
Volume 24

Issue 10

October 1997

PRESIDENT

Ellis Woumm, 701 Sybil Ave., San Leandro, CA 94577 (510) 483-3142

VICE PRESIDENT

Michael Fertitta
34943 Kinglet Court
Union City, CA 94587
(510) 489-5705
PerfectCpy@aol.com

TREASURER

Bill Santos
948 Olympus Ct.
Sunnyvale, CA 94087
(408) 732-6468
BSantos@Flash.net

SECRETARY

Capt Mike Drew
150 Westgate Dr.
San Francisco, CA 94127
(415) 334-7860
MikeLDrew@aol.com

**MEMBERSHIP
COORDINATOR**

Russ Britschgi
1618 Sparkling Way
San Jose, CA 95125
(408) 266-2055

**EVENTS
COORDINATOR**

Tony Harvey
6550 Tustin Rd.
Prunedale, CA 93907
(408) 663-1020

LIBRARIAN

Sharon Renshaw
480 Dale Road
Martinez, CA 94553
(510) 372-7021

RAFFLE CHAIRMAN

Larry Stock
42 Starlite Court
Mountain View, CA 94043
(415) 964-1531

NAME BADGES

Doris Britschgi
1618 Sparkling Way
San Jose, CA 95125
(408) 266-2055

MOTORSPORTS

Ed Kornegay
1344 Milton Place
Rohnert Park, CA 94928
Ed_Kornegay@hp.com

Minutes of Meeting 25 September, 1997

The meeting was called to order by president Ellis Woumm at 8:00 p.m. sharp. All officers were present except the secretary, Mike Drew, who was busy blasting around Europe with members of the DeTomaso Drivers Club of Great Britain. Judy DeRyke stepped in and took abbreviated minutes. 37 members signed the roster (well, Judy added Joel and Shelly Gust who forgot), and four Panteras graced the parking lot.

New Members/Guests: Frank Wissman brought his friend **Dan Burnham**, who doesn't own a

Pantera and instead gets by with a Ferrari 308 GT/4 Dino. Don't know if he has aspirations of Pantera ownership; presumably a full-throttle blast would make him a believer!

Correction to Last Month's Minutes: There was no *tent* present at the Ponies and Panteras car show, probably due to the small numbers of Panteras present. The only shade was provided by the raised decklids.

Club Library Report: Sharon brought the entire library contents again. Howard reported he had made some copies of old POCA *Profiles* that members can borrow. A list of club library items was published in the last newsletter.

Club Store Report: Bill brought the rest of the Monterey gear to the meeting; he reported that he still has 43 T-shirts and 10 sweatshirts left.

Past Events:

Nor-Cal Fabulous Fords Forever Car Show: Roger reported on this inaugural event, partially organized by our own Steve Liebenow. There were six Panteras present, and they generated a lot of interest. Dave Crego actively recruited several Pantera owners who were not PCNC members. Several people mentioned that having business card-sized info cards would help us spread the word, and Ellis said he'd check into the costs of getting some printed up. Larry reported he had at least a partial box full of our old cards—of course, they are all at his office in Nevada!

Upcoming Events:

Checkered Flag Open Track at Thunderhill — 26 October: Ellis reminded the crowd that Ed Kornegay's organization, Checkered Flag, was staging another open track at Thunderhill on Sunday, 26 October. This outfit offers one of the best deals going, with maximum track time for the dollar. The normal entry fee is \$200 (if you missed the early-bird special), but Ed is offering a special deal—\$199 for six 30-minute sessions. After three solid hours on the track, both you and your Pantera will be wiped out! But unlike open road driving, at the track you can go for it right up to and in some cases over the limits, without endangering yourself or others. No traffic, no cops, no surprises in the road. So come on out and drive your Pantera the way it was meant to be driven! Call Ed Kornegay for details (his number is listed on the front of the newsletter.)

PCNC Christmas Party — 6 December: The Christmas party will be held at the Acorn Restaurant in Menlo Park. Dianne had a sign-up sheet and a menu to pass around (the selections are fish, chicken or beef.) We'll gather starting at 6:30 p.m. Unlike last year, there are currently no plans for a DJ. Larry (for some reason) questioned how many gals would be wearing panties with pantyhose. Shari will probably have other concerns regarding her attire this year!

