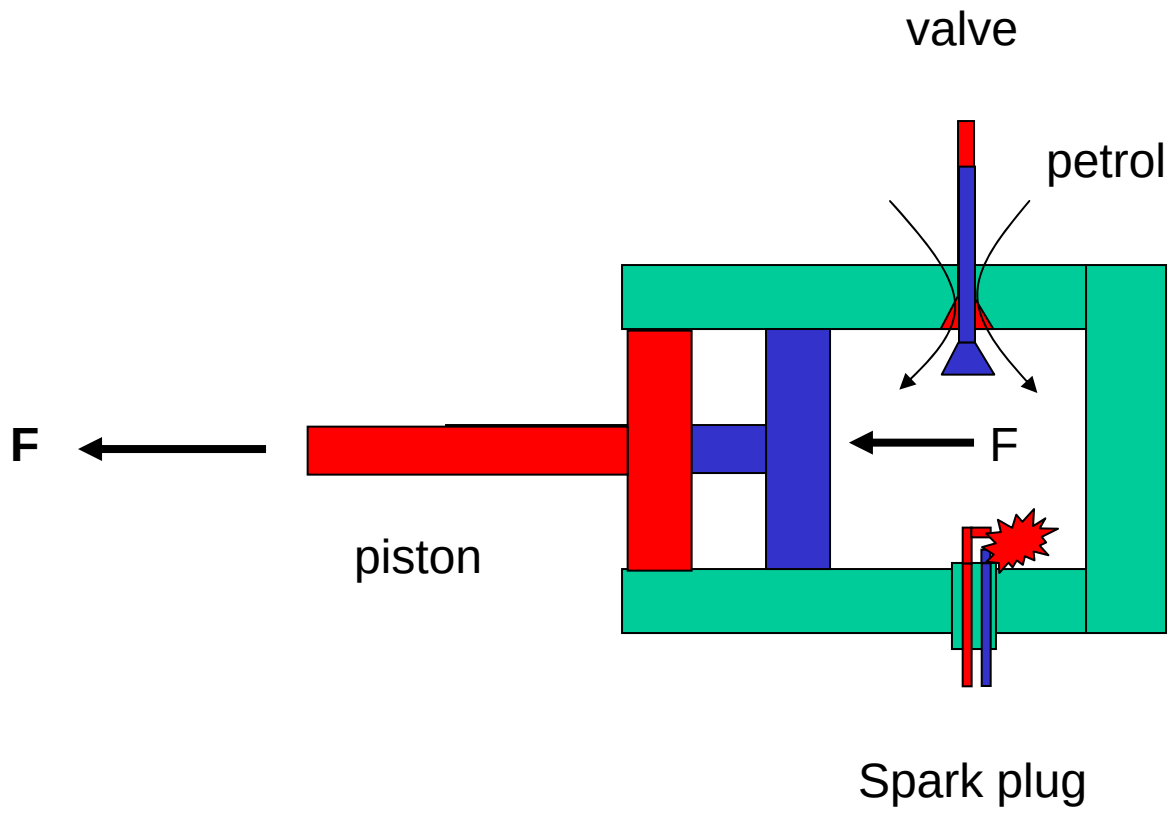
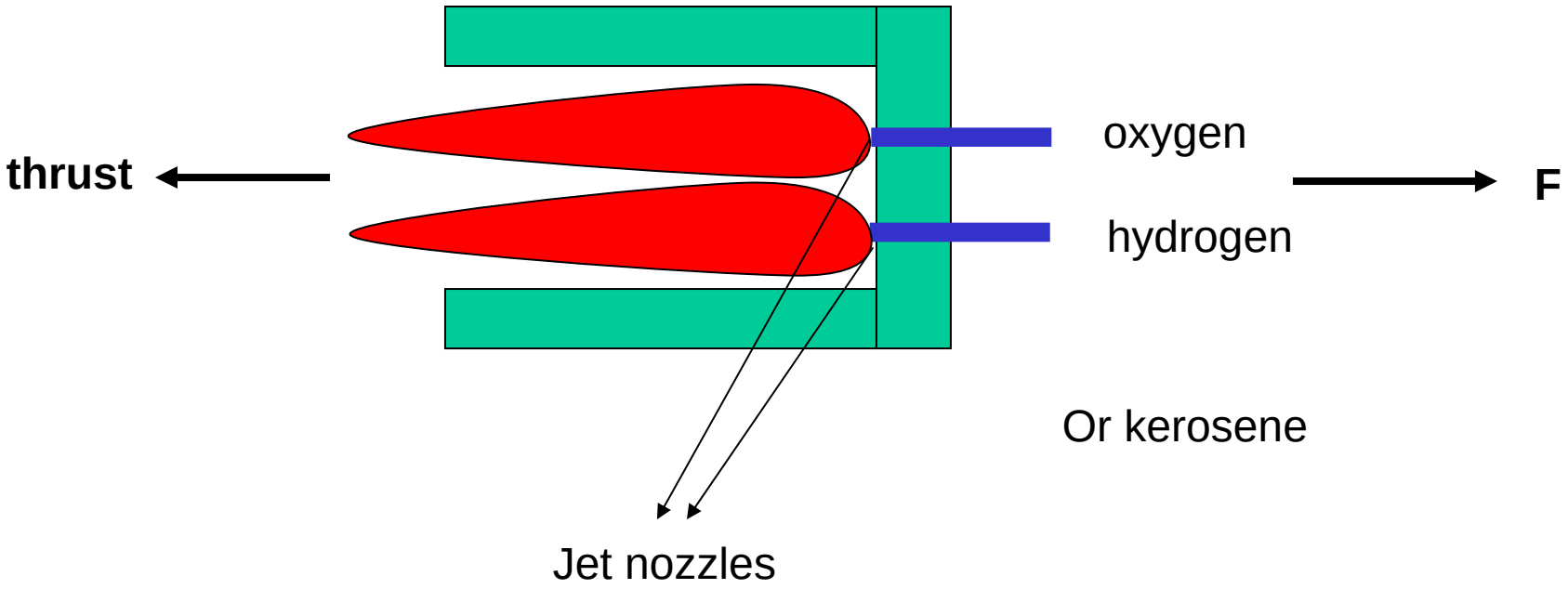
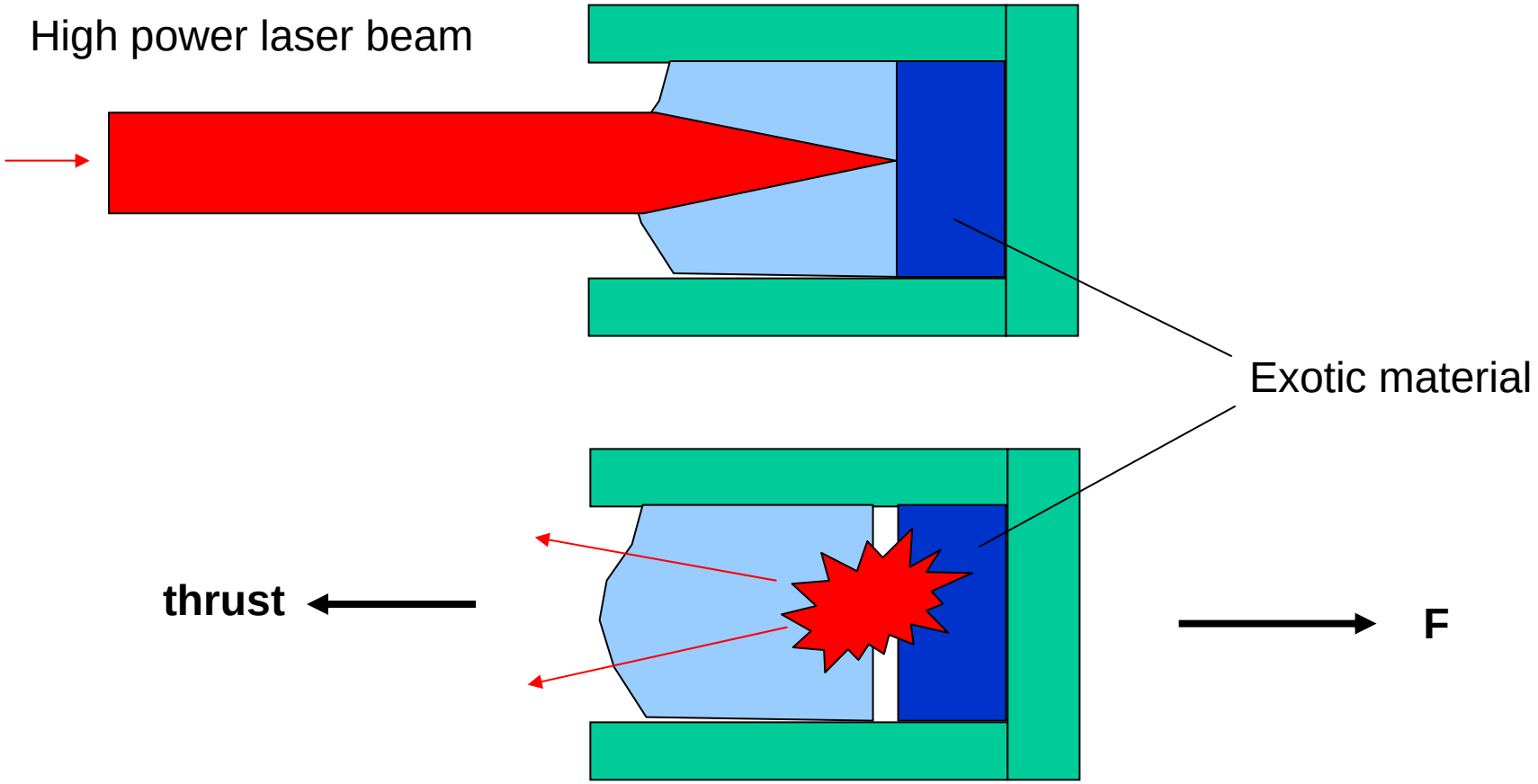
Car engine



