EPIPHANY™
Transporter

Development Report

EPIPHANY™
Transporter

- Two passengers, luggage and golf clubs
- 300+ mile maximum range at 130 mph
- Triple-redundant computer autopilot
- Efficient cruise between 110 to 160 mph
- About the size of a Tesla Model S sedan
- Neighbor-friendly, ultra- quiet operation

NO AIRPORTS - NO VERTIPORTS - NO HELIPORTS - NO ROADS REQUIRED

DEVELOPMENT OVERVIEW

Coming out of stealth development, the personal *Epiphany Transporter* delivers *fast*, efficient, door-to-door transportation for two people seated side-by-side, with luggage. And golf clubs! Having true VTOL (Vertical Take-Off and Landing) capability, it can hover like a helicopter and achieve very long range, high-speed, efficient cruise flight like a conventional airplane.

Designed for UAM (Urban Air Mobility), the vehicle can legally operate essentially anywhere outside of controlled airspace, below 700 feet AGL (Above Ground Level), and away from airports. Its neighbor-friendly, very low sound is incomparable to *any other* eVTOL, VTOL, or conventional aircraft when taking off or landing, and is virtually silent and undetectable to people on the ground when flying overhead at low cruising altitudes. The vehicle is easily ground maneuverable and garageable by one person, and can be fully-recharged in under 30 minutes.

In lieu of long, cumbersome, draggy wings, the craft employs six, small, uniquely designed, dual-mode ducted thrusters. The *fixed-pitch* fan blades work in concert with the ducts and internal components to produce powerful, yet quiet, static thrust during hover, and seamless ultra-efficient thrust and aerodynamic lift when tilted for cruise flight. With small footprint only slightly larger than an automobile, the vehicle can take off and land from almost any small, confined, nearly-level area.

Operation is easy and intuitive. The pilot sends commands via a "fly-by-wire" centered hand-joystick (no pedals needed) to the triple-redundant autopilot, which in turn manages power to the six thrusters achieving stable, comfortable, and safe flight in accordance to the pilot's wishes and commands.

The *Epiphany Transporter* is expected to experience no troublesome "transition" issues between hover and cruise flight, typical of winged eVTOL aircraft, because the thrusters continuously produce powered-lift and aerodynamic lift throughout the flight envelope. On deck, the thruster's ducts afford protection from the spinning fan blades; in the air, protection from nearby branches when hovering, and from birds during forward flight. The machine fits easily into a standard two-car garage, or a one-car garage with folded thrusters. For transport or shipping, with folded thrusters, it fits into a standard 8' X 8' X 20' container.

Originally developed under a $5.1 million DARPA grant, the NASA-Ames proven thrusters have undergone over a quarter-century of continued refinement and full-scale flight testing in both wind tunnels and numerous prototype manned vehicles. The highly proprietary CFD (Computational Fluid Dynamics) computer model used to design the thrusters has also evolved, currently able to accurately predict static and high-speed thruster performance *within* 2% of actual real-world testing.

Each of the vehicle's six thrusters are powered by state-of-the-art electric motors, earning it the moniker "eVTOL". Six separate, super-powerful dedicated battery systems, with single-point charging, provide impressive cruise speed and range.

'Normal' range in eVTOL aircraft usually means flight from point A to point B. However, point B must have an accommodating charging station to power the return trip home. Much more important for UAM operations is MRR (Mission Radius Range). This is the effective range, with reserves, from point A to point B, land, then return home to point A, *without needing to recharge along the way*!

Part of the splendor of flying the personal *Epiphany Transporter* eVTOL aircraft for UAM is having no need (nor desire) for airports or vertiports. The lack of available recharging infrastructure creates "range anxiety" with other eVTOL aircraft, which have MRR measured in only *tens* of miles.

At its predicted best economy cruise speed of 130-mph, and with *15% battery reserve*, and using new (soon-to-be commercially available) Silicon-Lithium-ion batteries, the *Epiphany Transporter* has a predicted normal range of over 300 miles, and a MRR of 145 miles! At 160-mph fast cruise, normal range is still an impressive 240 miles, with MRR of 114 miles. With current "standard" Lithium-ion batteries, and cruising at 130 mph, the normal range and MRR are 150 miles and 70 miles, respectively. For context, the *Epiphany Transporter* is predicted to economically cruise *2X faster*, and with greater range, than many EV automobiles!

