

Winning the Wheelchair Race at the 2024 Cybathlon

# Designing the BEAST

**MAKE+**  
creative solutions for better lives





I work and live on the traditional territories of the Coast Salish Nations of xwməθkwəyəm (Musqueam), Skw̱xwú7mesh (Squamish), and səl̓ílwətaʔɬ (Tsleil-Waututh).



# Agenda

- BCIT's MAKE+ - who we are
- \*CYBATHLON – an assistive technology Paralympiad
- \*The Wheelchair Race @ the Cybathlon 2024
- The BCIT wheelchair design ethos + some biomechanics
- Our design = the BEAST
- The winning race!

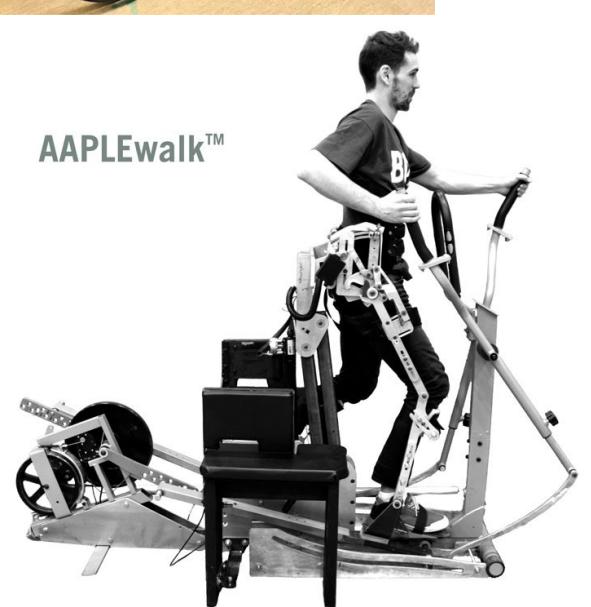
\* Audience participation required!

# MAKE+ Applied Research

## creative solutions for better lives



AAPLEwalk™



### Verathon Glidescope® Gives Doctors a New Perspective

New inventions often shed new light on old processes, and that is exactly what the Verathon Glidescope® did for doctors around the world.

Intubation is an invasive and uncomfortable medical procedure that



# Cybathlon

- Assistive Technology competition
- Zurich, Switzerland. 2026, 2020, 2024
- Develop and innovate new AT
- Teams from all over the world
- People with disabilities on each team
- Everyday tasks + overcoming barriers
- **8 events in 2024**



If you were organizing...

**What events would you have?**

- what people?  
(disabilities, barriers)
- what technologies?





## 8 events / races



# Wheelchair race

What 10 tasks would you have?



# Wheelchair race

10 tasks, including:

- Navigating tight spaces
- Climbing stairs
- Raising the user's height
- Traversing uneven surfaces
- Manipulating objects





past  
competitors





2024 competitors

# MAKE+ wc design ethos

- Manual wheelchairs
- “On the fly” adjustability
- Modular attachments
- Off-road mobility

