Miniature turbine generator

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Drone-maker Fusionflight has announced an 8-kW microturbine generator that weighs less than one-tenth of what an equivalent petrol generator would, and it"s the size of a toolbox instead of needing its own wheels - if you can handle the epic noise levels.

This company is best known for its JetQuad UAVs - ultra-fast VTOL drones using thrust-vectored jet turbine propulsion to act like quadcopters on steroids. Their performance levels are absolutely epic compared against electric quadcopters, with theoretical top speeds over 400 mph (644 km/h), much like Mayman Aerospace"s turbine-powered Speeder flying motorcycle design.

Fusionflight says it"s powerful enough to run an off-grid home with, light enough to mount as a range extender to small electric aircraft and drones, and it offers a way to charge up an electric car where no plug-in options are available. Mind you, it won"t charge the battery back up as fast as your EV drains it on the highway - by our math, the Tesla Model 3 uses around about a constant 15.6 kW at 90 km/h (56 mph), rising to around 21.6 kW at 120 km/h (75 mph).

Fusionflight doesn"t give any figures for noise, nor indeed does JetCat, a leading supplier of these kinds of microturbines. But I"ve stood behind David Mayman as he lifted off wearing a jetpack powered by similar turbines, and the noise split the sky right across Sydney Harbour. One noise evaluation study on an older JetCat P80 turbine measured 116.5 decibels - louder than a chainsaw, a jackhammer, or a typical rock concert.

To be fair, turbine noise is typically high-pitched, it can be quite directional, and it can drop off quicker with distance than lower-frequency vibrations like your typical thrumming petrol generator. And Fusionfight has surely put some thought into noise reduction on this thing, so we wouldn"t imagine it"d be as loud as the P80 in that study.

But it"s still a 130,000 rpm turbine, and if the video below is a good indication, this is not a machine to switch on when the baby"s sleeping - even if the noise is kinda awesome. Skip to 3:30 to hear it being switched on and throttled up to 50 percent. No pricing is available as yet, but these turbines are not cheap, so you can probably expect to pay a fair old premium for the extreme reduction in size and weight that the ARC delivers.

Advances in electronics allows unattended operation and electronic power switching technology eliminates the need for the generator to be synchronised with the power grid, allowing it to be integrated with the turbine shaft and to double as the starter motor.Gas turbines accept most commercial fuels, such as petrol, natural gas, propane, diesel fuel, and kerosene as well as renewable fuels such as E85, biodiesel and biogas.Starting on kerosene or diesel can require a more volatile product such as propane gas.Microturbines can use micro-combustion.

Full-size gas turbines often use ball bearings.The 1,000 ?C (1,270 K; 1,830 ?F) temperatures and high speeds of microturbines make oil lubrication and ball bearings impractical; they require air bearings or possibly magnetic bearings.[4]They may be designed with foil bearings and air-cooling operating without lubricating oil, coolants or other hazardous materials.[5]

To maximize part-load efficiency, multiple turbines can be started or stopped as needed in an integrated system.[3]Reciprocating engines can react quickly to power requirement changes while microturbines lose more efficiency at low power levels.They can have a higher power-to-weight ratio than piston engines, low emissions and few, or just one, moving part.Reciprocating engines can be more efficient, be cheaper overall and typically use simple journal bearings lubricated by motor oil.

Microturbines can be used for cogeneration and distributed generation as turbo alternators or turbogenerators, or to power hybrid electric vehicles. The majority of the waste heat is contained in the relatively high temperature exhaust making it simpler to capture, while reciprocating engines waste heat is split between its exhaust and cooling system.[6]Exhaust heat can be used for water heating, space heating, drying processes or absorption chillers, which create cold for air conditioning from heat energy instead of electric energy.

Forecast international predicts a 51.4% market share for Capstone Turbine by unit production from 2008 to 2032, followed by Bladon Jets with 19.4%, MTT with 13.6%, FlexEnergy with 10.9% and Ansaldo Energia with 4.5%.[13]

A similar microturbine built by the Belgian Katholieke Universiteit Leuven has a rotor diameter of 20 mm and is expected to produce about 1,000 W (1.3 hp).[4]