Up your Strasse

Mobility movers and shakers prefer built in Bavaria to talked about in Silicon Valley.

By *Janek Schmidt*
Photography *Conny Mirbach*
Illustration *Robert A. Di Ieso, Jr*

Andreas Faass stands beside a compact electric motor connected to a profusion of wires and sensors, and recalls how his relationship with this contraption began. In 2009 he left Germany for Silicon Valley; first at Tesla and then at Google X he designed batteries and, later, hovering wind turbines. "One day at Google we heard about an ultra-light motor that Siemens was developing," he says. "We got excited as it was exactly what we needed for our energy kites." A few months later he was back in Germany working here at Siemens' lab in the Munich district of Neuperlach.

Faass's homecoming illustrates a much-overlooked recent development in the world of mobility: namely that Munich and its environs have become a concentrated hub of entrepreneurship and innovation to rival Silicon Valley.

From flying taxis to Hyperloop pods to solar-powered cars, ventures being built in the heart of Bavaria have the potential to transform the way we move around, both within cities and between them.

And "built" is the operative word. "Silicon Valley has great access to venture capital, dynamic flat hierarchies and fantastic engineers," says Faass. Yet while this has given rise to mighty software firms on the US west coast, "Munich has industrial infrastructure and skilled technicians honed in companies' training programmes. So for building physical hardware, the city is world class."

Siemens and Airbus are Munich's mobility power couple and in charge of liaising between the two is Frank Anton, head of Siemens eAircraft. He was the engineer who developed the motor that

(1) The M3 Mapping Trolley maps indoor spaces

1

1

helped coax Faass away from the Valley and that nudged Airbus to attempt something previously thought impossible: constructing a large-scale electric aeroplane. He and Faass now work together on this project that by 2030, it is hoped, will have created an electric aircraft for 100 passengers and with a range of 1,000km – an achievement that would transform the aviation industry.

However, many of the most eccentric and exciting ideas coming out of the Munich mobility cluster are ventures dreamt up not by industrial behemoths but by young idealistic entrepreneurs operating out of small offices and cluttered workshops. Lilium is a case in point. The start-up was founded in 2015 by Daniel Wiegand and three other students from Munich's technical university, TUM. Their ambition is to create the world's first all-electric private jet combining propellers for vertical take-off (like a helicopter) and wings for fast, efficient flight. With a top speed of 300km/h and a range of 300km, the team claim their jet could zip between the city centres of London and Paris in less than an hour.

Sceptics abound. Undoubtedly Lilium will come up against a wall of regulation before too long and it's also far from certain that there is even a market for this personal air-taxi concept. Nonetheless Wiegand, a glider pilot since he was 14, is convinced that his aircraft is technically and commercially feasible: "Composite materials have become light enough, sensors and computers smart enough and batteries powerful enough."

He's making a strong case. In December the company secured €10m of funding from Atomico, the venture-capital firm run by Skype founder Niklas Zennström, and in late April it completed a series of successful unmanned test flights. With a current staff of more than 40 people, Lilium is set to hire 70 e-mobility and aviation experts this


2

year. If a company can run off ambition, then Lilium is it. In the next three years Wiegand wants to launch a plane-hailing app: "It will provide an air-taxi service only slightly more expensive than today's driving cabs."

Meanwhile, across town in the Münchner Technologiezentrum, a modern glass building full of technology start-ups, another ambitious project is just taking flight. This is the home of Sono Motors, an embryonic solar-powered-car brand. Founders Jona Christians and Laurin Hahn were just 18 when they bought an old car and converted it to electric power. Two years later, their design was advanced enough for the pair to drop out of university, take friend Navina Pernsteiner onboard and start a company.

"The app will provide an air-taxi service only slightly more expensive than today's driving cabs"

"We want to build a car covered in solar panels that looks cool and, with a starting price of €12,000, is still cheap enough to make green mobility accessible to as many people as possible," says Christians. Their pitch has grabbed the attention of some equally idealistic supporters: in September they collected more than €400,000 in a crowd-funding campaign. This summer they're planning a tour of Germany to present their currently top-secret prototype to customers for initial test drives.

