-788-4909

SCCoA
Bill Hull, President

Dear Mr. Hull,

Thanks for your immediate response to my letter about joining the SCCoA, the information you sent me has kept me awake many nights. I have even mentioned my membership to SCCoA in my web page with the hopes that many other SC owners will follow suit and join. I am however, curious about membership fees, none were mentioned in my initial membership packet, but while reading several member letters in past issues of Chargin' Thunder, I noticed a number of forty dollars to join. Is this the cost for a years worth of membership, or is it free? I always followed the saying that if something is too good to be true, then it probably isn't, and the SCCoA looks good to me, so where are the costs?

Being that we are in such an advanced technological age, have you considered putting the SCCoA on the world wide web? It seems that everyone has some sort of access to the internet these days, including myself, and with such a broad audience it seems silly not to get the SCCoA published on the internet. I have the tools and knowledge to work up a web page for the SCCoA - if I can be of any help let me know. KEEP ON SUPER-COUPEING! Sincerely.

Kevin Hillabolt
email: a7fordy7@aol.com
internet: <http://members.aol.com/a7fordy7>

Ed. Kevin, thanks for your letter! Glad you like the newsletters! Membership is indeed \$40 per year as mentioned in both the June and December newsletters, as well as the Feb. flyer. We are currently working on setting up our own (SCCoA) web page. Thanks for your offer of help!

Super Coupe Club of America

Feb. 6, 1997

I am writing in response to joining the Club. I own a 1986 Bird that I'm in the process of converting to 1990 SC power with a 5-speed gear box. Along with the engine and trans, I'm updating the suspension and brakes with '88 Turbo Coupe parts. I hope to have it going sometime in April if everything goes as planned.

I'm going to start off with a few modifications to help it's breathability and to make the swap go faster in terms of: a true 2½ dual exhaust with Flowmasters, a K&N air filter mounted in a cool-air stream, and a cool-air duct to the intercooler.

I'm including a \$40 check to be a member and as soon as it is completed I will send info and pictures.

Mike McGee
594 Maple St.
Saugatuck, MI 49453

p.s. - I also own a mildly modified 1984 Mustang GT with the 2.3L EFI Turbo that runs 13.20 @ 104mph.

Ed. Good luck on your swap, Mike, and keep us posted on the results! In the last month people have joined the SCCoA in order to receive information on the 3.8L SC engine for installations in: 1. Custom home-built aircraft, 2. A 1960's era MG, and 3. a boat. It seems many people are beginning to appreciate the 3.8L SC for what it is: a sturdy, lightweight, dependable power-package!

Dear Bill,

Please find enclosed \$40 for membership in the SCCoA. I look forward to reading your newsletter as much for the high praise given it by Paul Cornell at TIX as the fact that I (and most other SC owners) are starved for a good technical forum regarding our cars. It wasn't too bad when I owned my '91 5.0 T-Bird, as most Mustang articles on tech and upgrades could be applied directly. But since I traded that car to aquire my '93 5-speed SC, there is almost nowhere that info can be found on 3.8L mods, other than the normal free flowing exhausts, air filters, MAFs, throttle bodies, etc.

This is my third Bird and all have been fantastic cars. I bought this SC as a compromise between not having the kind of money to do the things Ed Bailes at R&E Racing is doing to 5.0L Birds, and being able to pay off some bills and own a performance car. It has been no compromise at all, as it ought to be illegal to have so much fun in a car with decent leg room and looks this good!! My only regret sometimes is that I wonder what an 11psi Procharger would have felt like in the 5.0 Bird. But those blues quickly fade under a hard 2-3 shift coming out of the sharp S-turn on my way home that sends this wonderful 4000lb car clawing the road as it rockets past some Chevy road debris and import fodder!

Sincerely,

Steven & Margarita Ruhl
538 Pence Rd.
Webster, TX 77598
281-488-0198

Dear Bill,

Dec. 30, 1996

I am really impressed with the quality and content of your December 96 Chargin' Thunder. It is so well written and informative as well as really enjoyable to read! You really have a literary talent as well as a lot of auto and T-Bird knowledge.

After reading about Energy Release I'd like to order a 16oz size (should it really be added to the supercharger?).

The modified SC adapter air outlet really works great! Thanks for all your help!

Lynn Ramirez, M.D.
905 S. Glenoaks Blvd.
Burbank, CA 91502
818-957-5423

Later follow up letter, Jan. 20, 1997 - The Energy Release is great!-please send me another 16oz bottle. Lynn Ramirez

Ed.- Lynn, thanks for your comments about the newsletter. Just knowing you members are benefiting from and enjoying Chargin'Thunder makes it all worthwhile! I substituted 1oz of Energy Release for the factory fluid in my S-Model blower awhile back - can't really say what it has done but I really believe in the benefits of ER.

The factory SC fluid is synthetic, was formulated by Eaton for Ford to have a low expansion ratio when heated, and for low volatility, so as not to build up excessive pressure which could blow the seals in the SC case. It also was designed for durability, not needing to be changed for the life of the blower. As good as the factory fluid is, after testing it with my Fallax Pin and Block machine, it seems to have only moderate friction reducing properties, and gives up quite easily under the extreme heat and pressure present during this test. I feel that by adding 1oz of ER to the factory fluid, it's performance is upgraded considerably. (I've checked it out with Bob McGinnis at Magnuson Products- he and Jerry Magnuson love ER!)

Even though the factory fluid never needs to be changed under normal conditions (according to Ford), I have noticed after a few thousand miles this clear fluid changes to a greenish-brown color. I intend to change mine periodically, just to be safe. Remember, these blowers spin 12000-15000 rpm at 5000 engine rpm (depending on pulley size), can reach temperatures exceeding 350 degrees, and are expensive to replace. One big caution on re-filling or topping off the fluid in these superchargers - DONT' OVERFILL! IT CAN CAUSE EXCESSIVE PRESSURE INSIDE THE FLUID RESERVOIR AND BLOW OUT THE SEALS! The fluid capacity of the reservoir is 8 fluid oz. Do not fill to the bottom of the threads, leave at least one-sixteenth of an inch showing beneath the threads of the plug-hole - it is better to run these blowers ½oz low than ½oz over - to allow for expansion. Believe me, I know! I over-filled mine and was lucky not to blow a seal! I am now stocking the 8oz bottles of SC fluid and can sell them far below the price Ford gets for it (thanks to Magnuson Products).

Dear Bill,

I just recently received the SC adapter air outlet I ordered, and after some difficulties, got it on. You were definitely right, this part does make a BIG difference. It seems that the computer needed a few days to learn the new air-flow (Is this right?) The car seemed a little sluggish, especially on the low end, for a few days. Then all of a sudden, it just seemed to go away. Now the car seems to want to jump off the line. Boost comes up much quicker (and is a little less). Also, the idle seems to have dropped a bit as well. This is an outstanding part, well worth the money!

Enclosed is a check for the True-Dual exhaust system. I'm looking forward to seeing how this will affect my car. I've also added an additional \$40 for next years dues.

I've also got a couple questions and was wondering if you could answer them:

1. I really like the way the SVT Thunderbird looked and was especially intrigued by having Cobra R brakes and rims. Is it possible to back-fit them to an SC?

2. I noticed that the new F-150 truck comes with a 4.2L V-6 standard. The manual trans is an M5R2. The dimensions seem to indicate that its just a stroked version of the 3.8L. I know Ford did change some things on the SC block, but by using a cloner 4.2L would it be possible to stroke the SC engine to 4.2L as opposed to having the parts custom made?

3. Do you plan to offer custom I/C tubes like the one on your car? I'd definitely be interested in those when I purchase a new intercooler.

4. What does the Cartech piece you offer do exactly?

Thank you very much in advance.

Sincerely,

Marc Lasky
32 Peake Rd.
Edison, NJ 08837
908-225-3488

Ed.- Marc, thanks for your letter. Glad you like the modified SC adapter! After receiving considerable feed-back from you members who have installed this piece, I have modified the installation instructions slightly to ease the swap. EVERYONE who has installed this modified top has noticed a definite increase in performance, even at low RPM! Many are also reporting a 1psi drop in boost, due to the reduced temperature levels of the discharge air out of the blower. This modified SC adapter no doubt lets the blower run easier, not having to force the air thru the restrictive stock piece, probably adding to the longevity of the blower. Bob McGinnis, at Magnuson, tells me that a 1psi pressure drop out of the blower means an approximate 40 degree drop in air discharge temperature. This by itself corresponds into a 4% increase in HP, not to mention the HP increase due to improved air-flow and the reduced thermal load on the intercooler (also less chance of detonation due to the decreased inlet air temp).

No one else has reported problems with their computer having to re-learn the increased air-flow. Is it possible this was caused by dis-connecting the positive terminal on your battery? Doing so can result in a short period of time where your computer re-programs itself (or so I understand).

I too, really loved the looks of the Cobra R rims (also the idea of the big brakes!) The T-Bird does have a different hub bolt pattern but obviously can be adapted to take the Cobra R rims and brakes. I have asked John Clore at SVT to send me the necessary information concerning the swap.

The 4.2L truck engine was discussed in the Dec newsletter, although not in great detail. It does appear to be basically a 3.8L with a stroker crank. It also has the Twin-Port intake system with the 6 intake ports PER head! I don't believe the 4.2L crankshaft is forged steel as in the SC 3.8L - so doubt it would live under 12-15 lbs of boost. Although increasing the stroke of an engine usually results in greater torque, (great for a truck, which often has to haul heavy loads) there is a down-side to too long a stroke. Increasing the stroke also increases piston speed (because it has to travel a greater distance per engine revolution), which can limit upper RPM levels. I personally believe the 3.8L (which has a relatively long bore to stroke ratio to begin with, especially for a performance engine) would gain little HP with the 4.2L crankshaft, could have durability problems if turned over 5000 RPM (even if it were forged steel), and probably wouldn't be worth the considerable expense of purchasing a 4.2L crank (about \$600).

Many people have asked me about boring the 3.8L block .030 or .040 over for increased CID. I wouldn't recommend overboring these blocks any more than is necessary for a satisfactory re-build. These engines, like most these days, are cast using what is referred to as a "thin-wall casting process" to conserve weight. Companies can get by with this due to increased precision with improved casting techniques. However, increased strength is NOT a result of the "thin-wall" casting process, and the SC block, being stressed because of the blower, does not need to be weakened by unnecessary over-boring. Besides, a .030 overbore only nets an approximate 2 cubic inch increase in engine displacement!

Custom I/C tubes are not needed, even with a 1" raised adapter top. When I installed my 1" raised adapter top, I just assumed the stock upper I/C tube would not match up, so I made a home-made one. After using this set-up for two years, I happily discovered the stock tube works fine!

The Cartech boost-controlled FMU, as do most other after-market FMU's, restricts return fuel-flow to the fuel tank, resulting in increased fuel rail pressure (making your injectors "work harder"). The Cartech part is adjustable, which is nice, but even on the lowest setting, it caused my SC to run too rich. I have removed it, as on the SC, with its factory FMU, it is not needed anyway (at least not until exceeding 400HP levels, or when using nitrous).

Dear Bill,

Feb 3, 1997

Inclosed is my check in the amount of \$40 for my '97 dues. I want to thank you for all of your hard work in the past year and tell you that you've done a terrific job! I'd also like to thank you for a wonderful visit last November at your house. I look forward to seeing you at Carlisle in June and if you need anything that I can help with, please let me know. Sincerely,

Ronald E. DiPaola
215 Odell Ave #35
Endicott, NY 13760
607-754-7297

Ed.- Ronald, thanks for your letter. I look forward to seeing you and many other Club members at Carlisle in June. As for offering your help, I would like to know which states, including NY, are willing to provide current SC owner lists from their DMV computer files. If you could find out, and send me the phone number, I can take it from there. Thanks!

Bill Hull
SCCoA

Feb. 7, 1997

Bill,

I just received my SCCoA kit in the mail and its great! I've enjoyed reading about all the neat stuff available for the SC, although I was aware of most of it. I've included some pages I copied from the Kenne Bell catalogue. Although primarily a Mustang parts company, they do have some interesting T-Bird parts that deserve some scrutiny from our club! I've only copied a few pages of some of the more interesting parts...there are many more.

I've also talked to Baer Racing off and on over the last few years and I'm getting the latest information from them next week on our car. The last I heard they only had the front brakes available for the T-Bird, I'm hoping that now all four corners are ready. If there's one thing that's a weak link in SC's..it's brakes!

I would also like to know what is the largest wheel/tire combo that has been fitted to the SC with no rubbing. I'm looking into 17 and 18 inch wheels of various offsets to see what will fit (2 and 3 piece). Since I'm in LA and have easier access to some of the manufacturers out here I'm also going to talk to Boyd's and Budnik about some custom wheels. I'll let you know what I find out.

I installed a set of PIA projector fog lights on the car in the stock locations last week..they look and work great! They look like they could have been stock. I'll send you a photo, tell me what you think. To do the job right, I had to remove the front bumper and headlights but it was definitely worth it!

Well, that's about it for now. I'll keep you and the rest of the Club informed of the LA adventures.

Yours Sincerely,

Colin Bloudoff
12810 Caswell Ave. #202
Los Angeles, CA 90066
Ph/Fax: 310-821-9647

Ed.- Dear Colin - thanks for you letter! After looking over the product sheets you sent from the Kenne Bell catalog, I will give MY opinion on them (as stated before, I don't consider myself an expert on ANYTHING, so this review is ONLY my opinion).

1. The Crane Hi-Intensity Ignition w/boost retard is a great product for supercharged Mustangs. I doubt it will work on SC's, nor do I believe it is needed. The SC, as discussed in the December newsletter, has an excellent crank-triggered ignition, and save for the factory plug wires, would probably

be hard to improve upon. The factory SC processors already incorporate timing retard under boost conditions, as well as fuel enrichment (increased fuel-rail pressure and injector pulse-width or "on time").

2. The Kenne Bell Hi-stall Lock Up Torque-Converters are no doubt quality pieces also, although I doubt they make their own. Retaining the lock-up feature while increasing stall speed is a good compromise for moderately modified SC's, but for SC owners going for all the "gusto", I believe the non-lock-up converters manufactured by Art Carr are far superior. One of the weak links in the factory AOD is the two-piece input shaft (really a shaft within a shaft). The Art Carr billet-steel one-piece input shaft (guaranteed lifetime against breakage) can only be used with their non-lock-up converters. Well known transmission rebuilders like Level 10 (and others) swear by Art Carr products and use them exclusively for high torque/horsepower applications. For supercharged applications, especially for heavy cars like the SC, that will see occasional drag strip use, Art Carr recommends their HD Super-Torque converter. It is a street converter with slightly higher stall-speed (500-800 RPM over stock) and allows greater torque bands at medium and high speeds and increased lock-up at the higher RPM ranges (I'm not sure what they mean by lock-up with a non-lock-up converter-probably less slippage than other brands). They also claim a 52 HP increase over stock with their 10" unit, and an increase in fuel mileage at cruise speed (over other brands) due to improved stator and fin design. Several SCCoa club members are using the ART Carr 10" HD Super Torque Converters and love them, saying they can really get "out of the hole". Reported .5 sec reductions in 0-60 times are common! I personally have chosen and purchased the 10" Art Carr converter for my own SC; when it is installed, I will let the Club know the results.

3. Kenne Bell Ram-Air Kit - as mentioned in the Dec issue of Chargin' Thunder, I don't believe anything is going to "ram" anymore air into a SC engine than what the blower already does on its own. Outside of full-race applications, I think "ram-air" is a mis-nomer. Fresh-air induction is, however, very effective on most high-performance cars, and certainly helps on the SC. (actually the factory system is "fresh-air" by definition, but can certainly be improved upon by removing the air-intake silencer, using a 9' K&N, and replacing the corrugated intake hose with a smooth one. (I'm still working on this upgrade). As mentioned before, Lee Bender at C&L cautions against using a "ram-air" system, as they can pressurize the air box, confusing the mass-air metering signal. Also, below bumper air pick-ups are prone to picking up road debris and water, and air temperatures close to some road surfaces (especially asphalt) can be considerably higher than with a fresh-air pick-up mounted further up from the surface of the road. Kenne Bell says their filters are NOT K&N filters, even though they look identical. K&N filters are generally considered the finest and most widely used on the market, and probably would be hard to improve upon.

4. Kenne Bell Boost-A-Pump - increasing fuel pump delivery by 50% by increasing the voltage to the stock fuel pump sounds risky to me, for the same reason there is a limit to how much you can over-work stock fuel injectors (also electro-mechanical devices) by increasing fuel-rail pressure - they can "burn-out". It seems like such a simple solution, increasing the voltage to the stock pump to increase it's out-put, but on the other hand, it is really not that hard to install a larger capacity fuel pump (the hardest part being having to drop your exhaust system in the back to get to the tank). Again, MY opinion is, anytime we ask a component to greatly exceed it's design limit, we are asking for reliability and durability problems (contrary to Kenne Bells advertising!). I personally would prefer to use larger injectors, instead of

greatly increasing fuel rail pressure; and a larger capacity fuel pump instead of feeding the stock unit electrical steroids.

5. Finally, the Kenne Bell Dual Calibration "Switch Chips" - "Switch between Power and Shoot-out, or Power and Towing" they say. They advertise: 1. More Horsepower & Torque, 2. Faster Acceleration, 3. More Towing Power, 4. Improved Passing, 5. Improved Shifting, and state that Kenne Bell, The Innovators, have engineered a line of high performance chips to "squeeze" that "last ounce of power" from computer controlled Ford cars and trucks. No more guesswork with "add on" boxes they say in their add. They even admit that no one chip can fit any particular car due to other after-market parts that may be present or because of production variations among the same model of car. Before I spend my money on a Kenne Bell "Dual Calibration" Switch Chip, I'll "double my pleasure and double my fun" by chewing Wrigleys Doublemint gum, a whole lot cheaper (and no doubt better tasting)! Besides, you all already know what a dedicated Jamie Turvey fan I am, and what a great supporter I am of the "Superchips" module for the SC. I would feel like a traitor to switch to another brand! I hate to be such a skeptic about these fine products by Kenne Bell - they may be great for Mustangs, I just don't see the need for the SC. Kenne Bell, "I LOVE YOU MAN, BUT YOU'RE NOT GETTING MY SUPERCHIPS MODULE"!(or my Bud-light!)

I am soon to become a Bear Racing dealer. Their high-performance brake packages are first-rate and competitively priced. They only have brake-packages for the front (for SC's), but tell me they would develop a rear brake package if someone would bring one by their shop (Phoenix, AZ). The fronts get most of the abuse, of course, but a complete set of high-performance brakes would be dynamite! All of their front brake packages for the T-Bird use CORVETTE! rotors and calipers, (the 12" from a standard 'Vette, and their 13" from the ZR-1). All presently require using '93 and up T-Bird spindles and sway-bar end links, however, adding about \$700-800 to the total price of their packages. They have 6 different levels of high performance brake systems for the T-Bird, the most to choose from of any other brake system manufacturer. Joe Sarcona, among other Club members, has purchased a set of Bear Racing brakes, and I am going to help a couple of Ford mechanics install them when "Mister Joe" brings his '91 SC down to Virginia from Staten Island, NY, to have Coy Miller Race Engines put the "Mo-Jo" on his 3.8L this month! After eye-balling his Baer brakes, I'll probably purchase the same, because if I'm going to run road course events with "Car Guys" this year, I will definitely need "more brakes"!

I am not sure what is the largest wheel/tire combo that will fit under the T-Bird. Kenny Brown is offering 17" wheels as standard on his Vortex-blown T-Bird, with 18" and 20" optional!

The PIA projector fog lights sound neat, Colin...check out the Competition Limited high-performance driving lights now being offered by the SCCoA! Awesome!

Thanks again, Colin, for taking the time to write...keep us informed about your on-going projects!

January 18, 1997

Larry Collins
7005 Bright Memory Ln.
Columbia MD. 21044

Dear Bill, I have enjoyed my association with the Super Coupe Club of America (SCCoA) since it's inception. My SC is a 1989 5 speed. The car was manufactured in March 89 and purchased by me in May 89. I had watched the development of the SC model since 87 or so. I always thought that the car would be special.

At the time of purchase there were three cars on my list; Taurus SHO, Porsche 928 (used) and the SC. I was anxiously awaiting the release of the SC before making my decision. I first drove the SHO 5 speed at the local Ford Dealer. The car had a sweet motor with a stratospheric redline that I eagerly explored. The sounds the car made over 5000 rpm were exquisite. There were two problems with the car in my opinion. The first problem was that you couldn't easily hit the 1-2 or 3-4 shifts when over 4000 rpm. This made the 7000 rpm redline a little ridiculous, you had to wait for the motor to slow down before shifting thus slowing YOU down. The other problem was the suspension. Can you say buckboard? The SHO can. Even with only a few hundred miles the car felt choppy and nervous when driven aggressively. My opinion of the SHO was not very good. I felt like it was a great motor looking for a good chassis and transmission. Oh did I mention that it was front-wheel drive!!! Real men don't drive front-wheel cars and real cars don't have front-wheel drive, nuf' said. Anyway It was getting late and I had to get back to work so the Salesman, (Freddie "Action" Jackson) told me to take the SC back to work and drop it off on my way home that evening. A light rain had started just after I brought the SHO back so the roads were wet when I started my drive in the SC. I drove about three miles in shopping mall traffic giving the car's fluids and metals ample time to come to operating temperatures. As I entered the highway on-ramp I thought to myself lets see what this thing can do. I ran the gears up to about 4000 before shifting. As I slipped the car into 5th gear I was quite surprised to look down and see the speedometer pegged at 120!!! "What a beast! I must have this car!" was my exclamation. I let the car slow down and I started appreciating all of the amenities of the car. Of which there were many. The six-way power seats, JBL sound system with CD and great ergonomics for me at least. Everything fell to hand as if the car was tailored for me. This car had a sophisticated ride that I had hoped to find in my next car. It had everything, notably missing was the buckboard ride of the SHO replaced by a very assuring automatically controlled suspension. The other features of the car, (4 wheel Anti-lock brakes and independent rear suspension, speed sensitive steering, aluminum heads and the supercharger) combined with Ford's other 140 mph plus cars (Mustang and Taurus) to make the only 140+ trio in the American industry during 1989. The General could only muster two, Camaro (a stretch maybe) and the Corvette.

Ownership of the SC was wonderful experience! In an SC you were pretty much the master of the roads and highways. On the open road the car's prodigious torque and horsepower, (there weren't a whole lot of cars in 1989 with 200 hp or more) made quick work of anybody who thought they could challenge you. From a rolling start most cars and drivers were toast! If it wasn't from surprise it was the absolute acceleration that the car could produce, and at high speeds (90+) there were few cars that could leave an impression the way a SC could. But I wanted more. The torque was great but I found the top end horsepower lacking (there was this incident with a new 928SC that hurt) and I started looking for the same type of aftermarket marketplace development that was sprouting up around the 5.0 litre Mustang. I was sorely disappointed for many years. There was absolutely nothing out there. Ford Motorsport made a performance chip for a short time but it made the drivability go south in a big way. It would also cause you to fail the emissions test reportedly. So for quite a number of years I had a great hunger for additional horsepower.

While looking for hop-up parts I came across an advertisement for SuperChips (more on this later). I called Superchips and inquired about their chip for SC's. I was told that the kit consisted of a pulley and a chip for the EEC-IV processor, they also told me that there was a local installer near me named Joe Scott. As I was going to be in the Orlando area during an upcoming vacation I decided to wait until I went on vacation to get the chip installed. What a vacation! Disney and a faster car! I visited the Superchips facility where I saw a supercharged 5 litre T-Bird being dyno-tested on Superchips chassis dynamometer. The car was being developed by Supercharger Specialties. The car was a lovely pearl white, I wish SC's came in that color. Anyway the installation went fine and I could feel a big difference in the car! Things were beginning to look up. I joined the Mid-Atlantic SHO Club (MASHOC presided by Joe Scott of Scott Performance) because the base Taurus 3.8 and the SC 3.8 share some common parts and the SHO club had some hop-up parts!! MASHOC also had access to mechanics who would do performance work. I couldn't wait to get started. It was about this time my neighbor at the time purchased a cherry Porsche 911 SC. I could not leave the neighborhood without those 911 headlights flashing in my mirrors. To his surprise I always had the Porsche covered until about 120 or so, then the superior breathing of the Porsche would take over. I had a plan to increase airflow through the motor. After talking to Joe I ordered a C/L 73mm Mass Air Flow (MAF) meter. The addition of the C/L MAF made quite a difference, whereas before my SC would not pull anywhere near redline in 5th gear. It now pulled eagerly, but I wasn't finished yet. I could tell that his Porsche was in trouble but he had no idea. After one of our spirited outings the driver's side Catalytic converter started rattling, indicating it had given up the ghost after only 95,000 miles. After doing some checking on a replacement Y-Pipe from Ford, (over \$700.00 for parts alone) I looked into the aftermarket. Through MASHOC I found Ben Wu of RHG automotive in Rockville Md. Who quoted me a price of \$700 for a 2.25in true dual exhaust for the SC. The system contained a crossover pipe, high-flow cats and was made of aluminized pipe (three years no rust) with DynoMax mufflers that gave my SC a very sporty tone. I now had a extreme traction problem in first and second gear. It's funny after the work on my car, and a chance meeting with my neighbor and his subsequent drubbing I never saw those 911 lights flashing in my mirrors. This was about the limit of hop-up parts through MASHOC. Joe had spoken with our esteemed editor and club president Bill Hull, on prior occasions and suggested that I call him since he reportedly had a pretty quick SC of his own and might be able to give further advice on my SC.

I called Bill and introduced myself. Bill was friendly and extremely knowledgeable. We talked for some time about SC's. Bill informed me that there was a company that produced headers for the SC in low volumes but were very expensive. It was at this time that I decided that maybe I should look into a 5 litre Mustang for hop-up purposes since there was a booming aftermarket parts industry for those cars. Parts were plentiful and cheap! My wife and I bought a 5 litre LX convertible that now runs in the 12's in the 1/4 mile but that's another story. I'm getting on my soap box now for just a short time. As club members we **MUST** support the developing aftermarket for the SC. Otherwise we won't have access to the parts that we desire at a reasonable cost. Ok I'm off. It was during this time that the SCCoA was formed. I excitedly joined the club and although I didn't make Carlisle last year but I'll be there this year supporting the club's display area. I am also looking forward to some drag racing at Carlisle. I autocross and drag race currently and do all my racing on the track now, lest anybody think that I'm confused about where to go fast.

