LITTLE-KNOWN VEGA DEVELOPMENT STORIES

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My previous article on "Vega Development and Production History, 1968-1975" showed a chronology of Vega product development during the 18 months or so prior to production launch. A number of these product content and specifications changes and feature decisions had interesting stories behind them, and I'll present some of them here. In today's product development context, the speed with which the product and its tooling was designed and developed was truly remarkable; virtually none of these decisions could be made this close to production launch in today's environment.

Engine Development - the Vega engine and its die-cast block technology were developed at GM Engineering Staff, long before the program was handed-off to Chevrolet to finish it and bring it to production. Then-GM President Ed Cole, who had been very personally involved with the design of the 1955 Chevrolet V-8 when he was Chief Engineer at Chevrolet, was equally involved on a personal level with the Vega engine. He was a frequent visitor on Saturdays to the Engineering Staff Engine Drafting Room, reviewing the design and giving direction for changes. He was a very cost-conscious engineer, and gave clear direction to Engineering Staff that there was no need for insert bearings in the cylinder head for the camshaft, as he felt "iron-on-iron" for the journals would work fine as long as "chevrons" were machined into the cam journal bores in the head to retain a good supply of oil. Every imaginable kind of "chevron" arrangement was tested, and all of them resulted in cam journal-to-bore lubrication failures; finally, after the program was transferred to Chevrolet, he relented and allowed the design change to add insert bearings for the cam journals, less than six months prior to production launch. He most likely relented on this issue after listening to Chevrolet engineers he trusted from his experience working with them on the original Chevrolet V-8. As the engine development progressed at Chevrolet, it became known (in closed offices) as "The World's Tallest, Smallest Engine" due to the very tall cylinder head.

The "Stillborn" L-10 Engine – although the optional L-11 engine with a 2-barrel Weber carburetor became a mainstream part of the program in December, 1968 (and ran at a 75% level in production), the Chevrolet Engine Group had an intense dislike for the tall iron cylinder head with its unusual tappet arrangement and side-flow "Heron" combustion chamber design that had been thrust on them from Engineering Staff, and set out to design their own. The design evolved rapidly as a "crossflow" aluminum head with a single centrally-mounted overhead camshaft and roller rocker arms operating intake valves on one side and exhaust valves on the other, remarkably similar to the Ferrari V-12 cylinder head design of that period; it was almost 4" lower than the production head, was a lot lighter, had true "hemi" chambers with big valves, and made excellent power. Numerous prototypes were built, manufacturing tooling was started, and it even got to the point where A.I.M. Sheets were issued in anticipation of approval for production. The REAL story never came out, but some combination of Corporate politics ("You don't need another cylinder head – mine will work just fine") and additional program investment killed the program. Had it gone to production, it would not have had the differential expansion head gasket problems that plagued the iron-head engine, and would have provided significantly higher performance than the optional L-11 engine.

Early Cooling Theory - at the very beginning of the experimental engine program at Engineering Staff, Ed Cole stated in a meeting that there would probably be no need for a traditional radiator, due to the excellent heat rejection to the air from the aluminum block; he felt that coolant could simply be passed through the heater core, with outside air ducted through the core and exhausted under the car to provide auxiliary cooling. Several pre-prototype cars were built this way at his insistence, and (as you might imagine) all of them were dismal failures from a cooling perspective. After having one seize up while he was driving it at Milford one Saturday, he backed away from his theory and allowed the design to continue with a conventional cooling system (although with the world's smallest radiator, which caused many later problems in the field).

Headliners – the original program design called for a full stamped roof inner panel, perforated with hundreds of small holes for sound attenuation, and no headliner, to reduce cost. Following a December, 1968 development ride session for Senior Management in early station wagon prototypes at Milford so configured, it became obvious that headliners were required, and they were added to the program for wagons and hatchbacks. One of the Senior Finance executives that drove them described the cars without headliners as "like being in a tin outhouse in a hailstorm". Two months later, headliners were also added to the base "11" style notchback for the same reason. The "05" style panel delivery went to production without it, but it was soon made available as an option.