Both Lilium and Sono Motors might end up no more than pie in the sky; it is still too early to tell if either company will succeed. However, the cluster of mobility businesses in and around Munich also comprises plenty of companies already making money. NavVis is one of them.

3

4
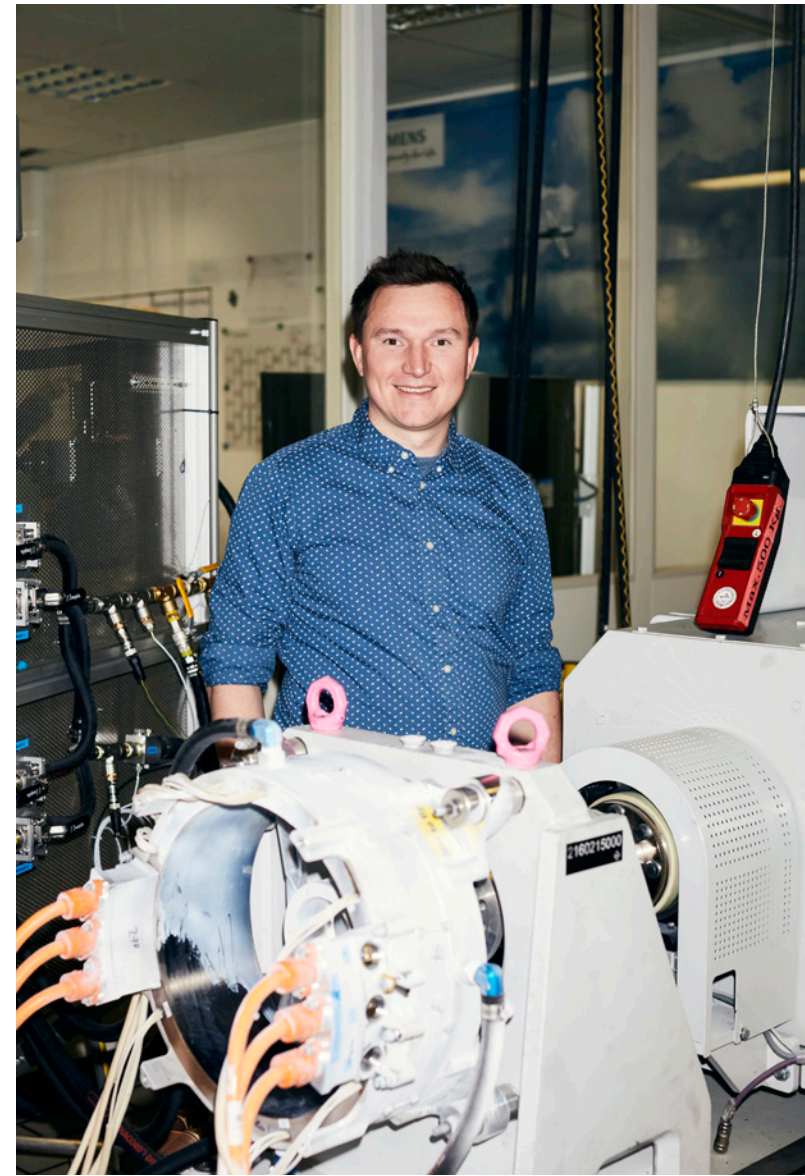
Since it was founded in 2013, the firm has pioneered the concept of indoor mapping with its M3 Mapping Trolley. Looking like the older brother of Pixar's cuddly Wall-E robot, this contraption fitted with cameras and lasers maps indoor spaces. It's a useful service if you run a logistics company with dozens of warehouses, or if you're planning refurbishments and repairs to your headquarters.

