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THE FUTURE OF TRANSPORTATION

A SOLUTION TO THE WORLD'S ENERGY PROBLEMS AND GLOBAL AIR POLLUTION

Everyone knows that the automobile will eventually become obsolete, the only question is when. The certainty of global gridlock as the world population increases will accelerate the obsolescence of the automobile." China's traffic jam, which has lasted a full 10 DAYS and is expected to last WEEKS, is being blamed on highway roadwork, compounded by minor accidents and a few breakdowns. " Peter Ford, Staff writer / August 24, 2010

China's traffic jam: Trucks jam up on the National Highway 207 in Wanquan county in north China's Hebei province Monday.

Newscom

"Less than half of 1% of the land area in the United States is covered by roads of all kinds, not including rights-of-way, parking lots, and driveways."

Which means that 100% of our ground travel is confined to 0.5% of available land area . It is no wonder that more tha 30,000 people in the U.S. alone and a million people word wide die from ground traffic collisions. Over the twentieth century, the number of automobiles in the U.S. has grown from practically none (about 1900) to one per household (about 1950) to more than one per licensed driver (2000). Growth in the number of motor vehicles just can't keep going up because there is nowhere for it to go.

The proposed automated air travel system would allow 100% of the travel over 100% of the land area multiplied by many flight levels generating nearly an infinite number of flight trajectories reducing the probability of a collision to be near zero.

The following is an excerpt from a paper written for the CAFÉ foundation sponsored by NASA.“Faster and Greener-- Pocket Airports by Brien A. Seeley M.D., President, CAFE Foundation August 26, 2010

INTRODUCTION

The most basic purpose of aviation is to travel fast without need of roads. Yet, afterAmerica’s first Century of Flight, our hub and spoke air transportation system fails to fulfill that purpose for the very trips that people most often make--trips of less than 200 miles. By converging

current and emerging technologies with a well-aimed technology prize program, this failure can be rapidly remedied. The remedy enables drastic reductions in the time and distance traveled between airport and destination doorstep. In our current built environment, the only feasible way achieve such reductions is by bringing forth a new class of small Green, Quiet, vertical or extremely short take off and landing (V/ESTOL) aircraft—the "GQ V/ESTOL aircraft". GQ V/ESTOL aircraft will be uniquely capable of operating at very small "pocket airports" that are within walking distance of one's destination doorstep. Such aircraft will be both faster and "Greener" than any other mode of transportation on trips of less than 200 miles. This paper explains how such aircraft, operating on-demand at a distributed network of pocket airports, will eliminate the wasteful and uncertain delays of road gridlock and bring many other benefits. The feasibility and rationale for the sequence of prize competitions necessary to bring forth the GQ V/ESTOL aircraft are presented as logical extensions of the NASA Green Flight Challenge. The GQ V/ESTOL aircraft can be appropriately named "Suburban Air Vehicle" or SAV for short, because their safe, ultraquiet, ultra-short runway capabilities accord them unique, unprecedented acceptability for operations in suburban areas. NASA articulated the need for such aircraft in 2003 as the natural sequel to its AGATE, GAP and SATS programs. Due to the continued worsening of road gridlock, along with global warming and the quest for Green, that need has become even more urgent and compelling today. The decline in the last 2 years' in America's general aviation industry (APPENDIX) and the increasing emergence of competitors to it abroad make support for developing GQ V/ESTOL aircraft more timely than ever before. Accordingly, NASA Langley Research Center held a Colloquium on this topic on May4."

The vast majority of travel is within 16 miles of a residence. According to the Federal Highway Administration, the average motor vehicle in the United States, including cars, SUVs, minivans and pickup trucks, is driven 11,218 miles per year. That translates into about 31 miles per day round trip. The ultimate vehicle would travel with maximum safety at high speed and minimum cost.The technology available in 1914 when the automoble was first mass produced made it the safest high speed (relative to the horse and carriage) vehicle to travel the 32 miles. Unfortunately 4 million miles of paved roads were built at an incredible expense both in money and environmental damage including massive air pollution from burning fossil fuels. National Household Travel Survey

Daily Travel Quick Facts

Daily Travel is a trip from one point to another on a single day.

