



A

Michael Gregg Image

A. The glories of the iconic SNAP exhaust extractors as seen on the iconic 250 GTO.

SNAP

THE HISTORY, DESIGN, AND TUNING OF THE SNAP EXHAUST TIP BY RESEARCHER AND MASTER TECHNICIAN TOM MEADOWS

The coast of California has some of the finest driving roads in the world and is also the home of the Monterey Historic races, which have been held at the Laguna Seca racetrack for the last thirty-seven years. The events surrounding these races each year draw over 60,000 spectators and vintage racing aficionados. During its early years, this racing venue was a much more casual event with just a few thousand spectators in attendance and with the local police turning a tolerant eye towards the excesses of the post-race traffic.

Many vintage racers during that era drove their Ferraris to the track and home again. This resulted in a parade of race cars leaving the track that was nonpareil in the automotive world. It was there, amidst this pack, that I found myself driving my 250 GTE off into the California sunset. Far behind me, I watched as a Ferrari 250 GTO filled my rear view mirror as it leapfrogged through traffic at a remarkable pace.

In a burst of speed that only the 250 GTO is capable of, it pulled around the parade of cars behind me and howled on past at well over 130 mph, splitting both lanes of traffic right down the center of the road, forcing the cars on both the left and the right to take to the dirt shoulder.

The sound of a 250 GTO passing you in fourth gear at 8000 rpm, just three feet away from your window, going 90 mph over the posted speed limit, will raise every hair on your body and leave you screaming out the window for the sheer joy of the experience. This was the day when I first fell in love with the sound of the SNAP exhaust tips and began a thirty year journey researching their history, design and function.

Once you get past the voluptuous body lines of the Ferrari 250 GTO, the exquisite design of the chrome tips on its exhaust pipes immediately captures your eye. These tips are engraved with the capital letters SNAP, and visually dominate the rear of the

car. **A** If you are a true technical aficionado, their spiral internal flutes and ellipsoidal side slots will give you a serious moment's pause to assess their design and function. Several questions immediately arise to those with a discerning eye: "Are these tips purely cosmetic? Are they an important functioning part of the exhaust or are they just some brilliant combination of both?" These questions have remained a minor mystery in the Ferrari world for many years and require serious examination to be properly answered.

To understand Ferrari's perspective on exhaust design in the early 1960s, you only have to look at what is probably the finest text of that era: "The Scientific Design and Tuning of Exhaust and Intake Systems" by Philip H. Smith. For any budding engineer or automotive tuner, this was the only text of its kind available. **B**

This book is the quintessential British text, which means that there is a profound amount of serious science and research em-



B

The Scientific Design of Exhaust and Intake Systems

by
Philip H. Smith, A.M.I.Mech. E.

With the co-operation of
John C. Morrison, B.Sc., Ph.D., M.I.Mech. E.

LONDON
G.T. FOULIS & CO LTD
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(photos between pages 102 & 103)

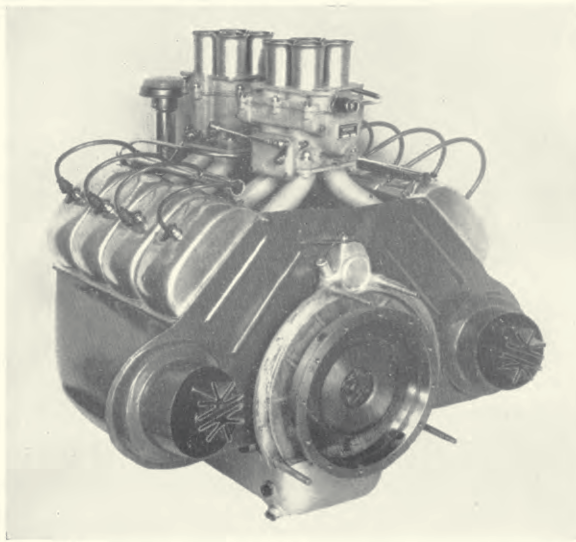


PLATE 8
2.5-litre 200 bhp Tatra air-cooled V-8 racing engine, with cooling air flow induced by exhaust ejector action.

Haynes Publishing Group Illustration

B. The finest text on exhaust design of that era was "The Scientific Design and Tuning of Exhaust and Intake Systems" by Philip H. Smith.

With the need for a full belly pan and the limited ground clearance dictated by a low center of gravity, the possible dimensions of the exhaust pipes and mufflers are then clearly established. Within the small space now defined as available for the exhaust system, Ferrari chose a solution that was to last up until the introduction of the mid-engine road cars. Two small pipes for each bank, side by side, continuing to the rear of the car, allowed for a smaller muffler cross section, and created the option, for both the road and track cars, of placing several small mufflers in a series to create the desired sound level.

Thus, the traditional four outlet Ferrari exhaust used on the twelves became the fortuitous creation of a required design compromise. This design also fit in quite well with the one area that Enzo Ferrari would never compromise, that of making the world aware that his cars used twelve cylinder engines. The four outlet exhaust became singular to the Ferrari cars and to this day are their hallmark.

