

The Project

Blue Origin's commitment to safety defines every step of its processes, from the first package that arrives at the warehouse to the recovery of materials post-launch.

Our SCOPE team's project was to design equipment that would make it possible for technicians to transport heavy, delicate boxes of avionics safely enough to meet Blue Origin's exacting standards. The solution we developed is an elevator cart that can lift and transport up to two boxes of avionics at a time and serve as a workbench during routine testing. This Safe-Avionics-Lifting Lab Equipment (SALLE) streamlines the workflow and prevents injuries. Starting in May 2023, SALLE will be used in Blue's Orbital Launch System warehouse alongside the myriad of other equipment that contributes to Blue Origin's culture of safety.

Safety

As a team sponsored by Blue Origin, safety was always our first priority. SALLE passed rigorous safety tests, including exposure to extreme load, tilt, and vibration.

Usability

Safety equipment only works if it is used. We aimed to make using SALLE easier than lifting the avionics by hand so that the technicians have every reason to use it.

Simplicity

SALLE had to be simple enough for our team to finish building and testing it within two semesters, and easy enough to maintain that it can be used for up to ten years.

Hidden Cable Routing

The Kevlar cables that control the gantry are routed through the 80-20 via a custom pulley system, eliminating potential pinch points.

Attachment Auto-Locks

Bars slide into place under handles on the cargo and automatically lock in place, securing it to the gantry for safe lifting. When it's time to release the cargo, the technician simply pulls tabs on the lock to slide the bars away.

ESD Surface

An electrostatic discharge (ESD) mat grounded via a drag chain protects cargo from static buildup.

TPU Handles

3D-printed handles make the cart more comfortable to push, especially in the storage freezer.

Elevator Lift

The rigid gantry system lets technicians lift heavy cargo safely and easily.

Worm Gear Winch

The winch is driven by a worm gear, which prevents the elevator from being driven by the weight of the cargo without the need for a loud ratchet system.

Sliding Tabletop

The tabletop slides forwards under the gantry to transfer the battery from the elevator to the body of the cart. It can be locked in both the extended and retracted positions and is big enough to hold two sets of cargo. It also doubles as a workspace for testing.

High-Speed Drill Drive

This off-the-shelf drill is reliable and fast. Its clutch disengages the motor when the torque is too high, preventing the gantry from being raised past its maximum height or lifting something heavier than it's designed for. The drill is tethered to the cart and rests in an easy-access holster on the side of the cart when not in use.

Aluminum Frame

The sturdy extruded-aluminum frame can support over 1,500 lbs, more than a 5x factor of safety for the load on the cart.

Spare Battery Charger

A charger for the drill battery is integrated into the bottom shelf, so a spare drill battery can be charged anytime the cart is parked near an electrical outlet. This way, the spare battery always stays with the cart.

