Advancing Culture As Well As Cars: Envisioning Social Progress Through Transportation Design

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ABSTRACT

Inviting students to design the future of transportation is not uncommon. Asking them, however, to imagine a new future for our society by way of wholly reconsidering what the future of Transportation Design could be provides a unique pedagogical opportunity to expand conceptual visualization skills.

The 2010 Senior Transportation Design Class of the University of Cincinnati’s School of Design was tasked to identify a significant societal need or issue that could be directly addressed by both realistically and radically rethinking current transportation paradigms affecting the issue. Their Capstone Projects were dedicated to researching, developing, and resolving designs envisioning new integrated transportation paradigms that would positively impact society.

The resulting projects ranged in scope from the pragmatic to the dramatic and in scale from the wearable to the inhabitable. Projects extensively utilized PACE CAD software (Autodesk Sketchbook Pro, Alias Automotive, and Maya) for design development, visualization, and final model creation through rapid prototyping.

The two projects discussed in this paper are: 1. A user-assembled automotive space-frame shipped in crates doubling as assembly bucks. This vehicle design gives the growing DIY market a more involved ownership experience including maintaining their vehicle’s longevity. And 2. A minimal foot-print personal vehicle that attempts to be a viable replacement for today’s automobile in order to address increasing road congestion and resource consumption by first solving the social stigma and fear today’s drivers may have for transitioning into a smaller vehicle while larger ones still share the road.

Projects presented demonstrate exhaustive design process and compelling visuals (2d and 3d), but their primary goal is to use the investigation of the cultural intersection between transportation design and it’s determining influence on our societal fabric as a method for expanding the creative exploration skills and social awareness in our students.

Keywords: design education, curriculum design, CAD.

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1 INTRODUCTION

Raphael Zammit joined the University of Cincinnati’s Industrial Design Program within the School of Design in the fall of 2009 as an Associate Professor and is currently transitioning into the role of Coordinator for the Industrial Design Program. He teaches primarily Transportation Design studio courses and technical visualization studios (2d and 3d traditional and CAD techniques). In addition to the three years at UC, he has taught Transportation Design as an adjunct instructor for two years at the Fochochschule in Phorzheim Germany while working in the area as an automotive designer.

Prior to teaching he gained thirteen years of professional experience in the automotive industry as an automotive designer. His first five years were spent in Europe as a Creative Designer for Porsche A.G. in Stuttgart, Germany and for the Volkswagen /Audi Group's advanced concept design studio in Barcelona, Spain. Upon returning to the U.S. he took a Senior Creative Designer position with Hyundai's advanced studio in Fountain Valley CA. with several experiences working in Seoul, Korea. He then joined General Motor's advance design studio in North Hollywood as a Senior Creative Designer which led him to Detroit to work at the GM Tech Center in Warren MI. His six years with GM offered him a diverse range of design opportunities and experiences including a long stint in Global Brand Design Strategy where he interacted heavily with the GM's Marketing divisions and Advertising affiliates. It was this last experience that he revealed the potential of holistic conceptual thinking and began his investigations into Conceptual Visualization. His aim now is to train a younger generation to become not just designers, but passionate visionary thinkers.

2 BACKGROUND OF INDUSTRIAL DESIGN PEDAGOGY

Transportation Design curriculum and related pedagogy follow those of its parent discipline Industrial Design. The origins of Industrial Design were predominantly concerned with the beautification of commercial products, as evident from the turn of the century up to the 1950's when Raymond Loewy catapulted the profession into public awareness. Today, however, the practice of Industrial Design has matured beyond just aesthetics and manufacturing to encompass a far more holistic approach that conceptually rethinks a product’s function, economy, purpose, role, emotional essence, longevity, and ecology. Contemporary Industrial Design curriculums reflect this shift and encourage students to consider all aspects of a holistic design solution. But perhaps the widespread use of terminology such as ‘design solution’ inherently implies a bias that Industrial Design curriculums have towards pragmatic problem-solving.