With four tailpipes at the rear of the car, a whole new area for cosmetic embellishment was opened up. Cars of the late 1950s and 60s were made during the advent of the space age, which inspired the "rocket ship and ray-gun" era of automotive design. This influence is clearly evident in the Alfa BAT cars, the American finned wonders, and also had a noticeable impact on Ferrari coachwork of that time, and ultimately on the SNAP exhaust tips.

ENTER THE 250 GTO

The 250 GTO has become one of the most legendary Ferraris ever built, with a string of victories that has been unequalled since. During the era when the 250 GTOs were built, Ferrari had very little time or money to capriciously play with any part of the car that did not improve its performance. Factory politics at Ferrari reached a new peak at this time and this also increased the pressure on the engineering personnel to make sound technical choices. To examine their use of SNAP exhaust tips in detail, all of these factors must be considered.

Threatened by the possibilities of the new Jaguar E-type, Ferrari set out to build a no-holds-barred racer intended for homologation. Considered the tuning apex of the Colombo designed motor, the 250 GTO was produced in a very small quantity, with no compromise at any level regarding its performance. With track performance as the main priority, the exhaust could be as loud as performance dictated while simultaneously

bodied in its pages. Being British in nature also meant that if you were searching for a practical solution to a simple question such as "How long should the headers of a three liter 12 cylinder motor be?" that it would take many re-reads of the related text and some serious math to come up with a practical answer.

The hardest part of automotive exhaust system design lies in the word "practical". A typical problem addressed in the Smith text was to design an exhaust system for a single cylinder motorcycle to achieve maximum horsepower at a given RPM. All of the required computations are laid out and the end result is that it would take a 32 foot long exhaust pipe to optimize the engine's performance. Clearly a pipe of that length is totally impractical and that some degree of compromise would have to be accepted in the final design. The ability to choose the best overall compromise is what separates just good engineers, from the truly great.

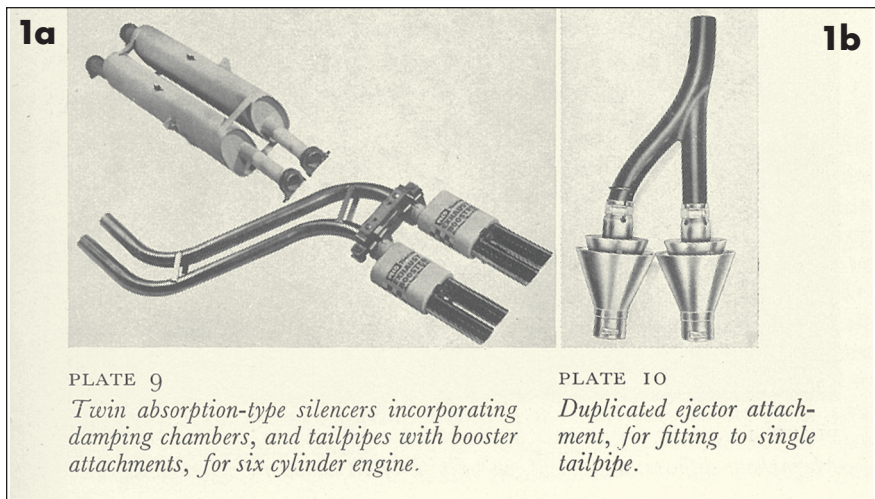
The areas that Ferrari engineers had to deal with to create their own exhaust system design compromise centered around this par-

ticular group of factors: Heat dissipation, the available physical space under the car to fit the exhaust components, minimum possible road clearance, sound levels inside the car and without, and appearance.

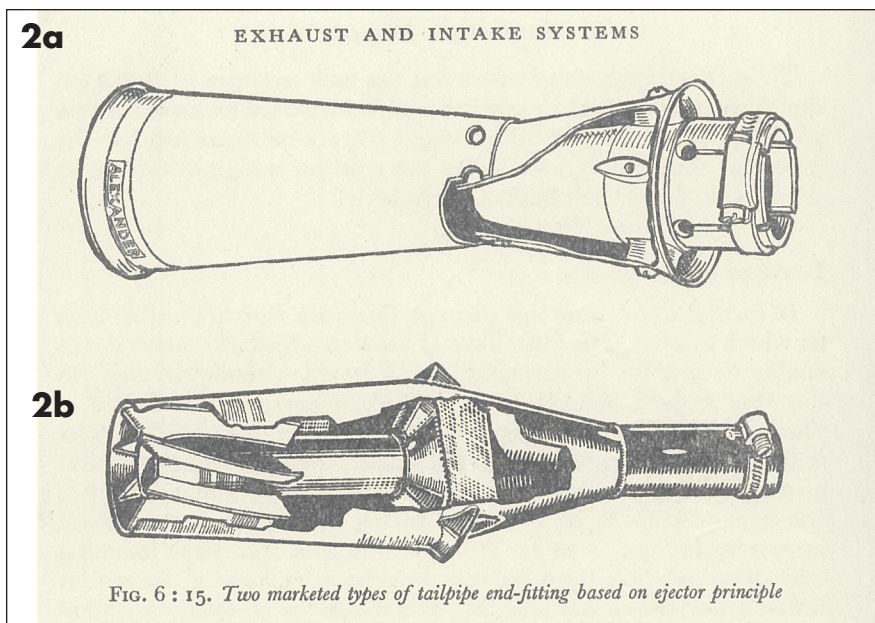
One particular balance of these factors often results in having to place the exhaust too close to the internal floor pan which transfers too much heat to the occupants of the car. Well into the late seventies, Ferraris were known for excessively warm passenger areas. This clearly demonstrates Ferrari's weighting of the importance of heat dissipation in its design compromise, both then and now.

