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From The Guardian | Original Article

Technology is designed to increase flying time 'from days to months', along with power available for weapons systems

A conventionally powered MQ-9 Reaper drone, which has a flight time of 14 hours when loaded, could fly far longer with nuclear energy. Photograph: Ethan Miller/Getty

American scientists have drawn up plans for a new generation of nuclear-powered drones capable of flying over remote regions of the world for months on end without refuelling.

The blueprints for the new drones, which have been developed by Sandia National Laboratories – the US government's principal nuclear research and development agency –

and defence contractor Northrop Grumman, were designed to increase flying time "from days to months" while making more power available for operating equipment, according to a project summary published by Sandia.

"It's pretty terrifying prospect," said Chris Coles of Drone Wars UK, which campaigns against the increasing use of drones for both military and civilian purposes. "Drones are much less safe than other aircraft and tend to crash a lot. There is a major push by this industry to increase the use of drones and both the public and government are struggling to keep up with the implications."

The highly sensitive research into what is termed "ultra-persistence technologies" set out to solve three problems associated with drones: insufficient "hang time" over a potential target; lack of power for running sophisticated surveillance and weapons systems; and lack of communications capacity.

The Sandia-Northrop Grumman team looked at numerous different power systems for large- and medium-sized drones before settling on a nuclear solution. Northrop Grumman is known to have patented a drone equipped with a helium-cooled nuclear reactor as long ago as 1986, and has previously worked on nuclear projects with the US air force research laboratory. Designs for nuclear-powered aircraft are known to go back as far as the 1950s.

The research team found that the nuclear drones were able to provide far more surveillance time and intelligence information per mission compared to other technologies, and also to reduce the considerable costs of support systems – eliminating the need, for example, for forward bases and fuel supplies in remote and possibly hostile areas.

A halt has been called to the work for now, due to worries that public opinion will not accept the idea of such a potentially hazardous technology, with the inherent dangers of either a crash – in effect turning the drone into a so-called dirty bomb – or of its nuclear propulsion system falling into the hands of terrorists or unfriendly powers.

Sandia confirmed that the project had been completed: "Sandia is often asked to look at a wide range of solutions to the toughest technical challenges. The research on this topic was highly theoretical and very conceptual. The work only resulted in a preliminary feasibility study and no

hardware was ever built or tested. The project has ended."

According to a summary of the research published by the Federation of American Scientists, an independent thinktank, computer-based projections were used to test the concepts. "Based on requirements and direction provided by Northrop Grumman, Sandia performed focused studies to translate stated needs into conceptual designs and processes that could be transferred easily from Sandia to industry design and production personnel," the document says.

So sensitive is the issue that the summary does not spell out the fact that it is referring to a nuclear-powered drone, referring instead to "propulsion and power technologies that went well beyond existing hydrocarbon technologies". However, the project's lead investigator at Sandia, Dr Steven Dron, is well known as a specialist in nuclear propulsion, having co-chaired a session at the 2008 Symposium on Space Nuclear Power and Propulsion, held at the University of New Mexico in 2008.

The research summary also stated that the results "were to be used in the next generation of unmanned air vehicles used for military and intelligence applications", where they "would have provided system performance unparalleled by other existing technologies".

It added that "none of the results will be used in the near-term or mid-term future", due to political constraints.

The potential impact of nuclear-powered drones can be gauged by comparing them with existing aircraft such as the MQ-9 Reaper, which is used extensively in Afghanistan and Pakistan in operations against insurgents. The Reaper presently carries nearly two tonnes of fuel in addition a similar weight of munitions and other equipment and can stay airborne for around 42 hours, or just 14 hours when fully loaded with munitions.

Using nuclear power would enable the Reaper not only to remain airborne for far longer, but to carry more missiles or surveillance equipment, and to dispense with the need for ground crews based in remote and dangerous areas.

Coles believes the increasing sophistication of drones poses many threats: "As they become low-cost, low-risk alternatives to conventional warfare, the threshold for their use will inevitably drop. The consequences are not being thought through."