

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 xwməθkwəy̓əm (Musqueam), Skwxwú7mesh (Squamish), and səlilwətaʔɬ (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



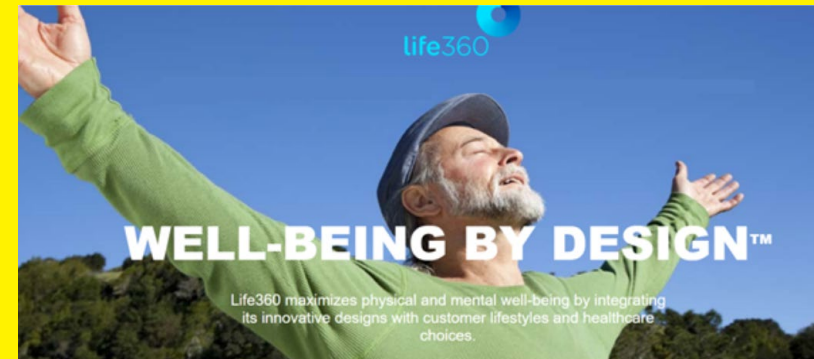
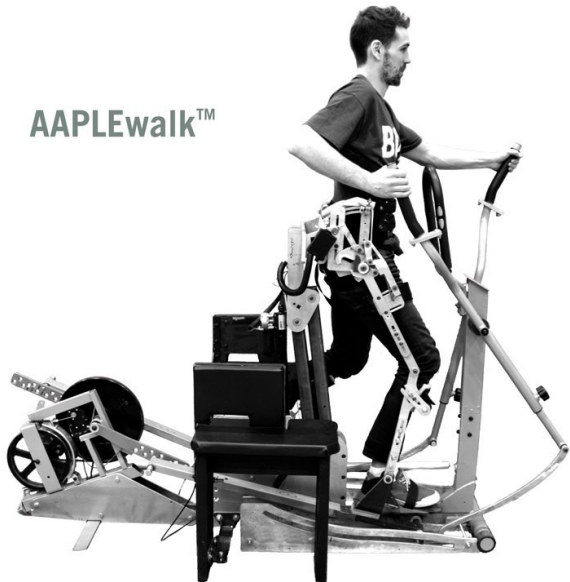
Verathon Glidescope® Gives Doctors a New Perspective

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



AAPLEwalk™



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?





