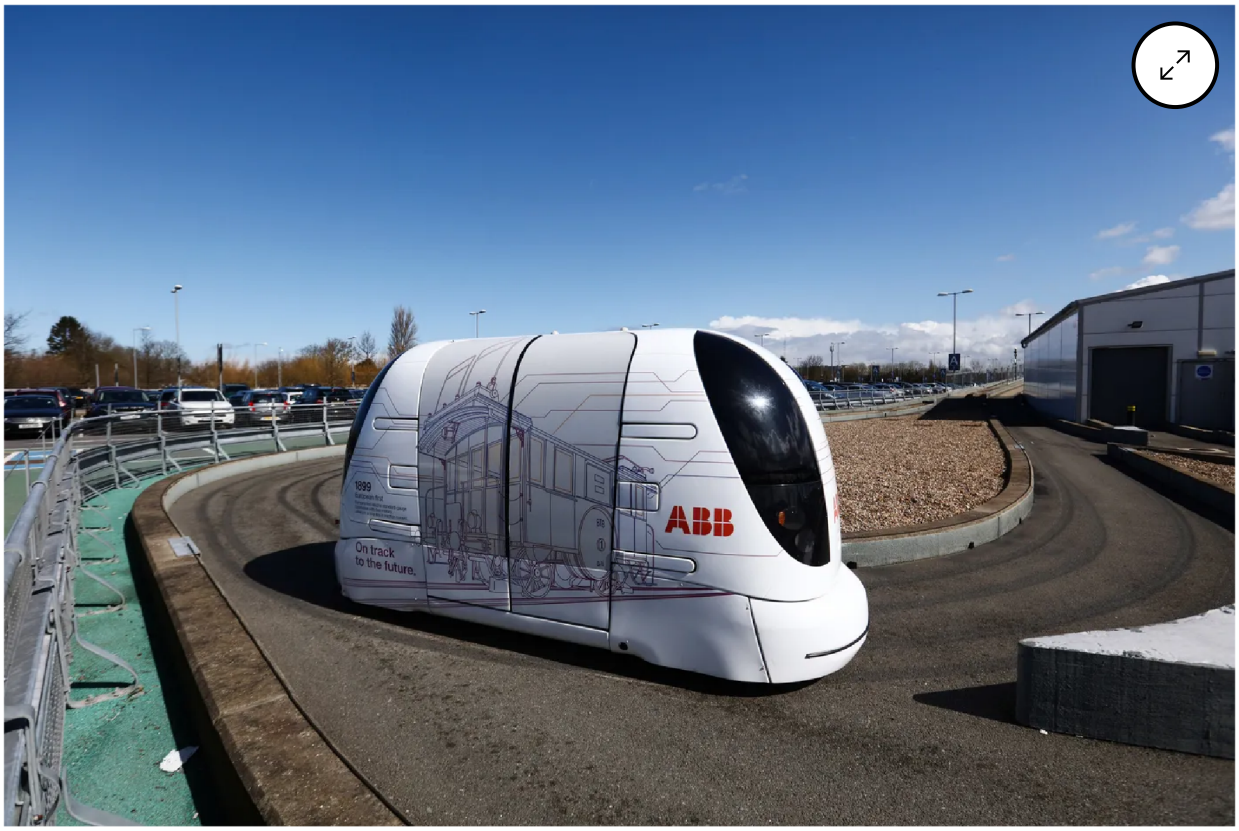
CityLab | Perspective

Don’t Shrink the Bus

Could Tesla’s Cybercab and similar smaller vehicles replace traditional trains and buses? Unfortunately, the idea of “personal rapid transit” has some big drawbacks.



An automated “personal rapid transit” vehicle in action at London’s Heathrow airport in 2016. The airport boasts one of the world’s only working PRT systems. *Photographer: Chris Ratcliffe/Bloomberg*

By David Zipper

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For many skeptics of public transportation, small is the next big thing.

