From Design to Fabrication: Using 3ds Max to Build a Real Rube Goldberg Machine

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Class summary

In this class we will examine how 3ds Max was used during the previsualization, design and fabrication phases of the Panasonic Toughpad “The Ultimate Torture Test” video.
Key learning objectives

At the end of this class, you will be able to:

- Discover how to apply tools traditionally used for VFX to Mechanical Design
- See how MassFX can be used as a quick solution for working out mechanical designs
- See how various features in 3ds Max can be used to create quicker previsualizations
- Understand how rigging tools in 3ds Max can be used to help design working mechanical assemblies
The Project
The Creative Challenge

To create a viral video that highlights the key points of ruggedness of the new Panasonic Toughpad in the context of a whimsical testing grounds inspired by Rube Goldberg machines.

The Logistical/Technical Challenge

5 weeks schedule from project award to shooting
No location established at time of award
Concepts for all torture tests not yet approved by client
Not technically a “Rube Goldberg Machine”
….actually harder
Concept
Original Concept Art

We have many ideas for different ways in which this machine can be built. For the purpose of conversation, here is one possible scenario.
Design and Previs : Overview

7 Primary Characteristics to Highlight:

• Impact Resistant
• Dirt Resistant
• Water Resistant
• Submergable
• Cold Resistant
• Heat Resistant
• Speakers Loud Enough For Noisy Environments
Design and Previs: Overview

Top 10 Biggest Challenges:

10 - Keeping total running time in mind
9 - Mindful of Camera Flow/Operators
8 - Moving a Single Object, Not Energy, from point A to Z
7 - Every component is dependent on component before and after
6 - Need to avoid repetitive mechanisms wherever possible
5 - Many Triggers and Releases needed to be designed
4 - Budget not so big that we can just throw money at it.
3 - Murphy’s Law In Full Effect
2 - The randomness of the universe
1 - Time
Panasonic Project Montage

Execution
Design and Previs : Ball Drop
Design and Previs : Ball Drop

Specific challenges:

Overall creative approach not approved until 3 days before shoot

Trigger balls from track via a blowtorch

Change from single ball impact to 3
Requires a way to trigger boat slide only after 3\textsuperscript{rd} ball impact
Design and Previs: Ball Drop
Design and Previs: Ball Drop

- Car to activate trigger embedded in track
- Releasing weight (washers tied to string)
- Setting off mouse or rat trap that pulls pin in blowtorch release
Design and Previs: Ball Drop
Fabrication: Ball Drop Weight Trigger
Design and Previs : Ball Drop Weight Trigger

Initial design concept based on single ball bearing impact
Design and Previs : Ball Drop Weight Trigger
Design and Previs : Boat Canal
Design and Previs: Boat Canal
Design and Previs: Boat Canal

Based on Toughpad measurements

Modelled in 3ds Max

3D CNC milled from foam
Design and Previs: Elevator
Design and Previs: Elevator
Design and Previs : Elevator
Fabrication: Elevator
Fabrication: Elevator
Design and Previs : Hoeken Conveyor
Design and Previs : Hoeken Conveyor

Challenge: How to execute linear motion without always using traditional conveyor belts and look interesting
Design and Previs: Hoeken Conveyor

Solution: Comb the internet until you find http://www.mekanizmalar.com/
Design and Previs: Hoeken Conveyor
Design and Previs: Hoeken Conveyor
Design and Previs : Hoeken Conveyor
Design and Previs : Hoeken Conveyor
Design and Previs: Hoeken Conveyor
Fabrication: Hoeken Conveyor

Derive measurements for full scale execution from previs

Fabricate linkages on CNC machine from splines extracted from previs

Source drive components from McMaster Carr
  Sprockets
  Chains
  Bushings
  Collars

Put it all together and pray
Fabrication: Hoeken Conveyor
Design and Previs: Ferris Wheel
Design and Previs : Ferris Wheel
Design and Previs : Ferris Wheel
Fabrication: Ferris Wheel
Design and Previs : Last Minute Tweaks

Custom Step Down Chain Sprocket - Freezer Conveyor
Step Down Gearing - Ferris Wheel
Mechanical Start Button
Thank You and Credits

Worlds Away Productions

Kai Lee – Production Designer
Kim Lee – Art Director/Previs Artist
Ales Brodsky – Lead Fabricator
Eric Fisher - Fabricator
Victor Barroso - Fabricator
Zack Freedman – Air Cannons/Electronics
Steve Cohen – Drone Specialist

Damaris Cozza – Props
Kathryn Vega – Props
Ruddy Heredia – Art Assistant
Sean Hechler – Art Assistant
Linda Albert - Art Assistant
Calvin Wong – Art Assistant
Thank You and Credits

Shilo

Anthony Furlong – Director
Cary Flaum – Executive Producer/Head of Production
Robert Berman – Head of Production - East
Tom Nifenecker – Line Producer

Kevin Kim – Behind the Scenes Photo/Video
Thank You and Credits

SIGMA
Diane deCastro – V.P., Sr. Account Director
Kelly Mastrojohn – Sr. Account Executive
Genevieve Gigi – Agency Producer
Tim Stapleton – Creative Director
Nik Nikolov – Creative Director
Skye Leith – Video Production Director
Jose Aguirre – Video Editor
Matt Reinheimer – Audio Engineer

PANASONIC
Marca Armstrong – Vice President, Marketing
Jayme Cunningham – Marketing Manager
Session Feedback

- Via the Survey Stations, email or mobile device
- AU 2015 passes given out each day!
- Best to do it right after the session
- Instructors see results in real-time
Students, educators, and schools now have 

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