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Design and Simulation of Fly Car Using Creo 7.0 Software

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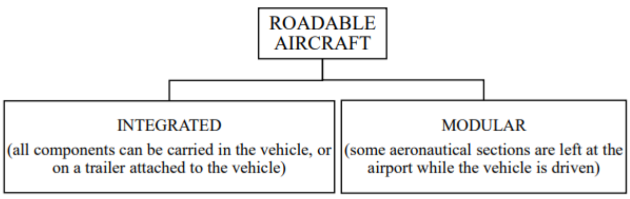
ABSTRACT

The aim of this project is to layout a personal aerial automobile (PAV) – Roadable plane i.e. Flying vehicle able to transporting two individuals and a small amount of bags from their door step to their vacation spot by way of making use of each road and air routes. The compact shape includes wings which remain folded on street and gets expanded when required for flight. This roadable plane falls below included style wherein all the additives can be carried in the car and the car may be converted into an aircraft inside few minutes of time vice versa. The combined layout of a car and aircraft eliminates the need of character vehicles for avenue and air, consequently reducing the value and time period of travel. On road the car is designed to run on battery and be propelled via a four cylindered piston engine even as on flight for that reason handing over an uncompromised flight.

I. INTRODUCTION

PAV - ROADABLE AIRCRAFT

A roadable aircraft (also referred to as a flying car) is a hybrid vehicle that combines the flying capability of an aircraft with the option of being driven as an automobile on the ground. The roadable aircraft is typically recognized as a small plane with retractable wings that has both the freedom to fly in the open sky and drive conveniently and flexibly along roads.



Types of Roadable Aircraft

Out of these two types this design project adapts the features of an integrated roadable aircraft where all the components are carried within the vehicle. The vehicle is designed in such a way that once transformed into an aircraft it will be able to take-off even from a small airport/open lawn with required area clearances. As the vehicle is designed for personal purpose certain parameters have been set by NASA in order to meet the requirement of a PAV envisioning the future requirements.

DESIGN DESCRIPTION

The aim of this project is to design a Personal Aerial Vehicle (PAV) i.e. Flying Car capable of transporting at least two persons and a small amount of luggage from their doorstep to their desired destination (medium range) by utilising road and air-routes bilaterally. The compact structure consists of wings which remain folded on road and gets expanded when required for flight.

This roadable aircraft falls under integrated style where all the components can be carried within the vehicle. The primary motive of the design is to fulfil the standards of a PAV set by NASA.

The vehicle on road shall utilize a front wheel drive mechanism i.e. the power generated by the engine will be transmitted to the front wheel through conventional shaft transmission and the rear wheels are free to follow. This design does not dive into the details of the automobile configurations and features, the main focus is given to the aircraft configuration and features. All the steps and assumptions made are based on aviation methodologies and references. The main motive of adding the automobile configuration is to be enable the user to drive the vehicle to the airfields even those located in the middle of busy cities. Today's airplanes require large hangers and other facilities to park. This design provides a convenient solution as the user can be able to park the vehicle in his garage, thus avoiding the requirement of separate parking arrangements in airports etc. Maintenance other aviation related procedures can be taken care accordingly. Certain new set of rules and various level of modifications are required in the existing rules and regulations to realize this concept. Technological advancements will ease the way we transport thus carving our footsteps into the future world making our life easier, safer, and better. Future modification may include electrification of whole vehicle, though major design modifications are required yet it would be an eco-friendly multipurpose vehicle.

WHAT IS CREO

Creo, the shorthand name for Creo Parametric, (formerly known as Pro automotive engineer) is a powerful and intuitive 3D CAD software optimized to address the challenges organizations face as they design, analyze, and share information with downstream partners. Developed by PTC, the original pioneers of parametric CAD, Creo is powerful foundational software supporting an integrated family of product design tools used by thousands of manufacturers worldwide.