The "Base" 3-Speed Manual – following another executive drive review, it became obvious that the MB1 Torque-Drive manually-shifted 2-speed automatic, which was to be the base transmission, was hopelessly inadequate, and the base transmission must be a manual. Opel had a 4-speed available that was in high-volume production, but the Finance types insisted that the base transmission must be a traditional low-cost 3-speed, with the traditional profit-generating 4-speed as an extra-cost option. The existing Saginaw 3-speed ratios were unsuitable, so Opel was commissioned to tool up a new 3-speed derivative of their production 4-speed (there was no such thing as an Opel 3-speed, as the Europeans had given up on 3-speeds many years earlier). Opel did just that, and tooled up a new 3-speed from scratch, just for the Vega application, whose actual cost was higher than the (optional) Opel 4-speed due to the tooling investment and low production volume. Tradition prevailed however, the Finance types got their way, and the (new) Opel 3-speed became the base transmission, even though it cost more than the optional 4-speed. Both transmissions came by ship from Germany in HUGE wooden crates, 100 transmissions to a crate, and arrived in shipments of thousands of transmissions at a time. When the initial crates were opened, most of the transmissions were rusty from the salt air, and subsequent shipments had the transmissions sprayed with an oil and wax coating to prevent corrosion during shipment. Saginaw probably could have whipped up the desired ratios for both 3- and 4-speeds in less time and for a lot less investment, without the ocean shipping, inventory, and service parts problems that came along with the Opel transmissions.

Electric Fuel Pump – someone decided that the AC mechanical fuel pump was an ugly appendage sticking out of the side of the cylinder head, and the electric fuel pump was released to replace it. As you may know, the fuel pump circuit ran through a fuse in the junction block, through an oil pressure switch in the engine’s main oil gallery so the pump couldn’t operate with the ignition in the “On” position with no oil pressure; the “Start” position bypassed the switch to provide fuel pressure with low oil pressure at start-up. The oil pressure switch was a constant source of trouble, stranding many customers on the side of the road when it malfunctioned and killed the fuel pump. Our Lordstown-assigned company cars and “overnight” test cars all carried a “fuel pump kit” in a little Anacin tin in the glove box, consisting of a spare fuse and a cotter pin; if the oil pressure switch failed and killed the fuel pump, you’d pull the harness connector off the switch and insert the ends of the cotter pin into two of the three female terminals in the connector as a shunt, and the fuel pump would then work with the ignition in the “On” position, oil pressure or not.

Rear Suspension Design – the rear axle lower control arms were originally designed so they ran forward and inboard from the outer ends of the axle tubes at about a 45° angle and attached at the front to a bracket welded to the kickup area of the rear floorpan under the rear seat. All the first-generation prototypes fractured that panel due to braking and acceleration loads fatiguing it. The final production configuration, with the lower control arms running straight forward and attached to the rear of the inner rocker panel box structure, was a Milford Proving Ground “fix” that was cobbled-up to keep the cars running on mileage-accumulation durability test schedules, and was “crashed” into the body design very late in the program. The rear upper control arms, angled in the other direction, also failed the panel where they were attached higher up behind the rear seat, resulting in the addition of a large reinforcement in that area to stop the “oil-canning” noise from the rear bulkhead panel. The ultimate solution for axle control, adopted in much later production years, was the “torque arm” design.

Transmission “Tuned Absorber” – as you all know, the Vega engine generates a very high second-order vertical shaking force, making it a major challenge to isolate the engine vibrations from the body structure. Ultimately, the only way to “calm down” the drivetrain vibration transmitted to the body (which amplified it even more) was to cantilever a “tuned absorber” pack of steel plates riveted together on spring-steel arms from the back of the transmissions (nothing was known about rotating engine balance shafts in those days, which is the “cure” these days for cancelling second-order vertical shaking forces). This development also came very late in the program, requiring casting and machining changes for the tailshaft of all five transmissions to provide the attaching provisions; each transmission combination required its own part number of “tuned absorber” (vibration damper). The earlier 4-cylinder version of the Chevy II, with the “Iron Duke” 153 cu. In. OHV four, had the same problems, but nobody knew how to cure it – they just used huge, soft rubber engine mounts, a 5”-diameter prop shaft with an oiled cardboard liner, and they just “let it shake”.