How We Travel

87 percent of daily trips take place in personal vehicles

91 percent of people commuting to work use personal vehicles

How Many Trips We Take Every Day

Americans take 1.1 billion trips a day — four for every person in the U.S

U.S. daily travel averages 11 billion miles a day — almost 40 miles per person per day

How Many Trips We Take in a Year

Americans take 411 billion daily trips a year or about 1,500 trips per person

U.S. daily travel totals about 4 trillion miles — 14,500 miles per person

Why We Travel

45 percent of daily trips are taken for shopping and errands

27 percent of daily trips are social and recreational, such as visiting a friend

15 percent of daily trips are taken for commuting

What We Drive

There are 204 million personal vehicles available for regular use

57 percent are cars or station wagons

21 percent are vans or SUVs

19 percent are light trucks

When We Travel

The most daily trips are made on Friday (16 percent)

The fewest daily trips are made on Sunday (13 percent)

More daily trips are taken between noon and 1 p.m. (7.4 percent) than between 8 a.m. - 9 a.m. (5.5 percent)

The Average Driver

Spends 55 minutes a day behind the wheel

Drives 29 miles a day

Men vs. Women

Women drive less (21 to 38 miles per day)

Men drive longer (67 to 44 minutes per day)

SOURCE: National Household Travel Survey, 2001-2002. For further details, see our Frequently Asked Questions.

Research and Innovative Technology Administration (RITA) • U.S. Department of Transportation (US DOT)

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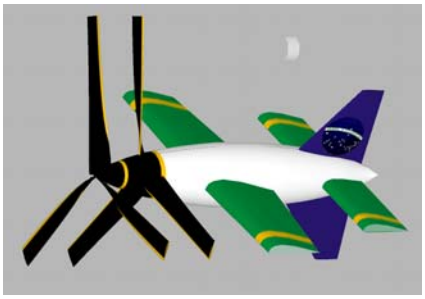
The ultimate transportation vehicle is the Verticraft.



The Verticraft is a vertical takeoff and landing aircraft that can fly nearly as fast as a private jet but takeoff and land like a helicopter. The Verticraft maximizes safety by eliminating the airport convergence problem of aircraft and the ground collision possibilities of ground vehicles.

The Verticraft uses compressed air expansion rotary engines that use high pressure compressed air stored in cylinders to run the engines.

The average travel time by Verticraft is about 8 minutes per day versus 55 minutes by car to travel the average 31 miles, which means that the Verticraft when parked would act as a wind turbine to recharge the air cylinders an average of 23 hours and 52 minutes a day. The 4 minutes of average air consumed would be recharged by nearly invisible translucent wind turbines and solar panels at the destination. At home the Verticraft would land on top of the garage roof which would descend on a counter balance weight system to the floor of the garage with the propellers protruding above the roof to act as a secondary wind turbine to recharge the air cylinders when parked in the garage. The heat generated to compress the air can be used for the home or business hot water heater.

Each destination would have a wind/solar powered air compressor and storage cylinders available for recharging the compressed air that was not compressed by the Verticraft compressor. The Verticraft will carry 8 passengers traveling 287 mph for 2 hour and 12 min for a range of 625 miles. Travel greater than the average distance would require using the compressed natural gas tank on board at a cost of $0.02 per mile. Hotels would have wind/solar powered air compressors and storage cylinders to recharge the cylinders overnight at no costs to the customer. The Verticraft can be scaled up to replace the current ground tractor trailer trucking system. The average large truck travels 178 mile per day. The Verticraft will have an on board refrigerator and air conditioning system that will be cooled by the extremely cold exhaust air from the air expansion engines. The heat absorbed by the air conditioning and refrigeration system increases the efficiency of the air expansion engines. The refrigerated trucks would be of great benefit to the food delivery business. The average person travels about 1140 miles per year by commercial air taking about 16 hours round trip total time, including driving to the airport, security screening, baggage checking, waiting 2hrs for departure, flight time, baggage collection, and driving time from airport to destination. The total round trip air travel time by Verticraft would be about 4 hours at no cost.

The New York area has the longest average commuting time -- almost 35 minutes -- of any metropolitan area, according to the Census Bureau in its analysis of the 2009 American Community Survey. But the other nine metro areas in the top 10 also averaged a half hour or more, compared to the 4 minutes of travel time in the Verticraft.