The greatest single factor governing the equation of compromise in Ferrari exhaust systems has always been in the area of available road clearance. Good high speed road holding requires a low center of gravity which reduces the available ground clearance. In addition, the requirements of high speed aerodynamics are best met by covering the underside of the car with a full sheet metal cover called a belly pan, which further reduces the amount of area available for the exhaust.





1a. The Peco brand four outlet exhaust booster. **2a.** The Alexander venturi principle exhaust ejector. **1b.** A dual inverted "cone within a cone" exhaust ejector. **2b.** A centrifugal spinner type of exhaust ejector.



Haynes Publishing Group Illustrations

broiling the car's occupants, both results of which were considered acceptable choices from the different set of compromises allowed in an all-out race car.

There were two significant automotive design developments that were coming into use at the time of the GTO's creation, the first being in the budding field of body shape aerodynamics. Both Bizzarrini and Scaglietti worked on the GTO and each had an intuitive ability to design an aerodynamically sound body shape, and this would later be proven as wind tunnels became a common tool for body design.

Simultaneously, out of both automotive engineering and aviation research came the concept of using the velocity of air moving past the car to aid in exhaust system performance. Thus was born the "Extractor Era" when the emphasis of sales ads for sports cars exhausts began to claim the benefits of exhaust

gas extraction through superior design. The Italian engineer Carlo Abarth was an early pioneer in this field, and became well known for his highly efficient exhaust system designs, as well as his prowess in tuning and modifying engines.

At the time of the GTO's creation, there were several significant designs available as exhaust extractors, or as the scientific treatises of the day called them: "exhaust ejectors". Mounted at the end of the tailpipe, these devices all claimed to reduce back pressure and increase performance. Engineering studies of the day backed up these claims and offered the possibility of horsepower gains without engine modification.

One such design was called the "Exhaust Booster" and was made by Peco, a British firm which is still in the business of making performance exhaust systems. Their exhaust booster was a relatively large dual

inlet and outlet chamber with road air coming in one end of the box, exhaust gas coming in from a separate pipe at the same end, and the two gases mixing as they exit the dual tailpipes. Their physical size alone ruled them out on a Ferrari, as four of them would be required, with a considerable weight penalty as well. **1a**

Another design of the time split the single entry tailpipe into two dual inverted cone outlets, creating a long "Y" with a separate exhaust extractor at each end of the "Y". **1b**

The Alexander design used a cone within a cone to create a venturi effect aided by a large volume of road air. Its main drawbacks were its large physical size, particularly if four of the units would be required, and lastly was its unattractive appearance. **2a**

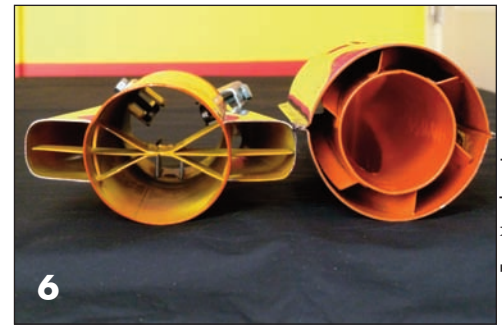
The design that came closest to that of the SNAP tips used small side scoops to direct the road air into a venturi chamber that was lined with spiral fins that added centrifugal force to the outgoing road air. This design was quite complex, and like all the others, bulky and unattractive. **2b**

Ted Rutlands recently acquired a group of twelve SNAP exhaust tips, in three different sizes, and Ted generously provided them for photographs, comparison and measurements used in this article. One of Rutlands SNAP tips, which had never been mounted, is shown in direct comparison with three O.B.A. exhaust tips from the same era. The O.B.A. company in Italy created their own unique designs for exhaust extractors, which when compared with the SNAP tip, clearly demonstrates the depth of range possible in the internal design of exhaust extractors. **3, 4, 5, 6**

THE SNAP SOLUTION

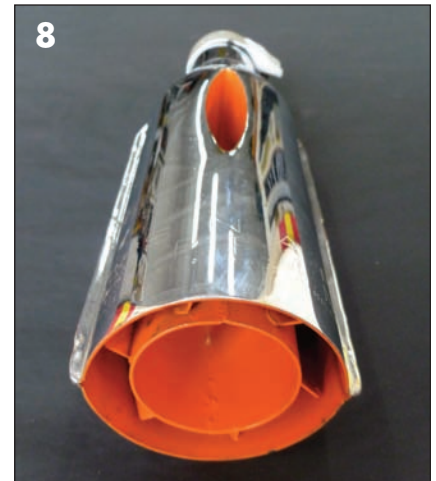
Italian engineers are like no others in that they always somehow manage to make the most simple mechanical object visually attractive, while incorporating a high level of technical innovation. The SNAP design incorporated one element that made it unique, in that it used spiral vanes to accelerate the exhaust gas rather than using these vanes to accelerate the air from the road as some other designs did.

