Gateway Norton Owners News #7

"To Promote the
Use and Pride of
Norton Motorcycle Ownership"

Compiled by J. Jump
February 2001

EDITORIAL

Happy New Year! Hope all is well with you and you are looking as forward to the new riding season as I am. Last year I was able to ride quite often to work during the first couple months. In fact, New years day 2000 the temps were up to around 65! Not so this year! I'm pretty good down to 39 degrees-below that I'm a big puss.

The club survey yielded some interesting information. Out of 25 surveys distributed, I received 12 responses. A lot of the questions were answered the same, but some were totally opposite. One thing that seemed most consistant was that you want to keep the club as a Norton Only club. No big surprise here, but I thought I'd ask the question anyway.

As a result of the survey responses I have finally gotten off my ass- I am happy to announce that we now have a **CLUB BANNER**, ***A BIG CLUB BANNER!*** - a blown up version of the club logo (above on the left) filling a 4 ½' x 6' white vinyl banner. In addition, I have had another batch of T-shirts printed up in both long sleeve and short versions. The long sleeve shirt is white, no pocket, Henly design with circular GNOA emblem on front pocket area and the big 3 color logo on the back. I had the printer add "St Louis MO" under the name. The short sleeves are white Haynes Beefy Tees with a pocket and the same graphics. Those who responded on the survey have first dibs, but I have about 4 longs & 4 shorts that need a good home. All this procurement has pushed the club's financial status into the red, so the majority of the T-shirt charges are on my credit card. I would appreciate it if you guys would bail me out and not leave me holding the bag-please buy a shirt!

This issue will continue with more technical diatribe taken from the internet, specifically a follow up on camshaft timing. Anybody can move a sprocket 1 tooth this way and move a gear 3 teeth that way, but this article really explains a lot of the details and the why fores. I took this article from an Austrailian Ducati Club web site. Part I is a little basic, but will be followed up by Part II in the next issue, which has all the good dope.

THE FATBACK REPORT

I just received the Norvil "Ultra Soft" Isolastics kit for both front & rear, and to be honest, they aren't what I expected. Hopefully they will work as advertized. Allow me to explain.
When I was first assembling the Fatback, I studied the INOA Tech Digest to learn of documented improvements and incorporate as many of the into my machine as possible. Mark III Isolastics were touted

as being the cat's meow for their ease of adjustment. I found a rear Vernier Isolastics at a junkyard and incorporated it into my machine, but the front mount was rebuilt as original. Shortly after roll-out I had to remove the head due to a bad valve job that caused loose & broken guides, and excessive oil consumption. When refitting the head I noticed that the head steady frame mounts did not center on the backbone; the head was offset about 3/16" to the right. Tightening up the mounts would swing the top of the engine over to the left, move the swingarm to the right, and cause the gaps on the Isolastics to close up. I decided to place washers under the mounts to allow the head steady to be tightened up right where the engine naturally wanted to rest. After doing this I noticed a dramatic reduction in the vibes coming through the seat, pegs, and handlebars.

Since that time I have often questioned what caused the mis-alignment in the first place, and have wondered if more improvement was possible by eliminating the source of the problem. I figured there were three possible sources to the problem: a bent frame; manufacturing tolerance stack-up; the mixing of the Mk III rear Isolastics mount with the original front mount The first two sources are difficult to analyze, so I decided to pursue the latter.

With the original setup (utilizing shims for adjustment) one is at liberty to place the shims under either the left or right side end caps-the vernier set up uses no shims and has a different abutment than the earlier models. Perhaps I did not assemble them correctly, or maybe the Mk III Iso has a different assembled height, allowing the rear of the engine cradle to rest too far to the right. If you couple that with no attention given to which side the shims are installed on the front mount, that might be the source of my alignment problem.

Mick Hemmings is marketing a set of replacement abutments, which will convert an early iso into a vernier set-up. In addition, Norvil offers a vernier conversion that requires no machining of the front engine mount to install, and claims the use of " super soft" rubbers, yielding vibration isolation at a lower rpm. After riding John Wuebbelling's Big Smoothie, I opted for the latter, hoping to kill two birds with one stone. I ordered the parts directly from Norvil over the Internet and received them 7 days later. Cost was 44 pounds sterling plus 15 for shipping, which equates to about $90 US.