Other Ideas?: Ellis invited anyone with suggestions for club events to please step forward. There was brief discussion of a 'Pantera Preservation' tech session, but nothing firm has come of it yet. Ellis suggested that this chapter probably has enough spare parts lying around to have a swap meet similar to the one in San Diego. Roger volunteered the use of his house, and there

was some discussion of combining the event with the A/C tech session before the Las Vegas event.

Club Business:

Officer Nominations: Nominations for 1998 PCNC officer positions will be opened at the upcoming meeting. Volunteers are urged to step forward now! If no volunteers step forward, don't miss the next meeting or you may find yourself voted in office!

Don Gerig Update: Ellis reported on Don's condition—he spoke to Don and Jane before the meeting. Don is feeling stronger, gaining weight and generally feeling better. He's not quite up for visitors yet, but he welcomes any and all phone calls—mornings are best because he has more energy then. They said they'd appreciate if folks mailed them some photos from club events. We're all thinking of you, Don!

News, Clues and Rumors:

PCNC Jeans Quilt: Anita Kuehne presented to the club the quilt she and her parents made from old jeans various club members had donated. This quilt will be taken on future club tours to serve as a mat for working under cars (assuming a Pantera has a problem, which rarely happens. Honest.) She said she'd still take any old jeans for future projects.

Clutch Rebuild: Frank Wissman reported he had a Kevlar-lined clutch disk and pressure plate built for his Merak by "Friction Phil" at Bay City Friction; he showed it off, but of course hasn't actually installed it in the car yet. He'll give a full report on its effectiveness in a few months.

Jet Hot Coatings: Ellis showed Lee Scales' newly-coated Hedmann Headers to the crowd. There was plenty of oohing and aahing over the beautiful finish. Larry Stock now has the headers available already coated, and finishes other than 'chrome' are available.

SB-42 Update: As of the meeting date, Senate Bill 42, the bill that would exempt all 1973 and earlier cars from smog checks, was sitting on the governor's desk awaiting signature.

PPC Web Page: Larry reported that he's moved into the '90's and has produced a comprehensive Pantera web page, featuring the parts book, price list, as well as all sorts of links to other Pantera sites. He plans to have tech articles, special sales, and a newsletter up and running soon.

Shadetree Mechanic Tech Session: The tech session, which was postponed from last month's meeting, was delayed again due to an EMERGENCY EVACUATION of the club meeting room! Seems that Darlene Pavlu was fooling around in her purse, and accidentally hosed husband Eddie with pepper spray when the safety lock caught on something in her purse! The room quickly emptied, the emergency exit was propped open and eventually the air was clear enough to continue with the meeting.

Note: The PCNC board has declared that all hazardous materials (sprays, guns, bombs, thermo-nuclear devices, etc.) shall be checked at the door from now on!

Raffle Results: Larry once again did the raffle thing, with the following results:

Monterey Sweatshirt — Nancy Haney

Air Cleaner — Red-eyed Eddie Pavlu (how appropriate!)

Bug Sprayer — Howard Renshaw (Eddie had enough already!)

Monterey T-shirt — Shari Stock

The meeting was (accidentally) adjourned at 9:00 p.m. After all the excitement, several of the guys remarked that the tech session had been forgotten. So Jack gave a tech talk on the ins and outs of steering rack maintenance, while the gals surrounded Shari and gave her all sorts of vital information about her pregnancy. As a result, the room emptied at its normal time, closer to 10:00 p.m.

NEXT CLUB MEETING

THURSDAY, OCTOBER 30, 1996
8:00 P.M.

COCO'S RESTAURANT
1209 OAKMEAD PARKWAY
SUNNYVALE, CA
(Take Lawrence Expressway South Exit off Highway 101)

UPCOMING CLUB EVENTS

October 26 ————— Checkered Flat Open Track at Thunderhill (Ed Kornegay)

December 6 ————— PCNC Christmas Party (Dianne Dean)

REMINDER — NEWSLETTER ARTICLES DUE BY 15TH OF EACH MONTH

Everything You Wanted To Know About 351 Cleveland Cylinder Heads

(but were afraid to ask)

by Steve Liebenow

This is an attempt to discuss the different cylinder heads available to you as 351 Cleveland owners and some of the options that you have available. Before getting into the basics on Cleveland cylinder heads and their various configurations, let's first address a basic concept that can be applied to them all: compression ratio and how to calculate it.