The Creo family of design applications, modules, and extension speak a common language, meet the needs of different stakeholders, and truly combine parametric and direct modeling techniques. Creo helps build bridges instead of barriers between you, your ideas, your teammates, your partners, and your customers.Creo Parametric 3D CAD software can easily be customized and extended through the addition of modules and extensions, but the product family also contains stand-alone purpose build design applications such as Creo Simulate, Creo Direct, Creo Layout & Creo Options Modeler. Each stand-alone app serves a different purpose in the product development process. From concept to design to analysis, to effectively sharing your information with downstream partners (such as manufacturing and technical publications), Creo is a rock-solid foundation for any design group. It supports the needs of modern manufacturing and product development organizations.In short, it is a powerful, integrated family of product design software. It's used by thousands of leading manufacturers across the globe. It is a PTC product – the originators of parametric CAD technology.

The way Creo works is that it is made up of individual apps, including:

- Creo Parametric
- Creo Simulate
- Creo Direct
- Creo Layout
- Creo Options Modeler

Each Creo app serves a different purpose in the product development process. This means that Creo takes you through every stage, including concept design work, design and analysis. Then it also enables you to communicate effectively with downstream partners, for instance manufacturing and technical publications.

II. SIMULATION

PTC's simulation software is designed uniquely for the automotive engineer, complete with the common Creo user interface, automotive engineering terminology, and seamless integration between CAD and CAE data, allowing for a more streamlined process. Best of all, the results are accurate and reliable and can be easily calculated with very little input from non-simulation experts.The simulation software is a complete structural, thermal and vibration analysis solution with a comprehensive set of finite elements analysis (FEA) capabilities that allow you to analyze and validate the performance of your 3D virtual prototypes before you make the first part.

CREO PARAMETRIC

When you work with Creo Simulate, your goal is to create a simulation model that reflects both the physical nature and the real world environment of a part or assembly, analyze the model, and evaluate the results of the analysis. To help you complete these tasks efficiently,

Creo Simulate provides a tool—Process Guide—that leads you through each step in the simulation process. Process Guide is available for 3D Structure modeling in both native mode and FEM mode. You can use Process Guide for both parts and assemblies.

Process Guide also provides the user interface to Creo Simulate Lite, the free limited functionality version of Creo Simulate. Process Guide serves several purposes. In its simplest form, it leads you through the process and workflow and prompts you to complete the following steps involved in successfully creating and analyzing a basic simulation model:

III. METHODOLOGY

The feature-based parametric modelling technique enables the designer to incorporate the original design intent into the construction of the model. The word parametric means the geometric definitions of the design, such as dimensions, can be varied at any time in the design process. Parametric modelling is accomplished by identifying and creating the key features of the design with the aid of computer software. The design variables, described in the sketches and features, can be used to quickly modify/update the design.

CONFIGURATION OF FLYING CAR

AERAUTO PL.5C

It was one of the first design to have a foldable wing configuration, designed in Italy in the year 1949. It was a high wing two seater monoplane. Only one such kind of aircraft was built. It used pusher propeller for propulsion on air as well as road, this became one of the major limitation factor of the design.

Aerauto Pl.5c

BRYAN AUTOPLANE

Bryan Autoplane was a low wing integrated roadable aircraft with a hinged foldable wing. The design was inspired from a primary gliders and most of the features resembled the same. It had a welded steel tube fuselage frame and twin tail booms. This was a single seater aircraft. It took its first flight in the year 1953.

Bryan Autoplane

AVIAUTO

Aviauto is a mid-wing integrated roadable aircraft. The compact design satisfies both the requirements of an automobile and an aircraft. The aircraft retracts its parts to look like a car, even though the mechanism is complex it still has look wise advantage. It has foldable pusher type propeller engine.

Aviauto

DESIGN OF AERO MOBIL 3.0 (FLYING CAR)

Aero Mobil says it Will Put a Flying Car on the Market in 2 Years

If Back to the Future 2 holds your standards for technology there are a lot of things we should have by now -- one of them being flying cars. But while modified DeLoreans haven't dotted the skies, Slovakia-based AeroMobil says we'll be seeing flying cars on the markets soon as 2023.