Another way of visualizing the craft's striking performance and utility, is by drawing a circle with a radius of 145 miles from home base on a map. It will show the maximum outbound range achievable at best economy cruise, while still being able to return back home, *without recharging*!

The *Epiphany Transporter* has been carefully designed to safely accommodate the loss of a thruster, motor, motor controller, or battery. During normal flight, it is able to take-off and hover using approximately 50% of its installed power, providing a very large margin of excess power for non-standard day, high-altitude, and emergency operations. It also has built-in redundancy for all potential single-point-of-failure components and systems, including its triple-redundant autopilot.

The *Epiphany Transporter's* design and engineering have been tailored to comply with known and anticipated rules and regulations for the FAA's (Federal Aviation Administration's) new MOSAIC (Modernization of Special Airworthiness Certificates) program which recently received preliminary approval, subject to formal industry ratification expected before January 2024.

MOSAIC contains very favorable changes to LSA (Light-Sport Airplane) certification and sport pilot rules. Crucially, the *Epiphany Transporter's* design meets the new LSA certification standards as they relate to powered-lift aircraft.

It is anticipated that FAA certification for the *Epiphany Transporter* under the new favorable LSA rules would be greatly simplified, in terms of cost and time, even when compared to other winged and wingless eVTOL aircraft, for the following essential ten reasons:

1) The *Epiphany Transporter* would be certified for personal, non-commercial use.
2) The *Epiphany Transporter* is limited to two occupants.
3) The *Epiphany Transporter* will not have the same airspeed transition issues faced by other eVTOL aircraft.
4) The *Epiphany Transporter* would be certified only for flight operations in Class G airspace, i.e., between ground-level and 700 feet AGL, and clear of controlled or restricted airspace.
5) The *Epiphany Transporter* would be certified *initially* only for daytime, VFR (Visual Flight Rules) operations.
6) The *Epiphany Transporter* is being designed to meet or exceed the same level of safety standards and protocols being applied to the manufacturing and operation of other eVTOL aircraft currently pursuing FAA normal certification under the more rigorous Part 23.
7) The *Epiphany Transporter's* fuselage and overall design are greatly simplified, and have a much lower part count, when compared with other eVTOL aircraft pursuing LSA or Part 23 certification.
8) The *Epiphany Transporter's* thrusters are designed to meet or exceed known international safety and noise mandates.
9) The *Epiphany Transporter's* triple-redundant autopilot and distributed propulsion are compliant with DO178C, DO254, DAL-A, and DO160 standards for eVTOL UAM certification.
10) The *Epiphany Transporter's* operation is intuitive and easy, with redundant controls.

Although a few other *personal* eVTOL aircraft are in various stages of development, compared to the *Epiphany Transporter*, they have incredibly loud noise, disappointingly low airspeeds, dismal normal range, insignificant (if any) MRR, long cumbersome wings, minimal cargo space, and serious airspeed transition concerns.

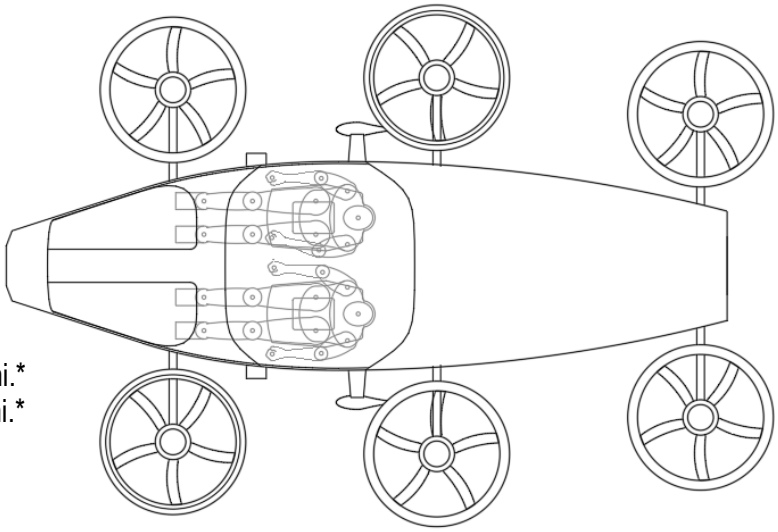
Several other eVTOL aircraft in development are targeting the commercial "e-taxi" market, and are well along their way to achieving normal FAA Part 23 (non-LSA) certification. However, as a commercial air carrier, they must also comply with onerous FAA part 135 rules and regulations established for this industry which pertain to carrying passengers for hire. These aircraft would typically cruise along burgeoning "highways-in-the-sky" between 3,000 and 4,500 feet AGL and be relegated to operate only out of designated regional "vertiports".