Students are commonly encouraged to search for and consider improvements across all areas of a product - from the practical to the emotional. Yet it is the practical that is more commonly addressed within design education, often at the expense of the emotional. For example, Universal Principles of Design – a text growing in popularity, lists 210 universal principles for design education and reference. Of the 210, only 11 only loosely address issues of ‘emotional design’ and then only in terms of psychological functionality (again, problem solving). More specific to Transportation Design education is another widely used text, H-Point. It is dominated by course material surrounding the practicality of vehicle architecture and solving the user's pragmatic functional needs as the priority. In contrast, when asked what is good design? Professor Dale Harrow, head of vehicle design at the Royal College of Art (one of the longest standing and a prominent Transportation Design Programs), included early in his answer a discussion of the “...fantasies associated with the car: speed, freedom, comfort, and status”. While speed and comfort can be measured objectively, fantasies of them as well as even more ethereal notions of freedom and status cannot. Automotive Design education is uniquely placed somewhere between Industrial and Fashion Design, and seems therefore to be more comfortable and eager to seriously address issues of emotional content (equally) alongside function problem solving. It is important then to further identify both of these polar approaches to design, objective problem solving and subjective emotional intuiting, in order to discover why the first appears to be favored.
Aspects of a design that may be deemed practical or pragmatic are objective in nature. Their performance or application can be quantifiably measured against common or accessible norms. Aspects of a product's being or how it performs in regards to its utility, technical functionality, efficiency, economic profitability, materiality, and or manufacturability are all qualities that are scientific or numerically concrete in value. This category of product attributes is referred to in this paper as 'pragmatic.' In contrast, there are aspects of design that are abstract or intangible such as the inherent emotional content of a product, or the emotional response (connection) that a design is able to elicit from or project onto its user. These aspects are highly subjective in nature and therefore can be difficult to quantify. This is being addressed in two growing fields of research: material culture, and the biological nature of aesthetic universals. Assessment of the subjectively abstract however tends to generally be more qualitative and involves a deeper examination into the meaning or essence that a product may have or embody. Plastics being developed by GE to smell like suntan lotion or feel uncharacteristically squishy are examples of how a product may try to expand its holistic appeal or aesthetic identity beyond its primary function. Other subjective aspects of a product to be designed involve its social significance such as its longevity, nostalgic & traditional qualities, and brand equity. This category of product’s character is its 'essence.'

This second category is no more or less important than the pragmatic. However, innovations that occur only in the pragmatic realm may be more likely to yield only incremental improvements. However, innovations that consider the holistic essence of a product in addition to the pragmatic are more likely to generate fresh or even radically new thinking. In fact GE, with its notoriously no-nonsense and pragmatic business culture, is encouraging its industrial designers to ‘dream more’ as it continues to experience substantial profit increases attributed directly to such intangible design objectives. This holistically visionary approach to design development has more potential to generate truly inventive design breakthroughs and 'leap-frog' reinventions that surpass multiple incremental improvements in a single bound. These are the visionary designs that have the best potential to become classic and iconic.

The ability to produce visionary designs is a powerful skill set to develop. It is one that will greatly benefit clients and creators who are visionary enough to appreciate its application, and that have the courage and means to risk the significant investments required for such implementation. David Lyons, GM's Executive Director of Interior Design said recently, “Vision can't always wait for technology, sometimes it (vision) has to lead development (of technology)”. GM's bold affirmation of vision, as laid out by more of its visionary thinkers in Reinventing the Automobile, is seen in a comprehensive reimagining of the future landscape of personal mobility. A future where new interpretations of mobility afforded us by the Internet will intertwine the complex and ever evolving networks of energy infrastructure, e-commerce, and social media to radically change today's norms of transportation. Academia, where risk is encouraged, offers a perfect opportunity to learn such visionary design skills. The projects discussed in this paper are the results of a deliberate attempt to build this skill set at the appropriate student level - during their senior year.

