
# Lanciana

2009:2



*this page: Lambda on the Snowball Rally. photograph by Kjell Nelin*
*cover: photograph by Donald Osborne*
*rear cover: Beta Montecarlo Turbo at Watkins Glen, 1980. photograph by Edward Levin*


# Performance and Character

Geoffrey Goldberg

Measuring a car's performance should provide one indication of its character. But what to measure? Most recent measurements of performance focus on acceleration and top speeds, and ignore the causes and developments behind those statistics. Older road tests used many other measurements—Tapley readings, wind resistance, and sound levels were part of road tests then, as the critics tried to find some way to objectively convey their impressions.

One common measurement is the ratio of power to weight, a simple measurement derived by taking the weight of the car and dividing it by peak horsepower. It provides a basis for comparison across model lines. It may not convey the full driving experience as it has no reading of engine character: for example, the question "is the torque curve flat or peaked?" is not addressed. However, done reasonably, one can compare similarly tuned engines and differing chassis weights to get a sense of how cars perform compared to each other. So what can this tell us about Aurelias? Can it tell us how one model compares to another?

### Lancias and Power

In most cases, Lancia factory weights were used—these appear to be dry weights. Are they accurate? Some Aurelias have been weighed recently and with reliable scales, wet with a 1/2 tank of gas:

| | Listed | Actual | % Difference |
|---|---|---|---|
| B20 Seriss 2 | 1050 | 1090 | +4% |
| B20 Seriss 4 | 1150 | 1236 | +7% |
| B24 Seriss 6 | 1165 | 1263 | +8% |

For horsepower estimates, factory numbers were used. However, two exceptions: the B20 4th series is also calculated using a Nardi kit with the Nardi numbers—131 hp—estimated. Also, for a B24, one was used with a revised motor built a few years ago that was dyno tested.

### General Observations

Lancias were sophisticated cars, and were not competitive in the power races. Their engines and cars were built for smoothness, quietness, longevity and flat torque curves. While many American cars looked to 10

lbs/hp as a good number for the 1950s, a more reasonable Lancia goal is double that. In fact, only a few models of Lancias achieved that, and were under 20 lbs/hp, or 9 kg/hp.

**Berlinas**

When the B10 was introduced in 1950, it was quickly understood to be a bit underpowered, with 56 hp for 1080 kg, about 19.3 kg/hp, replacing the Aprilia with its lesser 48 hp powering a lighter 950 kg berlina delivering about 20 kg/hp. This situation was quickly rectified with the B21 and B22. By 1954, the B12 gained more comfort, and lost some performance, but this was within Lancia's ability to tune gearbox rations. The B12 was a very satisfying car with its ample torque and larger engine.

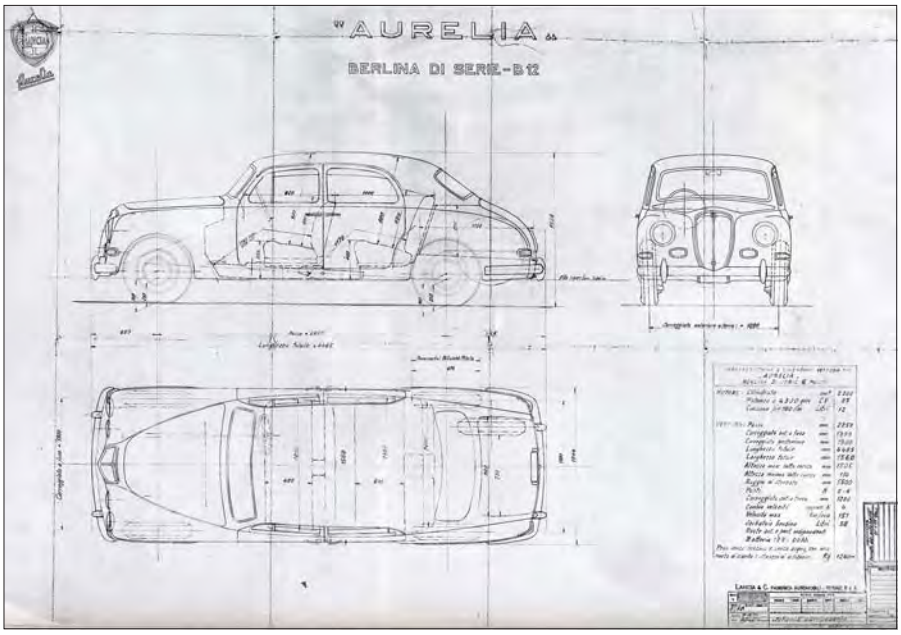
A B50 originally was equipped with a B10 motor, and had yet more weight to carry and even more performance loss. However, a B50 with the later B12 engine was a reasonable performer.

