

# Enjoying the ride

**After surviving a near-fatal fall, Clair Hain envisioned a manufacturing business to help people fall for fun.**

*In the fifth installment of CTE's Made in America series, Mike Principato visits a U.S. manufacturer of wooden roller coasters to get a seat-of-the-pants perspective on how modern metalcutting technology has made a great ride even better.*

Clair Hain, a builder of wooden roller coasters, shouldn't even be alive.

Miraculously, Hain has reached age 40, 12 years after freefalling 55' from a roller coaster track he was helping construct at an Indiana amusement park. In the tiny town of Sunbury, Pa., Hain presides over the business he dreamed about during 100 days in a hospital, where he struggled to recover from paralysis, punctured vital organs and more broken bones than most of even know we

GCI's Lightning Racer wooden coaster at Hersheypark.



have. It was this hospital bed vision of his company-to-be, he said, that kept him alive—a company that would ultimately build the kind of amusement ride that almost killed him.

Fortunately for Hain, Great Coasters International Inc.'s steady climb since its 1994 birth has been as thrilling and rewarding as a ride on one of the company's famed wooden roller coasters.

## Wooden Coaster Mastery

Novice riders of wooden roller coasters often have two questions when they get to the top of the first hill on their first ride, during that agonizing second between the end of the clickety-clack of the chain lift and the first glimpse of the abyss: "Am I nuts?" and "Did the guy who built this know what he was doing?"

If you're on one of Hain's coasters, the answers are no and yes, respectively. When it comes to designing and manufacturing wooden roller coasters, GCII is an acknowledged master in the amusement park universe.

Tune in to a "Top 10 Roller Coasters" cable television special or search the Internet and you'll likely find several GCII rides listed among people's favorite roller coasters. These rides include Lightning Racer at Hersheypark, Hershey, Pa.; Gwazi at Busch Gardens, Tampa Bay, Fla.; Thunderhead at Dollywood, Pigeon Forge, Tenn.; and, most recently, Kentucky Rumbler, opened last May at Beech Bend Park, Bowling Green, Ky.

All of these rides have been celebrated by coaster enthusiasts as among the best of the wooden coaster breed. These projects, along with five others built by GCII since its founding in 1994, have vaulted the company to a leadership position among manufacturers of this icon of American amusement parks. Interestingly, GCII's success in producing a product that draws heavily on nostalgia has been made possible in part because of modern machine tool technology.

To learn how, CTE met Hain and his East Coast team (the company has satellite offices in Kentucky and California) at GCII headquarters in north-central Pennsylvania on



Track brackets produced by Ashland Technologies.

a sunny, amusement park-perfect August afternoon. That seemed fitting, since GCII's lobby and offices—filled with roller coaster models, posters, press clippings and memorabilia—resemble a miniature roller coaster theme park.

Hain, youthful looking despite partial paralysis on his left side (a remnant of his 1994 injuries), introduces himself and GCII's go-to guy, Chris Gray, who handles everything from building GCII's famed Millennium Flyer coaster trains to overseeing purchasing.

### A classic wooden roller coaster by the numbers

Lighting Racer at Hersheypark is considered one of the best wooden roller coasters in the country. Here's the recipe:

- More than 700 pages of CAD drawings;
- more than 1 million board feet of southern yellow pine;
- 185,000 bolts;
- 3,800 yds. of concrete;
- 48 cars in 12 separate trains, 1,300 individual components and hardware pieces per car;
- 187,000' of rebar;
- 1,000 boxes of nails;
- 250' of lift chain, weighing about 5,000 lbs.;
- approximate ride time: 2 minutes, 20 seconds; and
- approximate cost: \$12.5 million.

Typical of the roller coaster industry, the company operates with a limited roster of full-time employees, staffing up only when there is a coaster to build, refurbish or relocate. This is a business that measures projects by the number of seats on roller coaster trains and the board feet of lumber used (a board foot is equal to the volume of a 12"×12"×1" board). Hain gives an example, noting, "One of our coasters will ride on 500,000 to 750,000 board feet of

lumber costing \$600,000 to \$700,000," just the first of many cool tidbits of information CTE learned about GCII's even cooler finished products.