Front Fender Liners – the original design provided for molded plastic front fender liners right from the beginning. I remember being in the Cost Review Meeting with the Finance types when they killed the liners, as the liners would have added $1.14 per side, or $2.28 per car to the product cost. One of the program objectives was to produce a 2,000-pound car to sell for $2,000.00, and every penny was watched. Five years later, after GM had spent millions to replace thousands of sets of rusted-out Vega fenders in the field, I remember very clearly the night on second shift when I was a Production Superintendent when the plastic fender liners were reinstated as a mid-model change during the 1974 model year. The Fisher Body trim, pierce, and flange dies for the fenders had already been built when the Finance types killed the liners late in the program, so the flanges stayed – only the die punches and buttons for the screw holes were removed from the dies; when the word came down to put the holes back in, they only had to make new punches and buttons and install them in the existing holes in the dies.

Quarter Window Moldings – the painted quarter window moldings on the base cars were supposed to be “cheap”, with the bright molding option being more costly (traditional thinking). After five years the Finance types finally figured out (as I had shown them initially) that the painted moldings added more cost to the car than the optional bright ones due to the special handling the painted moldings required; special magnetic spray racks in the Paint Shop to paint them as loose parts, racking by color on wheeled carts, transport downstairs to the Trim Shop, storage by the line, handling damage, etc. The bright moldings just came out of the box and went on the car. They never approved production release of the bright moldings as standard equipment on the “base car” in spite of the real cost savings, but they did finally admit that my numbers were correct. Traditional Product Cost thinking said bright was more expensive, and nobody was willing to buck the tide.

Front Seat Contour Appearance – the front seat backs on the base first-year 1971 Vega were designed to have an ultrasonically-welded feature to create an 8”-wide horizontal “tie-down” appearance about 10” down from the top of the front seat back, like the actual tie-downs used in the Custom Trim option by means of tie wires, sewn-in wire pockets on the seat cover, and hog-rings tying the wire down through the foam pad to the seat frame, but without the cost and assembly complications. This was a Fisher Body “first”, and was to be accomplished by gluing a special piece of fabric coated with a heat-curing adhesive to a recess in the foam pad; after the cover was skinned over the foam and frame and hog-ringed at the bottom, the seat back assembly was fed into a huge 4-station indexing dial machine in the middle of the Cushion Room. This machine was then to precisely position the seat back, and a copper electrode would then come down from above on a cylinder, press the cover material into the foam at the location of the heat-activated adhesive strip glued to the foam, give it a blast of high-current RF energy through the dielectric electrode, and the result was supposed to be the contoured “tie-down” look without the expense of the Custom Trim, as the heat from the RF energy (microwave energy, if you will) was supposed to cause the inner backing of the cover material to adhere to the activated heat-sensitive adhesive strip that was glued to the foam pad. It was a disaster – the results were thousands of seat back assemblies with the vinyl cover either fried, burned, melted, or that didn’t stick at all, and even the F.A.A. got involved, as every time the machine cycled and cut loose its blast of RF energy, it affected the instrument navigation systems of commercial airliners flying over the plant on final approach to Youngstown Municipal Airport. After about six weeks of “All the King’s Horses and All the King’s Men” from Fisher Body Trim Engineering and GM Research and Engineering Staff trying to make the thing work, they gave up and tore out the machine and scrapped it. That’s why you see some very early cars with base trim that have a “tie-down” feature near the top of the front seat back, and then it disappeared forever.

Bent Hatchback Lids – when production began, many hatchback lids bent slightly at the sides, just above the bottom of the window opening, after the torsion rods were re-set stiffer in the Trim Shop to accommodate the added weight of the glass and trim panels – you could stick your finger in the gap with the hatch closed and latched. We stopped production, and Geoff Waterworth, the Fisher Body Vega Chief Engineer, personally worked all weekend with the adjacent Fisher Body Stamping Plant to develop a solution by Monday; they worked out some die and material thickness changes, and by Monday we were running loose replacement hatchback lids through the Paint Shop to take care of the units already in the Trim Shop, and had a supply of lids to maintain production in the Body Shop by Monday night. Geoff was a credit to Fisher Body Engineering – a great engineer, leader, and a nice guy to work with who wasn’t afraid to get in close and get his hands dirty to help solve a problem.