Elon Musk, who once said that “public transport is painful, it sucks,” unveiled a concept for an autonomous “Cybercab” in October – the Tesla CEO’s latest take on what he’s called “individualized mass transit.” Each vehicle will have just two seats. The Vegas Loop, an earlier Musk-inspired, transit-like venture built by the Boring Company, deploys a fleet of human-driven Tesla cars (maximum passengers: three) in an underground tunnel beneath the Las Vegas Convention Center. Meanwhile, leaders of US cities like Atlanta and Arlington, Virginia, have envisioned fleets of little vehicles –

typically autonomous shuttles or aerial gondolas – that whisk people to and from major destinations in near-privacy, without a moment lost to gridlock.

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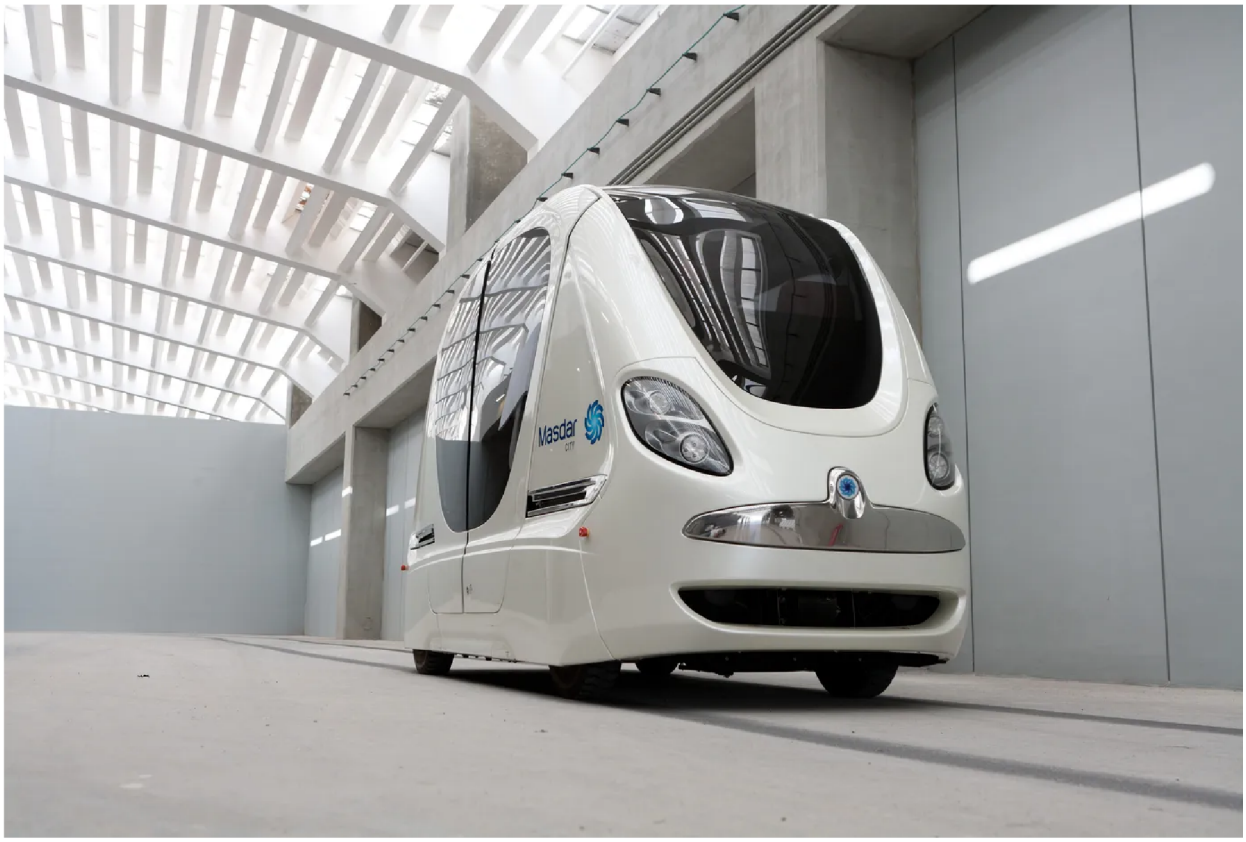
The idea of shrinking mass transportation is tantalizing, particularly to those who bemoan the crowds involved with riding a bus or train. Mark Seeger, the CEO of Gldwys, a venture-backed startup building a network of autonomous pods in San Jose, California, has said that the Bay Area's transit system is mired in "an economic death spiral because people don't want to use it because the experience is terrible."

