

# Corrugated Innovation

*Designing a lightweight and strong corrugated  
cardboard no-pedal bicycle*

*Have you heard the one about the first-class airline cabin, the bowling alley and a bicycle made out of cardboard?* Sounds like the setup to a bad joke, but these are all pieces of a puzzle that create a picture of innovative design. Innovation is not the end, but rather the process by which something new begins. It doesn't happen by accident.

## MAKING STRENGTH FLY

Kelly McConnell, CEO and second-generation co-owner of child product manufacturer Prince Lionheart, had a challenge. The company's wooden balance bikes, bicycles without pedals for young children to push with their feet and glide, were a tad too heavy for some toddlers who otherwise would be able to ride and enjoy. "I always wanted to find a way to reduce weight so we could capture even younger riders than the recommended 2-plus years," says McConnell. "Still, safety is always at the forefront of everything we do. So, no matter what, the bike would have to be strong enough to support weight while being lightweight, but also be able to withstand wear and tear from kids."



McConnell considered the option of using recycled plastic but was concerned that this wouldn't reduce weight sufficiently. Perhaps it was just not meant to be.

One day inspiration struck. McConnell was touring a manufacturer of first class airline cabins. She realized they were facing many of the same challenges she was facing. The cabins must be strong and stable, but also must be lightweight enough that to be cost effective. She studied the materials used to support the structure (in this instance a hexagon honeycomb pattern) stood up and told her team then and there she wanted to make a cardboard bike. "Of course, I had no idea where to source the materials or how we were going to do it."

## THE BOWLING ALLEY AND THE BIKE

One day, McConnell found herself having fun at a bowling alley. There, she met Tim Wilson, President of Ernest Packaging Solutions. "When Tim and I first spoke of the cardboard balance bike, he told me he was working on a cardboard surfboard," said McConnell. "So I figured if something like that is doable, then mine would be too."

In addition to the surfboard that was in production, Ernest Packaging Solutions had previously built a cardboard snowboard and had plans in place to produce a paper skateboard as well. But one type of corrugated does not meet the needs of every project. Each design had to be customized and engineered for unique uses and specifications.

That didn't concern Tim Wilson. "Paper has so many great characteristics. It's got strength, but it's flexible, so it's the best of everything as long as you have people who know what they're doing" said Wilson. "Paper can also be constructed in a way that makes it biodegradable and recyclable which was something Kelly had asked for as well. So right away I knew she was on the right track and had come to the right place."

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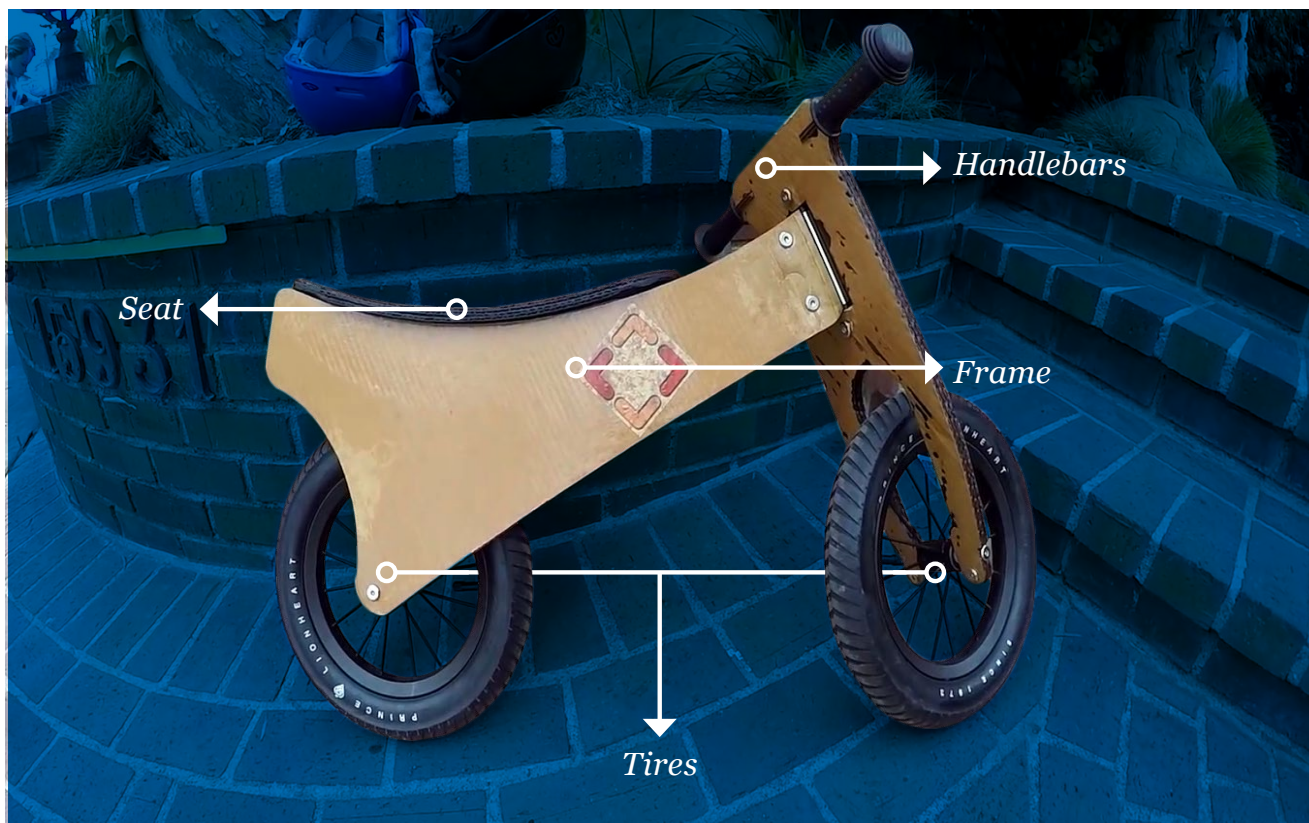
## CRAFTING A CORRUGATED SOLUTION