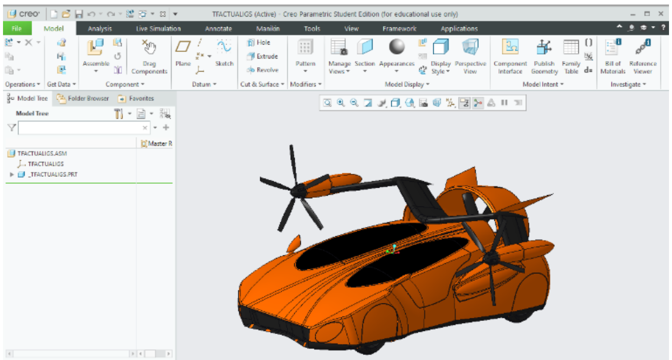
Speaking at SXSW Interactive 2015, AeroMobil co-founder and CEO Juraj Vaculik talked about his company's vision for a future where flying cars are just as ubiquitous as planes, trains, and standard automobiles.

The company has already unveiled a prototype for its "Flying Roadster," the AeroMobil 3.0. The two-seater functions as both a car and personal airplane, measuring at about 328 x 236 inches in airplane mode and 88 x 236 inches in car mode with its wings collapsed -- thin enough but too long to qualify as a compact car in the US.

The steel framework, carbon coating construction has a Rotax 912 engine under the hood with a top speed of 124 mph when flying and 99 mph on the road -- though Vaculik said the final version may be faster. The vehicle has a 81 mph takeoff speed.

Aeromobil

IV. DESIGN AND SOLUTION



Design Profile of model flying car

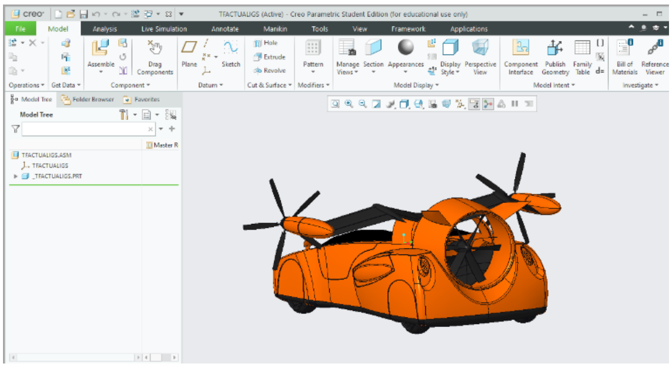
Terrafugia is also known for being at the forefront of this ground-breaking technology. In 2013, Business Insider stated that the company, which was founded by five MIT-trained engineers, was well on its way to releasing its first model, the Transition, a small plane that also drives on the road.

To come up with the Transition, the engineers started by researching possible roadblocks to flying. They came up with four issues including price points, weather, airport travel and where to land these aeronautical vehicles.

Once they identified these obstacles, they created Transition so it can fly at 100 miles per hour, get 20 miles to the gallon and drive at up to 35 miles per hour. Similar to AeroMobil's brainchild, Transition also has wings that can fold, making it easy to store the vehicle in a garage.

Several other companies are rumored to be working on futuristic automobiles. It's to be seen who will win the race to commercialize the flying car. However, in the mean time, the world can tide itself over with the XTI Aircraft, touted by Popular Mechanics as "better than a flying car."

According to Popular Mechanics, the XTI Aircraft isn't quite a flying car. It's a small jet that promises to bring people from point A to point B. Created by David Brody and a team of aviation experts, the TriFan 600 has two gas-turbine engines, two wing-mounted fans and can reach a speed of up to 400 miles per hour and an altitude of 30,000 feet.



Design Profile of model flying car

The flying car price should be fairly competitive with many high tech, luxury vehicles on its release date. Aero Mobil has their model set to be released in 2020 with a price tag of $1.2 million to $1.6 million. Terrafugia's model is projected to be $279,000, but Popular Mechanics believes that they will not be able to meet this price point with the cost of labor and development costs. Only time will reveal the actual cost of a car that can fly.

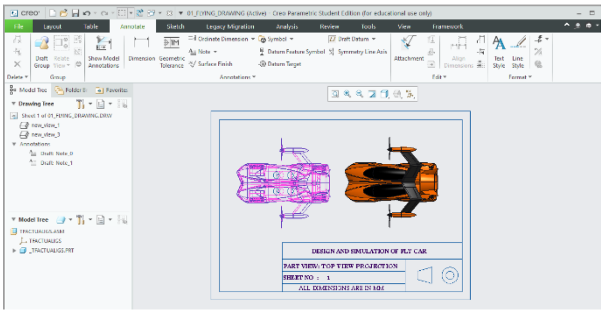
Flying car companies will eventually also have to learn how to offer drivers insurance and mitigate risks associated with flying and driving. It might be a rocky road to meeting stringent requirements that must be met for a car to get on the road and a plane to get in the sky. But it will happen.