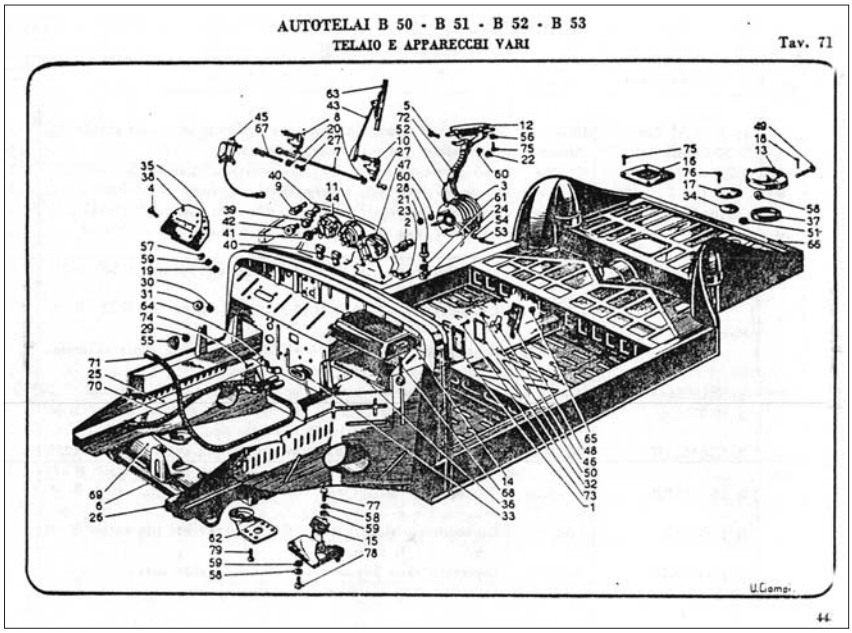
**B20 comparison**

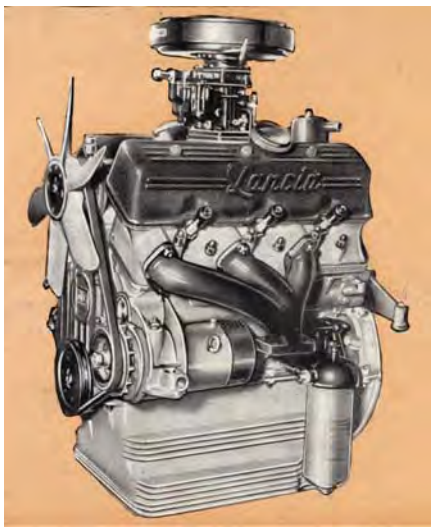
The early cars clearly suffer from a lack of HP in comparison to the 3rd and 4th series, Lancias best. What this doesn't tell us about is the feel of the lighter earlier cars. A 2nd series car, with 12% less weight than the 4th series and 20% less than the 6th, may render the power issue moot. Personal experience with early cars leaves the impression of no performance difference, but about 10 mph less top cruising speed—70 mph vs. 80 mph is comfortable. Again, Lancia were wizards with gearing ratios.

The later (5th, 6th) series cars have a more comfortable touring character—and this may be due to a flatter yet torque curve. They also have a quieter gearbox, and a more resolved drivetrain, and are more sophisticated cars. Contemporary test comparisons between the 4th and 6th series B20s reveal the rolling tests of both cars at 30 – 50 mph to be practically equal.