The venture was founded by Georg Schroth, with Robert Huitl, Sebastian Hilsenbeck and Felix Reinshagen. Like many mobility-company founders they had a choice to make when it came to selecting a base. "When the four of us founded NavVis in 2013 we had all studied or worked in Silicon Valley and in Munich," says Reinshagen. "So we compared the two to decide where to start our firm."

One of the reasons they opted for Munich was the overheated market in the Valley. "California has more venture capital and competition for talent, so salaries for engineers are three times higher than those in Munich," he says. "Plus, southern Germany provides fantastic suppliers for precision tools and more industrial clients." Four years on the company has 120 employees and customers in 25 countries.

Understanding how NavVis made the journey from start-up to successful enterprise illustrates the unique business environment that Munich has become. "Three institutions here have been crucial for us," says Reinshagen. First, CDTM, a joint institute of Munich's top two universities: TUM and Ludwig-Maximilians-Universität (LMU). It takes 25 students per semester for a master's degree in technology management. "This is Germany's elite creator of start-ups," he says. "Its alumni form a powerful network that we use for recruitment."

Second is BayStartUp, an organisation set up by two associations and the Bavarian Ministry of Economics. It runs annual business-plan competitions that
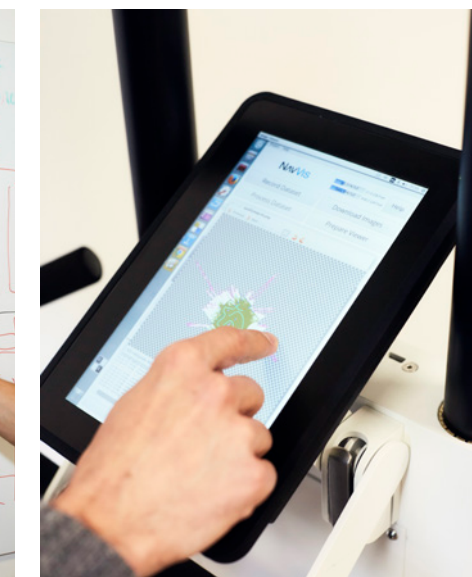
5   6

"Funding is crucial. In the past, insufficient venture capital was the top difficulty for start-ups here. So we quickly wanted to improve that situation"

NavVis

(1) M3 Mapping Trolley at NavVis
(2) NavVis workshop (3) Back to
the drawing board (4) Mapping
Trolley in action (5) The important
bits: wheels and battery

provide budding entrepreneurs with coaching and contacts to private investors. Over the past 20 years this competition has given rise to 1,600 new companies with a combined staff of 11,400. BayStartUp is just one example of how proactive the Bavarian state government has been in supporting and encouraging business creation. "Financing is crucial," says Ilse Aigner, Bavaria's minister of economics. "In the past, insufficient venture capital was the top difficulty for start-ups here. So we quickly wanted to improve that situation." In 2015 it set up a venture-capital fund with €100m.

As Reinshagen puts it, institutions such as BayStartUp, supported by local government and private-sector businesses, have created a resilient cluster in and around Munich. "The whole ecosystem is self-reinforcing," he says. "When the first start-ups succeeded, the university, companies and the government increased their support."

Perhaps more than any other institution, however, NavVis and countless others rely on UnternehmerTUM, a fast-growing centre for innovation and business creation that is associated with TUM but is an independent company. Set up in 2002 by Susanne Klatten, heiress to a large stake in BMW and Germany's richest woman, it is a linchpin of Munich's start-up scene, providing diverse guidance to founders. In 2015 it launched MakerSpace, Europe's largest public hi-tech workshop. "There we get access to high-end tools such as CNC [computer numerical control] machines and large-scale 3D printers," says Reinshagen.

Stepping into the TUM MakerSpace, visitors are immediately struck by the mingled smells of sawn wood and smouldering metal, as about 100 entrepreneurs hammer, weld and drill. One of them is Anna Branz, the 27-year-old technical director of a team of 32 students who are developing another potential mobility game changer: a Hyperloop. It's a mode of transport involving a pod – resembling an oversized bobsled – hurtling across land in a reduced-pressure tube faster than an airliner.