Currently my black SC is modified with the addition of C/L MAF 73mm, Superchip and pulley, custom dual-exhaust system with hi-flow cats, swiss-cheesed airbox inlet and Eibach sport springs. The car ran 14.9 @94 mph in a heat wave two summers ago with this setup. Planned modifications include aftermarket sparkplug wires (the order accompanies this letter), Modified SC inlet top, reworked heads (valve sizes, spring rates and porting TBD), cam, studs, FMU, headers, windage tray, throttle body 70mm, centerforce clutch reworked Supercharger, roller rockers and headers. From my readings, the porting on the exhaust side will be very beneficial to the car's performance as supercharged engines don't like backpressure. This and some slicks should put my SC firmly in the 13's or possibly 12's and I will be one happy camper!!

Now on to some recent business. I have been following the purported ineffectiveness of Superchips product and other manufacturers of EEC-IV chips among others I might add. I have read comparisons of chips in such magazines such as Super Ford (SF), Mustangs and Fast Fords (MaFF) and 5.0 Mustangs. These magazines are great sources of information on how to improve the performance of your *FORD*. There aren't a whole lot of articles that are SC specific yet, but that depends on how active we get. Write letters to them asking for SC articles and they will respond. But I digress. Super Ford in particular performed a very comprehensive evaluation of the chip marketplace. I have enclosed a copy of the test for reprint here. SF dyno tested many of the more popular chips on the market including the Superchip. SF's methodology is to perform testing that is repeatable and within certain limits of variance. This ensures results that can be expected in the real-world as well as repeatability of observer results. I state this to address the issue of the EEC-IV processor "learning" different operating parameters of the engine and thus negating any change that a chip could cause after a short time. I quote "There is a myth about disconnecting the battery after a change has been made to the engine to enhance the performance. It is alleged that the computer must lose power to clear the stored data tables before it can perform correctly. In reality, the computer learns and adjusts to the changes made in a matter of seconds. The only advantage to disconnecting power is at initial startup and the first W.O.T. blast. By the time you do your first burn-out or head to the second corner, the computer has re-calibrated and developed new data tables."¹ This ties in to the aforementioned SF testing methodology. If there was a performance improvement gained by resetting data tables and then installing a chip to get a elevated result. That result would not be repeatable due to the EEC-IV "learning" and generating new data tables. As we can see from the article the chips made 4 - 10 additional horsepower on a 5 litre Mustang engine. This compares with 12.3 hp by adjusting the distributor advance and increasing fuel pressure, things we can't do with our SC's Distributorless Ignition System (D.I.S.) system. The article goes on to say "Additionally, a wide open throttle dyno test does not indicate how the part-throttle re-programmed values issued by an add-on chip will affect overall performance. Empirical evidence from chip users typically holds their engines are a bit "crisper" when it comes to throttle response, so advanced part-throttle timing could make the engine respond slightly better. Also, things were stacked against the chips in our dyno test because we could optimize our particular test engine on a particular day. The chip manufacturer's had to be more conservative because their chips fit a wider variety of engines than just our one, plus they have to leave some safety margin. We could tune right to the ragged edge. Just the same, it shows what an experienced tuner can do on a dyno.

In summary a chip is a great way for a non-technical enthusiast to gain approximately 10 horsepower and 6 lbs-ft. of torque at wide open throttle without lifting the hood. But, with some experience, we believe an adventurous tuner can achieve gains by investing in a fuel pressure regulator, a high quality gauge, a timing light and a little time"²

The data that I have included in this letter is real and has been backed up by testing. It does give evidence that chips can produce additional power gains over stock. These gains have been shown to be repeatable. Now I challenge Bill Evanhoff and/or others to show the data substantiating the assertion that chips are ineffective at best.

¹ Mustang Performance Handbook
HPBooks
William R. Mathis
ppg. 111

² Mustang Performance Handbook
HPBooks
William R. Mathis
ppg. 113

By the way, my chip was installed when my car had 90,000 miles, it now has 140,000 miles and as you may have gathered it has been driven enthusiastically at long periods of W.O.T. I have not suffered a blown head gasket or anything untoward in the engine department. I have also not seen the check engine light. Also my muffler bearings were just recently serviced and I should have another 100,000 miles of trouble-free driving.

Please find enclosed my membership renewal for this year.



Larry Collins

Member 147

Ed. - Larry, thanks for taking the time to write such a fine letter! I really enjoy hearing about SC's dusting off Japanese and European auto exotica (also domestic ware - especially Bowties!). The T-Bird SC really is a "Super" automobile, capable of outstanding performance in many different arenas! I must clarify one of your comments and beg to differ with you on several others, however.

In his article on "Chips and Dips", (Sept 96, Chargin' Thunder), the only time Bill Evanoff actually expressed HIS opinion was when he stated "BUYER BEWARE". The rest of his well-researched and written article was actually quotes from other sources - including Ford engineers, chip manufacturers and users (or past users) of various after-market chips. Neither Bill Evanoff nor myself have ever stated that after-market chip modules (in total) are ineffective. My fear of them, specifically in regards to the 3.8L SC, is that they do ACTUALLY "WORK" - that is, that they DO actually change, over-ride, or otherwise modify the base tables for fuel delivery and spark timing in the factory ROM - making them DANGEROUS! Refer to "How Engines Make Power" in this issue of Chargin' Thunder.

You have to remember, THE MUSTANG ENGINE SYSTEM IS MUCH DIFFERENT THAN THE SC's. What may work on a Mustang does not necessary mean it will work on a 3.8L SC! I have been subscribing to Super Ford and Muscle Mustang & FF since they first started publication. The article on my Super Coupe in Aug. 96 SF was the first "in depth" article on a modified SC (and one of the very few at all) I have ever seen in either of these (or other) magazines. These two magazines are self-proclaimed "Mustang Dedicated" - although SF has started to include a section on Ford trucks. There has been precious little ever written about SC's in these or any other magaiznes. My point here is, again, that an article on after-market chips for the Mustang does not necessarily translate into the same information holding true for the Super Coupe.

After reading the information you included with your letter I am more convinced than ever that the SC, in particular, does not need an after-market chip. The writers of this article (who tested the various brands of chips on this test-mule Mustang) state that ON AVERAGE, 4-10 HP and 6 lb ft of torque improvement can be expected. However, they were able to improve the stock Mustang by 12.3 HP JUST by adjusting the advance and fuel pressure (fine tuning - with no chip!). The most effective chip combo they tested, the JET, I believe, was the only one that approached the 10 HP improvement, and this only because Jet included an octane rod which increased the base timing advance from 10 degrees to 14 degrees BTDC. They state, when they removed the chip, but left the octane rod in place, they saw NO change in performance, leaving them to conclude that "THE JET

CHIP MODULE DID ABSOLUTELY NOTHING AT ALL” - the 10 HP gain was caused by the octane rod ONLY! The writers go on to say “things were stacked against the chips in our dyno test because we could optimize our particular test engine on a particular day. The chip manufacturer’s had to be more CONSERVATIVE because their chips fit a wider variety of engines than just our one, plus they have to leave some SAFETY MARGIN” (editors emphasis). When I “read between the lines”, I believe they are really saying, “Even the manufacturers of these after-market chips admit that because of the many variables (even between seemingly identical cars), even THEY cannot guarantee verifiable results on EVERY car, and FURTHER, that their chips COULD even be DANGEROUS on a PARTICULAR engine! Of course, they don’t actually come out and state this in so many words. I have even read reports where some after-market chip “suppliers” repackage factory modules, advertise them as “high-performance”, sell them at high prices, and of course, people buy them! Talk about dis-honest!

Isn’t the reason so many people are convinced an after-market chip will help their particular car is because most people believe the factory left TOO MUCH safety margin in their factory module? So, many car owners purchase an after-market chip module, hoping, I suppose, to remove this factory “safety margin”, and “run on the ragged edge”. I had one SCCoA member call to inform me he was going to have Mike Wesley, of “Calibrator” fame, “burn” him a custom chip. This club member says that Mike Wesley promised him an 150HP INCREASE!!! for his SC. Unfortunately, I get calls like this on a regular basis. If Ford Motor Co. really left a 150 HP “safety margin” out of an engine system only rated at 210-230 HP to begin with, than there really must be a Santa Claus, an Easter Bunny, a Tooth Fairy, (and honest lawyers and politicians)!!! So why spend \$200-\$300 dollars for a chip, when for practically nothing (a little time) a person can fine-tune his stock Mustang, (SANS AFTER-MARKET CHIP), and realize TRUE performance gains! But I digress - this article from Super Ford magazine really has NOTHING to do with the SC.

As stated previously, (Sept. Chargin’ Thunder) I am convinced any substantial increase in performance realized on an SC by using the Superchip chip/pulley combo is due to the pulley alone. Of course, there is always the danger of using the over-drive pulley with the stock exhaust system - a fact well documented by now by many other SCCoA members (and others, including engineers at Ford, Magnuson Products, and other authorities). I believe you have had good luck with the OD pulley because you have a free-flowing modified exhaust system. I am all for OD pulleys - I ran an Auto Specialties 10% for two years (with modified exhaust), and run an SVO 5% pulley now (w/ S-Model blower). The main reason I have singled out Superchips, Inc., and especially ex- Chief Engineer Jamie Turvey, is because of their totally false and mis-leading sales brochure on the Super Coupe (included in Sept Chargin’ Thunder). In my opinion, any person or company which would allow such trash is published (ONLY for THEIR financial gain), cannot be trusted. If I ever were to purchase an after-market chip for any car I owned (which will only happen when 3 feet of snow is laying on my front porch in mid-July), I would never buy one from a bunch of LIARS!! The fact is, a Super Coupe can easily pick up a noticeable, (seat-of-the pants as well as stop-watch verifiable) 20-30 HP gain in performance on a nice cool evening (as opposed to a hot 90 degree afternoon!).

Again, all of the above is ONLY MY OPINION! It is based not only on my experience but also on very good information from many source articles and other SCCoA members - and I truly believe it to be valid! However, as always, I encourage your or anyone else’s opinion and comments. They are surely worth as much as mine!

Member #345
4A Beacon Village
Burlington, MA 01803
January 12, 1997

Bill Hull, President
Super Coupe Club of America
2239 Banbery Street
Charlottesville, VA 22901

Dear Bill :

Thanks for your quick response to my membership request. I called you to join the club with a credit card and two days later I had all four issues of Chargin' Thunder for 1996. I thoroughly enjoyed every issue. They were packed with lots of great technical information for these super cars we own. I could never find any performance information on my car, until I joined your club. Your club is an excellent resource for the Super Coupe. Many other Super Coupe owners are sure to join.

My SC is a 1994 with the five speed manual transmission. Unfortunately the car is in storage for the cold New England winter months. As soon as the spring rolls around, I plan to buy your modified SC adapter top and free up my exhaust system.

I will see you at Carlisle, PA in June 1997 with my SC. Reserve me a spot, I'll be there. I hope to meet alot of members so we can exchange information, performance tips, and stories. I love this car and would not trade it for anything. I have been a Thunderbird fan and owner since the Turbo Coupe days and refuse to own or drive anything other.

If anyone in the New England area wants to chat with their super coupe stories or performance mods, give me a call at 617-273-2044. I can also be reached electronically, my email address is gkoester@baynetworks.com.

Enclosed is a check in the amount of \$40 for my annual 1997 club membership. I look forward to receiving more information in 1997. Bill, keep up the great work, you are doing an excellent job as editor for Chargin' Thunder.

Sincerely,


Greg Koester

DEMPSEY, ROBERTS & SMITH
ATTORNEYS AT LAW

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(702) 388-1216 Fax: (702) 388-2514

Internet: vegaslaw@accessnv.com

JOSEPH F. DEMPSEY
KENNETH M. ROBERTS
BILLY SMITH, JR.

JOHN W. KIRK
AARON M. STEINHOFF

January 28, 1997

Bill Hull
Super Coupe Club of America
2239 Banbury Street
Charlottesville, Virginia 22901

Re: Nevada Open Road Challenge

Dear Bill:

I am writing this letter to introduce myself and to inform you that the Nevada Open Road Challenge will be held this year on May 18, 1997. I ran the Silver State Challenge last September, 1996 and really enjoyed the experience. I own a 1993 5.0 V-8 Thunderbird with a few performance modifications and last year ran in the 120 mph class. I also subscribe to the Thunderbird Information Exchange.

I have learned that during the past several races there has been at least one late model Thunderbird or Cougar in each of the races. I am suggesting that we attempt to get a group of Thunderbird/Cougar owners to participate in the May 18, 1997 race. I had a great time last year.

Please disseminate the information in this letter as well as the attached sheet with race information. It would be great fun to have a group of Thunderbird/Cougar owners participating. Please contact me if I can be of any further assistance.

I have a few lessons learned which may assist any first time entrant. I will be glad to share these lessons learned. I can be contacted at home at (702) 395-7940 after 7:00 P.M.

Sincerely,

DEMPSEY, ROBERTS & SMITH



Kenneth M. Roberts

KR:dbm
Enclosure

COME RACE WITH US!

Lets all get together and go racing May 18, 1997! As I have previously mentioned (TIX #498), the Silver State Classic Challenge Open Road Race (held in September each year) and the Nevada Open Road Challenge (held in May each year) are ideal and fun "races" for our cars. The races are held on a ninety mile section of State Route 318 in Nevada between the towns of Lund and Hiko. The races are ideally suited to our cars since the road is mostly straight with a few sweeping curves for the entire ninety mile length and the cars are started at one minute intervals. At the time of entry the driver selects a target speed that he or she intends to meet for the entire race. The target speeds are broken down into five mile per hour increments from 95 up to 180 miles per hour. Entry fees vary from about \$295 up to about \$580 depending on the class entered. Required safety equipment varies depending on target speed. For target speeds up to and including 110 mph original equipment seat belts are all that is needed. For target speeds from 115 through 125 mph five point seat belts are required. Beyond that additional equipment is required. All classes require the use of helmets. All the details are in the entry packet available from the organizers of the event. Now is the time to request your free event information letter. One or two Thunderbirds have entered in each of the past several races and all have done very well. Notably, Joe Leonard won the 160 mph class in the May, 1996 race in a modified 1995 Thunderbird. Brian Miller (TIX #324) also entered the 125 mph class in the May, 1996 race. He ran his 1994 4.6 Thunderbird. See Muscle Mustangs and Fast Fords, October, 1996 pages 105-108 for an article on the May, 1996 event. Note: Some of the information contained on page 108 regarding the rules is incorrect. The photo on page 107 is of Brian Miller and his car. Rumor is that Ed Bailes of R&E Racing is also going to enter the May 18, 1997 race. There are activities during the entire weekend beginning in Las Vegas on Friday, May 16 with the race actually occurring on Sunday, May 18, 1997. Contact the Silver State Classic Challenge, Inc., P.O. Box 420, Ely, Nevada 89301. Call (702) 289-6267 or FAX (702) 289-8837 now for the free event information letter. I will volunteer to assist Thunderbird owners, especially first time entrants, if requested. Ken Roberts, (702) 395-7940 after 7:00 P.M.

Mr. Ray Pollon

Box 263
Canora, Saskatchewan, CANADA
S0A 0L0

January 02, 1997

Dear Mr. Bill Hull

I just received the December newsletter, and as usual it's OUTSTANDING!
S.C.C.of A. RULES! I thought with the amount of time and energy you devote to this club, the least I could do is let you know it's most appreciated and hope that the club continues to prosper.

Its also nice to know, after reading the other issues of the newsletter that I am not the only one know puts the club card on the windows of other SC owner cars or drop the task at hand to read the new issue of Chargin' Thunder. I am interested to know how many Canadian (eh!) members there are in the club.

I really enjoy seeing pics in the newsletter of the meets that SC owner's attend, it fun to see what other people have done to make the ride unique.

I currently own a '89 white SC, little has been done to the car other than a SONY 10 Disc changer, rear spoiler, Comp T/A's, and a K & N Filter. I plan on upgrading the sound system (FM Mod. changer just doesn't cut it), and a security system (VIPER system) I also want to add a factory keyless entry, can you give me an idea what I would need to do this (will the keypad plug into existing power lock wiring or is there more involved?)

Finally, Bill take care of yourself, I have been working ambulance for nearly 10 years and have seen many things, the one thing I have come to learn is that *you don't have anything, if you don't have your health!*

Ray Pollon
EMT

bassman@sk.sympatico.ca
(friends e-mail where I can be reached at)



January 15th, 1997

Bill Hull, President and Editor
Super Coupe Club of America
2239 Banbury Street
Charlottesville, VA 22901

Dear Bill,

Just wanted to let you know I just read your newsletter for the first time and was quite impressed! The depth and technical insight of your articles are excellent. I am currently working in the Powertrain Systems section of Special Vehicle Engineering, and prior to that worked in Powertrain Development in the Thunderbird/Cougar section for about 10 years. Although I did work on the S/C in the very early development stages (1986-87) I was relegated to working on the base 3.8L, affectionately referred to by most of us as the "cash cow". I was however, fortunate enough to work right next to several very talented people who did the calibrations for the S/C and were in my opinion, the heart and soul of the "Coupe". Since we worked with the same designers, I was witness to the many trials and tribulations that plagued the car from day one, until it's quiet passing in 1995. Many things contributed to the demise of the Coupe, including government regulations, declining sales, and one thing I think hurt the car badly, was because of the many additional parts required over the base car, Lorain had a devil of a time building them! Not that they didn't bust their behinds to make it great, the design was just not overly "assembly friendly". The people at Lorain are as dedicated to making dynamite cars as any plant I've ever been to. (and I've been to a bunch!) Enough about that. The cars themselves are dynamite! I've driven every level of prototype and production vehicle all the way back to when we used 1985 Fila bodies for the first prototypes, and man have they matured with age. Sure, they are more than a few pounds on the portly side, (This was a BIG issue during development of the car!) but do they cruise as smooth as a baby's behind! There were more than a few of us "gearhead" development types who begged for the S/C in a Mustang and or Ranger as a stealthy bandit to sting uninformed Z-28 types before they knew what hit 'em! We built a couple of pre-production SN-95 cars up with some old 3.8 S/C development motors and 4R70W transmissions. The first black one affectionately dubbed the Superstang was bone stock except a 3.73 gear and ran mid 14's all day at Milan in 90 degree heat and NEVER even got hot. The second orange car dubbed "Ultrastang" had a stock motor save for the 89 m/y manual camshaft, and minor clean up in the head port. A 150 lph pump and a 4.10 gear. How about consistant 13.85 @ 98 mph all day long? This was with slicks and oops, almost forgot a 2.8 ratio blower pulley vs. the 2.5 ratio stock piece. These cars were flogged unmercifully for almost two years and nothing broke! (The thrust bearings did get pretty eaten up from the converters ballooning...) Trust me, it was a riot spanking those shiney new 5.0L Mustangs and Cobras too! When they'd ask me what was in it, I'd smile and say..."it's just a little ole 3.8L V-6"

Keep up the great newsletter, although as some of your readers commented in the December 96 issue, it is much more than just a newsletter, and I agree with them! Loved your bashing of the Superchip gang!

ps... There are many of us at SVE who hated to see the SVT Thunderbird cancelled. It was an awesome package! Maybe someone will reconsider... never say never!

Dave Dempster
Powertrain Systems Engineering
Special Vehicle Engineering (AVT)

Dear Mr. Hull,

Thought I'd drop you a line. I received the September newsletter and it's great that our membership is rising so fast. That reminds me, if you could you send me about five club cards so I can give them to fellow SC owners here in Europe. I have seen five others in Germany. Speaking of Germany, there is nothing like cruising down the autoban at 120 mph all day(no speed limits).

I didn't see much on your SC. I hope the motor is coming alone. Can't wait to see the dyno and the times on it. I received my parts and I can't wait to put them on. I hope you don't mind me giving the club's name to NR Automobile Accessories, the manufactures of the colored gage faces. These gage sets are awesome! It really sets the dash off from all the "other cars". I have enclosed some directions about installing them. Please feel free to publish them to the club members or they can write me or even call if they want to call Belgium.

Did you see the SVT T-bird in Muscle Mustang and Fast Ford(Oct.96)? It has a 390hp, supercharged 4.6 liter, what a BEAST. Its sad that Ford scrapped the program. They say that the \$28,000 price tag will not make Ford enough money. In my opinion, charge \$30,000 and make them a limited edition. I'm sure someone will buy them. Look what happened to the Cobra 'R'. I wish MM and FF would run a better story with color pictures on the SVT T-bird.

I have an idea about the newsletter. I don't know how hard or how expensive it would be. How about featuring a members SC, in color, with a small write-up about it. You can call it "Super Super Coupe" or "SC of the Quarter". I always love seeing a nice SC, especially with mods. Just an idea.

I liked the "Chips and Dips". It should have been "Chips, Dips, and RIPPED OFF". I am the proud owner of a Hypertech Chip and what a waist of \$200. My SC sputtered around until I had to take it off. I wrote Hypertech twice and no response. Guess I'll just write it off as a huge mistake.

Is there any way to get a picture of the front air dam offered by A&A Fiberglass and a list of the colors for the seat covers and inserts? Oh well I'll let you get back to what you were doing. If there is anything I can do for you or the club please let me know! Have a great Christmas! Maybe Santa will bring me some custom wheels.

Sincerely,

Robert C. Dill

Instructions for Colored Gages

TOOLS NEEDED: Philip screw driver, small Philip screw driver, No. 10 and 15 torx bits.

1. Please read the manufacturers instructions first.
2. Remove the two Philips screws that hold the black dash insert to the dash. The screws are located under the top lip of the dash above the gage cluster.
3. Pull the headlight switch knob off. It will be kind of difficult to do. Gently start pulling the insert from the dash. There will be two hook type fasteners located on both sides of the steering column. These may take a little work but they will come off. After the insert is pulled away from the dash, unplug the automatic headlight dimmer switch (if equipped).
4. The clear cover will have to be removed before the cluster can taken out of the dash. Using the torx bit, unscrew the 7 screws, unscrew the trip mileage reset, and work the cover off. Then remove the gray cover.
5. All the gages, except the boost and fuel gage, can be pulled out of the gage housing. Just grab the clear plastic around them and pull straight out gently not to move the needles.
6. After the gages have been placed safely out of the way, remove the 4 torx screws that hold the gage housing in the dash. Flip the housing up toward the windshield and unplug the two plugs and the boost gage hose(a little muscle is needed for this). Pull out the housing.
7. Place the housing face down and remove the torx screw holding the boost gage. Remove the gage and put the housing out of the way.
8. Work on one gage at a time!!! Some needles will not fit or work on the wrong gage!!! With the tool provide, gently lift off the needle. If you notice the needle is painted white on the back. This will not show up on the faces. The paint can be sanded off with 1500 grit paper. You can separate the needle from the circle by either melting the fasteners or by drilling them off. DO NOT LOOSE THE WEIGHTS!!! Now gently sand off the paint. You can paint the backs of the needles any color you wish (red is nice) with plastic model paint. After the paint has dried, glue the needle back to the circle part with model cement.
9. The factory gage covers can be pulled off at this time. If working with the speedo or the tach you first have to unscrew the small screws. They are glued on by contact cement. Now put on the new gage and ensure proper fitting and proper needle travel. A small amount of glue can be used to secure them to the gage. Gently replace the needle. If the location of the needle is forgotten or moved it will have to be put on will the car is operating.
10. After all the gages are re-assemble, replace the gage housing into dash and then the gages. Just push them in. Before you put on the gray cover, start your SC and check for proper function. If the speedo is wrong, while still in the dash, pull off the needle, put it at 30 mph and push onto the pin. The Needle should fall to trip reset. If not keep, working with it.
11. Put the gray cover and the clear cover on. Screw into place. Replace the black insert, connecting the automatic dimmer switch. Screw into place. Push the headlight switch knob on.
12. Enjoy.

Any questions you can write me at: Robert Griffin
RSGS B SQN
CMR 450 #3231
APO AE 09705

You can call over seas at 011-32-65-22-66-24 (7 hours ahead of EST)

utechniques

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Mr. Bill Hull, President
Super Coupe Club of America
2239 Banbury Street
Charlottesville, Virginia 22901

Dear Bill,

Happy Holidays. Let me first apologize for not writing sooner. I have been very busy this year. I was married and purchased a house this fall. Enough excuses, I have a lot to say and ask.

Thank you for the great SCCoA window stickers. Also thank you for the color photo of your SC on the cover of June's *Chargin' Thunder*. I was disappointed *Superford* did not print a color photo. I guess if you don't drive a 5.0 Mustang....

My wife and I own a 1990 Cougar XR7 and a 1995 Taurus SHO. Both are 5 speeds. We are members of the SCCoA and the SHO Registry. I have been a blue oval boy all my life. My father retired from Ford after 31 years. I subscribe to *Superford* and *Ford High Performance*. My first car was a '66 Mustang. Well, you get the picture.

The Cougar is my daily driver and has over 96,000 miles. I purchased it used in May of '94. Unfortunately the car has suffered several Michigan winters; it is an uphill battle fighting oxidation. It is in excellent shape though. As you can see by the enclosed photo, the Cougar is red with black interior. It is stock except for a K&N air filter. I believe it has every option including moonroof, JBL, cd, and leather. No AOD though. I haven't seen the production numbers for '90 and '91 XR7's. If you have any information it would be greatly appreciated, especially 5 speed production numbers. I suspect this car is fairly rare.

I've just moved to the Lake Michigan shoreline area. The amount of snow and bad weather we get here is significant. I've even considered selling my baby. I don't want to, but I fight these practicality demons almost daily. I did purchase some Michelin XGT V4's last fall. I would recommend these to anybody driving a rear wheel drive car in poor weather conditions. I would love to find/buy another Cougar exactly like mine but with low miles. Seen any?

ideas for hire!

