



### **WARNING:**

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## A CALL FOR SANITY

The Nissan 300ZX is a very potent performance car. This booklet describes how to maximize the abilities the car has, and also how to improve them by adding aftermarket products.

Some of the performance parameters discussed are beyond the limits of the law. Be sensible. This booklet in no way encourages you to break the law. If you want to drive beyond street limits, take your Z to a closed track and drive it there. Serious Z drivers do exactly that.

And, of course, always wear your safety belts.

I have years of experience upgrading my 1990 300ZX. I am active in Z clubs and in Internet chat groups, and my information is current as of press time.

But I am not a professional mechanic. The information here details my own experience, which is extensive, and I offer it as just that. Use this information to complement your own research. Be sure to consult a performance professional. When you have gathered all the information, then you can proceed. Or not. The decision is yours.

Finally, thanks for purchasing this booklet. We shall be forever in praise of the Z!

— Scott Philbrook  
Los Angeles  
March 1998

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Dedicated to **EMILY**

# THE DAY EVERYTHING CHANGED

Early in 1990 I had an incredible day.

How incredible? Imagine test-driving a 1989 Lamborghini Countach and a brand-new 1990 300ZX Twin Turbo on the same day. That's what I did.

The Countach, white with a white leather interior and silver wheels, was — and still is — my all-time favorite car. Both cars belonged to a friend of mine who sold used exotics to discriminating buyers. The Countach was for sale, but the Z was one of his personal cars.

I drove the Countach first. On one off-ramp — posted at 35 mph — I drove almost 70 mph! This, after achieving 178 mph. (Warning: I am not encouraging you to break the law. I was very young.) Nothing built then or since could rival the sound of a 5.7-liter Italian V-12, and I thought nothing could rival the car's handling.

Until I drove the Z later that afternoon.

It was a 1990 black 300ZX Twin Turbo with HICAS (four-wheel steering). The difference between the two cars certainly didn't feel worth \$80,000. I was overwhelmed with instant obsession. I must have this car, I thought.

The Japanese car felt as though it handled just as well, if not better, than the "Raging Bull," thanks to the Z's four-wheel steering package. On that same off-ramp, at more than 70 mph, I realized a

new market was being born. The high-performance Japanese sports car had arrived, and by my standards it was affordable. Affordable, that is, compared to more than \$100,000 for comparable performance from the Countach.

It took me four and a half years, but I saved the money and finally bought a Twin Turbo in 1994. That's my car on the cover; every day I drive my Z, I love it even more.

But I began to wonder if the engineers at Nissan had truly maximized the Z's potential. The depth of thought that went into Nissan's engineering was obvious, but had the threat of liability restricted this machine?

I wanted more out of my Z. So I did some research, and it brought me great rewards — I began to learn about the American subculture of aftermarket performance products for all sports cars and coupes, especially Japanese models.

I did a lot of digging to learn what I learned, and it was hard work. I got some bad advice in the beginning, but soon I learned who to trust and what I could do — safely — without sacrificing reliability.

I wrote this booklet to share that information with you. I want to let you know about the Z's great possibilities, and you're getting a three-year head start from where I began in early 1995. You also might learn a thing or two about the Z you drive or you dream of driving.

There's a great deal of valuable information compiled here, and I didn't do it alone. I consulted with some very intense aftermarket experts. How intense? People with 600-horsepower Zs with nitrous oxide injection, racing seats and five-point harnesses. These are the drivers who know the most because they have been there.

When I started this book, the Z was still in production, but I had already heard the rumors of its demise. Due to changing world economies and the yen's struggle with the dollar, the price of the Z was raised and as a result it wasn't selling very well. Nissan discontinued selling it in the United States. Since then there have been some new rumors about the next generation Z.

Many of you are anxiously awaiting the twin-turbocharged V8 rumored to lay under the hood of the next Z. Many others are probably hoping for an American version of the 276-horsepower, all-wheel-

drive Nissan Skyline. The Skyline has been tuned all the way up to almost 1000 bhp (that's horsepower) by some tuners! While I'd love a chance to drive either one of those machines, nothing could change the way I feel about my 1990 Twin Turbo.

Now that the car has been discontinued, there is a chance that those of us holding onto ours and taking good care of them may be making a good investment. As time goes by and styles age, I feel the 1990-96 Zs will age well. Time will tell. But I am so sure of the car's timeless quality that I did not even produce this booklet until the car's production run ended.

This guide will show you what many other Z owners have already learned the hard way. I hope you find it useful.

Remember — always drive carefully. It takes only one mistake to ruin your life or someone else's.

Have fun!



# **COSMETICS: TAKING CARE OF THE CAR YOU OWN**

If you're anything like me — and I suspect you are, since you've read this far — your car is much more than just a device that gets you from point A to point B. It is a finely tuned machine that will deliver years of unending enjoyment.

But with that enjoyment comes at least one major responsibility — you have to take care of your vehicle. One of my favorite things about the Lamborghini is the atmosphere that surrounds it. I'll never forget what the Lamborghini Countach — during my one experience driving it — did at intersection after intersection. The traffic lights changed, but no one went anywhere. They sat and stared at the aggressive stance and sharp edges of Paulo Gandini's masterpiece. Parents pointed and told their children. Younger drivers gaped. And all of them were smiling. No doubt the Countach reminded people of their hopes and dreams.

For me, that's one of the best parts of driving a car like that. I'm not talking about being the center of attention. I'm talking about giving people something to dream about, or a story to tell. Perhaps not everyone wants to own a car like that. But just about everyone can appreciate art on wheels.

Your Z has that same kind of power. It inspires those who dream

of owning one (I dreamed for years) and it demands the respect of other sports car enthusiasts. It's your job to keep it clean and presentable, especially if you want it to look sharp as it ages.

## EXTERIOR CARE

### KNOW YOUR FINISH

I'll presume that most of the purchasers of this booklet are owners of a 1990 or newer Nissan 300ZX, either normally aspirated or twin-turbocharged. These cars enjoy excellent paint jobs, not just in color but in durability, too. Originally the Z was available in 11 colors. They were (exterior/interior):

Cherry Red Pearl/Charcoal  
 Azure Blue Pearl/Blue  
 Charcoal Pearl/Charcoal  
 Diamond Black Pearl/Charcoal or Tan  
 Gold Pearl/Charcoal  
 Midnight Blue Pearl/Blue  
 Platinum Mist Metallic/Charcoal  
 Super White/Charcoal or Red  
 Aztec Red/Charcoal  
 Yellow Pearlglow/Charcoal  
 Glacier White Pearlglow/Charcoal or Tan

There were some restrictions. The tan interior was not available on the Turbo model for some reason, and the Yellow and Glacier White Pearlglow<sup>®</sup> colors were available only as extra-cost options. They used a three-stage painting process.

There were three types of interior material choices — leather, cloth and “turbo cloth,” which came only in charcoal and red. The other interiors came in charcoal, red, tan and blue.

While the Z is no longer sold in the United States and Canada, it's still produced for the domestic Japanese market, and its production line remains the same. Near the front of the Z's production line, the body is cleaned in a chemical bath, which allows the paint to bond better to the steel. Then, an anti-corrosion coat and a base coat are applied.

After that, a color coat and, finally, the clear coat are applied. Those lucky owners of one of the Pearlglow color options have an extra Pearlescent<sup>®</sup> mica coat to give it — you guessed it — that Pearlescent Glow.

All Zs are painted by robots, which gives Zs a smooth, perfect finish.

I appreciate the care that goes into painting a Z, because it means that the cars don't require a lot of work to stay looking great. In college, I was a partner in a very successful automotive detail service. I found out quickly that, generally, the better the original paint job, the less work I had to do to make it sparkle.

All 300ZXs since 1990 have what is commonly called a “base coat clear coat” paint job that requires very little maintenance. See your owner's manual. It's not necessary to wax this car regularly. In fact, it's not necessary to wax it at all, at least for the first few years of ownership. Those of you who have Zs that are more than three or four years old may want to consider an occasional polish.

Steer clear of “waxes.” They can leave a debilitating buildup on your car that actually accelerates oxidation. Clear coat paint is a very strong, protective and durable coat that acts as a “permanent” wax on your car. If your paint is in good shape, just wash the car regularly with a mild soap. Do not use dish detergent, as it has harsh additives that can damage your paint. Dish detergent is also formulated to work in warm or hot water. Most car wash soaps are formulated to work in cold water.

## **WASHING YOUR CAR**

If you decide to wash your car yourself, make the extra effort to buy a soft wool washing mitt.

Why? Chances are that your Z already has what I call “micro-scratches.” Almost every car on the road has them. I once saw a brand-new yellow Ferrari Testarossa with them.

Micro-scratches can be created by a variety of things; the first and most obvious cause is the orbital buffer. More on that in “polishing.”

Do you have micro-scratches? Park your car in bright sunlight and look closely at the paint. The steeper your viewing angle, the clearer they will appear. No sunlight? Try looking under fluorescent

light. Any good detailer will tell you that a car that looks good under fluorescent light will look good anywhere.

Another cause of micro-scratches is drying your car with an abrasive towel. While most towels may not feel abrasive to you, they can feel very different to your paint. An old towel that has been left to dry inside your car — or worse, outside — may as well be fine-grained sandpaper. If you are washing your car and drying it yourself, use a professional drying cloth from a good auto parts store. Use that cloth to remove excess water, then use a chamois for the finishing touches. A chamois (relax, you've heard of them — they're pronounced *sham-my*) is a super-absorbent cloth. Originally they were made of deer-skin, but now many are synthetically manufactured, and they work well.

Anyway, if you're like me, you have neither the time nor the space to wash your car yourself. Now listen carefully — do not take your car to an automated wash with brushes.

Let's repeat. Do not have your car washed at an automated wash with brushes. No matter how soft the car wash advertises them to be, brushes will scratch your paint over time.

Prior to my wheel upgrades, I got my car washed at a brushless hand-wash. The car was guided through a garage similar to a regular automated wash, but there were no brushes. There were a couple of guys who washed the car after it had been sprayed with a soapy goop, and then it was rinsed twice and blown dry without being touched by machines. Another employee drove the car onto the lot and finished cleaning the car by hand.

They did a very good job, but I still had to keep an eye on them. Occasionally the employees wore a mister or spray bottle on their front pants pocket or belt loop. It didn't offend my fashion sensibilities, but those bottles can badly scratch your door or fender when the employee leans over your car to dry the windshield or the glass on the T-tops.

Cars collect water in strange places after they've been washed, and the Z is no exception. You might think it's dry, but later you might find water spots on the hood, the doors and/or the rear quarter panels. That's because water collects in the side view mirrors, along the lip of the tailgate and under the leading edge of the hood.

Bring an old shop towel with you to the car wash. When the

employee starts finishing your car by hand, pop the hood and dry its front lip and the rubber seals along the tops of the headlight casings. Also, have the car wash guys open your tailgate immediately. This gives it time to drain while they're doing everything else. Dry between the lip of the tailgate and the seal to prevent the excess water from staining the rear quarters.

As for the mirrors, unless you have access to compressed air, you just have to let them blow out on the road. Unfortunately, this process will leave droplets all over your doors. If you are as anal as I am about this issue you can go to just about any office supply store and purchase CFC-free cans of compressed air. They work great for blowing out all the water that usually hides until you hit the road. With this, you can dry both the mirrors and the edges of the light casings above the rear bumper.

If you don't get all the excess water, take your chamois and get it wet when you get home. Then wring it out really well and lightly swipe it across any drip marks on your doors, quarters or rear bumper. It will clean them nicely.

Most synthetic chamois will actually work better if you store them moist. They are mildew-resistant and machine washable.

These details may seem inane, but by adding a few extra steps into the washing of your car, you can always sport a spotless Z that will be the envy of everyone on the road.

## **POLISHING YOUR CAR**

Remember those micro-scratches I mentioned earlier? An orbital buffer — a round, hand-held polishing machine — in the wrong hands can cause those scratches or even more serious damage to your car's finish. Circular micro-scratches can be created by applying too much pressure or by using an overly abrasive wax or polish. Never use an orbital buffer yourself unless you know exactly what you are doing, and definitely do not pay some detailer whom you don't know well to punish your car's finish like that. An orbital buffer is often nothing more than a substitute for elbow grease.

If your Z is a few years old and you think that it is necessary to have more work done on the paint than just a wash, you're probably thinking wax. Paste wax is not good for your car. It can actually build up and encourage oxidation, which happens when your paint deterio-

rates and microscopic flakes break off and slowly rise to the surface through the wax. It takes a lot of sunlight for this to happen on newer Zs, but I have seen it.

Use a polish instead of a wax, and apply it very rarely, depending on weather conditions. In sunny Los Angeles, where I live, you may need to polish only every six months or so (provided the car is less than two or three years old). New York is a different story, so consult a knowledgeable and respectable local detail shop.

Lighter colors are prone to oxidation sooner; darker colors, while showing dirt more readily, usually last much longer. All paints can last a long time if properly cared for.

## CAR COVERS

I highly recommend keeping your car out of the sun. The sun is your paint's worst enemy, with acid rain a close second.

Invest in a high-quality cover from Nissan. One made from Kimberly-Clark's Evolution 4<sup>®</sup> fabric, which is water-resistant, or, better yet, the new NOAH<sup>®</sup>, which is water-proof, are ideal. Both are porous enough to allow water trapped under them to evaporate. Your car may still get wet when it rains if you use Evolution 4, but not with NOAH.

In general, I don't recommend dealing with dealerships, but you can't get a better cover than the one Nissan sells, which is specially cut for your Z, and usually available in the Kimberly-Clark fabrics.

Don't pay retail! In appendix A, I'll tell you how to get Nissan supplies and parts at near-wholesale prices.

Don't forget to have your cover professionally cleaned at a dry cleaner. These covers won't fit in most washing machines, but dry cleaners can make it happen. It is not necessary to have the cleaner dry clean the cover, just have them wash it. Request a very mild detergent wash, or no soap at all, just warm water. Soap that is not rinsed out can defeat the water-repellent properties of Evolution 4.

A downside to covers made from Evolution 4 is that occasionally they can leave a film on your windows. It's more evident in high-humidity situations. I don't know why, but it rarely affects the paint, just the windows. When necessary, wipe down the windshield with the towel you used at the car wash.

Don't put a clean cover on a dirty car, or vice versa. Both can

cause micro-scratches. Don't cover your car even if it's just slightly dusty. There are dusters on the market, but my detail shop tells me that even though they claim not to scratch your paint, they do scratch it, so steer clear of them.

Covering your car may seem like a hassle. But once in the habit, you'll find that it takes no time at all to add years of life to your paint. My car never sees the light of day unless it is rolling. It has nearly 90,000 miles on the odometer, yet most people think that it's a 1996 model (it's a '90). That's because I take care of its Diamond Black Pearl finish.

## **RESTORING DAMAGED PAINT**

If your paint is already damaged, you have a few restoration options.

Does your car have dried water spots? It's likely been a victim of acid rain. Often these spots can be buffed out with a high-quality polish, but I recommend it be done professionally. Not only does that save you a sore arm and back, it puts the liability on them. Remember to look carefully for a reliable detail shop. Here in 1998, you should expect to pay \$120 to \$150 for a full detail. That's a lot of money, but protecting your car's finish is worth it.

## **CLEANING TIRES AND WHEELS**

Cast aluminum-alloy wheels are relatively easy to keep clean. Much of the dirt on your wheels comes from your brakes. Brake dust is unavoidable — it's created when you use your brakes. To prevent brake dust from building up on your wheels, rinse off your wheels every week. Don't rinse them with cold water when they are hot — it can bake the dust onto your wheel. Let the car cool down or use hot water to rinse them.