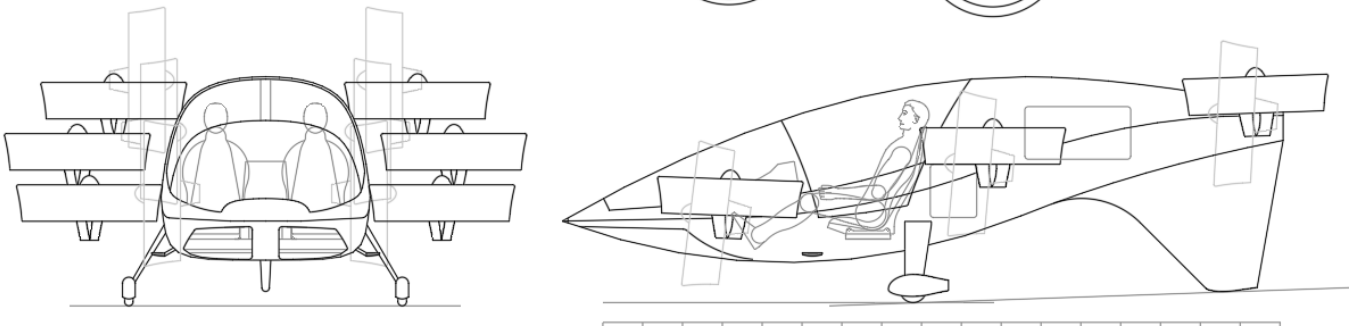
Epiphany Transporter

Specifications and Predicted Performance

Length:	19.5 feet
Width:	13.2 feet
Width (ducts folded):	8.0 feet
Height:	6.7 feet
Height (ducts folded):	7.5 feet
Normal Takeoff Gross Weight:	1670 lbs.
Empty Weight:	1270 lbs.
Normal payload (people + cargo):	400 lbs.
Max. payload (people + cargo):	475 lbs.
Economy cruise / normal range:	130 mph / 305 mi.*
Economy cruise / MRR:	130 mph / 145 mi.*

** With Amprius (or equivalent) Silicon-Lithium-Ion batteries, and normal payload.*





Tesla Model S size comparison

CONTROL METHODOLOGY

INTRODUCTION

The *Epiphany Transporter* has a single, center-console-mounted, 3-axis, spring-loaded-to-neutral, joystick with integral thumb-switch, and thumb/finger-buttons, which together let the pilot send control inputs to the autopilot from either seat. The autopilot in turn sends the *processed* signals to the six thruster motor controllers which manage the thrusters both collectively and differentially. Absent any overriding control commands from the pilot, the autopilot automatically maintains stabilized hover, and straight and level cruise flight, i.e., the last pilot-selected airspeed, altitude, attitude, and direction of flight.

The following subsections are proprietary, and available for viewing subject to the execution of a non-disclosure agreement.

ATTITUDE CONTROL
AIRSPEED CONTROL
ALTITUDE CONTROL
eVTOL MODE vs AIRPLANE MODE

SAFETY BY DESIGN

The *Epiphany Transporter* has been carefully designed to provide extraordinary levels of safety. Other than its motors and spinning, fixed-pitch fan blades, it has only three (3) moving parts, i.e., its three pair of tiltable thrusters.