It is hard to say exactly how much exposure the various extractor tip companies had to competitor's designs, or engineering studies of the day. The SNAP design would certainly indicate exposure to a concept that was revealed by A.G. Filimanov, an automotive engineer, who did a study in 1958 on gas ejectors. Gas ejectors are air assisted exhaust extractors, successful designs of which were used on various aircraft in past years. His study concluded that at speeds as low as 25 mph, significant reductions in the total back pressure could be achieved. These results were based on using a very large road air intake, but the key point here is that it was not necessary to use the spiral vanes to accel-



erate the road air, as road speed alone, in an efficient design, could do the full job. **7**

Since the whole purpose of the extractor tip was to increase the movement of the exhaust gases, the logical engineering extension of Filimanov's results would be to allow road speed alone create the velocity of the clean air column, and then use the spiral vanes to accelerate the exhaust gas, which ultimately became the heart of the SNAP design. In a uniquely Italian fashion, SNAP had created a design that was technically brilliant, compact, and visually appealing. They had in fact created a product that almost seemed purpose built for the GTO project. **8, 9**



3. An original unmounted SNAP tip with O.B.A. tips.

4. End view of the SNAP and O.B.A. tips showing internal designs.

5. The SNAP next to the O.B.A. tip with the large side air inlets.

6. An end view of the SNAP and O.B.A. tip showing vaning design details.

7. The internal structure of the SNAP vanes.

8. A detail view of SNAP tip from the rear.

9. A detail view of SNAP tip from the side.



Tom Meadows Images

Tom Meadows Images



10. A Ferrari 156 Dino "sharknose" in front of a SNAP banner.
11. A SNAP banner behind a 250 F Maserati at a French race track.



At this point it is quite reasonable to presume a formal connection between the SNAP factory and Ferrari. It is interesting, however, to note the lack of formal advertising associating the two, which would have been much to the SNAP company's benefit. Certainly their presence in Formula One racing is verified by the race track picture of the Tipo 156 Dino "sharknose" Ferrari in front of the SNAP advertising banner. The SNAP banner shown behind the 250 F Maserati (s/n 2531) has the words in French: "Pour Ferrari et tous les voitures" across the bottom, which translates as "For Ferrari and for all the cars" **10, 11**

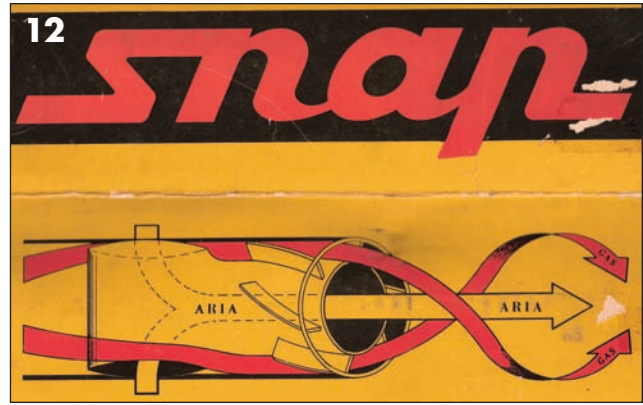
Information on the SNAP company is all but non-existent, and small bits and pieces of information appear from time to time. Perhaps this article will prompt the memories of others and new information will surface, as it is evident that there are many pieces of the SNAP history yet to be discovered. In the last fifty years, SNAP tips have appeared on many different models of the 250 and other series Ferraris. Whether these are factory installations, or correct period after market installations, remains to be seen.

Ferrari factory build sheets will usually mention in the exhaust system portion of the sheets if SNAPS are installed. The build sheets however were occasionally incomplete, and the lack of mention of installed SNAPS does not necessarily preclude their correctness on any given car.

According to Ed Gilbertson, who was Chief Class Judge for Ferrari at the Pebble

Beach Concours d'Elegance for fifteen years, before becoming Chief Judge and who is now Chief Judge Emeritus for the event: "In addition to the 250 GTOs and some of the 250 GT SWB Comp berlinettas, some of the 250 GT SWB Spyder Californias also had them. In addition, I believe that a couple of the other individual early comp cars had them. If other cars are shown with SNAP extractors that did not have them originally, it is a deduction, neat though it may be."

Alan Boe is the current Chief Class Judge for Ferrari at the Pebble Beach Concours and he adds this to Mr. Gilbertson's list: "In addition to the Ferrari models Ed has listed, I think the 330 LM Berlinettas also were built with them and the last of the TRs such as 0792, 0794 and 0808. Apparently, they were intended to draw out the exhaust gases more efficiently at speed, thereby reducing back pressure and enabling more horsepower to get to the rear wheels. They were also used on the 1959-60 246 Dino F-1 Ferraris. They reportedly were effective at the top end of the rev range and could add three to five mph onto top speed by scavenging a bit more exhaust out of the cylinders permitting more fuel-air for the next cycle. SNAPS came in at least three sizes, from a tiny one inch diameter, to the F1-GTO-TR nearly three inch diameter size. A concours judge should be looking for two things: One, that SNAPS not be found on Ferraris that didn't have them originally (such as TdFs, GTEs, and Lussos), and two, making sure that SNAPS, if used, are not poor replicas of the originals."