Most of the dust will rinse right off, especially if you have chrome wheels and you use a reasonable amount of water pressure. Some of the dust, however, will not be so easily removed. To remove the more serious dust, use a very soft shop rag, which you can find at any good auto parts store. Harder rags will scratch your car.

Rinse the rag well when you're finished, but don't expect the rag to come clean. Use a new rag every few months.

Avoid using harsh wheel cleaners. They can stain your wheels

permanently and possibly irritate your skin and eyes, and usually they are not necessary. High-pressure self-service spray washes generally do not clean your car very well, but they can be effective in rinsing your wheels. Remember — find one with plenty of hot water, if you can.

## INTERIOR CARE

The inside of your Z is easier to care for. Remember a general rule — stay away from those milky interior dressings. I won't mention brand names, but you know which ones I mean.

Those vinyl cleaners/polishers somehow suck all the moisture out of dashboards. When you stop using them, the dash dries out and eventually begins to crack.

So don't start using them. If you already have, then stop and try using a non-milky alternative. When I had my detailing shop I used a product called Shine-all<sup>®</sup>. Unfortunately I have never seen it in stores and am not sure how to get it now. It was the best interior dressing I have ever seen. It made interiors look brand new and left no residue of any kind. It seemed to evaporate almost instantly. If you wish to try and track down this product or a similar one, you might call some car wash supply vendors and see if they can help you.

Plenty of products out there will protect your dash that aren't in the aforementioned category. A minimal approach is the best for interior care. Just use a damp cloth regularly to wipe down your dash.

The best way to protect your dash from aging is to shield it from sunlight while you are not driving. As before, keep your car covered, or parked in a garage. If you're in a situation when you can't cover your car or don't want to, use a windshield shade.

Rumor has it these ingenious devices were invented by immigrants to this country in the early 1980s. Maybe it's an urban myth, but I remember a story about a couple of men who came to Florida from Cuba on a boat, and to make a living they cut out pieces of discarded cardboard boxes and sold them as windshield shades. If it's true, I hope they're millionaires! Those shades will add years to your dash. There are plenty on the market now that fold away quite nicely. I store one behind my passenger's seat.

Another good purchase — the interior version of the California

Car Duster. This too will tuck away neatly behind the passenger's seat.

Once a year you should have a detail shop shampoo your seats and carpets. Other than that, the Nissan cloths require very little maintenance. Just vacuum the interior regularly.

Leather is an entirely different story. The best thing to do for the leather seats is to keep them out of the sun as much as possible. You should also apply a good leather cleaner/moisturizer at regular intervals. I try to do this once a month, but that is my own personal preference. I use Lexol<sup>®</sup>. Lexol is one of the best leather cleaners available and is used regularly by equestrians and shoe shops.

Other hints for cleaning your interior: Use a paintbrush to dust your car's vents and crevices. If you choose to use a vinyl cleaner/polisher for your dashboard, apply it before you wash the windows. This may seem obvious, but cleaning those substances off your-already clean windows can be a pain in the butt. (Besides, who wants to clean their windows twice?) You can also save yourself from this mishap by applying the dashboard polish to an applicator (sponge or paper towel) and then rubbing the dash with the applicator.

## **CLEANING YOUR WINDOWS**

Cleaning your windows can be difficult. There are all kinds of "old wives' tales" out there about using newspaper to avoid smearing. I've tried that before and have never had much luck.

I'll say this: Always clean your windows after you've cleaned the rest of the car. You will invariably overspray water or other cleaner as you wash the car.

Lastly, I can whole-heartedly recommend only one glass cleaner. It's called Seaspray<sup>®</sup> and is sold by Amway. Yes, Amway. I have used this foamy glass cleaner in the past and found it to be exceptional. It has fabulous cleaning power and doesn't streak. You can't find it in stores, but I'm sure you can find Amway in your local phone book.

I've tried other foamy glass cleaners from local auto parts stores and found that they do not work as well.

## **WINDOW TINTING**

You can also protect your interior by tinting your windows.

In may states this is illegal, so always check local laws before

you tint your windows.

Many states have laws against tinting the side door windows because law enforcement officers get nervous when they can't see inside a vehicle. Officers have been shot and killed from behind darkened glass. If window tinting is illegal in your area, don't do it.

If it's legal and you are interested in it, your first step is to arrange an appointment with a window-tinting professional. Find a professional who offers a guarantee lasting as long as you own the car. The tinter will chemically clean the inside of your windows and then use a template to cut out a portion of the tinted film, which comes on rolls. The tinter then will apply the film to the window using soapy water for adhesion. When the water dries from between the film and the glass, the smooth film coat will adhere flawlessly to the inside of your window, if done properly.

Tinting isn't easy. Don't do it yourself. I tried and failed miserably. Pay someone to do it correctly.

Tinted windows can greatly reduce ultraviolet (UV) light entering your car. You can choose several degrees of darkness. Generally, the percentages of tinting are 50 percent, 30 percent, 20 percent and five percent (also known as a limousine tint). Those percentages represent the amount of available light allowed to pass through them, so the lower the percentage, the darker the film.

There are also colors available, including bronze, reflective and silver. In most states, you can legally apply all the way up to a five-percent tint on your back windows and portholes. This does not include side door windows. Again — check your state's laws.

Be careful not to wash your tinted windows with too strong a cleaner. Ammonia-based cleaners can cause cheaper films to fade or change color.

Aside from protecting your interior from UV rays, tinted windows can also help prevent theft. Some articles have said that tinted windows can even help prevent carjacking.

But they may not be for you. A tinted back window can create a disconcerting darkness in your rearview mirror. If you've tinted your windows and you find out you don't like them, you can have them stripped by the same people who installed them.

## REPLACING PARTS

The last solution for a damaged interior is so obvious that it's often overlooked. If you have damaged interior parts, think about replacing them. This can often be a quick and easy way to refresh your interior. It can also be expensive so you may want to wait and do it when your car gets older.

If you want to do it now, start with the smaller parts, like switches. Look around your cockpit. Do any switches look worn or have writing that is rubbed off? These little things can make a big difference, and they may not always be inexpensive. For instance, the dashboard clock costs around \$130 wholesale and \$160 retail at press time. Again: never pay retail. I'll tell you how to do that later.

You can easily install most interior parts by yourself. It's a good idea to invest in a Nissan service manual. I purchased a used one for \$10 from someone who had sold his Z (for some insane reason). Later, I'll tell you how to make purchases like that, too.

## ENGINE CLEANING

Cleaning your engine can be tricky. There are certain risks associated with spraying high-pressure water in your engine compartment. Things to avoid are spraying cold water on a hot block, spraying water into the alternator and spraying water onto electrical components.

All of these things can cause problems. As a general rule, I do not recommend cleaning your engine yourself. Pay a respectable professional to do it. Make sure that he or she uses steamed hot water. Cold water can crack an engine that is hot.

I have owned my car for four years and I have had my engine cleaned once. I had it professionally done and was very pleased with the results. As far as I can tell it had no lasting effects on the car in terms of damage. It was steam-cleaned and then dressed with a high-gloss coating. It still looks very good.

If the engine is generally clean and you feel a need to clean it regularly, you can find some safe grease removers at most auto parts stores, but watch out for the residue.

Lastly, be considerate of the environment when cleaning your

engine. Don't wash your engine at your house and let those chemicals and grease drain into your yard or down your street. These strong chemicals are not meant to be released untreated into the environment.

# **OPTIMIZING THE PERFORMANCE YOU ALREADY HAVE**

It's easy to get excited about adding aftermarket products to your 1990 or newer Nissan 300ZX. But remember that aftermarket performance doesn't mean much if your car isn't running properly in the first place. This chapter is about properly maintaining your car so that when it's time to upgrade it, your car will be as ready as you are.

## **TIMING BELT**

Your timing belt should be replaced every 58,000 miles as per the owner's manual. At that time you should also consider replacing all engine belts, your air and fuel filters, your plugs and your water pump as well as the timing belt tensioners. It makes sense to do this while the front of your engine is disassembled. It saves you money. Water pumps may generally outlast your timing belt by a few thousand miles, but do you really want to pay all of that labor cost twice?

The tensioners should always be replaced when replacing the timing belt. If they start to fail the belt can slip and seriously throw off your timing, causing much more serious problems.

# TIRES

Many car owners underestimate what a good set of tires can do for your performance. What makes a good set of tires? Ask yourself these questions — what is their rolling resistance? How long will they last? What tread pattern is best for the way you drive your Z? What size do you need?

Tire sizes are easy to understand. Let's use this designation — 245/50ZR16 — as an example. The first number is the tire's width in centimeters, so this tire would be 245 centimeters wide.

The second number is the ratio between the height of the tire's side wall (where the raised letters are) and the tire's total width. In this case, the 50 means that the side wall's height is 50 percent of the tire's width, or 123 centimeters. That may seem tall, but in fact it's a very low-profile tire. The ratio of the lowest-profile tire money can buy for street use is around 30 percent.

The Z refers to the tire's speed rating or performance threshold. A Z-rated tire is designed to travel above 150 mph. That does not mean that you can drive 150 mph all day. It means that the tire is certified to run at 150 mph for 30 minutes, on a properly maintained vehicle, before the tire is likely to begin to disintegrate. This disintegration is brought on by the heat of the road friction. Once that heat reaches temperatures comparable to the heat at which the tire was originally vulcanized, it will become an unstable compound and will start to disintegrate.

Although Z was the highest tire rating for many years, there are two new ratings in the tire game, ZW and ZY. ZW tires are rated for 168 mph, and ZY tires are rated for 186 mph. At press time, ZW- and ZY-rated tires were not available for the 300ZX.

The R16 indicates the radius of the rim to which the tire must be mounted, measured in inches. This tire belongs on a 16-inch rim or wheel. Wheel size makes a big difference in handling and horsepower.

There are other tire specifications you should know about, not just those indicated on a tire's model number.

Rolling resistance measures how much friction a tire produces. The higher the rolling resistance, the more friction (or traction) the tire produces, the worse the fuel efficiency and, more than likely, the

better the handling. The tire will also wear down more quickly because it is softer. A harder compound will last much longer but not handle as well.

Road noise is an important issue. Is it important to you how noisy your tires are?

Another important issue is a tire's treadwear rating. This scale was developed by the United States government to indicate how long a tire should last. The scale can run anywhere from 40 all the way up to 600. The higher the number, the longer the tire will last. This number is not a guarantee of mileage, but a wear scale that depends on the driver's habits. Generally, a tire rated at 300 will last twice as long as a tire rated at 150. Although the scale runs from 40 to 600, most street tires fall between 100 and 300.

Traction ratings are important, too, and a bit easier to understand. The traction rating scale is lettered from A to C, A being the best. That's pretty self-explanatory.

I have used several types of tires on my Z, and I prefer the Dunlop SP8000. For my chromed stock 16-inch wheels, I found the Dunlops to be relatively inexpensive. They were also fairly quiet and handled well. Their treadwear rating is 200, which is high for a high-performance tire.

When I moved up to a 17-inch wheel with an extra half-inch of width, I continued to run Dunlop SP8000s and have never been disappointed with them.

The Tire Rack, which sells tires by mail order, is a valuable source of information. Its staff is well informed and usually can answer all of your questions. You can reach them at (800) 445-0179. I've found that they offer the best prices on tires, although the competition often matches their low prices.

They ship tires wherever you want. I have my tires sent to my mechanic, and he installs them.

## **THE RIGHT TIRE SIZE**

Stock non-turbo Zs should have P225/50VR16s on all four wheels. The Twin Turbo should have 225/50ZR16s in front and 245/45ZR16s in back. The rear tire on the Twin Turbo is wider and has a lower (45 percent) profile than the front. I will talk more about upgrading wheel and tire sizes in a later chapter.

Don't take chances when fooling around with the physics of your Z. There are Z owners that have gone before you and can offer sound advice on what tire sizes work for the Z.

If your driving style is anything like mine, you can expect to go through two sets of rear tires for every one set in front.

Care to guess why?

## **BALANCING YOUR TIRES**

Tires are never perfectly balanced, so weights must be installed on your wheel to keep it from spinning out of balance, which can cause violent shaking. There is no reason to have the unsightly weights hammered on to the outside edge of your rim. Have the weights mounted on the inside, where they are out of sight. Any decent tire shop should be able to do this.

Some wheel balance experts will tell you that you must install weights on both the inside and the outside edge of your rim for your wheels to be truly balanced. If you have nice aftermarket rims, this may not be preferable. But if you don't care, you might want to look into it.

## **TIRE PRESSURE**

Keep an eye on your tire pressure. Your owner's manual will tell you the proper tire pressure to maintain. Atmospheric and other variables might demand a different pressure, so make sure you read your manual.

You don't have to check your tire pressure every day, but you should "eyeball" your tires whenever you can. Remember what the tires look like at the proper pressure and make a quick visual comparison.

There's no substitute for checking your tire pressure with a gauge. Keep a high-quality tire pressure gauge in your car. Low tire pressure can lower your gas mileage and diminish performance. Improper tire inflation has telltale signs — if your tires are worn excessively down the middle they are overinflated. Tires worn on both outside edges are underinflated.

If you're a true gadget junkie, you might want to check out the SmartTire Wireless Pressure Monitor System. This ingenious device uses sensors strapped to the inside of your wheels to send pressure

and temperature information to a display in your car.

It's useful information if you race or tend to run over nails a lot. Contact the company at its Website (where I found them):

[www.smartire.com](http://www.smartire.com)

## TIRE ALIGNMENT

Tires also carry signs of improper alignment. If they're worn only on one edge, the camber is probably incorrect. Camber (pronounce it *CAME-bur*) is the vertical angle of the tire to the road. Ideally this should always be 90 degrees. The more perpendicular the tire is to the road, the larger the "patch" of tire that is in contact with the road. That contact patch is all that keeps you from spinning out or losing traction, and you want it to be as big possible!

If you notice worn-out edges, correct your camber immediately with an alignment. You should probably replace those tires as well.

A tire alignment is an absolute requirement every time you buy new tires, or else you're throwing your money away.

Factory-recommended tire alignment specifications are as follows (toe is the position of the wheel in relation to the path of the car; caster on the Z is not adjustable from the factory):

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Front caster:	9.0 degree minimum; 10.5 degree maximum
Camber:	-1.6 degree minimum; -0.10 degree maximum
Toe:	0.00 degree minimum; 0.09 degree maximum
Rear camber:	-1.7 degree minimum; -0.7 degree maximum
Toe:	0.00 degree minimum; 0.19 degree maximum

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The 300ZX has upper links with notoriously short life spans. The upper links are cross-members that make up the "upper" part of your front suspension. They are parallel to the road and are fixed in length. Their rubber bushings wear out after three to five years. Once they wear out, the camber of your front tires will be incorrect. See chapter three, "Common Problems," for more details on how to handle this situation.

## ROTATING YOUR TIRES

Tires can be rotated on non-turbo Zs but not on turbo models because the back wheels on the turbo are wider than the front wheels.

If you rotate your tires, be aware of unidirectional and asymmetrical tread patterns. Some tires must always rotate in the same direction! This means that wheels on the left side of your car must stay on the left side, unless you flip them. Even that can't be done if they are both unidirectional and asymmetrical. Unidirectional tires have arrows on the side wall, indicating in which direction the tires must spin.

## THE UNMODIFIED ENGINE

Sooner or later every Z owner will have to look under the hood, and it can be frightening. You gain a new appreciation for your Z when you see that vicious 3.0 liter V6 staring back at you from its cramped compartment. It often looks like it's about to pop out and attack you.

It won't. Quite the contrary. It needs very precise care.

Fortunately for you, you bought a Nissan. They're not perfect, but your life is a lot less complicated than if you owned a Porsche or Ferrari, which have comparable performance. I knew a guy with a RUF Porsche 930. A tune-up cost him \$1400! And that's if nothing's wrong.

