THE STARSHIP INITIATIVE

PUSHING THE BOUNDARIES OF WHAT'S POSSIBLE IN FUEL EFFICIENCY

Shell ROTELLA®
HEAVY DUTY DIESEL ENGINE OIL

THE POWER OF INNOVATION

> “THE ENERGY TRANSITION WILL PLAY OUT OVER MANY YEARS AND IT SEEMS UNLIKELY THAT ANY ‘SILVER BULLET’ SOLUTION WILL EMERGE. IN THAT SENSE, IT’S USEFUL TO WORK OUT JUST HOW GOOD WE CAN BE TODAY IF WE DRAW TOGETHER THE MOST PROMISING EFFICIENCY CONCEPTS INTO A SINGLE PLACE… IN EFFECT BEING THE BEST WE CAN BE EVERY DAY.”

BOB MAINWARING, SHELL LUBRICANTS TECHNOLOGY MANAGER FOR INNOVATION

Moving people and goods efficiently is vital to economic prosperity. Transport accounts for more than one quarter of the world’s total energy use and one fifth of global energy-related carbon dioxide emissions. Increasing efficiency and fuel economy in the transport sector could make considerable progress to help reduce emissions.

We need to leverage the full power of innovation and collaboration to reduce CO_2 in the most socially, environmentally and economically responsible way. This means doing things differently and better than before.

Shell has partnered with the Airflow Truck Company to collaborate on a hyper-aerodynamic, super fuel-efficient class 8 concept truck: Starship. By bringing together the best of today’s existing and custom technologies, we aim to find out just how energy-efficient goods transport by road can be – today – and elevate the conversation about the energy transition.

STARSHIP INITIATIVE

Shell ROTELLA

HOW STARSHIP PUSHES
THE LIMITS ON EFFICIENCY

USING TECHNOLOGIES THAT ARE AVAILABLE TODAY, SHELL AND AIRFLOW TRUCK COMPANY HAVE DESIGNED AN EXCEPTIONALLY ENERGY-EFFICIENT TRUCK CAPABLE OF REDUCING THE ENERGY USAGE ASSOCIATED WITH GOODS TRANSPORT IN A MATERIAL WAY.

AERODYNAMICS:

- Cab is bespoke design, 100% hyper-aerodynamic carbon fiber.
- Active grill shutters (active based on temperature to maximize aerodynamics and maximize efficiency) when open, enable air to flow through the radiator and into the engine compartment, allowing cooling. When cooling isn't needed, the shutters are automatically closed, leaving the air to reroute around the vehicle. The result is less aerodynamic drag and reduced fuel consumption. There is also the additional benefit that closed shutters provide in cold weather, with reduced warm-up time of the engine.
- Boat tail: aerodynamic tail to make the truck streamlined and reduce drag. Bespoke design, elongated flaps to fit the truck with long side skirts that reduce rear-end drag.

EFFICIENCY:

- Hybrid electric axle system: electric motor and axle replacing the rear tractor non-driven axle. This provides a power boost while climbing grades, where most of the fuel is consumed per mile. Takes the energy out of the truck and feeds it into the battery for acceleration/braking.
- Custom automatic tire inflation system that ensures consistent tire pressure for optimal fuel economy.
- A downspeed axle configuration using advanced engine controls and automated manual transmission provides improved efficiency as well as good pulling power.
- 5,000 watt solar array on trailer roof that charges and stores power in the battery pack for the main 48 volt battery bank on the tractor, powering the normal truck loads such as lights, wipers, blower motors, gauges, air conditioning and heating, microwaves, and other electrical components.

SHELL TECHNOLOGIES:

- Starship will utilize full synthetic Shell Heavy Duty Engine Oil, blended to a low viscosity meeting the American Petroleum Institute FA-4 performance standard in a 5W-30 weight. The use of fully synthetic base oils, plus advanced additive technology provides protection against wear, deposits and oil breakdown, while also providing enhancements in fuel economy and high/low temperature performance. The lower viscosity delivers superior fuel economy compared to a conventional SAE 15W-40. The technology is the same as Shell Rotella® T6 Multi-Vehicle 5W-30, a full synthetic heavy duty engine oil that meets both the API CK-4 and API SN performance standards.
- Shell Rotella™ DEF Diesel Exhaust Fluid and Shell Rotella® Extended Life Coolant will further help keep the engine and cooling systems operating at peak efficiency.
- Starship will also use full synthetic Shell Lubricants, including Spirax S6 GXME 75W-80 transmission oil, Spirax S5 ADE 75W-85 differential oil, and Spirax S6 GME 40 wheel hub oil.

