iCar 11/07/07

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Images :: Jason Hill (Design by 11), Aptera, Darren McKeage, Foose Design, Nathan Armstrong

When he was eleven years old, A3Design Group president Nathan Armstrong attended the Birmingham Motor Show in the UK. He remembers the day as typically English – cold and drizzly – and the air around the displays redolent with gas fumes and rubber. And then there was the car: a 1985 Lamborghini Countach 5000S – gleaming red, oozing with boyhood possibilities. Very much the epitome of the 80's vehicle, the car presented such an overstated, aggressive visual aesthetic that to fight the urge not to be instantly infatuated was an effort in futility. Brash, excessive, and full of testosterone, this Italian icon of the day would stick in Armstrong's cranial closet as the significant turning point shaping his design career.

Time shifting 22 years ahead, away from the Birmingham drizzle, finds the now locally situated design engineer sitting in elemente's boardroom in downtown Calgary reflecting on his life-altering encounter with the Lamborghini.

"That was the first time I woke up out of a dreamy, child-like mind state and saw something real," he says. "I have a strong suspicion that we spend the majority of our adult lives trying to re-create the best moments of our childhood."

As a boy, he watched his father, a luthier, turn pieces of old wood into guitars of remarkable beauty. Growing up, Armstrong sought to fulfil a similar vocation, though in a very different realm. The moment with the Countach made sure that it would be all about cars.

His first foray into the automotive world occurred while studying drafting at Golden West College in California. Working as a Jaguar and Lotus mechanic in Costa Mesa, he learned first hand a 'hands-on' approach on how to build automobiles. "That was the real education," he says. "Working on cars physically."

After college, Armstrong worked briefly for Arrowhead Products on Delta IV rockets and joint strike fighters, before being hired by legendary concept builders Metalcrafters to work on show cars like the PT Cruiser, the GM Precept and the Cadillac XLR.

Pictures:

Details:

Armstrong's participation on the now famous Foose Hemisfear concept project involved body and chassis engineering. Chip Foose brought in and white-light scanned a 1/4 scale model of the open wheeled 500 HP concept. Armstrong then worked closely with a friend to develop the exterior body surface in GeoMagics, which then received his signature engineering evaluation and refinements. (See images for the finished product.)

After Metalcrafters, Armstrong joined Aria Group as Lead Project Engineer, where he built concept cars and preproduction prototypes. Finally, in 2004, after helping to pioneer and perfect low-cost, low-volume manufacturing techniques, Armstrong established A3Design Group to design, engineer and assemble custom vehicles and vehicle parts.

Armstrong's design-engineering goal is to turn a designer's vision into a working vehicle. Inspired by the work of designer-engineers like Ferdinand Porsche and British contemporary Gordon Murray, A3Design Group has engineered the T3 Motion Standup Vehicle and the Dodge Rampage. Many prototype projects remain on the level of concept, destined to tour the show circuit before finding 'rest' in transportation museums. However, a number of Armstrong's vehicles have gone into low-volume production. Most recently, he was the primary body and interior engineer on the Aptera (see sidebar), a high-tech, environmentally friendly vehicle designed to run either on electricity or as a gasoline hybrid.

The crisis ::

By the time Armstrong's childhood dream came true with the creation of A3Design Group, his passion had carried him far beyond the aesthetic pleasures of making visually responsive designs to the brink of a cultural revolution in automobile design – construction and ownership.

For the past ten years, global concerns over greenhouse gas emissions and the limit to fossil fuel supplies have led to calls for a complete overhaul of the automobile industry. Yet, for Armstrong at least, change has come with excruciating slowness, if it has come at all. Some of the problem, he believes, lies in outdated business models. Large car companies (i.e. the Big-3) would rather maintain their current approach to production than face the spectre of massive layoffs. But how do you layoff a significant portion of the automotive workforce and still keep friends? Perhaps a retooling of the existing Mesozoic business model, and CEOs with an environmentally friendly bear trap in the governmental feeding trough would fix the Big-3's prehistoric mentalities? Yeah, perhaps. . .

Additionally, the high cost of tooling dies (one million dollars plus per machine) makes manufacturers reluctant to implement radical changes to car designs, some of which have been in production for more than thirty years (Ford's Mustang being one of the most glaring examples of American design apathy – oh, I'm sorry, was that the sound of a fender being retooled after 10 years?).