The Z isn't like that. It rarely requires tuning, although changing the plugs is important.

## SYNTHETIC VS. ORGANIC OIL

First things first — use synthetic oil. There is no reason not to, except for price, and even that really isn't that different.

There are a variety of reasons to use synthetic oil. The first and most important is because synthetic oil reduces friction more efficiently. Reduced friction creates less wear on the engine and more horsepower.

Also, synthetic oil resists breakdown. Regular oil ages more quickly — as it is tortured thousands of times a minute inside your cylinders, it becomes overheated and charred and begins to break down. It becomes sludge, which isn't a good lubricant.

Synthetic oil, on the other hand, resists molecular breakdown. Its tolerances are far beyond that of organic oil. The big oil companies

recommend an oil change every 3000 miles or every three months, whichever comes first. Most synthetics are recommended for changes every 5000 miles or five months. This fact alone shows the superior ability of synthetic oil to hold up under identical conditions.

Even though I use synthetic oil, I'm a little paranoid, so I change my oil every 3000 miles anyway. It is always remarkably clean and shows almost no signs of breakdown.

## **CHANGE THAT OIL**

Let me repeat, change that oil.

If you never do another thing to take care of your Z, always get regular oil changes. Oil is the lifeblood of your car. Nothing else matters when your car is circulating dirty, broken-down oil. The effects of infrequent oil changes are long-term. You might not notice any difficulty this month, but seven or eight years down the road when it's idling rough or burning oil from worn rings and scored cylinders, it will be too late to switch. Even if you can't afford synthetic oil, be rigorous about your oil changes.

Always use Nissan oil filters when you change your oil. Automobile manufacturers put a lot of research and development into their filters, and they are usually the best you can get for your car. The valves in the Nissan filters are specifically designed for your engine, and you should take advantage of that technology.

Like me, you can add a magnetic band to your filter to do an even better job of capturing stray shards of metal. Magnetic bands can often be found in high-end auto accessory catalogs. I found mine in a Porsche catalog. This band, which has magnets all through it, is adjustable and stays tightly wrapped around your oil filter. I can only assume that it does its job.

There are lots of places that you can go to get your oil changed, but they aren't all good. Often times the quick-stop oil change shops lack experienced mechanics. While changing the oil in a car is fairly simple, little mistakes can add up over time. Find a good independent mechanic that you can trust to do your oil changes.

In the past on other cars that I have owned, I have actually seen the quick stop oil changers use the wrong drain plug and strip the hole for it. I have also had them not screw it all the way in. My point is, find some one you can trust.

Whenever you get your oil changed, have your transmission fluid and differential fluid checked. These two don't have to be changed as often, but keep an eye on them.

## **POWER STEERING FLUID**

Your power steering fluid is of little concern as well. This system is closed and fairly durable.

If you have a Twin Turbo, the SUPER HICAS® warning light will come on when the power steering fluid gets low. The Z doesn't have full power steering, but power-assisted steering. The amount of assist it provides is inversely proportional to the speed at which you are traveling. In other words, the faster your speed the less assist you get. When you're parking, you get the full benefit of the power assist. When you're scooting along the open road, you get very little.

## **BRAKE FLUID**

Brakes require regular maintenance. The blood of a brake system is brake fluid. If you have a stock brake system you should be fine with Nissan fluid, and you should only very rarely need to adjust the level. If you have an upgraded braking system or you are just paranoid, consider a high-end brake fluid. Motul DOT-5 is generally considered one of the best brands of brake fluid you can buy. It is fully synthetic and safe for all types of lines.

As your pads wear down, your brake fluid level will drop too because the closed system now has more space for fluid. When this happens your brake light may come on. Obviously if this happens, you should check the reservoir and fill if necessary.

## **BRAKE PADS AND ROTORS**

When your brake pads wear out, pick the best replacements. There are lots of choices in this arena, and the simplest is to buy Nissan pads. They are quiet and have a fairly good life span.

Years ago, brake pads contained asbestos and were very quiet. But asbestos became illegal for health reasons, and pads then were made with metal. The problem with metal, as you can imagine, was noise. When metal pads squeak, pad friction is usually, but not always, the cause. Metal pads, however, have excellent grip and are actually preferred by "tuners."

If you wait too long to replace your pads, your rotors or disks may become scored when the fittings beneath them create a groove. All pads contain material designed to squeak when they get dangerously low. These are called sensors. If your brakes start squeaking, that's generally not a sign that something is wrong — it's a sign that something will be wrong soon if you don't get your pads checked.

If the rotors get grooved, and the damage isn't too serious, they can be "turned." Although Nissan recommends that they be turned on the car, some mechanics (including mine) remove them from the car and they are resurfaced on a lathe until they are smooth again. This process thins the rotor, so you can only have them turned a few times before they must be replaced.

Some mechanics will tell you that the brakes should be turned at every brake job, but this isn't necessarily true. Don't get mad at your mechanic; turning your rotors is a good idea, especially if you don't mind replacing them every couple of years. But if you replace the pads before they are completely worn, then you don't have to turn the rotors each time out.

There's a long list of aftermarket improvements to your braking system. See chapter six.

## **COOLANT/ANTIFREEZE**

When driving your Z, keep an eye on all of your gauges. But one of the more important gauges is the temperature gauge. You might forget about it sometimes because it's pretty boring to watch, but few things are more serious on an automobile than a rising temperature gauge.

I once drove to Las Vegas from Los Angeles in my Twin Turbo Z during the heat of the summer, and my gauge went up a great deal. It was 120 degrees outside and my poor car was not happy at all. The gauge was well above its normal halfway operating range. I assuaged the problem by coasting at high speeds as much as possible and turning the heater on high.

When I returned to LA, I had the radiator drained, flushed, and refilled with antifreeze. Some may think they don't need antifreeze where they live because it never gets below freezing. They may also think that water is a better coolant, but it is not. Antifreeze is a much better coolant than water and it is also less likely to promote internal

rusting in your radiator.

I recommend flushing and filling your radiator twice a year. It's a closed system and fairly impervious to contamination. You can certainly have it done more frequently if you are concerned, but I would never do it less than once a year.

Additionally, you may want to invest in a rigid, aluminum lower radiator hose for your Z. The stock rubber one has been known to fail in extreme heat and cut off coolant circulation. I suspect that this is what happened to me.

Redline<sup>®</sup> offers an advanced synthetic coolant called Water Weather<sup>®</sup>. It costs a little more, but in my experience it generally outperforms regular coolants.

## **WINDSHIELD WASHER FLUID**

There's not much to say about windshield washer fluid except that I prefer to use straight water. Water doesn't remove grime as well, but a lot of washer fluids can leave permanent stains on your paint. Living in Southern California, I don't need the stuff very often. If you choose to use a solvent in your washer fluid reservoir, make sure that it is safe for your paint by purchasing a relatively mild washer fluid or by diluting it with water.

## **WARMING UP AND COOLING DOWN**

These are important to all Z owners, but especially those who own Twin Turbos.

Warm up and cool down your Z every time you drive it (you should do it no matter what kind of car you drive). Oil thickness and resistance changes dramatically with temperature changes. The warmer the oil (to a certain extent, of course), the better it lubricates and the less wear on your engine. Your Z is designed to operate within certain tolerances, which are based on a standard oil temperature and pressure.

Depending on where you live, the Z can take several minutes to warm up. It's not necessary to wait for it to reach normal temperature before driving it. Waiting that long at idle speed can foul the plugs and create carbon build-up in your cylinders. Generally just give it 30 to 45 seconds, unless you are in the middle of a harsh winter. Then you might want to give it as much as a minute and a half. After this

period drive the car gently and try to stay under 2500 rpm until the engine temperature and pressure reach their normal operating range.

If you don't have the time or the energy to warm up the car, you can take other measures to make life easier on your Z. First, drive very gently. Slow and easy. For me, driving gently can be a challenge. But you can add years of life to your Z by being very gentle with it every time you start it, at least (as I said before) until the temperature and oil pressure gauges reach their normal operating range. If you are unsure of this, consult your manual.

Cooling down your car after a drive is also especially important if you have a turbocharged Z. The number one cause of turbo failure is coking, which is a term applied to the act of hot oil cooling down too quickly and caking up on lubricated surfaces. Although the Z is so well designed that it has a built-in system that uses water from the radiator to cool the bearings after shutting the engine off, a little extra safety is never enough. Generally, let your car cool down for about 30 seconds after a mildly to moderately aggressive drive. This ferries hot oil away from the turbines and thereby prevents coking. If you've been at the track doing top-speed runs, you may want to let the car cool down for three or four minutes. More than that isn't really necessary.

Several companies make a device that will automatically cool your car down every time you turn it off. It is called a turbo timer and is nothing more than a device that allows your car to keep running for a predetermined amount of time even though you've removed the key and set the alarm. There is no danger of theft as the alarm can still be set, and even if someone were to try and take the car, the steering wheel is locked. You can find more information on this in chapter four.



# COMMON PROBLEMS

There are many miscellaneous problems that can stump you as a Z owner. Here are some insights about the ones with which I have had the most experience.

## **LOST IGNITION KEY**

I suppose this isn't really that common of a problem, but I didn't know where else to put this information. When I bought my Z (it was used), I was looking forward to that really cool titanium ignition key. It was the symbol of the car and represented the engineering philosophy that I believed in so much.

Sad to say, the prior owner of my car had lost the prized key.

I purchased a new one. Before I knew better, I paid \$64.15 retail for a titanium key blank. My guess is that they cost \$50 or less wholesale.

## **POWER TRANSISTOR RECALL**

The power transistor in the Z was recalled for the years 1990-91. It was determined that the factory power transistor for these models may fail, causing poor driveability and a rough idle. A new counter-measure power transistor was developed to resolve this problem. The part number on the power transistor is 22020-97E25.

A source told me that the first batch of replacement power transistors was also no good, and to be sure to get the replacements manufactured by Mitsubishi. The Mitsubishi transistors should be the only

ones available at this point.

The replacement work should be available from any dealer free.

## **TRANSMISSION FLUID AND THE ENDLESS GRIND**

The gear-grinding problem in the 1990 and newer 300ZXs with manual transmissions is the car's most common problem. I know more people who have experienced this problem than any other one mentioned here or anywhere that I have done my research.

My own car was a good example. It ground the gears when shifting into and out of fourth and sometimes other gears. The worst thing about was it most often happened during hard acceleration.

Apparently there is a problem with the synchronizers in the manual transmissions of the 1990 and '91 models.

I waged an unsuccessful battle against Nissan to have something done about this. I wanted a service recall or at least some financial assistance with repairs. Nissan dealt with me diplomatically — I received a form letter that demonstrated to me that they hadn't even read the letter I sent them. Nissan stated that there was no evidence that my problem was apparent in any cars other than my own. My original letter listed almost 30 other 300ZX owners from all over the world who had the same problem. I had even discovered a Technical Service Bulletin that indicated how to fix the problem that Nissan was now denying to me even existed.

Here's information on the bulletin:

### **BULLETIN INFORMATION**

It was titled, "GRINDS REPAIR KIT NTB91-086" and specifically related to the 1990 and '91 300ZXs. It was labeled Manual Transmission Classification MT91-002, and its bulletin number was NTB91-086, dated October 24, 1991.

The bulletin applied to the following VIN numbers:

JN1RZ26\*\*MX999999

JN1RZ24\*\*MX504315

JN1CZ24\*\*MXSOS910 [that's MXS and the letter "O" followed by S91 and the number zero].

The bulletin said that customers may complain of a grinding

problem when changing from fourth to fifth gears. It goes on to say that, after checking all the basics, like pedal adjustments, etc., that a repair kit is available.

The repair kit is to be installed by removing the transmission and installing the kit, using the same procedure as used to overhaul the transmission.

The kit's part number is 32220-30P25. It contains the following:

Spring-Insert Fifth Reverse, 32615-30P10;

Fork Rod, Fifth, 32816-30P10;

Sleeve Coupling, Fifth, 32616-30P10;

Ring-Baulk, Reverse, 32617-30P10;

Gear-Reverse Countermeasure, 3220-30P10; and

Ring Baulk, Fifth, 32614-30P10.

These parts must be used only as a set on vehicles built prior to the applied VIN numbers.

More information on the bulletin might be available from authorized Nissan dealers. A few dealerships could not find the bulletin when I requested it, but one did retrieve it and gave me a cost on the parts.

When I first discovered the grinding problem, I consulted with the head engineer at Stillen, an aftermarket performance shop. He was well aware of the problem and generally recommended installing a 1993 or newer transmission into the car. That's a \$1500 solution, not including labor. The parts alone on the Technical Service Bulletin cost around \$900 wholesale.

I preached the transmission-replacement solution for quite some time to those with the problem. But I couldn't bring myself to replace my own transmission as it wasn't failing on a more significant level. I was also discouraged by grinding problems reported by Z owners with 1995 Zs. Some of these transmissions had only 15,000 miles on them. It began to seem like there was no solution to this problem.

When I finally made my move to a full stage-three setup with my car (I'll explain what that means later) and I knew that I had to install a high-performance clutch, I switched to a high-performance synthetic lubricant for the transmission.

I drained the transmission and filled it with Redline Brand MTL. The difference was amazing — the grinding all but disappeared. I still occasionally experience it when racing very hard (on a closed course), but for the most part it is gone. That is even after 70,000 miles of grinding (I bought the car with 48,000 miles on it).

In any event, the gear grinding is one of the Z's more serious problems, and it is not easily repaired. If I were more financially fortunate I would probably buy a new transmission. If you have the grinding problem, I recommend trying the Redline MTL Synthetic transmission lubricant.

One final note on this subject: After I added my short-throw gear shifter (see chapter seven), I could hear much more clearly all of the sounds made by the transmission. It's obvious that my fourth gear has suffered serious damage, although it never pops out of gear or grinds much anymore. I am certain that eventually it will fail completely, and at that time I will buy a newer transmission.

I have recently heard rumors that GReddy, an aftermarket manufacturer, is developing a six-speed transmission for the Z. These rumors remain unsubstantiated, but we can only hope. That could be a solid solution to the fourth gear grind.

I don't have as much experience with automatic transmissions, but I do have one interesting story. My mechanic recently worked on a 1992 300ZX (non-turbo) automatic that had repeated problems with its transmissions. After replacing the transmission three times, my mechanic determined that the computer controlling the solenoids that affect downshifting was malfunctioning. This malfunction led to chewed gears and poor performance. He had to apologize to the company supplying the used transmissions, as he thought they had all been faulty, when in fact it was the car's computer.

If you notice that your automatic 300ZX is not downshifting properly, then get this checked out. Some symptoms in the aforementioned case were that the car would downshift all the way to first, when it should have just gone to second, or not downshifting at all when the car was coming to a stop.

You also want to keep an eye on the transmission fluid filter, which is part of your radiator (automatics only). When it gets clogged, the flow of the fluid can be restricted. This, in turn, can lead to overheated transmissions and burnt clutches.

## HUNTING IDLE AND/OR CRANK ANGLE SENSOR FAILURE

Another common problem is a hunting idle. My idle has always been a source of trouble. It's relatively complicated to solve because so many things affect the idle speed.

My problem usually involved idling too high. Sometimes it would stick at around 1500 rpm. I would race the engine, but the idle wouldn't come down. The only way I could get it to come down was to turn the car off and back on. This reboots the engine computer. On the advice of a dealer (I was desperate), I replaced my air regulator (I paid \$92.51 for it wholesale). The problem subsided but only for a few months.