In January, a group of students travelled to Silicon Valley to present their design

at a competition funded by SpaceX and Tesla founder Elon Musk. "The Munich team built the fastest vehicle, which was a huge success," says Branz. "We're now designing a new prototype for the second SpaceX competition in August."

Just a few metres away in the Maker-Space is Felix Harteneck. With two friends, Jakob Sturm and Clemens Techmer, he has developed rubber strips with integrated sensors that can be embedded into parking spaces to monitor whether they're free or occupied. Using this data, an app can then direct drivers to free parking spaces and electric cars to available charging stations. Unlike other similar innovations, Harteneck's sensors do not need to be linked up to batteries or the electricity grid, which is usually a stumbling block for such devices; his strips can harvest energy from the movement of passing cars. In 2015 the trio founded ParkHere. With the support of BayStartUp and BMW they have installed several sensors in Munich and in a pilot scheme in Ingolstadt (the home of Bavaria's other car giant, Audi).

Like many entrepreneurs in Munich's mobility cluster, Harteneck owes much of his venture's existence to the presence of industrial partners in and around the city. Bavaria is home to some of the world's largest mobility companies, including Audi, Airbus and BMW, and they are all actively involved in supporting the small-business cluster. When Austrian-born Sebastian Jagsch first pitched his idea for building smart lamposts to German car-makers, it was BMW that showed immediate interest. "So we set up our office close to its headquarters here in Munich," says Jagsch, the founder of Eluminocity.

The relaxed atmosphere in the company's office betrays a light-hearted Austrian touch. As two engineers tinker with LEDs, tables are rearranged for a clutch of new employees and chief financial officer Robert Lee prepares pizza in the open-plan kitchen for the 14-strong team. Jagsch, meanwhile, draws a map of seven locations worldwide that have already installed his streetlamps – with further dots in New York, Seattle and Singapore that are following suit. The lamposts'
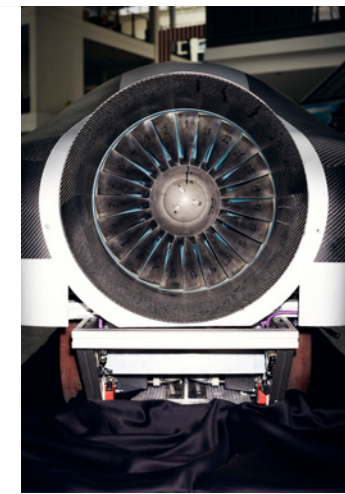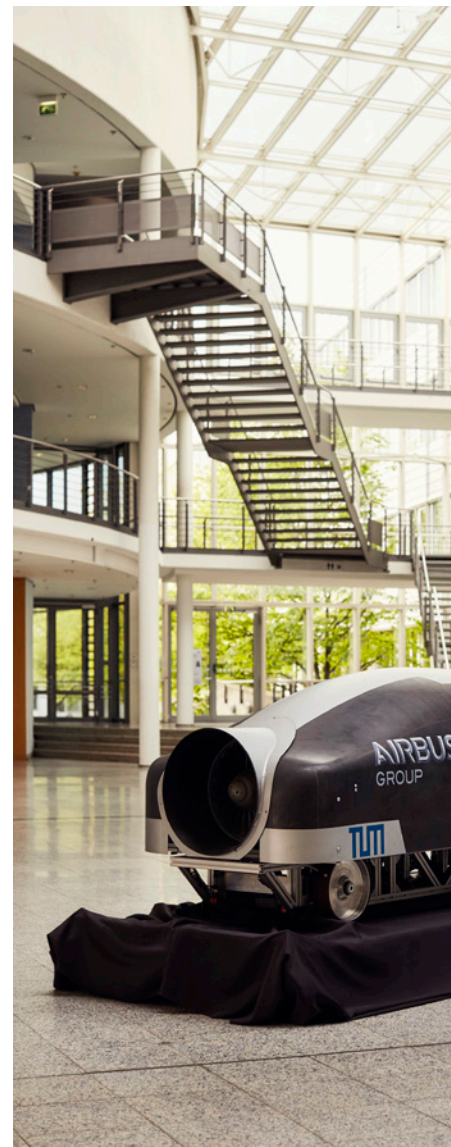
"This guy had a PhD and had read everything about our company. I realised that in Bavaria even some bureaucrats think like entrepreneurs"