But according to Armstrong, the factor that has most slowed reform of the automobile industry is attitude. Manufacturers are so accustomed to large-volume production that they continue to build regardless of demand. Again, three old boys hopelessly stuck on a 1965 demand model, failing to address market conditions or bottom lines, continue to force-feed mediocre products down the throats of the masses – one Dodge Calibre at a time. Henry Ford's age old adage 'You can have it any colour, as long as it's black' still applies, with 'black' now being replaced by 'mediocre.'

Armstrong cites an astounding fact: 2006 marked the first time in history the number of registered cars on the road in the U.S. exceeded the number of licensed drivers. Translated – each U.S. household, barring income, could theoretically have three H2s, two Ford Thunderbirds and one Dodge Nitro in its driveway. "There are enough cars in the dealerships and on the used car lots," he says, "that they could stop making cars today and everybody in North America could have a car for the next twenty years." And yet car makers continue to produce at their usual volume, apparently because they forgot to check their emails. "They perfected the art of building a car in 3.5 minutes," Armstrong says, "when they should have invested in finding ways to produce low volume vehicles and still make a profit." Or design better cars to compete in a global market.

You say you want a revolution?

In his quest to turn the designer's vision into reality, Armstrong has found exactly the vision the large-scale automakers lack. New manufacturing technologies, materials and software now mean that designs can be brought to life much more easily than ever before. Rapid prototyping, for instance, prohibitively expensive in the past, is now a viable means to construct functional plastic parts using ABS printers. Although currently used only for one-off prototypes, Armstrong predicts that new technologies will soon replace current techniques. Parts that 'pop out of the machine, Star Trek-style' are in fact the wave of the future. Tribbles not included.

Armstrong also notes that construction costs are dropping as newer and cheaper materials begin to replace traditional metal parts. Urethanes, silicones, and composite materials have all become accessible in the past five to ten years, and even glass products can now be manufactured at next to no cost. Carbon fibre is one of the best examples of this new trend.

New computer software technologies have also rendered the manufacturing process both faster and more efficient. Armstrong explains that before a car is even assembled on the shop floor, it is modelled virtually using computer aided drafting (CAD). Computer efficiency and safety tests can even be performed online, with results so accurate that an actual crash test may no longer be

unnecessary. Government agencies are beginning to approve some models based on this new development.
Another significant practical result of new automotive technologies is increased safety. A common myth, Armstrong says, is that lighter composite materials offer less protection. In reality, however, heavier metal vehicles have a higher level of inertia, resulting in greater damage to the vehicle and its occupants in an accident – a sort of 'bowling ball versus beach ball' effect. By contrast, composite vehicles actually offer more protection in a crash because they offer less inertia and lower energy absorption.
And as for cost, Armstrong suggests the economics of this kind of production are as, or more, viable than conventional manufacturing. While initial build costs are higher because of the complexity of labour involved, economies of scale, etc., tooling costs are actually significantly lower. As a result, manufacturers like A3Design do not need to produce as many vehicles as the big boys to see profit on their initial investment. It is a sustainable model, says Armstrong, one that does not demand a high volume of vehicle production in order to provide substantial returns.

iCar ::
"Imagine if you can a vehicle being like an iPod, but with wheels," Armstrong says. On the level of design culture, the emerging automotive revolution has blurred the conceptual line between vehicular construction and electronics manufacturing. Once damaged in an accident, composite materials are disposable, much like a broken laptop. However, because building costs are low and materials can be recycled easily, replacing a vehicle is not as difficult as it once was. Consequently, Armstrong says, we are seeing a shift in the very idea of the automobile. No longer keepsakes to be repaired over and over again, vehicles are becoming more akin to consumer electronic items – useful, efficient, and ultimately recyclable.
Armstrong envisions automobiles of the future returning to the mechanical simplicity of classic cars like the Volkswagen Beetle, with low-maintenance electric motors. Simultaneously, he foresees the electronic components inside vehicles becoming more and more sophisticated, so that occupants will be able to interface with their cars as extensions of their home computers.
Inevitably, though, Armstrong's model will require a radical shift in consumer attitudes. On this model, consumers would purchase their cars directly from the designer-manufacturer, ordering to their specifications, much like ordering, say, a Dell computer. What people will have to get used to, Armstrong notes, is walking home empty-handed and waiting six to eight weeks for their cars to be assembled. He feels, however, that the sacrifice would be well worth it for vehicles custom-built to consumers' needs, rather than lower quality, pre-fabricated automobiles.
This 'client spec/customization' factor gives whole new meaning to the term exclusivity. Like the Foose Hemisfear, Armstrong envisions a day when clients will work with his team on their 'dream concept' – much like a homebuyer would employ an architect – to deliver a vehicle that meets their design wishes exactly. Imagine 2+2 incorporating F430 haunches, a Vantage hood line, BMW V10 powerplant, and a custom interior finished off with a carbon fibre roof with expansive glass treatments. In your driveway, in under three months. Possible? Yes. "This," Armstrong affirms, "is very much a reality." Cost will of course dictate the final build, but for some, the price of individuality and exclusivity will be no object.