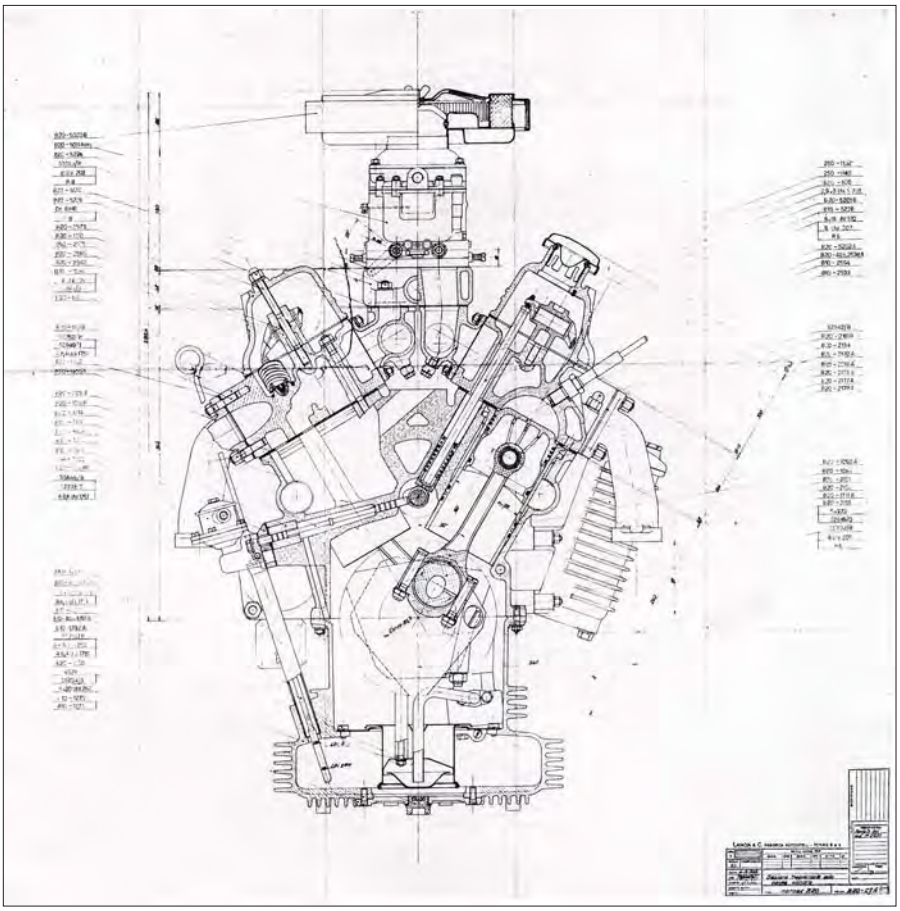
So are the 4th series really the best trade-off? The British love the 3rd series, for the 2.5 liter motor and the earlier suspension. Americans like the 4th with the de Dion suspension, and it's the first LHD B20; it's also lighter than the 5th/6th series. The

