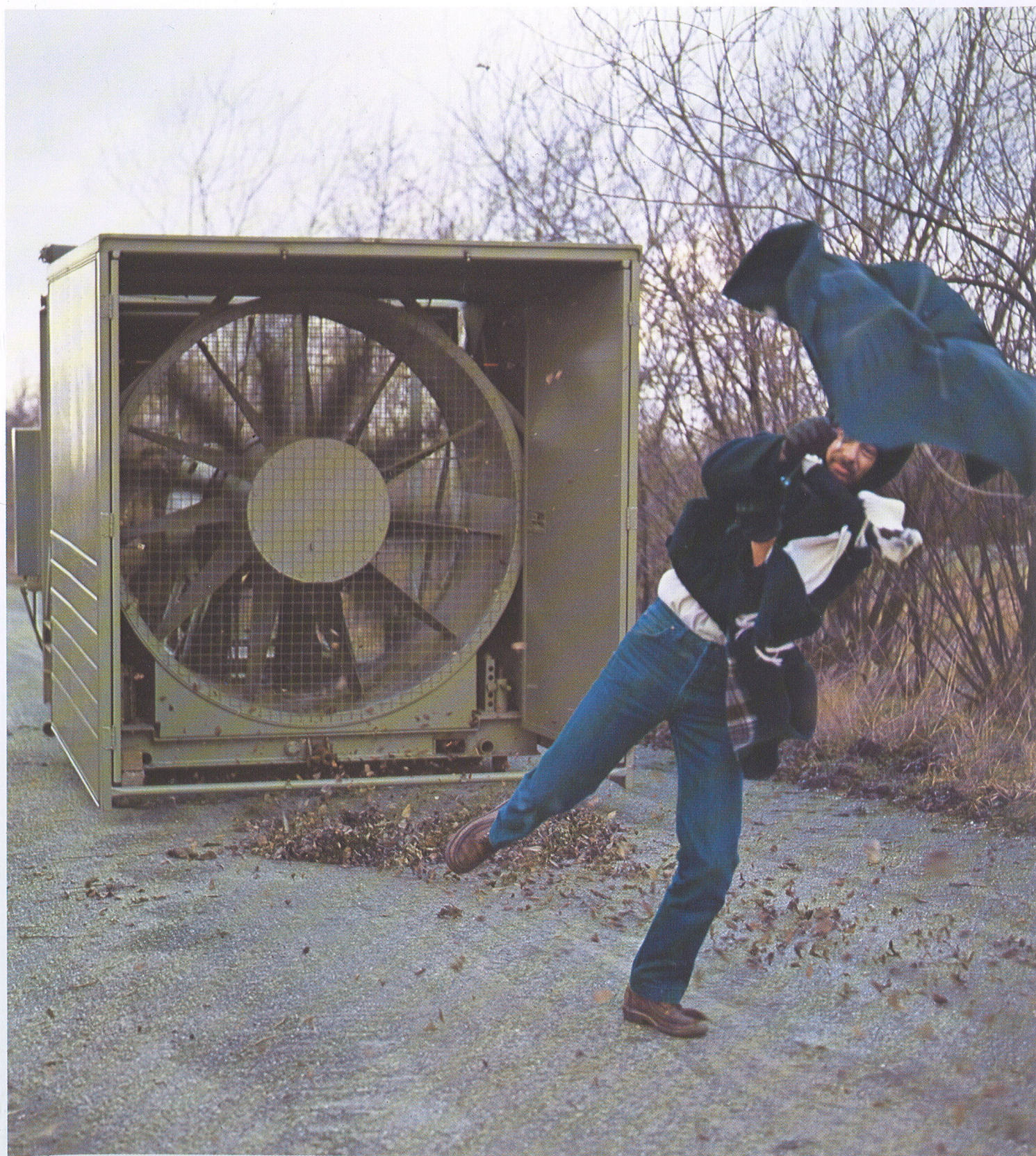


research institute for road vehicles tno



wind to measure



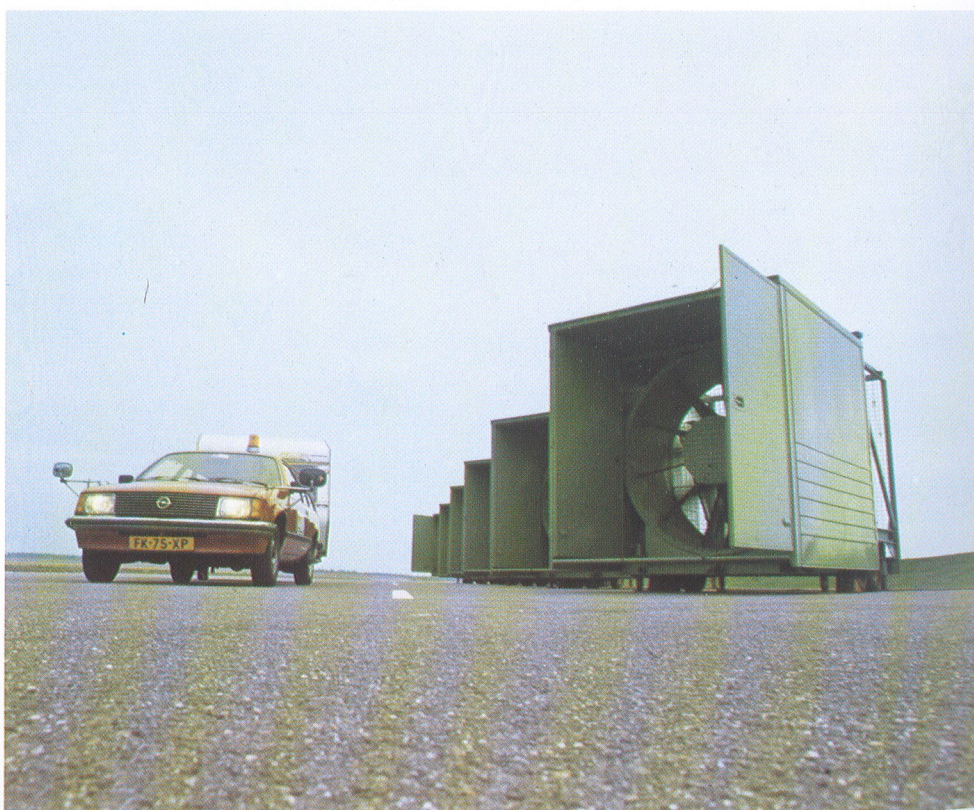
wind to measure

The Netherlands is a very windy country. Yet the wind lets many people down at very critical moments. There are situations that the wind must blow at a certain time and at a certain force.

A manufacturer of caravans wanting one of his products to be tested on cross-wind behaviour, a tent supplier wanting a new type to be tested under storm conditions, or someone who wants to expose a sun-blind to wind, they all need wind at the exact moment of their tests! And they need wind to measure! Force 3, 5, or maybe even 9 Beaufort, because all of them want to know the exact behaviour of their product under different circumstances.

TNO does supply wind to measure and (within reason) on the location desired. The TNO Research Institute for Road Vehicles has developed a windsimulator for the benefit of research in the field of road vehicles and active road safety.

The windsimulator is also very suitable for other tests. It may be adapted to the needs of the customer: from one to max. six simulators lined up as a street. A test field at TNO - Delft may be used, but the wind can also be delivered at home.



Above: Measurement of windspeed

Bottom: Crosswind sensitivity test

wind from a machine

A complete 'windsimulator' consists of six units. These do not have to be used together: for many applications only a few or even one machine will suffice. One such a windsimulator is already very powerful. It consists of a big fan, driven by a petrol engine. Between the engine and the shaft of the fan, which finally produces the wind, a gearbox with a speed reduction of 4 to 1 has been installed.