The Green-Mobile ::
The automotive revolution Armstrong proposes extends far beyond the borders of design and construction. New methods and materials ultimately have wide reaching and beneficial consequences for environmental sustainability.
Armstrong notes that car construction is making increasing use of citrus-based (mmm, oranges) resins and natural fibres, as well as recycled or recyclable materials. This a marked contradiction to the U.S. models: these cars will literally be made out of lemons.
Manufacturing composites does not produce volatile organic compounds (VOCs) that contribute to global warming. As Armstrong says, "The modern factory of this type wouldn't be belching out smoke or putting sludge into the rivers. It's a very clean, almost clinical, environment."
Even more significant for the environment, however, are developments in engine technology. Quoting U.S. Department of Energy research, Armstrong says electric vehicles could replace 73 per cent of light duty vehicles on the road today with no change in infrastructure. To avoid excess demand on the power system, people would be encouraged to charge their cars at night, when grid power is underutilized. Armstrong adds that by incorporating solar panels onto garage roofs this could significantly supplement charging. The telling result? A one-third reduction in the consumer use of oil, a 27-40 per cent drop in tailpipe emissions, and ultimately, a sustainable solution to the automobile fuel crisis.
In the past, EVs have failed to match the range of their fossil fuel counterparts. Thanks to new research and development, however, the situation has radically changed. GM's EV-1 (see Sony Pictures, Who Killed the Electric Car?) was capable of 160 miles on a single charge, a number that well exceeds the 25-40 mile range of most drivers. The Aptera boasts a similar performance, and its hybrid option has tested at 330 miles per gallon. With numbers like that, even

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companies like Bosch are producing electric engines that will 'plug and play' in any automobile structure. Clearly, Armstrong suggests, "Automotive manufacturers have no more excuses for denying that the electric motor is the rightful successor to outdated and dirty fossil fuel engines."

The one drawback with electric vehicles certain hybrid manufacturers rarely mention is the voltage factor. A vehicle like the Toyota Prius puts out roughly 500 volts, enough to kill a good sized Heifer dead if involved in an accident. The movement to less voltage, in the Aptera for example, is another critical component in the successful evolution of the EV.

According to Armstrong, however, the key to successful electric vehicles lies in 'lightweight, high aerodynamic efficiency.' "A heavy electric car – you might as well forget it," claims Armstrong. Excellence of design, state-of-the-art materials and good engineering must all work together in symbiosis to produce a design that is not only visually appealing but also functional on a daily basis and that will ultimately work to help the environment as opposed to killing it slowly, one penguin at a time.

Car Trek :: The Next Generation

In the end, Armstrong's ultimate goal is to 'get people comfortable with making things.' "The world needs all the creative design input we can give it," he says. "There's no lack of space for creativity. So let's get these creative ideas and these sketches out there and into real world projects."

In 2006, Armstrong moved to Calgary, the hometown of his wife of seven years to teach at the Alberta College of Art and Design (ACAD). Having taught engineering at Pasadena Design Centre, he proposed a course, first entitled Introduction to Transportation Design and later Design for Manufacturing, slated to run later this winter.

"What we're trying to do," he says, "is run students through a complete project from start to finish, encompassing every aspect of what it takes to get a design out into the real world." Although focused on transportation, the course is applicable to all manufacturing. A special practical feature is the students' involvement in an upcoming public transportation project for the city.

In the near future, Armstrong plans to set up shop in Calgary with up-and-coming design wunderkid Darren McKeage and continue the revolutionary work of A3Design Group.

As of today, his childhood vision remains undimmed, the headlights of the Countach still emblazoned on his retinas. Like his guitar-making father before him, he continues to transform unformed materials into beautiful objects. Unlike his father, Armstrong's enterprise carries with it a topical urgency that can no longer be ignored. "The world doesn't urgently need more guitars," he says. "But it definitely needs improvement in its transportation infrastructure." He adds: "Whether we do it or the next man does it, it's going to have to happen. Because everybody knows the oil is running out, everybody sees what's coming in the future. And if we don't make this happen, we're going to be in a real mess. So if we want to keep this social model where you have a car and freedom to go where you like, this change is going to have to happen. And it can, quite easily. It's simple. It's not rocket science." Well at least not for some designers.

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