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Roller Coasters: Background and Design

Spring 2015

Week 14 Notes

Design Theory: What Makes a Coaster Good?

Coaster Polls

Coaster Polls attempt to rank roller coasters subjectively (what is the best coaster) as compared to ranking them with stats (what is the tallest coaster). As with any subjective ranking, this is very difficult to do correctly, but these polls give insight into what coasters contemporary wisdom and coaster enthusiasts consider to be the best.

NOTE: Most of the rankings in these notes are from the 2012 iteration of the coaster polls (so three years stale).

Golden Ticket Awards

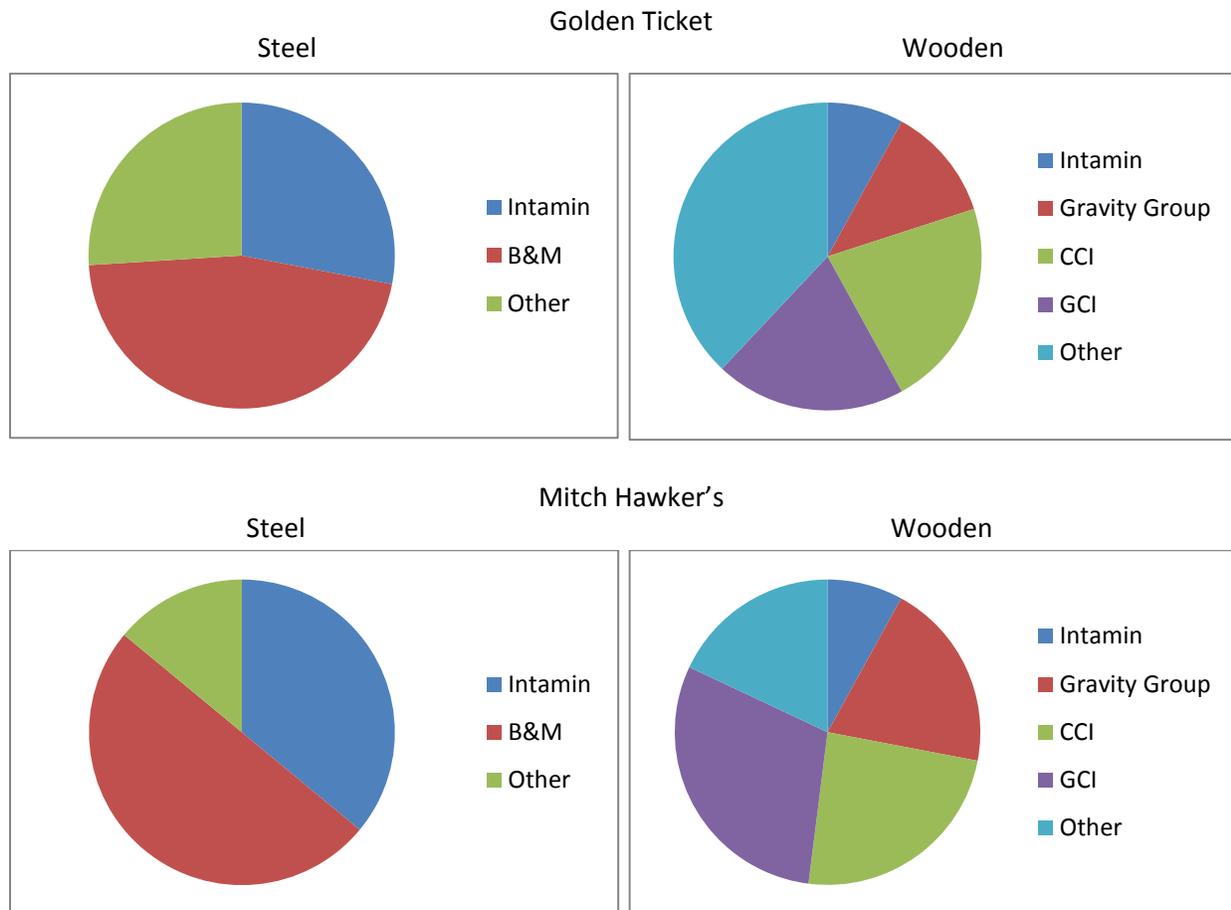
- The Golden Ticket Awards are the awards given annually by Amusement Today, an amusement industry magazine. It has been awarded for the past 15 years
- They award multiple categories beyond coasters, including many awards for amusement parks in different categories. Notable park winners include
 - Cedar Point – Best Park (15 years)
 - Busch Gardens Williamsburg – Best Landscaping (15 years)
 - Knoebels – Best Food (14 years)
 - Holiday World – Cleanest and Friendliest Park (13 years)
 - Kings Island – Best Kid’s Area (12 years)
- For ranking roller coasters, Amusement Today surveys a group of enthusiasts that they have picked (based on the number and variety of coasters they have ridden) and use their preferences to make their list.
- There are some major draw-backs and criticisms of Golden Ticket’s coaster poll.
 - The poll tends to represent a more industry-centric view of coasters, which is highly biased towards America (foreign coasters, especially those in Asia, have trouble making the poll).
 - The poll is in some ways a popularity contest, with coasters who are more well-ridden by enthusiasts having a better chance of being higher
 - There is a certain element of nostalgia that keeps old classics like Magnum XL-200 and The Beast high on the list.
- On the steel side, the number one spot always goes to either Millennium Force at Cedar Point or Bizarro (formally Superman: Ride of Steel) at Six Flags New England, with Nitro at Six Flags Great Adventure consistently taking 3rd. They trade every few years. Millennium is the current number one.
- On the wooden side, the top tends to be some ordering of the following four coasters: El Toro at Six Flags Great Adventure, The Voyage at Holiday World, Phoenix at Knoebels, and Boulder Dash at Lake Compounce. Boulder Dash is the current number one.