VIS
Vision Assistance Race



ARM
Arm Prosthesis Race



ROB
Assistance Robot Race



BCI
Brain-Computer Interface Race

8 events / races



EXO
Exoskeleton Race



FES
Functional Electrical Stimulation Bike Race



LEG
Leg Prosthesis Race



WHL
Wheelchair Race

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

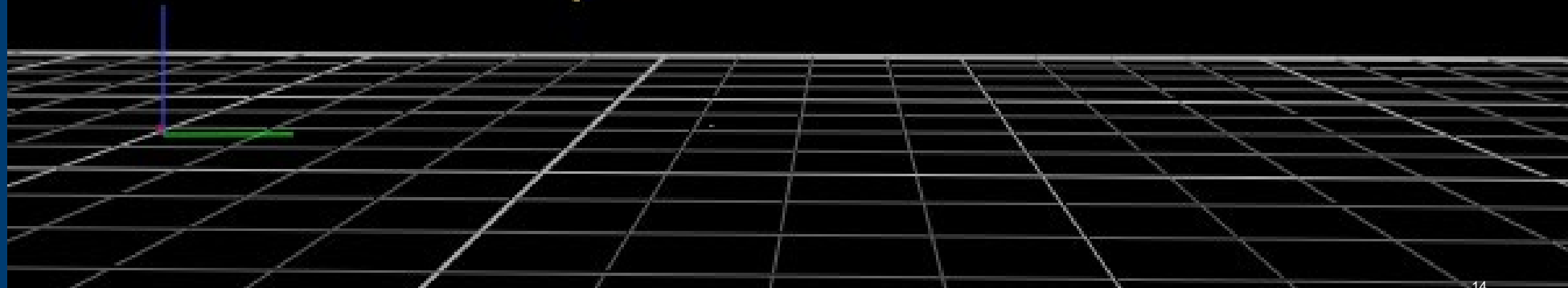
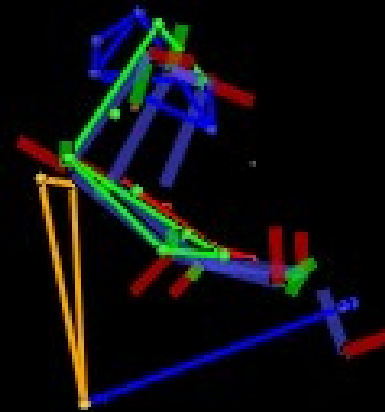
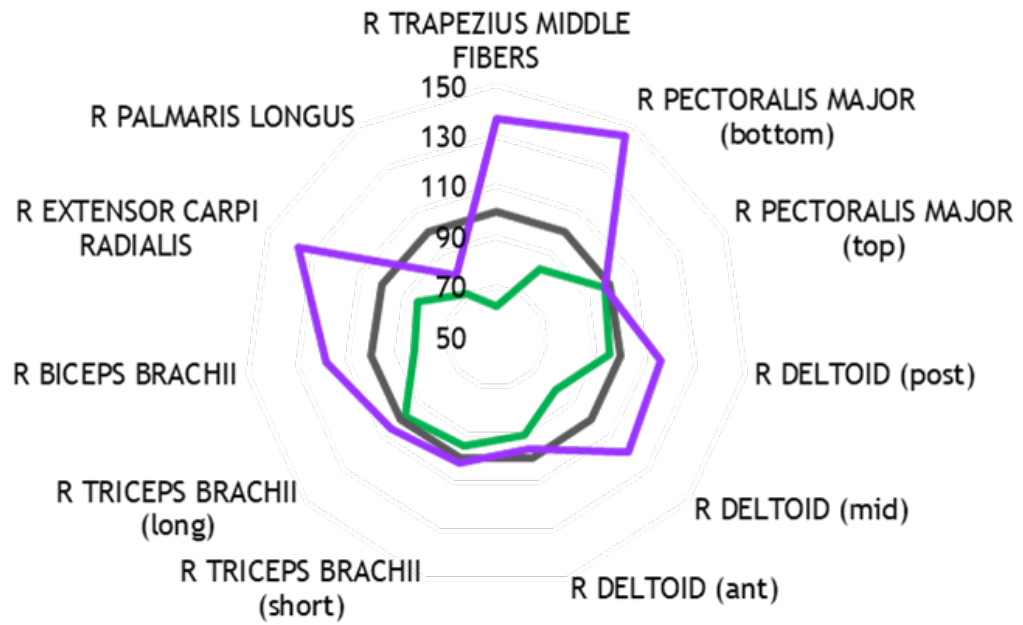
- Manual wheelchairs
- “On the fly” adjustability
- Modular attachments
- Off-road mobility

