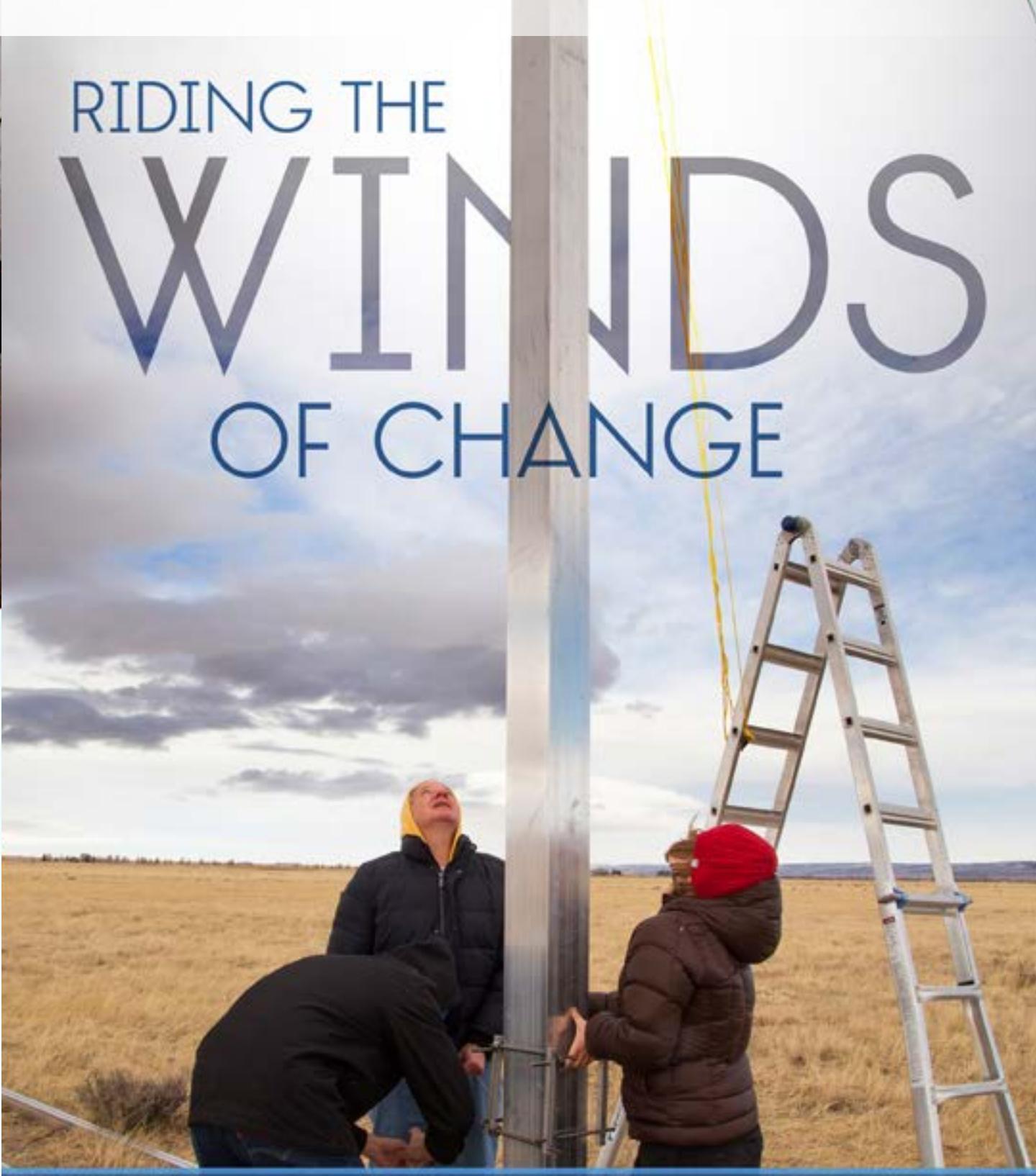
RIDING THE WINDS OF CHANGE



It has been said that inspiration strikes in the most unexpected places — and entrepreneur Robert Lumley can attest to that fact.

