

98-186

Roller Coasters: Background and Design

Spring 2015

Week 5 Notes

### Early Major Manufacturers

#### Manufacturers

NOTE: As a reminder, I would like you to know about Arrow Dynamics, Schwarzkopf, Vekoma, and Custom Coasters Int. (CCI) for this class, but other manufacturers are presented so you are aware of them.

#### Arrow Dynamics (often shortened to Arrow)

- Founded in 1946 by WWII vets Karl Bacon and Ed Morgan. Originally a small company making merry-go-rounds and other minor attractions for local amusement parks
- They were contracted by Disneyland in 1953 to build many of Disneyland's trademark rides, most of which were quite different than what else was around at the time
- Disney was pleased with their rides and continued to hire them for many years. This resulted in Arrow's development of the modern steel roller coaster for the Matterhorn Bobsleds
- During the 60s, they didn't do much coaster-wise, but worked towards developing the log flume, a roller coaster-esque water ride where riders sit inline in log themed boats and navigate a trough of water, culminating in a major drop and splashdown
- In the mid-1970s, they picked back up in the roller coaster market with the development of the modern inversion, securing their position as the dominant steel coaster manufacturer in the US
  - Their coasters were in high demand at this time. During the 70s / 80s, pretty much every major park had an Arrow coaster, if not multiple Arrow coasters
- One of Arrow's major trait was of being innovators in the industry, often being the first to create a certain style of ride
  - They invented the suspended coaster, a style of coaster where the cars hang beneath the track rather than ride on top, and the cars can swing freely from side to side (unlike inverted coasters). Their first suspended coaster was the Bat at Kings Island which, while quite popular, was plagued with mechanical issues (more in Week 7)
  - They were also the first to break the 200ft barrier with the Magnum XL-200 at Cedar Point. The ride didn't go upside down but rather featured large hills in an out and back layout. Classified as a hyper coaster
- In the 1990s, other steel manufacturers like B&M and Intamin began stealing the steel coaster market from Arrow. The better quality of these manufacturers caused parks to prefer their rides over the outdated technologies of Arrow
- On the edge of bankruptcy, Arrow made a hail mary with X at Six Flags Magic Mountain in 2002. X was the world's first 4<sup>th</sup> Dimensional roller coaster, meaning riders sat on the side of the track in seats that could rotate based on a fourth rail set-up
  - Search 'dinoconda pov' on youtube for a good video showing this off from Theme Park Review
- While intended to be a revolutionary new concept, it wasn't the success Arrow was hoping for. It had technical issues which meant it didn't run much its opening year. It was too expensive for

other parks to buy. Finally, Arrow ended up spending far more money than originally anticipated developing it.

- Shortly after X, Arrow went bankrupt in 2002, with the company being sold to S&S

### Schwarzkopf

- Schwarzkopf, along with Arrow Dynamic, was the major pioneering firm for the steel roller coaster
- Named after Anton Schwarzkopf, a German engineer who owned the company. The company began doing work for travelling fairs (which are very popular in Germany)
- In 1964, they made their first steel roller coaster, the Wildcat. It featured a simple figure-8 layout and was only ~60ft tall, but was copied across Germany and even in the US
- Similar to Arrow, Schwarzkopf was a major innovator in the amusement industry
  - He pioneered the portable coaster which, while irrelevant to America, was immensely important in Europe. He made large rides that stood over 100ft tall and featured as many as 5 inversions on very small footprint that could be taken down in a week or two, transported to another site, and reassembled
  - He is also well known for shuttle coasters; coasters that are not complete circuits. His most famous shuttle coasters are the shuttle loops, which launch you into a vertical loop via a flywheel or weight drop and then up a spike, at which point you go backwards through the loop back to the station
  - Schwarzkopf also came up (possibly independently) with the suspended coaster concept, but financial issues prevented it from being built.
- While a brilliant amusement engineer, Anton Schwarzkopf wasn't a great businessman. His company went bankrupt several times, finally in the late 1980s. Most of their engineers and assets went to manufacturers like Zierer and Gerstlauer, which both operate today
- Even though his rides aren't very widespread in America, they have a reputation for being very high quality from both a mechanical perspective and ride experience perspective, much more than the average Arrow coaster

### Vekoma

- While they may not be considered to have the highest quality rides, they are probably the largest steel coaster manufacturer by volume, with over 250 roller coaster projects across the world (not including relocations) and many over flat rides and other amusement attractions; Dutch
- Originally founded as a manufacturer of agricultural machinery in 1926, they moved into the amusement industry in the 1970s, building their first roller coaster in 1979 (Super Wirbel at Holiday Park in Germany)
- Vekoma rides share many similarities with Arrow Dynamics ride system, including identical track styles, similar layout and design style, and they often run Arrow Dynamics rolling stock
- They are famous for two main coaster lines, each of which have been cloned over 30 times
  - The Boomerang coaster is a shuttle coaster which pulls riders backwards up a ~100ft spike, at which point they are released and travel through a cobra roll and vertical loop. The train then goes backwards through the same element. Boomerangs are quite popular due to their cheap price and small footprint, but tend to have high forces and low capacity
  - Their standard SLC (Suspended Looping Coaster) is an inverted coaster which features a 100ft lift hill and 5 inversions. The ride provides a cheaper alternative to B&M inverted

coasters, but are considered by enthusiasts to be uncomfortable due to restraint designs.