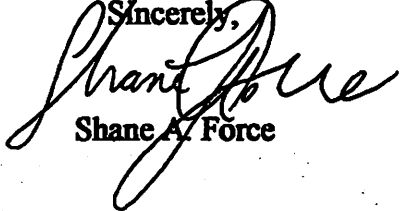
utechniques

339 East Street
Rochester, NJ 48307-2017
810.65.65.111
Fax 810.65.68.636

I recently was able to buy a set of 17" wheels from the never produced SVT Thunderbird. The look great. I'll send you another photo when I put them on in the spring. This is my first major performance upgrade. I realize the money could have been better spent, but when would I ever have a chance to buy these wheels again? This brings me to my next question. Now that I have the 17's, I'd like to do a brake upgrade in the spring. What is available? I see you have a Baer upgrade for the fronts. What about the rears? Are there any others out there?(like maybe Cobra R from Ford Motorsport if they'd work)

Speaking of the SVT Tbird. I guess *Motortrend* (Aug 96) decided to go with the SVT Ranger instead. What a shame. Some information to pass on to Mr. Jon Thibodeau regarding the Borg Warner T56. Check out *Ford High Performance*, Aug '95 and Oct '95.

In closing let me thank you for starting this great club. I have enclosed a check for an additional \$15 to help offset your costs. If you can please send me a few more of your business cards, I have given all of mine away. I hope to attend some SCCoA events this summer. If I decide to keep the car, I will be in touch regarding some serious performance upgrades. If anyone sees a '90 XR7, 5 speed for sale with low miles, preferably from the south (I know I'm asking a lot) please let me know. Oh, one last thing, I forgot my membership number, please let me know what it is.

Sincerely,

Shane A. Force

P.S. please change my address from
321 Knapp
Brooklyn, MI 49230
(517) 592-8434

to
1127 Pennoyer
Grand Haven, MI 49417
(616) 847-6947

ideas for hire!

"GET BLOWN OR GET BLOWN AWAY!"

February 18, 1997

I have to admit. I have never been a "club" person. When Bill called me last summer telling me about a club, I was real skeptical about joining. I figured it would be a newsletter of ten pages talking about what color and options the SuperCoupe comes in, and that's fine if that's what you're into. The SuperCoupe in stock trim is a very nice car, it's just that I was on a mission - 12 second E.T.'s and triple digits for the mile per hour. I was so used to getting no information from other sources about the 3.8, I started intensive research of my own. That's why I'm glad to see that with Bill's effort a lot of valuable information is put into each newsletter.

Bill tells me that we have almost 400 members now, so I would like to introduce myself to the new members. I'm Neal Frisbie, owner of the fastest SuperCoupe in the country. **THE QUESTION - WILL I KEEP MY TITLE IN 1997?** I can't say. I know that there is readily available parts to let anybody run in the 12s. But it isn't just a matter of bolt on parts to go that fast. With my many conversations with Bill, he has entitled me "cylinder head research guru". (I wonder what the salary is for this title?)

I do not claim to be an expert, I do have a lot of knowledge. I've fooled around with heads for many years and continue to learn more about them everyday. The latest lesson - bitterness of poor quality remains long after the sweetness of a low price is forgotten. As always, the right tool for the job makes all the difference.

For anyone that is going to do some porting of their own or having a "professional" do it, here is some information to help get honest numbers for comparison. First, find out what size flow bench will be used. My buddy and I have talked to SuperFlow, at distributor shows and over the telephone. They recommend that a 400 c.f.m. bench be the smallest bench used. They make a 110 c.f.m., 400 c.f.m. and a 600 c.f.m. unit. The 400 c.f.m. unit will be around a \$5,000 investment, so only serious shops will have one. The 110 c.f.m. unit is much cheaper at around \$1,300. The shops that use these machines will tell you that they can flow a head even up to 300 c.f.m. by flowing the head at a lower column of water reading and then converting it to the standard 28" of water. This is how my heads were flowed and the numbers are not true! My numbers indicated the intake didn't flow anymore c.f.m. once you past .450 lift. The exhaust numbers were close but not accurate.

After we talked to SuperFlow, they said a 110 c.f.m. bench is meant to flow heads for small horse power engines. It just doesn't have the volume of air to generate the inches of water needed to produce real numbers.

Since my buddy and I are still working on coming up with \$5,000 for our own bench, we did the next best thing, we found a bigger bench. I'm not into sports much, but I do know who Larry Nace is. He is at my home track of Norwalk Raceway quite frequently. On a slow day, his car runs mid 7's. Fortunately, he stores his cars up the street from me and his engine builder is about a twenty minute drive from my home. This engine builders has a J.K.M. 400 c.f.m. unit that is modified to flow 600 c.f.m.. Now we can get accurate numbers, but SuperFlow is the standard in the industry. Their set-up involves taking percentages of what the machine flows and changing orifices when lifts are above .400 of an inch. J.K.M. machines don't use metering orifices, they use a Pitot tube. With this difference, J.K.M. says that their higher lift numbers will be .05% to .07% lower than SuperFlow numbers.

So now that you know about the differences in benches, there are also differences in the set up to flow a head. Both companies agree that when flowing the intake, it needs the actual intake manifold on the head or an air horn entrance made out of clay. This smoothes the incoming air into the port compared to the 90° edge of an open port. The exhaust port should have an exit pipe held up to it when being flowed. The pipe should be 4 to 5" long and the diameter of the header or manifold opening. This simulates the header tube and smoothes the turbulence in the port. The other main factor, is having an adapter that simulates the bore of the cylinder. Using one larger or smaller will affect the numbers.

I've gone over all this because more people are having head work done and comparing (or should I say, bragging) about the flow numbers. If one person had his head flowed, what is called "bare flange" - no air horn entrees and no exit pipe - his numbers will be down 7 to 10%. The other important factor is head porters always want bragging rights and will sometimes fluff the numbers. This is easy to do because flow benches measure pressure differences not c.f.m. So now factors such as air temperature, humidity, barometric pressure and elevation come into play. There are correct factors for all of these, course, with elevation being one of the biggest. You can bet that all advertised flow numbers in magazines are corrected to sea level. This means where I live at just 700 feet above sea level, my flow numbers would be down 10% compared to those listed.

So, if you are looking for low 13's or even faster, you have to do head work. At the minimum, the exhaust has to be improved. I have found that every time I make a 30 c.f.m. change in the exhaust port, the car responds to it. These heads, with a little effort, really wake up and can flow what some of the after-market heads for the 5 liter pony car flow.

With my test head, I have reached well over 200 c.f.m. with the stock intake valves and around 200 c.f.m. on the exhaust with a 1.6 diameter valve. I believe the head is capable of 230 c.f.m. on the intake and 210 c.f.m. or better on the exhaust.

Now a quick comment on a product from Entech Corporation called "Energy Release" (E.R.). To put it simply, I am a believer. I have a small milling machine and lathe in my shop and have used these machines to put E.R. to the test. It does what it claims, it out performs the other anti-friction additives that I have tried. I will be using E.R. in my engine oil, transmission, power steering and blower from now on.

If you have any questions or need some head porting done, I can be reached at (216) 366-5979 after 3:00 p.m. EST.

Neal Frisbie

Enlarged Blower Top Evaluation Report

by Charles Warner

I recently received my long awaited Enlarged Blower Top and upon opening the box I became quite convinced this modified top from SCCA is the ticket. The enlarged top came with everything needed for a successful installation; bolts, flange sealer, anti-seize and instructions that include, as one might expect, a splash of Bill's humor. There is nothing humorous about this blower top however, its serious business.

The stock blower top is severely restricted where the air passage transitions from the square top area to the round section just before the intercooler tube nut. The reduction is 50% in this area. By comparison the raised and enlarged blower top from SCCA maintains nearly full cross sectional area through this region and is smooth and aerodynamic.

I started the technical evaluation by measuring the pressure drop between the square section of the blower top and the intercooler tube by tapping into the castings and measuring the pressure difference with a differential pressure gage. The stock blower top measured 2 PSI pressure drop at 6000 RPM! This pressure drop, caused by friction, heats the incoming air causing it to expand, reducing the available air mass. Also, because the blower sees a higher pressure it must do more work reducing available horsepower to the wheels. By comparison the Enlarged Blower Top from SCCA measured less the 1 PSI, quite an improvement.

Part two of the evaluation was an acceleration test. The improvement is quite remarkable. My SC with the stock exhaust and stock blower top accelerated from 20 MPH to 55 MPH in 4.17 seconds. With the 3 1/2 inch exhaust this time was reduce to 3.80 seconds, a .37 second improvement. The Enlarged Blower Top from SCCoA reduced this time to 3.57 seconds a .23 second improvement! This kind of power improvement is not easy to come by in most applications, but lucky for us this part is available from SCCoA. The enlarged blower top from SCCoA is a real power builder and a necessary addition to any performance minded SC owner.

SC Intercooler Evaluation Report

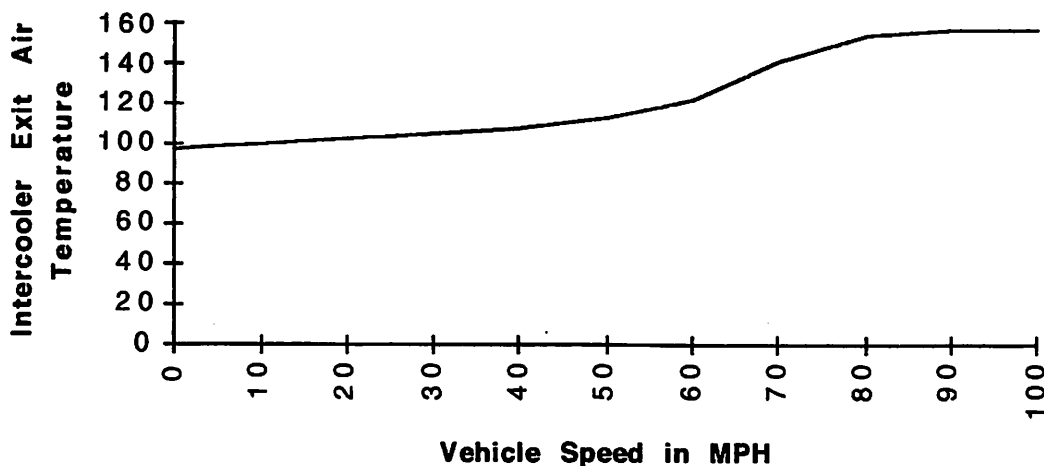
by Charles Warner

The Thunderbird SC sports two power making devices, a Supercharger and an Intercooler. The idea of the supercharger is to force more air into the engine than the engine can normally inhale, thereby allowing more fuel to be burnt, producing more power. The disadvantage is that air gets hot when compressed. As hot gasses expand there are fewer air molecules per cubic inch resulting in less air to burn fuel, hence less power produced. This is where the intercooler comes in. The intercooler cools the supercharger's hot gasses causing the air to become denser, burning more fuel and producing more power.

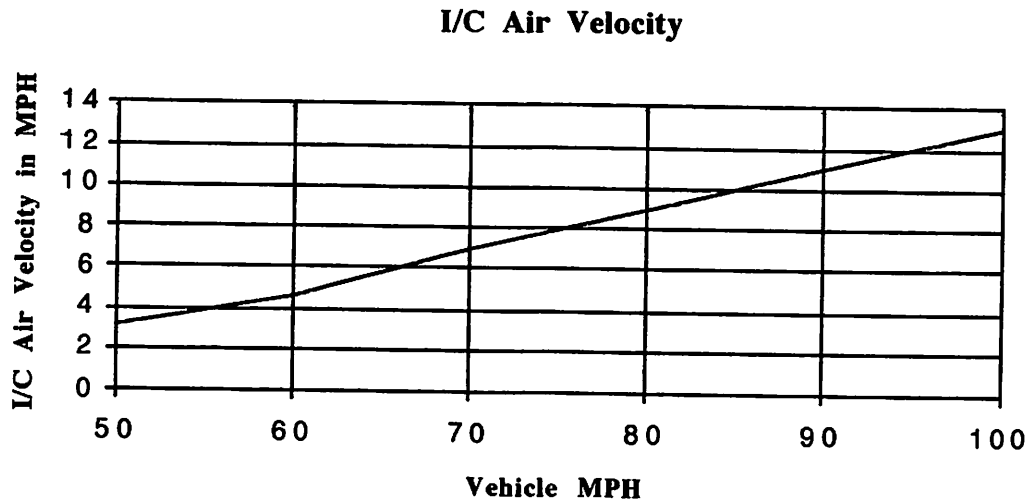
Over the last few months I measured the air temperatures and pressures between the supercharger and the intake manifold, this article reports my findings. The supercharger and intercooler from Ford work quite well, but as one might expect there is room for improvement.

At a normal 60 MPH to 80 MPH cruise the air exiting the supercharger is 160° F to 170° F when the ambient temperature is in the mid 50's. Under full throttle I measured a maximum temperature of 404° F at 6000 RPM! These temperatures were much higher than expected and demonstrate the need for an intercooler. Power increases 1% for every 10° F of air temperature reduction. In this case an intercooler capable of reducing air temperature from 404° to 55° would improve power by roughly 35%. This represents the maximum benefit one could expect from an intercooler when running 15 PSI boost.

How good is the stock SC intercooler? See chart below. Note, exit air temperature measured while accelerating under full throttle.



Ambient cooling air velocity measured at various vehicle speeds is displayed in the chart below. Note, air speeds were too slow to measure, with my equipment, when vehicle speeds were below 50 MPH.

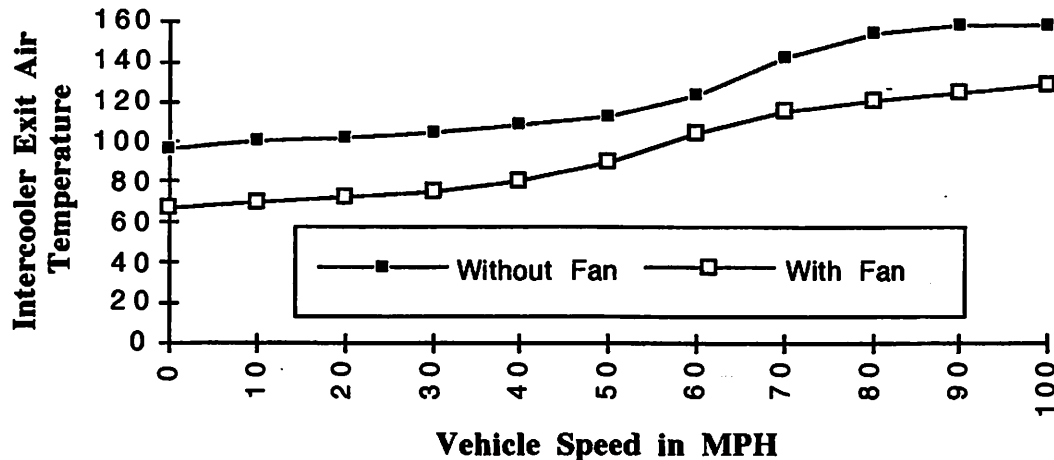


What I learned by making these measurements. First, the intake system including the intercooler, supercharger and intercooler tubes are heated by the engine and are quite warm even when the engine is under very light loads. Between 60 MPH and 80 MPH the intercooler's exit air temperature hovers around 100° F, even with light throttle. Around town and in stop-and-go traffic this temperature creeps up to 112° or so with the ambient temperature at 55°. Under full throttle this temperature is much higher. Referring to the first chart you can see that the exit air temperature rises only slightly as the car accelerates from 0 MPH to 50 MPH. From 50 MPH to around 80 MPH the intercooler's exit air temperature begins to rise as the intercooler's mass continues to absorb heat. From 80 MPH and up the intercooler's exit air temperature begins to stabilize since the vehicle speed is high enough to force significant quantities of cooling air through the intercooler, extracting heat from the air charge. Note that at 100 MPH there is three times as much as air moving through the intercooler as at 60 MPH.

Next I installed the intercooler fan from SCCoA and saw a significant improvement. With fan running and the car parked the ambient air moving through the intercooler has a velocity of 4.5 MPH. Although this is not very high it is enough to make meaningful improvements. I noticed a reduction in all temperatures throughout the system. At a 60 MPH to 80 MPH cruise the intercooler's exit air temperature was only 67° compared to 100° without a fan. Around town the exit air temperature with a fan rose to only 75° compared to 112° without a fan. Also observed was a reduction of supercharger air

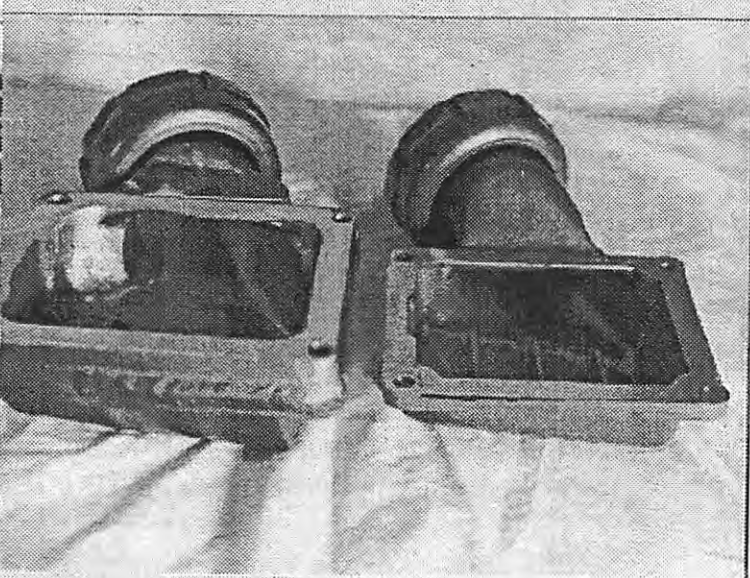
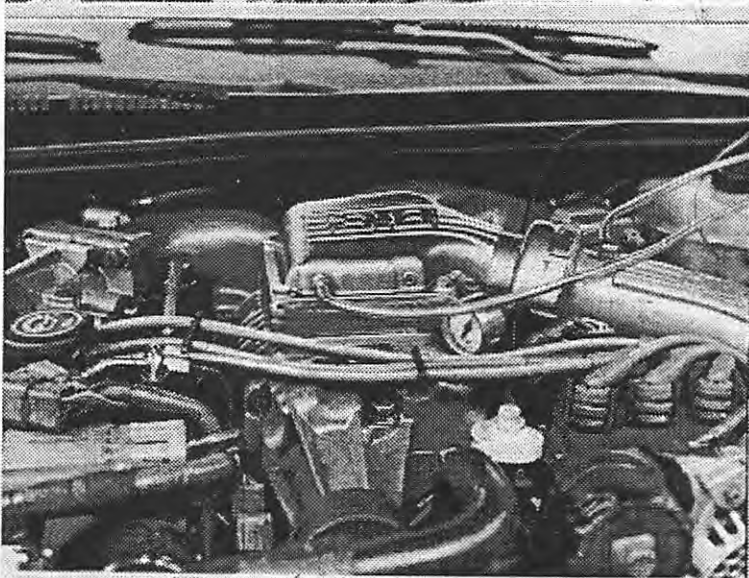
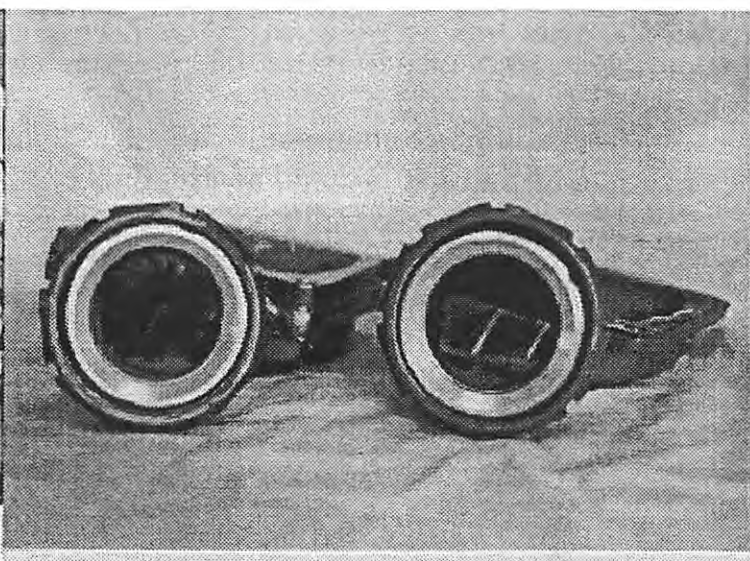
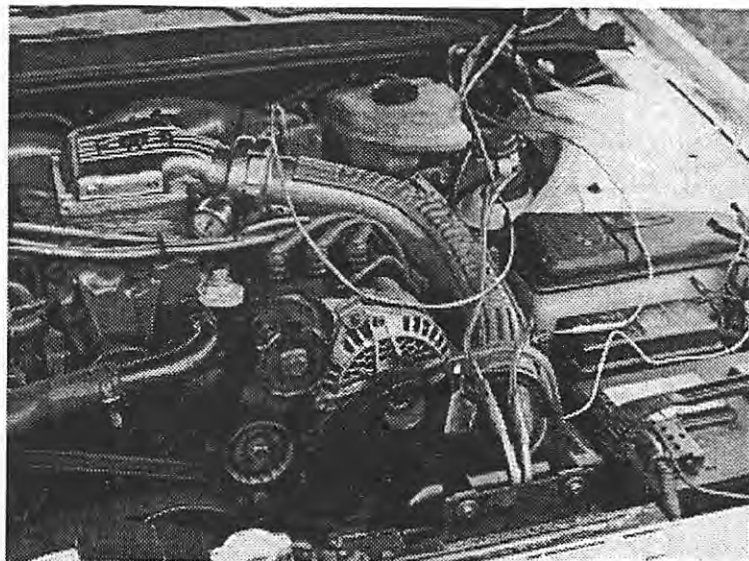
temperature from around 175° to 123° at cruise speeds. This might seem a little odd at first but is explained by the fact the SC has a supercharger bypass which under no boost conditions circulates air from the intercooler back to the supercharger's intake. This cool air cools the supercharger and tubing.

Below is a chart showing the improvement using an intercooler fan under full throttle acceleration.



On the average this is an improvement of about 30° that translates to about a 3% improvement in power or about 10 HP, not bad for a \$90 part.

Next I measured the pressure drop across the intercooler and again found room for improvement. At full throttle and 6000 RPM I measured 3.5 PSI drop across the intercooler, not good! The reason, the SC intercooler is much too small, at least for high RPM operation. Spearco recommends designing an intercooler with a pressure drop of 1 PSI or less. What this means is the supercharger is working much harder than if the SC had a larger intercooler. If you read 12 PSI boost on your boost gage the supercharger is really pumping out something like 15.5 PSI! This requires extra HP to drive the supercharger and is part of the reason I measured temperatures from the supercharger as high as 404°. According to the numbers there is something around 50 HP improvement possible by going to a much more efficient and larger intercooler. I plan to design a high flow intercooler system for my SC using a large Spearco intercooler. Those of you out there who are handy and have the need for speed can do the same. Have fun!



Photos showing SC Blower Motor instrumentation connections.

You all know about the Darwin Awards

It's an annual honor given to the person who did the gene pool the biggest service by killing themselves in the most extraordinarily stupid way.

Last year's winner was the fellow who was killed by the Coke machine, which toppled over on top of him as he was attempting to tip a free soda, out of it.

Now we present this year's winner:

The Arizona Highway Patrol came upon a pile of smoldering metal embedded into the side of a cliff rising above the road at the apex of a curve. The wreckage resembled the site of an airplane crash, but it was a car. The type of car was unidentifiable at the scene. The boys at the lab finally figured out what it was, and what had happened. It seems that a guy (or gal) somehow got hold of a JATO (jet Assisted Take Off) unit that is used to give heavy military transport planes an extra 'push' for taking off from short airfields. These are solid-fuel rockets which burn as the airplane starts down the runway, then are discarded once the fuel is spent. (They don't have an 'OFF' switch. They burn until the fuel is gone.) He took the JATO and his (her?) Chevy Impala out into the desert, found a long, straight stretch of road, attached the JATO to the car, jumped in, got up some speed, and fired off the rocket. Best as they could determine, he (she?) was doing somewhere between 250 - 300 mph when he came to that curve ... The brakes were completely burned away, apparently from trying to slow the car.

The facts as best as could be determined are that the operator of the 1967 Impala hit JATO ignition at a distance of approximately 3.0 miles from the crash site. This was established by the prominent scorched and melted asphalt at that location. The JATO, if operating properly, would have reached maximum thrust within 5 seconds, causing the Chevy to reach speeds well in excess of 350 mph and continuing at full power for an additional 20-25 seconds. The driver, soon to be pilot, most likely would have experienced G-forces usually reserved for dog-fighting F-14 jocks under full afterburners, basically causing him to become insignificant for the remainder of the event. However, the automobile remained on the straight highway for about 2.5 miles (15-20) seconds before the driver applied and completely melted the brakes, blowing the tires and leaving thick rubber marks on the road surface, then becoming airborne for an additional 1.4 miles and impacting the cliff face at a height of 125 feet leaving a blackened crater 3 feet deep in the rock.

Most of the driver's remains were not recoverable; however, small fragments of bone, teeth and hair were extracted from the crater and fingernail and bone shards were removed from a piece of debris believed to be a portion of the steering wheel.

HOLY COW!!! Some Bow-Tie buffoons will do ANYTHING to try to keep up with Super Coupes!! The above article sent to me by James Pearce, SCCoA member, Cherry Hill, NJ. Thanks James!

P.S. - As promised in Dec 96 Chargin' Thunder, I have some "HOT TIPS" on swapping the Mazda M5R2 5-speed for a World-Class T-5, a T-56, or a HD Tremec. I also received this info too late to include in this issue. Call for details if interested.

WHAT'S IN A NAME?

By Bill Evanoff

The naming of an automatic transmission is likely an after thought in the entire process of designing and manufacturing a new model. Ford has historically used simple nomenclature most can remember easily. FMX, C6, C5, and C4 are famous examples of rear wheel drive transmission names from the past. The AOD is also now an old example and was used in automatically shifted Supercoupes from 1989 to 1993.

For the 1994 model year, the AOD was updated and strengthened and subsequently renamed the 4R70W. "The 4R*#@# WHAT?", you ask. "What about the AOD-E"? Were the Ford engineers hangin out in a back room of the Automatic Transmission Operations building smoking tranny fluid soaked pot when they dreamed that name up? Had they been keeping company with Chief Engineer, Jamie Turvie of Superchips, and his computer chip enhanced stash? Not likely, because Ford did have a method to their madness in this name and others like it to come on future transmission programs. The numbers and letters can be explained simply.