I had heard that in the first months of Z production there was a flaw in the manufacturing of the block, which affected the angle of the shaft of the crank angle sensor. The crank angle sensor is a photo-optical disk connected to the crank shaft which monitors the speed of the engine and piston position. The computer uses this along with other data to calculate fuel injection and ignition timing, among other operations. If the shaft angle of the sensor were off even one one-hundredth of a degree it could send misinformation to the computer and cause the car to idle irregularly.

I also heard that the crank angle sensor is prone to accumulating rust in the coupling splines. So I replaced it. The idle still hung.

When the idle would hang high, I drove to my mechanic to get it diagnosed. Of course the idle would always come down by the time I got there.

Finally it hung up once around 1900 rpm. I took it to the dealer, which replaced the AAC valve. The AAC valve, or auxiliary air control valve, is something of a mystery to me. I paid \$215 for a new valve and thought my problem was solved.

Wrong. It still idles high occasionally. I'm sorry I don't have a workable solution for the high-idle problem. If you have a solution that works, send it to me and I will try to publish it (and give you credit, of course) in updated versions of this booklet. At least I can tell you what is not causing it.

I have also heard that this idling problem may be caused by a faulty mass air sensor. It's located in the intake and gives your ECU data on the volume of air being drawn into the engine. I have never replaced it and don't know anyone who has.

## **GURGLING IN THE WHEEL WELL**

The Z has what's known as AIV (air induction) valves, one inside each front fender. The design of the valves causes water to sometimes get trapped in them and make them gurgle. It's fairly easy to hear, but only when you are sitting still and idling. I replaced the one on my driver's side, and the noise has disappeared.

## **CLICKING BETWEEN T-TOPS**

A clicking sound coming from the two small vent holes in the ceiling between your T-tops most likely means the tiny fan there has either bitten the dust or is hitting something. The fan inducts air from the cockpit across a sensor that tells your climate control computer the temperature inside the car.

## **GAS ODOR**

Ever since I've owned my Z I've smelled gasoline whenever I make a hard right turn. Other Z owners have experienced this, and I am not sure what causes it. A while ago I was advised to replace my carbon canister, which is supposed to capture gasoline fumes from the tank to prevent them from polluting the atmosphere. The theory on the odor problem was that the carbon filter in the canister had become saturated and could not absorb any more fumes. I have not replaced the carbon canister in my car, but the solution makes sense.

I have checked thoroughly under the hood for fuel leaks and found none.

## **SPEEDOMETER FAILURE**

This was one of my most baffling problems. To my knowledge at least two other Z owners have also experienced it.

Speedometer failure is a far more serious problem than you would at first think. It's tricky to diagnose because, at first, you think it's the symptom rather than the actual problem.

The speedometer in the Z is one of several sensors that feed data to the computer for the power steering and (if you have a Twin Turbo) your Super HICAS four-wheel steering. The Z never relies on just one sensor for anything. It averages information from several different sensors and extrapolates what it needs to know from that average.

A good example of this is the HICAS system in the Twin Turbo. This system relies on a number of factors: speed information from the speed sensor (located on the drive train), the speedometer itself, the gearshift position indicator and the steering angle sensors. If any of these sensors fail, the twin-turbo Z is supposed to go into a failsafe mode, deactivating the HICAS steering to protect the driver from a fatal error. The failsafe mode activates only when it is deprived of sensor information for a period of ten seconds or more. This means that a fluctuating sensor does not cause it to go into failsafe mode.

My speedometer was jumping all over the place. I would be driving about 40 mph and the speedometer would be bouncing around between 30 to 80 mph. The computer did not sense that there was a problem (no ten-second deprivation of signal); the speedometer told my car I was going 80 mph when I was going 40.

That meant a lot of things were not working properly. The variable power assist on the front steering was lessened (as it should be at higher speeds), making the steering feel strange. And the angle of the rear steering mechanism was behaving erratically to compensate for the different speeds. The back end of the car was all over the place. I was fortunate not to spin out during these strange events. The weirdness made me feel like I was in the middle of the Bermuda Triangle.

I replaced the speedometer sending unit, located at the transmission. It didn't solve the problem. Then I replaced the gauge itself. The new gauge cost me \$266.42 retail (this was before I found a wholesale outlet). The dealership damaged my turbo boost gauge installing the speedo and replaced the boost gauge free. Problem fixed.

It took me six months to figure this out; it was the most dangerous problem I've ever had. If you're having this problem, get it fixed immediately. A malfunctioning HICAS system could cause severe handling/car control problems, a potentially very dangerous situation.

## **FUEL PUMP FAILURE**

I replaced my fuel pump; it was creating hard starting and a rough idle. I purchased it wholesale for \$242.50 (down from \$324 retail) and had my independent mechanic install it. Both hard starting and rough idle were fixed.

## CLOCK

The clock on the Z's dash uses a watch battery for power when the car is not running. When that battery eventually dies, the display becomes hard to see. It may not show up at all, and then come back. Here's the bad news: There is no way to replace the watch battery; you must replace the whole clock. The part number on the clock is 25820-44P00 (\$127.38 wholesale). I replaced mine with one from a junked Z for \$20.

## BRAKE COOLING

You probably know that the brakes on the Z are often said to be one of the car's weakest points. Brake cooling is a problem for many of my Z-owning friends. Although the Z is on the whole one of the best-designed mass-produced cars, its stock braking system can leave something to be desired. On the 1990 and '91 300ZX you may have repeated difficulty with brake fading and poor brake cooling.

I have often experienced "fading" in my own Z. Fading is a ramped failure of stopping power due to overheated brakes. You may feel it when exiting the freeway. If you were exiting onto an off-ramp that appeared to be backed up, you'd step on the brakes pretty hard. After continuous braking, the pedal may no longer respond correctly and, even worse, the car may not slow down as it should.

You can do some things to correct brake fade. The most likely cause of fading is poor cooling of the brakes. The rear disc brakes seem to cool fine, but the front disc brakes have difficulty cooling.

If you have a 1990 or '91 Z, there's an easy quick fix. In 1992 Nissan redesigned the undercarriage protection in front of the front wheels to include a new venturi (wind scoop) to create a vacuum behind the intercoolers, to make the intercoolers work more efficiently by forcing more air through them. A secondary result was that the new panels better cooled the front brakes.

Replace those pieces on your Z the next time you have an oil change. They cost about \$41.90 wholesale. Their part number is 63841-45P10 (that's the left, it may vary slightly for the right-hand side). I replaced mine and noticed a marked improvement in braking performance, and that was prior to my brake system upgrade. You might want to replace those panels, anyway; concrete parking stoppers are murder on them.

## CENTER BEARING

A center bearing failure is not likely to happen to you more than once, or for a while if you have low miles. But eventually it will happen.

The drive shaft on the Z is quite long and hangs freely between the transmission and the differential except for one support. That support is the center bearing, which helps support the drive shaft and keep it balanced as it spins.

The center bearing is under a fair amount of stress and won't last forever. Mine went out around 84,000 miles. The symptoms were frightening at first because I thought they may have indicated a faulty transmission. The car made a solid clunking when I would start from a dead stop. Once under way, the sound went away. As usual, this problem happened on a weekend. Good thing my mechanic works Saturdays!

He put the car on the lift with me in it, and I engaged the car in and out of first gear. He spotted the problem — the bearing was shot. I ordered part number 37521-33P25 (\$92.08 wholesale). He put it in that Monday and the car has been fine ever since. Check with me again when I reach 160,000 miles!

## WHEEL SHAKING

Wheel shaking can be caused by a variety of conditions. The first and probably most common is an unbalanced wheel. Contrary to the obvious assumption, tires are almost never perfectly round. Even those of us who flunked college physics know that when unbalanced things spin, they shimmy and shake.

So wheels must be balanced. Weights are attached to the wheel to counterbalance the imperfections in the tire. The wheel is taken off the car and placed on a balancing machine, which spins the wheel at revolutions equivalent to driving at 60 to 100 mph. It senses a lack of balance, and a computer calculates how much weight would be needed to counterbalance the imperfection. It also indicates where to put the weight. Here's a hint for those who, like me, take a great deal of pride in the look of their automobile — have the weights mounted on the inside of the wheel, not on the outside.

Another little-known way to balance tires is to shave them with lasers to perfection. Finding a shop that does this is probably more

difficult then it would be for you to shave the tires yourself with a pocket knife (don't do it — it was a joke). Tire shaving is an expensive process and best reserved for track enthusiasts.

Brake problems can also cause wheel shaking. If your rotors (discs) become warped, your wheels could shake when you apply the brakes. Warped rotors are caused by overheating of the brakes. A warped rotor causes the brakes to seize a bit during normal revolutions. This seizing can feel like a wheel shaking, or can pull your car to one side of the road. The only cure for a warped rotor is to replace it. Find out why it overheated and try to fix the problem. Read more about brake cooling in the previous chapter.

Worn-out shock absorbers can be another cause of wheel shaking. Worn-out shocks tend to overreact over bumps and can shake violently, like driving on a washboard. If you replace your shocks, use the stock Tokico shocks so that your driver-adjustable suspension will still function properly.

Another problem that can lead to wheel shaking is bent wheels. You can bend your wheels by driving over deep potholes, bumps or curbs. There is very little that you can do with a bent wheel except replace it. A bent wheel is not always obvious to the naked eye. If you think you have one, have it evaluated by a good wheel and tire shop before replacing it.

## **WHEELS PULLING TO ONE SIDE**

Perhaps you've heard of toe-in? No, it's not a method for entering a swimming pool. If your car pulls to one side or the other, your toe-in is probably off. Toe-in is the position of the wheel in relation to the path of the car. Ideally if you are traveling along a straight path, your wheels should be pointed straight ahead. If one of them pointed slightly to the left, your car would pull to the left, and vice versa. A good front-end alignment will include a correction for toe-in.

## **IRREGULAR TIRE WEAR**

Here's the last thing that I'll say about tires — camber. Let's say you've driven to the grocery store in your Z, and you parked and left your car with the wheels turned at a sharp angle. First, you should scold yourself for doing that. It is bad for your suspension. Park with your wheels straight, unless, of course, you've parked on a hill. Here

in California it is illegal *not* to turn your wheels when you are parked on a hill.

After flogging yourself for parking with your wheels turned, you notice that your tires are wearing unevenly. Let's say the inside edge of your tire is completely bald, while the outside edge has plenty of tread. This means that your camber is way off.

Camber refers to the angle of your tire in relation to the surface of the road. Ideally, you want your tire to be at a 90-degree angle (or less for the more aggressive driver) at all times, even in hard cornering. Why? Because you want to maximize your contact patch for safe handling.

The contact patch is the very small area of your tire that does the work while the rest of the tire goofs off. It's the part that touches the ground. Wider tires improve handling because they have a larger contact patch. Suspension plays a big part here — not only does it absorb bumps, but it keeps your tires at a 90-degree angle to the road at all times (including while cornering).

As we discussed earlier in this chapter, your camber problem might be fixed with a normal wheel alignment ... or perhaps not. As the Z ages, the bushings on the upper links (they're part of the suspension) wear out. The upper links control your camber. There are two solutions (that I know of) to correct "collapsed" upper links. First, they can be replaced with new stock upper links from Nissan.

Or, and this was my choice, you can purchase a pair of adjustable upper links from a performance shop. I don't know anyone who carries them besides Stillen. Stillen's adjustable upper links are much stronger than the stock ones. They have polypropylene bushings rather than rubber ones and Zerck fittings for lubrication, and they are adjustable. Stillen's adjustable upper links retailed for \$499 when I bought them. I paid \$425 and had my independent mechanic install them for me.

The adjustability means that if you ever decide to lower your car for improved handling, you can simply adjust your upper links to compensate for the change in the relationship between the chassis of your car and the position of the wheel in relation to it.

What does that really mean? If you lowered the car and left the stock upper links on it, the front wheels would be at a severe angle. Their camber would be way off and they would go bald on the inside

almost overnight. With the adjustable upper links you can simply adjust the length of the upper link to compensate for the change in the cars height.

But what if you have no plans of ever lowering your car? The adjustable links are still worth it. The polypropylene bushings are reason enough to get them. Those bushings have a much longer life span than the rubber bushings on the stock upper links. Additionally, even if those polypropylene bushings wore out, you could probably buy even more time by simply adjusting the links to compensate for the worn bushings. They are not that much more than a new set of stock ones and can last much longer.

Caster on the Z is not adjustable from the factory. There is, however, an aftermarket tension/compression rod available from Stillen that makes caster adjustable. There is a small note on this in chapter five.

If you are not familiar with what caster is, let me take a moment to explain it. Caster is the angle measured from the center point of your wheel to the top of your suspension. That can be confusing, so let me elaborate. Have you ever seen a chopper like the ones in the movie *Easy Rider*?

Those motorcycles have an extreme caster angle and are very difficult to steer. The further forward the wheel is, the less control you have. The further back, the more precise your control is. This can contribute to understeer and oversteer.

As we said, a good front-end alignment can correct most of the aforementioned problems to factory specifications. You should have your front end aligned any time you notice that your car is pulling to one side or the tires are not wearing properly.

## **STARTING PROBLEMS**

I also briefly had what turned out to be a very simple starting problem. On occasion I'd turn the key and nothing happened. There was no sound from the engine at all, as though the battery was completely dead. I knew it wasn't because the interior lights and the clock were functioning normally.

I took the car to the dealer; they determined it was my starter relay. For \$21.14 the problem was fixed. I was grateful for a simple solution.

## OIL LOSS

There are only two ways your car can lose oil — leaking it from a seal or burning it in the cylinder.

How does oil leak out of your engine? An engine is composed of several pieces of metal bolted together. Metal against metal makes a lousy seal. So the engine has thin pieces of rubber where metal meets metal. These thin pieces of rubber are called gaskets. Rubber is not nearly as durable as metal, so eventually it will age and lose its ability to seal these metal joints. You must replace the gaskets periodically.

It's not always easy to tell when a gasket needs replacing, except by checking your oil level or, of course, if you see a puddle of oil under your car. Check the engine as often as you can and look for oily residue. The gaskets that most often wear out are the valve cover gaskets and the front and rear seal. On the Z, the front seal should be checked most often. It can be replaced easily whenever you replace the timing belt, which itself should be replaced at least every 58,000 miles as per the owners manual. Replacing the front seal at that time can save you a lot of labor costs.

The other, more serious way of losing oil is by burning it. Oil, used as both a lubricant and a coolant, coats the inside of the cylinder and allows the piston to move smoothly within it. Oil is burnt when it slips past the piston and enters the chamber where the volatile mixture of gasoline and air is exploded to create power.

Expandable metal rings circling the piston are supposed to prevent this from happening, but due to incredible heat and pressure, they can wear down. When this happens, the seal between the edge of the piston and the wall of the cylinder is broken, and excess oil finds its way into the combustion area at the top of the cylinder.

The most obvious sign of this is blue smoke coming out of the exhaust system. At first it may only be visible under hard acceleration, but then as it gets worse it will be visible all the time. At the time of this writing, the oldest second-generation Z is only eight years old, so worn rings are probably not much of a problem. Yet.

The only solution for worn rings is a ring job — the replacement of the rings, and that involves massive disassembly of the engine. At that point you may want to replace a lot things while everything is apart, but I'm not going to get into that here.

## BATTERY AND ELECTRICAL PROBLEMS, INCLUDING JUMPING

First: I recommend that you never jump another person's battery off your Z, or likewise be jumped from another person's battery.

The delicate computers that make up the brain of the Z can easily be fried when you jump or are jumped. The computers run off less electricity than a static shock you get from rubbing your feet on the carpet, so imagine what a full 12-volt battery jolt can do to them.

But I must tell you the following information about jumping cars, for your general knowledge. It isn't as simple as it seems. Most people don't know that you should never hook the two batteries together, with all four ends of the cables connected directly to the batteries' four posts.