The basic formula used for compression ratio is this:

$$\text{Compression Ratio} = \frac{\text{S.V.}}{\text{C.V.}} + 1$$

where S.V. is the swept volume of the piston traveling from bottom dead center (BDC) to top dead center, and C.V. is the clearance volume, or the space above the piston at top dead center (TDC). Clearance Volume includes the combustion chamber volume of the cylinder head, the volume created by the head gasket thickness, additional volume of any piston deck clearance, and any volume created by the top of the piston. A dished piston would create more volume where a pop-up or domed piston would reduce volume.

In order to maintain the same compression ratio when increasing an engine's displacement, the clearance volume must be increased. This is an important consideration when changing heads when considering today's gas octane ratings. Too high of a C.R. and you get detonation problems. Too little CR and you get reduced power output and fuel economy.

Because of the SV-to-CV relationship, you will find that many oversize pistons are usually dished where the standard piston will be flat. This is due to the fact that the swept volume increases as the bore size increases. You must increase the CV to maintain the SV-to-CV ratio if the original compression ratio is to be kept. Note: I crunched the numbers for an .030" overbore and found a very little increase in CR, less than .2, but it did increase. Stroking a 351 to, say, 370 may cause problems when you want to use your special small-volume heads, unless you use dished pistons! Nothing is free.....

In using the aforementioned formula, don't forget to convert cubic inches to cubic centimeters, otherwise you'll end up with very strange numbers! (1 cu. in. = 16.39 cc!) Also, the formula for volume is π (π) times 'r' squared times length. Or in most cases 2" (half of a 4" bore) squared times π which boils down to $4 \times \pi$

where $\pi = 3.1416$. Crunch this out to be $4 \times 3.1416 = 12.5663$. Then multiply times length, or crank stroke in our case, which is 3.5". The result of $12.5663 \times 3.5 = 43.98$ cubic inches. Multiply times 8 cylinders and you get 351.85 cubic inches! (Now don't feel cheated out of that extra inch—the 352 name was already taken by an older FE-blocked power plant of the 60's.....)

Back to our formulas, 43.98 cubic inches times 16.39cc/ci gives us: 720.87 cc's of swept volume per cylinder! If you increase the bore to 4.030" (.030" over bore) you would substitute 2.015" into the formula and crunch out 731.72 cc's. Divide this number by the combustion chamber size plus the space for a head gasket (stock 4V thickness is .047") and add "1" to the number and you have your static compression ratio! ($62.8\text{cc} + (2 \times 2 \times 3.1416 \times .047 \times 16.39 \text{ (ci to cc conversion)}) = 62.8\text{cc}$ (mean '70 4V head volume) + $9.68\text{cc} = 72.48\text{cc}$.) $720.87 \div 72.48 = 9.94$, add 1 = 10.94 or real close to 11.0:1 compression ratio for '70 closed chamber heads. '70 combustion chamber volumes are listed as from 61.3 to 64.3 cc's. Smack in the middle is 62.8cc which is what I used. Using the smaller 61.3 value will result in a higher CR and the opposite for the 64.3 number. A motor for all-out racing would have measured and matched combustion chambers to assure that all is equal from cylinder to cylinder, side to side! Note: No value was included for the valve relief in the piston. In the case of a flat top, you would add about 2cc to the combustion chamber size and the gasket volume figure when calculating the clearance volume.

With the technical part out of the way, let's talk hardware! The Cleveland engine family proved that Ford had learned that cylinder heads are what makes the motor. Others had done the canted valve design before, but Ford refined it as well as incorporated a "bigger is better" policy when it came to port sizes! (See pictures 4 & 5)

There are basically six flavors of Cleveland heads around if you include the Aussie 2V head, and exclude anything made of aluminum. (See picture #1, 4 & 5) Two, two-barrel versions and four four-barrel versions. Of these flavors, there are only two different types of combustion chambers, closed and open. (See picture #2.) Closed chambers are sometimes referred to as "quench" chambers 'cause they tend to quench combustion at the outer edges of the combustion chamber as it is cooler there. This is good for performance and for keeping pinging down, but this contributes to incomplete fuel combustion which drives up the hydrocarbon

count. This quench design creates more turbulence in the chamber, as well as increases compression. The major advantage is improved mixing of fuel and air (at low rpm's), which yields more complete combustion and greater low and mid-range torque.