4....Four speed transmission

R....Rear wheel drive application

70....

W....Includes a wide ratio gear set

Several years ago Ford began standardizing transmission naming and the updated AOD was the first to be renamed. For instance, the new 5 speed automatic transmission in the '97 4.0L OHC Explorer is called the 5R55E (E = Electronic). Another new 5 speed automatic transmission that is to debut in the 1999 "DEW98" code named vehicle is called the 5R55N (N = Nonsynchronous). If the T-Bird is redesigned, it will likely have this transmission also if it stays rear wheel drive. Full size truck enthusiasts have also heard of Fords heavy duty successor to the C6...the E4OD. The E4OD is scheduled to be renamed the 4R100E in another year or two. One can easily see by the "100" designation that the E4OD is indeed a heavy duty workhorse by its approx. 1000 ft/lb torque handling capability.

While the 4R70W is mechanically similar to the AOD, it is more than just an "AOD with electronics." There were significant changes to the valve body, torque converter clutch, pump assembly, input shaft and other components. In addition, the split torque function in third and fourth gears has been eliminated to enhance shift quality. The 4R70W uses a Ravigneaux style compound gear set with two sun gears and a dual pinion set to produce four forward speeds plus reverse. Two bands, two one-way roller clutches and four friction clutches are used to hold or drive various planetary gear set members.

Major changes from the AOD to the 4R70W:

Torque Converter - A pressure plate-style torque converter clutch was added to the 4R70W. The bell housing and the converter was lengthened to accommodate the change. The split-torque style converter of the previous AOD was replaced by this converter clutch style.

Fluid Pump - An updated gerotor design replaced the gear and crescent design of the AOD. The new pump has approximately the same pumping capacity as the old one, but has a higher flow at lower engine speeds due to better efficiencies. The 4R70W pump housing is made of aluminum, making it lighter than the AOD pump.

Main Control Body - The thickness of the valve body was increased for more rigidity. Three electronic solenoids (two shift solenoids and a torque converter clutch control solenoid) were added and most spool valves were changed to aluminum for reduced leaking and more consistent operation.

Electronics - The tie-in between the transmission, the engine and other vehicle systems is now electronic. This provides more accurate information (on temperature and engine load, for example) for smoother, more accurate shifting. Some of the new components you will find on the 4R70W transmission include an output shaft speed sensor, a manual lever position sensor and a transmission electrical connector. What you won't find on the 4R70W are the TV cables and linkages of the past.

AOD-E

So, why do most national magazines continue to refer to all '94 and up T-Bird and Mustang transmissions as the AOD-E? It could go back to the reasons mentioned first in this text. Its simple and easy to remember...but often incorrect.

I can now throw in another zinger into this name game. There actually was a transmission called the AOD-E. It was produced for four years, but was only available in '94/95 Mustangs and some '92/93 Trucks. The AOD-E retained the AOD's weaker gear set and stodgy gear ratios but otherwise was identical to the 4R70W. Both were made at Ford's Livonia Michigan Transmission Plant. The AOD-E was the less expensive of the two transmissions to manufacture. This was the main reason the SN-95 Mustang team chose it instead of opting up for the 4R70W transmission which included the new wide ratio gear set and increased torque handling capability. After several years of making the AOD-E and 4R70W on the same assembly line, the Livonia plant finally said, "Enough". The added complexity of model changeovers and relatively low volume for the AOD-E equipped vehicles had eliminated any cost saving vs. 100% 4R70W production. So, for the '96 model year the modular motored Mustang debuted with a 4R70W transmission also. The wide ratio gear set and also a switch from 3.08 to 3.27 rear gears were obviously necessary to keep the 4.6L 2V engine from totally being an embarrassment compared to the venerable 5.0L. Ok, OK, enough of the Mustang history lesson.

Now everyone understands that the '94/95 SC automatic transmission is not an AOD-E. What about the next most common name...the AOD-EW? This name is acceptable and even acknowledges the improved wide ratio gear set and electronic controls. But its almost as confusing and as long as the correct name.

F.M.S. Wide Ratio/Upgrade Kit

Ford Motorsport realizes a good thing when its available for their catalog. Their catalog is full of current and past production parts that enhance performance or durability. The wide ratio/upgrade kit (#M-7398-D) for the AOD shown in the catalog is a production part manufactured at the Livonia transmission plant specifically for the 4R70W. F.M.S. buys it factory direct and repackages it in a kit form that you and I can buy from our favorite Supercoupe Club parts list to upgrade and rebuild our aging AODs.

It is a complete "hardware" kit for rebuilding an AOD. It includes a new direct clutch assembly, sun shell assembly, reverse assembly, forward clutch hub, reverse/forward clutch assembly, 2" wide overdrive band, intermediate clutch pressure plate, intermediate clutch steels and friction plates and #2 through #9 needle bearing thrush washers. Verses a standard rebuild of an AOD, the kit offers an improved intermediate one-way clutch, wider overdrive band, and improved lube for the forward clutch hub as well as needle bearing thrust washers and improved support washers. Also, the wide ratio gear set offers a stronger gear design capable of higher torque handling capability than the AOD gear set.

The entire F.M.S. kit should be viewed as a substantial durability improver for an AOD with a small side benefit of improved acceleration in first and second gear and reduced gear noise. A down side to the wide ratio kit is that the ratios between the gears are, well...wider obviously. RPM drop between gears will be increased which for a small displacement engine can be a problem. The 3.8L SC has a tremendously broad torque curve, so this problem is minimized. Drag racers prefer a close ratio set of gears accompanied with a very steep rear gear because it provides quick acceleration and keeps the engine at its peak power with minimal RPM drops between shifts down the track. The problem is this setup equals a gas hog for street use. A transmission with a wide ratio gear set accompanying a moderate rear end gear of approx. 3.55:1 will produce a satisfying car for drag, closed track, or street use.

1995

TRANSMISSION LINE-UP — PASSENGER CARS AND LIGHT TRUCKS

TO BE 4R100

E40D Automatic Transmission

Manufacturer/Assy. Plant Ford Motor Company/Sharonville, Ohio

Transmission Type 4-Speed Automatic Overdrive Transmission —
Electronic

Gear Ratios

1st	2.71
2nd	1.54
3rd	1.00
4th	0.71
Rev.	2.18

Gear Range Selection P - R - N - OD - 2 - 1

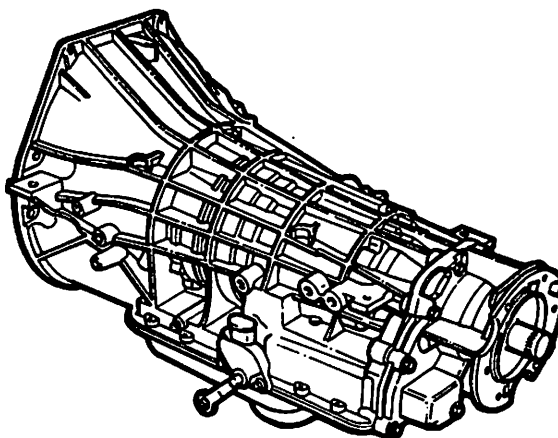
Fluid Refill Capacity 14.8 Liters (15.7 qts.) (4x2)

15.3 Liters (16.2 qts.) (4x4)

Fluid Recommendation MERCON®

Availability

- F-Series 150/250/350
- F-Super Duty Chassis Cab
- Motorhome Stripped Chassis
- Econoline 150/250/350
- E-350 Commercial Cutaway
- Bronco



AODE Automatic Transmission

Manufacturer/Assy. Plant Ford Motor Company/Livonia, Michigan

Transmission Type 4-Speed Automatic Overdrive Transmission —
Electronic

Gear Ratios

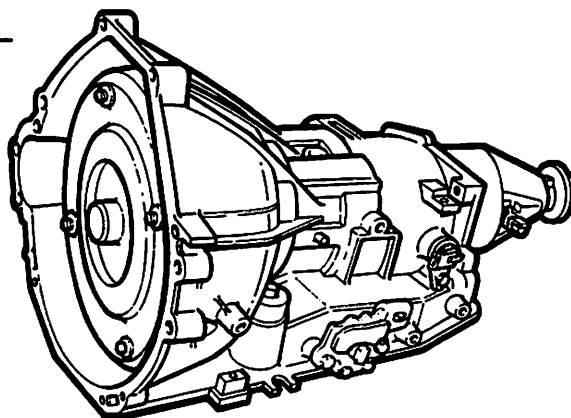
1st	2.40
2nd	1.47
3rd	1.00
4th	0.67
Rev.	2.00

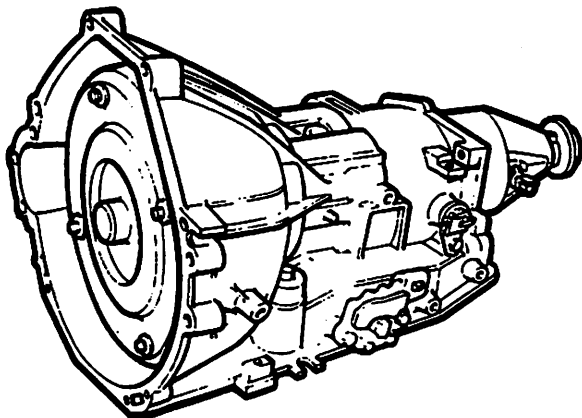
Gear Range Selection P - R - N - OD - 2 - 1

Fluid Refill Capacity 12.9 Liters (13.6 qts.)

Fluid Recommendation MERCON®

Availability Mustang





4R70W Automatic Transmission

Manufacturer/Assy. Plant Ford Motor Company/Livonia, Michigan

Transmission Type 4-Speed Automatic Overdrive Transmission — Electronic

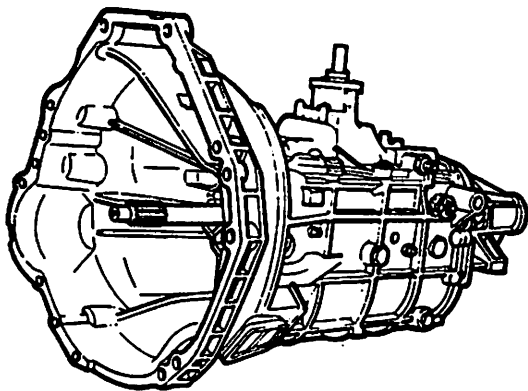
Gear Ratios	1st	2.84
	2nd	1.55
	3rd	1.00
	4th	0.70
	Rev.	2.32

Gear Range Selection P - R - N - OD - 2 - 1

Fluid Refill Capacity 12.9 Liters (13.6 qts.)
11.8 Liters (12.5 qts.) — 4.6L 4V only

Fluid Recommendation MERCON®

Availability Thunderbird, Cougar, Mark VIII, Town Car, Crown Victoria, Grand Marquis E/F 150 Series



M5R2 Manual Transmission

Manufacturer/Assy. Plant Mazda/Japan

Transmission Type 5-Speed Manual Overdrive Transmission

Gear Ratios	1st	3.42
	2nd	2.16
	3rd	1.34
	4th	1.00
	5th	0.75
	Rev.	3.26

Fluid Refill Capacity 3.0 Liters
Fluid Recommendation MERCON®

Availability Thunderbird Super Coupe



MN12 Thunderbird 8.8 Differential

The independent rear suspension (IRS) found on 1989-present Thunderbird's and Lincoln Mark VIII's are different from the well known solid axle's found on Mustangs (FOX or SN95), and other rear wheel drive Fords. I will refer to the MN12 Thunderbirds differential here only. The differentials for the MN12 Thunderbirds have come in two sizes 7.5 and 8.8 (diameter of the ring gear). All Thunderbird SC's came with 8.8 differentials and depending on the transmission (automatic or manual) either 2.73, 3.08, or 3.27 ring and pinion gear set. If you decide on replacing or upgrading your Limited-slip or Traction-Lok as it may be referred there are some important things to keep in mind. When upgrading the 8.8 Traction-Lok unit you will find a lot of 8.8 units that were made to fit the solid axle cars but, will not fit the IRS cars without some modifications. For example, if you decide to choose a SVO or Auburn Limited-slip make sure it is a 28 spline and not the 31 spline unit since the halfshafts on the IRS are 28 spline. Second, you will need to machine a "Step" (grove) in both differential side gears in order to retain the Circlip (C clip) that holds the halfshafts in place. A "Step" is a groove that will allow the Circlip to slip over the halfshaft and secure the halfshaft in the differential. The differential has precise tolerances and should not be disassembled or assembled without the proper tools and experience. When replacing or adding a Traction-Lok to your SC that may or may not have one installed the easiest way is to get a stock replacement Traction-Lok unit from your Ford dealer. To determine if your car has a Traction-Lok installed from the factory you can check the axle tag and if the second letter is F, it's a Traction-Lok axle. The total cost will run about \$500 dollars for a new Traction-Lok and installation.

Rick Thomson
95 SC w/AODE

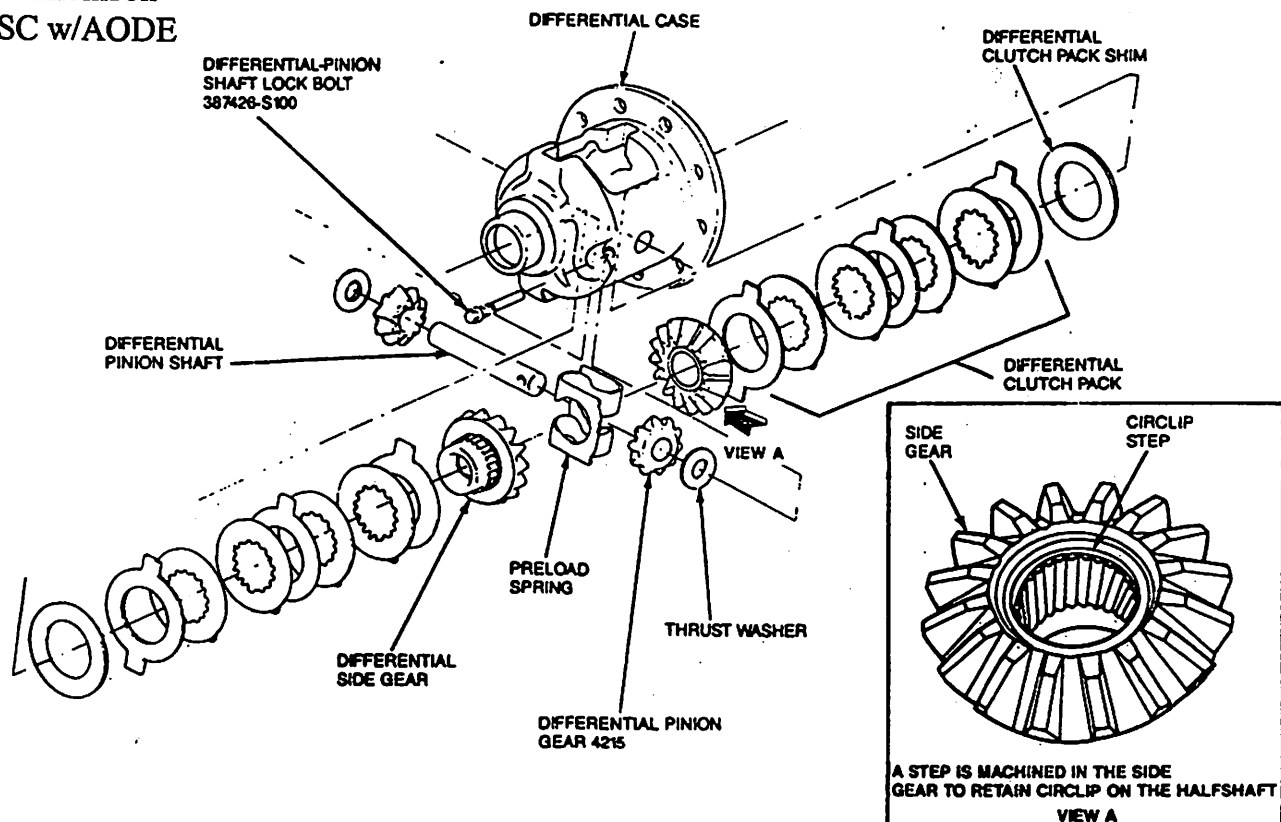
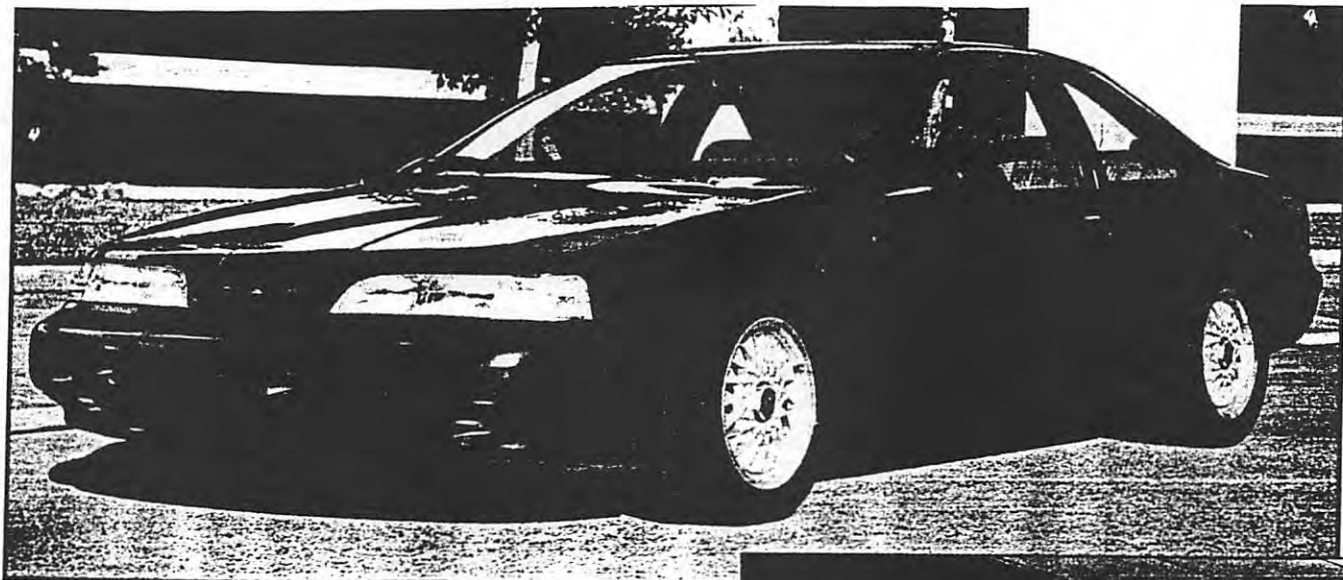


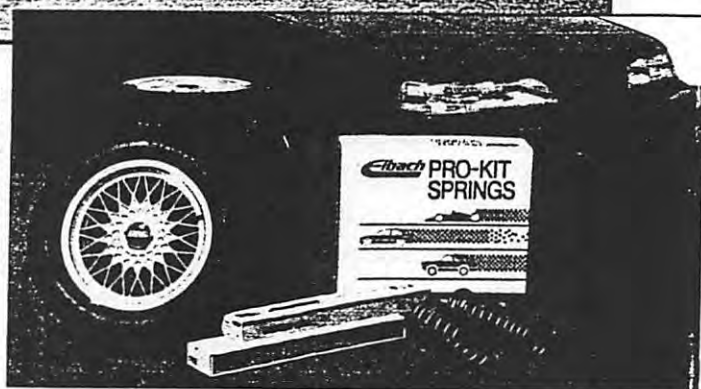
FIG. 110 Exploded view of the 8.8 inch Integral carrier Traction-Lok® differential



Call us Dr. Jekyll and Mr. Hyde about the current Thunderbird LX. We like the styling, the luxury it provides and the advanced features; such as fully independent rear suspension. Naturally, it could use more power out of its version of the 5.0L engine, but what it needs most of all is suspension that is more taut. Stock, the car likes to lean in turns like an inebriated mariner, and suspension control over bumps and washboard road surfaces is too flabby. Ford aimed at luxury; we want handling and a comfortable ride.

To accomplish these goals, a suspension upgrade is necessary and easy to

This '93 Thunderbird LX's upgrade consists of the Eibach Pro-Kit Springs, Bilstein shocks and BF-Goodrich T/As mounted on BBS alloy wheels. Together, they transform the T-bird into a world-class handler.



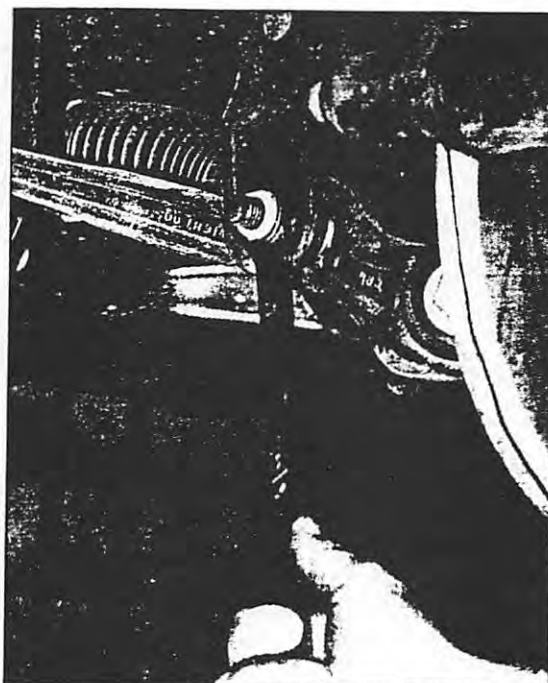
Lean Cuisine

Turn A Flabby Thunderbird LX Into A Lean, Taut Handler With A Bolt-On Suspension Upgrade

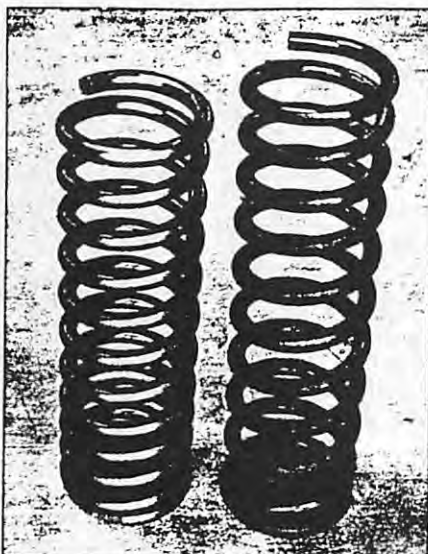
**Text & Photography
By Ken Schwoerer**



Support the chassis securely on jack-stands, and remove the wheels. On top of the strut tower, loosen the retaining nuts from the shock mounting bracket studs located in the engine compartment.



Below, remove the shock retaining bolt from the lower control arm.

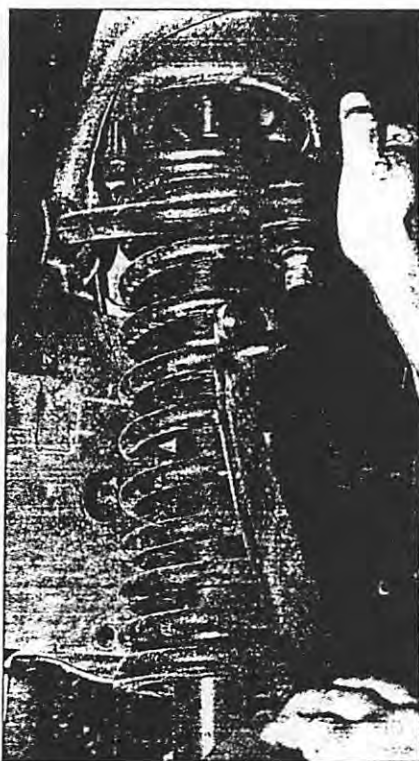


This is a comparison of the Eibach spring next to the taller stock spring. Being shorter overall indicates that it's stiffer. Also, the Eibach is a progressive-rate design, which retains stock ride characteristics, but stiffens as suspension travel increases.

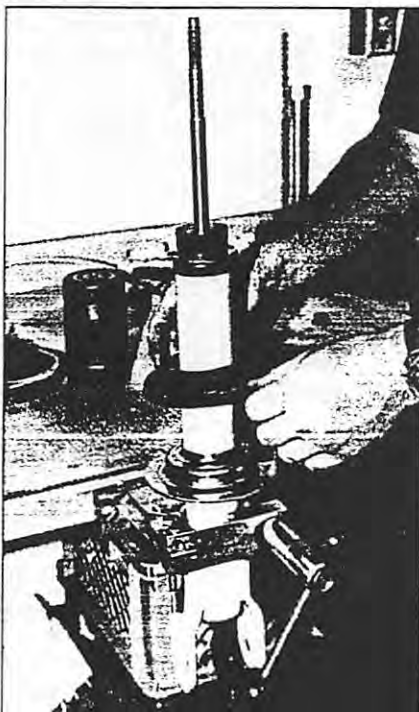
achieve, thanks to a set of Bilstein gas-pressure shocks, Eibach springs and BBS wheels wearing Z-rated BF-Goodrich radials. Together, these components melt suspension flab and make handling a lot crisper. Best of all, this is a bolt-on package, so a day's investment of wrench turning pays off in an '89-'95 Thunderbird that's a lot more fun to drive.

The Bilstein pros offered to demonstrate the shock and spring installation. Bilstein gas-pressure shocks (part No. B46-1505 front, B46-1506 rear) are a single-tube design that employ nitrogen gas to exert pressure on the shock oil reservoir via a floating piston. This design allows dampening characteristics to remain constant because the fluid is always under pressure, eliminating aeration. Hence, the self-adjusting working piston functions at maximum efficiency, particularly when the shock is at operating temperature. Also, the working piston is a raising-rate design, so the faster the shock is cycled, compression and rebound stiffen proportionally.

To complement the shocks, a set of Eibach springs was added. Its Pro-Kit (part No. 3524.140) series is a progressive-rate design, so front springs start at a 285 lbs-in rate and increase to 411 lbs-in. As the spring is compressed, the spring rate or stiffness increases, providing more suspension control, which results in better handling. Rears begin at 514 and finish at 714 lbs-in. Those rear rates sound high, but understand that the T-Bird weighs a bulky 3500 pounds, so the rear springs have their work cut out for them. The bottom line is that braking nose dive is reduced, as is acceleration squat, and the car is flatter in



On top, in the wheelwell, loosen and remove the retaining bolt at the upper control-arm ball joint, freeing the strut assembly for removal.