- They combined their boomerang and SLC coasters with the Invertigo model, which is an inverted boomerang with riders sitting back to back, so as to face other riders. They also made a version over 200ft tall in 2001 with many technical issues
- In 2001, they invented the flying coaster with Stealth at Paramount Great America (now California Great America). However, the ride featured many technical issues and slow loading times
- They manufacturer a wide variety of kiddie and family roller coasters, as well as mid-sized roller coasters. While known for their cloned coasters, they do make custom coasters based on client need. A good recent example of this was their work on the track for Expedition Everest at Disney's Animal Kingdom

#### Philadelphia Toboggan Company / Coasters (PTC)

- The oldest existing coaster manufacturer today. Originally formed in 1904 in Philadelphia and began making general amusement devices like carousels
  - They are sometimes credited with inventing Skee-ball
- Early in the 1900s, they began producing wooden coasters with early designers, most notably John Miller
- They survived the lull between the First and Second Golden Age of Roller Coasters by pulling back production and focusing on kiddie/family roller coasters, which were popular with Baby Boomers
- Under the ownership of John Allen, the company began making coasters again in 1972 (despite a reluctant John Allen ironically) with the Racer at Kings Island, which marked the start of the Second Golden Age of roller coasters
- They produced another 10 coaster between 1972 and the early 1980s, at which point they stopped creating original roller coasters
- They are most known for their wooden roller coaster trains, which run on most wooden coasters today. They are a distinctive box shape with 2 or 3 rows and typically individual lap bars
- Currently, they focus entirely on train production and restoration jobs

#### Dinn Corp. / Dinn & Summers

- Charlie Dinn was an engineer at Kings Island who helped with the construction of the Racer in 1972. 7 years later, he helped design the Beast at Kings Island as part of an in-house project. The success of the Beast earned him notoriety
- In 1989, he teamed up with Curtis Summers to form Dinn Corp. (also called Dinn & Summers), a major wooden coaster manufacturer at the time
- Between 1989 and 1991, they produced around 10 roller coasters, including massive wooden coasters like Mean Streak at Cedar Point and Texas Giant at Six Flags Over Texas. These coasters stood higher than ~150ft and were larger than most other coasters at the time
- As quickly as they had begun, they stopped production in 1991
- While known for their large rides, their coasters had the issue of commonly deteriorating over time relatively quickly. This meant many of the rides required intensive re-tracking only after 5 years. The extent of this work required for Mean Streak and Texas Giant helped show that very tall wooden coasters were not a good idea (if done incorrectly)

### Custom Coasters International (CCI)

- Custom Coasters International was founded in 1992 by Denise Dinn-Larrick, the daughter of Charlie Dinn, and featured many of the designers and engineers from Dinn Corp. They produced wooden roller coasters
- They started out with a few small coasters (their first one was 55ft tall), but quickly went on to make bigger rides
- They were easily the dominant wooden manufacturer during the 1990s and helped to bring back the wooden coaster from the obscurity it faced during the 1980s due to the rise of the steel coaster
- They produced over 30 wooden coasters in less than 10 years, including 7 coasters in 2000 alone, an impressive feat rarely matched
- In 2002, CCI went bankrupt while building the New Mexico Rattler
- Pretty much all American wooden coaster manufacturers today have some connection to CCI
  - Denise Dinn ran a small wooden coaster manufacturing division for S&S, which produced only 4 coasters
  - Mike Boodley, who left CCI in 1994, went on to form Great Coasters International (GCI)
  - Four of the primary designers from CCI formed their own company after CCI's bankruptcy called The Gravity Group. They are currently considered the premier wooden coaster designers in the world

### Togo

- Togo is an oddity of early manufacturers in that they were a Japanese firm. They formed in the early 1950s and actually built a coaster as early as 1953.
- They primarily operated in Japan, but in the 1980s began building coasters in America
- In the 1980s, they invented for first stand-up roller coaster, although the restraints (and the coaster) were uncomfortable
- Togo also created several large roller coaster (like Fujiyama at Fuji-Q Highlands which, at 259ft tall, was the tallest coaster in the world when it opened in 1996) as well as strange rides like their Ultra Twister pipeline roller coasters
- In general, Togo rides tended to be poorly engineered, featured unique albeit awkward elements, and had some of the most uncomfortable cars of all designers
- In the early 2000s, the company went under after a lawsuit from Knott's Berry Farm concerning their Windjammer Coaster, which was extremely poorly engineered

### Summary Table for Early Manufacturers (will be expanded next week)

Name	Wood or Steel*	Country of Origin	Years of Primary Operation**	Operating or Defunct
Arrow Dynamics	Steel	American	1960s – 2002	Defunct
CCI	Wood	American	1992 – 2002	Defunct
Dinn Corp	Wood	American	1989 – 1991	Defunct
PTC	Wood	American	1920s – 1970s	Defunct (coaster-wise)
Schwarzkopf	Steel	German	1960s – 1990s	Defunct
Togo	Steel	Japanese	1950s – 2000	Defunct
Vekoma	Steel	Dutch	1979 - Current	Operating

\*Primarily; occasionally they might spill over into the other type

\*\*When they were making many coasters; they may have been operating before and after this range