

Challenge exercise: Design an accessible trail storage solution

The challenge: design a storage solution that lets the rider carry one essential trail item on the adaptive bike, and reach, use and re-store it from a seated riding position – without making major modifications to the bike.

Project Mjolnir is an adaptive mountain bike built around one rider and their riding context. On a standard bike, accessories clamp onto a conventional frame, so off-the-shelf storage usually fits. An adaptive bike has no standard frame geometry and almost no existing solutions, so anything you add must be designed around that rider. Storage matters because vibration, impacts, mud and uneven terrain work things loose, break them, or lose them along the way – and if something fails a long way from the trailhead, the rider may not be able to get off the bike, push it, or carry it out. Carrying the right item, in a place the rider can reach, is a safety consideration rather than a convenience.

Before you start, watch both videos about Noel Joyce's story and the storage challenge, which explain why this rider needs a custom solution rather than a standard bike accessory. Note the needs and constraints Noel describes, because they define the approach you should take. Then open the supplied dataset **Storage-Challenge.f3d** (see Figure 3) and review the bike as a system before you choose what to store and where it goes.

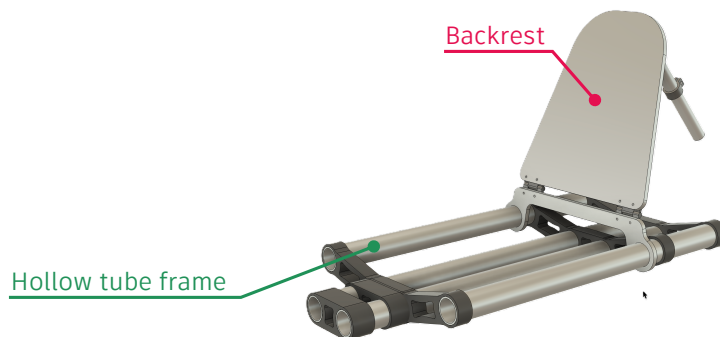


Figure 1. The adaptive mountain bike design file (Storage-Challenge.f3d)

The rider

The rider stays seated and strapped into the bike for the whole ride and cannot dismount, push the bike, or carry it out on foot. Anything stored on the bike therefore must be found, released, used and put back one-handed, from the seat, with the other hand keeping the rider stable – often with cold, muddy or gloved hands, and sometimes stopped on a slope. Reach is limited to the area around the seat; backrest supports, hollow tubes and handlebars.

Design requirements

Your solution must:

- Hold the chosen item securely in a holder or mount you have designed
- Mount realistically onto the bike, using space and fixing points that exist on it
- Let the rider reach, release and re-store the item while seated
- Keep the item retained on rough trails, through vibration, impacts and steep slopes
- Add to the bike without major modifications, and without interfering with its structure, how it works, or the rider's safety

What counts as a major modification? Small changes are fine: adding holes to attach a bracket, or slightly reshaping part of a component. Removing a part, replacing it, or changing what it does is a major modification, so it is not allowed. There is no single correct answer – many different designs can meet these requirements. Check your idea against each point above before you start modelling.

To complete this challenge

- **Ideation:** sketch 2–3 storage solutions that meet the requirements; choose one to take forward
- Modify ***Storage-Challenge.f3d*** with your chosen solution, modelled in place on the bike
- Render (and/or animate) your design to demonstrate how the item is accessed and re-stored
- **Recommended:** 3D print a prototype of your design for demonstration