After the stock-strut assembly is placed in a vice, the spring is compressed and removed along with the spring mounting bracket. With the Bilstein in place, slide the lower spring seat (provided with the shock) onto the tube until it rests on the snap ring located in a groove on the shock body. That's followed by the O.E. rubber spring isolator. Slide the bump-stop down the piston rod until it sits on the shock tube.

turns. Besides the handling, the Eibachs drop the car 1 inch, so the T-Bird looks flat-out cool when slightly lowered.

The last, and by no means least, elements are the tires and wheels. Tires are one single item that most improve a car's handling because they allow the suspension modifications to work at maximum efficiency. This Thunderbird came equipped with a set of weakened P215/75R15 radials. In their place went a foursome of BFGoodrich P255/55ZR-16 Comp T/A radials. Tire benefits are multitude, starting with a larger contact patch for more grip. Also, the shorter sidewalls make the tire stiffer, so steering response and turn-in are improved. The sidewalls' Z-rated tread and body construction allow the Thunderbird to safely exceed the speed limit a couple times over (on a racetrack, of course).

Bigger tires need bigger wheels, so a set of BBS 16x8-inch alloy wheels was installed. BBS quality also includes details like "hub centricity," a highfalutin' term meaning that the hub center bore and other critical wheel dimensions match Ford O.E. specs.

After the last bolts are checked for tightness and the car is lowered off of the jackstands, there's one more item: Because of the height change created by the springs, it's recommended that front- and rear-wheel alignment be checked, since rear-end alignment be as critical as front.

We also pass along a safety tip: Do not attempt this project without using a quality spring compressor. In the case of the front springs, a foolish attempt to remove the spring without a compressor will give you a spring in the kisser. And we assure you, it will hurt. **M&F**

Sources

BBS of America, Inc.

Dept. MF

15320 BBS Dr.

Brashton, GA 30517

770/967-9848

BFGoodrich

Dept. MF

P.O. Box 19001

Greenville, SC 29602

803/458-5000

Bilstein Corporation of America

Dept. MF

8845 Fahco Rd.

San Diego, CA 92121

619/453-7723

Eibach Springs

Dept. MF

15311 Barranca Pkwy.

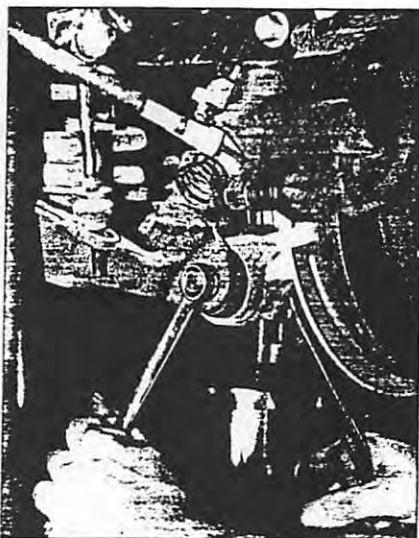
Irvine, CA 92718

714/727-3700

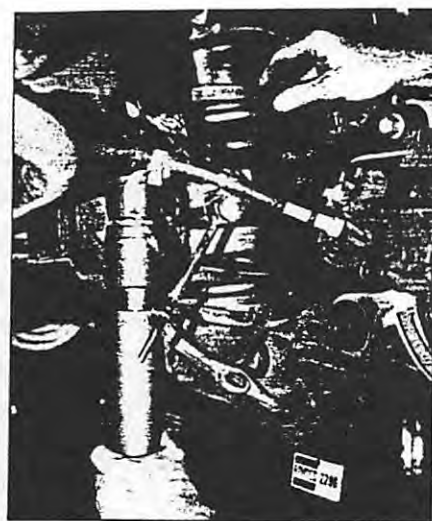
Lean Cuisine



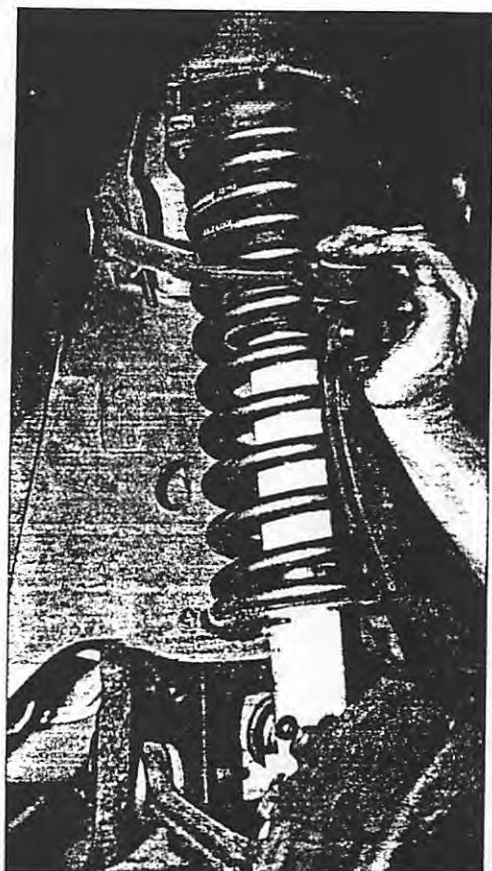
Install the O.E. dust boot, and compress the Eibach spring, positioning it on the lower spring seat. Now add the shock-mounting bracket, and install the retaining nut. The spring is safely contained and positioned so that the compressor can be released.



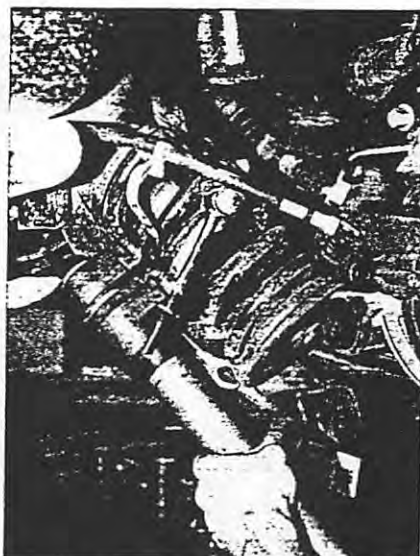
In the rear, remove the old shocks, then unbolt the lower control arm and loosen the antiroll bar connector. Support the brake caliper with a piece of wire, so that the brake-hose assembly isn't strained. Now unbolt the shock retaining nut up top and the bolt at the control arm.



Compress the new spring, and position it on the car. Swing the control arm back and install the retaining bolt along with the caliper assembly. Make sure that the spring is properly positioned in the spring pockets.



Secure the lower strut bolt, and tighten the nuts on the shock mounting bracket studs under the hood to secure the assembly in place. Reconnect the upper control-arm ball joint to the spindle. Torque the nut and install a new cotter pin. Install the wheels, and lower the car. Now tighten the lower shock mounts to eliminate any bushing preload.



Attach a spring compressor on the inboard side of the spring. Compress, swing the control arm out of the way and remove.



Attach the Bilstein to the control arm with the lower shock mounting bolt. Because of gas pressure, the shock will be fully extended. With full suspension droop, the shock top aligns easily with the upper mounting hole where the retaining nut is installed.

Here are before and after shots. The stock suspension sits higher and leans more in a turn as shown in the bottom (after) photo. Plus, compare the skinny P215/75R-15 radials to the P225/55ZR16 Comp T/A radials mounted on BBS 16x8-inch wheels. The bottom line is that four big-tire contact patches are better than four dinky ones.





Thunderbird Club Center
P.O. Box 2909
Farmington Hills, MI 48331

Dear Thunderbird Supporter,

Ford Public Affairs has asked that we pass the enclosed letter on to you. Please feel free to share this letter with your affiliate clubs and members.

Thank you and feel free to give us a call at 1-800-TBIRD10 or contact us at the above address if you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read "Dave Marchand". The signature is fluid and cursive.

Dave Marchand
Thunderbird Club Center Coordinator



Public Affairs
Ford Division

Ford Motor Company
300 Renaissance Center
P.O. Box 43303
Detroit, MI 48243

March 17, 1997

Dear Thunderbird Supporter:

As you may have heard, Ford Motor Company has decided to discontinue Thunderbird production at the end of the 1997 model year.

Introduced originally as a two-seater in the 1955 model year, Thunderbird has evolved over the years into today's two-door mid-specialty coupe model. Ford and its dealers have sold more than 4.3 million units throughout the years.

There aren't many cars on the road today that can evoke the kind of sentiment that the Thunderbird can. In fact, many people will tell you they still get a thrill at seeing the early Thunderbirds that became a symbol of glamour for Postwar America.

In recent years, however, sales of Thunderbird and other cars in the mid-specialty segment have declined as customers moved into four-door sedans like Taurus, sport utility vehicles like Explorer and minivans like Windstar.

Therefore, we intend to restore the Thunderbird magic and return the car to the charismatic specialty vehicle that it once was. :

Thunderbird has been – and continues to be – one of the most successful cars in racing history, attracting legions of fans to Ford. We aren't about to lose our presence in motorsports. We are exploring all our options in regard to our NASCAR race car, including holding over the Thunderbird. But I can assure you – now and in the future – that we will have a competitive car on the race track. We owe that commitment to our teams, our drivers, our sponsor partners and our fans.

Again, we appreciate your loyalty to Ford Motor Company and Thunderbird. We will keep you informed of future developments concerning the Thunderbird name.

Sincerely,

A handwritten signature in cursive script that reads "Jim Bright".

Jim Bright
Public Affairs Manager

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35 Main Street • Scottsville, New York 14546
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A black and white photograph showing a close-up of a piston. The piston is angled, showing its crown and rings. A bright light reflects off the top of the piston crown, highlighting the texture of the coating. The background is dark and out of focus.

HIGH-TECH COATINGS FOR HOT RODS

By Rob Kinnan

SPACE-AGE COATINGS

High-tech coatings for engine and driveline parts have been around for decades, but they have had a voodoo mystique about them that scares off the typical hot-rodder. It's kind of like the stigma nitrous had 15 years ago. And as with nitrous, the uninformed enthusiast still believes the old stories associated with internal engine coatings. Early, poor-quality coatings sometimes deserved their reputation of poor durability and ineffectiveness, but when you consider that most of the top Winston Cup and Top Fuel teams (and even a few O.E.M.'s) use several types of coatings in their engines today, we think they've proven themselves. Hot-rodders owe it to themselves to take a look at what's available.

There are three main types of coatings, and their names are self explanatory. Thermal barrier coatings hold heat in, heat-dissipating coatings let heat out, and low-friction coatings remove power-robbing and heat-inducing friction. There are also a few coatings that are purely cosmetic—they look good, are very durable

and clean up easily. Virtually every part on a car can be coated, from the suspension to the pistons. We'll start with thermal barrier coatings (TBC).

Heat makes power. The more heat you can generate, the more power an engine will make. Unfortunately, the internal combustion engine is terribly inefficient when it comes to managing heat, using only about 20 percent of the heat energy created by the combustion process. Most of the energy escapes through the exhaust system or is absorbed into the engine and removed by the cooling system. Obviously, you can't eliminate the exhaust system, and the cooling system is mandatory to keep the internal parts from melting or coming apart due to extreme heat levels. The only thing we can do to make an optimized engine more efficient is to more effectively contain and manage the heat that's made when combustion occurs. That's the purpose of thermal barrier coatings.

The most commonly used TBC is a ceramic-based material that's applied to

the top of the piston and to the combustion chamber and valve faces in the cylinder head. The TBC holds more heat in the chamber, instead of letting it dissipate through the piston, valves, and head (where it is then absorbed by the cooling system). This theoretically increases cylinder pressure and pushes harder on the piston, making more power. The TBC also protects the aluminum piston from the intense heat, so the air/fuel mixture can be leaned slightly for maximum power without burning through the piston. And, since the amount of heat radiated into the rest of the engine is reduced (since it's contained in the chamber), the operating and oil temperatures of the engine come down. This is also beneficial to the piston rings, improving their radial tension and sealing ability. TBC's are also used on intake and exhaust ports and headers to improve scavenging and lower the underhood temperature. They are also used on the underside of an intake manifold to keep hot oil from elevating the

intake charge temperature.

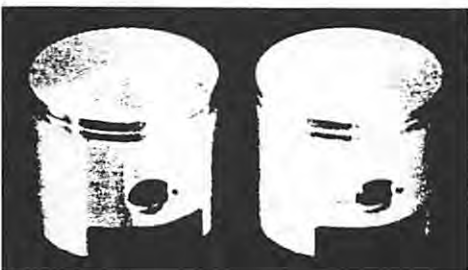
The three key players in the coating game are High Performance Coatings (HPC), Polymer Dynamics (Poly-Dyn, for short) and Swain Tech Coatings. Much of each company's information is proprietary, so they wouldn't tell us exactly how the coatings are applied, but they're much more than mere paints. A two- or three-part process is used for TBC's, and the coatings normally go on with a thickness of .002 to .004 inch, so very little compensation needs to be done during the machining process—unless of course the pistons are at zero-deck before coating. The coating material is permanently bonded to the part, so the old problems of flaking have been eliminated.

Low-friction coatings, also known as dry-film lubricants, are split into two types: self-lubricating and oil-shedding.

The self-lubricating type of dry film is applied to piston skirts, valve springs, camshaft lobes, engine bearings, wristpins, valve stems, and oil and fuel pumps—just to name the engine-related

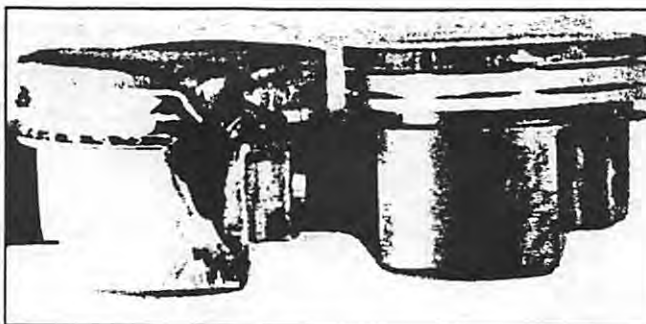


The difference in shades tells you that this piston has been coated. Swain Tech applied its thermal barrier coating to the face and its Poly-Moly, low-friction, dry-film coating to the skirt. The areas between the rings and the ring lands are not coated, and neither are the rings. Because less heat is absorbed by a coated piston, the piston doesn't get as hot and therefore doesn't expand as much, so some engine builders tighten up the piston-to-cylinder-wall clearance for better ring seal.



"Who has the Toni?" Can you tell the coated piston from the uncoated one? For racing classes that demand "stock appearing" parts, Swain has a Stealth Coat treatment that features a thermal barrier on the dome and Poly-Moly low-friction on the skirt. Give up? The piston on the left is coated.

parts. Most of these coatings are polymers, although each company has a slightly different combination of materials. Swain Tech, for example, uses a molybdenum-disulfide material in high load-bearing applications, such as on cams, valve springs, and wristpins. These materials hold oil on the surface of the part and have a very low coefficient of friction. Applied to a piston, the dry film reduces piston-to-cylinder-bore friction, which also reduces bore wear. Swain Tech is experimenting with cylinder-bore coatings as well, but some feel that coatings take away the all-important crosshatch and, therefore, ring seal.



Swain Tech sent us this photo of two severely used pistons. The one on the left suffered extreme heat damage from a lean condition. Swain claims that the coated piston on the right was put through the same test and suffered virtually no damage.

Another application where a self-lubricating dry-film coating shines is on valve springs. Tests have shown that uncoated valve springs can run 30 degrees hotter than the engine oil, while coatings on the springs bring the temperature down about 20 degrees, which can dramatically increase the life of the spring, allowing it to maintain tension longer. The self-lubricating dry-film coatings are especially helpful in situations where a part is momentarily starved of oil. Dry-film coatings are typically applied less than .001 inch thick, so there's usually no need to compensate for them during machining.

The oil-shedding type of dry film is used on connecting rods and crankshaft counterweights to reduce windage, as well as in engine-block lifter valleys and oil pans to aid in oil drainback. This polymer acts like the Teflon® or non-stick coating in a cooking pan: it beads up oil and won't allow the oil to stick.

The third type of coating is for heat dissipation. Swain Tech's heat-dissipating coating is a black body emitter, using high-emissivity materials such as copper oxides, vanadium, and some ceramics that radiate heat from a surface. Applied to the exterior surfaces of the engine block, the intake manifold, the brake calipers, and about a hundred other parts, these coatings get heat out of a part. They aren't pretty (unless you like an all-black engine), but they're functional and very durable.

There are other coatings available that have minimal effects on heat and friction and instead are purely for cosmetics. These coatings are typically applied to headers when a true thermal barrier is not needed, as they are impervious to oil and chemicals and won't discolor or flake off with high heat, which is a problem with chrome and high-temp paint. They still reduce underhood heat a little bit, but not to the level of a TBC. Some of the better cosmetic coatings also protect the header from thermal fatigue, which is the real header killer. Cosmetic coatings are also commonly applied to intake manifolds, suspension parts, and other parts that are otherwise hard to keep

clean or subject to corrosion.

Theoretically, every internal engine part can benefit from some type of coating, but the largest benefits are realized by treating the pistons, combustion chambers, valves, exhaust ports, headers, and valve springs. For the hot-rodder on a budget, these are the areas that will give the most bang for the buck from both horsepower and durability standpoints.

At this point, you're probably wondering how much all of this will cost, and what it's worth. Well, price is relative to the value you place on durability and that last little bit of ultimate power. To fully coat an engine inside and out will run you around \$1000 and may provide a horsepower increase of about two to five percent. But horsepower isn't really what coatings are all about. Rather, long-term durability is the key. There are three reasons for engine coatings: to reduce friction, to improve thermal efficiency, and to improve the durability of the engine. None of these three provide much in the way of immediate, seat-of-the-pants benefits. But if the motor goes way lean at the big end, chances are you'll burn a piston or two and maybe even take out something bigger. And temporary oil starvation, even for a second, will create a box of broken parts faster than you can say "What . . . ?"

An engine treated with quality coatings has a much better chance of coming through the catastrophe alive, and chances are the major parts can be used again, saving significant money at rebuild time. Also, other than the cost, there are no drawbacks or compromises to coatings. Ask yourself how much your engine is worth and how badly you crave that last 10 horsepower, and then decide if coatings are for you. **HR**

SWAIN TECH COATINGS

35 Main St., Dept. HR
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716-889-2786
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Coatings Come of Age

Technology
improves the
reliability of
race parts.

by Dan Swain

Dan Swain shows the
Thermal Barrier Coating
on a new piston's dome.



Mention coatings to racers, and responses are likely to be mixed. Some believe the technology is just for well financed Winston Cup and Grand National teams. Others compare coatings to snake oil, and still others think they can solve every racer's performance and reliability problems.

Here's the truth of the matter.

Coatings have come of age. They've evolved through five generations, and a sixth is almost upon us. Coatings now offer improved durability at every level, from Saturday night racers to the Daytona 500.

In the 1970's, while working for a company that made ceramic industrial parts and plasma-sprayed coatings, I applied my ceramic engineering background to developing a coating for piston domes. My three brothers and I also owned a NASCAR modified that we ran at local tracks. Our ceramic coating was plasma-sprayed onto piston domes .015" thick. We tested it extensively in our own race car

Dan Swain is president of Swain Technology, headquartered in Scottsville, New York. Swain, a ceramics engineer, has experience with General Motors, and developed the first commercially-available ceramic piston coating in 1973. He established Swain Technology in 1981.



Swain Tech has an agreement with Dale Earnhardt's truck team to supply coatings, and the race vehicles serve as a test bed for the company's products. (Karl Fredrickson)

before offering to sell it to anyone.

Not surprisingly, weekend racers were reluctant to invest in our unproved product. But Winston Cup engine builders began asking us to coat their pistons. One of the first to use our new coatings was the Junior Johnson team, with Harold Elliott as engine builder. Elliott must have liked what he saw because he is now in the coating business himself.

The second generation of coatings appeared in the early '80's. While some were professionally formulated and applied by either plasma spray or flame spray, others were nothing more than self-applied high temperature paint. Some of this stuff didn't work well at all and hurt the whole industry.

Despite this black eye, the major companies continued their research, and technology progressed. As the fly-by-nights and garage operators faded away, the third generation of coatings emerged with three major players—Swain Tech Coatings, High Performance Coatings (HPC) and Polymer Dynamics, also known as Poly Dyn. This generation of coatings was engineered to provide added durability and increased horsepower. As each company went its own way, differences evolved. Improved formulations could be applied just .002" thick, eliminating the clearance problems created by the earlier, thicker coatings. Bonding was also improved, so there was no chipping, cracking or crazing.

The fourth generation began with header coatings. HPC and Jet Hot developed inexpensive "wet" processes aimed at street rods and show cars. Improved appearance was the primary goal; enhanced performance was secondary. We offered a header coating in which form—specifically thermal insulation—followed function. Our three-layer header coating may not have looked as nice as the others, but it held the heat in. Then, as header coatings became a specialty all their own, ceramic and fiberglass header wraps began competing with them.

While the three leading companies continued to improve the technology and variety of high tech coatings, a fifth generation of coatings appeared, characterized by a new crop of do-it-yourself coatings that showed up in the early '90's. This has caused some concern among major coating companies because some of the new companies claim that their products are professional quality. I don't think they are telling you the straight story.

As coatings have matured, so have racers' reasons for using them. The emphasis has changed from performance to durability. Maintenance-cost savings have prompted some sanctioning bodies, that had pro-

hibited coatings, to change their rules to allow them. Coatings are currently used in 9:1 motors, street stocks, go-karts and other economy divisions.

Today, there are coatings to protect every part or component that is subject to heat, wear, corrosion or friction. While pistons, combustion chambers and headers remain the most popular parts to coat, an increasing number of engine builders are having engine bearings and valve springs coated. Brake coatings are increasingly popular on heavy cars that need a lot of stopping power. Transmission and ring-and-pinion gears now get coated as well.

The coatings evolution is now approaching the sixth generation. Products currently under development include diamond coatings for wear and lubricity, self-lubricating coatings, laser-applied surface coatings and catalyzed coatings. Catalyzed coatings, which have precious metals in suspension to enhance combustion and con-

trol combustion rates, could be the next generation of piston coating.

Many weekend racers now look upon coatings as an investment rather than an expense. JBR Racing of Rochester, New York, runs both a Grand American IMCA modified and a super stock. Says Jon Burroughs, the team captain and a ten-year veteran of both dirt and asphalt tracks, "Coatings are the affordable thing to do, and we're a small budget team."

We've coated their pistons, valve springs, intake manifold, rocker arms and balls, bearing races and their exhaust systems. The stock manifold on the Grand American car is also coated. This team and others report good reliability, which they attribute to coatings.

"Last season," Burroughs relates, "the oil pump pickup broke in the Grand American car. We were in the championship race at Apple Valley [NY] Raceway. Oil pressure dropped and fluctuated between 0 and 60 PSI, depending on whether we were in a straightaway or turn. We just kept running and took the championship. When we tore down the engine, the bearings, pistons and cylinder walls had no damage, so we just put the engine back together and we're running it again this season."

We do not recommend running your race engine on limited oil pressure, no mat-

ter whose coatings or additives you use. We can sometimes get you through an otherwise impossible night, but running with fluctuating oil pressure or other serious problems should not become a way of life.

I can tell you with confidence, however, that coatings can save parts and entire motors. All of us in the aftermarket business hear on Monday mornings when our stuff works, and we really hear when somebody thinks it fails. We've been around for a long time, and we just couldn't keep doing this if those Monday morning calls were mostly angry ones.

Don't get the idea you need to rely on the phone to reach us. UPS and FedEx have shrunk the world, and coating companies regularly service teams far from their home base. In fact, we've been told that our Winston Cup work has helped several teams save engines after terrible punishment. We know the other coating companies have some similar stories to tell, too.

When it comes to the high dollar teams, well, they could probably afford to run without coatings. But the added reliability makes coated parts an important element in their plans. Same thing with teams that operate on a limited budget.

It would be nice if you could avoid it, but to get the job done you've just got to pay the extra money for professional application. Some do-it-yourself coatings are advertised as performing the same as professionally applied coatings, but it is technically impossible for a coating that is painted on and cured in your kitchen oven to provide the same quality and performance as those formulated and applied by trained professionals using sophisticated equipment. The big three coating companies all agree that it takes more than a spray can or air brush and kitchen stove.

Professionally applied coatings don't cost as much as you might think. In fact, coated parts represent a modest insurance investment. Our company has never raised its price for piston coatings. This means that piston prices have been the same for sixteen years. We haven't even had to adjust for inflation because volume has increased dramatically. As a result, coated pistons actually cost less today than when we first opened in 1981.

Each company publishes a price list. Terms and shipment policies vary by company as well. When shopping for coatings, as with other racing investments, it's smart to not shop on price alone. Coatings are not commodity items. Each company's formulation and application method is different, so be sure the coating will perform as you want it to. Check out the company's reputation in the marketplace. In short, shop for value, not just price.



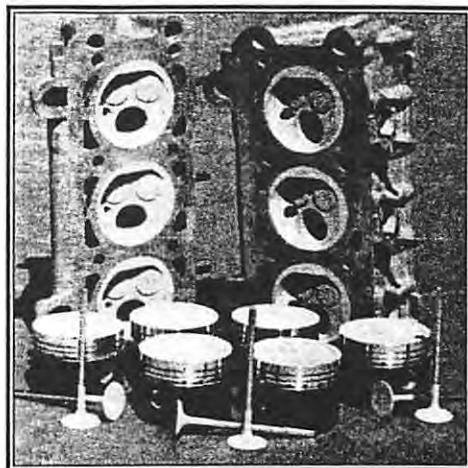
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Edited from *European Car* magazine

GETTING TECHNICAL

Coatings

by James Sly*

In the film *The Graduate*, Dustin Hoffman's character Jonathan is approached by a friend of his father's at his graduation party. The well-meaning but smarmy friend has but one word for Jonathan in planning his future: "Plastics." In the not-so-distant past when *The Graduate* was filmed, that was excellent advice and would have served Jonathan's financial future well. Plastics, and the composites that followed them, have experienced impressive growth. Were that smarmy friend to give similar advice today, what would that one word be? How about "Coatings."