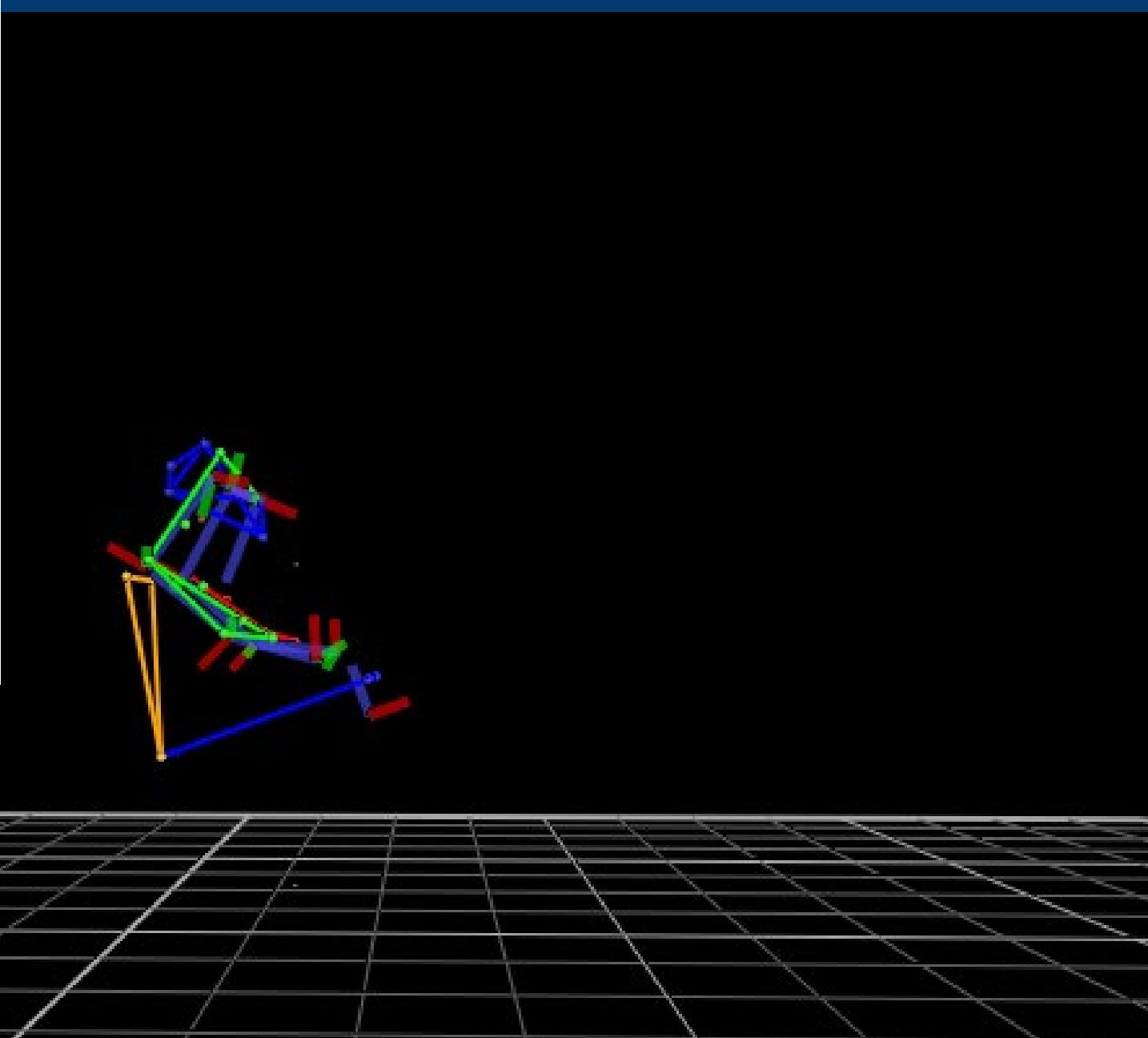
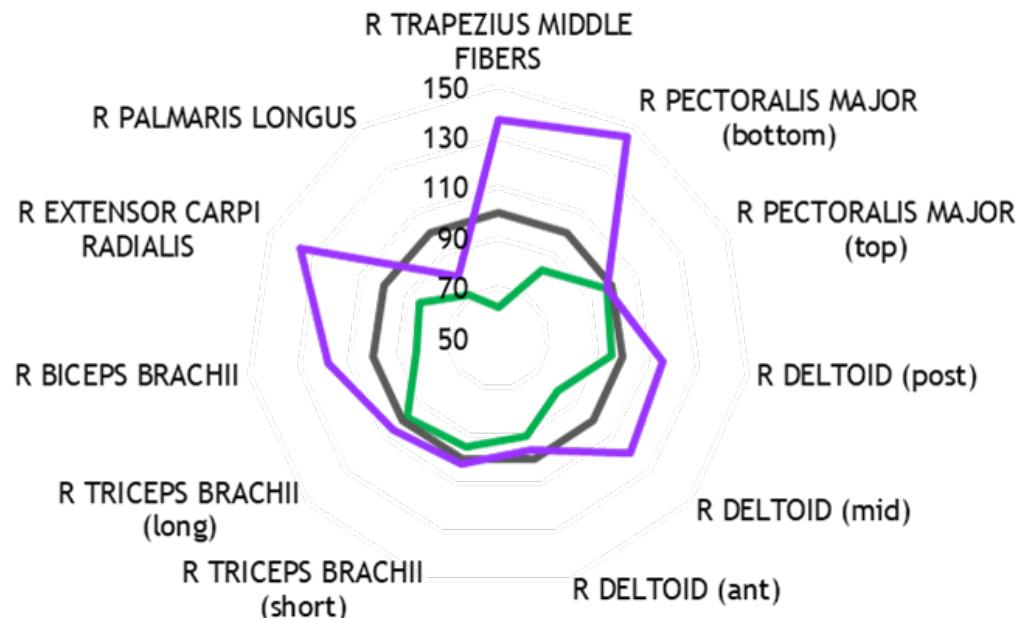