The Norvil units replicate the Mk III units, which consist of a single long tube that all the rubbers are vulcanized directly on to, which makes for a tidy assembly. The abutments thread onto the ends of the tube. One of the abutments is meant to be fixed in place on the tube and is provided with a setscrew that needs to be tightened down after the abutment is threaded home. The other abutment, which I will refer to as the adjuster, has no set screw but is intended to be held in place by friction when the frame mounting bolt is tightened. I was hoping that the new isolastics would have had adjusters on both sides. That way I could adjust the engine cradle to the right or left by loosening one side and tighten up the other.

A couple of months have passed since writing the above and I have not gotten around to installing the new Isolastics. And the way the cold weather is going it may be a while until I do. But I look forward to the day that I have all this sorted out, and I promise to write on what I find out on replacing the Isolastics without removing the engine cradle from the frame.

RUMOR CONTROL

Seems that Joe Jump has been avoiding his Norton lately, having finished fixing up a tasty Guzzi and spending countless hours trying to reassemble a BSA twin. When questioned lately about his apparent loss of loyalty to our favorite marque, he responded by saying, "Tain't so! Just trying to finish all my projects prior to passing from this world." Seems to be a bit of good advice we should all heed (Tom, ya listening?)

There has been some rumblings about the Norton National this year and there is a good chance our chapter will be represented. Anybody interested should contact Joe Jump or Mike French for details.

Ted Hoyer seems to be recovering well after his spill last fall which resulted in a broken collar bone and a punctured lung. And he reports his Roadster is ready to roll even though it still bears some scars from his mishap. On the other hand, Bill Henderson has publicly stated that he intends to sell his Norton and vows never to ride with Ted again. In the mean time, Ted continues to look for a partner in the Two-Up class for this year's Iron Butt.

LETTERS FROM THE MEMBERSHIP

Gordie Broon's Motor Bike

A poem submitted by Mike French

When Geordie Broon of Backworth, saved and bowt
a motor-bike,
He sed – Aal see the country noo and aal hev ti hike,
He had ti larn to ride it and get used ttiv all the gears,
But it wasent lang afoe ye'd think he had the thing fer
years.

As this bike waas the forst one geordie ivvor had
possessed,
He had ti wear his L's of course, till he got throo his
test,
He elwayswaas a it self conscious, when he passed
his mates,
He hoped they didn't they war his destination plates.

Noo Geordie had a lot of pals, and he gave them a
treet,
By ridin them aroond the place upon the pillion seat,
He sed – He'd nivvor had a crash, but that waas only
swank,
Becaas he dropped his fag-end once, inside the
petrol tank.

It went off like an atom bomb, the next thing Geordie
knew,
He woke up in the R.I.V. in front of all the queue,
But they suen fixed him up aalreet, relieved him of his
pain,
In next ti nee time he waas on the motor-bike again.

One day he tuck his old pal Bill, oot for a country run.
Bill sat upon the pillion seat and thowt the ride waas
fun.
He wore a leather jacket to protect him from the
breeze,
But even then poor Bill waas caad, he thowt that he
wad freeze.

So Geordie stopped the motor-bike and pulled it on
the stand,
He set – Noo taak that jacket off aal give ye a hand.
Ye put it on the wrang way roond, that winnet de'id
nee harm,
Aal buttoned for ye up the back, and that shud keep
ye warm.

Bill did feel warmer eftor that, it was a good idea,
Though the buttons and the collar, at the back lukked
kinder queer,
The bike waas gannin champion, for aal its double
load,
But on passin throo a village, Bill fell off and hit the
road.

They wor opposite a blacksmith when they had theor
little spill,
And Geordie tvelled half a mile, afore he missed poor
old Bill.

And then of course he torned aroond, and horried
back agyen,
And there waas Bill surrounded by half a dozen men.

The blacksmith with his apron on waas kneeling doon
by Bill,
And Geordie thowt He's fainted 'cos he's lying varry
still.
Bill's claes war torn and dusty, and his hair waas
pulled aboot,
And Geordie thowt he luks that pale he's hort aa
doot.

He asked the blacksmith strite away of any bones
war broke,
The blacksmith sed – Aa divven knaa, he's had a
nasty knock,
But aa cannot undrstand him lying still upon the
groond,
He seemed aalreet until aa torned his heed the reet
way roond!