Initially the Verticraft makes all subsonic aircraft obsolete and eventually if mass produced, will make ground transportation obsolete except for the mass transportation system which it will complement. The Verticraft transportation system would be similar to the FAA's NextGen air traffic system. To maximize safety, the autopilot would fly the Verticraft to the desired destination address entered into the FMC (flight management computer) which calculates the optimum trajectory (flight path) for the trip. The data is sent to the air traffic computer system which determines if a conflict exists with any other aircraft. If a conflict is determined it will generate an alternate trajectory for the trip. The Verticraft will be equipped with a TCAS (traffic collision avoidance system) that is currently used by many aircraft. The TCAS system would also

be used to avoid emergency vehicles such as ambulances, police and fire vehicles in the air. The Verticraft can also have a ballistic recovery parachute system for emergency landing if desired. The Verticraft will have a medical emergency button that will take the vehicle

to the nearest hospital at 360 mph or 6 miles per minute in case for example one thinks they are having a heart attack and needs immediate medical attention. This would drastically reduce the emergency medical response time which would normally require a 911 call

for a ground ambulance to drive to you and then to the hospital.

For example, say 60 people go to a supermarket. Each person is given an unconflicted flight path separated horizontally and vertically to the entrance of the parking lot and is assigned an empty spot to taxi to after landing at the entrance. Under the current system the 60 people travel on conflicted paths called roads at the same altitude therefore maximizing the possibility of collision.

The peak rush hour traffic in Sacramento , Ca. is about 15,800 vehicles per hour. With a

500 ft vertical, lateral, and horizontal separation in the average 16 mile area 384,000 Verticraft per hour can be flown using only the altitudes up to 10,000 ft. The ground traffic has zero vertical separation and average 2 ft lateral separation with minimal horizontal separation.

The Verticraft has a synthetic vision flight display that shows the landing area in a day time clear weather view regardless of the actual conditions such as heavy rain or fog. The position of all surrounding traffic is shown on the moving map display as well as weather conditions. The Verticraft would greatly enhance the capabilities of ambulance, police and fire vehicles. The current ground transportation system has no ability to prevent ground collisions which kill an incredible number of people per year worldwide. The Verticraft has an autopilot that will allow for totally automated flight including takeoff and landing which is not possible in the current ground transportation system.The automated flight system is equivalent to a ground transportation system where each vehicle has its own separate road to its destination assuring zero probability of collision. Travel by Verticraft eliminates the needs for roads, bridges, destruction of the environment, foreign energy sources and eliminates the air pollution and possibly the global warming caused by the current transportation system. The Verticraft would eliminate the twenty five percent of the total energy of the nation that automobiles and trucks consume. The Verticraft would minimize the effects of natural disasters such as the storm that hit the Northeast USA by allowing rapid transportation to and from the area without the need of roads or bridges or fuel sources or electricity. It would allow the electical grid system to be at ground level to eliminate the weather related shutdowns of the current

elevated systems.The railway system would be enhanced with the elimination of the current roadway system.

The obvious elimination of rush hour traffic is a major advantage of the Verticraft transportation system. According to data from the U.S. Department of Transportation's 2008 "Report to Congress on the Conditions and Performance of the Nation's Highways, Bridges and Transit,"—the most recent report— all levels of government should currently be investing $139 billion per year in highway improvements just to maintain current physical and performance conditions on the nation's highways and bridges. This would grow to $150 billion by 2015 if highway construction costs grow at the same rate as the overall inflation rate. It is reported that in 1995 alone, the U.S. spent $95 billion on road building. Reducing the cost of road-building is a societal benefit that could enormously reduce the use of and dependency on fossil fuels. In 2004, NASA Chief Scientist Dennis Bushnell cited Arthur Clarke's 1984 quote that "The roads to support Autos cost as much as a small War and the casualties are on the same scale" as a reason to support future personal air travel. In that same presentation, he pointed to William Seifert's 1968 prediction that "Any form of transportation that offers the lowest door-to-door travel time will always drive out lower speed competing modes unless the economics of the higher speed system are grossly unfavorable".

The UAV (unmannned aerial vehicle) version for the U.S. military would save billions in runway construction costs world wide and eliminate the need for military bases outside the USA .

The Verticraft would be the ultimate border control vehicle greatly reducing drug/ arms and human trafficing across our borders. The UAV's can operate from aircraft carriers and any ship with a helipad. 92% of the world's consumer products are moved by ships and those ships could be protected from pirates by Verticraft gunships launched from the ship's helipads.

Many more jobs in the transportation industry would be created as the Verticraft begins to replace the current aircraft and ground transportation vehicles. Mass transit in high density cities would be greatly enhanced by the elimination of autos and trucks and their associated traffic jams as well as the related infrastructure of traffic lights, etc.

AAA has released its 62nd annual "Your Driving Costs" study, which shows a 1.9-percent year-over-year increase in the cost of auto ownership. That's an average of $8,946 per year per car, with costs including monthly payment, fuel, maintenance and insurance. The average family has 2 vehicles and the Verticraft can be mass produced for that same cost. A cost many would be willing to pay to never again waste their life away in traffic jams.