Mitch Hawker's Best Roller Coaster Poll

- Mitch Hawker's poll, which has been conducted since 1994, is considered by most enthusiasts to be the best coaster poll out there.
 - I personally also prefer this poll over Golden Ticket
- The poll uses mutual ridership to help determine rankings. The idea is a rider who has ridden coaster A and B will be better suited for deciding whether A should rank higher than B or vice versa. This fixes many of the popularity issues that mess up the Golden Ticket poll.
 - For instance, if the Mitch Hawker's poll was conducted like Golden Ticket, Mean Streak at Cedar Point would be ranked in the top 30s. But using its method, Mitch Hawker would rank Mean Streak at the bottom of the poll (around 160th)
- Because of this correction, the poll represents a view on roller coasters that is much more enthusiast-centric and is consistent with the views expressed on coaster forums. It also allows international coasters to be better represented.
- Even though it is very good, there are some faults to the poll
 - Anyone is allowed to vote, including those who haven't ridden many coasters and thus aren't as much of an authority on the subject
 - International voters, who tend to have ridden fewer coasters, will bias their home coasters higher. This leads to an over-representation of some international coasters, like Shambhala at Port Adventura in Spain, although these usually only last for a year or two.
- On the steel side, Bizarro at Six Flags New England usually gets 1st, but the 2012 poll saw its spot usurped by Expedition GeForce at Holiday Park in Germany.
- On the wooden side, El Toro at Six Flags Great Escape leads the poll currently, with many of the same favorites from the Golden Ticket poll also taking top spots. T Express and Balder, two Intamin woodies, also tend to do very well.
- There are some interesting differences in opinions between the polls
 - Millennium Force, 1st on Golden Ticket, is only 14th
 - Magnum XL-200, 8th on Golden Ticket, is 80th
 - Apollo's Chariot, 4th on Golden Ticket, is 32nd
 - The Beast, 7th on Golden Ticket, is 47th

Manufacturer's Performance in Coaster Polls

Here are some charts showing the percentage of coasters in the top 50 coasters by manufacturer.