A self-described "serial entrepreneur" whose first company was a pioneer in business process outsourcing, in 2009 Lumley was living on Kauai, Hawaii, U.S.A. Always on the lookout for a new idea, one day Lumley was riding a kiteboard when the wind came up suddenly, filling his sail. Noting the sudden power that resulted — and how fast and efficiently his kite moved him across the water — he wondered if somehow a system of graceful kites could be used to generate energy on a broad scale, replacing large wind turbines. Inspired, Lumley began to study the global wind-based power generation industry so that he could understand the existing technologies and carve a new niche for himself.

While attending an international wind energy conference in Berlin, Germany, in 2013, Lumley sketched on a cocktail napkin an innovative wind power–generation system — one that would merge established technology from horizontal-axis wind turbines (HAWTs) with emerging kite concepts. With that sketch, AirLoom Energy was officially born. Today, the company is based at the Wyoming Technology Business Center in Laramie, Wyoming, U.S.A. and capitalizes on research and development activities at the Wind Energy Research Center at the University of Wyoming.

"Although the physics of the AirLoom are identical to HAWT technology, our design turns the geometry of the whole thing on its ear," explains Lumley. In his innovative design, small gliders acting as a hybrid of kites and HAWTs travel along an oval track, where they continuously capture the wind's energy. Mounted on each traveling glider are magnets that induce an electric current in the winding next to the rail. The thin rail acts as the structure of the wind turbine, the winding of the generator and the power transmission infrastructure.

"The AirLoom is 23 times lighter and 15 times cheaper than the dominant wind technology today," notes Lumley. "The flexible, scalable design of the AirLoom also makes height and length a design choice rather than a predetermined necessity, making the AirLoom perfect for both utility-scale installations and mobile applications such as emergency response."