CONFIGURATION OF DESIGN

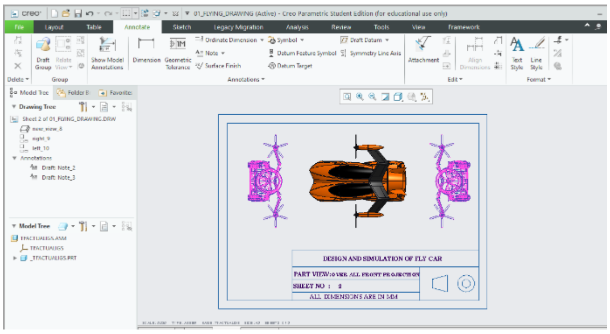
When considering the flying car as a concept, the designer is left with plenty of configurations to choose from. In fact, despite of the over 70 designs built, there is no a clear tendency in the design configurations. However, some of them are either likely to be more appropriate or become obsolete. In this section, the basic design options are discussed.

The concept: The ultimate aim of the flying car is to develop the function of a personal vehicle which serves as a complement or substitute of the nowadays conventional cars. On this basis, any flying car may fall into one of the following descriptions. A roadable aircraft (an aircraft which is certified to circulate on roads), a personal air vehicle only (it is only able to fly) or a car which is able to fly (the design is closer to the conventional car and it deploys the lifting components when it has to go on flight).

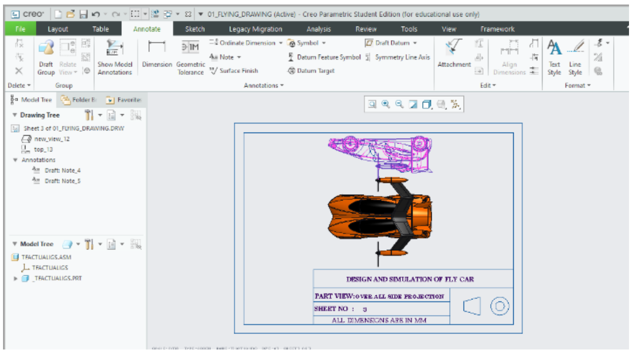
DRAWING SHEET – 1



DRAWING SHEET – 2



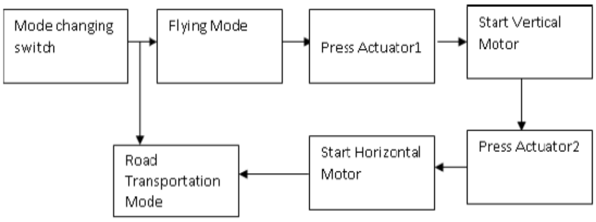
DRAWING SHEET – 3



Designs Configuration

V. TESTING AND RESULT

Lot of system has put forward by government to control traffic jam and avoid road accidents. Such as LASER guns, RADAR etc which are expensive. A company has going to launch which are similar to car. But it is accomplice on two to three members only. They are also having the following disadvantages, they are expensive. They suggest major changes in automobile architecture



Architectural Diagram of Flying Car

We use three motors. Two for lift the car vertically and another one motor for horizontal movement of car. First of all when the flying mode is on and the actuator switch 1 is pressed. Then the actuator pull the wing like shaft and then another actuator inside that turn the motor set to 90 degree upward. After that Motor start switch is pressed. It achieve the enough RPM to lift the vehicle it lift it to 1-2km from ground surface. And then Actuator2 switch is pressed, it pull the horizontal motor set from the front side of car. Then press the Motor2 switch ON to move the vehicle for front and turning . For turn the vehicle , just steer it to side to turn. The sensor give the input to Microprocessor it control speed of the motor on that side for turning or change the polarization of the motor for turn the vehicle in that side. For landing the vehicle first Off the Motor2 switch and then press the actuator2 switch for retraction of the actuator with the motor set. Then press the Landing switch in the Switch panel.