The car with the good charge has the cables hooked to both posts of the battery. The car that won't start does not get the cables hooked to both posts.

Let's repeat: *The dead car does not get the cables hooked to both posts.* On the dead car, connect the positive jumper cable clamp to the positive terminal (the post with the "+" sign). Connect the negative cable end (connected to the "-" post on the good car) to a good ground on the dead car, any solid, thick piece of metal (but not the body). Do *not* connect the jumper cable to the negative post ("-") on the dead car's battery.

Also, never let the two cars that are being jumped touch each other.

Are we clear on that? Batteries can explode if this isn't done right. It happened to a member of my family, and he suffered battery acid burns. It's no fun. Believe me.

If your car won't start and you think it's the battery, it could be the alternator. The alternator recharges the battery once the engine is running.

The system works like this: When you turn the key, the battery sends an electrical charge to the starter, which is an electric motor. The starter cranks the engine, which pumps gasoline into the cylinders and ignites the spark plugs. When the gasoline ignites and combustion begins, the engine takes over.

Now that the engine is running, it's time to replenish that battery. A belt on the engine connects to the alternator, which generates elec-

tricity while the engine is running to recharge the battery. When an alternator ceases to function properly, the car will run fine ... for a short while. The car can run off of the battery alone for a brief period of time, depending on the quality and age of your battery.

Rest assured, however, that soon the battery will die without being recharged and the engine will quit. If you're noticing that your car is starting weakly or that your lights (inside or out) are dimmer than normal, your alternator could be going. If you notice these things, have your mechanic check it out. It is simple, quick and often free.

Replacing the battery is inexpensive. Replacing the alternator is not quite so cheap, but still relatively inexpensive. Don't cut corners on a good battery. It's worth it to spend a little extra. Ask for the cold cranking amp ratings of the batteries you are looking at as well as their intended life-span. The more cold cranking amps a battery has the stronger it is.

## **BIRD-CHIRPING SQUEAK**

Another common problem is a squeaking sound you can hear inside the cockpit of your Z. It is accentuated when you drive over a bump. I spent more than a year trying to figure out where it was coming from and finally isolated it. It's the hood latch. Although the sound seems to come from somewhere inside the car, it is actually coming from the hood latch.

As the car ages and the body settles a bit, the hood apparently becomes slightly misaligned with its latching mechanism. When this happens, the U-shaped bolt on the hood rubs against the hood latch receptacle and causes a sort of hi-pitched bird-chirp-type squeaking.

This problem is easily remedied (once discovered). You can do one of two things — buy some kind of sleeve for the u-bolt and glue it on, or grease it up with a heavy-duty graphite lubricant. This will usually cure the problem for at least six months if not longer, depending on the climate where you live.

This problem can also be evident in the rear hatch latch and solved similarly.



# THE BASICS OF BOLT-ON POWER

We enter new territory, the part many of you have been anxiously awaiting. I hope you didn't skip ahead to this section, because you should know what has already been mentioned in this book before you begin to understand aftermarket modifications.

Fortunately, there is a huge selection of aftermarket parts and shops to choose from. The 300ZX sold well its first few years, so you can be certain that bolt-on performance parts will be available for some time.

More research and development went into the 300ZX than most people realize. Close inspection of technical information on the engine and drive train reveals that the car makes regular use of technology usually reserved for race cars.

The engine can produce much more power than it does from the factory. I don't know why they weren't built right from the start to maximize their potential, but I know how to make the 1990-96 Z cars faster and more powerful than they are when they were first sold in North America.

In this chapter I'll refer to some of the country's most reputable aftermarket shops. The first two that come to the minds of Z tuners are Stillen and James Wolf Technology.

Stillen, or Steve Millen Motorsports, is a company started by IMSA racing champion Steve Millen several years ago. Steve Millen

has a great deal of racing experience and was Nissan's official driver during the years that the 1990-96 Z was in production. Over the years he compiled the knowledge of all of his engineers and mechanics and began to manufacture high-performance parts for the 1990-96 300ZX.

He opened Stillen in Costa Mesa, California, and at first catered exclusively to 300ZX owners. Now his shop offers upgrades for most Nissan models as well as some packages for American-built trucks like the Chevy/GMC Suburban, Tahoe and Yukon. He is not to be confused with his brother Rod Millen, who is also a race car driver and whose company Millensport caters to Mazda owners.

James Wolf also has a very impressive aftermarket Z shop called James Wolf Technology, or JWT. Wolf's shop is also in Southern California (just east of San Diego; Stillen is south of Los Angeles. They aren't far apart).

An engineer, Wolf developed the ECU chip upgrades that Stillen purchases from him. Wolf is very knowledgeable and reasonably easy to get in touch with directly if you have questions. As with all competitors, Millen and Wolf have some differing philosophies, but both are backed with extensive experience and education.

Products and services at both Stillen and JWT can be expensive, but well worth the money. They have spent quite a lot on research and development, and they stand behind their products. It is up to you as a Z owner to get as much information as you can from all available sources before choosing each upgrade option. That way you can make a well-informed decision that you won't later regret.

## HOW TO GO FASTER

The first step in making any car faster, especially a turbocharged one, is to "open up its sinuses." The better a car breathes, the better the gasoline burns, and the more horsepower the engine creates.

All aftermarket "tuner" shops have their own "stages" of upgrades. The universal stage one package almost always means an upgraded exhaust system.

### EXHAUST SYSTEMS

You may have thought that exhaust pipes are nothing but corri-

dors for exhaust fumes, but it's not true. The exhaust pipe on a car serves several purposes. The first and most important one is to ferry the burnt oxygen and gasoline, which includes carbon monoxide, away from the engine.

The exhaust first runs through the catalytic converter, a device designed to dramatically reduce hydrocarbons and carbon monoxide.

The second function of the exhaust system is to help keep the engine cool and reduce back pressure that might hinder the combustion process. There is significant back pressure behind exiting exhaust fumes. In *Beverly Hills Cop*, Eddie Murphy put a banana in an exhaust pipe and prevented the car from starting. This wouldn't happen — the car would start, and the exhaust fumes would blow the banana apart and send banana debris flying out of the exhaust pipe.

The easier it is for exhaust fumes to exit the engine, the stronger the engine runs, and some exhaust systems create a lot less back pressure than others.

(A note for Turbo owners: On turbocharged cars, the exhaust fumes have one extra stop on their way out of the car. The fumes pass a fan (turbine) just before entering the exhaust pipe. That fan connects to another fan or compressor outside the exhaust path that forces additional clean air into the cylinders via compression. Thus the gas in the cylinder burns better because, instead of just having the air/gasoline mix drawn in by the downstroke of the piston, additional air is pushed in by the spinning turbofan. This even-more-compressed oxygen-rich environment allows the gas to burn more completely and produce more horsepower. That's the turbo boost.)

Larger exhaust systems can bring a lot of extra power. I was skeptical about getting 10 to 20 extra horsepower with my new high-flow exhaust system, but I felt the difference immediately. If you have a non-turbo you can expect 11 to 13 extra horsepower.

There's another benefit: I was quite disappointed with the sound of the stock 300ZX exhaust system. It was too muffled for a world-class sports car.

I searched for the best solution and purchased a Borla cat-back exhaust system, crafted out of aircraft-quality T-304 stainless steel. The pipes are three inches in diameter and end at the back of the car with four three-inch tips. The tips are polished stainless steel, with the trademark Borla spoke-vented inset pipes which enhance tonal quali-

ty. The pipes have very few bends in them and therefore reduce back pressure. They are bolted onto your catalytic converters and run back to the end of the car where they release the exhaust. Most aftermarket exhaust systems are 'cat-back' or used only from the catalytic converters on downstream. Borla offers a "Million Mile Warranty," too. The car sounds much better and had a noticeable improvement in take-off.

The Borla pipes use a traditional H-pipe configuration, which means that the exhaust fumes from your left cylinder bank exit the car on the left side. And fumes from the right bank exit on the right side.

Recently, there has been a new development in exhaust pipe configurations. The X-pipe actually crosses underneath the car, thereby further reducing back pressure and vastly improving the tonal quality of your exhaust system.

There are a variety of aluminum high performance exhaust systems on the market, too, and you may prefer a different one. I know many Z owners who complain that their aluminum systems are deteriorating quickly, though. My stainless-steel system looks as good as the day it was installed and it is three years old.

It is also important to research the audio qualities of different exhaust systems and pick one with a sound you like.

My system cost about \$925 in 1995 (retail: \$1288). It has been worth every penny. I purchased it from Stillen, which installed it for me. If you do not live near a good speed shop you could probably get a shop like Midas or some other chain to put it in for you. Always look for a place where you know you can trust the mechanic.

A note about pre-cats, the parts of the exhaust system upstream of the catalytic converters. Many Z owners will tell you that gutting your pre-cats will bring you extra power and a quicker spool up from reduced back pressure. The pre-cats are located directly after your turbos in the exhaust path. The path is: turbos; pre-cats; downpipes; catalytic converters; exhaust system with mufflers. Gutting the pre-cats is not easy and will supposedly give you a little extra oomph. The downside is that you are affecting your emissions output, which even if you still pass your local laws just isn't good for the environment. I think it's one of those mods that you can do without. Invest in other legal mods unless you are really planning on limited use for your Z.

## INTAKES

Another simple way to improve the performance of your Z is to upgrade the intake. This is generally called the stage two upgrade. There are basically only two ways to upgrade the intake, and the second way is reserved for super-high-end modifiers only, although there are some exceptions. See the section on dual-pop chargers, later in this chapter. The first way is to pull out the stock intake box and replace it with a single element funnel intake. The stock intake box has seats for two flat filters. It can be entirely removed.

K&N makes a relatively inexpensive replacement. It replaces the dual stock square intakes with a single funnel that has a circular conical filter at the end of it. It vastly increases the volume of air available to the engine. This additional oxygen can improve combustion and give the car as much as 20 extra horses. The K&N air filter can be cleaned via a special spray solution, so you can use the filter indefinitely. I paid \$115 for my K&N single-element intake. Like the Borla exhaust, it also has a “Million Mile Warranty.” Remember not to upgrade your intake box until you’ve upgraded your exhaust system. There is no point in bringing more air into a car that doesn’t have a way to let it out after the combustion process.

The second intake solution is for those modifiers who have passed stage three of development (those who have already upgraded the intake, the exhaust system and E.C.U., or the computer). This second solution is the “dual pop-charger” solution. It takes advantage of the Z’s two separate intakes by using two independent intakes, with smaller versions of the single-element K&N conical funnel filter. It’s too much oxygen for the unprepared engine and is not recommended for any car below stage three.

Some Z owners say that you can install a dual pop-charger intake on a stage-three Z and experience marked improvement with no sacrifice. Again, see the entry on dual-pops later in this chapter.

An important note on one of the side effects of removing the stock intake setup: If you have a turbocharged car, when the stock intake system is removed, so is all of the sound insulation associated with that system. Without the insulation you will clearly be able to hear a honking sound from your factory-installed blow-off valves. While this sound may frighten you at first, most Z owners grow attached to it and tend to find it as pleasant as the low rumble of a

high-quality exhaust system. There are aftermarket blow-off valves available that make different kinds of sounds and work better than the factory ones.

It is also important to note that the K&N intake can make your Z more prone to hydro-locking. This happens when you drive your Z through a puddle that is too deep. The water rushes in and is forced through your intake into the engine where it causes serious and irreversible damage. Although the filter is water-repellent, this can still happen in deep water. You should never drive a car as low as the Z through any kind of puddle anyway, especially one that you can't judge the depth. Hydro-locking is not something you should be paranoid about, just aware of. Use judgment when driving in the rain.

## THE CHIP

The stage-three upgrade is the ECU, or the computer chip. It's the most significant power increase you can get for the least amount of money and effort.

Your Z has a computer on board, as all modern cars do. The Z's computer is on the passenger side of the car under the carpet and behind a wooden (yes, wooden) board. The chip performs thousands of tasks, from managing your fuel and emissions systems to monitoring your speed and the anti-lock brake system (ABS). The chip most directly affects performance by controlling your air/fuel mixture or ratio; that is, it controls how much gas enters your cylinder at any given RPM as well as modifying cam and ignition timing. These modifications, along with boost jets, give the turbocharged Z more power — 56 more horses, to be precise. The normally aspirated Z can expect a 17 horsepower jump. (See my section on nitrous, later in this chapter, if you have a non-turbo Z.)

You can purchase a stage three chip and boost jets from a variety of speed shops including Stillen, James Wolf Technology and Dinan.

Dinan is considered one of the best BMW aftermarket suppliers. The company advertises a chip for the Z, but I've never met anyone with a Dinan chip in their Z.

The chip upgrade is not a new computer chip, it's an old one that has been reprogrammed. It starts out as a Nissan OEM (original equipment) chip and is reprogrammed to work with your new boost jets to give you extra horsepower. You can install it and the jets in

less than 15 minutes. Let's repeat — you can add 56 horsepower (17 horsepower in a non-turbo) in 15 minutes!

The reprogrammed chip (uninstalled) ranges in price from \$495 to \$695, which typically requires you to trade in your factory chip so it can be reprogrammed for the next customer. With the upgraded chip, my car passes emissions with flying colors, and it can still be hooked up to a Nissan “consult” computer and diagnosed for trouble.

Are you running out the door to purchase a reprogrammed chip? Slow down. There are other things to consider when adding 56 horsepower. That power punch adds a lot of additional torque and can shred the stock clutch of even the most conservative driver in just a few months. Strongly consider upgrading your clutch when you upgrade your car's computer. It costs more money, but that's one of the drawbacks to picking up 56 horses in a jiffy.

Don't worry about the rest of the drive train. The Z can handle it.

## **TWIN HI-FLOW (DUAL-POPS)**

Twin hi-flow is the next step in upgrading your intake if you have already gone to the K&N single element filter-charger. It is a special contraption that, mated with two K&N cone filters, creates a dual feed for your intake that greatly increases the amount of air your Z can take in.

This particular upgrade is controversial. I say that only because a good friend of mine with a Twin Turbo will tell you that this is a good upgrade for a stage-three Twin Turbo, but Stillen will tell you not to do it if you haven't already upgraded injectors and turbos. Stillen maintains that stock injectors cannot provide enough fuel to burn the additional oxygen.

Who's right? I'm not sure. I've driven in the Z with the dual-pops and a stage-three package and it drove great! It had a lot of what felt like reliable horsepower. My friend says he got a specially engineered ECU from James Wolf Technology that allowed him to add this arrangement to his Z.

No matter what you believe, if you add a twin hi-flow package to your Z, you will definitely need an ECU that knows how to deal with the extra oxygen.

You'll have to determine for yourself whether or not the twin hi-flow package is right for your car.

## BLOW-OFF VALVES (TURBOCHARGED Zs ONLY)

The blow-off valve, or wastegate, is one of my favorite subjects. The blow-off valves release back pressure generated by your turbos once the engine has had all the compressed air it can take. If you've upgraded to any type of aftermarket intake, you may have noticed that you can now hear a "honking" sound whenever your turbos come off boost. That sound is the stock blow-off valves releasing that extra air. Their primary function is to prevent back-spooling in your turbos — which would occur if the excess air were not bled off. Back-spooling is horrible for your turbines and bearings. You never have to worry about this in the Z since it is equipped from the factory with good blow-off valves.

I've been told that the stock blow-off valves in the Z are rated to 500 bhp and can hardly be improved upon. Many Z owners love that honking sound, too. But is there some way to make the sound better? Sure there is.

A large variety of aftermarket blow-off valves is available for all turbocharged cars. They make really cool sounds. A well-manufactured blow-off valve makes one of the coolest sounds I've ever heard, besides the low rumble of a carbureted Lamborghini V-12.

