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**Topic:** Clean vehicles and alternative fuels

**Submission date:** 2006

**Name of measure/service etc:**

## Phileas, the Eindhoven's cleaner and faster high quality public transport system

**Location:** Eindhoven, The Netherlands

**Initiator and partners:**

Stichting (foundation) Platform Hoogwaardig Openbaar Vervoer (HOV).

The foundation is a cooperative of:

- Autobusfabriek BOVA B.V. (now VDL-group).
- N.V. Brabantse Ontwikkelings Maatschappij (limited BOM).
- Duvedec International B.V.
- Netherlands Car B.V. Product Design & Engineering (now APTS).
- Simac Systems B.V.
- Neways Electronics B.V.

**Short description of the activity:**

The City of Eindhoven has developed a cleaner and faster high quality public transport system, which is more competitive with the private car. It is called Phileas.

**Background and objectives:**

The Eindhoven transport policy aims to stimulate the public transport within the city (center) and the direct surrounding region with a transport concept that could be further established in the first decades of the 21<sup>st</sup> century by:

- Improvement of the bad air quality and the fear of further air quality reduction because of growing mobility, specifically in Eindhoven's city center.
- Reduction of the overall national trend of growing 2<sup>nd</sup> car ownership in the households living in the direct area of service of the new Phileas APT network system.
- Inverting the trend that the city center (shops, train station, etc.) becomes less accessible for residents and commuters from the new to develop residential and industrial areas in the West Corridor of the city of Eindhoven and vice versa.
- Inverting the trend of quality cuts in the local public bus services due to decreasing profitability because of diminishing numbers of passengers.

To stimulate the public transportation service (first objective) it is necessary to take supportive policy measures:

- Making the use of private cars less favorable through increasing the usage costs, which can be locally influenced.
- Making the transport to and from the APT network easier and faster.
- Stimulation and developing mobility management plans for industrial estates.
- Stimulation of the quality of the public transportation system.

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## Implementation:

A cleaner and faster high quality public transport system and more competitive with the private car, implies:

- Environmental cleanliness:
  - Reduction of the exhaust to Euro 3 norm for buses.
  - Hybrid or electric propulsion giving the ability to run on electric traction for a stretch of minimum 3 kilometers.
  - Electronic guidance increasing fuel economy, enabling more accurate and quicker stops, thus a higher average speed and decreasing the use of road space.
- Speed and capacity:
  - Average speed on total route of 25 - 30 km/hr.
  - Maximum speed within municipal boundaries on free infrastructure of at least 70km/hr and outside these boundaries of at least 80 km/hr.
  - A transfer time factor (travel time per public transport divided by travel time per private car between two points) below 1,5.
  - 1000 passenger's capacity maximum on busiest time of the day, on the busiest spot in the busiest direction.
  - Large passenger capacity leading to a maximum of travel schedule intervals of 10 minutes.
- Costs:
  - Costs per kilometer of the free infrastructure of the Advanced Public Transport Network System should be between a conventional bus on a free lane and a fast tram.
  - Reduction of 25% of fuel use compared to normal bus.
  - Income - cost ratio should be at least 50%, based on the Dutch public transport budget reimbursement system.
- High quality of the vehicle system:
  - A quick and easy access for all passengers, more specifically senior citizens, passengers who are handicapped, in wheelchairs and with trolleys for children.
  - An appealing design, which adds to the public experience.
  - A payment system requiring no interference of the vehicle operator, contributing to shorter stops and higher average speed.
  - A vehicle system with a large flexibility from the infrastructure.
  - A network system that can be extended to the rest of the Eindhoven region.

Since the start of Phileas until today the technical evolution has increased in speed. Due to the fact that the Eindhoven Phileas was the first in its sort, a real pilot project in the full sense of the word, several new technical developments have surpassed the Eindhoven Phileas versions.

Currently diesel engines with a Euro 5 norm are on the market and Euro 6 Diesel engines are being developed. The newest diesel engines save 30% of fuel and have a better environmental performance, as compared to the normal bus.

The Phileas which has been sold to the French city of Douai has a more advanced propulsion system than the Eindhoven version and would qualify for the current EU emission norms. This version also tackled the safety back up for the failure of power steering during a situation when driving emission free.

If future technology allows further improvements like the use of the gas turbine or fuel cell, the combustion engine and / or the complete generator will be replaced by an alternative energy source.

The guidance system proves to be very accurate and enables Phileas to drive in a straight line, stop automatically at a guaranteed distance from the station platform (curb) and provide a constant information between the vehicle and the control room of the transit organization and vice versa. This is essential for accurate passenger information on station platforms, in the Phileas and the control room.

In combination with the all wheel traction (except front wheels) and all wheel steering, the Phileas needs less space than a tram or multi segmented bus. Lanes can be smaller and curves less wide, thus saving on construction costs.

### **Conclusions:**

The current techniques of the hybrid engine and battery system meet the Euro 3 norm easily. Emissions CO: 0.6 g/kWh – NOx: < 0,4 g/kWh – CH: < 0,02 g/kWh – particles: < 0,01 g/kWh

The battery management system enables the Phileas to run 4 kilometers without any exhaust. This contributes to the improvement of the air quality, which is so essential in the air polluted city centers.

The transfer time factor has been decreased from 1,93 between Eindhoven airport and Eindhoven central train station in 2003 to 1,19 in 2005. Total trip length first took 31 minutes. Phileas uses 19 minutes and is also more dependable in time of departure and arrival. During rush hour this figure will be even better. All this is realized by driving within the speed limit of 50 km/h.

Furthermore the quick changing of passengers due to the low floor at the same height of the platform and the decisions not to sell tickets by the bus driver, plus the installment of stop buttons (instead of halting at every stop even if no passengers board or exit) have contributed to a high operation speed.

Costs per kilometer of infrastructure for Phileas can be compared to the costs for a regular bus on a free lane. This is much cheaper than a fast tram on a free lane.

The Phileas needs only 0,84 liter/km, a reduction of 25% as was required.

On the cost – income ratio the performance is still under strain, mainly due to the cost side. Exploitation costs need to be reduced substantially to reach the objective of at least 50% income – cost ratio.

The station platforms are different from normal vehicle systems. The level of Phileas and the platform are equal. Thanks to the wide access doors and the level entrance, wheelchair and rollator users and people with pushcarts have no problems boarding Phileas. The electronic guidance system controls that Phileas docks exactly alongside the curb.

The user travels in great comfort thanks to the excellent shock absorption and air-conditioning facilities of Phileas and there is extra space for luggage, pushcarts and wheelchairs. On board the Phileas passengers will be given information on the route, the upcoming stops and the expected time of arrival at the final destination.



**Picture 1: Easy accessible due to exact docking, wide entrance doors and level floor**

Even when Phileas is guided electronically, there is always a driver on board as a general safety precaution and to ensure that it follows its route safely. To further promote the general safety of travelers, Phileas is fitted with cameras.

Phileas is now not only highly dependable, it also brings you to the city center in the same time and cheaper than by private car.

To create a supportive dynamic image the vehicle system supports real time passenger's information on mobile phones, via internet and at bus stops.

**Website address for more information:**

[www.phileas.nl](http://www.phileas.nl)

<http://www.aps-phileas.com>

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