THE POWER OF TECHNOLOGY

OPERATIONAL EFFICIENCIES

Driver behavior, predictive cruise control, regenerative braking

ROOF-MOUNTED SOLAR PANELS

Powers interior accessories when engine is off

AERODYNAMIC IMPROVEMENTS

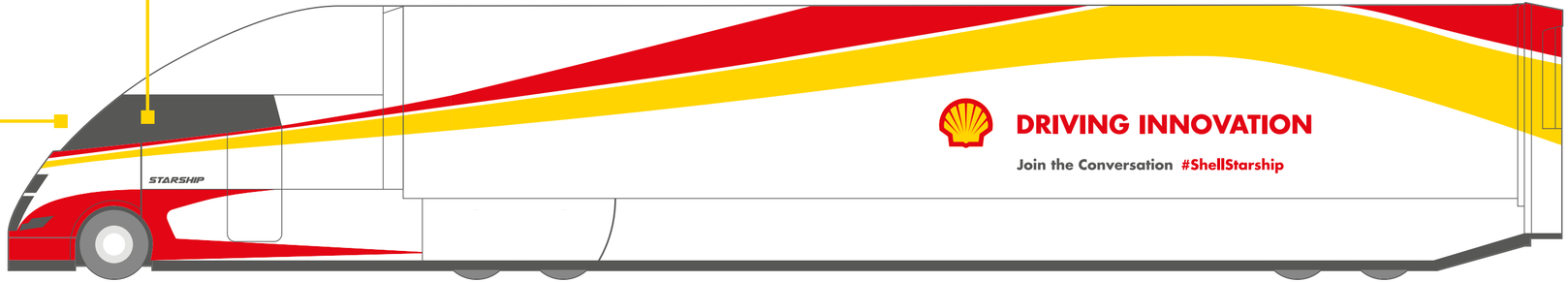
Creating minimum wind resistance

ACTIVE GRILL COOLING SYSTEM

Closes when cooling is not needed to improve air flow

LOW VISCOSITY, FULL SYNTHETIC SHELL LUBRICANTS

Reduce friction for more efficient operation



TRANSMISSION

Ultra-low RPM operation

AXLE-RATIO

6x2 configuration for lower weight, friction and better fuel economy

TIRES

Low rolling resistance, single-wide to help lower friction plus auto-inflate technology

OWNER – AIRFLOW TRUCK COMPANY

ROBERT SLIWA

> “THE GREATEST CHALLENGE FOR THIS PROJECT IS THE NUMBER AND PHYSICAL SCALE OF THE COMPONENTS THAT NEED TO BE DESIGNED, MANUFACTURED AND HANDLED – OFTEN AS ONE-OFFS – STARTING LITERALLY FROM A BLANK SHEET OF PAPER. ”

After six years of regional trucking, Bob knew that he was ready to open his own over-the-road trucking company and become an owner-operator. But he soon realized how inefficient long-haul trucks were, as he could only average 4.4 mpg.

He then decided to use the lessons of his prior racing days to make his fledgling business more profitable, by modifying the cabover to be more aerodynamic and fuel-efficient.

Starting from the 4.4 mpg baseline, he changed only one item at a time, and documented the effects. Through hard work and constant experimentation during “real-world” freight runs, he would soon average close to 10 mpg.

He began work on a second super-aerodynamic and hyper fuel-efficient Class 8 rig, the BulletTruck, in 2009. He introduced it to the public and began weekly “real-world” freight hauling runs with it in 2012.

Bob resides in central Connecticut with his German shepherd dog, Kayla. In his free time he enjoys hiking with Kayla, home theater and utilizing his private pilot’s license.

TECHNOLOGY & INNOVATION MANAGER, SHELL LUBRICANTS

BOB MAINWAIRING

Bob is a mechanical engineer. He worked in the heavy engine and nuclear industries prior to joining Shell in 1988. Bob leads Shell’s global automotive engine and lubricant research team for this project. Bob has an especially keen interest in the energy transition that is now underway and the technologies that will emerge as we strive to minimize the world’s carbon footprint.

Bob leads many co-engineering projects for Shell, including the Shell Concept Car, an urban vehicle that uses less energy than other cars available today. The Shell Concept Car sought to explore the role that lightweighting, streamlining and lubrication played in personal transport. And now he is responsible for the Starship Initiative, which explores the equivalent to the Concept Car for freight transport.