Coatings? Yes, coatings are an exciting materials technology that is reshaping the way engineers think about some basic engineering. Think about some of the miracles we experience in our daily lives. Coatings are everywhere. The closest example to home is probably DuPont's Teflon™ and the family of non-stick coatings that Teflon spawned.

More esoteric coating examples lie in the machine tooling field. Thin cerametallic coatings on cutters used in mills or lathes allow machining jobs thought impossible a few years ago. Even your local hardware store is liable to carry a line of titanium nitride-coated drills with improved cutting power and longer life.

Coatings in an Engine

Coatings with special properties are used to protect internal engine parts from damage. In addition to damage protection, coated parts can provide engine improved throttle response, lower coolant and oil temperatures, and more power.

To understand just why coatings could possibly

work, you have to look at an engine from a thermodynamic point of view. The cams, valves, pistons, rods, crank and all the other parts of an engine are simply there to convert the heat energy of combustion into rotational force, to move the car on down the road. The job of an engine's cooling systems, be they air, oil, water, or a combination, is to remove enough heat so that the engine parts don't self-destruct. So, on one hand we are creating heat to use it for energy, and on the other hand we are working hard to remove that heat. If that doesn't sound too efficient, you're right.

The typical four-cycle Otto internal combustion engine manages to convert a mere 25 percent of the fuel's energy into useful work at the crankshaft, while a passenger car Diesel manages but 23 percent. Noisy, specialized truck Diesels manage to eke out 30 percent, still a largely wasteful number. Where does all the energy go? A large portion goes out the tail pipe—about 35 percent of the energy of a normal gasoline passenger car engine's energy is just passed on.

Another big chunk of energy goes out the cooling fluids in a car, such as coolant and oil. This is 20 percent, a number almost as large as the net power produced. Part of this is simply heat from combustion, and a smaller part is frictional heat from the engine's rotating parts. The remaining 20 percent of the power is lost to radiated heat, from the exhaust system, crankcase, and coolant jacket and pipes.

Most of us would be pretty disappointed with an investment that only paid us back twenty-five cents on the dollar. Sadly, though, 25 percent is a good return on automobile engine energy. Is it possible to recuperate some of the lost energy? Yes. Take the exhaust, for example. One reason turbocharged engines are so effective is that they are able to recoup some of this lost thermal energy going out the tailpipe. What about the other two losses, through the coolant and through radiated heat?

We mentioned earlier that the job of an engine's cooling system is to remove enough heat so the engine doesn't self-destruct. Removing heat,

however, means removing energy. So adding too cool a thermostat or over-cooling the oil can actually tend to reduce power on a correctly designed engine. We can try to get around the inefficiency two ways. One, we can make the parts so they don't destruct from the heat. That's the goal of the development work with materials technologies like ceramic pistons and such.

The second idea is to make better use of the energy. What if we could direct the energy to the piston, and avoid putting it into the cooling jacket? Couldn't we advance slightly on that atrocious 25 percent figure?

Coatings are one step toward a more efficient engine. Coatings can be used to reduce friction and prevent scuffing, or as a heat barrier, to keep unwanted heat away. Swain Tech also offers specialized coatings to make intercoolers and heat exchangers more efficient, repair worn parts, and effect a surprising number of other results.

Swain Tech is a leader in the field of performance coatings for automotive high-performance use. Dan Swain has a degree in ceramics engineering and worked for General Motors in the specialized area of materials development. Some twenty years ago, in 1973, coatings started taking off when zirconia-based plasma coatings were first developed.

Over the years, plasma-sprayed zirconia coating technology hasn't changed much. Swain found that the bond strength of the old-style application was not good enough with high cylinder pressures, and that the relatively thick layer of zirconia required has a different expansion rate than the metal it's applied to. As a result, Swain has researched and developed a number of other coatings. In addition to heat barriers, they have developed a number of special coatings.

According to Dan Swain, as many people call asking about coatings to improve durability as call to get more power. Most of the things we do to increase performance increase the stresses on an engine. If we raise the compression to increase the power, we get higher output at the expense of increased thermal loading. The same holds true if we increase airflow to better fill the cylinders. To

get more horsepower by spinning the engine at a higher rpm, the mechanical loading on components increases tremendously. Coatings can increase durability by reducing the frictional and thermal loads on the engine.

How do coatings work to increase horsepower? There are a great number of ways that coatings function. To simplify, we'll deal with the four basic ways that coatings are likely to help the serious racer: 1) reduce friction; 2) direct heat to where it's needed; 3) block heat from where you don't want it; and 4) improve heat radiation. If that sounds like a tall order for a single coating, you're exactly right. No one coating can do "all of the above." Instead, companies like Swain Tech Coatings use different coatings for each problem and usually for each environment.

Randy Hubbard, the owner of Race Tech Engineering, had this to say about his experiences with coatings: "If you can control the energy, you make more power. Coatings help keep the heat out of the oil, for example. The problem is finding a coating elastic enough to deal with thermal shock. Most of the coatings I have seen were developed for the aerospace industry and are used in NASCAR, where thermal loading is tremendous. Think about the stresses running an engine for four to six hours at full throttle."

Traditional problems with coatings have included the obvious: "How do you make it stick at 7500 rpm?" When you think of a fragile porcelain plate being hammered like a piston, you begin to have doubts. Over the years, coatings have received a bad rap for lack of adhesion. Improper bonding that allowed the coatings to flake off were a problem in the early years of their use. Porsche sidesteps the bonding problem neatly in the 944 Turbo by casting the zirconium oxide exhaust port liners in place on the cylinder head. That's a good solution for a manufacturer but nigh impossible for the aftermarket tuner. Enormous progress in bonding technologies has all but solved the adhesion problems.

Swain has developed a process they call Ion Bonding, a high-tech modification of the plasma process. Using Ion Bonding, the substrate, or bottom layer of the thermal barrier coating, actually becomes a part of the metal being coated, a process of metallurgical bonding. In addition, the coatings are chosen to match the thermal expansion rate of the base metals, and to resist high-temperature oxidation. The process seems to work; the company claims to have never had a coating fail.

These new coatings are tough. An intake component failed and was ingested on one of AutoThorty's 944 Turbo Street Power engines with a Swain coatings package. Subsequent engine teardown was required, and inspection revealed a scratched cylinder wall. In spite of a foreign object banging around in the chamber, the coatings on the piston dome valves and combustion chamber face were untouched.

Experts using coatings in their race engines tell us that the typical results one can expect from

an engine with a thermal barrier coatings package include some increase in fuel mileage, better throttle response due to a hotter combustion chamber, an immediate difference in oil temperature, with the rod and wrist pin running cooler. Oil burn on the back of a piston becomes nonexistent. Anti-friction coatings (not Teflon) on the piston skirts, valve stems, and valve springs reduce scuff and lower rotational losses. Here's some other areas where coatings can shine: piston domes, combustion chamber, exhaust port, valves.

Here is where the highest gains are to be made. Swain typically coats the intake valve face and the back and face of the exhaust valve with thermal barrier coating. The valve stems receive a low-friction anti-seize coating. The combustion chamber and gasket face of the cylinder head and the exhaust port get the thermal barrier coating. Swain coats across the exhaust valve seat, which must then be lapped back into place.

Valve Springs: Swain Tech has been working with top engine builders and has solved a persistent valve spring failure by using a coating to reduce fatigue and heat. Cooling and longevity are two of the advantages of coatings for valve springs. Some companies use Teflon on valve springs. Swain feels that Teflon has "creep," a quality that allows it to move and deform under heavy loading. Teflon is relatively soft and can wear off when rubbed heavily—a fact most frying pan owners can attest to. It is also an insulator.

Swain uses a proprietary tungsten disulfide/molybdenum disulfide polymer, trade named PolyMoly. It is a low-friction, high load-bearing coating metallurgically bonded to the valve spring. Tungsten disulfide is extremely tough and scuff resistant, and has an even lower coefficient of friction than moly. Highly stressed race engines can now run valve springs for an entire season without wearing them out.

Piston Skirts: On piston skirts, a 0.0005-in. coating of Tungsten disulfide/molybdenum disulfide in a polymer matrix. This coating is best suited for high-speed, light-load situations. Why not just use Teflon coatings? Teflon is an insulator and will hold heat in a piston, not let it out.

On most pistons, the rings' lands are not treated. Current NASCAR engines use compression ratios as high as 17:1 to deal with restricted intakes and still make power. In high-pressure situations like this, piston rings can actually gall in the groove. For these specialized applications, Swain uses an anti-gall coating. This anti-gall coating is used only on a few severe duty cases.

Exhaust Manifold: The purpose of these coatings on exhaust headers shouldn't be confused with the lower tech cosmetic coatings that are now becoming popular. Those coatings form an attractive, durable finish. These coatings help to hold the heat energy in the header, which serves two purposes. It makes the engine compartment cooler, and it keeps exhaust gas velocity high, improving scavenging. The latter is especially important in turbocharged engines, where a coated exhaust manifold can improve turbo response.

Swain Tech uses two different thermal barrier coatings, a thicker coating on the outside of the manifold and a thinner inner coating. For application reasons, the inner coating can't be applied on the inside of longer headers.

What do performance coatings for an engine cost? All the basic coatings cost about \$400-600 for a four- or six-cylinder engine. That includes pistons, heads, exhaust port and exhaust system. Swain feels that these basic coatings offer the "most bang for the buck." The Swain Tech price list is quite comprehensive, and might give you some ideas about some other coating solutions. Other coatings are available for special applications. Low friction coatings for cams are one example.

In addition to their standard coating line, Swain Tech has a large research and development effort underway at all times. Interesting new products are bound to result. In a move that will appeal to the "dark side" of the racing community, Swain Tech has a new line of Stealth coatings that are just about invisible on the cylinder head, valves or piston. Showroom Stock tech inspectors may soon have to resort to checking telephone records in order to catch racers anxious to bend the rules.

Swain Tech has a large industrial side to its coatings business, dealing with such diverse high-tech objects as jet turbine components and pump components ten times as large your average European car on down to tiny components. As far as industry is concerned, coatings are here to stay.

It is difficult to ascertain just how widely accepted coatings are in the racing world. Why is that, you may ask? In racing, even a tiny advantage is kept secret. It should suffice to say that Swain Tech, one of the leaders in a growing field, does approximately 2000 engines a year for the racing community, which indicates a major degree of acceptance. AutoThorty takes a positive stand on the virtues of coatings. They've made them a part of their awesome Street Power 944 package, citing improved throttle response and reduced tendency for detonation as positive gains.

European Car is going to be testing Swain Tech coatings on our New Dimensions turbocharged Project A2 GTI. We are having the piston domes, the exhaust valves and intake valve faces, combustion chambers, gasket face and exhaust ports all coated with the Swain TBC thermal barrier coating. A pair of different coatings are going on the inside and outside of the exhaust manifold. Finally, several different slippery coatings are going on the valve springs, valve stems, and piston skirts. We are making no other changes to the engine, so the results should bring us some interesting data. In the meantime, we have just one word for all you young people: "Coatings."

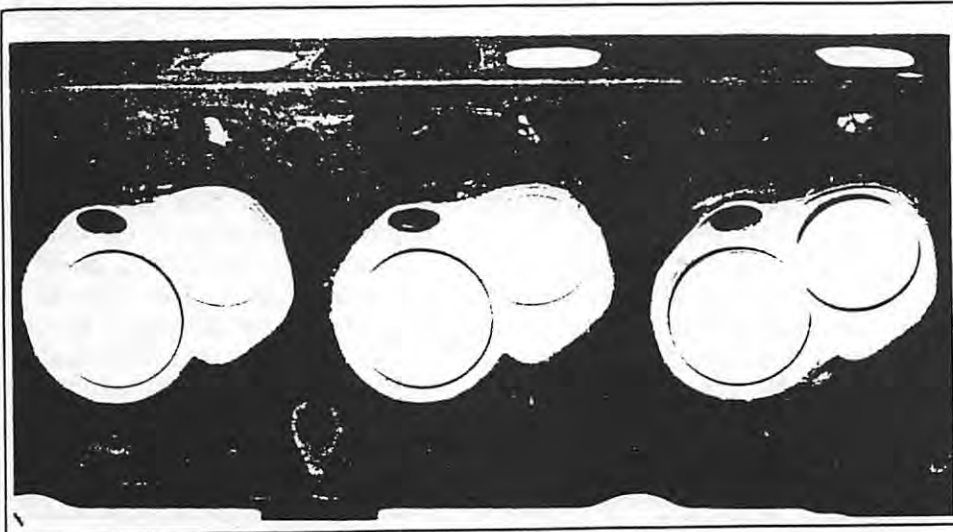
Swain Tech Coatings

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Thermal-barrier coatings applied to combustion chambers often improve power and full-throttle fuel economy by about 3%, with greater gains possible on aluminum heads. Insulating coatings applied to the pistons, chambers, and valves can produce power improvements over 10%. Unfortunately, these special coatings are rather expensive.

If your engine project is more modest, perhaps just involving the rework of a set of cylinder heads, the cost of milling the heads to increase the compression ratio represents one of the cheapest means of adding power and economy.

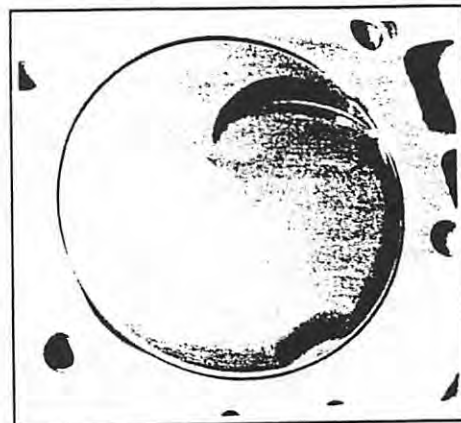
HEAT LOSSES

Burning fuel in the combustion space of an engine generates heat that expands the charge and forces the piston down the bore. If heat is conducted away from the expanding charge before it can fully act on the piston, potential power is lost. If the ideal engine could be built, it would harness all of the heat of combustion into expanding the charge, and none would be lost through dissipation into the surrounding metal surfaces. Under these conditions, the engine would have maximum thermal efficiency and the power output would almost double that of a conventional performance engine. Imagine, a 300 cubic inch V8 with a single four-barrel carburetor producing almost 800

horsepower! Unfortunately it's just not possible to obtain near 100% thermal efficiency. Nevertheless, one goal of any engine development project must be to maximize thermal efficiency, since it controls how the engine converts fuel into usable power.

Thermal Efficiency And Metallurgy

There are many ways to improve thermal efficiency. Some are subtle and require considerable research to uncover, but others are so obvious that they are completely overlooked. The thermal characteristics of the metals exposed to the burning charge, primarily the cylinder head, is one of these areas. Aluminum heads are more effective heat conductors than cast-iron, and power can be measurably reduced by heat loss into the water jackets. But on the plus side, an aluminum head suffers from fewer combustion-chamber hot spots and generally has lower surface temperatures. These latter factors permit a higher compression ratio with aluminum and reduce the vulnerability to



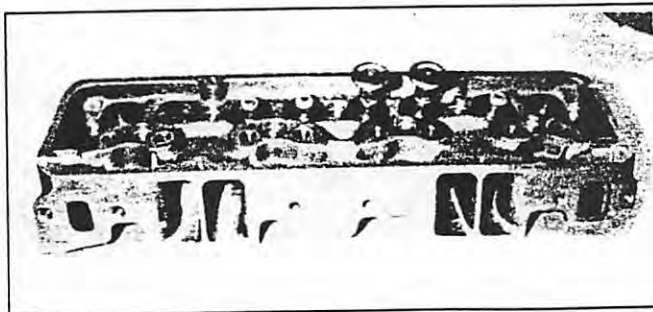
detonation. For lower-compression applications, such as street performance or economy use, cast-iron is a better base material because of its improved thermal efficiency.

Combustion Space Coatings

The heat conduction of both aluminum and cast-iron can be substantially reduced by using a relatively new technique to the automotive industry: *thermal barrier coatings*. These high-tech insulation materials, with as little thickness as 0.015-inch, can dramatically reduce thermal conductivity. Their use in the last few years has become increasingly common, and the fact that they work is beyond doubt.

The amount of gain from thermal-barrier coating depends on the design of the head, the size of the chamber, and the material from which the head is made (as we have said, aluminum has a greater thermal conductivity and can benefit more from insulating coatings). Generally speaking, power gains in the region of 3% are common. Likewise, gains in fuel economy at full throttle often fall in the region of 3%, with predictably larger improvements in part-throttle economy. As we discovered in the previous chapter, insulating coatings applied to the piston can also improve thermal efficiency in the range of 4 to 8%. So coating both the pistons and the chambers can produce power improvements approaching 10%. But

Aluminum heads conduct heat away from the combustion chambers faster than cast iron. But on the plus side, aluminum heads suffer from fewer hot spots and have lower surface temperatures.



there's even more horsepower to be harnessed; read on!

Valves & Thermal Coatings

Though the piston and combustion chamber represent the principal use of thermal coatings, they can be used in other less-obvious areas. Coatings can be applied to both the intake and exhaust valves to further improve power and reliability. It isn't commonly realized that the intake charge picks up a great deal of heat as it moves past the hot intake valve. Coating the front face of the intake valve can dramatically reduce the temperature on the back side of the valve, and this reduces charge temperatures, improves thermal efficiency, and boosts horsepower.

Furthermore, most valve-related problems are heat associated and center around the extremely hot exhaust valve. Thermal coatings reduce valve-head temperatures and the need for extra-wide exhaust seats. By coating the front face of the exhaust valve, much of the heat of combustion is prevented from reaching the valve and less heat is rejected to the seat. In addition, if the backside of the exhaust valve is coated (with the exception of the seat and the stem), the heat picked up by the valve is reduced even further. These modifications allow designers to concentrate on seat widths that optimize airflow. So in the case of exhaust valve coat-

ings, the insulating material may not directly result in more power, but it permits modifications that can improve performance.

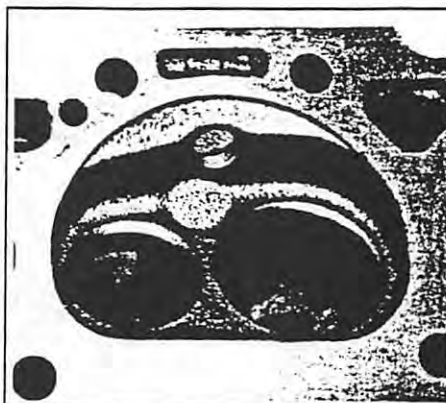
Unfortunately, these special coatings are relatively costly and are rarely used on other than professional racing engines. For a street engine, built on a reasonable budget, they really aren't practical. Many other modifications can be done within a sensible budget that are less costly and more effective, and would therefore put limited resources to the best

use. Thermal coatings should only be considered the "last step" in building a cost-is-no-limit engine. But for those that wish to make the investment, the potential gains are there.

CHAMBER FINISH

If applying thermal coatings to the combustion chamber is not practical, the next best thing is to polish the chamber surface. This reduces the surface area by eliminating the thousands of "nooks and crannies" that absorb heat. It also reduces the

Combustion Chamber Modifications

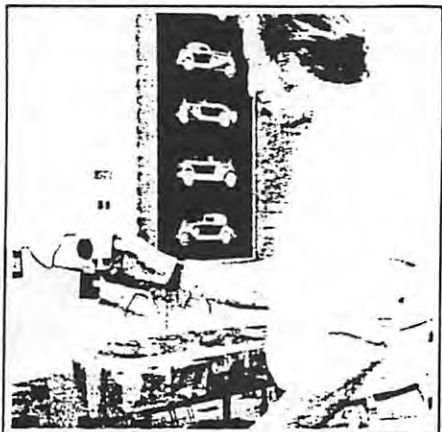


- 1** A larger chamber requires additional flame travel and contains more heat absorbing surface area. Use smaller chamber heads and don't enlarge the chambers any more than necessary.

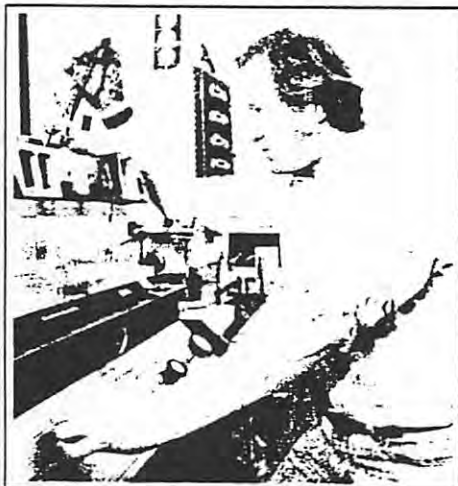
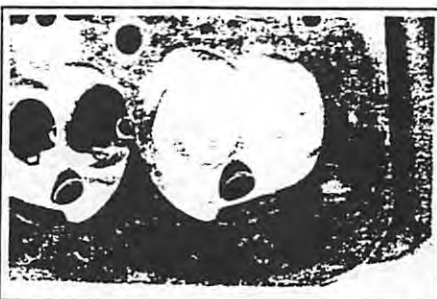


- 2** Only remove material that contributes to valve shrouding. Smooth any sharp edges, but don't "reshape" the combustion chambers.

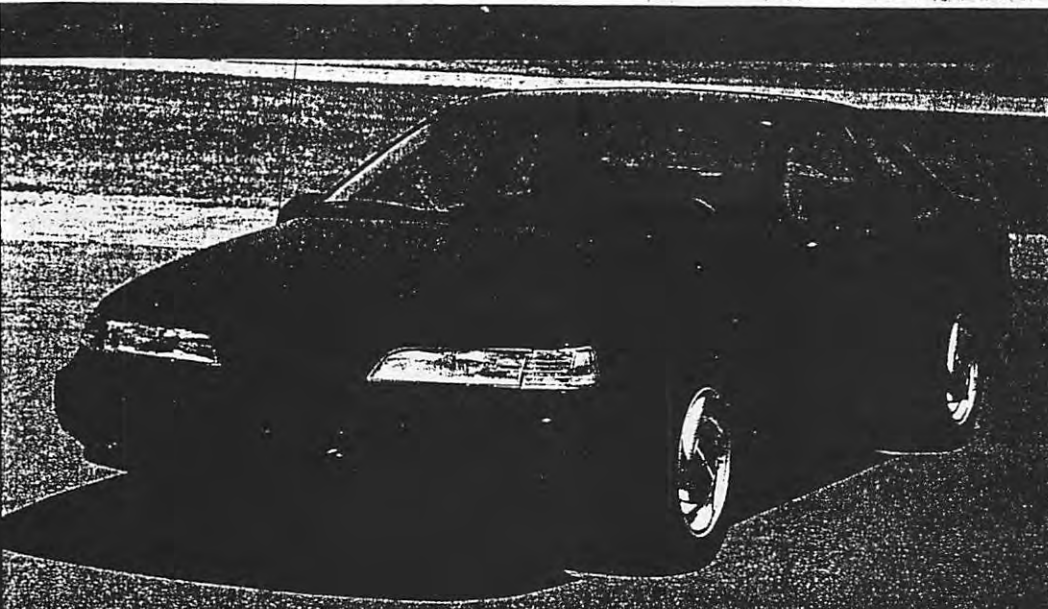
Measure the volume of all chambers after the valve job and grinding are complete, since both of these operations greatly affects final chamber volume. This digital flow meter makes the job much easier.



- 4** To protect the valve seats from damage, always install a pair of "junk" valves before working on the chambers.



Although the flow bench and the dyno always have the final "say" when it comes to combustion chamber modifications, I have found a few basic changes that will improve power in most engines. Follow the guidelines presented here and you should obtain good results.



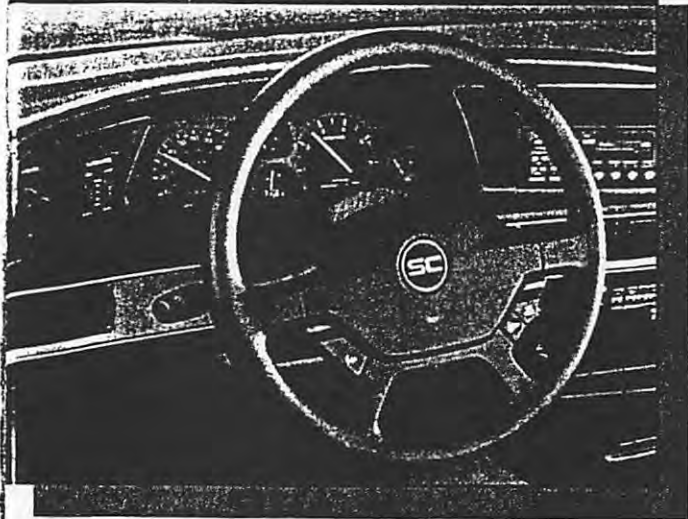
By John Baechtel

**'89
THUNDERBIRDS:
BLOWN
T-BIRDS FOR
THE MASSES**

Sinister Super Coupes



Introduced in the spring of 1983, the all-new Thunderbird was a complete and welcome departure from the slab-sided, rolling monsters that preceded it—and it soon established itself as one of the major automotive success stories of the '80s. A softer, more rounded aero look signaled Ford's departure from the monotonous, cookie-cutter school of automotive design that typified late-'70s automotive styling. The new Thunderbird spearheaded Ford's assault on traditional



automotive values and lofted the nation's oldest automaker back to an almost unchallenged position of leadership in domestic automobile manufacturing. In terms of the automotive styling revolution it fostered, the new Thunderbird may well have been the most significant American car of the decade. And now the natural extension of its lineage has arrived with a world-class attitude and everything it needs to maintain Ford's current advantage in contemporary automaking.

The all-new '89 Thunderbird represents more than the next evolutionary level of the car. It's a strong reaffirmation of Ford's commitment to building world-class cars. While the enormously successful mid-'80s Thunderbird was actually built on the old "Fox" platform (Fairmonts, Zephyrs, etc.), the '89 model is new from the ground up. Blessed with an almost limitless degree of freedom, designers were challenged to pen a Ford flagship that would offer a combination of styling, performance, ride and handling quality, and passenger comfort second to none. Now, more than a billion dollars later, the sinister-looking new Thunderbird has emerged with an all-new chassis, suspension, body, and high-performance engine that Ford obviously feels is ready to take on the world.