12. An original SNAP box showing air flow details.
13. A long style SNAP original box with company name and address.



Images Courtesy Alwin Hietbrink, Hietbrink Coachbuilding

Alan Boe's comments on exhaust scavenging add a new dimension to the possibilities of the SNAP's function. They unquestionably reduce overall back pressure in the pipe, and on a car with a straight pipe with no muffler, they could have a pronounced scavenging effect directly at the exhaust port, due to their changing the pipe's sound wave tuning.

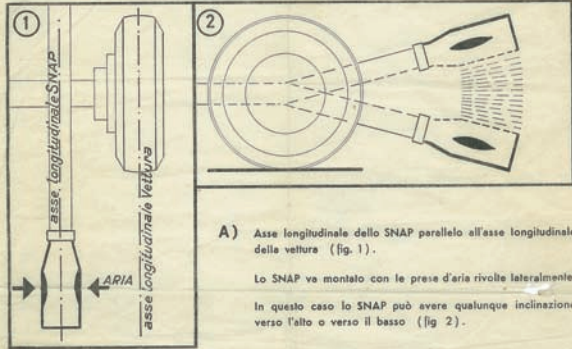
SNAP MEANS... WHAT?

Many suggestions have arisen as to the meaning of the four letters "SNAP", and it is very likely an acronym of some sort. Some have suggested it could be the initials of the design engineers, or it could be a reference to the crackling sound that characterizes these tips. It is the author's opinion that SNAP could also stand for *Scarico Negativo Aria Pressione* or "negative exhaust air pressure", which roughly translates to "exhaust extractor" in English. **12**

Engraved on the tips are also seen the letters I.P.R.A.N., which correspond to the words *Italiana Propulsor Rotori Aereo Navali*, as seen in the image of the original long SNAP tip box provided by Hietbrink Coachbuilding. These words individually translate directly as "Italian Propellor Rotors Aircraft Naval", which could indicate that the company originally manufactured airplane propellers or that it had military origins and used aeronautical and naval design engineers in the creation of SNAPS. FCA judge Richard Cole has suggested that the origin of the SNAP design may go back to WWII tor-

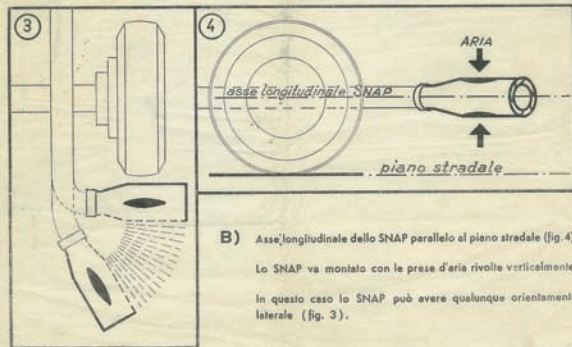
Si deve evitare che l'aria entri nelle due feritoie laterali dello SNAP alla velocità della vettura.

Lo SNAP potrà perciò essere montato nei modi A) oppure B)



A) Asse longitudinale dello SNAP parallelo all'asse longitudinale della vettura (fig. 1).

Lo SNAP va montato con le prese d'aria rivolte lateralmente. In questo caso lo SNAP può avere qualunque inclinazione verso l'alto o verso il basso (fig. 2).



B) Asse longitudinale dello SNAP parallelo al piano stradale (fig. 4).

Lo SNAP va montato con le prese d'aria rivolte verticalmente. In questo caso lo SNAP può avere qualunque orientamento laterale (fig. 3).

pedo design, which is a serious possibility. Exhaust ejectors have been used in aircraft design, and military technology is often shared between the air force and naval aviators. This presents the possibility that the SNAP is a hybrid design of aerodynamics and underwater hydrodynamics.

Although SNAP is usually perceived as the company name, it is more likely that I.P.R.A.N. was the name of the manufacturer. This conclusion is based on the words *Brevetti Italiana Propulsor Rotori Aereo Navali s.p.a MILANO* which is printed on the SNAP box. This would indicate that I.P.R.A.N. was a registered Italian corporation under that name. Two addresses are known for the manufacturer, the one printed on the box for I.P.R.A.N., **13**, and a second address which is listed on the tuning sheets as the location of technical offices for customer support.

SNAP INSTALLATION

The SNAP factory installation sheets shown here were provided by Anton Krivanek, the noted Siata 208 and Fiat 8V specialist, after they were found in a box of old fan belts and dead spark plugs slated for the dumpster at VRS Racing Service, his Van Nuys, California, restoration shop. They have been diligently translated and contain information on the proper installation of the SNAP tips and factory tuning recommendations. **14**

Translating any language can be quite difficult, and in this case more so, as the material is technical in nature. In addition, as

with any technical document of the era, there appears to be several typographical errors. The best solution to providing an accurate translation involved a group of translators from three different technical backgrounds: one is the author of this article who is an experienced Ferrari technician with thirty-seven years in the field; Mark Valsi, a friend and occasional lunch guest of Enzo Ferrari; and the Conte Clement Salvadori-Paleotti, who is fluent in Italian and a prolific motorcycling journalist. Out of this group collaboration came the translation of the SNAP sheets you see here, with a strong emphasis on retaining the flavor of the original language.