TPU Bumpers

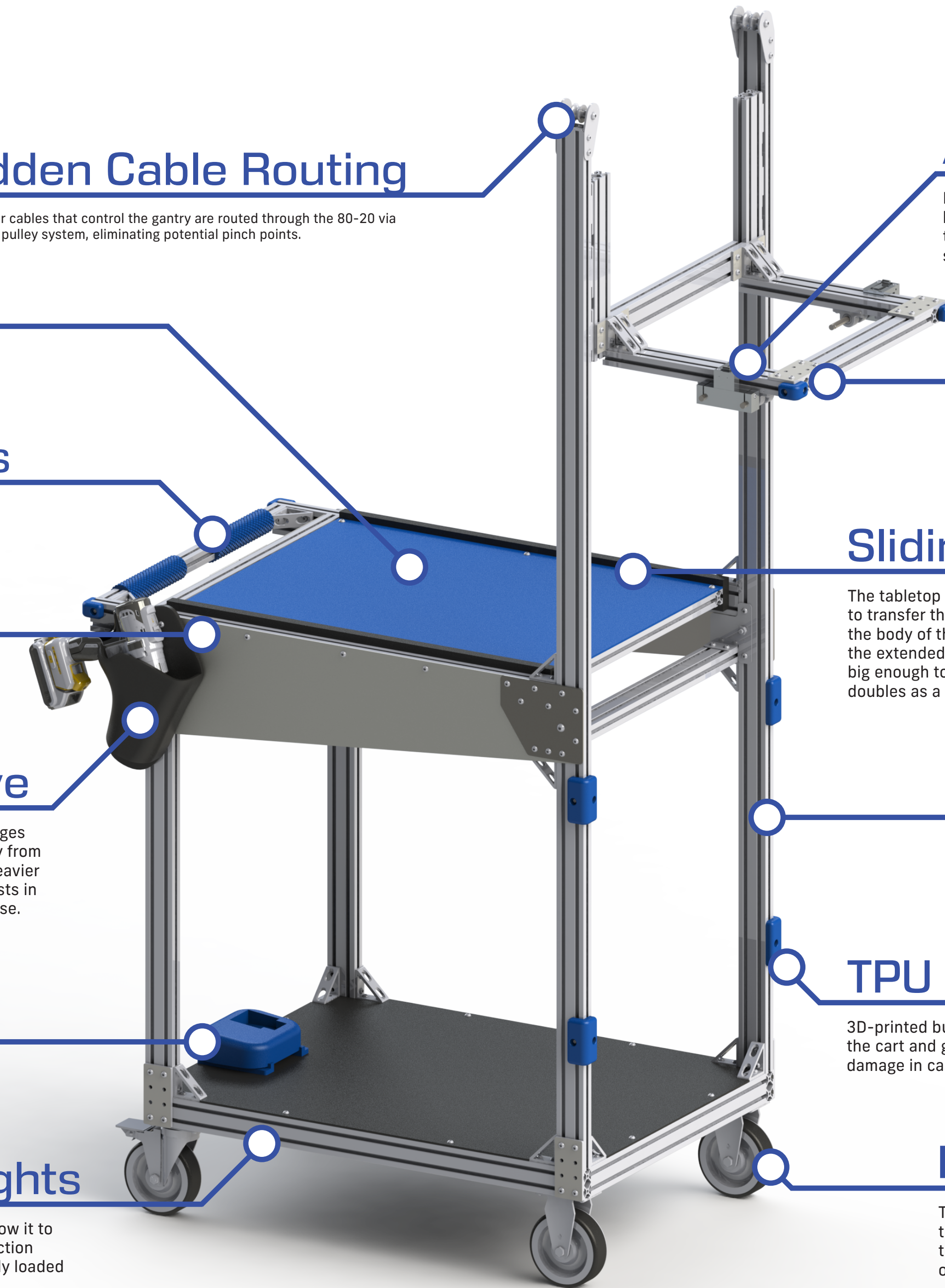
3D-printed bumpers on the corners of the cart and gantry arms reduce damage in case of collision.

Counterweights

Steel bars hidden under the cart allow it to accommodate 10° of tilt in any direction without tipping over, even when fully loaded with cargo.

Heavy-Duty Casters

The casters are designed to withstand extreme loads and temperatures. Technicians can lock the swivel casters in the rear so the cart won't roll away when it's being stored or used as a workbench.



Unpack Avionics



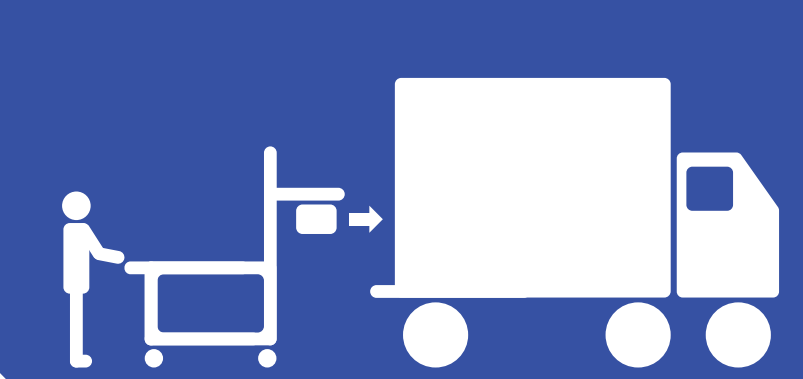
Transport to Testing



Transport to Storage



Periodic Inspection



Transport to Rocket