Although all key and life-critical components have been engineered, sized, stressed and tested to ensure that they will not fail, or be otherwise compromised, the reality is that components can, and do, fail… an unfortunate and adverse acknowledgement and testament to Mr. Murphy's longtime omnipresence. Accordingly, the *Epiphany Transporter* has been designed with redundant backup solutions for all potential and crucial single-points of failure.

DUCTED FAN THRUSTERS and POWERTRAIN

The ducted fan thrusters incorporate special purpose aerodynamic rings and rigid vanes designed to: 1) double the static thrust of the fans; 2) generate efficient lift when tilted at cruise airspeeds; 3) significantly reduce noise; and 4) provide protection to and from the rotating fan blades. The rings are structurally rigid and are attached to the fuselage in a unique way that provides vertical thrust for hover, and, when tilted, longitudinal thrust AND efficient aerodynamic lift, during cruise. They can also be folded for garaging and transport.

Each ducted fan thruster is directly powered by its own electric motor. This *distributed* propulsion concept is the heart of the vehicle's safety. The motor is driven by its associated electronic motor controller, which in turn is wired to its dedicated high-energy density battery.

In the highly unlikely event of a total or partial loss of *any* component of a ducted fan thruster "system", for any reason, i.e., a failed fan, or motor, or controller, or battery, then the polar-opposite ducted fan thruster is simultaneously adjusted by the autopilot, instantly preserving the balance of the aircraft's lift and torque. At the same time, the thrust from the remaining four operating ducted fans is increased up to 150%, as required, to seamlessly maintain altitude and safe flight.

The motors and associated controllers are sized to accommodate this increased power demand, allowing the aircraft to normally hover and fly requiring approximately 50% of its installed power. In other words, the vehicle has a very

large margin of excess power to deal with increased payloads, emergencies, hot weather, or high-altitude operations.

The motor controllers and batteries are physically separated from each other by firewalls to eliminate any cross-contamination between a failed unit and an adjacent unit. Since each ducted thruster system includes its own dedicated battery, the four batteries powering the four remaining fully-functional ducted thruster systems continue to produce required power, albeit with reduced aircraft range.

DUCTED FAN THRUSTERS and TRANSISTION FLIGHT

Flight associated with winged-eVTOL aircraft, or fixed-duct eVTOL aircraft, specifically during transition between hover and cruise airspeeds, and back, can be problematic and often spontaneously dangerous. The problem that develops involves the ever-changing *character* and *location* of lift vectors, e.g., raw fan, propellor or jet lift versus aerodynamic wing lift. As airspeed changes, different locations of lift vectors results from migratory centers-of-lift relative to the fuselage, while changes in lift character add the complexity of managing varying powered-lift sometimes, and varying aerodynamic lift other times.

The *Epiphany Transporter*, with its NASA-proven unique and proprietary ducted thrusters, benefits from a favorable amalgamation of powered-lift and aerodynamic-lift modulated seamlessly *throughout* its flight envelope *without changes in centers of lift*. Moreover, the character of lift production does NOT change, i.e., the thruster is always generating both powered-lift and aerodynamic-lift, and does not experience the same transition issues as other eVTOL aircraft. The result is streamlined, safer flight testing, and ultimately day-to-day operations.

It is anticipated that bird strikes are effectively eliminated with the craft's relatively slow airspeeds allowing birds time to get out of the way. Ultrasonic air-powered sirens mounted on the vehicle's exterior surface provide an additional layer of insurance helping to eliminate birds in the flight path.

DUCTED FAN THRUSTER TILT SYSTEM

The front two thrusters, the middle two thrusters, and the aft two thrusters, are each tilted by their dedicated dual, inter-connected, electro-mechanical servos controlled by the autopilot. Either of the dual servos is capable of doing the job,

albeit at half the rate with both servos working. In the highly unlikely event of a failed servo (even with certified life of > 100,000 cycles), monitors ensure that all six thrusters tilt at the same rate so their positions always match.

The craft also has the additional safety feature of a guarded, three-position toggle switch that provides an alternate method of directly powering the thruster tilt servos in the highly unlikely event of an autopilot problem.