Designed under the code name MN12, the Thunderbird was the subject of considerable debate within the management and engineering community at Ford. The general consensus was that the traditional rear-wheel-drive layout should be maintained because the car had already built a loyal following of rear-wheel-drive buyers. Moreover, rear-wheel drive is still the preferred platform among the finest European

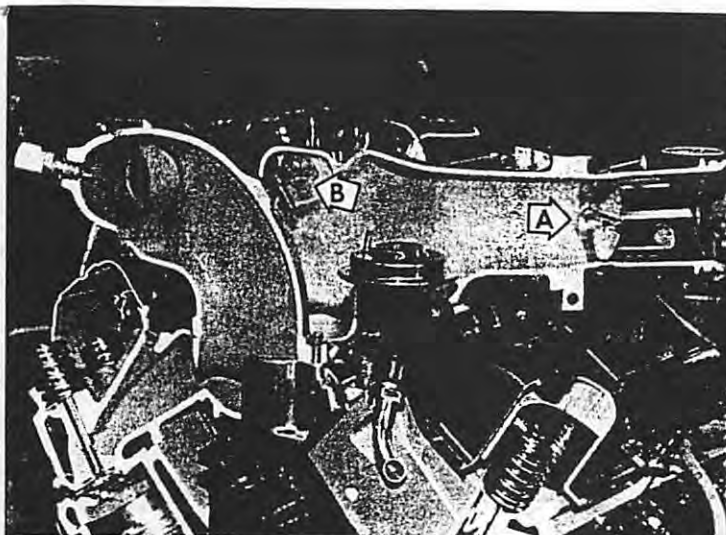
luxury performance sedans, and, since the domestic competition was almost entirely committed to front-wheel drive, it was felt that a traditional layout would give buyers a real choice. A calculated decision was made to emphasize the rear-wheel-drive platform by accentuating the proportions with a familiar low cowl and longer hood design. A steeply raked 63.9-degree windshield angle was incorporated to heighten the effect, and the overall silhouette is wider, flatter, and lower. The Super Coupe version is distinguished by its own unique front and rear fascias with integrated fog lamps, special lower body flares, fat P225/60VR16 tires, and dramatic, new 16x7-inch wheels.

With its striking new styling and revised package size, Thunderbird seeks to establish a new benchmark for performance cars in the prestigious mid-size specialty car market. Look carefully and you'll see how well the designers integrated dramatic changes, such as the decrease in length of 3.4 inches while extending the wheelbase almost nine inches. The front tread width is increased more than three inches, while the rear is wider by almost two inches. This longer, wider stance not only facilitates greatly improved ride characteristics, but it also provides a more spacious interior with seven additional inches of rear-seat hip room and nearly four more inches of shoulder room.

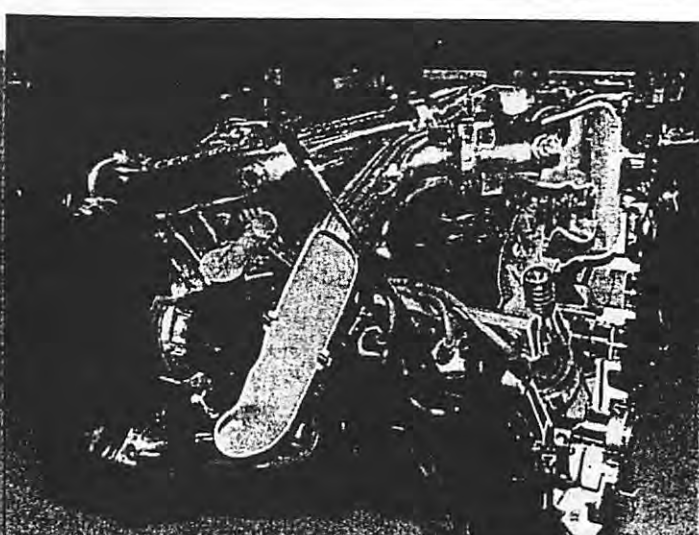
Mechanically we're being treated to a new four-wheel, fully independent suspension for better-handling steering modifications designed to quicken response, as well as bigger brakes and a hot, new supercharged V6 engine. More than three decades have lapsed since blown factory T-Birds stalked the

earth, but now the supercharged Super Coupe version of the Thunderbird stands ready to deliver the kind of performance modern hot rodders can best appreciate. Everything about the Super Coupe is new and exciting, but naturally we'll begin with a look at the engine because we're hot rodders and blown powerplants are near and dear to us.

The Super Coupe's engine is based on Ford's existing 3.8L 90-degree V6, with extensive improvements that were actually begun in the '88 model year. A very precise multiport electronic fuel-injection system incorporates a sequential feature that enables each individual fuel-injector to deliver its precisely metered fuel pulses in time with the opening of the intake valve. The sequential delivery provides greater efficiency than those conventional EFI systems that pulse all the injectors at once or half of the injectors at each revolution. Hydraulic roller tappets have also been incorporated to reduce internal valvetrain friction, and all '89 versions of the 3.8L V6 are fitted with magnesium valve covers as a weight-saving measure. An aluminum-hub crankshaft damper sheds another pound or two, and a die-cast aluminum oil pan that bolts to the transmission bellhousing provides additional weight savings and also contributes to a reduction in noise and vibration harshness (NVH). Dual catalytic converters located forward in the toeboard area help increase interior floor room and the thermactor air-injection system (smog pump) has been eliminated, resulting in improved fuel economy and quieter engine operation. The long, low hood dictated a 16-inch, seven-blade fan design in place of the previous 18-inch, five-blade design. (continued)



This detail shows the throttle valve assembly (A) that regulates engine speed and the bypass butterfly valve (B) that routes the excess inlet air back to the inlet system when power demand is low.



Compressed air from the blower enters the intercooler at the top and exits at the bottom, where it is directed to the back of the intake manifold. Just behind the cutaway portion of the intercooler outlet you can see the oil filter and the oil-to-water oil cooler.

The 3.8L supercharged/intercooled V6 engine that replaces the 2.3L turbocharged engine previously used in the Turbo Coupe represents a new dimension in performance from Ford Motor Company. The engine generates 210 hp at 4000 rpm and 315 lbs.-ft. of torque at 2600 rpm, a full 20 horsepower and up to 75 lbs.-ft. more available torque compared to the previous turbocharged 4-cylinder engine. The V6 actually delivers 15 lbs.-ft. more torque than the Mustang GT's 5.0L V8. Smooth, instant throttle response characterizes this engine. The supercharger is not plagued by turbo lag and the low-end power is dramatically increased. Since the engine is being used in a rear-wheel-drive application, the previously incorporated balance shaft was eliminated. With the use of hydraulic engine mounts and added isolation in the number three cross-member, no detectable vibration increase was noted, and removal of the balance shaft provided another significant weight reduction at the front of the car.

Most of the engine refinements mentioned thus far were made for the Thunderbird application in general, but specific modifications for the supercharged Super Coupe were also required. These changes were necessary to properly package the supercharger under the hood and strengthen the engine against the added stress of supercharging while minimizing the weight increase of the added hardware. The 3.8L V6 with supercharger and intercooler weighs approxi-

mately 63 pounds more than the standard V6 engine, and that's just the beginning. An advanced distributorless ignition system eliminates the need for a distributor cap and rotor. A "chopper wheel" on the aluminum crankshaft hub is used to time the spark, and a synchronizer mounted in the now-vacant distributor hole keeps track of the number one cylinder so the spark is routed to the right cylinder. Ford's (EEC-IV) engine control regulates the entire system, using a knock sensor to pull the spark back if it hears detonation. Platinum-tipped spark plugs are also specified to increase service life up to 60,000 miles.

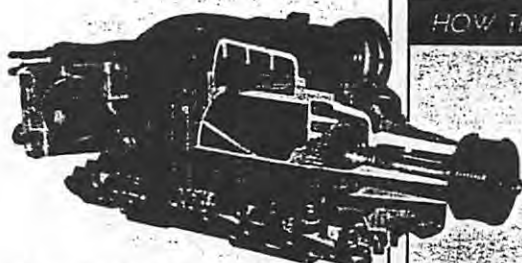
The engine block was beefed up to contain the increased gas loads generated by supercharging, and the heat-treated aluminum cylinder head was strengthened in a similar manner. Special hypereutectic aluminum alloy pistons have an 8.2:1 compression ratio, as compared to 9:1 in the base 3.8L engine, and a new "duracast" austempered ductile iron crankshaft replaces the nodular iron crank for improved durability.

The supercharged application required an all-new intake manifold and specialized ducting for the intercooler. A mass airflow sensor is used because it delivers more precise air metering, which can enhance fuel economy in the supercharged application. The fuel-injection system operates with 39.5-psi pressure, with pressure increasing by one pound for each pound of boost delivered. The supercharged engine's fuel pump has a range up to 60 psi and a

flow rate of 110 gallons per hour. Premium 92-octane fuel is required. The automatic transmission version of the supercharged engine uses the same camshaft as the base engine, but a special high-lift cam with eight degrees greater intake duration, four degrees less exhaust duration, .31mm greater intake lift, and .13mm greater exhaust lift is specified for the manual transmission engine. A reverse Y-pipe, dual-exhaust system snakes its way beneath the car, merging into a larger single pipe to pass between the dual fuel tanks and then splitting into duals once more.

An integral oil-to-water engine oil cooler is mounted between the front cover and the engine oil filter. Additional cooling refinements for the Super Coupe also include a down-flow radiator design with two-row copper and brass construction and a special electrically driven 16-inch, eight-blade plastic fan in place of the standard belt-drive design.

The Eaton-built supercharger uses two counter-rotating rotors to compress air within the supercharger body and force it into the engine. It is a 90-cubic-inch unit (1.5L) indirectly driven off the crank via a separate poly-V-belt that runs the supercharger at 2.6 times crank speed, with a maximum speed of 15,600 rpm. It generates a maximum boost pressure of 12 psi at about 4000 rpm. This supercharger can actually draw about 60 hp at around 5000 rpm, but the overall increase in power under full boost more than compensates for it. Most of the power draw only occurs under high-boost, high-demand condi-

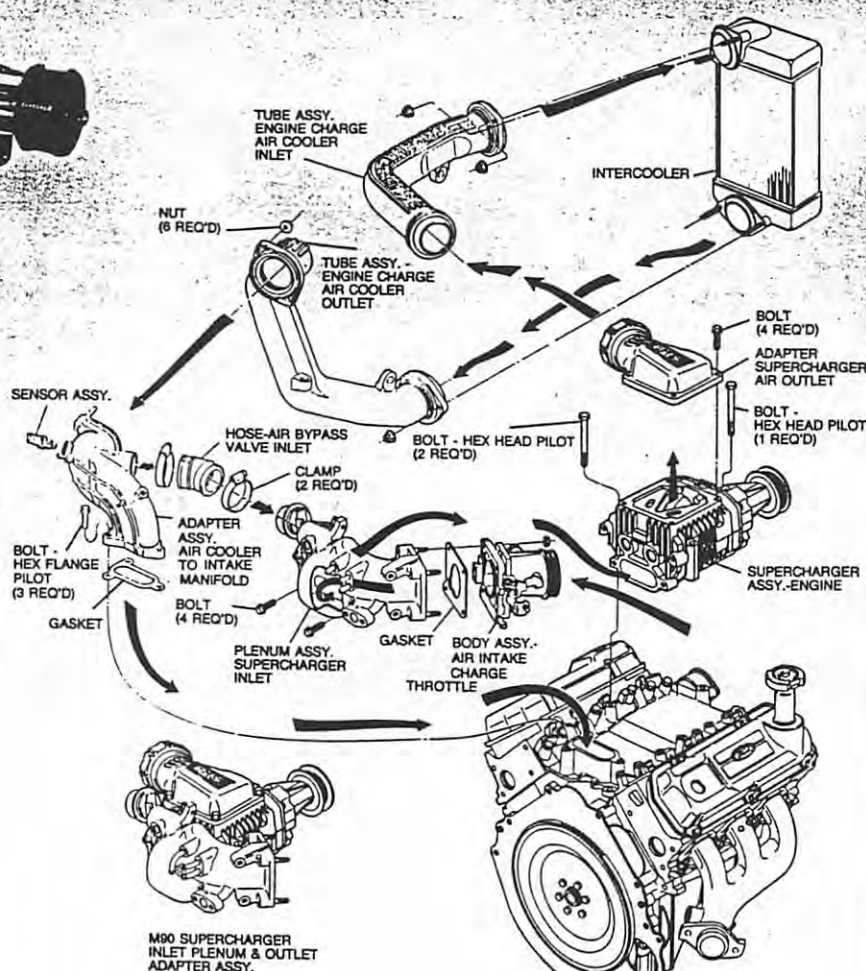


tions. At cruising speeds the supercharger only draws about one-half horsepower. Supercharger noise levels are controlled by a 60-degree helical twist in the rotors. Eaton uses a special three-lobe rotor configuration designed to pump smaller volumes of air at higher frequencies. The helical design reduces carry-back volume to only 1.2 percent of overall supercharger displacement. Carry-back volume is the amount of air carried back to the inlet side of the supercharger due to the unavoidable space between the meshing rotors. Even this small amount of carry-back volume contributes to higher noise levels, so Eaton milled pulsation chambers into the casing to achieve another six-decibel noise reduction across the supercharger's operating range. Gear whine and belt noise are almost nonexistent. In fact, the supercharged engine is now significantly quieter than the former turbocharged engine, even under high-boost conditions.

Another major design change is the move to fully independent suspension for improved stability, handling, and ride quality. The front suspension incorporates a long spindle, short/long arm design with an upper A-arm, a single lower arm, double isolated tension strut and coil spring assembly, and a 1.2-inch-diameter stabilizer bar on the Super Coupe. This design has a lower overall profile, which was necessary to permit the design of a long, low hood-line. Its improved geometry promotes better tire wear and greater flexibility in wheel control for optimum handling. Special Teflon-coated suspension bushings eliminate friction and permit components to pivot at low torsional rates. Moreover, the suspension ball joints are plastic-lined to further reduce friction.

The rear suspension is also fully independent. It utilizes a lower H-arm with a single upper arm, coil springs, and a 1.1-inch-diameter stabilizer bar. This layout not only improves the ride and handling qualities, but it is also mounted on an isolated subframe that significantly reduces NVH characteristics for greater passenger comfort. A special "toe link" attached to the control arm and the subframe actually "steers" the rear wheels over large bumps and resists conditions of high

HOW THE SUPERCHARGER WORKS



This illustration indicates the flow of air through the supercharger. Air enters through the remote-mounted air cleaner and the mass airflow sensor (which are not shown). It then passes through a 60mm-diameter opening in the throttle body assembly and through the supercharger inlet plenum assembly bolted to the back of the supercharger. The air enters the supercharger from the bottom, where it is pressurized and pushed out the top via the air outlet adapter. To remove the heat of compression, the air is then routed through the intercooler, entering through the top and exiting at the bottom where it is directed to the back of the intake manifold via the air cooler intake adapter. The intercooling process can lower charge air temperature as much as 150 degrees to produce denser, pressurized air for more power. The intake manifold itself employs a plenum instead of individual runners. Pressurization promotes efficient routing of the intake charge, so separate runners are not required.

You also notice that the system has a bypass between the air cooler to intake manifold adapter and the supercharger inlet assembly. The bypass routes excess air back through the supercharger inlet assembly so the engine operates in a normally aspirated mode. The air damper permits the supercharger to idle along with virtually no drag when extra power is not required. A vacuum motor regulates the amount of air routed in the bypass according to the power requirements of the engine. As power demand increases, the vacuum motor progressively closes off a butterfly valve so boost will build up in the manifold. And since the supercharger's pumping power is limited by the speed of the engine, no wastegate is required to limit boost. Supercharger boost is directly controlled through the opening and closing of the throttle, with 12-psi maximum boost available.

side loading. It permits the suspension to be tuned for neutral handling. The suspension geometry was designed to prevent understeer, but without the toe

link it would exceed neutral and go to an oversteer condition.

The new independent suspension system reduces roll significantly, and

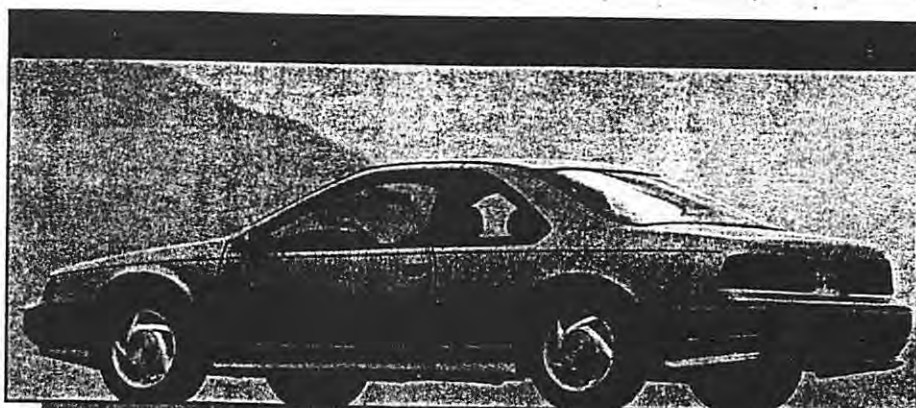
the front and rear roll centers are now at the same height so the car rolls parallel to the ground without dipping or bobbing in an uncomfortable manner. The front suspension is also very resistant to dive, so the car stays level when the brakes are applied hard. This makes the car feel more controlled under braking. Increased suspension travel offers additional tuning flexibility that enables the system to absorb more of the shocks generated by rough roads. Variable-rate front and rear coils deliver a smooth ride under both loaded and unloaded conditions, and gas-pressurized shocks with hydraulic rebound stops provide consistent ride control.

This system also incorporates the Automatic Ride Control first introduced on the '87 Thunderbirds. A control module monitors signals from speed, brake pressure, and steering sensors, and acceleration signals from the ECM. With this input it automatically adjusts shock absorber firmness to optimize ride and handling characteristics for current driving conditions. The EEC-IV module selects a soft ride when in the automatic mode, but it will automatically switch to a firm mode when it perceives the need. The "firm" mode can also be manually selected and held as long as the driver desires.

A new speed-sensitive, electronic, variable-assist power rack-and-pinion steering system has been devised to provide a much more sensitive steering feel for the driver. At higher speeds the driver gets higher steering effort for a solid, down the road feel. At lower speeds reduced effort is introduced for ease of parking and maneuvering. An electronic variable orifice (EVO) incorporated in the power steering pump uses an algorithm to monitor vehicle speed and adjust the steering effort based on that input.

Ford has perhaps the best brakes in the industry and has chosen to make them even more efficient on the new Thunderbird. The intent was to optimize the brakes for overall performance, including fade resistance, stopping consistency, lining life, noise, and pedal effort. With four-wheel power discs and antilock braking (ABS), the new Thunderbird Super Coupe also features larger rotors with improved lining compounds and insulators for reduced brake noise.

The new Super Coupe is a very efficient automobile. It is heavy—something in the neighborhood of 3800 pounds—but it's hard to pack so many world-class performance features into a car without incurring a weight penalty. Remember that this car is equipped with virtually every performance asset currently available and even some that



are just now becoming available. In spite of the weight problem the car is very stable and extremely agile. It will do what you want it to do, but there will probably be some initial complaint about acceleration. Even with 315 lbs.-ft. of torque it doesn't feel any stronger than the previous Turbo Coupe, but since we were unable to instrument the car at this time we can't accurately comment on its acceleration capabilities. We suspect it will be as fast and possibly faster than the Turbo Coupe, and it now has the low-end power it needed. The Turbo Coupe would run very strong as long as you kept it cranked up, but any low-speed turn would find you constantly searching for another lower gear as the vibrations made it sound like it was going to spit the crank right out on the pavement. All that is gone with the new V6, which is smooth and responsive throughout the powerband. If these cars keep getting better like they have recently, even earthbound drivers will soon be suffering from g-lock, a temporary blackout condition suffered by fighter pilots during high-g maneuvers. They're that good.

The new Thunderbird design will probably be very fast in NASCAR trim because of the fast windshield angle and the high rear quarters and blended backlight. Not surprisingly, though, the T-Bird will soon lose some of its significance on the dragstrip because the longer wheelbase works against it in Pro Stock applications. It might make a great-looking Funny Car, but then who can really tell what brand a Funny Car is anyway? These cars will definitely make awesome street machines, and now that everyone on the block owns an IROC Camaro, the Super Coupe will probably become the next high-profile status machine. As hot rodders, we will be challenged more than ever in our efforts to modify these cars because they already have everything you could

SPEC SHEET

'89 FORD THUNDERBIRD SUPER COUPE

RETAIL:

Base Price\$ not available yet
Price As Tested\$ not available yet

ENGINE:

Bore & Stroke3.80x3.40 inches;
96.8x88 mm
Displacement232 cid, 3.8L
Compression Ratio8.2:1
HP, SAE Net @ rpm210 @ 4000
Torque, SAE Net @ rpm315 @ 2600
Induction SystemEFI with supercharger, two
rotors, three lobes each
with 60-degree helical
twist, 12-psi maximum
boost

DRIVETRAIN:

Transmission5-speed manual
Axle Ratio2.73:1, 3.08:1, and 3.27:1
optional with automatic
trans

CHASSIS:

Front SuspensionShort/long arm with double
isolated tension strut,
1.20-inch stabilizer bar, and
automatic ride control
Rear SuspensionFully independent H-arm
and single upper arm with
coil springs, 1.1-inch
stabilizer bar, and
automatic ride control
SteeringPower-assisted
rack-and-pinion, 15:1 ratio
BrakesPower-assisted four-wheel
discs with ABS
Front: 10.8x1.02-inch discs
Rear: 10.0x0.94-inch drums
Wheels16x7-inch cast aluminum
with pinwheel spokes and
39mm offset
TiresP225/60VR16 Goodyear
Eagle Gatorbacks

GENERAL:

Curb Weight3865 pounds
Wheelbase113.0 inches
Fuel Capacity17 gallons

PERFORMANCE:

Power to weight18.4 lbs./hp
0 to 60 mph7.5 seconds, est.
Quarter-Mile15.9 @ 89 mph, est.
Skidpad85g, est.

want. Does that intimidate us? Naaah! Just trot one out here and we'll come up with some surprisingly innovative ideas in no time. Just wait and see. **NR**

BEAK TO BEAK..... (Question & Answers; Plus, Face to Face, Heart to Heart, & Tongue-in-Cheek chit-chat, true confessions, and unsolicited testimonials!)

Jamie Turvey
Ex-Chief Engineer, Superchips, Inc.
Somewhere-in-Europe

March, 10 (I think), 1997

Bill Hull, El Presidente'
Super Coupe Club of America

Dear Messeuer Hull,

I am finally crawling out from under my rock to make a genuine, heart-felt confession; not just to you and other Super Coupe owners world-wide, but also to all car owners everywhere unfortunate enough to fall for the false and mis-leading advertising claims made by me while in the employ of Superchips, Inc. I want you and others to understand that I was under great duress to make these wild & exaggerated claims - you have no idea how stressful it is to try to work shackled to a desk, with a loaded shotgun pointed at your head 12 hours a day! Superchips, Inc. will stop at nothing to "top the competition".

Further, I was the original "Dumpster Baby". I was a dumpster child before it became "chic" as it is today! After being dropped on my head at birth, my genetic parents "slam-dunked" me into the first available trash dumpster they could find, and bid me "adios"! Lucky for me, some "space aliens" who just happened to be flying over, spotted me on their infra-red radar. After "beaming-me-up" to their UFO, they took me home to "Outer Galactica" where I was raised by loving "parents" and had the rare opportunity of benefiting from technology which is still 1000 light-years ahead of that available on earth. In addition, the celestial atmosphere surrounding "Outer Galactia" (no hydro-carbons, CFC's, acid-rain, or holes in the ozone), allowed "super-natural" mental development.

Upon returning to earth on my 21st birthday, and armed with the above-mentioned "unfair-advantages" (compared to mere-mortal earthlings) I found employment with Superchips, Inc. Realizing my I.Q. was totally "off the charts", my new employers had me design and help produce their superlative line of computer chip-modules. The rest, as they say, is HISTORY! As sucessful as I was, I eventually grew tired of the constant nit-picking and complaining from people such as yourself (and others). Recently, feeling that I could not answer these unfounded charges face to face, I decided to give up my "lofty" position with Superchips, Inc, and fled (I mean moved) to Europe. I know you would personally like to "take the credit" for not only "running me out-of-town-on-a-rail, but all the way out of the country! This is just not the case however, I really did move to Europe on my own free will! Honest Injun!

Upon discovering that European auto enthusiasts are generally much more discerning than their American counterparts (just try hogging the hammer-lane on the Autobahn while trying to "look important" hugged up to a cell-phone!!), I decided to deny the world of my automotive computer-chip expertise, and go off on a different "tangent". Presently, I am working with a top-flight team of scientists and engineers (of course, I am still the "Big Dog") to develop a new line of computer-chip enhanced "BUFFALO CHIPS" - THAT'S RIGHT - SUPER COW-PATTIES!!! Now, I am sure you are thinking - "What possible use would there be for an improved "cow-pattie"????!! Well, just in case you are not aware, in many Western states in the U.S.of A, buffalo chip tossing contests are quite common and extremely competitive (even offering big prize money and the keys to the city to the winners!). Generally, these buffalo-chip tossing contests are held in conjunction

with state and county fairs, but recent consumer surveys indicate this little-known sport is fixin' to bust wide open nation-wide, as millions of present NASCAR fans are growing tired of watching Chevrolet and Pontiac (running their "kit-cars" with their unfair aerodynamic advantages) every week-end, and may be ready to start a new national past-time - THAT'S RIGHT, ...YOU GUESSED IT, MR. HULL...BUFFALO CHIP-TOSSING!!