Terrible or not, there are reasons that public transportation revolves around vehicles that can simultaneously transport dozens if not hundreds of passengers. Enticing though downsized conveyances might seem, they sacrifice immutable and substantial advantages – in efficiency as well as practicality – that result from going big.

Small-scale mass transportation is not a new concept. In the 1960s and '70s, "personal rapid transit" – individual pods, each with four or six seats, traveling on dedicated guideways to select destinations – seemed like an antidote to creaky public transportation networks that were in decline nationwide. Compared to a familiar bus, PRT promised greater privacy, fewer delays and faster journeys (largely due to the elimination of cross traffic). Because they were designed to accommodate only a few passengers at a time, PRT pods avoided the rows of empty bus seats that indicate inefficiency to many casual observers (although not to transit professionals who note that many buses half-empty at noon will be full during the afternoon rush).

The Nixon administration approved a demonstration PRT project in Morgantown, West Virginia – a five-station network that opened in 1975 and remains in operation today, connecting the campuses of West Virginia University. "It was supposed to usher in a new age of public transit," NPR's All Things Considered observed in 2016. "It didn't."



A PRT vehicle at the Masdar Institute of Science and Technology in Abu Dhabi in 2011. *Photographer: Duncan Chard/Bloomberg*

That's putting things mildly. Fifty years later, you can count on your fingers the number of PRT deployments worldwide, in places such as London's Heathrow Airport, the UAE's Masdar City, and Suncheon in South Korea. A key obstacle: the enormous cost of building the specialized tracks, often elevated, that PRT has historically required.

Now a new generation of believers – most of them hailing from the private sector – is again singing the praises of PRT. Adherents claim that newfangled versions, often using self-driving technology, can finally supplant traditional transit, in part because they do not require installing tracks.

Glydways, which describes itself as "transit, designed for riders," won a contract last year to connect San Jose's airport and central transit hub, a

decision described as a “repudiation” of traditional transit modes like buses and subways. Glydways intends to deploy six-seat autonomous pods running on at-grade guideways closed to other vehicles, such as cars or buses. The company is planning another deployment at Atlanta’s airport; the Georgia commissioner of transportation has called Glydways “a vision of the future for personal rapid transit.”

A plethora of other companies also offer transportation systems that, like the PRT systems of yore, move only a few people at a time. At a public cost of over $50 million, Musk’s Boring Company built the Las Vegas Loop, a 2.4-mile, neon-lit tunnel beneath the Las Vegas Convention Center that is traversed by conventional Tesla Model X and Model Y vehicles. The Boring Company initially proposed autonomous shuttles holding up to 16 people; none materialized, but in October, Tesla showed off a prototype “Robovan” that could hold up to 20 passengers, with no details on possible production dates.

A (human-driven) Tesla negotiates the Las Vegas Loop. *Photographer: Bridget Bennett/Bloomberg*

Some futuristic small vehicles are airborne. Several suburban cities in the Dallas area are currently considering a network of capsules that would zip

over the sprawl below, partnering with a company called Whoosh that describes its product as a "gondola-like ride-hailing network" and is preparing a deployment in Queenstown, New Zealand. Swyft Cities, Whoosh's US partner, said that the company "provides the 'perfect Uber' – fast, on-demand, nonstop trips with a great view."

