

Terreplane's Lab Operational for Vehicle Prototype

(L:D ratio optimization, arm-mechanism optimization)

2/25/18 - R&D Update

Lift-to-Drag (L:D) ratios of Terreplane vehicles are a critical design feature that impacts energy consumption. Energy economy is directly proportional to these L:D values (a doubling of the L:D results in a doubling of the miles per gallon). During the last few weeks, Terreplane Technologies, LLC has upgraded wind tunnel facilities to include the capability of measuring L:D ratios of prototype vehicles. The new facilities provide the capability to Design, 3D print, and document L:D ratios of several prototype vehicles designs in 24-hour turnaround times.

A recent TRB conference publication documented how Terreplane's zipline-type guideways result in a more than 80% savings (less than 1/5th the cost) of infrastructure costs relative to alternatives like high speed rail, Hyperloop, maglev, and interstate highways. Terreplane's suspended guideway infrastructure is similar to the infrastructure of electrical power transmission lines, and decades of documented costs of that industry allow a high degree of confidence in the cost estimates.

These inexpensive guideways allow for easy routing; and this combination enables achieving 3 of 4 of Terreplanes metrics of performances: 1/5th the cost, 1/5th the time, and 1/5th the environmental footprint.

The fourth metric is 1/5th the energy consumption. Leading the energy efficiencies of transportation are intercity-speed rail and airlines at 55 and 52 passenger-miles per gasoline gallon equivalent, respectively. A "1/5th the energy consumption" metric translates to fuel economies in excess of 250 passenger-miles per gasoline gallon equivalent (p-mpg)--an advance unprecedented in history.

The major factors that enable such an advance in energy efficiency are:

- absence of fuel on the vehicle to reduce weight,
- direct use of grid electricity for powering the vehicle with little to zero battery storage which has higher fuel-to-thrust overall efficiency,
- logistical practices that allow a standard of non-stop service, and
- L:D ratios similar to commercial piston-engine aircraft.

Terreplane's vehicle prototyping lab and wind tunnel lab are enabling rapid progress on the last of these factors (the first three factors are verified by calculations and enable the 1/5th energy metric). Targeted L:D ratios could be easily achieved and exceeded if commercial gliders were to be tethered by Terreplane's open-sided coil chassis; however such vehicles would require a wider transit corridor than desired. The goal is to attain L:D ratios of 10-14 (as exhibited by piston-engine aircraft) under the following constraints:

- Total vehicle widths (including wings) between 6 and 30 ft,
- Passenger compartment walkways of 6.5 ft height, and
- Passenger compartment widths (for seating) of 4.5 to 7 ft.

These constraints would allow wings to extend up to 12 ft from both sides of the vehicle; however, the goal is to minimize or eliminate the wings.

A significant advantage of Terreplane toward achieving the L:D goal is the increased stability of a tethered glider versus an isolated aircraft. This feature allows for the safe use of airfoil shapes (wings, fuselages) on Terreplane vehicles that would not be safe on commercial aircraft.

Within the design constraints, Terreplane's executive board believes it can achieve the goal of meeting L:D ratios of commercial aircraft for passenger service. For parcel and small freight service, the board believe that L:D ratios 1.5X that of commercial aircraft will be attained due to reduced heights of the payload compartments (heights of 1.0 to 1.5 ft). The said fuel economies for parcel service would establish a new playing field for online shopping including: a) reduced delivery costs, b) same-day delivery being available over wide regions, and c) ability to maximize use of local suppliers by autonomous parcel service. Such same-day parcel service would not require the use of flying drones; rather, Terreplane vehicles would deliver/pick-up within a 1-mile distance of destination/origin with completion of the route using autonomous or Uber-type vehicles on existing streets.