"As this process proceeds to lower prices that enable high volume production, NASA's Chief Scientist has forecast that this can become "a potential Trillion Dollar Market". Accordingly, GQ V/ESTOL aircraft could revitalize aviation, transform our transportation system, grow thousands

of new jobs and bring many other societal benefits as described below.

SURFACE GRIDLOCK: BOUND TO GET WORSE

Experts predict that ground travel delays due to surface gridlock will get substantially worse in the next 20 years. Door-to-door trip speeds in the Los Angeles Basin, for example, are predicted to be just 22 mph in the next 10 years.1 Tom Vanderbilt, in “Traffic”, page 15, points out that “We (Americans) spend more on driving than on food or health care. There are more cars than citizens.” He goes on to point out that “The average American, 2005, spent 38 hours annually stuck in traffic.” Daniel Sperling, 18 Director of the Institute for Transportation Studies at UC Davis, states in his book “Two Billion Cars”9: “Virtually all attempts to get Americans out of their cars have failed.” Due to the runway length requirements and noise footprint of today’s GA and air carrier aircraft, large CTOL and metro airports are usually relegated to locations tens of miles outside town centers. This sentences most of today’s air travelers to suffer the increasing delays of gridlocked commuter highways to reach their destinations. Our interdependencies and continuing population growth make the trend to gridlock appear inexorable. Even when and if all cars become electric vehicles, the gridlock will remain. The growth in surface vehicles and VMT prominently outstrips the growth in population. The rate of increase in the number of cars is likely to continue to outpace the capacity growth of our highways, whose average cost is $20M per mile.”

According to the National Research Council of National Academies

"The quality of life for Americans in the 21st century will depend in part on whether the nation’s critical infrastructure systems can meet such expectations. At the same time, other national challenges that will affect quality of life include, but are not limited to, the following:

- Remaining economically competitive with the European Union, China, India, and other economic powers;
- Reducing U.S. dependence on imported oil;
- Reducing the greenhouse gas emissions linked to global climate change;
- Protecting the environment and conserving increasingly scarce natural resources, including potable water; and
- Developing the capacity to withstand and recover quickly from natural and human-made disasters.

An important first step in creating a new paradigm is to bring together those who have an essential stake in meeting 21st century imperatives and who are already involved in sustainable infrastructure efforts. They include infrastructure owners, designers, engineers, financiers, regulators, and policy makers, as well as ecologists, community activists, scientists, and researchers. Working within the framework, experts in such areas could begin to identify a full range of new approaches, technologies, and materials for providing the services of mobility, connectivity, water, wastewater, and power to meet multiple objectives. They could also identify new approaches to decision making,

finance, operations and processes related to infrastructure. The results of such a gathering could serve to initiate a longer-term, collaborative effort to develop a vision, concepts, and objectives for the nation's critical infrastructure systems and then to identify the policies, practices, and resources required to implement the vision. The results could be critical infrastructure systems that are physically, economically, socially, and environmentally sustainable for the next 50 years."
The Verticraft computer model developed at the Georgia Tech Aerospace Design Laboratory will simulate the actual flight capabilities so accurately that the flight of the real prototype will be exactly like the simulator, just as the airline simulators exactly duplicate the flight chracteristics of airline aircraft. The flight simulators are so accurate that airline pilots do all of their FAA approved flight training in the simulator and immediately fly passengers in the real aircraft without ever having previously flown the real aircraft.

An informal survey show s that the majority of people would alter their combined housing and vehicle costs to be able to purchase the Verticraft and still maintain desirable housing conditions in an area that was previously too far from work to be practical due to commuting distances. The vast majority of people have no idea how

isolated fishing lake in the mountains or a deserted island for a picnic or camping. The possibilities of exploring the planet are infinite.

Stan Sanders

President

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Affordable System Designs, LLC (ASD) – Preliminary Design and Analysis of a variety of complex VTOL Aircraft Concepts through direct access to the Georgia Tech Center of Excellence in Rotorcraft Technology (CERT) and Aerospace Systems Design Laboratory (ASDL). Examples of supported programs: Carter Aviation Technologies (CAT) Slowed Rotor/Compound (SR/C); DARPA Heliplane Program. Developed the Verticraft computer simulation model in the X-Plane flight simulation program for demonstration of the performance capabilities of the Verticraft.