Aircraft of the future could capture and re-use some of their own

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Tomorrow's aircraft could contribute to their power needs by harnessing energy from the wheel rotation of their landing gear to generate electricity.

They could use this to power their taxiing to and from airport buildings, reducing the need to use their jet engines. This would save on aviation fuel, cut emissions and reduce noise pollution at airports.

The feasibility of this has been confirmed by a team of engineers from the University of Lincoln with funding from the Engineering and Physical Sciences Research Council (EPSRC). This forms part of the Research Councils UK Energy Programme.

The energy produced by a plane's braking system during landing – currently wasted as heat produced by friction in the aircraft's disc brakes - would be captured and converted into electricity by motor-generators built into the landing gear. The electricity would then be stored and supplied to the in-hub motors in the wheels of the plane when it needed to taxi.

'Engine-less taxiing' could therefore become a reality. ACARE (the Advisory Council for Aeronautics Research in Europe) has made engine-less taxiing one of the key objectives beyond 2020 for the European aviation industry.

"Taxiing is a highly fuel-inefficient part of any trip by plane with

emissions and noise pollution caused by jet engines being a huge issue for airports all over the world," says Professor Paul Stewart, who led the research.

"If the next generation of aircraft that emerges over the next 15 to 20 years could incorporate this kind of technology, it would deliver enormous benefits, especially for people living near airports. Currently, commercial aircraft spend a lot of time on the ground with their noisy jet engines running. In the future this technology could significantly reduce the need to do that."

The University of Lincoln's research formed part of a project that aimed to assess the basic feasibility of as many ways of capturing energy from a landing aircraft as possible.

"When an Airbus 320 lands, for example, a combination of its weight and speed gives it around three megawatts peak available power," Professor Stewart explains. "We explored a wide variety of ways of harnessing that energy, such as generating electricity from the interaction between copper coils embedded in the runway and magnets attached to the underside of the aircraft, and then feeding the power produced into the local electricity grid."

Unfortunately, most of the ideas weren't technically feasible or simply wouldn't be cost-effective. But the study showed that capturing energy direct from a plane's landing gear and recycling it for the aircraft's own use really could work, particularly if integrated with new technologies emerging from current research related to the more-electric or all-electric aircraft.

A number of technical challenges would need to be overcome. For example, weight would be a key issue, so a way of minimising the amount of conductors and electronic power converters used in an on-

board energy recovery system would need to be identified.

Provided by Engineering and Physical Sciences Research Council