Stargate
within EU Green Deal

Project Fact Sheet

Sustainable taxiing

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement GA101037053

01 BASIC PROJECT INFORMATION

Project name	**Sustainable taxiing with TaxiBot**
Partners involved	**Brussels Airport Company** **TUI Fly** **Aviapartner** **Smart Aiport Systems** **VITO** **To70**
Implementing airport / site	**Brussels Airport**
Period tested	**2024-2025**
Project lead / contact	**Brussels Airport Company**

02 OBJECTIVE

What are we trying to solve or tackle with this project?

Assess whether TaxiBot can reduce aircraft engine use during taxiing and lower ground noise, ultrafine particle emissions, NOx emissions, and CO_2 emissions.

The project evaluated operational feasibility, stakeholder coordination, and environmental impacts during real-world taxi operations at Brussels Airport.

Based on these results, a large-scale deployment scenario was simulated by T70 to assess the technology's full potential and quantify its airport-wide environmental benefits.

Success criteria

- Measure the potential reductions in noise, ultrafine particle (UFP) emissions, and CO_2 emissions.
- Evaluate pilot and operator experience and acceptance.
- Assess operational integration within airport processes and daily operations.
- Determine the viability of TaxiBot deployment at Brussels Airport.
- Assess the impact of an airport-wide rollout to unlock the technology's full environmental and operational benefits.

03 APPROACH (HOW WE TESTED)

Test set-up & method

The project followed a two-stage methodology.
First, a controlled real-life proof of concept tested TaxiBot operations at Brussels Airport. Second, To70 used fast-time simulation to assess the potential for airport-wide TaxiBot deployment.

The physical trial used a narrow-body TaxiBot with TUI Fly B737 aircraft. Test movements were conducted without passengers, on a predefined route between the TUI hangar and an aircraft stand.

The simulation assessed scenarios ranging from cargo-only, home-carrier and certified-aircraft use to full adoption, alternative uncoupling locations and limited TaxiBot fleets. Modelling focused on taxi-out operations, using actual traffic from four high-traffic summer days.

Data & measurement

The physical test combined environmental measurements and stakeholder feedback. Noise was measured at two locations along the test route, while ultrafine particles (UFP) were measured downwind, supported by TaxiBot GPS, ground-radar data and visual observations. Double-engine, single-engine, TaxiBot-assisted and TaxiBot-only movements were compared. Key environmental KPIs included noise (dB), UFP concentration, particle size and peak duration.

The simulation combined BRU operational data, experience from Schiphol and BRU traffic data. Key KPIs included CO_2 emissions, ground delays and airport capacity/performance.

Risks & mitigations

Key risks include limited aircraft certification and airline demand, manual (un)coupling, additional vehicle movements, limited space for coupling , complex airfield flows, and high CAPEX/OPEX.
Successful deployment also depends on clear responsibilities between stakeholders, adequate training, and sufficient TaxiBot availability.
At Brussels Airport, relatively short taxi times may further limit the business case.
Mitigations include standardized procedures and training, clear stakeholder agreements, careful planning of coupling locations and return routes, and demand-based fleet sizing. Regulatory or policy measures could also change the business case by creating a broader driver for sustainable taxiing.

Limitations

TaxiBot is currently certified for B737 and A320-family aircraft and requires trained drivers and suitable airport infrastructure.
At Brussels Airport, relatively short taxi times limit the potential fuel and emission savings compared with airports with longer taxi routes.
While TaxiBot offers additional benefits, such as reduced local noise and faster clearance of congested apron areas, these are currently not sufficient to offset the operational and economic constraints and create a business case for deployment at BRU.

04 RESULTS & IMPACT

Key results

The TaxiBot trial demonstrated significant environmental benefits. Noise levels decreased from 85 to 75 dB. UFP concentrations were reduced by 83% while the average particle size increased from 14 to 46 nm compared with dual-engine taxiing.
UFP peak duration also fell from 45 seconds to 15-25 seconds.

Based on the trial results, To70 modelled an airport-wide deployment scenario, indicating a potential 25% reduction in taxiing-related CO_2 emissions while maintaining airport performance, provided sufficient TaxiBots are available.

Feedback from pilots, dispatchers and operational stakeholders was positive, confirming that TaxiBot can be integrated safely and effectively into daily airport operations.

Nevertheless, the current business case for Brussels Airport remains challenging. Relatively short taxi distances, infrastructure constraints, the limited number of certified aircraft types, and the investment required for large-scale deployment currently limit the economic attractiveness of the solution, despite its clear environmental benefits.





05 RATINGS (QUICK ASSESSMENT)

Deployment Approach

How standardised is the solution: can it be deployed off the shelf, or does it require extensive customization?

Off The Shelf — Custom-Built

Investment Magnitude

From low-cost deployment to major investment.

Low Investment (less than €10k) — High Investment (more than €15mio)

OPEX ☐ ■ CAPEX

Sector Readiness

From non-existing or emerging standards, regulations, and certification pathways to fully established industry practices.

Emerging Framework — Established Framework

Innovation Maturity

How does the solution score in terms of maturity, from low TRL experimental/pilot-stage to high TRL market-ready.

Experimental — Market-Ready

Operational Impact

Does the innovation deliver targeted improvements or rather drastically transform processes and/or operations.

Incremental Improvement — Transformational Change

Notes

TaxiBot is promising where taxi distances are long, aircraft compatibility is broad and infrastructure supports efficient coupling/return flows.

At BRU, benefits are real but scale-up depends on automation, wider certification, layout changes and stronger airline or regulatory drivers.

06 NEXT STEPS / RECOMMENDATION

Recommendation:

Monitor and reassess later: do not scale at BRU at this stage, but revisit if technology, certification, layout and/or regulation changes.

Next steps:

1) Track wider TaxiBot certification, especially cargo/widebody aircraft.

2) Reassess if autonomous coupling or new taxi infrastructure emerges.

3) Compare with alternative low-emission taxiing measures.

4) Keep evidence for future air-quality/noise policy discussions.