(1) Sono Motors team (2) Moss for the Sion car's dashboard (3) Mail-order moss (4) Solar panel at Sono Motors (5) Ace plant stand (6) Hyperloop in the TUM MakerSpace (7) Hyperloop in all its glory

sensors detect approaching cars at a distance of 80 metres; if there is traffic, the lights are turned up but if not, they are dimmed to conserve energy. The data from these lamps can be used for traffic management, while the lampposts also serve as charging stations for electric cars.

Yet Munich isn't only attracting talent from neighbouring Austria. José Mariano López-Urdiales, the chief executive of Barcelona-based company Zero 2 Infinity, secretly surveyed several cities when deciding where to set up his first foreign outpost. His business operates helium balloons to launch satellites into orbit and float so-called space tourists to the higher levels of the Earth's atmosphere. He decided on Bavaria because of its industrial suppliers, wealthy potential clients and also the city's high quality of life, which allows firms such as his to attract picky international talent.

The definitive moment that tipped the scale in favour of Munich was a meeting López-Urdiales had with a representative of the Bavarian state government. "This guy had a PhD and had read everything about our company. He had even checked on former colleagues of mine that he knew from university," says López-Urdiales. "That's when I realised that in Bavaria even some bureaucrats think like entrepreneurs." — (M)

COMMENT
## The boldest innovations
By Janek Schmidt
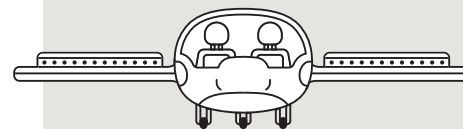
Air Taxi by Lilium
The Air Taxi prototype has 36 electric propellers that can tilt on their axes, running along the length of its two wings. When directed towards the ground these fans allow the two-seater plane to take off vertically and land like a drone; once in the air, the propellers pivot backwards to provide thrust. There are three flight computers for added security and six batteries provide 340 kilowatts of power.
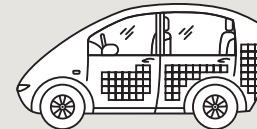
Sion by Sono Motors
The five-seater Sion car is also still a prototype. Sono Motors has covered the vehicle with photovoltaic cells to generate enough energy in one day to drive 30km. As a special feature, its dashboard is fitted with a special type of moss that filters the air in the car; who knew you couldn't get walnut trim for €12,000? The Extender version will have a range of 250km and will set eco-friendly buyers back €16,000.
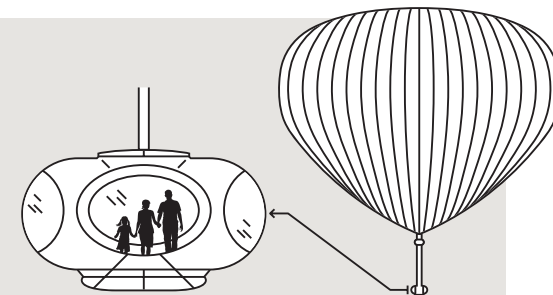
Bloon by Zero 2 Infinity
Zero 2 Infinity is based in Barcelona but is setting up an outpost in Munich. Its Bloon is a pressurised carbon-fibre capsule that can sustain human life in the stratosphere. Attached to a helium balloon, it is able to carry space tourists or scientists on five-hour trips to a height of 36km and then land them back on Earth. With a diameter of 4.4 metres, it holds four passengers and two pilots. Public flights are planned for 2019.