The first assembly sheet deals with the proper installation of the tips. It clearly addresses two standard exhaust mountings, and while the first line of the translation might appear to be confusing, its intent is to make it clear that the road air is to pass indirectly across the oval slots, rather than directly into them.

One important detail of the SNAP installation on the GTO is the noticeable distance they protrude from the rear of the car. SNAP did compromise its design in one area, which was their choice to use lateral vents without any protruding air scoops. This reduces their efficiency at low speeds and makes it critical that the SNAP is not shrouded by the coachwork, and as fully out in the air stream as possible. In a road car this could be an aesthetic problem, but the rear design of the GTO lent itself well to this requirement. The reality that the GTO would be driven

ASSEMBLY INSTRUCTIONS

Proper mounting avoids having air coming into the two side slits of the SNAP due to the speed of the car.

The power from the SNAP comes from being properly mounted as shown in A) or B)

A) The longitudinal axis of the SNAP is parallel to the longitudinal axis of the car (fig. 1).

The SNAP should be installed with the air inlets facing sideways.

In this case the SNAP can have any angle towards high or low (fig. 2).

B) The longitudinal axis of the SNAP is parallel to the surface of the road (fig. 4.)

The SNAP is installed with the air inlets oriented vertically.

In this case the SNAP can have any lateral orientation (fig. 3).

mostly at triple digit speeds also allowed for optimum use of the SNAP design.



On the 250 GTO, the distance that the SNAPs extended beyond the body turned out to be a distinct advantage.

15 DA OSSERVARE ATTENTAMENTE!

Osservate scrupolosamente le istruzioni di montaggio! LO SNAP NON FUNZIONA SE NON VIENE RISPETTATO IL PARALLELISMO con l'asse longitudinale della vettura (vedi istruzioni di montaggio A 1 e 2) o con il piano stradale (vedi istruzioni di montaggio B 3 e 4).

Non tutti i motori sono uguali e perciò può accadere che in qualche caso non debba essere diminuito il getto al carburatore, anche se da noi allegato allo SNAP; questa necessità o meno è facilmente individuabile provando sia con il getto di serie, sia con quello ridotto, riscontrandosi una differente resa del motore.

Per vetture nuove di fabbrica o per motori revisionati, consigliamo di compiere il rodaggio con il getto di serie; la sostituzione del getto, se necessaria, va compiuta a motore rodato. Un indice palese di tale necessità è dato dall'osservazione delle candele.

Nel mesi freddi è consigliabile usare il getto di serie; conservate quindi per l'inverno il getto sostituito.

Il nostro Ufficio Consulenza Tecnica, in Via Plinio 54 - MILANO Telef. 209.385 - 265.756, è a disposizione gratuita del Cliente per il controllo di un perfetto montaggio dello SNAP.

USATE LO SNAP SOLO PER LE VETTURE DA NOI INDICATE

15 FOLLOW THESE INSTRUCTIONS CAREFULLY!

Follow scrupulously these assembly instructions! The SNAP will not work unless it is installed properly with respect to the length of the car (see the mounting instructions "A" parts (1) and (2) on the additional instruction sheet) or if installed parallel to the road (see the mounting instructions "B" parts (1) and (2)).

Not all motors are the same and that is why it may be for each case you may not have to reduce the size of the jets in the carburetor with the SNAP attached. It will be easiest to try the jets in a series of various decreasing sizes to check the different performance of the motor.

For new cars from the factory, or for modified motors, it is advised to perform the testing with jets in a series, substituting the jets, if necessary, to accomplish the running in of the motor. An evident indicator of the correct jet type can be given from the inspection of the spark plugs.

In the cold months it may be advisable to try different jets in a series, keeping therefore, the correct jets for the winter.

At our offices, Ufficio Consulenza Tecnica, in Via Plinio 54-Milano Telef. 209.835-265,756, we offer free service for our clients to check for a proper installation of the SNAP tip.

USE THE SNAP ONLY ON THE CARS RECOMMENDED

The tuning instructions reiterate the importance of proper orientation when mounting, and the possible need for re-jetting of the carburetion to optimize performance. It is quite interesting to note that use of the SNAP tips might require the use of smaller jets. At a technical level this could indicate that the design engineers believed the SNAP tips provided the same power with a leaner mixture, which would indicate an improvement in fuel efficiency and economy from their use.