Still, why replace something that the car already has? While many people will argue that the stock blow-off valves in the Z are more than adequate, I replaced mine and it was one of the best things I've done. I was first intrigued by the sound of many aftermarket blow-off valves, but I was later sold by the quickness of their performance. I installed a pair of HKS Sequential blow-off valves in my Z and found that I was able to shift faster than ever before. These valves are so much quicker at bleeding off that back pressure that if you shift fast enough you can actually avoid lag altogether, except in first gear. I know because I've done it, and am doing it every day to and from work. The valves also make a really cool IMSA-style racing sound that's hard to describe. It's sort of like an air-brake system on a truck but way cooler!

Different brands make different noises. GReddy made one of the best, but it was no longer available for the Z when I wrote this book.

The theory behind the HKS sequential valves is that each valve (two for a Twin Turbo) has two valves within it. This can get confusing, but it's essentially like halving four valves for blow-off. They

have a smaller concentric valve designed to release the onset of pressure instantaneously and a larger valve that opens fully when the pressure is increased. Theoretically this provides faster relief than a one-piece valve. HKS has just come out with a new version of the sequential blow-off valve that is made from aluminum rather than the strange plastic that the ones before them seem to be made of.

GReddy's blow-off valves have steel housings, and Blitz offers them with damn horns on the end! I can only imagine what it sounds like. Always be sure to purchase the model specified for your Z. The wrong valve model (which probably won't install too easily anyway) could damage your turbos.

I think most people buy these things for the noise they make, including me. However, combined with my short-throw shifter, these valves helped me become a more efficient driver.

## CLUTCHES

A variety of high-performance clutches is available, and different ones have different advantages. You should really start thinking about clutch replacement when the changes you've made to your Z result in more than an additional 40 horsepower or so. Obviously, you should also think about it when your stock clutch starts slipping.

Stillen offers a couple of clutch solutions for the Z. Most of them use Kevlar-faced clutch discs with both a full face and a puck-style face with spaces between the gripping material. Wolf Technology offers a clutch, as do most speed shops.

When I first started this booklet, I had a Centerforce Dual-Friction clutch. It uses weights and centrifugal force to obtain a better clamping force and was rated to 500 bhp. Mine failed after only six months of usage. I'm not sure what went wrong, but I have spoken with others who have had similar experiences. Should you choose a Centerforce clutch, your experience may be different.

I have heard many good things about the other clutch brands as well, especially RPS. Do your own research before making a purchase. Also, have a professional speed shop install it — poor installation can cut your clutch's life in half. Lastly, follow all break-in advisements as well. I know the temptation to test your new-found performance is strong, but wait until after that 500 miles or the recommended minimum. It will help your clutch last longer.

## **EVC (TURBOCHARGED Zs ONLY)**

The EVC, or electronic valve controller, is something you generally don't want to consider until you've reached at least stage three, if not later, with your Z, and is only usable in the turbocharged model. Although many Z owners purchase an EVC at stage three, it's really not necessary until you upgrade your intercoolers, which is stage four. At that point you can safely make more boost than even the upgraded ECU is programmed to provide you with.

In a turbocharged car, once the turbos maximize the amount of boost allowed by your ECU, your boost regulator opens up to bleed off the air that continues to be compressed by them. On a stock Z this excess air is recirculated into the intakes and can be heard clearly through the intake if you have an aftermarket intake, as I mentioned before. With an EVC you can choose to raise the desired amount of boost by setting the wastegate or blow-off valve to stay closed longer. The EVC also helps the blow-off valves operate more efficiently and achieve factory or preset boost levels faster (that's why some Z owners add one at stage three). The regulated additional boost allows your turbocharged Z to develop more horsepower sooner than it would with the stock boost regulator.

There are a few EVCs on the market. The most common one is probably the HKS model. It is tried and tested and has an easy-to-use interface that you can mount in an accessible position in your cockpit. You can adjust it to wait for a specific amount of boost before bleeding off or you can nullify its effect by setting it to factory specifications. This gives you the ability to tweak your car's boost for those times you need it.

I recommend boost levels be set at 13.5 PSI for a stage-three Z; this boost level is programmed into most stage three ECU upgrades. With upgraded intercoolers, you can raise your boost to 14.5 PSI safely and enjoy additional power without risking damage to your engine. Your fuel injectors are the most restrictive factor in how much boost you make. With the factory injectors you should never try to make more than 16 PSI of boost, and that includes flash boost pressure. EVCs help you make your turbocharged Z a daily driver by allowing you to lower boost for safe regular driving.

The counterargument to the information on EVCs stated so far is that it is a marketing ploy to make you upgrade to at least stage three.

Some Z owners say that you can add an EVC to a stock Twin Turbo and make 16 PSI of boost with no other modifications. The innate boost of the Garrett T-25s on the Twin Turbo is 6 PSI. Solenoids add another 3.5 PSI. With the EVC you can go up to 16 PSI with this setup.

The other interesting thing about going with an EVC only is that you can turn it off and make only the innate boost of 6 PSI (less than factory stock) and save wear and tear on your engine. It would obviously cause more wear on your engine if you drove around at 16 PSI all the time, which is why you have the EVC. You only turn it on when you need it. The stock engine could not handle 16 PSI on a regular basis without upgraded injectors.

Take these two points of view and do some research to find out what is best for you. Wolf and Stillen may have some convincing counterarguments to adding an EVC to a bone-stock 300ZX Twin Turbo. Use caution in this area — too much boost on an unprepared engine can damage it. Research it well.

## **INTERCOOLERS**

The intercoolers cool the air from the compressors on the turbos that's directed back into the intake manifold. They do it by mixing the hot air from the compressors with outside air. Cooler air is denser and facilitates better combustion.

Larger intercoolers are available for the 300ZX Twin Turbo from a few sources. Upgrading to larger intercoolers does not generally provide you with a great deal of extra power, but it does wonders for the life of your turbos and your engine. Cooler air is denser than warm air and facilitates better combustion in the engine. Larger intercoolers cool the intakes and give you a power increase of around five horsepower.

Also, with larger intercoolers, you can safely raise your boost levels to 14.5 PSI, if you have an EVC.

At one point there was talk of Stillen developing a large single-unit front intercooler for the Z, but it was apparently scrapped due to feasibility problems. The twin-intercooler setup on the Z is very efficient and well placed, anyway.

## TURBO AND FUEL INJECTOR UPGRADES

Now we start talking about the big-time stuff — upgrading turbos. Larger turbos can provide lots of benefits, but be sure you have a clear understanding of what else needs to be done to use larger turbos.

First, you can't replace just your turbos. You must also replace your fuel injectors and spark plugs. More powerful turbos deliver a great deal more oxygen to your engine, so you must give the engine more gas and a stronger spark to burn all of that additional oxygen.

The stock fuel injectors in the 1990-96 Turbo Z are 370cc (259cc in the normally aspirated Z). An upgraded computer can compensate for a certain amount of increased boost, but not beyond the physical limitations of your stock injectors.

Upgraded injectors always require a special ECU programmed specifically for the new injector/turbo combination.

Many turbo upgrades are nothing more than a rebuild of stock turbos. The stock turbos are disassembled and the turbines are replaced with higher-output turbines. Basically, you are changing the number and angle of the blades on the turbine. The beauty of this upgrade is that the housing is still that of the stock turbos, and they bolt easily into the factory positions.

The turbo may be reshaped, too, to maximize air flow characteristics.

You can develop up to 550 bhp from turbo and injector upgrades with the proper additional upgrades. With upgraded turbos, you definitely want to move up to the dual-pop charger intake I mentioned in the intake section. The new turbos need more air, and the dual-pop charger intake gives it to them.

There's a downside to upgraded turbos — a delay in spool-up time (or lag). Larger turbos have more mass and require more time and energy to get up to speed. They spool up and kick in at much higher RPMs than your stock turbos. With larger injectors that's okay; you'll still develop more unboosted power than you did when you were stock, but you'll also travel farther down the road before your turbos kick in. This won't be true much longer, though, because ball bearing turbos have been developed that drastically reduce lag by reducing the friction on the turbo. If you are interested in ball bearing turbos, contact any high-end turbo shop that sells or rebuilds turbos.

There are still other ways to eliminate turbo lag, if you want. See my section on nitrous later in this chapter.

Another recent development in turbo technology is ceramic-coated turbos. Ceramics are much more heat-resistant than metals and cool much more efficiently than them as well. At the time of this writing, this is still new technology and can be a bit pricey, but look for it to be more affordable in the future.

## **OIL COOLERS**

Stillen and others offer an upgraded oil cooler for Twin Turbo Z. The upgraded oil cooler is three times the size of the stock oil cooler. Although not very exciting, this can be a valuable upgrade for those who have significantly increased the power their car generates. Cooler oil will increase the life of your engine and turbos.

## **HEADERS**

Headers are available for non-turbos. Headers are specially constructed exhaust pipes that are designed to reduce resistance to air-flow. They can add as much horsepower to your normally aspirated Z as the K&N intake. To the best of my knowledge, there are no header solutions for the Twin Turbo (due to the complex plumbing, I imagine).

## **EXTRUDE HONED INTAKE MANIFOLDS**

Many speed shops will allow you to trade your intake manifold for an extrude honed manifold. This is a factory intake manifold specially treated on the inside to smoothen the surface of the interior of your intake. This allows the air to flow more freely, which translates to more horsepower. This upgrade is available for Twin Turbos and non-turbos.

## **HKS AUTOMATIC LINE CONTROLLER**

For those of you with automatic Twin Turbos: The automatic line controller is a simple device that regulates the line pressure that controls shifting. It gives you higher-performance shifting. I haven't seen many of these on the market, but HKS makes one and I thought you ought to know.

## NITROUS OXIDE & LARGER FUEL INJECTORS

Nitrous oxide, also known as laughing gas, is a highly flammable gas that, when injected into your car's engine, can generate an instantaneous increase in horsepower up to ten percent. NOS<sup>®</sup> is also a company that offers these systems for all types of vehicles.

I don't want to get overly technical, but this is what nitrous does: Injected into the engine along with your regular fuel, it's lit by the spark just like your regular fuel. Nitrous releases oxygen as it is burned and enhances the burning of the fuel in the cylinder. The additional oxygen in the chamber makes for a much more oxygen-rich environment than what is normally drawn in through your intake(s) from the atmosphere.

Imagine a fire in your fireplace burning strong. Would you want to inject pure oxygen into that fire? Not unless it was well-contained by the rock-solid 3.0 liter V-6 of your 300ZX.

Have you seen the movie *Mad Max*? It used nitrous in those cars with the human bumpers. The movie didn't really exaggerate the feeling you get when the nitrous kicks in. It goes way beyond noticeable.

You may have heard horror stories about people using nitrous who blew their engines right out of their car. Well, it's true. That's the way it used to be. But not anymore.

In the early days, nitrous was introduced into the engine in a relatively primitive way. You had a tank in your car with a valve on it. When you wanted to go really fast, you opened the valve. *Careful!* If you left it on for more than ten seconds, your engine could become a solid block of fused metal, and that's not good for getting around.

Although some cheaper systems still offer that setup, the days of turning a valve mostly are over. Now you just refill your tank periodically and let your ECU (computer) do the rest.

It's a complicated upgrade and should be installed by a professional.

Don't worry about how the nitrous oxide is introduced into your system. If you buy a good system, you'll get a special ECU programmed to control precisely the way the nitrous is injected into your intake manifold. All you have to do is step on the gas.

Those of you with normally aspirated Zs can expect up to an 80 horsepower increase (according to Stillen) from its NOS nitrous oxide kit.

Twin Turbo owners generally use nitrous oxide in a very different way — it eliminates turbo lag. The NOS nitrous oxide kit for the Twin Turbo Z only functions at low boost pressure, or just until your turbos spool up and kick in. From the very second you step on the gas all the way up to the redline, you have a smooth delivery of awesome power that is created at first by the nitrous and then carried on by your turbos. Clever, huh?

Nitrous oxide is a very serious upgrade and should be taken seriously. I have only touched on how it works here, and you should do your own research and determine if it is right for you.

Remember that when installing a nitrous oxide kit, you must upgrade (if you haven't already) to larger fuel injectors and turbos. The stock fuel injectors on the Z cannot inject enough fuel into the cylinder to satisfy a nitrous oxide-enriched environment.

You will also need to have your EPROM changed so that your computer can manage the larger injectors. The stock injectors in the Z are 370cc in the Twin Turbo and 259cc in the non-turbo. You can upgrade either to 485cc or 555cc for the Turbo or 370cc for the non-turbo, depending on your needs.

It's important to note that when your injector size exceeds the displacement of one cylinder in your engine, you may experience low-speed driveability and idle problems. This can be addressed with cam replacements or other more radical upgrades. The Z's three-liter engine displaces 500cc (half a liter) per cylinder. Keep this in mind if you plan to upgrade to the 555cc injectors in your turbo.

Once again, this is not an area for guesswork. Seek out serious professional advice for the best solution to your power needs.

## **ALUMINUM FLYWHEEL**

Stillen has developed an aluminum flywheel for the Z. What does that mean to you? An engine's horsepower is greatly diminished as it travels from the engine to the rear wheels. Although figures vary, I have heard that you can lose 15 to 20 percent or more in the drive train. An aluminum flywheel could greatly diminish that loss by cutting in half (figuratively) the power that the engine expends rotating a stock flywheel that weighs 40 pounds. Stillen's aluminum flywheel is (according to Stillen) only 20 pounds. That difference in weight will theoretically allow you to shift faster and if you have a Twin Turbo,

your turbos will spool up sooner.

This upgrade is relatively expensive and is so new that I don't know anyone who has installed it. E-mail me if you have installed an aluminum flywheel, and let me know how it feels.

# HOW TO HANDLE BETTER

## SUSPENSION

You can do a wide variety of things with your suspension, and some of them may be too extreme for your tastes.

Handling and aesthetics are two reasons to modify your suspension. Many excellent aftermarket springs and shock absorbers will both lower your car, which looks great, and vastly improve handling.

Lowering your car carries many serious ramifications. It radically changes the position of your tires relative to both the car and the road. You must correct for this change in position or you will find yourself replacing your tires every couple of months.

You should also be aware that lowering your car means less ground clearance. High speed bumps can be a problem as well as those already-problematic parking stoppers. I always back in when I park and as a result have never damaged the front of my Z. This may sound like a pain, but once you get in the habit, it is easy.

Different people have different goals. I lowered my car for aesthetic reasons, and the improved handling was a side benefit. I think the stock Twin Turbo Z sits a bit too high on its tires — there's too much space between the tire and the lip of the wheel well.

Several companies make aftermarket springs for the Z. I chose Eibach. Eibachs are made of high-quality steel with better resistance to aging and fatigue. Do your own research to find a set of springs for yourself.

Springs encircle your shock absorber and control how high your car rides on your suspension. Springs are available in a variety of

lengths and can lower your Z anywhere from three-quarters of an inch to an inch. I didn't want to lower my car much more than three-quarters of an inch because then you have to worry about tires clearing the wheel well or rubbing when you turn. My springs are progressive-rate springs as well, which means that the force they exert increases exponentially as they are further compressed. This helps prevent bottoming out, which can lead to an extensive loss of control.

It's also a consideration at the car wash. The car's clearance on the conveyor track is already tight, and if I lowered the car any more, I would have to start washing it myself. I've washed all the cars I want to for the rest of my life.

My mechanic installed my new springs with no trouble. Having only lowered the car three-quarters of an inch, I left my stock shocks on the car to preserve the "dial-a-ride" feature available in the cockpit of every Twin Turbo. A friend with a speed shop says that tests have been performed on a shock dynamometer that show that the stock shocks in the Twin Turbo are quite capable of dealing with a three-quarter-inch drop. Tokico shocks are stock in all Zs and are also available in upgraded types that are five-way adjustable (at the shock). My Z's ride now has more bounce but isn't uncomfortable.