TECHNICAL

The Black Mystic Art of Cam Timing

Part One

by Peter Shearman

INTRODUCTION

Like Electrics many people think that cam timing adjustment is a 'Black Art'. They think that you have to be some sort of a Magician or Semi-God to be able to do it! Like most things in life experience is the best teacher and the only way to get experience is to have a go yourself.

Years ago (many!) I didn't have a clue how to adjust Dellorto carburettors but by watching someone do it, asking questions and finally trying it for myself I learned how. If you are willing to have a go then you will always learn something. Even if you make mistakes, and we all do, you will learn from them.

I wasn't game to try cam timing until a couple of years ago when I rebuilt the 900 engine. Before I tried it I did a lot of reading and watched it done on a belt drive at a service day before finally tackling it myself. Like Desmo shimming it isn't very hard you just have to give yourself plenty of time to take it slowly and double check all your figures. The good thing about cam timing is that even if you completely mess it up you can always go back to the standard factory timing marks and start again **but** don't try running the engine until you are sure the timing is where you want it!

This article is divided into three instalments. The first explains the role of valve timing starting with the basics and moving on to more complex explanations. The second part describes how to measure your existing valve timing and the final part gives a guide on how to change the valve timing.

BASIC FOUR STROKE PRINCIPLES

For those with little knowledge of what goes on in a four stroke engine this first section will cover the simplified basics of operation including the part that valve timing plays in the four stroke cycle. If you already know all this just move on to the advanced section.

A four stroke engine crankshaft rotates twice (2 x 360° = 720°) for each cycle of operation. During this cycle the piston moves up and down the bore twice which gives us four strokes! When the piston is at the top of its stroke this is called Top Dead Centre or **TDC** for short. When the piston is at the bottom of its stroke this called Bottom Dead Centre or **BDC** for short. TDC and BDC are reached twice during each cycle of operation.

During these two rotations of the crankshaft the camshaft only goes through **one** rotation. This is achieved by driving the camshaft at an overall 2:1 reduction ratio from the crankshaft. The camshaft controls one valve cycle which covers two rotations of the crankshaft so whilst the crankshaft goes through 720° the camshaft only goes through 360°. You need to remember this relationship when it comes time to move the camshaft to change the timing.

Valve timing is usually given using two figures. The first is the number of crankshaft degrees degrees before/after TDC/BDC that the valve completely closes. This gives rise to further abbreviations of, **BTDC** (Before Top Dead Centre), **ATDC** (After Top Dead Centre), **BBDC** (Before Bottom Dead Centre) and **ABDC** (After Bottom Dead Centre).

Four stages are passed through for each four stroke cycle and these are listed below in simplified terms to explain the basic four phases involved. We will go into these phases in greater detail in the 'Advanced' section.

Let's start at TDC at the end of the compression stroke.

POWER At TDC (Compression) the spark ignites the compressed mixture resulting in a burning of this mixture to create the power to drive the piston down the cylinder. Both valves must remain closed for this power stroke.

EXHAUST At BDC the inlet valve must remain closed and the exhaust valve must be open whilst the piston in on the up stroke. This movement forces the burnt gases out past the exhaust valve to the exhaust port and the exhaust system.

INTAKE At TDC (Exhaust/Overlap) the exhaust valve must be closed and the inlet valve must be opened. The pistons downward movement causes a pressure below atmospheric in the cylinder which allows atmospheric pressure to feed the air/fuel mixture past the inlet valve and into the engine via the inlet port.

COMPRESSION At BDC the exhaust valve must remain closed and the inlet valve must be closed. Whilst the piston is on

the up stroke the air/fuel mixture is compressed dramatically ready for ignition by the spark plug. The cycles repeats with the power phase next.
If an engine was set up like this with valves opening and closing at TDC and BDC it would run at low revolutions but such basic valve timing is not good enough for an engine to develop any usable power. If you have grasped the basics and want to know more it's time to move on to what happens in a real motor.

ADVANCED CAM TIMING THEORY

I found a diagram helpful in understanding what is happening. With reference to figure 1, I have divided the two crankshaft rotations into two circles joined at TDC this should be followed as a 'Figure of Eight' through the various cycles.

