RISKING YOUR NECK RIDING A SINGLE-FRONT-WHEEL E-BIKE TO YOUR STAND

62 year-old Joe Green (real name withheld for privacy), with his quiver on his back, rode his major brand e-bike up a steep hill to his stand relishing the ease of the climb. Suddenly the front end lifted and before he knew what was happening, he and his bike flipped over backwards. He landed with a thud, feeling an excruciating pain in his neck. All his limbs tingled. Though he knew flipping backwards was a probable occurrence with his old ATV, he couldn't believe it could happen to him on an e-bike. Stunned and winded, he lay there. He knew he had to summon help. Gritting his teeth against the pain, he reached for his cellphone. With trembling fingers, he dialed 911 and after what seemed was an eternity, Search and Rescue evacuated Joe to a nearby hospital.

One of the rescuers later casually remarked that Joe was lucky – the broadheads in his quiver missed his head by less than an inch.

After surgery and six months of recovery, Joe could walk again, but he vowed never to hunt on an e-bike again.

Why did Joe and his bike flip backwards?

Joe was not trying to do a wheelie. There was no rut, stone or log that caused him to fall backwards.

No. Joe was climbing a hill that was too steep to climb without getting out of the saddle.

When climbing a steep hill on a bicycle, maintaining proper body position is crucial to prevent flipping over backward. If a rider remains seated and fails to shift their weight forward sufficiently, the center of gravity can shift too far back, causing the front wheel to lift off the ground. As the hill's steepness increases, so does the force pushing the rider backward. Without the counterbalance provided by standing on the pedals and leaning forward, the bike becomes unstable, and the rider flips over backward. This phenomenon, known as "endo" or an "endo crash," resulted in Joe breaking his neck. Therefore, it's essential for riders to anticipate steep inclines and stand on the pedals to maintain stability and control while climbing.

Hunter on E-Bike mid-"endo"

Unfortunately for many hunters on E-Bikes, circumstances make standing on pedals inconvenient, difficult, and even ineffective. There are two factors –

1. Hunting gear is bulky. Gearing up with a bow on a backpack and bulky camo cover interferes with a hunter's ability to comfortably maintain balance standing on pedals on flat ground and even more so when there's limited space between the saddle and handlebars in a

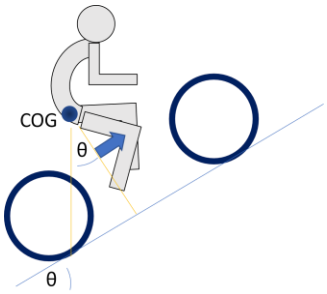
climb. Standing on the pedals is a recipe for getting a jacket caught on the handlebar-mounted controls.

2. Backpack and cargo rack load defeat the purpose of standing in a climb. Backpacks and cargo racks carry stands, bows, tarps, guns, and all manner of supplies. Individually these items don't weigh much. Collectively they can add 30 or more pounds to the carried load, but worse, the load is all on the hunter's back or on the cargo rack over the rear wheel. Being on the back instead of the front means the center of gravity moves to the rear making an "endo" even more likely.

Standing on pedals is also uncomfortable. Most e-bike hunters switched from ATVs – ATVs with wide saddles. Being much heavier than e-bikes with a much lower center of gravity, ATVs let hunters ride seated up grades up to 40% per manufacturer labeling. Staying saddled is easier on the knees and with a good saddle, comfortable for longer rides.

So how steep can a hunter ride saddled on his e-bike?

Depending on the size of the rider, a typical hunting e-bike will endo with a saddled rider at a grade between 20% -25%. The actual "tipping point" depends on the geometry/type of e-bike and the location of the center of gravity for the hunter on the e-bike. The typical E-Bike has an 85%-15% weight distribution where 85% of the rider's weight is focused on the rear wheel of the bike. This weight distribution guarantees great rear wheel traction and power delivery. The diagram below shows the maximum climbing angle as a function of the center of gravity (usually around the hips of the rider of a very light bicycle) relative to the slope. The tipping angle occurs when the center of gravity of the rider and bicycle (usually) is just behind the ground contact patch of the rear wheel. In general, the center of gravity moves higher for taller and heavier riders. When the center of gravity moves higher the tipping angle decreases meaning that the rider will "endo" on a lesser grade climb.



Maximum Climbing Angle as Function of Center Of Gravity

Adding a backpack and gear on the rear rack of an e-bike makes an "endo" even more likely. The additional weights move the center of gravity backwards causing the tipping point angle to be even more shallow.

How do Rungu Dualie Double-Wheel E-bikes make a difference?

Rungu Dualie® lets hunters ride saddled on steeper grades. With a wheelbase of 54.7 inches, a longer rear triangle and two wheels in front, Rungu Dualie riders start with a 75%-25% weight distribution. Translated into practical terms, riders can avoid flipping backwards riding saddled on

grades exceeding 34%-50+% (though at grades above 45%, even Rungu Dualie's powerful 52V mid-drive motor may not have enough rear-wheel torque to climb the hill).

The table below shows the relationship between inseam and rider-bike weight to tipping point for Rungu Dualie riders (not including rear rack cargo or a backpack loads). The table makes obvious that even a heavy and tall rider will not "endo" at grades of 20%-25%.

% grade Tipping Point	Total combined weight on bike (no trailer, bike weight 84 lbs.)										
Inseam (proxy for height on saddle)	200	225	250	275	300	325	350	375	400	425	450
Tallest - 36" in seam	57%	52%	48%	45%	42%	40%	39%	37%	36%	35%	34%
35 in inseam	58%	53%	49%	46%	43%	41%	40%	38%	37%	36%	35%
34 in inseam	59%	54%	50%	47%	44%	42%	41%	39%	38%	37%	36%
33 in inseam	60%	55%	51%	48%	45%	43%	42%	40%	39%	38%	37%
32 in inseam	61%	56%	52%	49%	46%	44%	43%	41%	40%	39%	38%
31 in inseam	62%	57%	53%	50%	47%	45%	44%	42%	41%	40%	39%
30 in inseam	63%	58%	54%	51%	48%	46%	45%	43%	42%	41%	40%
29 in inseam	64%	59%	55%	52%	50%	48%	46%	44%	43%	42%	41%
28 in inseam	65%	60%	56%	53%	51%	49%	47%	45%	44%	43%	42%
27 in inseam	66%	61%	57%	54%	52%	50%	48%	47%	45%	44%	43%
26 in inseam	68%	63%	59%	56%	53%	51%	49%	48%	47%	45%	44%
25 in inseam	69%	64%	60%	57%	54%	52%	50%	49%	48%	47%	46%
Shortest 24" inseam	70%	65%	61%	58%	56%	54%	52%	50%	49%	48%	47%

Riding Rungu Dualie, Joe would have made it to his stand and we would have had to publish a similar story from another Joe. Don't be that Joe. If you're serious about getting out to your stand and back with the stealth and lack-of-scent-trail while avoiding an "Endo", seriously consider Rungu Dualie Double Wheel E-Bikes.

To learn more about how Rungu Dualie out performs single-front e-bikes in hills, in mud, on sand and in snow, visit https://riderungu.com/e-bike-compare-2024/. If you have more questions, email sales@riderungu.com or call (949) 877-9755. We speak English.