3 PROJECT OVERVIEW

Brief:

- Identify a serious societal issue, concern, or need (macro scale) that you personally care about. It can be philosophical or practical - the broader the better.

- Design a transportation vehicle or system that attempts to address or resolve that need / concern / issue in some innovative way.

Participants:

- UC School of Design Transportation Design senior class: Erik Chapman, Clay Davis, Jason Fuller, David Heyne, Charles McCusker, Brandon Wilson
UC Professor of the Transportation Design senior capstone studio: Raphael Zammit
CAD & rapid prototyping fabrication support: Scott Lincoln, Aaron Rucker

Special thanks to UC Professor Brigid O'Kane (UC Transportation Track Creator)
UC SOD Director Sooshin Choi

Parameters:
- Individual projects ~ senior capstone (not team collaborative efforts)
- Demonstrate mastery of traditional and CAD skills learned throughout the undergraduate education

Process:
- Consider and envision the broadest possible implications of both the issue to be addressed and the effect of a potential solution
- Research the issue generally, before specific criteria for user, cost, feasibility, and technological considerations
- Imagine and document a back-story around entire project (specific, detailed)
- Create a compelling ad campaign (hook, pitch, tag line ~ to grab and direct attention to issue, to sell your solution, and be easily remembered
- Design development (2d sketching, 3d modeling) traditional and CAD techniques
- Critical review of designs, equally for reach as well as pragmatic resolution (dream & solve big)
- Extensive design evolution and refinement to push creative conceptualizing, pragmatic resolution, and technical execution of final designs
- Execution of final designs using CAD tools and rapid prototyping fabrication.

Deliverables:
- Process book documenting:
  - Research
  - Written outline of conceptual thinking,
  - Design development (2D sketching, 3D modeling)
- Final presentation Assets:
  - Final 2d presentation boards
  - Finished 3D presentation model (hard-model)
- Verbal presentation:
  - Explanation of final design decisions (and process)

Timeline:
- Quarter 1: Autumn 2009
  10 weeks ~ Research, early conceptual development
- Quarter 2: Winter 2010
  10 weeks ~ Design development: (final 2d design, 3d CAD models started)
- Quarter 3: Spring 2010
  10 weeks ~ Final design evolution, resolution, refinement
  (3d CAD models finished & fabricated via rapid prototyping, final 2d presentations created)
As described in the Project Brief, the goal for the students was to seek out a societal issue that was seemingly too big to tackle. Much time and effort was spent in the first weeks of the project encouraging the students to simultaneously increase the scope of their chosen issue, looking the macro impact it would have on society, as well as hone in on precisely what the issue or concern specifically was or entailed. The goal from the student perspective was to increase their capacity to handle complexity in their designing as well as expand their sense of social awareness. Then to incorporate this newly formed empathy for the global condition into their design development so as to increase the benefits of their design beyond just the immediate product being designed.

Equally important, however, was the hidden pedagogical agenda to develop the students’ creative visionary design skills while in a safe and relatively risk free environment (academia vs. the business world of professional design practice). The project was constructed to foster the students’ learning how to stretch not only their imaginations but also their abilities to visualize and realize such visions. The design maturity required to take on such a challenging endeavor was suitable for the Senior Capstone Project in that it is a year-long in-depth inquiry intended to showcase the culmination of all that the students have learned from their undergraduate experience.