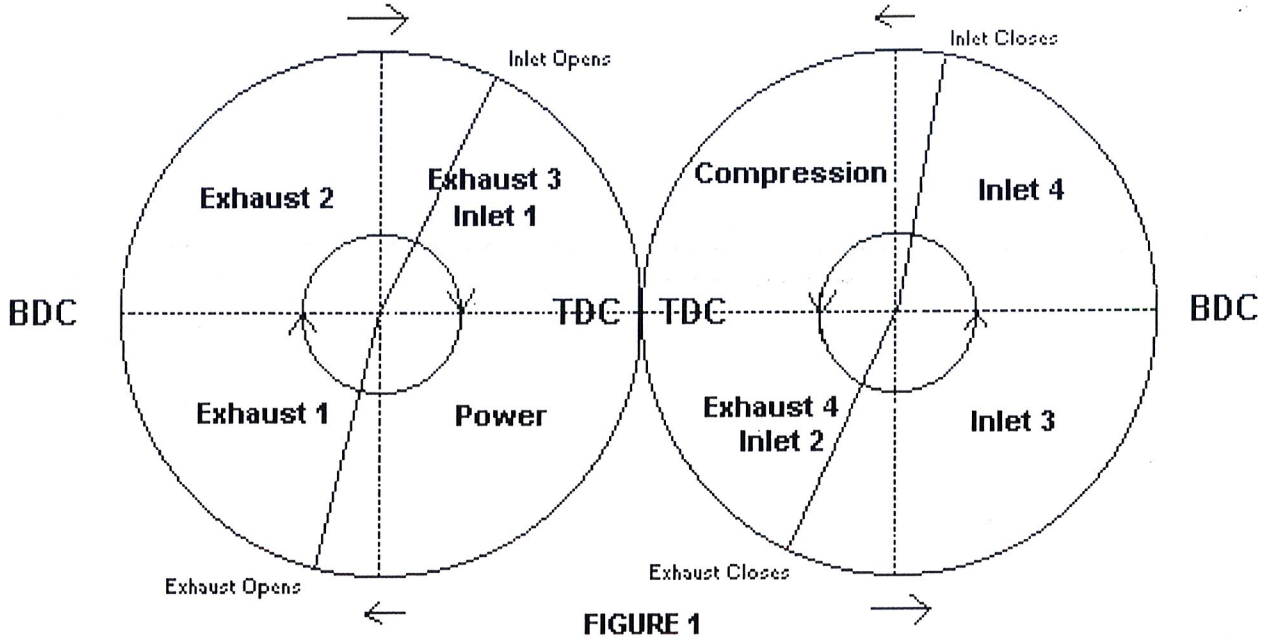

FIGURE 1

Starting at TDC compression follow the left hand circle clockwise until you return to TDC exhaust. Then follow the right hand circle anti-clockwise back to TDC compression. I have divided each circle into four 90° segments giving eight phases for the purpose of our advanced discussion. The actual degree settings for cam timing will be discussed later on.

We start at TDC compression. As discussed previously both valves are closed and the air/fuel mixture has been compressed into a small area. Because the mixture takes a finite time to become completely ignited we must start the ignition before the piston gets to TDC. I won't get into ignition timing in depth here but suffice to say the faster the crankshaft rotates the further before TDC the mixture needs to be ignited. The net result of this is to ensure that the maximum push of the fully burning mixture peaks just as the piston starts its downward stroke regardless of piston speed.

POWER For the first 90°-100° ATDC both valves remain closed whilst the mixture burns causing pressure to rise pushing the piston down on its power stroke.

EXHAUST 1 At around 80° BBDC the exhaust valve starts to open. The main reason for opening the exhaust valve earlier than BDC is so that it will be fully opened by the time the piston reaches the start of the upward exhaust stroke. Most of the power from the burning mixture has been used at this point so there is virtually no loss of power by opening the valve early. Also we can use the small amount of combustion power left to begin the exhaust phase early even though the piston is still moving down.

EXHAUST 2 & 3 From BDC to TDC the exhaust valve is wide open and the rising piston is forcing the burnt gasses out of the cylinder

INLET 1 At around 60° BTDC the inlet valve starts to open. As for the early opening exhaust valve we do this to give the inlet valve a chance to be fully open by the time the piston is reaching its maximum downward velocity and it gives a head start to filling the cylinder with fresh air/fuel mixture. By the time the inlet valve is fully open the exhaust gasses are moving fast out through the exhaust port and the inertia of this column of gas causes a slight depression in the cylinder which allows atmospheric pressure to feed in the fresh mixture. Exhaust systems are designed with this in mind and the

term 'Extractors' is fairly self explanatory when you understand what is happening in the engine.