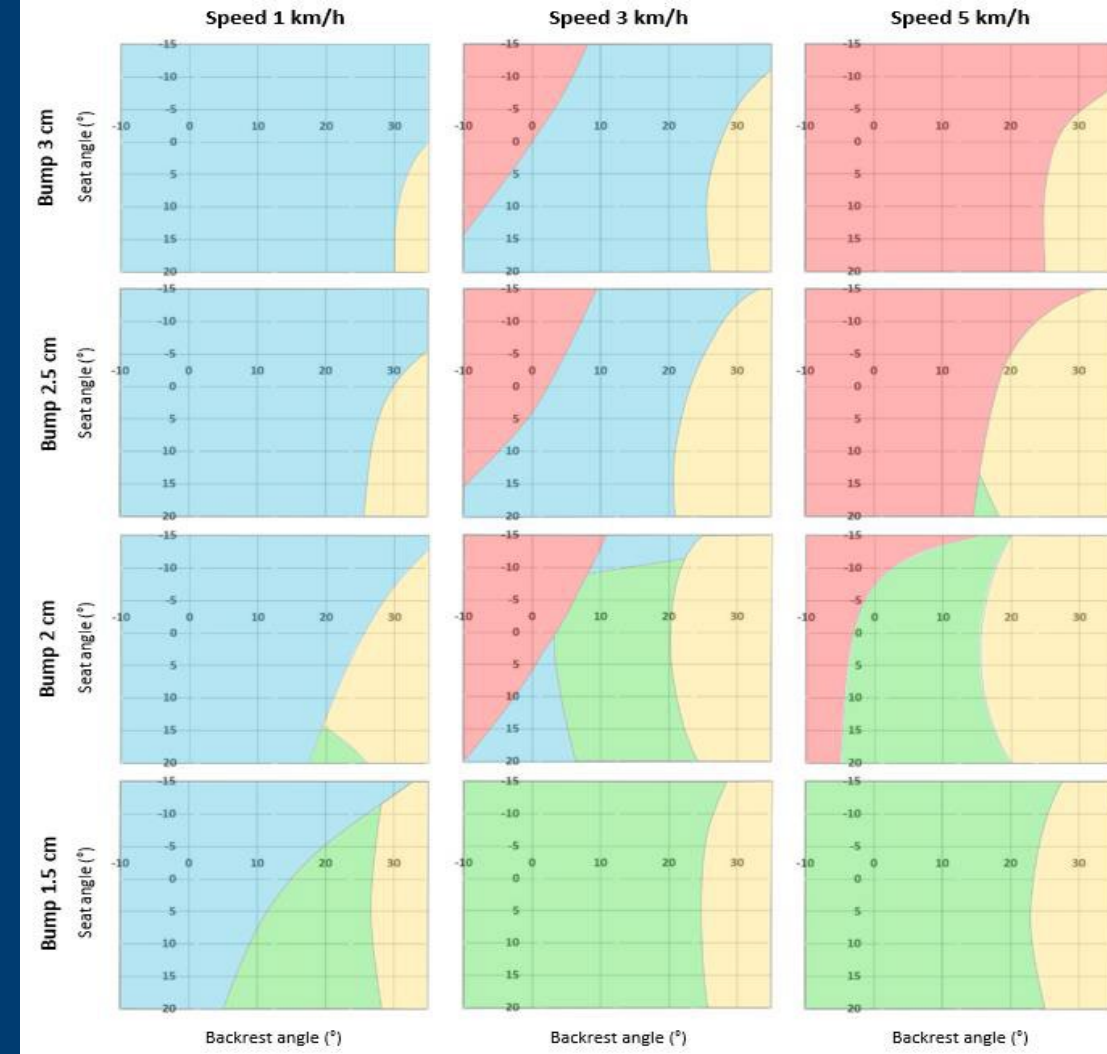
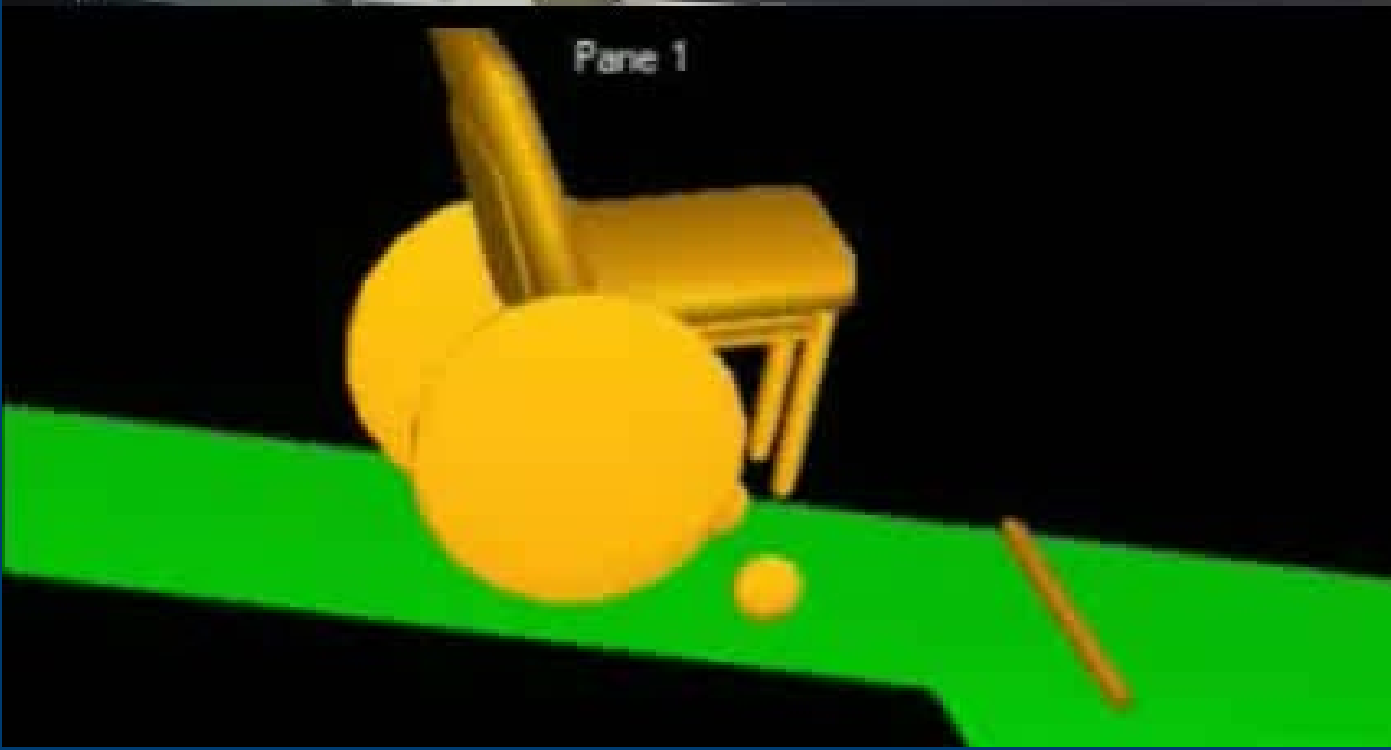