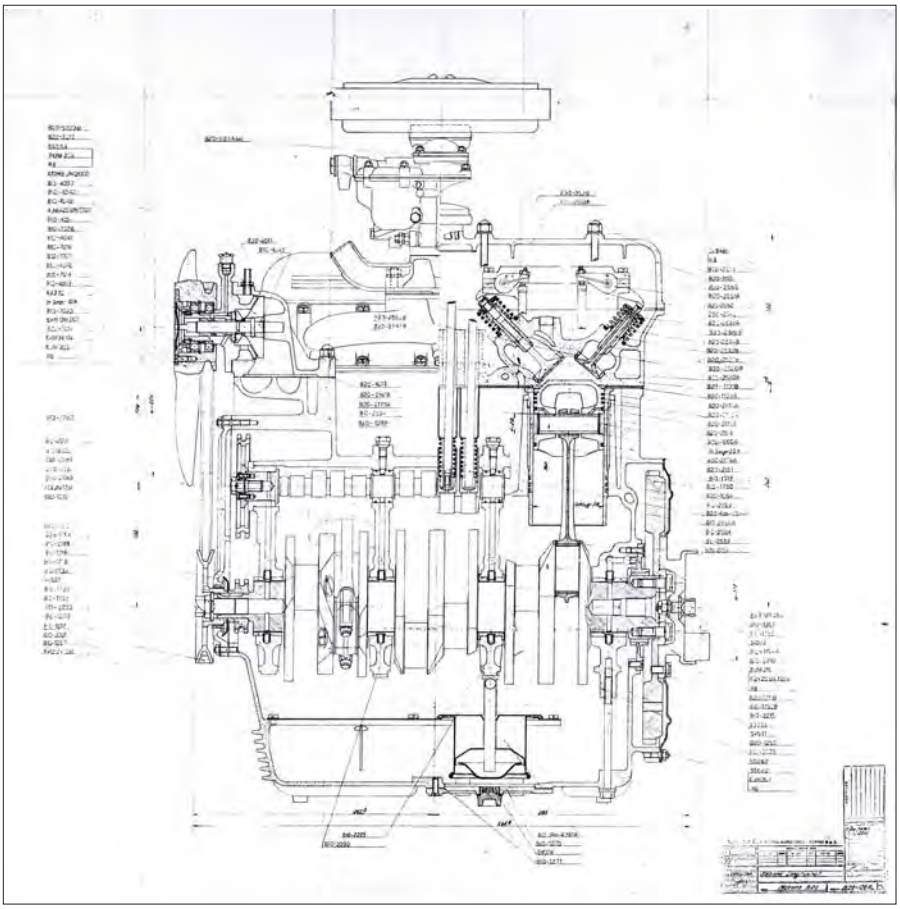



*Opposite: 4th Series Aurelia B20 GT sales brochure.*
*Top: B12 Berlina production drawing.*
*Above: B50, B51, B52, B53 chassis exploded parts diagram.*
*Left: 4th Series 2.5 engine.*





Italians, being sporting at heart, also treasure the earlier cars for their competition history. Such is the stuff of debates.

### Aurelia Open cars

The Spider has a bit more horsepower than the Convertible and less weight—together these combine for a 15% difference between the two models' power to weight ratio. This is one part of the difference in "feel" between the two—certainly less weight is the other aspect.

A 6th series B24 Convertible was weighed and its motor, with enhanced cam, pistons, ignition and carburetion, dyno'd. This combination gets one back to the Spider's power/weight ratio, but will still carry the additional weight.

### So where did it go?

Improvements in the Aurelia showed up in many ways—the revised transaxle is one area; the newer one was more robust, able to take abuse which the earlier one could not. The de Dion suspension was heavier, its leaf springs and tube not as delicate as the simpler coil springs and triangulated arms. There were improvements in componentry everywhere: more comprehensive gauges, better door hardware, window winders, driveshaft revisions—all improved, but in every case the newer solution was bit more robust, more durable and, as it happens, heavier.

And then the final piece: as the weight goes up, other parts of the car had to grow as well: as the motor gets bigger, the crankshaft gets larger. Brake drums get bigger. It is hard to stop.

Engineering improvements helped, as engine efficiency—hp per liter—increased. From the 32 hp/liter in the B10, then 35/liter in the B21 to 38/liter in the B12, combined with increased engine size—1.8 to 2.0 then 2.2—helped cover the B12's 170 kg weight increase. Engine enhancements continued in the Flaminia; the first motor of the 2.5 Berlina yielded 41 hp/liter,

*Left & above left: Longitudinal and transverse sections through 3rd Series B20 engine.*
*Opposite: Power to weight comparison for Aurelias and some of its contemporaries.*

improved to 50/liter in the later 140 hp 2.8 Berlina. Lancia's engine designers were hard at work under the hood, while the rest of the team was adding weight elsewhere.

**Conclusions**

The Spider's combination of light weight and a sporty motor is similar to the model heavily used by Alfa Romeo, where each more sporting version of the line was introduced with slightly more carburetion, compression, or cam, and less weight. Done together, performance increased without the need for very radical tuning changes. For the 1900 and Giulietta, this approach proved successful, leading to Supers, TIs, Speciales, Zagatos and ultimately the special chassis Zagatos, the TZ models. Alfa's path is a wonderfully direct one.

Lancia clearly understood the importance of weight in their cars; starting with the Lambda and its monocoque chassis, Vincenzo and his engineers certainly saw the benefits of a light stiff chassis. This approach was very clearly seen in the design of the Augusta, Aprilia and Ardea. It is at the heart of Lancia's prowess, and should be regarded as a valued legacy of the company.