The project began with the students being asked to invent and then carefully consider broadly hypothetical blue-sky scenarios. Doing this required the students to break out of their normal scope of perception. They were encouraged to dare to dream of the most far-reaching potential responses to match the gravity of the issue they were researching – even if these potentials seemed highly unlikely or infeasible at the outset. Once the students became comfortable imagining in general macro terms of open possibilities, they were immediately asked to switch gears and begin to make these scenarios as concretely real as possible. The development of these seemingly unreal scenarios into detailed realities was to take the analytical skills that they were comfortable using on a localized pragmatic level and apply them on a highly conceptual level. The creation of these detailed back-stories (with the help of extensive research) acclimated them to look for specific opportunities for innovation surrounding areas of design investigation other than the pragmatic problem solving of localized functionality. This back and forth exercise of switching between expansive contemplation and minute analytical scrutiny was intended to increase the students’ depth of focus as well as strengthen not only their analytical skills but also their synthesizing skills through repetitive detailed scenario formations. This process took place mostly in the first of the three quarter project. This phase was crucial in both conditioning the students to be open to all possibilities as well as challenging them to continually refine their focus of opportunity. By the end of the first quarter most of the students’ general conceptual directions were impressive in their reach and offered sufficient potential for pragmatic investigation.

Before discussing how these pedagogical principles were specifically applied in student projects, it should be noted that this approach does involve risk on many levels. Firstly, the notion of encouraging students to intentionally indulge in ‘blue-sky’ daydreaming (even if only for a short time) raises the concern that a student may find him or herself falling in love with a concept that has little or no chance of being brought back to reality. Great discipline is therefore required to allow total suspension from pre-judgment for a period. When it is time for the project to advance to the next stage, however, fantasy must be recognized as such. That said, ‘dream directions’ do not necessarily need to be abandoned just because they may be highly fantastical in nature. Very often, if a student has a strong attachment to a particular direction, there is something of value in the conceptual thinking even if it may appear outlandish in its initial form. In these cases, it is important to harvest a student’s interest in the direction rather than dismiss it outright.

An effective approach is simply to permit the direction to be pursued as long as it can somehow be brought into practical reality. Here multiple variations would need to be explored due to the likely large gap between fantasy and reality. This is excellent however in that it yields further practice of detailed analysis and scenario resolution while also maintaining the student’s personal interest.

A second, more subtle yet equally potent, risk is that of doubt from ridicule. Indulging in visions of grandeur or ridiculous flights of fancy, especially in the earliest phases, can be seen by onlookers (in this case, other professors or students from other classes) as nonsensical and therefore a waste of precious time and effort. Such criticism can take on detrimental momentum very quickly. It is for this reason that professional design studios will often keep highly experimental design projects hidden
from their clients and even from senior management until they have had time to mature them to a level that their extreme reach has been backed by the sound development and the exceptional execution needed to sell a concept's more progressive or controversial design. In fact, the automotive industry has even institutionalized this practice by creating advanced studios that are deliberately located offsite and far away from peering eyes. For students, this is not an option. Instead, it is important to instill in them a strong confidence in their work and a thick skin to deflect early criticism.

4  PROJECTS: PEDAGOGY DEMONSTRATED

Two of the 6 senior projects were selected for discussion in this paper due to the diverse range of issues, conceptual thinking and pragmatic approaches involved in their development and resolution.

These projects are:
1. A do-it-yourself self-assembled modular car that is a response to the ecological concerns and growing social discontent with the disposable modality related to our culture of overconsumption.

2. A small footprint vehicle that can be used practically and safely on our roads now alongside today's larger cars and trucks. This vehicle would be designed to help encourage the transition from our familiar cars over to smaller efficient vehicles that are more appropriate to the way we most commonly commute (low occupancy). The issues addressed here is the cumulative and intertwined detrimental effects that growing urban density is having on our transportation infrastructure and energy resource scarcity. As well as the resulting cost on increased national security (oil related conflicts, and terrorism) and the total effect this has on our economy.

Project 1: by Charles McCusker

DIY Car: Go your own way
~ Pioneering a conscientious alternative

Fig. 1: Final design CAD illustrations by Charles McCusker.