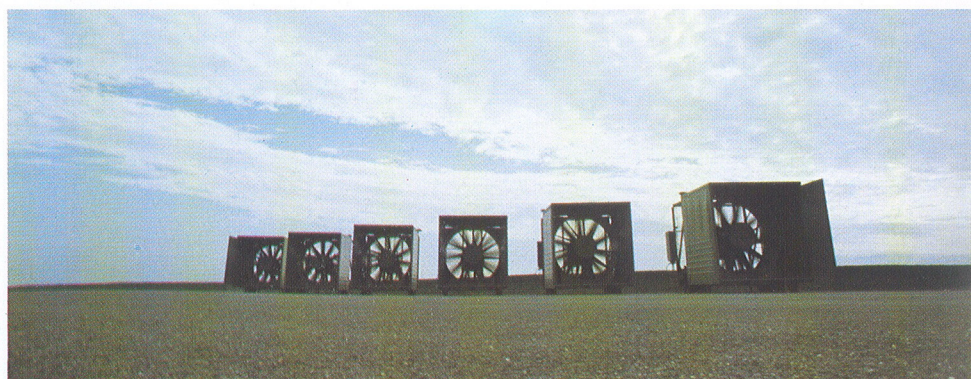
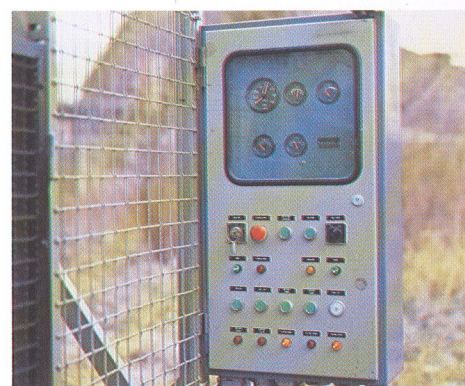
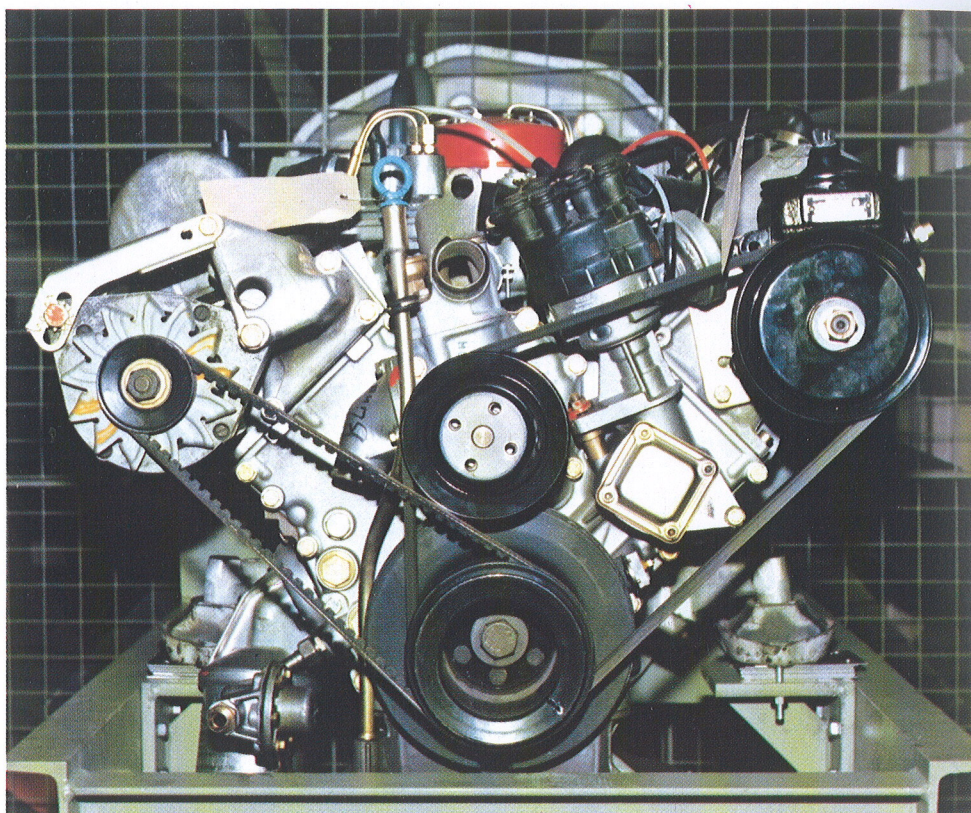
The axial fan has a diameter of 2 meters. At 1.000 revs./min. it has a maximum delivery of 100 m³/sec.: one hundred thousand liters of air per second!

The customer does not always require gale force wind. Therefore the simulator has a control by means of which the wind force can be chosen. Remote control is also possible.

Wheels have been placed under the supporting frame of the simulator in such a way that the unit can be moved over short distances.

technical data:

Max. force	12 Beaufort (distance 2-3 m)
Noise level at 6 m. distance	100 dB (A)
Noise level at 500 m. distance	60 dB (A)
Length	2.50 m.
Width	2.55 m.
Height	2.65 m.
Weight	3,600 Kgs.
Driving engine - power	160 kW at 5000 rpm.
torque	380 Nm at 3000 rpm.



