

SOLUS – Solutions and Technologies, LLC

Seeks partners for commercializing.....

Vortex Flow Based Aerodynamic Drag Reduction Technologies for Fuel Economy Improvement of Light and Medium Vehicles

SOLUS seeks partners to license/commercialize four vortex flow based aerodynamic drag reduction technologies for fuel economy improvement of light and medium vehicles. The inventions are in use by the heavy truck industry where they are manufactured and sold through a license agreement with Silver Eagle Manufacturing Company.

Technology Overview

To reduce our nations carbon footprint SOLUS-Solutions and Technologies, LLC has developed a suite of **advanced vortex-flow based aerodynamic technologies that reduce fuel use and harmful emissions by 15%**. The SOLUS inventions employ advanced aerodynamic vortex-flow based design principles, used extensively on advanced military aircraft, to develop a highly effective, practical, and low cost drag reduction system.

Approach

Aerodynamic drag is a primary resistive force that light and medium vehicles must overcome. The SOLUS technologies subtly alter the flow patterns around the vehicle to reduce pressure drag and increase fuel economy up to 15%. The geometric simplicity of the inventions belies the complexity of the governing aerodynamic principles of these devices.

In developing viable innovations to reduce aerodynamic drag it was recognized that typically used streamlining based technologies would not perform well in the unsteady and separated-flow operating environment that ground vehicles experience during normal operation. In contrast to traditional streamlining innovations, vortex-flow based designs are a better fit for the operating environment where they provide a more practical design with a much larger operating sweet spot.



Wake Board

Frame Extension

Vortex Strake

Mini Skirt

Technologies

The drag force on a typical vehicle is concentrated in three regions (i.e. drag hot spots); the front of the vehicle, the vehicle base, and the vehicle undercarriage. A suite of four advanced vortex-flow based aerodynamic technologies have been developed to reduce the drag force on the vehicle base and undercarriage.

Base drag is the most difficult challenge due to the various base shapes and rear door designs as well as diverse operational and maintenance requirements for this class of vehicle. To address the base drag hot spot three inventions were developed; the Vortex Strake, Wake Board and Frame Extension.

The Vortex Strake invention can be used with all vehicle types. This invention mounts to the vehicle side and top surfaces where the innovation generates large coherent vortex structures that energizes the flow leaving the vehicle rear edge and stabilize the wake thereby increasing base pressure and reducing base drag. The Vortex Strake device is sized and orientated on the side and top surfaces based upon the selected streamwise position, surface roughness, vehicle length and boundary layer state. Properly sized, this technology will increase fuel economy up to 2%.

Wake Board and Frame Extension inventions employ trapped vortex principles to create virtual boattail structures that stabilize the base wake resulting in lower base drag. The Wake Board invention consist of two vertical panels that mount on the rear of the vehicle and the Frame Extension invention is a rigid rectangular cylinder that mounts to the rear of the vehicle.

The pair of panels that comprise the Wake Board device are symmetrically positioned about the vehicle centerline. The inset position of the Wake Boards is based upon the vehicle side surface roughness, length and boundary layer state. Properly sized, this technology will increase fuel economy up to 4%.

The Frame Extension device is designed to not interfere with the operation and loading requirements of a rear door vehicle. The two side panels and top panel of the invention are inset from the outer edge of the frame less than 3 inches whereas the bottom panel is structurally designed to support loading and off loading operations. Properly sized, this technology will increase fuel economy up to 6%.

Undercarriage drag results from high-energy flow entering the underside of the vehicle and impinging upon the various structures and components. The Mini-Skirt invention redirects and captures the majority of the undercarriage in-flow through the use of a vortex induced upwash field. Compared to traditional single panel skirts the novel inner and outer skirt surfaces of the Mini-Skirt invention allow for the blockage of a greater amount of undercarriage in-flow for a given skirt drop length. The outer skirt surface of the Mini-Skirt has an aerodynamically sharp lower edge that is used to generate the controlling vortex that induces the upwash field. The induced upwash is then captured and redirected by the inner skirt surface. When installed in accordance with design requirements the Mini-Skirt technology will increase fuel economy up to 6%.

Applications

Light and medium ground vehicles below 20,000 pounds:

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