Interestingly enough, there seems to have been an historical conflict within Lancia, and it revolves around this issue of weight. Because of the peculiarity of Lancia's marketplace, the company often found itself torn in designing to serve different masters.

The history of Lancia's products points clearly to their sensitivity to the user and driver; while absolute performance on the racetrack was of little interest, usability and understanding of the driving experience was paramount. Thus all Lancias have a particular feel, and providing such a considered, designed experience is part of the joy of the marque. Much of that sensitivity comes from the engineering of the cars with several factors working together to provide that feel. These include the aforementioned stiff chassis, along with careful suspension design, and attention to weight. These were worked hand in hand, to provide a balanced driving experience.

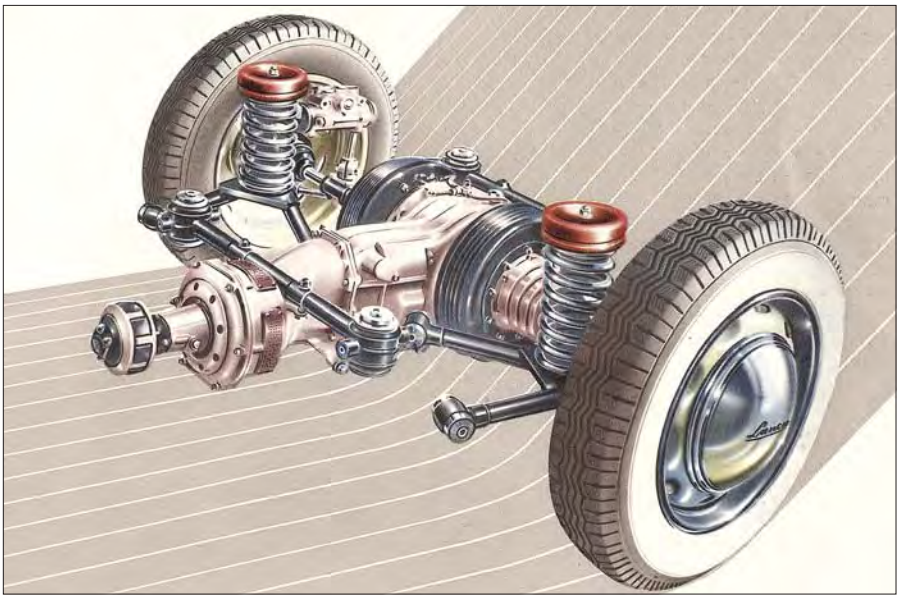
Clearly a part of that was the fact that