## Twisted Genius

Hain's specialty is manufacturing "twisted" coasters featuring multiple hills paired with contorted wooden track overlaid with steel plate, over which the coaster's train rolls. GCII's expertise in the design and on-time installation of twisted coasters has helped the small firm establish a reputation as "the Rolls-Royce of wooden coasters," according to Hain. He credits his former business partner, Mike Boodley ("a genius"), and GCII designer Jeff Pike ("a great designer who's really a little kid inside"), with helping him capitalize on his talents. (Boodley left the firm for health reasons.)

"We've delivered 100 percent of our projects on or before the scheduled completion date, at or below budget," said Hain, no small feat considering that GCII's small staff supervises every aspect of the track construction, from wind ratings to rip sawing, while installation is performed by subcontractors.

The basic elements of a wooden coaster include a track, train, station, chain lift system, restraint system, brakes and controller. GCII designs, manufactures or assembles every one of those components.

Hain's twisted track designs are complex and require detailed engineering to ensure a safe and smooth



## CTE roller coaster critics rate Lightning Racer “two arms up!”

**S**ome fathers and sons bond while fishing, others by shooting hoops in the driveway.

My 14-year-old son, D.J., and I prefer waiting in long lines in the August heat for our opportunity to scream in terror, laugh hysterically and exchange high fives before, during and after a front-car ride on the world’s best roller coasters.

So you can imagine how excited I was that D.J. accompanied me on the research phase of this story. Our mission: To ride and report on our experience on Great Coasters International Inc.’s Lightning Racer roller coaster at Hersheypark. Armed with two park tickets and a light breakfast, we sallied forth to do our duty for CTE. Ah, the things I do for this magazine.

We’ve seen and ridden a lot of coasters, wooden and steel, seated and standing, medium- and mega-height. And although we prefer the speed and altitude that only steel coasters deliver, there’s nothing more beautiful or fun to ride than a well-designed wooden coaster. On those two scores, Lightning Racer hits a home run.

For starters, it’s absolutely beautiful. From its double serpentine tracks to GCII’s clever Millennium Flyer trains, Lightning Racer is one of the focal points of the Hersheypark landscape. It’s considered a “hybrid” coaster, combining the cyclonic features of a pure “twisted” coaster with the “out and back” design of a traditional coaster (an out-and-back coaster climbs a lift hill, races out to the far end of the track, performs a 180° turn and then races its way back to the station).

But Lightning Racer is also a racing coaster. Two trains carrying 24 riders each leave the station house simultaneously and duel each other for almost 2½ minutes, beginning with a 100’ drop that provides the gravity needed to propel

the trains—named “Lightning” and “Thunder” to drive home the racing theme—for the balance of the ride. And what a wild ride it is.

The crowds were mercifully light and our wait for the traditional front car was brief. Stepping into the Thunder train, I was immediately impressed by the comfort and safety features of the car, which slickly merges modern materials and manufacturing processes with a classic retro look. The older I get, the more I appreciate comfort—a characteristic usually in short supply in lesser wooden coasters that pinch my growing derriere and twist my skinny neck in the turns.

Seconds later, we were on our way up, up, up, until for a long second I was able to take in an aerial view of the coaster that was about to hurtle everything but my stomach at 50 mph down a 60° angle.

It’s a blessing to have ridden so many coasters up to this point; the absence of newbie terror meant I was able to admire the work of GCII. The coaster is intimidating in its immensity and sprawl, just as a good wooden roller coaster should be.

D.J.’s arms left the safety bar to wave in the air, signaling the beginning of our first screaming downhill and the official start of our bonding ritual: He keeps his arms up throughout the entire

ride, as usual; I yell at him in vain to hold the safety bar, also as usual. Fifteen drops, 3.6 Gs, a rushing waterfall, a dark tunnel and almost 2½ minutes later, we roll back into the station, grinning from ear to ear in between yells of “Awesome!”

Lightning and Thunder repeat this race about 240 times a day, roughly 35,000 times per operating season. Who won this time? A dad and his son.

—M. Principato



GCII's Lightning Racer coaster at Hersheypark, with two “racing” trains, Thunder and Lightning.

GCII

ride. Too much lateral or downward force on the ride produces premature wear and an uncomfortable experience for park guests, which in turn creates unhappy park owners.