Of particular note is the recommendation for different jetting in the winter. This is a highly unusual recommendation for any car of the era. Winter air is colder and therefore denser, and the recommendation to compensate for the increased air density would indicate the significant degree of effect the SNAP tip has on gas flow. **15**

THE VIRTUES OF SNAPS

One of the suggested functions of the SNAP tip was that it kept the rear of the car clean. This suggestion might seem spurious at first, but with the 250 Ferraris of the day using a quart of oil every 1000 miles right out of the factory, it might not be an unreasonable design element or side benefit. During the research for this article the author was fortunate to encounter Charles Knill-Jones of the Ten Tenths organization in England. One of the strengths of this organization is its support of serious road use of vintage sports and racing cars. Charles maintains and travels with

Nick Mason's GTO (s/n 3757 GT) which is regularly raced and rallied. Charles commented that he had tried Mason's GTO both with and without the tips and confirmed that the back of the car does indeed stay cleaner with the tips installed. Whether this was part of the original design, or an accidental benefit, this test makes it clear that the gas flow outwards from the rear of the car was significantly improved.

Although sound can be a very subjective matter, the sound of the GTO is unique and is clearly some combination of cam timing, carburetion and the SNAP tips. Cam timing can be a very strong factor governing the exhaust note, as anyone one who has ever heard a desmodromic Ducati can testify. The commonly seen square cut at the end of an exhaust pipe can often create an unpleasant note in the exhaust which is heard as a buzz, whistle or crackle, particularly with high rpm engines. Simple changes to the end of the tailpipe such as cutting it at an angle, known as a "baloney cut", can change the tone of the exhaust and alleviate some of the unwanted sounds.

Later Ferraris used Ansa exhausts as standard equipment and Ansa addressed sound control quite thoroughly with their use of the baloney cut and the addition of a resonator built into each tip of the exhaust. These parts of the Ansa exhaust design were responsible for the very refined and well tuned exhaust note typical of the later Ferraris.

BEWARE POOR REPROS

Original SNAP tips are extremely rare, as heat, rust, and racing have all taken their toll on these parts. In addition, badly home-built copies and poor attempts at replicating or copying the SNAP design have been constructed, all of which clouds the field of creating an historically accurate reproduction.

16, 17



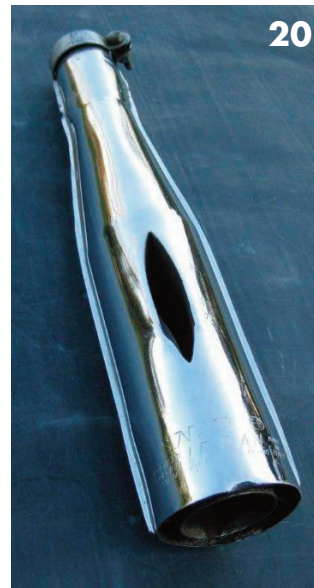
16. A low quality reproduction SNAP with incorrect oversized side vents.

17. A set of low quality reproduction SNAPS on a 250 GTE rebodied as a GTO.

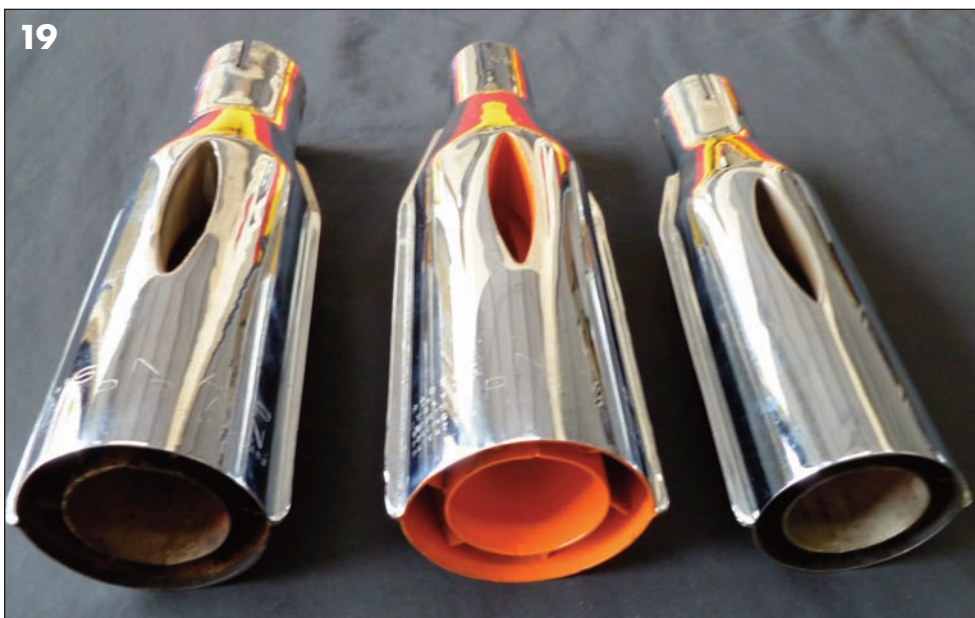




Tom Meadows Image



Alwin Hietbrink Image, Hietbrink Coachbuilding



Tom Meadows Image



Alwin Hietbrink Image, Hietbrink Coachbuilding

18. A top view of three different size SNAPS all with different inlet diameters.
 19. An end view of three different size SNAPS.
 20. An original long style SNAP.
 22. A cutaway Hietbrink SNAP tip showing the internal vaning.