This project proposes the design of prefab, modular car that is designed to last for generations instead of years and is meant to stimulate ownership value through fostering a long-term relationship between the product and its user. This engagement is achieved in that the vehicle would be ordered and delivered as to the user's home in a self-assembly kit. The user would follow the simple instructions aided by a modular space frame that was designed for easy assembly and disassembly via specially designed self-guiding 'sure-lock' connection nodes on the ends of the frame pieces (Fig. 2). In addition to the frame, lightweight foam body panels with a vinyl laminate cover (replacing painted body panels) easily attach to the space frame once fully assembled.
Explanation of the particular user is an important part of this design proposal. It is unlikely that many customers would be willing to go through the trouble to assemble their own car. Despite this assumption, Charles found in his research that the do-it-yourself market was one of the fastest growing and offered a demographic sub-genre that was large enough to warrant low volume production runs of extruded aluminum parts comprising the majority of the frame pieces, whereas more costly castings would be designed to be few in number, standardized, and to have a life expectancy extending their production run (est. 30 years, Fig. 3) more than long enough to recoup the initial tooling investment.

The specific sub-genre of the D.I.Y market that Charles decided to target were on average 45+ years of age, highly educated, married, affluent homeowners ($75 K average household income) and were found to be very active in their communities (volunteering) and willing to pay up to 20% more for environmentally responsible products. The most surprising facts discovered about this group that Charles named 'P.C.Es' (Pioneers of the Conservation Economy) was their dissatisfaction in the low quality of disposable products today and that they were far more likely to engage in D.I.Y activities, such as automotive repair, than the average 18+ adult. Charles’ conceptual focus then centered around providing this small but vocal and potentially influential user group a ‘vehicle’ by which they could promote their values and actively campaign their cause simply through an enhanced ownership experience. The modular design of their car is therefore intended to supply them with a solid chassis that would not only last long enough to be reconfigured to accommodate their own changing needs as they go through life, but also to be passed down to their children (Fig. 4) if they so choose. The negative association of owning a product for 30 years would be gladly offset by this group for the chance to hold onto one product that is of superior quality and that they know inside and out, including how to fix or repair when needed due to its designed ease of disassembly.

Fig. 2: ‘Sure-lock’ connection nodes, finished frame subassembly.

Fig. 3: 30-year lifecycle & expense comparison between conventional and modular car.
Further investigation went into determining which major drive-train components would have to be swappable since they would wear faster. Also, it was determined that critical components and sub-assemblies of the frame should be preassembled by factory or dealer certified technicians in order to guarantee a measure of predictable safety and legality.

Though this detailed conceptual thinking was commendable, by midway through the project, it was becoming obvious that most of the design development was centering around serious engineering research. And while this student was particularly inclined towards engineering thinking, difficult questions about feasibility, safety, and structural integrity remained unanswerable or at best assumptions without full and serious engineering validation. Additionally, another glaringly obvious problem lingering was that this concept at its most fundamental level was neither original, nor particularly innovative as it stood in its current execution.

The break-through point of this project came from Charles' stepping back and realizing that his limited engineering expertise would not warrant investigation of the frame alone. Therefore, if any significantly new innovations were to be discovered, he would have to once again increase his scope to examine the larger story. This visionary re-scoping ultimately led him to focus less on the feasibility of the frame and more on the user's process of receiving and assembling the it (Fig. 5).
Careful examination of how the parts would be stored, packaged, and shipped led to further searching for consolidation of parts and the designing of stiffening panels, pre-fabricated subassemblies (fig. 6), and most importantly the step by step build cadence of the entire vehicle. This focus led to a final solution that was as much about the design of the shipping crate and the optimization of the order of the frame pieces within it, as it was about the design of the frame itself (Fig. 7). The final solution and execution was not only a model of a handsomely designed frame modeled in Autodesk Alias CAD software and fabricated via SLA, but an impressive 3d animation of the frames step by step assembly process (Fig. 8) complete with the shipping crate doubling as a work bench and assembly buck during the construction. All this was visualized in Autodesk Maya.
Fig. 8: Maya animation of the frames step by step assembly process.
Project 2: by Brandon Wilson