I can still plainly feel the difference between "sport" and "touring" mode, although it's more subtle than with the stock springs.

## **SHOCK ABSORBERS**

Tokico Illuminas are the big brother of the driver-adjustable stock shocks on Twin Turbo Zs. The Illumina is a five-way adjustable shock for high-performance fine-tuning of your Z's handling characteristics. They are not adjustable from the cockpit. They can be adjusted at the top of each individual shock.

I do not have them, but reliable sources tell me that their softest setting is only mildly softer than the "sport" setting on the Twin Turbo. Their roughest setting is said to be unbelievably tight. I have driven a Z with Illuminas and found that it handles phenomenally. Weekend warriors have told me how the shocks can be adjusted for quarter-mile runs or even oval tracks by setting one side tighter than the other.

I thought about getting them when I lowered my car, but eventually decided against it as I was comfortable with the way my car han-

dled with the stock shocks. And being a gadget-junkie, I love being able to flip that switch from inside.

There are other companies that make shocks, of course, but everyone I know uses those from Tokico.

Whenever you modify your suspension, expect the steering characteristics of your Z to change. Be prepared to spend some time getting to know the new feeling of your steering and cornering. Don't run right out and make a dangerous mistake after a suspension modification by assuming that the car will feel and handle the same as it did prior to the work being done.

## **STABILIZER BARS**

I also have limited experience with aftermarket stabilizer bars.

There are many packages available for the Z, but I know only one person who has them. He mentioned a very marginal difference in his cornering.

But I've read many articles that say that, scientifically, there is no way stabilizer bars cannot improve handling when properly installed. Many companies offer them, including Stillen. If you are interested in getting some, call around and get as much information as you can.

The factory stabilizer bars on the Z are hollow, and Stillen offers one with a greater diameter that is solid and adjustable to three positions. In theory it should make your car a much more precise handler.

If you use upgraded stabilizer bars, E-mail me and let me know what you think.

## **TENSION/COMPRESSION RODS**

Stillen offers an adjustable tension/compression rod. It allows caster adjustment in the Z, which is not an option with the factory setup. Stillen's rods are chrome-alloy and have spherical bearings, where the factory rods use liquid-filled bushings. Eliminating these bushings gives you more precise handling.

## **WHEELS**

One of a few possible reasons for replacing your wheels is a desire to reduce unsprung weight. This term applies to any weight that's south of the springs on your car. Reducing unsprung weight makes it easier for your suspension to do its job properly.

Aesthetics are very important to me, but it was also important to find a wheel that was light and would not diminish the handling characteristics of my car.

I have strong personal feelings about wheels, mostly due to my concern with aesthetics. I love the way the Z looks, and that includes the stock wheels.

Most car companies fall short in wheel design. The companies don't quite know what to do with the wheels. The rest of the car is horizontal, long and low with relatively straight lines. The more a car's design makes it blend with the road, the more pleasing the car is to most people's eyes.

I think many designers are confounded by the wheel and its circular palette. How to make a circular wheel blend with a straight-line car? Well, Nissan did it with the Z's stock wheels. The shape of the areas between the spokes represents the car's overall feel and are functional.

Those wheels are designed to generate maximum airflow across the rotors (brake discs) to cool them more efficiently. It's important because heat can warp your rotors or cause your brakes to fade. Fading is when hot brakes fail to stop the car properly. There is much more detail on fading in the next chapter, and in chapter three.

Although the Z's stock wheels perform these functions, some people still want them replaced. That includes me.

Most people change wheels for looks. Everyone wants to own a unique-looking car. I looked at wheel designs for more than a year before finding one that I liked. I chose an uncommon design. That's important — wheel designs are subject to the old "flavor of the month" influence as much as anything else. There are seemingly a million designs out there, and a lot of them might look stupid in a few years.

I've never seen another Z sporting the ones I have, either in person or in magazines. I chose the Hart F24 in a 17-inch diameter. They have a definite racing influence but are not the popular loose-mesh style. Each wheel has 21 thin straight spokes, like looking straight into a jet engine from the front.

The lug nuts are concealed by a circular cover held on with a single large anodized red aluminum pentagonal bolt, which creates the illusion of having a single-bolt knock-off wheel, like on a race car.

Their 17-inch diameter, an inch more than the stock diameter of 16 inches, may not sound significant, but it is. I have also increased wheel width by one-half inch. Stock wheels are 16 by 7.5 in front and 16 by 8.5 in back. I upgraded to 17 by 8 in front and 17 by 9 in back.

The larger diameter has benefits and shortcomings. It translates more horsepower to the ground because the power has less side wall to travel through. But the ride is a little rougher, due to less side wall to cushion the road. And the bigger, wider tires are much more expensive.

The most important thing to consider when upgrading wheels is wheel offset. Offset is the position of the center of the wheel that bolts to the rotor in relation to the centerline of the wheel itself.

Imagine you're looking at two wheels that look similar. But one's hub — where the lug nut holes are — is pushed back, closer to the wheel's back rim. The other's hub is closer to the front rim. The one with the hub closer to the back (behind the wheel's centerline) is said to have a negative offset. The one with the hub in front of the wheel's centerline is said to have a positive offset.

This is important because wheels with negative offsets, in effect, push the wheel and tire farther out, and possibly outside your wheel well. The wheels can rub the fender when turning or going over bumps. And a wheel with a deep-dish design puts a different kind of stress on your suspension than more a conservative one, because, with a deep offset, the "meat" is shifted away from the center of the car.

On the other hand, wheels with positive offsets keep the wheel farther inside the wheel well and can cause the tire to rub against your steering and/or suspension parts.

You can find the factory offset of the stock wheels in the service manual. But you don't necessarily want the same offset as your stock wheels had. Why not? Because wider tires may rub on the inside of the fender if their offset is identical to the narrower wheel.

Complicated, huh? The best way to determine the appropriate offset is to ask a respectable wheel shop. Do some research and find someone who really knows what they are talking about. This is no room to cut corners here.

After upgrading wheels you will want to consult with the place where you bought them on what tire sizes you can safely run on

them. Remember, less sidewall equals more bumps and less protection for the wheels if you hit a pothole. You can often use a range in widths that's variable by up to 20 centimeters in some cases. I have been told that I could run anywhere from 255 to 275s on my car. I have 265s now.

# HOW TO STOP FASTER

## **BRAKES**

Brakes work like this — the caliper straddles the disk. When you apply the brakes, brake fluid is pushed out of the brake master cylinder, and the fluid pressure causes the caliper to clamp down on the disk. Pads between the calipers and the disk prevent the grinding of metal on metal, which is what happens when your pads wear down and you don't replace them.

Brakes are often the most overlooked upgrade. When people consider modifying their car, they usually think of adding more power — making the car faster, making it handle better.

But stopping is just as important as going, perhaps even more so. As I mentioned earlier, the brakes on the Z are one of its weakest links. I understand that the brake package that came on all North American Zs is smaller than the one available on the Fairlady in Japan. (The Fairlady is the Japanese name for the 300ZX.)

Several aftermarket brake packages are available for the Z, and choosing the right one is important. Stilen offers two or three options. The first option replaces your stock rubber brake lines with braided stainless steel brake lines and uses DOT-5 brake fluid. The steel brake lines reduce line expansion; line expansion can cause a loss of pressure going to the calipers. The steel lines are virtually incapable of expanding, so all the pressure created by your master cylinder translates directly to the calipers and pads. It's a simple upgrade, and the improvement is subtle.

The second brake option replaces your entire brake system with the system Nissan uses on its legendary Skyline GT-R, a Nissan supercar not sold in the United States.

The Skyline's brake package can easily be adapted to the 300ZX. The package includes larger cross-drilled and axially vented rotors for the front with new calipers, and cross-drilled and axially vented rotors for the rear (same size). The rear uses the original 300ZX calipers. You can purchase the Skyline brake package from Stillen, or through any Nissan dealership as a product of Nissan Motorsports.

Cross-drilled rotors offer a unique advantage in the war against fading or loss of braking power. As pads heat up under repeated or hard braking, the material on the surface of the pad is vaporized. This vapor can sometimes become trapped between the pad and the rotor. There are two ways to evacuate this vapor available today — cross-drilled rotors and slotted rotors. The cross-drilled rotors have holes that allow the vapor to escape almost as soon as it is generated and keep you from feeling brake fade.

Slotted rotors do the same thing, except that they evacuate the vapors through channels cut in the surface of the rotor. Both systems offer a unique advantage in that, in addition to evacuating vaporized gas, they also evacuate heat much more efficiently. This can help prevent the vapor from forming in the first place.

Many Z owners have modified brake packages, and they have differing opinions about the slots and the holes. Some Z owners say that cross-drilled rotors warp more easily than slotted ones; they have experienced it.

I have the Skyline package with cross-drilled rotors and mine work excellently. But I am not a regular at the track. If you plan to spend a lot of time at the track, consider slotted rotors with no cross-drilling. I prefer the Skyline package because I see it as a tested product that is already OEM equipment on the Skyline. I have done several hard braking tests in my Z and found that the Skyline package performs well above average.

The wholesale cost breakdown of the Skyline brake package when I bought it was as follows: \$144 for rotors (each), \$280 for new front calipers (each), \$2 for four longer pins (each), and approximately \$106 for the pads (total). That's about \$1,250 (parts only) for a brand-new four-channel ABS-compatible brake package that feels

much better than the stock brakes and shaves several feet off your 60-to-0 braking.

If you're going to get the Skyline package, definitely consider adding the stainless steel brake lines to your car. They are not available through Nissan Motorsports, and you will probably have to purchase them from a specialty shop. I got mine from Stillen for \$175.

If the Skyline package still doesn't deliver enough braking power for you, you can take it another step by installing the ultra high-performance Brembo brake package. Brembo is one of the foremost manufacturers of brakes for racing vehicles. Brembo brakes are stock equipment on cars like the Ferrari F40 and Dodge Viper. You likely will not find a higher performance brake package.

The Brembo brake package that Stillen offers for the Z can cost between \$3,000 and \$4,000, and it requires that you upgrade to 17-inch wheels. The package is much too large to fit within the confines of the stock 16-inch 300ZX wheel. It's expensive, but that's the price you pay for world-class performance. The package includes two 13.125-inch cross-drilled, slotted, and axially vented rotors for the front along with a pair of giant four-piston calipers with a patented one-piece housing.

The Brembo package is front-end only. There is no Brembo solution for the rear wheels. You should have at least the Skyline rotors or an equivalent on the rear wheels if you have the Brembo up front.

One of my good friends has the Brembo brake package and says that while it is more than amazing, he probably would never have paid for it as it is so expensive. It was on the car when he purchased it (lucky him!). He said that it performs so well that when he first got the car he was continuously stopping short at intersections by about 20 feet! The car he had prior to this one was also a 1990-plus Z, and there is no comparison, according to him. I drove it at my first opportunity; what he said was true. The stopping power was incomparable.

He also said that, with the Brembo rotors, the only pads you can get are primarily metal in composition, and they tend to squeak at certain times of the year. Carbon-based pads require little to no heating for maximum efficiency. Metallic pads have to be heated before they will perform as they were designed. These are important things to consider, especially if your Z is a daily driver and you think that metal squeaking might annoy you.



# OTHER IMPROVEMENTS

## TURBO TIMER

The turbo timer is another simple device designed to increase the life of your turbochargers. It allows your car to continue idling after you've turned off the engine and removed the key. It prevents coking on the turbos. Coking (as described in "Warming Up and Cooling Down," chapter two) is the dried buildup of oil that cools down too quickly as a direct result of not being circulated. The turbo timer prevents that by allowing the car to idle and continuing to cycle the hot oil away from the turbos. You can set the timer for anywhere from 30 seconds up to more than nine minutes (HKS model). I've set mine at the minimum, 30 seconds.

There are a few turbo timers on the market. I have the HKS model and am pleased with it.

I've been involved in several discussions about the necessity of turbo timers; the subject is more controversial than I suspected. Many Z owners feel that there is no need for a turbo timer if you are not a regular at the track. Others feel that the timer is necessary and will greatly extend the life of your turbos.

You might think that you can just as easily sit in the car for 30 seconds, so why buy the turbo timer? It sounds easy, but it can be a hassle. When you get home, you don't want to sit in your car and wait. Eventually you'll get lazy and you'll do nothing to help your car cool down.

With most turbo timers you should still be able to lock up your Z and activate the factory alarm without difficulty. If you have more

specific questions about specific alarms working with it, contact the seller of the timer you've chosen.

I paid \$161.43 for my turbo timer, plus another \$20.12 for the wiring harness. Stillen installed it for me.

## **ROLL BAR**

Autopower<sup>®</sup> offers a custom-made roll bar for the 300ZX (two-seaters only) as well as for many other models of cars. The roll bar is available with or without a cross brace (the cross brace requires the removal of the passenger seat). The bar adds structural rigidity to your chassis and provides you with an extra measure of safety.

One major drawback: It limits rear vision through your rearview mirror. That has certain ramifications, not the least of which is making it harder to tell if that Caprice Classic behind you has a light bar on top of it or not.

Installing the roll bar also requires some cutting of the interior panels just behind the seats (next to the porthole windows). I had my roll bar installed by a body shop. The mechanics were reluctant at first to cut the interior, but I assured them I would not sue if they made a mistake. Not only did they do an excellent job, they undercoated and rustproofed the exposed bolts on the bottom of the car.

I have seen two versions of the Autopower roll bar. Mine has no horizontal reinforcements; my friend has several horizontal cross braces behind the seats. It limits his ability to recline them, although he doesn't much care since the driver's seat in his Z is a one-piece molded seat with a five-point harness.

The roll bar allows you to enter certain regulated sports car events (if installed properly) that you would not be able to gain entry to without one.

I paid \$214 for mine and another \$100 to have it installed. I love the way it makes the interior of the car feel.

## **SHORT-THROW SHIFTER**

The short-throw shifter (for manual transmissions) is another hit-or-miss item, according to Z owners. I have one in my car and I love it. It is a much tighter, more deliberate shifter with a very solid feeling. But it offers less room for error, and if you have difficulty shifting in high-pressure situations it may not be for you.

A friend had one and removed it. His car is upgraded way beyond mine. He is an excellent driver with lots of experience, but he just didn't like the short-throw shifter. You can always switch back if you want to.

My short-throw shifter would probably be more difficult to use if my transmission were still grinding in fourth gear. At first it was so tight it seemed that something was wrong, but once I got used to it, I loved it. It also transmits more noise into the cockpit from the transmission than the stock shifter, so if you buy a short-throw shifter, be prepared to hear exactly what's going on in your transmission.

## **INTERIOR COSMETICS**

You can spruce up the interior of your Z, too, with aftermarket products. It's pretty elementary.

Consider carbon fiber interior trim. Carbon fiber is a special material developed for racing that compares to steel in strength but is much, much lighter. It has no practical use in the cockpit of your Z, but it sure looks cool.

Also, several companies make gauge faces of different colors than the factory ones. They are, however, very difficult to install.

You may also consider Italian shift knobs and racing seats. These things are expensive, so consider how they look and fit before purchasing them.

## **LIGHTS**

### **ACCESSORY FOG LIGHTS**

You can do a lot of cool things with lights. Although the black and white photos in my book don't show them, my Z is equipped with PIAA 959 fog lights installed in the lowest part of the intake area on my Z. It is one of the largest fog light sets you can fit in there, and mine were installable only because I purchased a special bracket to install them from Stillen. The 959s are especially cool because they have blue lenses when off, but cast an amber light when on.

I strongly recommend a professional installation for lights like these. Electrical accessories can badly affect your car if not installed correctly.