Sequencing

- The website www.rollercoasterphilosophy.com has some very interesting articles on design theory of roller coasters (some of which are quite ~~verbose~~ thorough). One of his ideas that I promote is Sequence Theory
- The idea of sequencing is to look at a coaster more abstractly than just a set of height and speed statistics or series of elements but rather a grouping of different patterns and sequences that dictate the psychological energy and excitement of the ride. These sequences can be seen as similar to poetry which follows rhyming patterns or stories with plot, rising action, and climax.
- There are several different sequencing strategies, and most coasters can be categorized into one of them.
- Progressive sequencing involves having a roller coaster which builds energy, with the climax of the ride taking place at or near the end.
 - Thunderbolt at Kennywood is a great example of this, with the largest drop taking place at the end of the ride.
- Maximalist sequencing is the opposite of progressive, with the largest, most intense element occurring first. This is one of the easiest sequences to achieve, since coasters have the most

energy at the start, but is often one of the worst sequences because it often ends with a lack luster element that leaves riders a bit underwhelmed. Avoid this, since the last element is sometimes as important as the first element in solidifying a riders opinion of a ride.

- B&M looping coasters tend to be classified as maximalist, which is why they tend to do not as well as other coasters on polls.
- Minimalist sequencing takes a simple concept and uses repetition with variation to make for an exciting ride. Most commonly the repeated pattern is hills. Variations in this repetition keep the ride from being bland and the repetition highlights even small changes.
 - Hyper coasters tend to be minimalist
 - Shivering Timbers, a CCI woodie at Michigan's Adventure, is very minimalist, with a giant out-and-back section of hills
- A-B sequencing is when a coaster has two major design themes that take place in two separate parts of the ride. A-B rides can usually be cut in half into distinct sections of coaster, with either a lull or powerful transition in between the sections (there are advantages to both). The themes could be repeated in other ways, such as A-B-A.
 - El Toro, a consistent #1 wooden coaster on both Golden Ticket and Mitch Hawker, uses A-B sequencing, with a large hill section in the first section and a powerful high-banked curve section at the end.
- Dramatic sequencing focuses on telling a story with the coaster, with the track design following a story arc of rising action, climax, and falling action. Mine train coasters lend themselves to this sequencing due to their nature
 - Disney coasters are masters of dramatic sequencing due to their high theming, such as Expedition Everest at Animal Kingdom and Big Grizzly Mine Train at Hong Kong Disneyland.
- Random sequencing involves a hap-hazard slapping together of ride elements to form the overall coaster. The issue with random sequencing is that the lack of flow reduces the rider's emotional investment in the ride, making it have a much lesser emotional impact on riders. This gives the ride a feeling of blandness. Avoid this sequencing as much as you can.
 - Dragon Mountain at Marineland always comes to my mind when I think of this. A great example of what not to do with coaster designing.

Presenting the Ride to Riders

- There is actually a major effect of how the ride is presented to riders, and it is something you ought to consider when designing coasters.
- On the one hand, it is good to hide elements of the coaster from riders, because then they will not know what to expect when riding the ride.
 - The Beast at Kings Island does this well, since it is almost impossible to see the ride from the park paths.
- On the other hand, showing off elements of a coaster can help to heighten the effect of the element. For instance, have a large part of the ride in clear view of park paths and riders. This will cause riders to inflate the element in their mind and consider it larger than if they had only seen it while riding.
 - Griffon at Busch Gardens Williamsburg doesn't hide the 200ft vertical drop at all, and viewing the drop from nearby makes it look much taller.
- Alternatively, you can completely hide the coaster by enclosing it. A coaster in a dark building is the ultimate unexpected journey. But in general, buildings usually look tacky and ruin the open atmosphere that coasters give. It also makes things feel smaller.

Use of the Environment

- The environment can increase the riding experience of a coaster immensely, or give it a sense of cheapness (see *Scream!* at Six Flags Magic Mountain; the parking lot coaster).
- If a coaster train is near the ground or if trees are nearby, then riders will feel like they are going much faster than if they were in the open. This is why *Boulder Dash* feels much faster than it actually is. The easiest way to improve this is through trees, because hills are a critical part of most coasters.
 - Also, trees will hide changes in the ride layout, creating an unexpected ride.
- If you watch videos of *Flight Deck* at Kings Island and *Eagle Fortress* at Everland in South Korea (both similar Arrow suspended coasters), you will see how environment can distinguish a world class steel coaster experience from a standard normal one.
- Even though environment is useful, it isn't completely necessary. *El Toro* at Six Flags Great Adventure, arguably the best coaster in the world currently, does not really take advantage of any environmental factors.