WIND™

Cleared for TakeOff: Wind River Helps Taxibot Pioneer Robotic Airplane-Towing Vehicle

Semi-autonomous Truck Eliminates Massive Fuel Waste, Pollution from Jets Idling on Runways

TaxiBot

Industry

Aerospace

Solutions

- Wind River VxWorks Cert Platform
- Wind River Professional Services

Benefits

- By using VxWorks to build the truck's intelligent soft-ware system and working with the Wind River team of engineers, the company was able to successfully address key certification, design, and project requirements.

- The TaxiBot project team was able to obtain the necessary industry safety certifications quickly, helping dramatically shorten the product devel-opment timeline and gain a five-year lead in the market.

- TaxiBot is now reducing fuel consumption and cutting CO_2 emissions by as much as 85% percent.

IAI

Getting a good idea to take flight is no easy task. But for the developers of TaxiBot®, a revolutionary vehicle for towing jet planes on runways, having the right kind of help from Wind River® made all the difference.

TaxiBot's makers wanted to solve a problem that had plagued the airline industry for decades. Idling aircraft cost the industry hundreds of millions of dollars a year while generating massive pollution from jet engine exhaust. But formidable technical and regulatory challenges had thwarted previous efforts to keep jet engines turned off before takeoff.

Israel Aerospace Industries (IAI), the largest government-owned aerospace and defense company in Israel, partnered with aircraft builder Airbus and ground support equipment manufacturer TLD Group to make TaxiBot a reality. But the path from prototype to runway was not without obstacles.

The Challenge

Pioneering an "Unprecedented Solution" Under Tight Time Pressure

The TaxiBot development team was breaking entirely new ground, with no blueprint to follow. "This was an unprecedented solution," says Project Director Ran Braier. "As pioneers, we had to find solutions to every problem that arose on our own."

Specifically, the development team identified three critical challenges:

- **Safety certification:** TaxiBot had to achieve safety certification under the DO-178B/ED-12B DAL B avionics software safety standards. The certifica-tion standards are extremely rigorous, with the potential to drive up costs and delay delivery.

- **Control:** From a technology perspective, the challenge was to optimize control capabili-ties while achieving operational simplicity. The pilot operates TaxiBot from the cockpit, but its steering adapts automatically

to runway conditions and the presence of other planes or vehicles. A unique electric driving system distributes power to each wheel separately for more precise acceleration and braking.

- **Time-to-market and cost:** The team was under enormous competitive pressure from the airline industry to deliver a high-performance solution quickly, but at a cost that would make large-scale deployment feasible.

> *"For me, that was a dream come true. Today we can say with confidence we are at least five years ahead of our competition.*
>
> —Ran Braier, Project Director

How Wind River Helped

The project called for a highly reliable real-time operating system (RTOS) that delivered fast and accurate response times. The development team also needed a system that would streamline the certification process, reduce licensing costs, and accelerate development. After reviewing several options, the choice was clear: Wind River VxWorks® Cert Platform. It has proven reliable in thousands of safety-critical aviation applications. And it comes with certification evidence that makes it easier and less costly to meet the stringent requirements of the aerospace industry.

"The VxWorks operating system was tailor-made for us," says the project's software manager, Zeev Gabbin. "VxWorks enabled us to ensure safety using a multi-redundancy approach with software at the heart of the system. That was our big breakthrough."

IAI also engaged Wind River Professional Services to adopt and certify their VxWorks board support package for the developers' custom hardware. "Wind River was a one-stop shop," says Gabbin. "From migrating the system to our hardware to the testing and certification, it was very seamless."

Braier concurs. "The people from Wind River were creative and the spirit of cooperation was outstanding."

The Result

Fully Certified, Ready to Roll in Four Years

With support from Wind River, TaxiBot's application software and VxWorks were certified to DO-178B/ED-12B DAL B by the European Aviation Safety Agency (EASA) quickly and efficiently, which cut their costs and enabled them to deliver a reliable product to market on time. Going from prototype to a safety-certified, fully operational vehicle took only about four years—virtually overnight by aviation standards. "For me, that was a dream come true," says Braier. "Today we can say with confidence we are at least five years ahead of our competitors."

Now, TaxiBot is eliminating a problem the airline industry has grappled with for more than 30 years. IAI's robotic taxi is dramatically reducing fuel consumption and cutting CO_2 emissions by as much as 85% for its airlines.

Already TaxiBot is saving British Airways more than $20 million a year at Heathrow Airport alone. From such early examples, IAI estimates carriers can recoup their investment in TaxiBot in 18 months.

Next Steps

The Future for TaxiBot

The long-term vision for TaxiBot is to make the solution completely unmanned as soon as the market is ready and the regulatory framework is in place. Braier also sees opportunities for some of the TaxiBot technology in urban air train systems. "We see great potential in our future," he says, "and we see Wind River as an important and stable partner to help us meet our vision for the coming decade and beyond."