Harley Davidson Switchback: Rebel with a cause
~ It takes a hog to clean up a pigsty

The social issue addressed by this project may seem uneventful at fist. Growing population numbers lead to ever-increasing gridlock and wear on transportation infrastructure. All of which contributes to the increasing demand on diminishing oil resources. Thus giving rise to global conflict, which in turn requires substantial investment in national security – ultimately becoming a substantial drain on the U.S. economy. However, Americans love their cars and are unwilling to give up the physical and expressive freedom that we hold so dear in our car culture without a seriously good reason (or attractive alternative option).

Although an alternative already exists for personal mobility, the motorcycle (according to Brandon’s research) fails to satisfy the needs of the masses due to perceptions of being: 1. unsafe, 2. impractical, and 3. socially inappropriate for those who do not associate themselves with the associated image of being especially sporty, adventurous, or even unlawfully rebellious. This project therefore set its aim on envisioning a much-needed viable personal transportation alternative that by design would address and overcome the three negative stigmas that Brandon had identified in his research.

The conceptual novelty to this approach was therefore not in attempting to solve a crisis in national security, ecology, and economy but rather a crisis in identity and practicality. In a similar vein as the previous project, there is nothing new about creating yet another low occupancy, small footprint vehicle. Alternative personal transportation has been explored by students, independent designers, and companies for as long as the automobile has existed. In fact, several such vehicles are readily available for purchase today. The difference and thus the focus of this project therefore lies in the observation that apparently none of these alternatives seem to be compelling enough to pull the majority of Americans out of their cars voluntarily. Yet potential crisis looms and there is a need for an alternative vehicle that must function in today’s existing paradigm while a transitioning towards a more sustainable future scenario evolves. Brandon’s design exploration sought to answer this call with a compelling alternative that matches or outperforms the safety requirements of cars and would therefore confidently handle a collision with either cars or trucks sharing the road today (Fig. 9). This vehicle must also offer protection from the elements, a relaxed driving orientation, and sufficient practicality for ingress / egress, passenger capacity, and luggage capacity that are found in conventional cars, yet appropriately scaled for this vehicle. Finally, this concept must appear to be naturally comfortable on the road alongside cars and trucks. It should signal a progressive modernity that points to the future without appearing to be so advanced that average car drivers would not be able to see themselves driving one on a daily basis.

Fig. 9: Relative strike zones and footprint of cars, trucks, and proposed concept.
Brandon's research estimated a total cost assessed with the crisis described at the beginning of this project being in the trillions, and likely in the tens of trillions if one would attempt to put a price on eventual environmental damage. He envisioned a scenario in which the federal government, seeing the cost-benefit analysis, would supply initial investment capital to fund research, development, and vehicle subsidies necessary to offset the high cost of implementing new safety technologies. With this in mind, Brandon first ideated around the issue of safety. His functional innovations included using durable airbag technologies currently used in the construction industry. These airbags are used to lift loads that are several tons and would be used as the basis to deploy and support selective exterior body panels that were reinforced and designed to telescope out on all both sides of the vehicle (Fig. 10) effectively doubling it's width to closely match that of a car. The airbags would be specially designed to progressively deflate under the crushing force from the impact of another vehicle. This would be possible by manufacturing deliberate weak zones in the bag that would tear and release air pressure as a way of absorbing and dissipating impact energy.

