LIRO elevators: Pioneering the future of vertical and horizontal transportation

A new chapter in elevator technology: The story of LIRO

Join Mihaela on a virtual behind-the-scenes tour of a visionary new skyscraper, where a groundbreaking motion system called LIRO could reshape the future of vertical (and horizontal) travel.

Arriving at the Sky District

The sun was just peeking over the skyline as I stepped out of the taxi onto a broad plaza. Rising above me was the newly completed Aurora Tower, its mirrored facade reflecting soft morning light. I had come here to meet Mihaela, a design engineer working on next-generation elevator systems, to learn about an innovation called LIRO. She'd promised a glimpse into a future where elevators can move not just up and down, but side to side without cables. Intrigued, I followed her inside.

A quick look at today's elevator landscape

As we passed through Aurora Tower's lobby, lush with greenery and glass partitions, Mihaela painted a picture of the broader elevator industry. Globally, the market for elevators and escalators has soared to nearly €94 billion in 2024, with forecasts projecting it could reach €167.62 billion by 2032, at a robust annual growth rate of 7.5%. Demand for taller and more sustainable buildings is driving innovations like:

- **Traction elevators** with regenerative drives, returning energy back into the building's grid.
- **Machine-room-less (MRL) systems**, saving floor space and lowering overhead.
- **Multi-directional elevators** like Thyssenkrupp's MULTI, which use electromagnetic traction to glide both vertically and horizontally.

"Even so", Mihaela explained, "most elevators today still rely on centuries-old fundamentals, cables, ropes, or hydraulic systems that constrain a building's design". She led me to a corridor marked *Research & Development* in bold letters, promising to show me an alternative approach: LIRO.

LIRO: A magnetic levitation marvel

We entered a cavernous testing bay, and there it was, LIRO (Linear Rotational), a prototype elevator system like nothing I'd ever seen. Instead of a bulky motor-and-cable setup or the linear track used by maglev-based solutions like MULTI, LIRO used a rotatable shaft lined with permanent driving magnets. Attached to the elevator cabin were propulsion magnets. When the shaft rotates, these phased magnets create a sliding magnetic field that levitates and propels the cabin, whether vertically or horizontally, without cables or continuous electromagnetic power.

"Think of it like a rotating maglev", Mihaela said with a smile. "But we rely on permanent magnets rather than constantly energized coils. That means minimal heat generation and no need for a permanent external power source to maintain the magnetic field".

As we watched a test cabin glide effortlessly along the shaft, the possibilities became clear. If MULTI was the industry's first big leap toward multi-directional travel, **LIRO** looked poised to push that idea even further, potentially requiring less energy and offering simpler retrofits because of its rotating shaft design.

How LIRO stands apart

Mihaela walked me through the key benefits:

1. **Permanent magnets, minimal power consumption**
   Traditional cable-based elevators and some maglev prototypes depend on powerful electromagnetic coils running constantly. LIRO uses permanent magnets to generate the fields that lift the cabin. This translates into significant energy savings, especially for tall buildings or extensive horizontal transports.

2. **Reduced heat and wear**
   Many next-generation elevators, including linear motors, struggle with heat buildup along their tracks. LIRO's permanent magnets largely circumvent this issue. With no direct mechanical contact between the shaft and the cabin, wear-and-tear is minimal, slashing maintenance costs.

3. **Enhanced safety**
   Because the system doesn't rely on external power to maintain magnetic fields, it remains operational during electrical outages. No ropes that can snap, no heavy counterweights to fail. Mihaela noted that while modern traction elevators are undeniably safe, LIRO adds yet another layer of reliability, particularly for skyscrapers in earthquake-prone or high-wind regions.

4. **Architectural freedom**
   The rotating shaft supporting LIRO can be extended to virtually any length, making it suitable for ultra-tall buildings, beyond even what conventional ropes or existing linear motor designs can handle. And because the cabin can move horizontally, architects can imagine structures where multiple towers are interconnected by elevator shafts, an entirely new approach to urban design.

5. **Space optimization**
   "Traditional elevator shafts can eat up a huge portion of a building's floor plan", Mihaela explained. "LIRO's more compact design frees valuable real estate, imagine converting spare shaft space into offices, apartments, or retail areas". Over the lifespan of a skyscraper, the financial gain could be enormous.

A parallel to MULTI

With a nod, Mihaela gestured to a diagram comparing LIRO with Thyssenkrupp's pioneering MULTI:

- **MULTI** uses linear motor technology, akin to maglev trains, allowing multiple cabs in a single shaft that can move in loops, both up and down and side to side.
- **LIRO** similarly enables multi-directional movement but leans on a rotating shaft of permanent magnets. This choice reduces the constant energy draw needed in traditional maglev setups and potentially simplifies the mechanical infrastructure.

"Both ideas are game-changers", Mihaela said. "MULTI has proven that multi-directional travel is possible. LIRO might push that further with less dependence on large-scale electromagnets and more modular, rotating-shaft architecture. We see it as a potentially greener solution, especially over a building's 50- to 100-year lifespan".

Crunching the numbers

The global elevator market is massive. Some reports value it at €41.95 billion in 2024 just for elevator installations, while modernization and maintenance push total revenues higher. Energy efficiency and sustainability are hot topics. By saving on power consumption, a building's annual operating costs could drop significantly. Over decades, those savings grow exponentially.

Additionally, with urbanization surging, particularly in Asia-Pacific, the demand for tall buildings keeps rising. High-rise developers are eager for new, safer, and more space-efficient elevator systems. According to Mihaela, that's where LIRO could shine: "In cities where land is precious, every square meter counts, and the reliability and efficiency of these systems can tip the balance for a project's overall profitability".

The road ahead for LIRO

We ended our tour on a steel walkway overlooking the test platform. A half-assembled LIRO cabin sat suspended off to the side, magnets gleaming under fluorescent lights. It struck me that what I was seeing might be a blueprint for the future, one where buildings aren't limited by the vertical constraints of ropes or the energy demands of conventional maglev designs.

Mihaela tapped the railing thoughtfully. "We're still in the prototyping phase", she admitted. "Scaling this up to full production requires partnerships with major industry players, companies like Otis, Schindler, KONE, or even Thyssenkrupp. There's a lot of testing ahead, especially in real-world high-rise environments".

Yet the potential is undeniable. As the elevator industry steadily shifts toward smart, energy-efficient, and architecturally flexible solutions, LIRO could prove a decisive

catalyst. Architects could dream bigger, connecting towers with horizontal elevator rails or optimizing buildings so they’re greener and less expensive to operate.

A vision of tomorrow

Walking out of Aurora Tower, I found myself imagining a future skyline. Buildings linked by sleek LIRO shafts, allowing people to glide freely between floors or even neighboring skyscrapers at the tap of a button. Streets less congested, cities less constrained by building cores and cables.

For now, LIRO remains a bold concept, much like MULTI was when it first appeared. But if the early promise holds, this rotating-shaft wonder could well become the next leap in how we move through the vertical realms of modern life, rewriting the story of urban architecture and giving the term "taking the elevator" a thrilling new dimension.