Minus the "great view," that line sounds a lot like the pitch for microtransit, a trendy form of public transportation that allows passengers to summon a van that will pick them up and deliver them to their destination, with rides costing little more than a bus fare. Microtransit is now deployed in cities big (Los Angeles), mid-sized (Kansas City), and small (Sioux Falls, South Dakota).

Compared to autonomous pods or gondolas, American cities have far more experience with microtransit – and the results have been dubious at best. Moving passengers in a small vehicle may look efficient ("fewer empty seats!") but providing the service can be astronomically expensive. Frank White, the leader of Kansas City's transit agency, told me recently that the average per-passenger subsidy of the city's microtransit program was ten times higher than for its fixed-route buses.

To be fair, some of microtransit's high costs result from its on-demand structure, but much of it is due to the inherent inefficiency of small vehicles. A transit agency incurs barely any added expense when a third, twelfth, or fiftieth passenger boards a full-sized bus, but it must deploy a new van as soon as all of its handful of seats are occupied. Lower capacity increases a service's capital costs (the vehicles that must be procured) as well its operating costs (expenses like staff, fuel, and maintenance). In economic terms, a bus offers economies of scale, while microtransit –like other mobility innovations reliant on small vehicles – does not.

In theory, autonomous PRT-like systems like Gladwys and Whoosh could be cheaper to operate than microtransit because they don't have a driver. But removing transit's human element opens a Pandora's box of complications.

"Drivers perform many different services in terms of customer service, like answering questions, responding to incidents, or offering help if somebody

has a health crisis," said Robert Goodspeed, a professor of urban planning at the University of Michigan. "There are many different social functions of having paid staff on the bus that contribute to the success of transit."

Without a professional on board providing a measure of security, many passengers – especially women – could hesitate before stepping inside a small vehicle that gives no opportunity to move away from an unpleasant or menacing stranger.

Autonomous pods and gondolas face other drawbacks, too. Their relative speed – often cited as a key selling point – relies on operating with their own right of way, on the ground or in the air. But providing that dedicated space comes at a substantial cost, either in terms of money (in the case of tunnels or gondolas, which require the installation of cables and platforms) or in street space (in the case of autonomous pods using asphalt that could otherwise accommodate larger vehicles). Compared to PRT-esque vehicles, Goodspeed said that bus rapid transit – standard-sized buses operating in their own lanes, with traffic signal preference – is often a far more efficient, if less flashy, use of public resources.

Furthermore, tunnels, aerial cables, and guideways can connect only a limited number of places, capping their utility across a sprawling city. "In an airport or Disney World, you have the density and institutional setup to justify the economics of these technologies," said Goodspeed. "But can that technology be scaled to the geography of a typical US metro area? Absolutely not."

And since the PRT network must remain limited, how will people travel to and from a station (the so-called " first mile/last mile " problem)? Enormous parking garages, which could be expensive eyesores? Traditional buses and

trains, which violate the essence of individualized mobility? As David Dayen noted in 2018 in the *Los Angeles Times* , the Boring Company's Las Vegas Loop "fails to solve that fundamental challenge of all PRT systems."

Considering these myriad drawbacks, the upsides of moving passengers inside a big metal box are immense. Because those vehicles can transport more people at once, they have a basic cost advantage that grows as ridership increases and the network expands. Smaller conveyances used in place of buses and trains inevitably require hefty subsidies, either from venture capital or public coffers. Such investments can conceal from users the real cost of a modest deployment, but one way or the other, someone has to pay. Those expecting to see the service expand are likely to be disappointed.

If you're not yet convinced that larger vehicles are superior, consider how Tesla moves its workers between a transit stop and its nearby "Gigafactory" in Berlin, which opened in 2022. Elon Musk's car company didn't hire the Boring Company to dig a tunnel to accommodate cars or autonomous pods. Instead, Tesla leased a regular 120-seat train .