

Boeing patent puts focus on laser-powered propulsion system (Update)

12 July 2015, by Nancy Owano

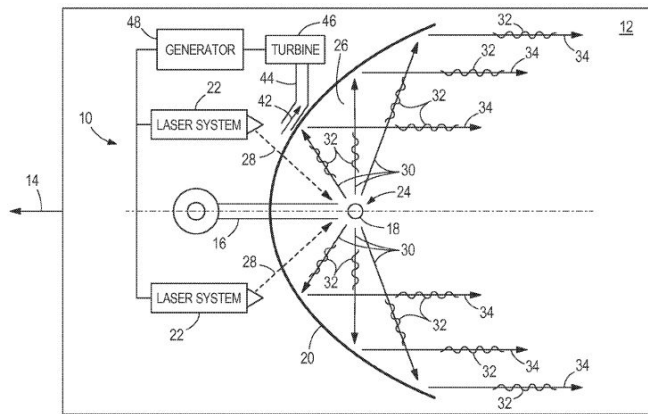


FIG. 1

Credit: United States Patent and Trademark Office

Boeing has patented a laser powered propulsion system for airplanes. A number of sites reported on the patent, with eye-rubbing headlines that told the story. The *BusinessInsider* headline read, "Boeing just patented a jet engine powered by lasers and nuclear explosions." Benjamin Zhang said the US Patent and Trademark Office approved Boeing's application for a laser and nuclear-driven airplane engine.

Zhang noted that presently the Boeing Dreamliner is powered by multiple turbofan engines with their fans and turbines in place to compress air and ignite fuel to provide thrust. The engine presented in [Boeing's patent application](#) takes another route. Zhang said the laser engine may also be used to power rockets, missiles, and spacecraft.

The new engine would work by firing high-power lasers at radioactive material, said *BusinessInsider*. "The lasers vaporize the radioactive [material](#) and cause a fusion reaction—in effect a small thermonuclear explosion," said the article. "Hydrogen or helium are the exhaust

byproducts, which exit the back of the engine under high pressure. Thrust is produced."

In this approach the inside wall of the engine's thruster chamber coated in uranium 238 reacts with the neutrons from the nuclear reaction and generates immense heat. "The engine harnesses the heat by running coolant along the other side of the uranium-coated combustion chamber," said Zhang. "This heat-energized coolant is sent through a turbine and generator that produces electricity to power the engine's lasers."

Three inventors named in the [patent application](#) are Robert Budica, James Herzberg and Frank Chandler of California. The applicant is listed as The Boeing Company in Chicago. The patent was filed in 2012.

PatentYogi founder Deepak Gupta also attempted to shed light on this propulsion system; he explained how a stream of pellets containing nuclear material such as deuterium or tritium is fed into a "Hot-Spot" within a thruster of the [aircraft](#):

Multiple high powered laser beams are focused on to the hot spot; the pellet is vaporized and the high temperature causes a [nuclear fusion reaction](#). In effect, he said, it causes a tiny [nuclear explosion](#) that scatters atoms and neutrons in all directions. "This flow of material is concentrated to exit out of the thruster, propelling the aircraft forward with great force."

He went on to say that "This is where Boeing has done something extremely clever. The inner walls of the thruster are coated with a fissile material like Uranium-238 that undergoes a nuclear fission upon being struck by the high energy neutrons. This releases enormous energy in the form of heat. A coolant is circulated along the inner walls to pick up this heat and power a turbine which in turn generates huge amounts of [electric power](#). And guess what this electric power is used for? To

power the same lasers that created the electric power! In effect, this space-craft is self-powered with virtually no external energy needed."

Evan Ackerman in *IEEE Spectrum* presented a how-it-works explanation with clear brevity in a word picture: "you've got a cavity that's a sort of hemisphere shape, kind of like the business end of a rocket engine. You toss a pellet of fuel into that cavity, and then lasers blast the fuel pellet, causing it to release a bunch of energy (by exploding, fissioning, fusing, or whatever). That energy pushes against the walls of the cavity, and the cavity moves forward. At the same time, the explosion heats the walls of the cavity, and this [heat](#) is harvested to drive the lasers."

Sebastian Anthony on Saturday commented in *Ars Technica*: "It sounds completely crazy—and it is completely unrealistic given our current mastery of fusion, or lack thereof—but, in the future perhaps, this could be a rather ingenious solution."

Anthony also remarked that "it's nice to see that Boeing is at least looking into novel propulsion methods. Turbofan and rocket engines have done a good job of getting us around the Earth and into space, but if we want hypersonic on-Earth travel, or if we want to send humans to far-flung reaches of the Solar System, we'll need new and [advanced](#) propulsion technologies."

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APA citation: Boeing patent puts focus on laser-powered propulsion system (Update) (2015, July 12) retrieved 23 October 2021 from <https://techxplore.com/news/2015-07-boeing-patent-focus-laser-powered-propulsion.html>

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