In some places it is illegal to drive with just your fog lights on or to have your fog lights on while your high beam headlights are on. Please observe your local laws.

## **FACTORY FOG LIGHTS**

I cannot personally recommend this because I don't fully understand the ramifications, but I have replaced the factory bulbs in my 300ZX's integrated fog lights with PIAA 55-watt Ion-Crystal® bulbs. They're great. They now cast a pale yellow light with a blue-green center. I found that PIAA bulb part number 13255 has an identical seat to the factory bulb. They cost about \$23.95 retail (each) and seem to last forever. My only modification was to splice the two leads together because one had a circular metal connector and the other had a square metal connector. When my first set burns out, I am planning to splice the proper connector on the car side of the circuit.

Once again, I emphasize that this is basically experimentation and that, although I've experienced no trouble with it, your experience may be different. Seek additional professional advice if you are considering this.

## **HEADLIGHTS**

When the new BMWs and Porsches came out, everyone wanted their fancy new ice-blue headlights in their cars. PIAA does offer a kit, but it runs several thousand dollars.

What's the next best thing? Some people use little colored plastic sleeves and put them over the bulbs. No thanks. Others bought special bulbs that were supposed to look like those BMWs. To me, they just looked blue.

I tried the simple way out, too. I replaced my headlight bulbs with higher-wattage models. They lasted about three months. I can't recommend this; leave well enough alone.

Again, I was just experimenting. Seek professional advice if you are considering these types of changes.

One thing worth noting — reflectors and bulb construction affect brightness more than pure wattage does.

## **FRONT COMBINATION LAMPS/TURN SIGNALS**

Some aftermarket accessory shops here in the United States offer

factory lamp assemblies for the front turn signals. This assembly has a much-higher-quality lens than the one for the U.S. Z, and a much brighter throw. Once again, they may not be legal in your area, so check your local laws before purchasing them.

The cool thing about them is that the turn signal and the parking light are switched from their normal position for a U.S. car. The turn signal is now house behind a clear lens and has an internal orange reflector instead of one of the surface of the lamp. It is much brighter and easier to see.

The parking lamp is also much brighter now and acts in much the same way as a cornering lamp on a luxury car, except that it is always on. I think this arrangement makes it easier to see the Z on a dark night and therefore a little safer to drive. These are quite hard to find. I purchased mine from CarMate in Glendale, California for around \$189 for the pair (retail).

## **REAR TURN SIGNALS & REVERSE LIGHTS**

I have also replaced my rear turn signals and reverse lights with 50-watt Candlepower® halogen bulbs. I bought them from a catalog called Autosport [(800) 726-1199]. The part numbers at press time were 24103 and 24111. I initially ordered turn signals from the company, too, but they do not carry them anymore. I'm not sure why. The brighter bulbs improve safety and rear visibility. Once again, they may not be legal in your area, so check your local laws before purchasing them.

## **BODY MODIFICATIONS**

I am not a huge proponent of body modifications on the Z, because I feel that the car's original design is nearly flawless. That's an entirely subjective opinion, though, and you may feel different.

There are a lot of available kits that bolt on to the Z that can change its appearance drastically or subtly. There are nose pieces, side skirts, rear valances, wings and more. One thing I can say for sure — you should definitely pursue a high-end body shop to paint and install them. Matching color on some cars can be tricky due to age and other variables. If you purchase some aftermarket panels, make sure you check the color match in both natural sunlight and under fluorescent lights.



# CONCLUSIONS

You've completed my booklet on the 1990 through '96 Nissan 300ZX. Thanks! I hope you've enjoyed reading it as much as I had writing it.

I once again must remind you to always seek professional advice. I have a lot of experience with this car, and I know a lot about it.

But I am not a professional. Steve Millen and James Wolf are professionals. Millen has a well-educated sales staff that's always more than willing to answer your questions.

If they can't answer them, they'll put you through to the head engineer at Stillen or someone else who can. James Wolf takes his own phone calls at his operation and is always more than willing to help out. There are many things that both of these companies offer that I haven't touched on here, because I just didn't feel it was necessary. At this point you should be able to find out what you need to know on your own.

Neither of these companies are paying for these endorsements. I'm just telling you my experiences with them.

Don't spend thousands of dollars and waste your time upgrading your Z incorrectly. Take your time and get educated. Get more than one opinion on whatever you are considering.

And here's another reminder about the importance of good braking. A fast car is a bad idea if it can't come to a solid controlled stop. Some aftermarket enthusiasts think that brake packages are boring and don't help you drive faster, but brakes are one of the best upgrades for the money. Safety should always be your number one

concern.

Don't neglect maintenance. Always, always change the oil in your car at regular intervals. Keep an eye on all of your fluids and watch out for leaks. Follow the service manual for recommended changes of belts, the timing belt and other parts that age more quickly than the rest.

Respect your car. If it's turbocharged, always warm it up and cool it down. Flush and fill your radiator at least once a year. Keep an eye on your tires and watch out for uneven wear. Find a gas station that sells quality gasoline, and always buy it at the same place. Steer clear of discount gas stations. They often mix additives into their gas that can affect your performance and the life of your vehicle.

Happy motoring to you and your Z.

# THE JOYS OF BUYING WHOLESALE

One of the most valuable secrets in this book is the path to wholesale parts. You don't have to pay retail prices for your parts. You can get them wholesale from a few select dealerships across the country. (They ship to you, and then you have your mechanic do the installation.)

My personal favorite is Brown & Brown Nissan in Tempe, Arizona. You can reach them at (800) 237-0003. They will ship anywhere in the world, and they are always courteous and knowledgeable. Be sure to ask for their wholesale parts division. You can find their ads in a variety of car magazines if you lose this booklet. These guys can save you a lot of money, even after shipping.

You'll also find that if you call Courtesy Nissan in Texas and join their Z Club, you'll get 25 percent off suggested retail. Their number is (800) 527-1909.

They even sell aftermarket performance parts. How? Nissan Motorsports is a division of Nissan, so you can buy the division's performance parts through a dealership. I ordered my entire Skyline brake package from Brown & Brown Nissan. It cost me \$1,281 delivered. (I couldn't get the braided steel brake lines from them). I saved hundreds of dollars from a pro shop's quote.

It is a good idea to order the Nissan Motorsports catalog. Then you can see for yourself what's available wholesale from Brown & Brown, rather than pay retail from an aftermarket specialist.



# HOW TO REACH ME

One of the greatest things about the age in which we live is the ability to use computers. I wrote this book on a computer, it was edited on a computer and a computer helped me get it published.

Computers can also help you expand your knowledge about your Nissan 300ZX. I compiled a great deal of the information in this booklet from postings, both mine and those of my friends, on the 300ZX message board within *Car & Driver* magazine's site on America Online. This site has in the past been possibly the most valuable source of information I know for the 300ZX, and any other car you can think of. Questions posted on the board will most likely be answered in short order by an experienced Z owner like myself or some of the hardcore aftermarket Z people.

If you have access to America Online, make your way to the "Newsstand" forum. Select *Car & Driver*, which has a great message board forum. Under sports cars, you'll find the Nissan 300ZX board. It is a fountain of knowledge. Many experienced Z owners read and/or post to the board daily.

Recently I have noticed more of a swing toward [www.twinturbo.com](http://www.twinturbo.com), an extremely active Z board that is well maintained. It is an endless supply of knowledge presented by (mostly) educated Z owners. You can find pictures of my car there under the "Reader's Rides" section — Scott P. The modifications listed there are not current as of this printing, but I hope to have them updated soon.

You will also find some great pictures of Zs at NEMA.com. Several guys from the AOL 300ZX board have posted pictures there.

The Net is a great place to find not only information, but parts, too. Remember that service manual I got for \$10?

And since you know my screen name now, you can E-mail me: sp300z (if you're on America Online), or sp300z@aol.com (if you're not).

Drop by my Website at:  
[www.atozx.com](http://www.atozx.com)

If you haven't already you may want to check out both *Sport Compact Car* magazine and *Turbo and Hi-Tech Performance*. They are filled with lots of solid information and good sources for performance products.

I'd love to hear your thoughts on Zs, this book, price concerns or ideas for other booklets. I am also very interested in making corrections and/or changes to future editions of book. If you have any information that would correct, change and/or add to what I've written, please forward it to me and I will try to make them in my next edition.

I hope you've found this book useful. Thanks so much for purchasing it. See you down the road.

## USEFUL CONTACTS

AutoSport  
Route 29 North  
P.O. Box 9036  
Charlottesville, VA 22906  
(800) 726-1199

Blitz USA  
4879 E. La Palma Ave. Ste.  
206  
Anaheim, CA 92807  
(714) 777-9766

Borla Performance Industries  
5901 Edison Dr.  
Oxnard, CA 93033  
(805) 986-8600

Brembo  
1567 Sunland Lane  
Costa Mesa, CA 92626  
(714) 641-0104

Brown & Brown Nissan  
7755 South Autoplex Loop  
Tempe, AZ 85284-9957  
(602) 598-6000  
(800) 237-0003

Car Mate Auto Boutique  
1125 S. Central Ave.  
Glendale, CA 91204-2212  
(818) 956-6383

Courtesy Nissan  
1777 North Central  
Expressway  
Richardson, TX 75080-3599  
(800) 527-1909

GRReddy Performance  
Products  
9 Vanderbilt  
Irvine, CA 92718  
(714) 588-8300

HKS USA, Inc.  
2355 Mira Mar Ave.  
Long Beach, CA 90815  
(310) 494-8068

Jim Wolf Technology, Inc.  
212 Millar Ave.  
El Cajon, CA 92020  
(619) 579-0680

K&N Engineering  
 P.O. Box 1329  
 Riverside, CA 92502  
 (909) 684-9762

Nissan Consumer Affairs  
 (800) NISSAN-1

Nissan Motorsports  
 P.O. Box 191  
 Gardena, CA 90248-0191  
 (\$5 for parts catalog)

Nissan Z&ZX Club  
 International Z Club  
 P.O. Box 287  
 Brookland Ville, MD  
 21022-0287

Nitrous Oxide Systems (NOS)  
 5930 Lakeshore Dr.  
 Cypress, CA 90630  
 (714) 821-0580

PIAA Corporation, USA  
 15370 S.W. Millikan Way  
 Beaverton, Oregon 97006  
 (503) 643-7422

RPS Performance Products,  
 Inc.  
 P.O. Box 804  
 South Pasadena, CA 91031  
 (909) 605-0688

Steve Millen Sports Cars  
 3176 Airway Ave.  
 Costa Mesa, CA 92626  
 (714) 540-9154

The Tire Rack  
 (800) 445-0179

Turbo Engineering  
 Corporation  
 15870 W. 6th Ave.  
 Golden, CO 80401  
 (303) 271-3997

Turbonetics, Inc.  
 5400 Atlantis Ct.  
 Moorpark, CA 80401  
 (805) 529-8995

## SPECIAL THANKS

I'd like to thank some of the people who helped me put this book together: Ricky Nardis, John Burnes, Carey Patin, Yosh, Emily, Maurice Messih and the mechanics at Playa Vista Texaco.

# A to ZX

8600 Tuscany Avenue, #424

Playa Del Rey, CA 90293

[www.atozx.com](http://www.atozx.com)

Dear Customers,

Thanks to everyone who purchased a print edition of A to ZX. It has officially sold out. Due to overwhelming requests we have now made this PDF version available online. There are some corrections that need to be noted for this PDF. I am hoping to make them to the document itself in the near future, but for now I must include this addendum.

I would also like to remind everyone that A to ZX costs money for me to maintain so please do not distribute your downloaded copy of the book to friends. All of the PDF's do in fact have embedded serial numbers which are attached to the purchase record and I will be forced to prosecute anyone who distributes the file without my express written permission.

Lastly, this book is slightly outdated at this time. There have been many advancements in the last 2 years that are not included here. That is why I have tried to make it as affordable as possible. A future edition is in the works but will likely take quite some time to complete as A to ZX is not a primary source of income for anyone involved. Keep an eye on [atozx.com](http://atozx.com) for updates.

Thanks again for your orders and here are the corrections and new information:

- All references to Red Line Lubricants should have the words, Red Line, as two words not one.
- On page 19 I have a brief section on cleaning your engine. In that section I mention that I have had my engine cleaned once and noticed no lasting effects. I can no longer say that is entirely true. I recently replaced the turbos in my 1990 Twin Turbo and as a result had to pull the motor out of the car. Upon doing this I discovered that there was a great deal of corrosion on most of my electrical connector plugs, including the ones to the fuel injectors. Although my mechanic tells me that all Nissans have this problem, I can't help but wonder if the water that was used to clean the engine hastened the process. The copper connectors were all green with corrosion.

In light of this, my best advice on cleaning the engine may be to talk to a Nissan Dealer. If that concept bothers you as much as it does me, you might consider just using a good degreaser, a rag and a toothbrush.

- On page 30 I refer to Red Line Water Weather, a high-performance coolant. Two corrections here, it is not "Water Weather", but "Waterwetter" and it is not a coolant but an additive to your existing coolant. Additionally the name of this product has recently been changed to "Super Cool."

• On page 34 in my discussion of Technical Service Bulletins and Recalls, I failed to mention an important source of that type of info. All Data. They provide CD-ROMS with model specific information. I'm sure they have a web site and you can find more information there (if you can't find them and want to, e-mail me). This omission is particularly interesting to me as I used to work at a BP Station on the east coast, and we had an All Data system. The owner of the station thought it was the best thing since sliced bread. Anyway, in an original draft of "A to ZX" I had something about this in the text, but it somehow was lost in my many revisions. My apologies.

- On page 34 I also refer to a Technical Service Bulletin on gear grinding problems. There is a VIN# incorrectly listed as VIN JN1CZ24\*\*MXSOS910, it should read JN1CZ24\*\*MX505910. That's "505" not "SOS."
- On page 36 I mention the possibilities of 6-speed transmissions. While I do not have much additional info on this, one of you was kind enough to point out that there are several on the market in Japan. Information on these and other amazing products for the Z is available in magazines such as, "Hyper Rev #25" (All in Japanese) which can be found or ordered at high-end bookstores and newsstands. Unfortunately those 6-speeds are apparently running around \$7000 (U.S.) right now.
- On page 43 I misspelled Zerk in reference to the Zerk fittings on the Stillen Adjustable upper links. It does not have a 'c'.
- On page 83 I mention wholesale purchasing and have been told that I should include nissanautoparts.com. Apparently they are unbeatable.
- On page 86 I obviously should have included "Z Car Magazine" as a good source of information. It is published every two months and can be had for \$20.00 a year in the U.S, \$25.00 Canada, and \$35.00 for all other countries. The phone number for their customer service line is, (408)476-7780.
- I also wanted to include a recent quick fix I discovered personally on my Z as well as on the twinturbo.com message board. If your windshield washer jets leak onto your hood or tailgate you can fix this easily with a part that is under \$5.00 called a check valve. It is easy to install and readily available at most dealerships.
- I wanted to mention that the web site that I made reference to at the end of the book, "www.twinturbo.com" has changed hands and has fallen out of popular favor although it still functions. It is now part of a larger site called "autoforums.com" and is filled with banners. However, some of the main participants at that forum are determined to save it by recreating it in it's original format. Visit [www.twinturbo.net](http://www.twinturbo.net) for that. (When I wrote this twinturbo.net was relatively new, but it is now the premiere Z forum on the web.)
- Lastly it has been recently brought to my attention that I have made some semantic errors in my description of how the internal combustion engine works. I would like to take this opportunity to correct them by saying that Oxygen is a Catalyst (enables combustion) to the burning of gasoline. Oxygen itself is not technically burned in the process.

Thank you for your time and happy motoring!

Scott Philbrook

Sincerely,  
Scott Philbrook