INLET 2 & 3 From TDC Exhaust/Overlap to BDC the inlet valve is wide open and the piston rapidly moving down creates a depression allowing atmospheric pressure to feed fresh mixture into the cylinder.

EXHAUST 4 The exhaust valve remains open till around 60° after TDC. This is done to purge the exhaust gasses. The rapidly moving incoming mixture not only fills the cylinder but forces the last of the exhaust gasses out through the closing exhaust valve until the returning exhaust pulse stalls the flow. The swirling air/fuel mixture at this point also provides some cooling for the hot exhaust valve.

INLET 4 From BDC to around 80° ABDC the inlet valve remains open. Although the piston is now moving upwards the inertia of the incoming air/fuel mixture is stronger and results in a mini super charging effect where the mixture is initially compressed into the cylinder.

COMPRESSION After the inlet valve closes at around 100° BTDC the rising piston continues to compress the fresh air/fuel mixture in readiness for ignition and the start of a new cycle.
When you realise that this full cycle happens around 70 times per second at high revolutions you can appreciate that cam timing is a very critical factor when designing an engine. The timing figures are dependant on the camshaft(s) which are ground specifically to suit the type of engine.
As you can imagine many factors effect the factory setting of cam timing such as, the intake and exhaust systems, fuel type used, compression ratio, maximum RPM of the engine, piston and combustion chamber shapes, torque and maximum power considerations, fuel economy, etc.

MORE TERMS & CONSIDERATIONS

Nearly all cam timing figures rely on having a known clearance between the rockers and the valves which is greater than the normal or **Running** clearance. This is called a **Checking** clearance and is normally **1.00mm** (40 thousandths of an inch). Timing at checking clearances means that you will have to temporarily change the shim or adjuster on each valve prior to measuring the timing but more on this later.

Some factory timing figures are given at Running clearance even though there is no appreciable gas flow below 0.5mm lift. This is done to provide enhanced figures which make Duration and Overlay appear much longer which is an advertising advantage when buyers think that longer must be better! If no checking clearance figures are given with the factory timing specification then you have to assume that timing is at running clearance. ie normal operating clearances are used.

The number of degrees from when the valve start to open to when it finally closes is called the **Duration** of the valve timing. Typical factory figures for the bevel drive 900SS are around 320° for both exhaust and inlet valves although these are running clearance figures and so are optimistic!

Another term mentioned above is **Valve Overlap**. This figure describes the number of degrees where both the inlet and exhaust valves are opened at the same time. The reasons behind this were discussed in the 'Advanced' section.

The duration and overlap can be worked out from the factory figures although as you will see later these do not always match the cam that is fitted to the bike! Lets take the bevel 900SS factory figures and do some calculations. Remember all degree figures are for the crankshaft and must be halved if applied to the camshaft.
Note, factory timing at **running** clearance for this model so figures are enhanced!

The exhaust opens 80° BBDC and closes 58° ATDC. The exhaust valve duration is 80° (To BDC) + 180° (BDC to TDC) + 58° (ATDC) = 318°.

The inlet opens 63° BTDC and closes 83° ABDC. The inlet valve duration is 63° (To TDC) + 180° (TDC to BDC) + 83° (ABDC) = 326°.

The overlap is the period of degrees where both valves are open. For this cam the overlap is 63° (BTDC inlet opens) + 58° (ATDC exhaust closes) = 121°.

The other figures we are interested in is the point of **Maximum Lift** (ML) of each valve. Normally this will be half way between the opening and closing degree figures if the cam is symmetrical. So work out where the point of ML should be we divide the duration of each valve in half and then add that figure to the opening degree figure.

The exhaust valve duration is 318° divide by 2 = 159°. The exhaust opens 80° BBDC (= 260° BTDC) plus 159° (Half exhaust duration). Therefore Exhaust Maximum Lift should be at (260°-159°) = 101° BTDC.
The inlet valve duration is 326° divide by 2 = 163°. The inlet opens 63° BTDC plus 163° (Half inlet duration). Therefore Inlet Maximum Lift should be at (163°-63°) = 100° ATDC.