Front Valance/Parking Lights – the original approved clay model had small rectangular front parking lights below the bumper. One morning when I was in the Studio, John DeLorean (GM Vice President and Chevrolet General Manager at the time) brought Zollie Frank, the owner of the world’s largest Chevrolet dealership (Z. Frank Chevrolet, in Chicago, which occupied almost an entire city block), into the Styling Studio to show him the clay and get his thoughts on the design. Zollie was a really big guy, with an even bigger cigar; he looked at the painted clay model, walked around it, and stood in front of it for a minute or so, and said "Get rid of those wimpy-looking parking lights – they should be big, round things that look like European driving lights". DeLorean turned to the Studio Chief, told him to make the change that Zollie wanted, and said they'd be back to look at it later that afternoon. After the two of them left, the Studio Chief blew a gasket and began to rant about "Who does he think he is – what does that big slob know about design?" He finally calmed down and put the modelers to work on large, round lamps, and DeLorean and Zollie came back later that day and approved the change. DeLorean mentioned to the Studio Chief as they were leaving that "Zollie sells more Chevrolets than anyone else on earth – he knows what the customers like." The car went to production exactly as it was revised that afternoon.

Wood-Grain Station Wagon – after two years of production, Sales asked for a wood-grain option for the Station Wagon, and it was released at the beginning of the 1973 model year. Nobody at Lordstown had applied wood-grain film to a car since the Caprice Wagon in 1969, and it was nearly impossible to apply to the Vega body contours at 100 bodies per hour without wrinkles and tremendous scrap of the material. Wood-grain was pulled from the production schedule, and we called in an expert from Schlegel, the wood-grain film supplier, to refresh everyone's skills and show us how to do it at our high line rate. The guy was a magician – he set up shop in the Company Car Garage, and trained a team of 12 people – six from each shift – on three wagons we sent through the system on purpose without the film installed. Everyone picked up the techniques, and we put wood-grain back in the schedule the next day and ran with no problems. We figured the guy could wood-grain a basketball without a wrinkle if we asked him to.

Exterior Paint Invented "On The Fly" – As initial production ramped up toward the goal of 100 per hour, a major problem developed in the Paint Shop. At 85 per hour, the incidence of runs, pops, and sags became a major issue, with nearly 100% of the units requiring repair, and we had to plateau the rate through the spray booth at 85 per hour. We simply couldn't lay the paint on fast enough with conventional pressures and tips, and when we increased pressures and opened up tips, we got runs and sags everywhere. Fisher Body Paint Engineering sent in their troops, and they didn't have a handy solution, so they called DuPont (lacquer paint supplier); DuPont sent in a small army of experts and chemists with two mobile paint laboratories. This bunch literally developed a whole new paint chemistry and application specifics over a weekend (NAD – Non-Aqueous Dispersion Lacquer), and we had production paint colors to that new formulation within a week, which enabled us to continue the production ramp-up successfully to 106 per hour in the Paint Shop (the Body Shop Main Line ran at 109, Paint at 106, Hard Trim at 104, and Chassis & Final Assembly at 102 in order to maintain 100 average off the Final Line with the inevitable occasional short stops for minor breakdowns. Masking, painting, and demasking the GT option's "skunk stripes" was something to see at 106 per hour!

Even The Broadcast Sheet Was Different – the normal Chevrolet Broadcast (which many people refer to today as the "Build Sheet") was an 8-1/2"x 11" printed form, with many boxes for part numbers and/or broadcast codes for both Body Trim and Chassis operations. When I began to develop the Vega Broadcast sheet long before production started, it became obvious that we couldn't use the standard Chevrolet sheet, as they were printed in about 30 locations throughout the plant on teletype printers (the ones that used the little hammer striking characters on a laterally-shuttling carriage), and it wasn't possible for the teletype printers to print the standard-length broadcast sheet at 106 per hour. About 80 per hour was the best they could do (none of the other plants had ever run at more than 65 per hour). There was no help in the wings from the printer manufacturer, so I arbitrarily cut the length of the sheet in half, condensed the codes, and created a Body Broadcast for Trim and Final operations and a Chassis Broadcast for Chassis and Engine Line operations; this was the only way the printers could keep up with production. That's why the front end of a Vega on the Final Line looks like it's "papered" with sheets – it took twice as many Broadcast sheets per car as at any other plant (and about 600 of them per hour filled up the trash cans in a hurry at the end of the line!).

Although none of these issues relate directly to the Cosworth, they illustrate some of the interesting episodes in the development of the Vega and its production system, which later provided the foundation for your rare cars. In retrospect, I think personally that if the stillborn "L-10" engine had been approved and gone to production in 1971, there might not have been any impetus later on to develop a performance package like the Cosworth. I drove several "L-10"-powered prototypes, and they really hauled! But, for all of you, the premature demise of the "L-10" is what eventually made the Cosworth possible.