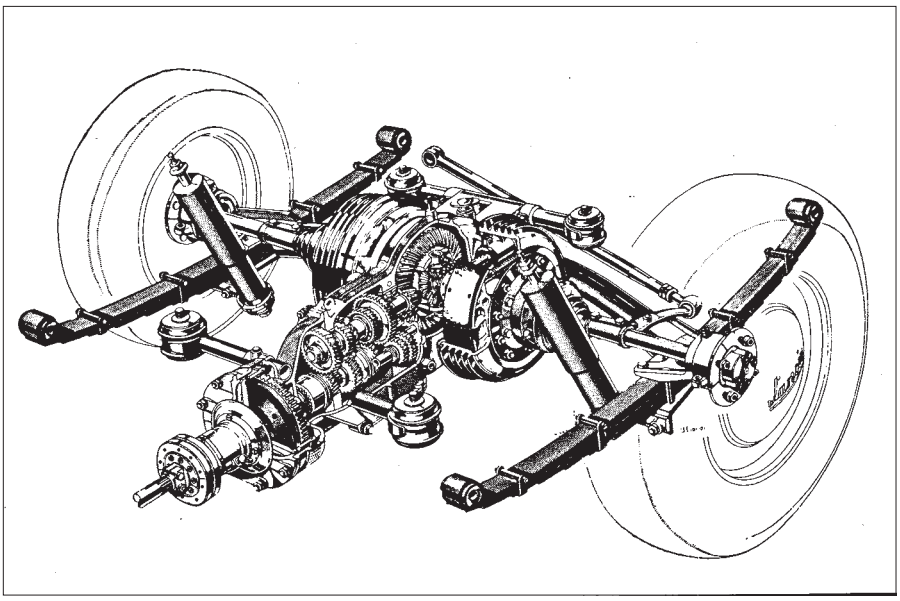
**AURELIA**

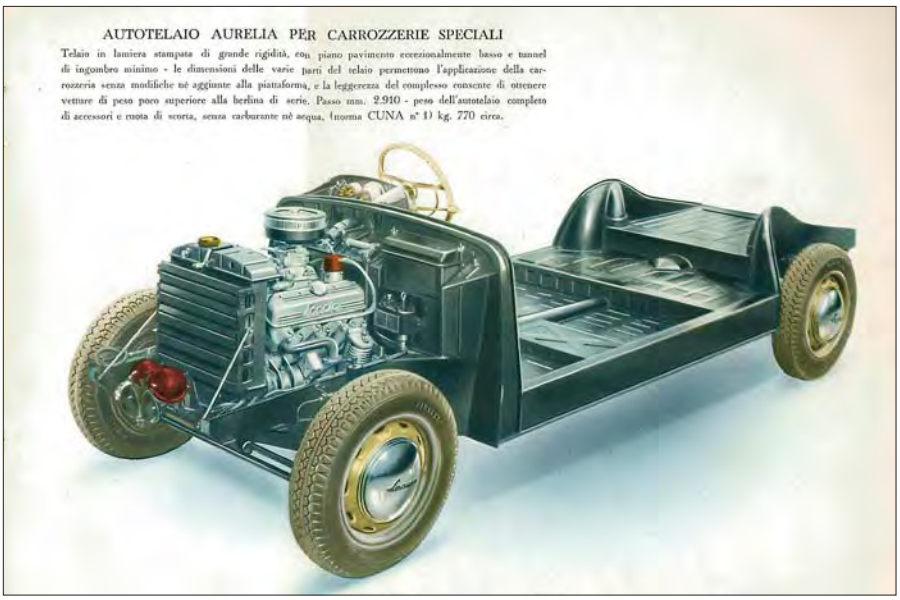
| Model | Series | Weight (kg) | Capacity (L) | HP | HP/L | kg./hp |
|---|---|---|---|---|---|---|
| Berlina | B10 | 1080 | 1.8 | 56 | 32 | 19.3 |
| | B22 | 1150 | 2.0 | 90 | 45 | 12.8 |
| | B12 | 1250 | 2.2 | 87 | 38 | 14.4 |
| Coupé | 1 | 1000 | 2.0 | 75 | 38 | 13.3 |
| | 2 | 1050 | 2.0 | 80 | 40 | 13.1 |
| | 3 | 1100 | 2.5 | 118 | 47 | 9.3 |
| | 4 | 1150 | 2.5 | 118 | 47 | 9.8 |
| | 4 (Nardi,real) | 1236 | 2.5 | 131 | 52 | 9.4 |
| | 5 | 1210 | 2.5 | 110 | 44 | 11.0 |
| | 6 | 1250 | 2.5 | 112 | 45 | 11.2 |
| Open | 4, Spider | 1060 | 2.5 | 118 | 47 | 9.0 |
| | 6, Convertible | 1165 | 2.5 | 112 | 45 | 10.4 |
| | 6, Conv (real) | 1263 | 2.5 | 140 | 56 | 9.0 |

**OTHERS**

| Model | Weight (kg) | Capacity (L) | HP | HP/L | kg./hp |
|---|---|---|---|---|---|
| Flaminia Berlina 2.5 | 1430 | 2.5 | 102 | 41 | 14.0 |
| Flaminia Berlina 2.8 | 1560 | 2.8 | 140 | 50 | 11.1 |
| Flavia Berlina 1.5 815 | 1190 | 1.5 | 78 | 52 | 15.3 |
| Flavia Milleotto | 1190 | 1.8 | 92 | 51 | 12.9 |
| 2000 carb | 1235 | 2.0 | 115 | 58 | 10.7 |
| Jaguar XK 120 OTS | 1282 | 3.5 | 160 | 46 | 8.0 |
| Jaguar E Type | 1150 | 3.8 | 220 | 61 | 5.2 |
| Jaguar Mark I sedan | 1270 | 3.5 | 210 | 58 | 6.0 |
| Ferrari 250 SWB | 1182 | 3.0 | 240 | 80 | 4.9 |
| Ferrari 250 GTE | 1432 | 3.0 | 215 | 71 | 6.7 |
| Maserati 3500 | 1445 | 3.5 | 220 | 63 | 6.6 |
| Mercedes 300 SL | 1295 | 3.0 | 215 | 72 | 6.0 |
| Mercedes 190 SL | 1180 | 1.9 | 106 | 55 | 11.2 |
| Mercedes 220 S | 1350 | 2.2 | 106 | 48 | 12.7 |
| Mercedes 300 SE | 1580 | 3.0 | 170 | 57 | 9.3 |