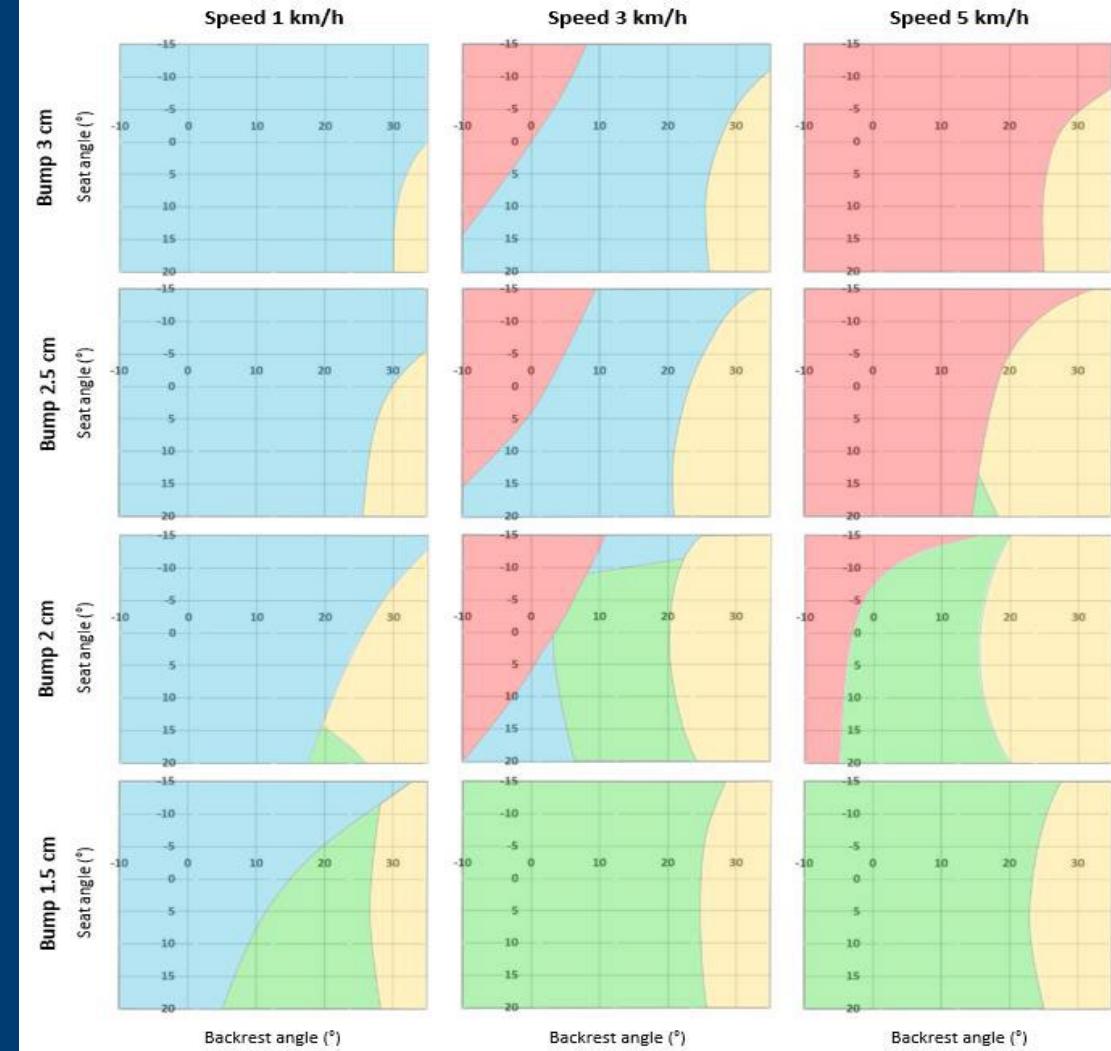
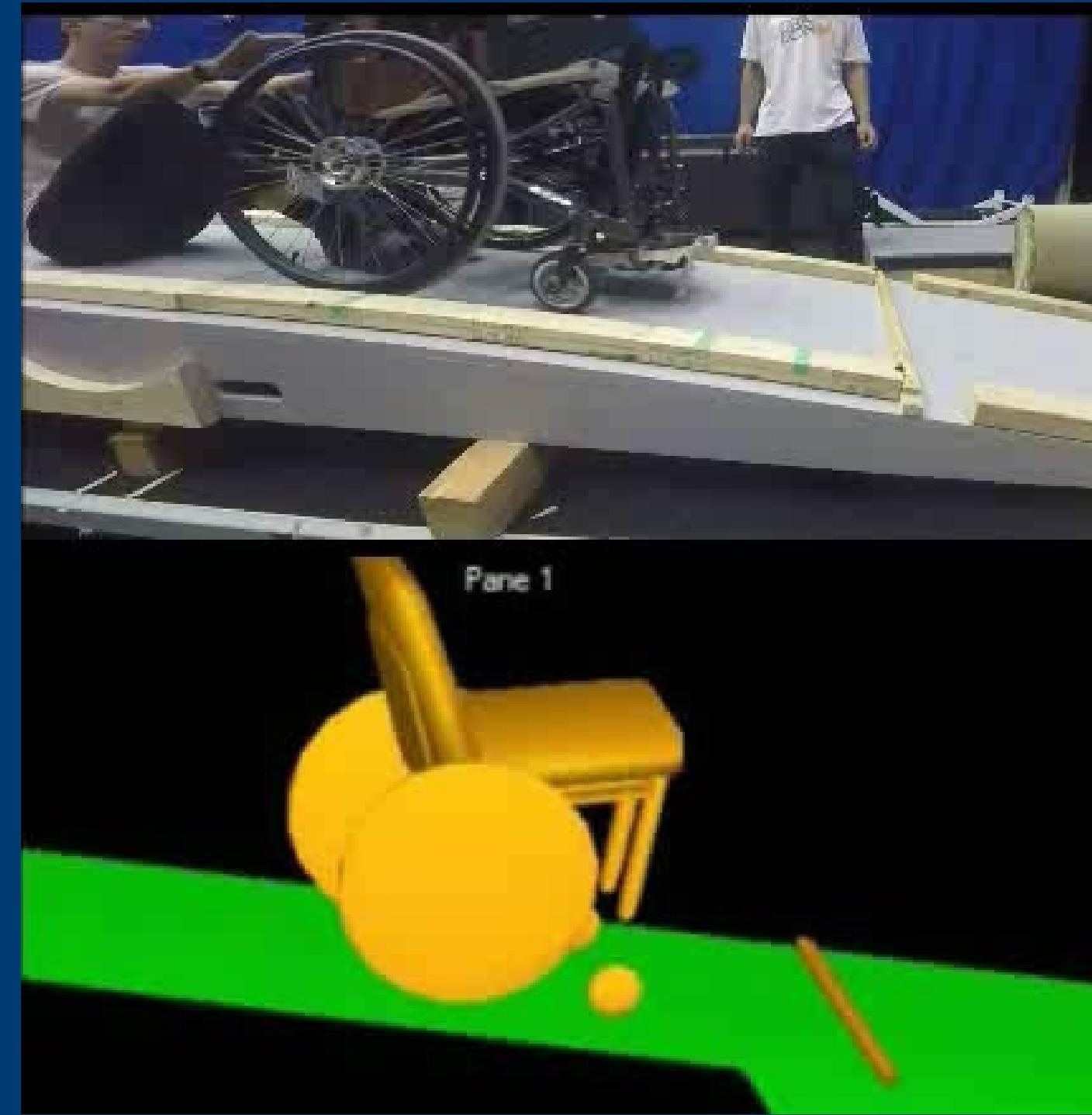