“We’re [part of] a very small community in the amusement ride business, and we get most of our inquiries by positive word of mouth,” noted Hain, who fields eight to 10 requests for proposals for new coasters every year. GCII wins a lot of those RFPs based as much on its Millennium Flyer train as on the track design.

### Flexible Flyer

The Flyer is essentially an aluminum-bodied car without an engine or steering mechanism and features a unique trailer design and independent suspension system. A typical roller coaster train includes a dozen cars, each of which contains 650 welded, fabricated and/or machined parts held together by more than 650 pieces of hardware.

The finished product sticks to a coaster track like glue and provides an unbeatable combination of comfort

and thrills, according to Gray. “When we’re building a coaster train, I feel a little like Dr. Frankenstein,” he joked. “The whole place is filled with weldments, bolts and machined parts.”

The Flyer is a GCII exclusive, designed and assembled at GCII headquarters. Individual components are outsourced to local machine and fabrication shops for just-in-time delivery, including Ashland (Pa.) Technologies Inc., a contract shop located just half an hour from GCII headquarters. GCII isn’t Ash-Tec’s only amusement ride

customer, but, according to Bill Wydra, president of Ash-Tec, it is one of the most prominent.

Ash-Tec's 25,000-sq.-ft. facility includes separate CNC milling (vertical and horizontal), turning, grinding, finishing and fabrication departments, all supported by a climate-controlled inspection room (see sidebar on page 72). When GCII gets an order to build or refurbish Flyer trains, 25 programmers and operators, working two shifts a day, produce a steady stream of critical parts, including plasma-cut letters like the ones adorning GCII's new roller coaster, Kentucky Rumbler. Parts are produced from drawings created by GCII's designers and drawn in AutoCAD, Microsoft Excel or a coaster-specific design program called "No Limits."

It's this skillful blend of parts outsourcing and in-house design that has allowed Hain and his team to be a total turnkey provider of wooden roller coasters—and to control costs.

Hain said he's learned a lot since building his first coaster as the then-co-owner of GCII. Back then, he and Boodley built Hersheypark's Wildcat, still considered by aficionados to be one of the best cyclonic wooden designs in the world. When asked how much it cost, Hain laughs and replies, "about a million dollars too little!", quickly adding that Hersheypark became and remains one of his best customers.

"When customers in the U.S. or Europe consider adding wooden coasters, we're usually on the list of suppliers they seek bids from," said Hain. "We'd like to grow to build four coasters a year—the best coasters

## Nothing retro about wooden roller coaster technology

The smooth ride, stability on crazily twisted wooden tracks and long-term dependability of Great Coasters International Inc.'s signature train, Millennium Flyer, are the results of highly advanced engineering and manufacturing processes.

The feast-or-famine nature of a roller coaster building business makes GCII the ideal customer for a sophisticated contract manufacturing shop such as Ashland (Pa.) Technologies, which produces machined and fabricated components.

Ash-Tec's two-shift crew of 30 machinists, programmers and welders produce many of the high-precision components that make up a Millennium Flyer train, holding 0.002" relational tolerances, even on weldments, which are made on a Messer MG plasma table, AccuPress CNC press brake, Eroclina pipe benders and Miller welding machines. The weldments are checked in-house before their ultimate Magnaflux testing and final inspection by an independent testing agency.

Precision-turned parts are produced in small batches, a few hundred at a time, on barfeeder-equipped Haas and Daewoo lathes; milled parts on Haas CNC vertical mills and, more recently, on Ash-Tec's newly acquired Haas HS-1 horizontal CNC machine.

"CNC machines allow us to be much

in the world."

### About the Author:

Mike Principato is a metalworking



M. Principato

Weldment mounted to coaster train chassis.

more precise, with each part ensuring a proper fit, of course," said Bill Wydra, president of Ash-Tec. "But building a coaster is much more about craft and art than the science of CNC machining. Our guys are not only at the top of their respective crafts—they're passionate about building roller coasters."

The business relationship between GCII and Ash-Tec is mutually beneficial. When GCII receives an order for a roller coaster, Ash-Tec's 25,000-sq.-ft. plant quickly makes available the needed capacity to produce the thousands of machined and fabricated components that make up the coaster's train.

Said Wydra, "Coaster trains are complex. We take the time to deal with the front end of the business and create processes that provide, among other things, proper project management."

—M. Principato

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