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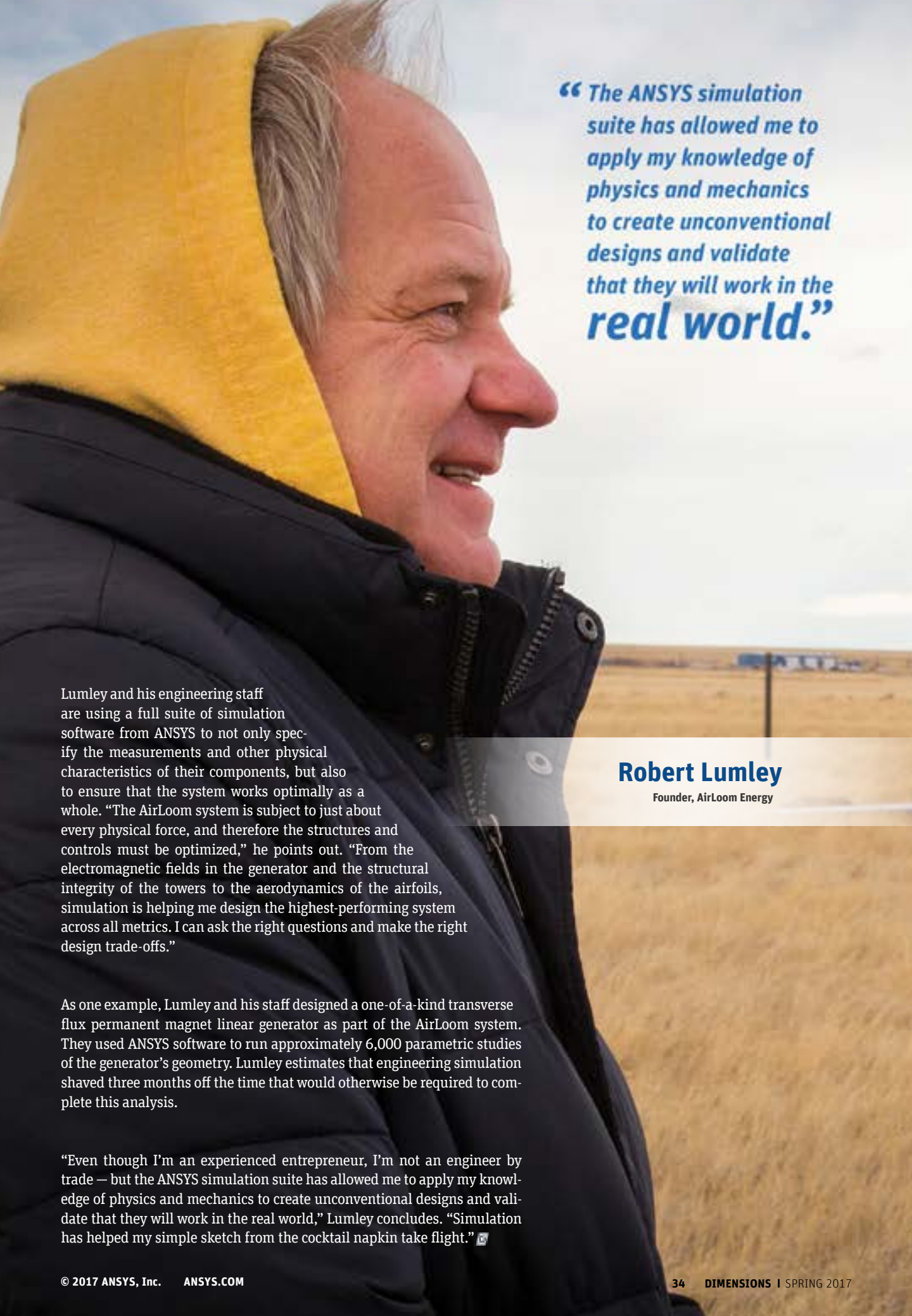
In July 2016, Lumley won a Small Business Innovation Research (SBIR) grant from the National Science Foundation (NSF) that will allow him to build a working prototype of his patented AirLoom system. His NSF proposal included multiple simulation graphics generated by ANSYS software. “It’s incredibly powerful to visually demonstrate to someone that your technology works in the real world, whether that audience is a funding organization, a private investor or a potential customer,” states Lumley. “Simulation software has enabled me to do just that. I don’t think I would have made such rapid progress through the research and development phase without having access to such a powerful and sophisticated tool.”

As any startup company can attest, preserving working capital — especially in the early stages — is of paramount importance. For this reason, Lumley calls the ANSYS startup program “a lifeline.”

“At this point in our development, the ANSYS simulation suite has basically replaced the need for us to coordinate the work of numerous remote contractors and experts in a wide variety of disciplines,” says Lumley. “We are constantly refining the overall design in response to data. Trying to coordinate that among an entire remote team at this stage would be expensive and time-consuming, especially as each expert would potentially focus on just one part of the elephant.”



Robert Lumley
Founder, AirLoom Energy

Lumley and his engineering staff are using a full suite of simulation software from ANSYS to not only specify the measurements and other physical characteristics of their components, but also to ensure that the system works optimally as a whole. “The AirLoom system is subject to just about every physical force, and therefore the structures and controls must be optimized,” he points out. “From the electromagnetic fields in the generator and the structural integrity of the towers to the aerodynamics of the airfoils, simulation is helping me design the highest-performing system across all metrics. I can ask the right questions and make the right design trade-offs.”

As one example, Lumley and his staff designed a one-of-a-kind transverse flux permanent magnet linear generator as part of the AirLoom system. They used ANSYS software to run approximately 6,000 parametric studies of the generator’s geometry. Lumley estimates that engineering simulation shaved three months off the time that would otherwise be required to complete this analysis.

“Even though I’m an experienced entrepreneur, I’m not an engineer by trade — but the ANSYS simulation suite has allowed me to apply my knowledge of physics and mechanics to create unconventional designs and validate that they will work in the real world,” Lumley concludes. “Simulation has helped my simple sketch from the cocktail napkin take flight.”