In a normal driving state, this vehicle would be roughly the same length but half the width of an average small car. This would provide enough of a presence on the road to both ensure visibility to other car drivers as well as inspire a sense of security in its own driver and occupants. The ride height however would be considerably lower than that of the average car in order to improve aerodynamics. The drawback to this decision is twofold. First it lowers it’s own occupants relative to the bumper strike zones of cars and trucks. To compensate for this, the vehicle would incorporate a reinforced inner tub (Fig. 11) that both cradles its occupants as well as houses the airbags deploying the body shields. These, when deployed are guided by scissor sliding tracks on an upward angle to raise the body shields up to meet the strike zone of convention care and truck bumper zones.
The second drawback to the lowered height is the need to incorporate seating that mounts cantilevered arms capable of lifting occupants to a height that clears the sides of the tub when entering the vehicle. This provides the added benefit of being able to assist less physically mobile drivers into a lower sitting ride height. The vehicle would make use of a single door that opens on one side only and most of the roof. This door would lift in a segmented gull-wing fashion to provide protection from rain, snow, or sun when entering or departing the vehicle (Fig. 12). Additional practical conveniences are enabled in a tandem rear seat that is capable of sliding rearward to accommodate additional rear passengers in sitting in a linear configuration that would straddle a bench-like seat similar to how a motorcycle could accommodate additional passengers. Though this option would be less spacious than a car when the rear seat would be used for more than one passenger, it would be a worthy compromise given the rarity that current cars drive under full occupancy. Behind the rear seat would be enough storage space to accommodate a five to six bags of groceries or luggage for two adult passengers.
With most of the ‘pragmatic’ requirements addressed, the design of the vehicle was well underway. Yet its aesthetic execution was over simplified in its modernity to the point of appearing toy-like. It was at this stage that the project really came to life and began to examine and address more of the ‘essence’ issues as well as the pragmatic ones. Brandon’s initial conceptual thinking was perfectly and inventively on target as reflected in the brand and name that he had chosen for this vehicle from the beginning. His strong feelings that only a brand like Harley Davidson, with its cache, bold swagger, and authenticity of no-nonsense street credibility, would be able to pull off such a daring attempt at reinvention while simultaneously maintaining a sense of trusted familiarity (Fig. 13). Drawing from a mixture of inherently classic automotive proportions as well the tough presence of Harley design cues, Brandon was able to entirely reshape the aesthetic message for his “Switchback” to communicate a bold fist-in-the-wind nose, long hood with a short tight cockpit-like windshield, long unbroken rocker lines that added a needed sense of structure, weight, and protection to the lower portion of the vehicle, as well as horizontally linear gestural trim accents that gave a narrow vehicle an added illusion of width (Fig. 14).

The end result was a confident blend of a near-gangster like boldness and seriousness as well as modern touch of sophistication and class with its long sweeping lines and clean surfacing.
Fig. 14: Final design conveys a bold toughness required to help convince users of its extreme safety, while simultaneously exuding a classic familiar elegance that communicates itself as a serious, attractive, and practical commuting option alongside today’s cars and truck variants.

5 CONCLUSION

Albert Einstein’s assertion that "imagination is more important than knowledge" seems to particularly resonate with his further observation that "we can’t solve problems by using the same kind of thinking we used when we created them."
Such a succinct call for imaginative reframing of our points of view is validation of the importance of employing visionary thinking approaches as a crucial component of pragmatic problem solving. If we are indeed facing the slow erosion of visionary skills as proposed in this paper, we should therefore prioritize the development of design pedagogy that emphasizes a carefully crafted combination of visionary & pragmatic sensibilities. A combination, that when used in consort will significantly increase the efficacy of both. To quote Executive

Though, it was never expected that any of the student project would literally change the world directly, Teaching the students the skills of visionary thinking is in fact changing the world for the better. It is doing so indirectly by attempting to train a new generation of needed visionary thinkers who are, and will be even more in the future, critically needed to take on massive issues of global concern - and to do so with an entirely fresh, imaginative, and optimistic perspective.

Some problems are simply too big to be fixed. Such puzzles must be unraveled in dreams.

6 ACKNOWLEDGEMENTS

All work (research, graphic illustrations and images of CAD, and physical models) presented in the individual projects were created by the University of Cincinnati Senior Capstone students Charles McCusker (project 1) and Brandon Wilson (project 2.).

7 REFERENCES AND CITATIONS