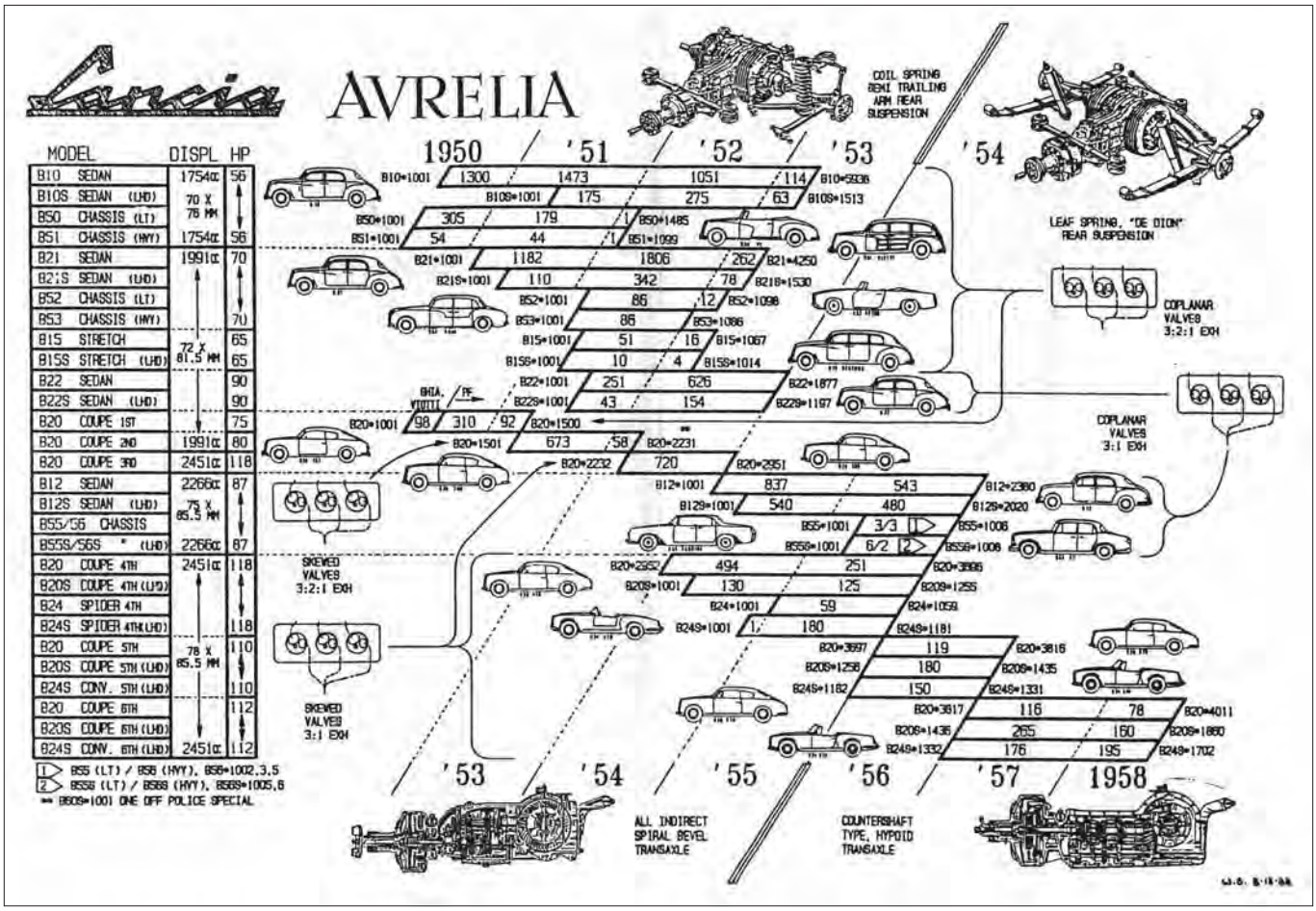

the Lancia market was also an upscale one, for the discerning motoring professional or individual. This clientele wanted a carefully made product that would be durable. This understanding helped rationalize the substantial premium one paid for a Lancia, as it was a car to last for many years.

Lancia addressed the needs and desires of this client group through constant refinement and steady improvement of their cars—even during production runs. Aurelias are well known for the complexity of their development, but constant development was a steady part of Lancia's process. There were four series of the Ardea and Astura, and nine of the Lambda. Lancia was constantly making their cars better.

This refinement was often done through component development, and coupled with Lancia's precise engineering, in many instances carried with it the reality of additional weight. One can marvel at an Appia cylinder head for being compact and light; but then consider the door hardware for the pillarless doors. It is flawless, will operate forever, but weighs as much, if not more than all the weight saved in the engine bay. A signature solution to be sure, but this represents that different notions of refinement were in operation.

Lancia history can be portrayed as a series of reconstructions of the original ideas of the company, played out over decades, each time in new iterations. This struggle between weight, on one hand, and refinement, on the other, is one such issue. The tension between designing for lightness vs. designing for build quality plays itself out throughout the company's history. After the Lambda success with its lightweight unit body, for example, Lancia furthered its appeal to an upscale audience with the Dilambda and the Astura, and with them, followed the path of higher refinement with build quality and greater weight and size.

The small Augusta Berlina that followed in the early 1930s was a clear reversal of that direction. It is a return to the principles of a light car, with a unit body, small engine, and less weight. This approach was a direct descendant of the Lambda, and was continued with the Aprilia. Thus, for *lancisti*, the most sparkling performers are factory




Berlinas, not the custom coachbuilt cars.