“They key to building a cardboard bike is to keep the shape as simple as possible. You want very few joints and to spread the weight distribution, so no one point gets too much,” said Director of Consulting Services at Ernest Packaging, Mike Martinez. “We created a few test pieces to test structure and weight. Then we tested and retested.”

Tim Wilson added that the bike, like other packaging solutions, should be able to handle extreme situations. “This bike was designed for toddlers, but we put ourselves in the mind of a parent who will want to test the strength of the bike before their kid takes it out. So if a parent wants to put their weight on it, it needed to be able to handle that. It needed to go above and beyond.”

The final solution took layers of 275# B-flute sheets, typically used for die-cut boxes, glued together for a more solid structure. Talking about the simple components,

*Martinez outlined the bike as having “... really only four parts. There is the seat, the frame, the handlebars/front forks and the tires.”*



Martinez outlined the bike as having “... really only four parts. There is the seat, the frame, the handlebars/front forks and the tires.” Basic hardware (nuts, bolts and rods) and strategically placed inserts hold it all together.

The front forks and handlebar are cut into one vertical piece and attached to the tire directly under the handlebars giving strength and ease of control of the front tire. The flexibility of the corrugated helped form the seat as the layers could be glued together then dried in a mold that allowed for the comfortable curve of the seat.



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*“We’re not just assembling boxes; we’re changing the way people view packaging.”*

In addition to being simple, the ride was also smooth and was easily able to hold the weight of an adult - a test that Kelly was more than happy to conduct.

## **STRATEGIC INNOVATION FOR REAL-WORLD CHALLENGES**

“I was definitely amazed by the strength of paper,” said McConnell, “I had fun, but I also learned so much through the process. We discussed how strength can be increased by the direction of the flutes and cross-layering. It was fun to learn about a material other than plastic, which is what we deal with in our everyday lives.”

Michael McConnell, Kelly’s brother and also Creative Director and co-owner of Prince Lionheart, spoke about the impact a product like this will have on their customers. “We all know we’re building a bike made of cardboard, but, could we build a bike the consumer feels has true value? We think Tim, Mike and the team more than delivered.”

“One may think Ernest Packaging is just a warehouse filled with boxes,” said Wilson. “It really is a hub of innovation and problem solving. We’re not just assembling boxes; we’re changing the way people view packaging.”

Just because you may be creating toys doesn’t mean that design is child’s play. Strategic packaging innovation takes the right people with the right kinds of minds. Ernest Packaging Solutions doesn’t just see what is, but also what can be. Learn more about our packaging design process, innovation lab today.

Oh, and in case you’re wondering...the Innovation Lab made an adult-sized bike, too, just for fun.



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