It slowdown the speed of the two Motor constantly. So, it comes to landing slow as helicopter. After landing press the Motor1 switch OFF and then Press the actuator1 for retraction. Now, it can change the mode to the Transportation by road for Roadways.

SIMULATION RESULTS

Three test networks having different sizes in terms of baseline modules, i.e. 3 × 3, 6 × 6 and 9 × 9 modules with L = 1000 m, have been considered for the experiments. The origin/destination trip demand (i.e., the set of agents moving between O/D pairs) has been generated starting from an average value of 300 vehic/h and variation coefficient cv = 0.4. The O/D values have also been split for several time slices—each one of 5 min for 1 h of simulation—in a random way for each simulation. In more detail, each O/D value has been split in 12 sub-values such that their sum is equal to the generated O/D value.

As described in Section 3, in the UAM scenario, an agent is associated with each flying car. All the agents are assumed to have the same characteristics, which are not unrealistic because flying vehicles have been considered standardized and automated and to avoid collisions, agents, also assisted by the Agency (see Section 3, point d), are compelled to respect some constraints.

To perform the experiment, the minimum flight height has been set equal to 40 m, which comes from the hypothesis that the highest building in the given urban context is no more than 25 m and there is a suitable distance of 15 m between the building roof and the lowest agent's height position, which has been considered proper to meet the minimum safety and security issues. Note that, setting different minimum height for skyscraper urban contexts could require some additional conditions on the initial hypothesis here made about uncongested aerial links, i.e. depending on the maximum allowed flight height.

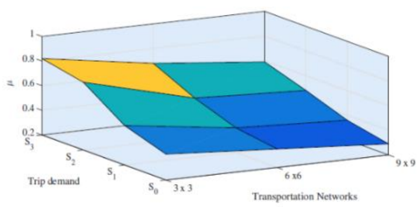
However, it is not in the aim of this study to explore these additional conditions. The ground speed follows the empirical relationship v = a – b · f (see also note at point 3.c in Section 3). As the number of agents on a given link increases, such speed is modified accordingly, and the travel time is computed.

Simulation – 1

RESULTS

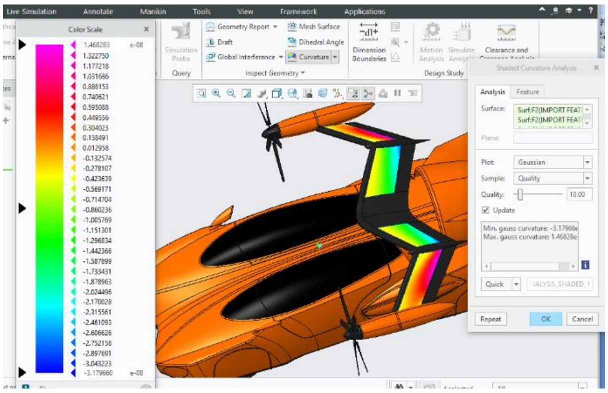
For each of the considered transportation networks and O/D trip matrices, the agent-based simulations have been made and the value of μ has been computed

	3 × 3 Modules	Transportation Networks 6 × 6 Modules	9 × 9 Modules
	μ	μ	μ
S_0 (Baseline /O/D)	0.41	0.35	0.29
S_1 (15% O/D increase)	0.52	0.40	0.36
S_2 (30% O/D increase)	0.75	0.52	0.48
S_3 (45% O/D increase)	0.82	0.68	0.59