It is common to refer to these cams as '101°/100° lobe center cams' and as you have probably seen there is a symmetry

between the ML figures either side of TDC. This is called **Lobe Center Symmetry** and most engines have the two ML's at equal distance away from TDC. We will use this symmetry to decide if the cam is advanced or retarded when we calculate the real ML figures.

Figure 2 shows the relationship between the opening, closing and maximum lift of each valve for the factory specifications for the 900SS bevel drive.

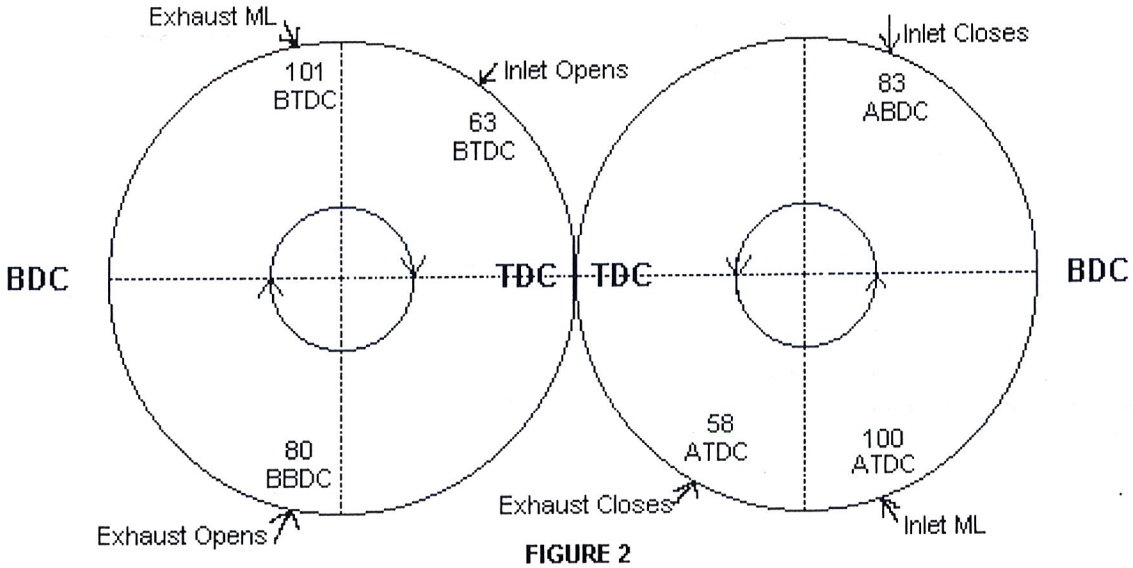

FIGURE 2

We now come to a problem not unique to Ducati which is that the cams fitted to the engines do not necessarily match the ones specified in the manual! For whatever reason most 900SS bevels were actually fitted with cams with a lobe center symmetry of '96°/96°' which are not quite as good a cam as the '101°/100°' items. Don't worry about which cams are fitted to your machine as when we measure the ML it will soon become obvious what you have got! The point is don't assume that the factory figures relate directly to what is actually fitted to your machine!

Figure 3 shows the timing diagram for the 900SS with '96°/96°' cams. Note that the opening and closing figures shown on the diagram assume that these cams have the same duration as the '101°/100°' cams although this may not be the case. As I have no factory figures for the '96°/96°' cams the only known points are the two ML's.