> “COLLABORATION IS CENTRAL TO EFFECTIVE INNOVATION… BRINGING PEOPLE FROM DIFFERENT DISCIPLINES WITH DIFFERENT EXPERIENCES TOGETHER TO TACKLE A COMMON PROBLEM. ”

DEMONSTRATING
WHAT IS POSSIBLE

Shell and Airflow Truck Company will demonstrate the performance of the Starship on a coast-to-coast run, measuring freight ton efficiency and fuel economy along the way in May 2018.

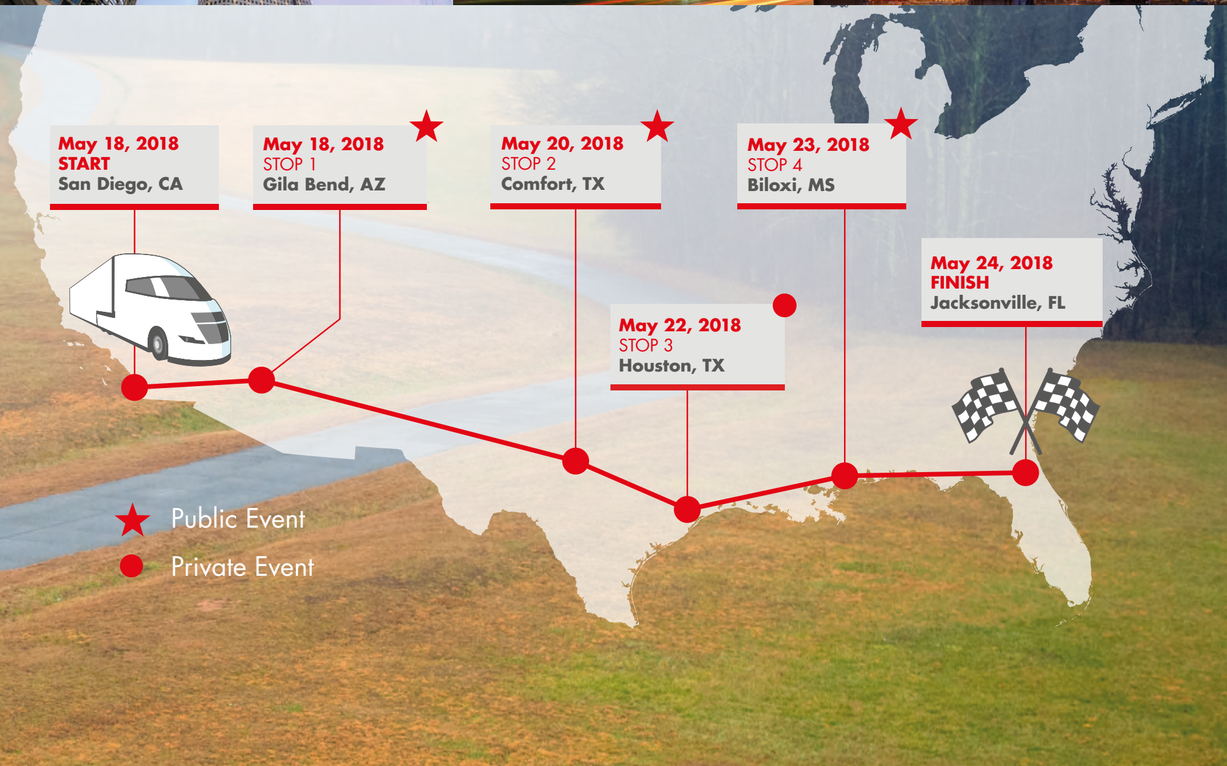
Freight ton efficiency is the primary indicator that will be measured on the Starship truck. It is usually expressed as gallons of fuel used per ton-mile of freight transported, but, equally, can be viewed as the force opposing vehicle motion per ton of goods carried. Small values of FTE are desirable and efforts to minimize the forces opposing vehicle motion and to increase the mass of goods carried will drive improvement. The mantra for this is: load up – go slow – go heavy.

The truck will be fully loaded, to a total gross vehicle weight of 80,000 pounds, maximizing freight ton efficiency. Maximizing the amount of load the truck is carrying can, in effect, decrease the fuel economy, however it will increase freight ton efficiency and reduce carbon emissions for the amount of energy used to transport goods from point A to point B.

The freight ton efficiency will be measured using the truck's on-board telematics system and will be verified by an independent third party.

The truck will be loaded with clean reef material that the Coastal Conservation Association will use to build an artificial reef off the coast of Florida.

Shell will host trucker appreciation and educational events at truck stops where the Starship truck will be on display during the coast-to-coast run. Truckers can learn how they can improve their own fuel economy, participate in chances to win prizes and a sweepstakes as well as enjoy a relaxing space to decompress on their journey.

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