JOYSTICK

The joystick, thumb-switch, thumb-button, and finger-button, and associated connective wiring are electro-mechanical devices and components, and as such are not immune from failure (even with certified life of > 5 million cycles). The solution to this potential single-point of failure is the addition of a backup 3-axis joystick and altitude control switch located close to their counterparts.

These alternate components are miniature versions of the primary controls, and are wired in a specific manner to the autopilot, so, effectively, either set can safely control the aircraft. The secondary controls are powered by a dedicated electrical power bus, separate from the craft's normal system's power.

AUTOPILOT

The autopilot has true, triple levels of fault-tolerant redundancy and "democratic" arbitration. It automatically provides stabilization about the pitch, roll and yaw axes by biasing the relevant thrusters. It also manages airspeed, turns and altitude by receiving signals from the joystick and other sensors then processing that data before sending it to the motor controllers which modulate the thrusters, differentially or collectively, to achieve the pilot's commands. The *Epiphany Transporter's* stabilization is always running in the background, regardless of the pilot's commands. The autopilot also provides auto-takeoff/landing capability, and collision avoidance heads-up notice from other aircraft and ground obstacles, including powerlines.

FUSELAGE

A bolted together, multi-piece, carbon-fiber monocoque shell with integral bulkheads, rollbar, shelving and hardpoints comprise the *Epiphany Transporter's* fuselage. Missing is the conventional "space frame" with welded, pre-cut,

problematic metal tubing requiring jigs and fixtures to ensure proper alignment and spacing, and paint.

A one-piece Lexan canopy, with integral UV & IR protection, is powered by twin electro-mechanical servos, and allows safe and easy cabin ingress and egress. The canopy, forward windscreen, and dual lower “chin” windows together offer excellent forward and look-down visibility.

Fixed, front landing “legs” and wheels provide a lightweight, robust, yet forgiving main undercarriage. The single rear ventral fin with rollerball-type wheel completes the three-point ground support and aids in the craft’s directional stability at high speeds. With three-point landing gear, the vehicle can accommodate landing areas that may not be perfectly level.

HIGH-VOLTAGE WIRING

The remaining potential points-of-failure include the high-voltage, high-current, wiring and connectors for the battery, motors, controllers, and other like-kind electrical components. All wiring must be properly secured to eliminate chaffing and/or other trauma, and terminal connections need to be effectively failsafe preventing overheating and outright connection failure.

These attributes and additional safety protocols are being vigorously designed and engineered into the wiring system making it extremely robust, using only the highest quality, properly installed, certified connectors, insulation, and shrink-wrap, while ensuring that there are no exposed high-voltage hazards to people or pets.

DESIGNED FOR RAPID MANUFACTURING & ASSEMBLY

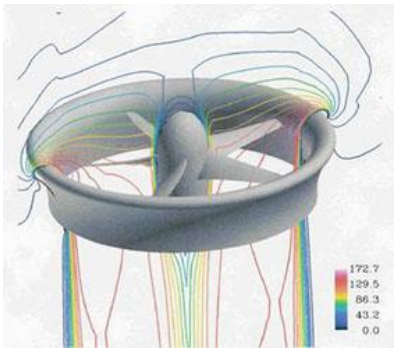
The *Epiphany Transporter* has been designed and engineered from the get-go to require only a small fraction of the time and manpower for manufacturing and assembly compared to conventional aircraft or winged/wingless eVTOL aircraft.

Other than one-time production tooling for the carbon-fiber fuselage, ducts and injection-molded fan blades, and tooling for the Lexan windscreen and canopy, which are all outsourced to world-class vendor partners, in-house high-volume production becomes more of an assembly process requiring no fixtures, jigs, conveyers, autoclaves, paint booths, machinery, or other major CAPEX.

Outsourced OTS (Off-The-Shelf), and custom machined and "printed" components, are easily assembled, connected and bolted in place using only hand tools. There are no welded parts, and virtually no rivets! Final assembly requires minimal workforce, factory space and utility power.

PROTOTYPE CONSTRUCTION AND FLIGHT TESTING

The *Epiphany Transporter's* development plan goes from "drawing board" to full-scale, manned prototype. Fundamental to that decision is the belief that nothing substantive is gained by diverting money, time and resources towards a scaled prototype aircraft, then trying to interpret results from nebulous scaling laws of questionable value when applied to thrusters operating in full-envelope testing.