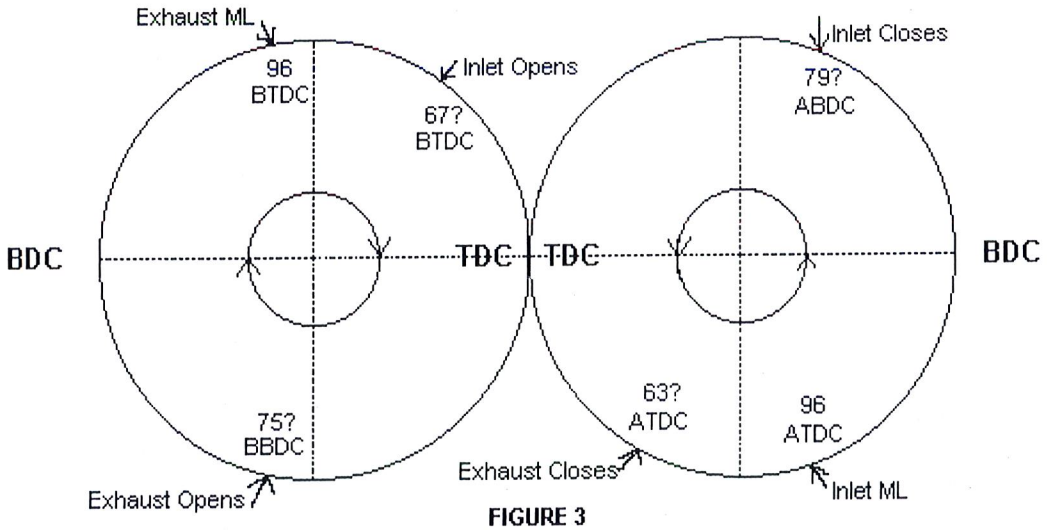

FIGURE 3

Next month we will find out more about the three different ways of measuring the valve timing, how to find an accurate piston TDC, how to accurately find the point of maximum valve lift and finally how to measure it using a step by step guide with real life examples!

TREASURY REPORT

Balance (11/02/00)	+$ 202.68
Money taken in (dues/donations)	+$ 140.00
Money Spent (printing/postage/t-shirts/banner)	-$ 503.71
Balance (01/26/01)	-$ 161.03

I would like to especially thank Marty Dupree whose generous donation of $100 has provided the club with enough funds to procure a banner. It should be noted that this is not the first such act of generosity displayed by Marty, and I believe the club is indebted to him.

JOKE OF THE MONTH

A Yank Norton rider went to visit his Triumph riding friend, an Auzzy rancher.
The Triumph rider said to the Norton rider, "*Is that you're dog?*"
The Rancher replied,"Yup."
"*Mind if I talk to him?*"
"Don't you know dogs don't talk?"
The Yank replied, "*So what's the harm? May I?*"
"Go right ahead."
The Yank said to the dog, "*Howdy!*" The dog replied, "Hello."
The Rancher's eyes popped wide open!
The Yank continued, "*Is this your master?*"
"Yep, he sure is."
"*Does he treat you alright?*"
"Sure does. Every day he takes me for a walk, he feeds me all kinds of great food, and once a week he takes me to the lake to play."
The Rancher was dumbfounded!
The Yank said to the Rancher, *"Is that your horse over there?"*
"Yes."
"Do you mind if I talk to him?"
The Rancher replied, "I know the dog spoke to you, but I know for a fact that horse can't talk."
"Well, then what would it hurt?"
"Go right ahead."
The Yank said to the horse, *"Hello."* The Horse replied, "Hello."
The Rancher stood there with his jaw wide open!
The Yank asked, *"Is that your owner?"*
"Yup, sure is."
"He treat you okay?"
"Sure, he rides me every day, brushes me down at the end of the day, and he keeps me in the barn away from the elements."
"Sounds good."
The Yank then asked the Rancher, *"Are those your sheep over there?"*
The Rancher is horrified and stammers, "Them sheep out there, they're nothing but a bunch of liars!"

UPCOMING EVENTS

GATEWAY NORTON OWNERS SECOND ANNUAL CLUB PLANNING MEETING

Is scheduled to take place SATURDAY, MARCH 10th, 2001 at Mike French's house in St. Charles. Pre-meeting social will begin at 12:00 pm with refreshments provided. Meeting to follow with discussion to focus on club business and the development of an agenda for club functions during the year 2001.
As usual, all aspects of club policy are open for discussion. Please make an effort to attend. This is your club and ***we need you there!!***
QUESTIONS? Call:Joe Jump (314) 909-0712 or Mike French (636) 940-9365

Daytona 200 March 11th If you can't be there in person, it will be televised. MCRA is hosting viewing at a bar on Telegraph road, same place its been for the last 2 years (can't remember the name). I heard it won't be broadcast until around 4:30 pm. Call me for details. At least watch it at home!

Mid Ohio Vintage Days: Mid July

Norton National: The week following Mid-Ohio, this year in Ontario Canada. See your Norton News (INOA) or look at the INOA web page, or ask about it at the planning meeting