The ELEVATION™  
wheelchair

# Average EMG Standard Seat Dump Position

Declined back   Standard dump/Standard back   Reclined back





Thomas L, Borisoff J, and CJ  
Sparrey. *J NeuroEng and  
Rehab.* 2018



# The BEAST

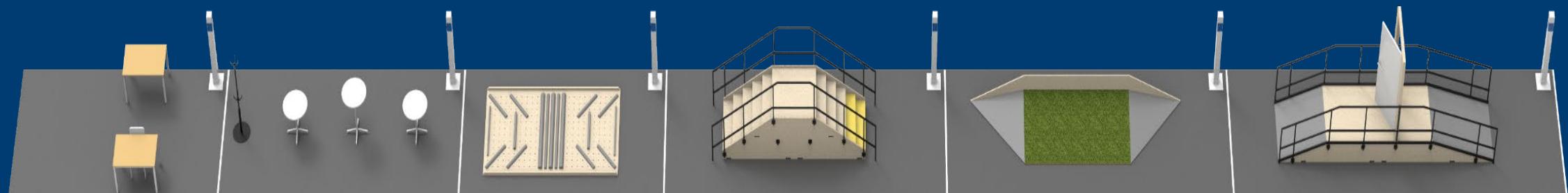
- BCIT
- Extending
- Articulating (wheelchair for)
- Serious
- Terrains



# Design requirements:

What things constrain the design?