Above: The engine (160 kW/5000 rpm)

Middle: Control panel

Bottom: The calm before the storm

wind, supplied at home or called for

One needs wind

- at a certain place
- at a certain time
- at one or more reliable forces.

TNO wind can be supplied at home, if desired. The simulators are transported on a specially constructed extendable semi-low loader. When only one or two simulators are needed, a smaller truck may be used with its own loading/unloading system. It is obvious that fewer simulators require less cost. In many cases one can achieve a performance of rather strong winds with only one or two simulators.

Coming to the wind may prove to be more economical. For less complicated tests (e.g. windstability of a tent) an open test ground at the TNO premises, Zuidpolder, Schoemakerstraat - Delft may be used.



Above: Transport of the windmachines

Bottom: A maximum of five can be loaded on a truck

wind directed at the practice

crosswind and traffic safety

Road traffic is often troubled by crosswind effects. Cars, especially cars with caravans or trailers, are not always easily controlled and motorcyclists and bicyclists may also get into trouble. The wind characteristics (force, pattern) play an important part, but also other factors such as design and width of the road, capability and attention of the driver, characteristics of the vehicle etc. The Research Institute for Road Vehicles TNO carries out research into the influence of crosswind on the behaviour and performance of the combination driver/vehicle in traffic. To this end practical experiments are necessary and the real life situation is approximated as close as possible. It should be clear for such a combination of conditions, wind on order, meeting specific requirements, is needed. The conclusion may lead to increased road safety.

camping safety

Camping is a form of leisure at which a tent has to offer sufficient protection against the elements.

Whether campers prefer a light-weight backpacker of a family bungalow tent, it has to keep its stability when a strong wind is blowing.

Canvas and lines have to stay intact, pages en pins have to stay fixed in the ground. A good tent can withstand much wind. Exactly how much will be proven by research and experiments. To that end the Research Institute for Road Vehicles TNO is able to approach with its windsimulator the hard reality in which a tent has to withstand severe weather conditions.



Above: Crosswind sensitivity

Middle: Gale resistance test of a caravan with complete awnings

Bottom left: Gale resistance test of a shelter-tent

Bottom right: Gale resistance test of a caravan-tent



the stage managed wind

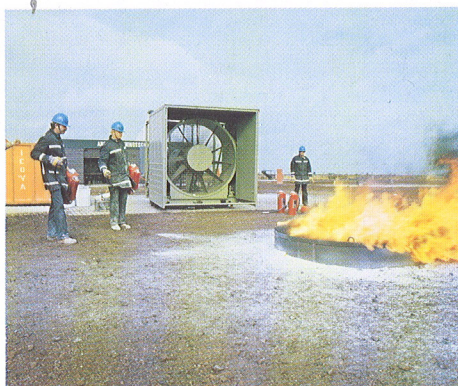
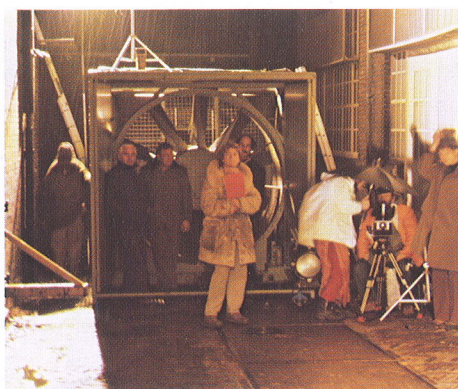
for further information:

Filming, whether for t.v. or the cinema, demands a strict organisation. Actors, filmcrew and properties are brought together on the filmset. And whenever there has to be wind as well it is very expensive to wait for it.

Thus, like actors, filmcrew and properties, the wind should in fact also be a manageable factor on the set. With the TNO wind simulator the producer has everything under control: a breeze, a rather strong wind or storm, he can order it on the right moment and at the desired place.

Many people and/or enterprises will want to carry out research or performance tests independent of weather influences. Wind on demand is the solution for them, either supplied at home or called for. Some examples:

- film or t.v. studio's;
- consumer organisations;
- tourist and motorist associations;
- tent and caravan suppliers;
- manufacturers of life-saving rafts etc.;
- public park services;
- agricultural institutions;
- hothouse builders;
- offshore enterprises;
- fire tests;
- and so on.



for further information:

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Above and bottom: Film set at night

Middle: Firebrigade training