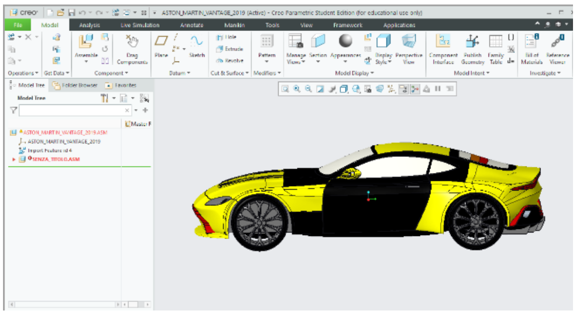
Simulation results

As Table 1 shows, an increase in the demand level generally produces an increase in the total travel times—measured by the value of μ—for all the test transport networks. Generally speaking, the travel time increase is more relevant for the smallest network, where the aerial links are expected to be less used because of the smaller distances. When the network size increases (from 3 × 3 to 9 × 9 modules) and then the average distances increase, there is a gain in the total travel time because the longer leg of the trip will be travelled by using aerial links, the travel times of which are shorter than ground travel times. Generally, aerial links are convenient on the longer distances, while ground links must be used for the shorter leg of the trip to reach the specific destination from the transition node and vice versa. When the demand level is increasing, as in scenarios S1, S2 and S3, the ground traffic flow component increases, then ground travel times increase too and travel-time savings reduce with respect to S0.

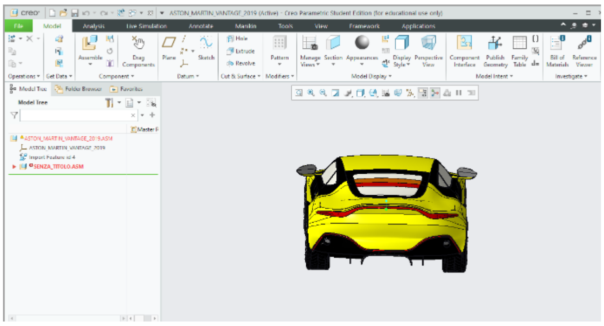


PROTO TYPE MODELS OVER VIEW – COMMERCIAL CAR

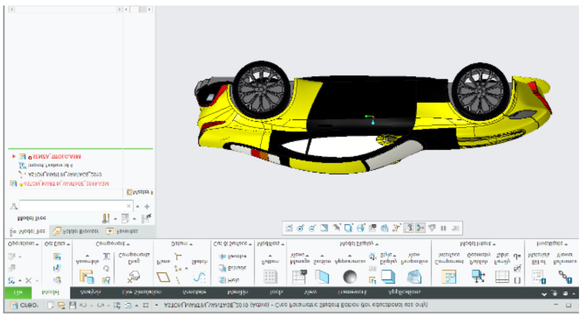
View – 1



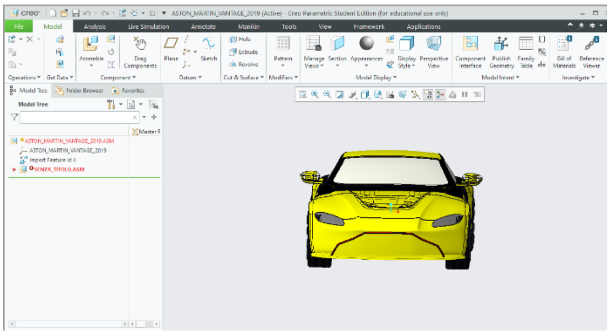
View – 2



View – 3



View – 3



VI. CONCLUSION

The idea of a flying car as described on this paper has been proven to have an area in the actual marketplace and to fill a need demanded by using potential customers. The conceptual layout and flying prototype of the flying car evolved in this project (Aero mobile) will must fulfil the primary layout necessities. Nevertheless, new vehicle utilization manner that several technological hurdles must be solved on the way to attain complete airworthiness and street use certification.

Moreover, for the flying automobiles to obtain completely success inside the destiny, many collateral enhancements should be executed in phrases of structures (autopilot generation, for example) and traffic management (digital highways will be required) and new street infrastructure.

Flying motors were around in various forms since the '30s however have by no means "taken off". This does not suggest that the idea become awful, simplest that the mechanization continually left a whole lot to be desired.

Besides bringing instantaneous advantages in simplicity, price and reliability to ultra-modern flyer, it will spawn regulatory modifications with the intention to open dependable low fee flight to the following generation of fly/drivers to the factor where mastering to fly becomes a own family mission similar to the rite of passage, mastering to drive. Simultaneously, a whole new industry will spring up to offer those flying automobiles and to amplify the road into analogues of the entire undertaking and commercial car line of these days. There will also be an exploration of the contemporary amphibious and waterborne family of machines for utility of fly/force technology.

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