The early Aurelias followed from the Aprilia and were light. With modest horsepower, the competition success of both Berlinas and B20s showed they had sufficient power for competing in the early fifties. They were early "modern cars," first on the market post-war with a unit body, stiff, light with exemplary handling, and they were able to catch the competition napping from 1950 – 1952. As the Alfa 1900 was developed and the Fiat 8V came to the market, this advantage began to pale; these cars met the lightness and chassis design challenge but had more power, and the B20s were being surpassed by 1953.

Lancia considered meeting this challenge by getting horsepower from other means: supercharging and overhead cams. De Virgilio even looked at modifying rocker ratios in the stock motor. As the competition focus shifted to a purer racer, the D series cars, the decision was made to keep the 2.5 liter pushrod motor for the street Aurelias. They had developed two prototype SOHC motors for possible use in road cars, but chose not to pursue them. In one of these, 170 HP was only available with three carburetors; with a single carb there was not much improvement over the stock 2.5 motor.

In the end, the change of ownership to Pesenti and engineering by Fessia led the company further down the path of refinement with weight. Thus the later Aurelias, Flaminias, and Flavias, while are all exemplary, all suffer a weight penalty of some sort.

Were the earlier designs of the Aurelia undersized? Perhaps it was a bit too light for the performance levels the car was able to reach. Or was it the change of clientele, from knowledgeable and skillful users who could drive the car nearer its limits without breaking it, to a different clientele who needed a more robust car which anyone could drive?

From a performance viewpoint, the power to weight ratio of the 4th series B20 with a Nardi kit was not equaled by Lancia until ten years later with the Flaminia SuperSport. By then the company began to see the penalty of having missed out on performance with the rising tide of the 1960s. Their successful response was to be found in the Fulvia HF, but that's a story for another day.

*Above: Bill Stebbins' classic chart of Aurelia permutations.*

*Opposite, top: Series 3 coil spring rear suspension.*

*Opposite, middle: Series 4 leaf spring de Dion rear suspension.*

*Opposite, bottom: B50 chassis for coach built cars.*