- Competition rules
- Competitive goals
- Tasks, environment
- Human factors!





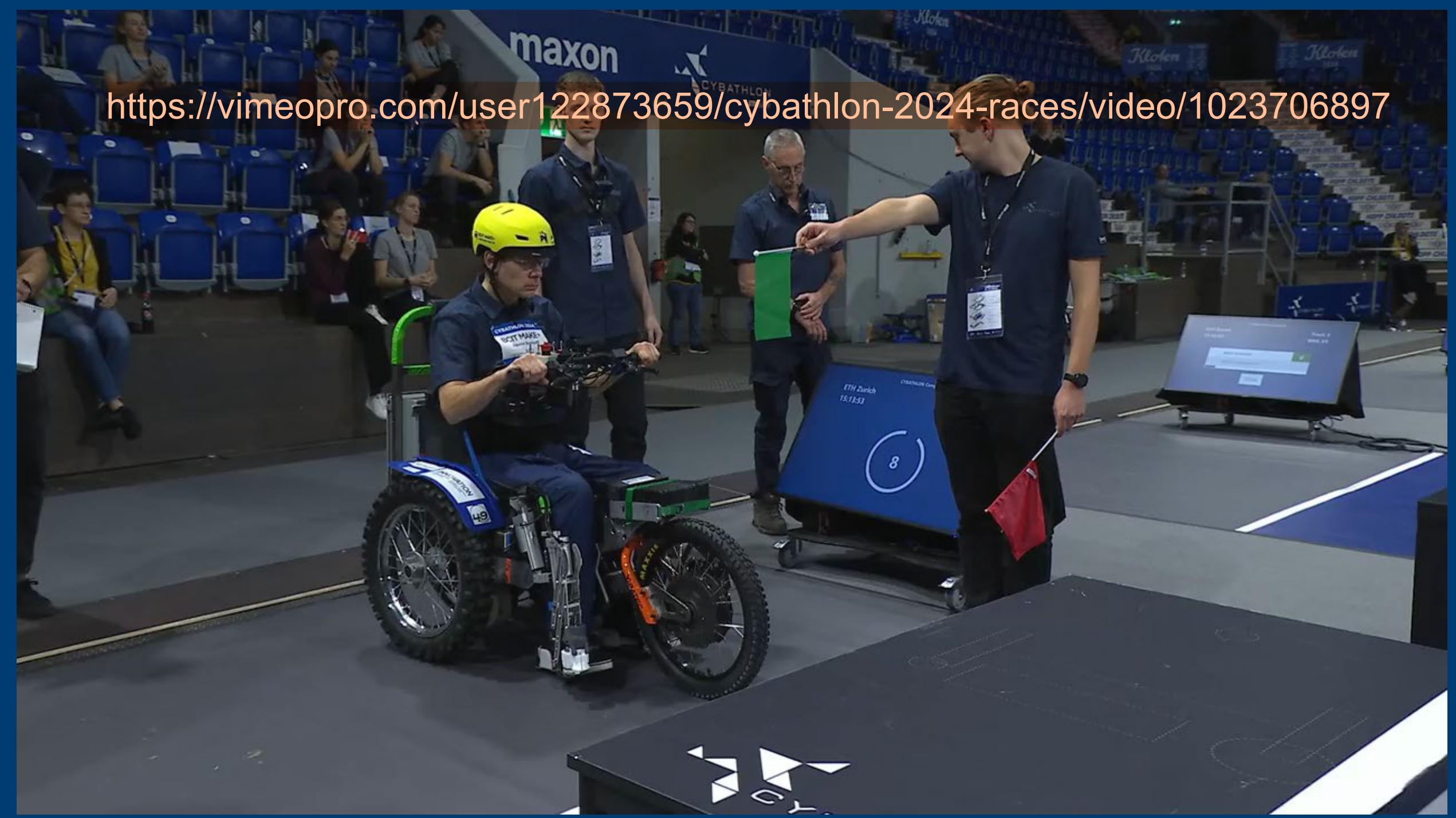


# The Final Race

The BEAST vs Swiss, German, & Japanese Teams



<https://vimeo.com/user122873659/cybathlon-2024-races/video/1023706897>



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# QUESTIONS & ANSWERS