As is my custom, I am on top of these earth-shaking developments, and ready, again, to alter the course of history (as I have previously done with Superchips, Inc.). I have developed a computer-chip enhanced cow-pattie, made from only the finest, organically-fed, pesticide, herbicide, and growth-hormone free cow pooh-pooh! THIS IS NO BULL! Starting with these premium ingredients, (hand picked, I might add), I have been able to perfect a process where-by we further refine (removing the natural aroma, but leaving the goodies) this great resource, and implant a computer-chip module. This has enabled us to manufacture a buffalo-chip which has a much lower co-efficient of drag, a higher co-efficient of lift, with resulting LESS down-force (maybe NASCAR should require Monte Carlos to attach one of these babies to their rear spoilers with that neat tape they use, to even the down-force with the T-Birds!). Preliminary tests have shown far superior flight characteristics compared to any non-computer-chip enhanced cow-pattie on the planet! We plan to market this DY-NO-MITE! new product this spring, starting in the Western U.S. of A., then nation-wide! No doubt, this revolution will soon spread to every part of the globe, as everyone knows other countries always copy America (just look at the Hula-hoop craze, Rock-and-Roll, skate-boarding, side-walk surfing, and thonged-foot-wear!).

Other computer-enhanced products will soon follow in rapid succession. First, we will greatly improve the Aborigine boom-a-rang! By implanting a Keene Bell-type "Switch-Chip" (because we want these babies to "return" to us), we will stamp out famine and poverty in Australia! Other computer-chip enhanced products presently on the drawing board (I mean, computer-screen, of course!) are Potato (or is it potatoe??) chips, chocolate chips, wood chips, and computer-cloned "chips-off-the-old-block." These computer-hatched off-spring, will provide this current generation of largely mis-guided youth with incomparable leadership, vision, and a "bridge to the next century" (which is a good thing too, because I don't believe Bill, Hillary, and the Democratic Party Money Machine can "cut the mustard") I will, however (after receiving the world-wide acclaim which is sure to follow these products, and also, I might add, is so long over-due!), accept my invitation to the White-Water (I mean, White House!) tea party sure to be held in my honor, as well as the over-night stay in the Lincoln bedroom. The great thing is, by this time, with my new-found wealth, I will be able to afford this visit!! Hey!, what's a couple million "summolians" sic.! when compared to the honor of being able to "rub elbows" with the greatest B.S.'er of all time - William Jefferson Clinton, along with his "charming" and "utterly ravishing" blushing bride, ol' "tree-trunks-for-legs" Hillary! But I digress!

Back to the computer-cloned "chips-off-the-old-block". To quote Isaac Newton, "The apple never falls far from the tree" (the basis of his original thesis on "the laws of physics"), I believe we can solve the ever-worsening problem of ugly, un-wanted, and orphaned children. Prospective parents can now custom-order children in their own likeness, (needing only to provide their VIN code and computer processor serial number - like Superchips, Inc.), having the assurance that they will receive (without having to wait nine months) the child of their dreams! Aren't I wonderful!!

Well, it is getting late, and I still have to "check in" with my Guru and "soul-mate" Ambrose - I believe I can "feel" him calling now! Good-luck with your continuing endeavors with the SCCoA - hope you can find another poor soul to "kick-around" now that I am gone! Sincerely, and in all "good conscience".....

Chief-Engineer (again, by-golly!), Jamie "Outta-This-World" Turvey
Super Buffalo Chips, Inc.

Supercoupe Club of America
Attn: Mr. Bill Hull, President

Subject: Complaint

I would like to share with you and your club members an unfortunate situation that occurred to my wife, Ester, and I last Labor Day weekend on the east side of Columbus Ohio near National Trails Raceway. As we sat in our Camaro Z-28 at an I-70 off ramp, three Thunderbird Supercoupes, one after another after another, screamed and squealed past us as the light turned green. Needless to say, my wife and I were extremely shaken by this violent and excessive use of torque. We also couldn't catch our breath for several minutes until the tire smoke in the air cleared. My wife has STILL not regained full control of her bladder since this altercation with these thunderous monsters.

I hired a private detective to investigate this matter and he returned quickly with your clubs September 1996 newsletter. On page 5 it shamelessly details the exact circumstances which happened to us. I hereby am filing a formal complaint with your clubs rules and bylaws committee. If I do not hear from you shortly, I will be forced to personally contact your chief committee member, the "Hangin Judge". I am confident that HE will find and punish the perpetrators with these pumped up T-Birds.

As I read the detectives full report, I also had an opportunity to read another of your clubs newsletter dated June 1996. It states your views on the Contour SVT. I immediately new that I had to have one. I traded in the Z-28, and am now the proud owner of the latest offering by Fords Special Vehicle Team...a 1998 Contour SVT!! WOW, what a mean machine. This souped up baby will surely protect me and the little lady from future bully episodes like what happened last year. I now have 192 rompin, stompin horses and almost as much torque. Surely this hot rod will mop the floor with any unsuspecting Supercoupes who cross our path! My SVT Contour has enough power to nearly spin its two front tires so you rebel Supercoupe owners better watch your rear view mirrors for the likes of us Contour SVT owners. I am glad that the SVT Thunderbird is dead. It was supposed to be have a DOHC V8 with over 300 HP. What a waste this would have been if it had made production. That is WAY TOO MUCH power to be turned loose in the hands of the public. Nobody would want such a car except those deranged mutant freaks who crave affordable speed and a comfortable ride at the same time. The Contour was obviously the logical choice for Fords next factory hot rod.

I was disappointed that they didn't put some cool air ducts in my hood or give it some paint that changes color like the SVT Mustang Cobra, but I did get that neat little SVT badge on my trunk. That alone makes the car worth every penny of its \$23,000 price tag. I know that for another \$2,000 I could have gotten a faster V8 SHO with a better ride, a real back seat and trunk, and plenty of room for five adult passengers but I did get that cool little SVT badge though and THAT, is worth something in my eyes. The 100K without a tune up guarantee also excited me because I hate getting greasy and I don't know what all those pieces of metal, hoses, and wires are anyway under the hood. Who needs a V8, rear wheel drive, superchargers or any of that other typical muscle car stuff...not me! I love my little Contour SVT.

FYI, everyone interested may now join my Contour SVT Racers Appreciation Program. Tell your friends since I am the only member so far. My first newsletter will pontificate on the beauty of front wheel drive in the snow. I will also provide drag racing tips. My personal best to date is a neck snapping 17.1 seconds at 65 mph. It could do better but us Contour SVT owners all know the national speed limit is 65 and we obey it. We also don't flaunt our power on the street, unlike other clubs!

Sincerely,

Perciville Q. Fudpucker, P.H.D.

President - Contour Racers Appreciation Program *(or CRAP, as many are beginning to call this new club)*

To: Mr. Bill Hull, President and "Fearless Leader"
SCCoA

March 15, 1997

From: The Honorable Dick Adams
Chairman, Rules & By-laws Committee
SCCoA

Dear "Great-One"

1. It has recently been brought to my attention that several SCCoA members may have been guilty of "Crimes Against Humanity", namely - undue use of "TORK", and other un-harnessed juvenile behavior.

As you already know, "O Omnipotent One", these actions, if proven to be true, are clear violations of Club Rules; specifically, Section 6, paragraph 2, sub-paragraph a., line 10 - found on page 6,009 of the SCCoA Rules & By-laws Manual. If found guilty, and few people escape my wrath (even SCCoA members), the penalties for these offenses are severe, indeed. 1. The guilty member must rent a used Yugo, come to the next SCCoA meet dressed "in-drag" (like Dennis Rodman of the Chicago Bulls, dyed hair is optional), 2. stay confined to the SCCoA Club tent for the duration of the meet, 3. write 1000 times "I will, from this day forth and forever, honor, obey, and abide by, all SCCoA Rules & By-laws", and, 4. Daily, upon their return back home, get on their knees every morning, face to the East, and pay homage to our "Great Gahuna", Bill Hull.

2. It has also been brought to my attention that many SCCoA members frequently call you, and really believing you to be "omniscient" AND "omnipotent" (as well as a fortune-teller, and a mind-reader), upon hearing your sweet "Hello" on the other end of the phone line, fail to state their full name, sometimes even forgetting to give you any name at all. These Club members, salivating at the mouth in their excitement to buy "GO-GOODIES" for their beloved SCs', no doubt fail to realize that you probably talk to several Mikes, Georges, and Billy-Bobs over the course of any given day. Knowing you are becoming quite deaf because of your old age (and because you fail to use hearing protection when you port & polish the SC adapter tops with your air-powered die-grinder) these members should not expect you to RECOGNIZE their voice either. By making you "play along, as though you really know who you are talking to", there-by adding undue stress to your already burned-out brain, these inconsiderate members should be duly punished. I know all of these guilty members cannot possibly be from the state of Indiana (Hoosier your Mama, Hoosier Daddy), so unless they are just ashamed to identify themselves, should know who their Mamas and Daddys are - and therefore their full names. From this day forth, failure to promptly identify oneself to our Great & Fearless Leader, "Bwana of the Automotive Jungle", Bill Hull, during a phone conversation, shall carry the MAXIMUM penalty provided under the SCCoA Rules & By-Laws. THAT'S RIGHT!!!!...These guilty members will be forced to 1. rent a CHEVROLET!!!, 2. drive to the next SCCoA meet in said Bow-Tie, 3. STAND IN FRONT of the SCCoA tent for the duration of the meet, RAIN OR SHINE, wearing nothing but their favorite SCCoA tee-shirt and a two-sided body sign, on which will be printed WILL WORK FOR FOOD, on the front, and CLINTON/GORE, on the back!

3. Another, even more serious offense, is calling you at all hours of the day and night, forgetting time zone differences, just to ask you questions which have been duly answered more than once in previous issues of Chargin' Thunder. I know for a fact (except for the initial issue of Chargin' Thunder - Mar. 96 - when you were "under-the-gun" to produce a newsletter), that you have not included unnecessary pages (with the possible exception of this Beak to Beak section) in the Club newsletter. Knowing that every priceless page of the newsletter takes valuable time to produce, plus increases printing & postage expenses, I know that everything in this hallowed

publication is in there for a specific purpose, that is, to educate us and to reveal your uncanny wisdom - not an exercise you go thru to improve your word-processing and computer skills! Therefore, from this day forth, any SCCoA member who fails to devote their undivided attention to each issue of Chargin' Thunder; who fails to read, assimilate, and commit to memory each and every glorious word which, by devine guidance, appears on the pages of our beloved magazine/book, shall suffer the same humiliating fate as #2 above. Failure to purchase a Haynes Shop Manual, so they can find their own answers to basic maintainence procedures, but instead, rely on you to hold their hand and "baby" them, step by step, thru simple "fix-its", will also result in penalty #2. Anyone asking confusing or nonsensical questions deserves an equally confusing or nonsensical answer, such as "Nan-na, Nan-na, Bo-na-na.....! As my Daddy used to say, "every stupid question deserves an equally studid answer"! Any Club member unwitting enough to violate more than two of the above "Rules & By-Laws" during one phone conversation shall henceforth and forever be deemed "too feeble-minded to find-their-own-butt-in-the-dark-with-both-hands"!

4. Back to the report of excessive use of "TORK" by SCCoA members: I have my faithful band of ACLU-card-carrying, "Hah-vahhrd" and "Yaley" educated "gumshoes" in "Hot Pursuit" of the guilty party(ies). NOBODY GETS ONE OVER ON THE HANG'IN JUDGE!! Thus far, the trail of blood and mayhem has lead my trusty troops to somewhere in central East Virgina (as opposed to West Virginia).....2239 Banbury St. or something...THE PLOT THICKENS!! They will not slip thru my clutches, this time!! VENGEANCE IS MINE!!, saith the "Hangin' Judge!

Well, it's time to put down my Coors Light (I mean my gavel), come out from behind the judicial bench, take off this silly robe, jump in my 95 SC and "hit the links". THAT'S RIGHT, CLUBBERS, I'm a genuine DUFFER, with only a 5 handicap!

Dick Adams, The "Hangin' Judge"

Member, American Honky-Tonk Bar Association (AHTBA)

To: Bill Hull, President
SCCoA

Date: Early Planting & Calving Season, 1997

From: Bubba T. Ledbetter
Member # 00
SCCoA

Dear Mr. Hull,

You cannot imagine how thrilled I was when I received my Dec. issue of Chargin' Thunder, and RIGHT THERE, smack-dab-in-the-middle, was my letter to you, MY IDOL! As my sister was readin' to me your MARV-A-LUS response to my questions, I fainted dead away from all the 'citement. It took 2 two doses of Granny Ledbetter's "recipe" plus 10 puffs of this home-grown "rope-tobakker" (as us locals call it) just to bring me back around! Anyway, thank you so much for taking the time to 'splain to me what the "S" in S-Model stood for. Makes sense when you think about it - should've figger'd it out for myself.

The other night, while out coon-hunting with my best palsy-walsy, Marcell (and my best hound-dog, Jamie T), we got into a heated DEE-BATE. Yes-Sir-Re-Bob, we almost had it out that night - right there before Buddha and everybody! Marcell got to runnin' off at the mouth about the Superchips, Inc 'puter chip modules that he had seen advertised in his fav-o-rite car magazine, BOWTIES FOREVER, Pee-Wee Herman, editor. Marcell swears that sticking a SuperChips, Inc.

module in yer 'puter will make you "go" faster. I told Marcell that he was stuffed fuller-than-a-Christmas-turkey! I know I'm a whole lot smarter than Marcell, because I'm a member of the SCCoA! Anyway, I told him that you have proven that a SuperChips, Inc module will only make you "go" slower, NOT FASTER! Anyway, one thing led to another - so we decided to have it out - once and for all.

We got all the guys together down at the MAIN ATTRACTION in town, Bill & Hillary's Pool Hall, last Saturday night. I mean everybody in town was there (except Widder Brown and the preacher man - they had to get together alone so they could pray for all the sick and poor, lost souls in the world - must be alot of them folks out there - the preacher man didn' leave Widder Brown's house 'til way past 3 in the mornin'!). Anyway, me and the guys, well,... we set up some rules - because some of them believed that a SuperChips, Inc module would make them "go" faster, and some of us swore they would make us "go" slower. We decided that those of them what believed the SuperChip would make them "go" faster should just go ahead and buy one of them there Superchips do-hickys. Those of us who believed that the SuperChip would make us "go" slower would just stick with our regular "brand". Well, seein' as how most of us had just finished selling off our hogs, we all had a little extra "spending cash". We all decided to meet back at Bill & Hillary's in two weeks and have a real "throw-down". Well, we did just that - and I'm tellin' you - I ain't never seen such a goin's on. Them Bowtie fellers swaller'd their Superchips, washin' 'em down with Boone's Farm apple brandy, chased with Pabst Blue Ribbon. Us good-ol'-Blue Oval boys, well,... we swaller'd our brand, and washed it down with some of Granny's recipe that I had brought down for this momentous occassion, then we chased it with Thunderbird wine (what else), Directly, they got to holler'n "TASTES GREAT". Well, not to be outdone, we holler'd back, "LESS FILLIN". You ain't never seen such a site! This went on for the better part of the evenin'. Well, long about daybreak, after a-drinkin' and a-holler'n for the better part of 8 hours, well....the truth about the SuperChips finally came "out", and you are absolutely right, Mr. Hull. The bow-tie boys all had to make a bee-line for the johnny-houses, but guess what??? Us Ex-Lax boys were a whole lot faster- we done beat 'em there by two hours!!!

I now have another favor to ask of you, Mr Hull. My dear Aunt Hattie went to visit her Guru, Ambrose P. Airhead, the Tibetan monk she had read about in Dec. 96 Chargin' Thunder - and guess what - she tripped over Ambroses' goat's rope,fell off "the mountain", and ain't never comin' back. We decided to sell the real nice lead-lined burial vault she had bought right before she left (she done got some 'surance money after Unka Jack died (well, actually he broke his neck when he fell backwards out of his rocker while dog-drunk one night). It was real sad; I really liked Unka Jack! He had taught me my first cuss-word, rolled me my first smoke of "rope-tobakker", and give me my first drink of likker - all before I turned 8 years old! Anyway, one minute he was a-rockin' away sawin' on his fiddle - just a-singin' away - next minute - BOOM - he was laying there on the front "poach" deader'n a rock! Now that Aunt Hattie and Unka Jack are both gone, things just ain't the same around here. Anyway, before he kilt hisself that night, Unka Jack had took my Dec issue of Chargin' Thunder to the little house behind the big house (said he really liked the high quality paper - even better than the Sears catalog or corn cobs). Now that I don't have my Dec 96 Chargin' Thunder, I need to know how to reach Prof. Purcival Q. Fudpucker, PhD. I want to know if he is still buyin' up lead for his "Hi-Mass Piston Project". If you could give me a holler, and let me know , I'd sure be grateful. I know you and Dr. Fudpucker are tite-as-a-tick-on-a-dog. Thanks a bushel-and-a-peck!

Signed:



Bubba T. Ledbetter
Member, Jeff Foxworthy's "Red Neck Hall of Fame"

THE BIRD COUPEBuy, Want, Sell, Trade, Swap-out, Flip-for, etc...

For Sale - SC -35th Anniv. Ed. AOD, 83,000 miles, moon-roof, JBL, new Gatorbacks, new brakes, new fuel pump, 35th anniv. car cover & kit, wired for phone. Stored in winter, Asking \$8300. Call Joe Kubifiak at 715-423-6273

For Sale - SC 1993 AOD - Loaded, Red w/black leather, 65,000 hwy miles, new professional paint job. Original owner. asking \$12,000 obo Call 804-296-9821

For Sale - SC 89 5-speed, 66,000 miles, loaded, white/titanium, minor mods & up-grades, have all receipts & documentation. asking \$6995 call 215-491-2387

For Sale - SC 35th Anniv. like new, only 9,000 mi. call 304-425-5346

For Sale - SC 90 5-speed 116,000 miles, black/red cloth, Cervini hood & wing, going back to school, need money, asking \$9,000

Wanted - 100,000 Tons of organically fed, herbicide, pesticide, & growth-hormone free, cow pooh-pooh for classified aero-space project. Top dollar! Call J. Turvey at 1-buffalo-chips

For Sale - Lead-lined burial vault - "Peaceful Sleep" brand, like-new, never used. Will deliver in continental U.S. in my pick-up truck (allow one day for dog-box removal). Also, slightly used SuperChips, Inc. chip modules, (5), NO WARRANTY! Call Bubba at 1-BR-549

THERMOSTAT OVERVIEW

WHY AN AUTOMOTIVE ENGINE NEEDS A BALANCED THERMOSTAT

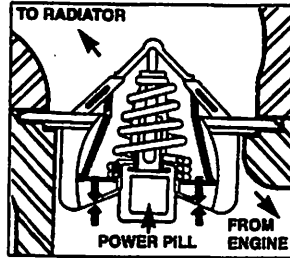
A thermostat is located in a water outlet connection housing at one end of the engine. The thermostat ensures rapid engine warm-up by restricting coolant flow at lower operating temperatures. It also assists in keeping the engine operating temperature within predetermined limits.

1) Until the engine warms up, the coolant is too cool to melt the wax in the balanced thermostat's Power Pill®, a tiny piston that opens the thermostat. With no open passage to the radiator, the coolant recirculates through the engine.

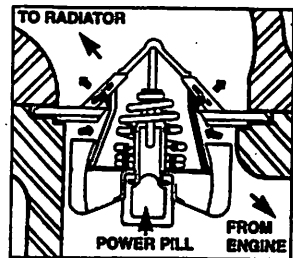
2) The unique three-port construction of the balanced thermostat equalizes the pressure above and below the thermostat's moving valve. Since the coolant exerts equal, yet opposite pressure on the sleeve, the thermostat is "balanced"—it responds to temperature changes only.

3) When the coolant is sufficiently heated to melt the wax in the Power Pill, the wax expands, forcing out the piston and opening the thermostat. The coolant can then circulate through the radiator.

4) Fast temperature response increases coolant flow to the radiator, unaffected by pump pressure surges on back side of opening.



CLOSED POSITION
(POWER PILL COMPRESSED)



OPEN POSITION
(POWER PILL EXPANDED)

WE RECOMMEND AND SELL ROBERTSHAW THERMOSTATS

Back in 1916, Robertshaw made the first thermostat for the first American cars. And today, Robertshaw is still first, giving you this exclusive combination of quality features:

1) **Stress-free construction.** Robertshaw makes the thermostat's strut assembly from brass, not stainless steel, because brass can be bradded to the housing with heat instead of sledgehammer-like stress. This technique permits two brads per strut. Other manufacturers forcefully attach the struts to the housing with intense, metal-weakening pressure on the struts, binding each strut in only one spot.

2) **The Power Pill®.** This is the heart of a Robertshaw thermostat. It detects minute changes in the temperature of the coolant, and quickly activates a precision-engineered stem or piston to open and close the thermostat valve.

3) **One-piece bypass poppet.** With other thermostats, the bypass valve stem is welded on. The weld tends to fail under stress. To eliminate this problem, Robertshaw manufactures the entire copper cup and bypass stem from a single piece of metal.

4) **Short-stroke piston.** In conventional thermostats, the piston must make a large stroke to open the thermostat far enough for adequate coolant flow. But the long stroke compromises durability. Robertshaw engineers achieved a shorter stroke with a uniquely-designed flange and poppet. This design increases the longevity of the thermostat, yet still allows adequate coolant circulation.

5) **Contoured strut.** Making the strut assembly from brass instead of steel provides another benefit: brass, being more malleable than steel, can be precisely formed to maximize coolant flow.

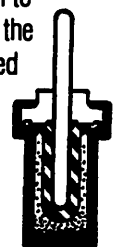
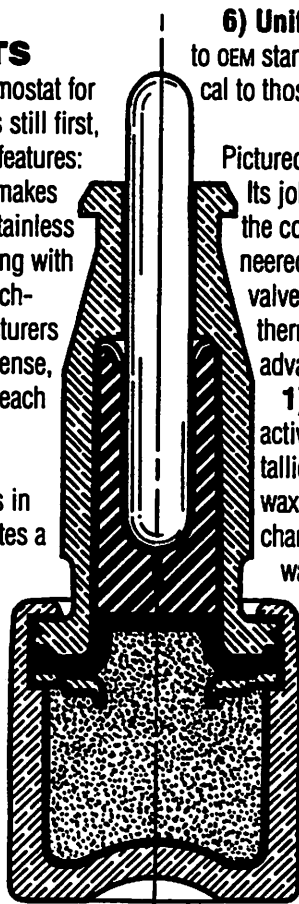
6) **Uniform quality.** Robertshaw builds all thermostats to OEM standards—so your replacement thermostat is identical to those used in new Fords, Chryslers, and other cars.

Pictured at left is the heart of a Robertshaw thermostat. Its job: to detect minute changes in the temperature of the coolant, and to quickly activate a precision-engineered piston that opens and closes the thermostat valve. Compared to the thermal elements in some thermostats, Robertshaw's Power Pill® has major advantages:

1) **Rapid response.** The Power Pill's piston is activated by a temperature-sensitive mixture of metallic powder and wax. Some thermostats use an all-wax charge, which responds slowly to temperature changes. Other brands mix copper powder with the wax for faster response, but the copper quickly separates from the wax. Robertshaw developed a process to maintain suspension of the copper powder in the wax, so the fast response doesn't deteriorate and the thermostat will not "stick-open" to cause the engine to run cool.

2) **Reliable performance.** Most manufacturers use a one-piece rubber diaphragm to seal the charge and drive the piston. If the rubber part ruptures, the thermostat fails. Robertshaw uses two separate parts: a diaphragm to seal the wax, and a stem seat or plug that drives the piston. Rubber material for each part is formulated especially to meet each part's unique requirements. Wear or damage to the stem seat still allows the thermostat to operate satisfactorily.

3) **Precise performance.** Every Robertshaw Power Pill is calibrated to bring the thermostat's start-to-open temperature within strict tolerances.



CONVENTIONAL
THERMAL
ELEMENTS



*Here are some common sense ways to
unleash all of the horsepower you can
...with DynoMax!*

*"Getting the most out of your exhaust system
modifications is easy."*

Restrictive Exhaust

A restrictive exhaust creates back pressure in the exhaust system that hurts your vehicle's performance in two ways:

1. The engine has to work harder to force exhaust gases out of the cylinders.
2. Engines cannot scavenge burned exhaust gases out of the cylinder efficiently. This leaves exhaust gases in the cylinder to dilute incoming air/fuel mixtures and rob your engine of horsepower.

Pipe Diameter

A common misconception is that the larger the diameter, the better the system. But, bigger isn't always better. Systems that are too large in diameter can actually hurt performance.

As a general rule, switching to a performance system that is 1/4" to 1/2" inch larger than stock will provide you with the *best* horsepower increases. To determine which pipe diameters will be best for your system, decide what RPM range your engine will operate at, most of the time. Smaller diameter pipes will produce low to mid RPM torque. Larger diameters produce mid to high RPM torque.

HORSEPOWER DEPENDS ON FLOW

(not pipe diameter alone)

Bigger isn't always better.
Systems that are too large
in diameter can actually hurt
performance. Improved flow
is what you need.

**Having large diameter pipes
isn't what's cool. Going fast
and making horsepower is.**

Engine CID	Pipe Diameter (inches)		Horsepower
	Single	Dual	
150-200	2.00	2.00	100
	2.25	2.00	150
	2.50	2.00	200
	2.50	2.00	200
200-250	2.25	2.00	150
	2.50	2.00	200
	2.50	2.25	250
	2.50	2.25	250
250-300	2.50	2.00	200
	2.50	2.25	250
	3.00	2.50	300
	3.00	2.50	300
300-350	3.00	2.50	250
	3.00	2.50	300
	3.50	2.50	350
	3.50	2.50	350
350-400	3.30	2.50	300
	3.50	2.50	350
	3.50	2.50	400
	3.50	2.50	400
400-450	3.50	2.50	350
	4.00	3.00	400
	4.00	3.00	450
	4.00	3.00	450
450-500	4.50	3.50	400
	4.50	3.50	450
	4.50	3.50	500
	4.50	3.50	500

Balance Tubes

Balance Tubes (or 'H' pipes) help to even out the pulses in the exhaust gases and balance the back pressure between both banks of your engine. They not only help improve horsepower, but sound as well.

To find the right location to install your balance tube, apply a strip of paint down the front portion of the exhaust pipes. The balance tube should be placed where the paint burns off (bubbles) on the exhaust pipes. Generally, put the balance tubes as close to the headers as possible. The balance tube diameter should be at least 75% of the diameter of the pipes with which it connects.