Previous development and testing of identical-sized thrusters as those used on the *Epiphany Transporter* have been carried out in both high-speed NASA wind tunnels and full-scale manned aircraft tests. *Hundreds* of wind tunnel tests produced valuable and repeatable data during both hover and high-speed cruise conditions with changing thruster tilt relative to the airstream. And *over sixty* successful flight tests on the full-scale, manned, *SoloTrek XFV* aircraft were carried out providing additional data in hover and low-speed translation flight.

SoloTrek XFV

The CFD program developed and refined over a twenty-five-year period, and used to optimize the design of the ducted fan thrusters, has been validated with its predicted results within 2% of real-world testing results. The thrusters used on the *Epiphany Transporter* directly benefit from all of this previous work.

Prior to beginning actual flight testing on the *Epiphany Transporter*, a custom-built flight simulator will provide SIL (Software-In-the-Loop) capability to safely test all of the software, including algorithms, PID (Proportional-Integral-Derivative) settings, control laws, etc., to ensure proper vehicle behavior in various flight situations from hover through high-speed cruise.

Once the full-scale, *Epiphany Transporter* manned prototype has been built and ground-tested, tethered hover tests will take place. At the same time, application will be made for a LSA airworthiness certificate, then for experimental R&D certification which will allow the craft to legally fly free of the ground tether, albeit with some operating restrictions imposed by the FAA. However, as the *Epiphany Transporter* will only be flown with a pilot on board, it will not be subject to rules for unmanned "drones" requiring flight testing to take place only in FAA designated "test ranges".

After demonstrating stable and controllable hover within a few feet of the ground, and during very low-speed translation, the flight envelope can begin to be safely and slowly expanded. Unlike conventional airplanes requiring high-speed flight and high altitude for testing, the *Epiphany Transporter* can take careful, measured, baby steps slowly and safely opening up the flight envelope to learn about its performance and manners.

One of the most crucial areas of eVTOL flight is the transition from hover to cruise flight, and back. Winged eVTOL aircraft must deal with powered-lift during hover flight, changing to aerodynamic-lift during cruise flight, with resulting centers of lift, e.g., fans or jets, migrating from one area of the fuselage to another, e.g., to wings. Typically, this has proven very problematic during flight, and difficult for the aircraft's control system to "get right".

However, the *Epiphany Transporter*'s thrusters are *always* producing both powered-lift and aerodynamic-lift, with their resultant centers of lift remaining virtually in place. For these reasons, it is believed that the craft will not suffer from the same translational issues plaguing winged eVTOL aircraft.

PROFORMA P&L SUMMARY AND ENTERPRISE VALUATION

The *Epiphany Transporter* 'sample' financial projections and valuation models are presented for context. While no similar products currently exist for comparison, it is believed the *Epiphany Transporter's* capabilities, performance and utility will have high-end and first-mover consumer demand exceeding production capability.

Assumptions

PER UNIT RETAIL PRICE:	$699,000 USD (2026)
PER UNIT COGS @ 39%:	($275,000)
PER UNIT GROSS PROFIT @ 61%:	$424,000
PER UNIT OPEX @ 9%:	($63,000)
PER UNIT PROFIT @ 52%:	$361,000
ANNUAL PRODUCTION RATE:	104 Units (ramped up over 18 months)

Financial Projections

ANNUAL REVENUE:	$72,696,000 (1st full-year ramped-production)
EBITDA @ 52%:	$37,801,920
ENTERPRISE VALUATION* @ 50X:	$1,890,096,000 (@ 104 units per year)
PROFORMA VALUATION** @ 20X:	$756,038,400 (LSA certification / no sales)
MARKET VALUATION:	$150,000,000 (with 1st prototype flight)
CURRENT VALUATION:	$TBD (pre-prototype)

* *Valuation multiple for listed technology companies based on established (enterprise) earnings.*
► Note: For context, Tesla's current valuation multiple is **70X** (as of 1 July 2023)
***Valuation multiple for listed technology companies based on future (proforma) earnings.*