THE HIETBRINK SNAP TIP

It is very fortunate for the Ferrari community that Alwin Hietbrink, the noted restorer behind Hietbrink Coachbuilding, shares the passion for the SNAP tips and has put in the research and engineering time necessary to reproduce them in perfect detail.

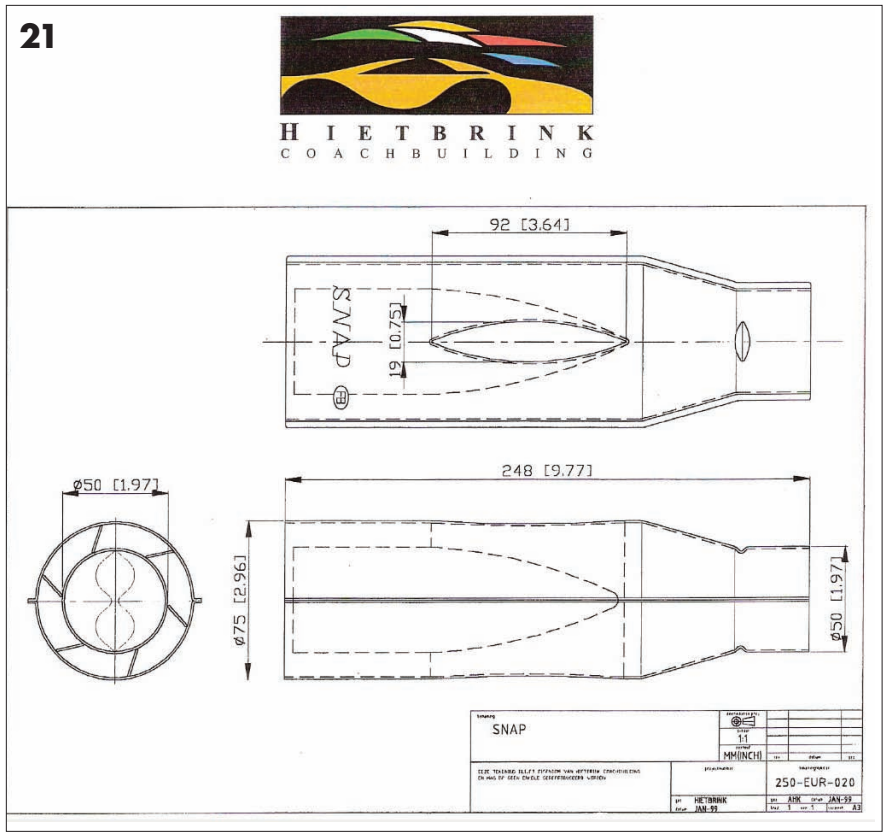
SNAPS are known to have come in at least three styles, a long, a short and a very short model intended for early Volkswagens, and also in several inlet diameters. There may have been other offerings, but without a formal product catalog, this is purely conjecture. **18, 19, 20**

The GTO used the short tips, and starting with a proper factory example, Hietbrink has created patterned engineering drawings to replicate these tips. The engineering drawings shown are the beginning point for Hietbrink's reproduction tips. These drawings allow for simple mathematical calculations that confirm one very important fact about the SNAP design, which is that it provides the same outlet area at the vaned end of the tip as at the inlet pipe. This results in no exhaust gas flow restriction through the vaned outlet. **21** (next page)

The cutaway example of the interior of the Hietbrink SNAP shows the accuracy of the

work required to follow the engineering plans. The parts shown laid out on the worktable were formed from precision dies preparatory to assembly and welding of the vaned interiors. Fabrication of SNAP tips is both time consuming and technically difficult. Attention to all of these details has made Hietbrink's tips the highest quality possible, and they are virtually indistinguishable from the originals. **22** (above), **23, 24** (next page)





21. A detailed engineering drawing used to manufacture the reproduction Hietbrink SNAP.



23



24

Alwin Hietbrink Images, Hietbrink Coachbuilding

23. A batch of stampings used to create the reproduction Hietbrink SNAP.
24. A completed reproduction Hietbrink SNAP.

A MEMORIALIZED DESIGN

Engineering developments in the racing arena can often be short lived, and the use of SNAP tips fell victim to more sophisticated directions in engine design and tuning. No higher tribute to the importance of their design in Ferrari history can be given, than in the re-creation of their signature vaned outlet found on the Ferrari 599 Fiorano HGTE. I spoke with Jason Castriota about his work at Pininfarina on the design of the HGTE, and he acknowledged that his use of that design element on the 599 Fiorano was a “tip of the hat” to the aesthetics of the early SNAP design. **25**

The success of their use on the race track cannot be denied, and SNAP design engineers must have often smiled knowing that the last thing everyone saw when a Ferrari GTO crossed the finish line was the chrome plated engineering work of art known as the SNAP!

Tom Meadows is one of the founding members of Len Miller's 250 GTE owners club and was its technical editor for 20 years. He contributes periodically to the Ferrari Market Letter and owns Marelli Service, which specializes in the restoration of vintage Magneti Marelli ignition systems. repairs@marelliservice.com



25. A 599 Fiorano HGTE rear view showing the signature vaning taken from the SNAP design.

Tom Meadows Image