The open-chamber design is "cleaner" burning and is probably why it won out over the closed-chamber design in the end. The open-chamber design unshrouds both valves and promotes more complete burning of the fuel/air mixture, but, is more prone to "pinging" even with fairly low compression ratios. Polishing the combustion chamber would be a good thing to do, to reduce hot spots that contribute to pinging. (Water injection is also a solution for pinging.) Finding performance pistons is a challenge, but Keith Black does produce an 8cc domed version for "'72 Boss heads", although the Boss was a '71 motor with closed-chamber heads.....???? (I could not tell if these were made for open-chamber heads of the '72 HO motor or the closed-chamber head of the '71 Boss! Hard to get reliable info these days.....) Check valve to piston clearance before hitting the ignition switch!

To confuse things a bit more, there are two styles of rocker arm designs, adjustable and non-adjustable. The adjustable design appears on only two heads, one an open chamber ('72 HO) and the other a closed chamber ('71 Boss). ALL others are of a non-adjustable design. The adjustable type was used with solid lifter camshafts and required the use of guide plates and hardened pushrods. Along with the adjustable rocker arms, the two head designs that used them also had machined pedestals for screw-in rocker studs and guide plates, and machined spring seats for multicoil valve springs. If you have to have these features, any competent machine shop can modify regular heads to include them quite easily.

To identify heads, you can do so by using casting numbers. (See picture #2) Or, you can at least tell what the heads were before someone did gobs of machining on them..... Date codes will also help you determine when a head was produced. (See picture #3)

The graph below will help you identify 4-barrel performance Cleveland heads. All 4V heads had 2.198" intake valves and 1.715" exhaust valves.

As for the 2V heads, well, there are a bunch of them. These had 2.050" intake valves and 1.659" exhaust valves. The only one of interest would be the Australian

2V head, which carried a "ARD1AE" casting number on the underside. (This is the only number found to date by this author.) It has no "CF" marking indicating "Cleveland Foundry." and minor external differences in the casting. (See Pictures 6,7) In Picture #6 you can see that the corner headbolt boss is square vs. round and that there is no "CF" marking between the valve springs as with the US version. In Picture #7, the Aussie head is on the RH side. Note the unusual casting on the exhaust (LH) side, lower corner. It is "hooked" and open, where the US versions are filled. Also, the casting just below the valve cover towards the exhaust side is slightly different as well. It has more surface area as well as a different shape as you get towards the exhaust side.

This 2V head features the same size intake and exhaust ports as the American 2V versions, however, it carries the closed-chamber design of the early 4V and Boss heads! With the smaller passages and the closed chambers, you are talking about some great low end torque! Not that the high end will suffer very much as even the stock ports are not that small when compared to other manufacturers motors! The only drawback is being able to locate a set without traveling to Australia. As such, there have been quite a few sets imported to the US, so they are around!

One last head to speak of, only briefly, would be the Ford Motorsport head. The pictures are of a version that carries an '82 Mustang part number. How this occurred, I have no idea, as the Cleveland was out of production long before '82! I would have expected some "X's" in the number.... If you look at Picture #8, you can see the machined areas for the adjustable rocker arm studs and the valve spring pockets for multiple springs.

Picture #9 shows the intake ports compared to a standard 4V port. They feature a slightly different profile, not so tall and a bit more "square." They also have no heat riser passage. Picture #10 shows the exhaust ports contrast. The most evident thing, even if out of focus (!) is the raised design of this port! Racers have been emulating this for years by doing extreme amounts of machining and installing port plates to take advantage of the resulting increased breathing benefits. Translate that into meaning big \$\$!! Unfortunately, I believe that this head is no longer in production and would only be available used or from dealers that may have stocked up on them.

Engine	Year	Comb. Chamber	Features	Casting Numbers
351C- 4V	'70-'71	Closed- 61.3-64.3cc		DOAE-H, R
351C- CJ	'71	Open- 73.9 - 76.9cc		D1ZE- DA
351C- 4V	'72-'74	Open- 73.9 - 76.9cc		D1ZE- GA
351C- Boss	'71	Closed- 64.6 - 67.6cc	Note 1 D1ZE- B	
351C- HO	'72	Open- 73.9 - 76.9cc	Note 1 D2ZE- A	

Note 1: Featured screw-in studs, adjustable rocker arms, pushrod guide plates, valve spring retaining cups, stiffer valve springs, single groove valve stem locks.