Notes
Completing the proof-of-concept prototype to first flight estimated at $750,000 / 9 months
Pre-certification first-article development and testing estimated at $2.5 million / 12 months
LSA certification and testing estimated at $300,000 / 6 months
Pre-production CAPEX (tooling, equipment, facility improvements) estimated at $1.5 million
Production start-up parts inventory and working capital estimated at $2 to $4 million
Administrative and legal estimated at $0.7 million (exclusive of "going public" costs)

ABOUT APPLIED eVTOL CONCEPTS

Applied eVTOL Concepts is a privately-held, debt-free, development-stage, company in formation with a mission to design and produce innovative eVTOL flying vehicles. The company principals, and predecessor companies, have a combined twenty-five-year history of design, engineering, fabrication and successfully testing of various ducted thruster related VTOL and eVTOL manned aircraft.

Its two visionaries, CEO and Lead Designer, Michael Moshier, and Chief Engineer and Senior Aerodynamicist, Rob Bulaga, have proven acumen and experience relating to all aspects of a vertical take-off and landing aircraft for personal, non-commercial use. One of their previous VTOL aircraft prototypes was awarded 'Invention-Of-The Year' by *Time Magazine* back in the day, with their *SoloTrek XFV* aircraft today remaining on permanent display at the *Hiller Aviation Museum* in San Carlos, California.

The company's current headquarters are in Newport Beach, California, however, similar to the way the *Epiphany Transporter's* propulsion is "distributed", ongoing development work is also distributed with world-class development partners in the USA and around the globe. Without incurring burdensome overhead, headcount, or investors, the company has been able to make remarkable, cost-effective progress while teaming with these partner-organizations, each responsible for different aspects of the vehicle's development.

Applied eVTOL Concepts has successfully integrated ("Applied") its proven propulsion technology, with its breakthrough aeronautical design and engineering, leading to the world's first truly *practical* "flying car". With that work essentially complete, the company is seeking a joint-venture or similar collaborative relationship with a strategic, aerospace-industry partner, or financially capable visionary partner, to expedite the prototype-build, testing and certification. Thereafter, introducing the *Epiphany Transporter* to an eager, long-waiting, worldwide marketplace.

REQUEST FOR PROPOSALS

Applied eVTOL Concepts is soliciting proposals from capable potential partners interested in collaborating on the *Epiphany Transporter's* remaining development, testing and certification. In their introductory email communication to the company, potential partners should address the following requisite points of discussion and forward thinking:

1) Your (non-airport) facilities and space availability to support prototype and first-article fabrication and assembly, ground and flight testing, and LSA certification;
2) Your bandwidth and available engineering and technical workforce to lead/support final design-engineering-systems review, fabrication, assembly, testing, and certification;
3) Your aircraft certification experience, or similar experience with the FAA;
4) Your manufacturing and production experience and acumen, with an emphasis on high-performance aircraft or land vehicles;
5) Your established industry, FAA, DARPA, and military relationships; and
6) Your constructive (positive and negative) initial feedback regarding the product design, specifications, predicted performance, and market. Other opportunities may include future Series-A round funding, technology licensing, or acquisition. Please take this opportunity to make your case why you or your organization are the perfect partner.

INITIAL CONTACT:

Please be sure to registered your name, title and organization. Registration will enable follow-on, two-way correspondence with the company and ensure that you will receive a response after sending your initial introductory email. Note that the information you provide will remain secure, and you will not be contacted or otherwise bothered. PLEASE DO NOT CALL OR TEXT THE COMPANY!

Send your introductory email directly to Michael Moshier. Importantly, in the Subject line of your initial contact email, please enter "Epiphany:" followed by "your organization name:" then "your name:" and "your title"., e.g., Epiphany: Lockheed Aircraft Company: John Doe: Business Development Officer.

Your email will be the initial step in letting the company determine if you are a good potential partner match, so please take the time to make your introductory email as substantive as possible.

Thank you for your interest in the *Epiphany Transporter*.
Michael Moshier, CEO, Applied eVTOL Concepts [mwmoshier@gmail.com]