**The ELEVATION™
wheelchair**

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

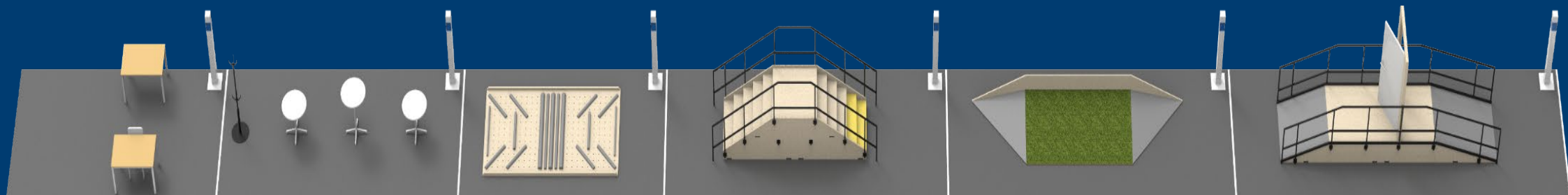
- **B**CIT
- **E**xtending
- **A**rticulating (wheelchair for)
- **S**erious
- **T**errains



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://vimeopro.com/user122873659/cyathlon-2024-races/video/1023706897>



INNOVATION.CA

CANADA FOUNDATION
FOR INNOVATION

FONDATION CANADIENNE
POUR L'INNOVATION



**BRITISH
COLUMBIA**

BC Knowledge Development Fund



**NSERC
CRSNG**

QUESTIONS & ANSWERS