

## Lightweight Buses With Electric Drive Improve Fuel Economy and Passenger Experience

### Background

The standard, 40-foot diesel-powered transit bus is noisy, consumes a gallon of fuel for every three miles it travels, weighs 28,000 pounds, and contributes significantly to urban air pollution. While hybrid electric buses do exist, they are very expensive, and typically get just four miles to the gallon. Autokinetics and the Department of Energy Office of FreedomCAR and Vehicle Technologies Program saw significant room for improvement in hybrid electric buses—in terms of weight and noise reduction, better fuel economy, lower cost, and rider perception—using lightweight body and chassis materials and relying extensively on a system-optimized electric drive propulsion system. Autokinetics is in the process of commercializing a technology that provides a 50% reduction in vehicle mass and a diesel-equivalent fuel economy of 13 miles per gallon. Autokinetics' technology stems from work done in partnership with Oak Ridge National Laboratory (development of the lightweight structure and chassis) and Argonne National Laboratory (optimization of the advanced propulsion system). The completely new design is 50%



lighter than today's standard bus. An independent study performed by IBIS Associates, Inc., found that the new design achieves cost savings of 15–20% over the standard bus body.

### The Technology

Autokinetics' improved body and chassis consist of ultra high strength stainless steel, specifically Nitronic 30™ from AK Steel. The line of thinking behind the completely new design is as follows: if you make the basic bus platform lighter, you can then reduce the size and mass of other bus components, including the suspension, wheels, brakes, and

propulsion system. This not only reduces the initial and maintenance costs of the bus, but also creates room for more passengers. In fact, the new low-floor ultra lightweight buses have room for 45 passengers, about 5 more passengers than can fit in a standard low-floor bus. The major enablers of this extra space are the absence of a mechanical drive train and the smaller wheels. While Autokinetics is currently focused on a battery-electric version of the bus, there are also plans to develop a plug-in hybrid version that would rely on a combination of off-peak electric power and a 30 kW diesel generator, and have a fuel



economy of about 12 miles per gallon (diesel equivalent).

### Commercialization

Autokinetics is working out an agreement with Terradyne Incorporated, a start-up company based in California that is dedicated to producing complete buses that provide significant operational cost savings and demonstrate environmental responsibility for commercial fleet operators. Under this agreement, Terradyne would be a licensee of the technology. Autokinetics is also exploring other opportunities, even some abroad, including China. One of the main messages that Autokinetics hopes to pass on to the transit bus community is that the new design is not just economical, but can also improve rider satisfaction. It is

hoped that cleaner, quieter buses will attract riders in greater numbers by improving the image of the urban transit bus.

### Benefits

- 300% fuel economy improvement over standard diesel bus
- 50% mass reduction
- 15%–20% reduction in cost over standard bus body
- Reduction in operating and maintenance costs
- Room for 45 passengers (about 5 more passengers than a standard bus)

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