Rocket engine



Laser engine



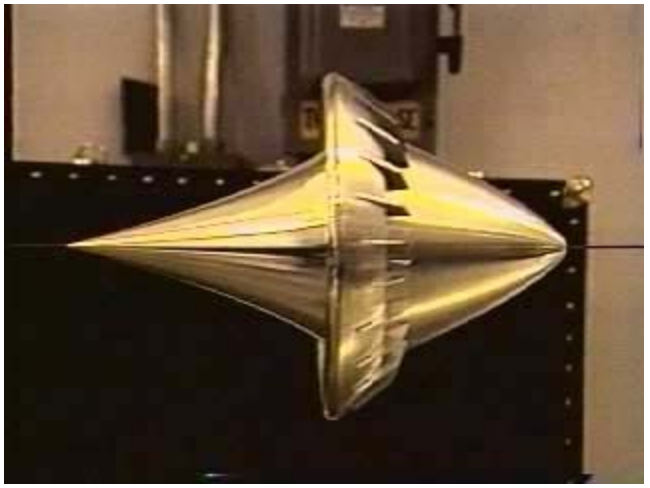
Laser rocket

Related laser rocket technology

USA – NASA & US Air Force

Acorn shape object

Maximum 40 m height



50 gm weight, 10-20 cm length

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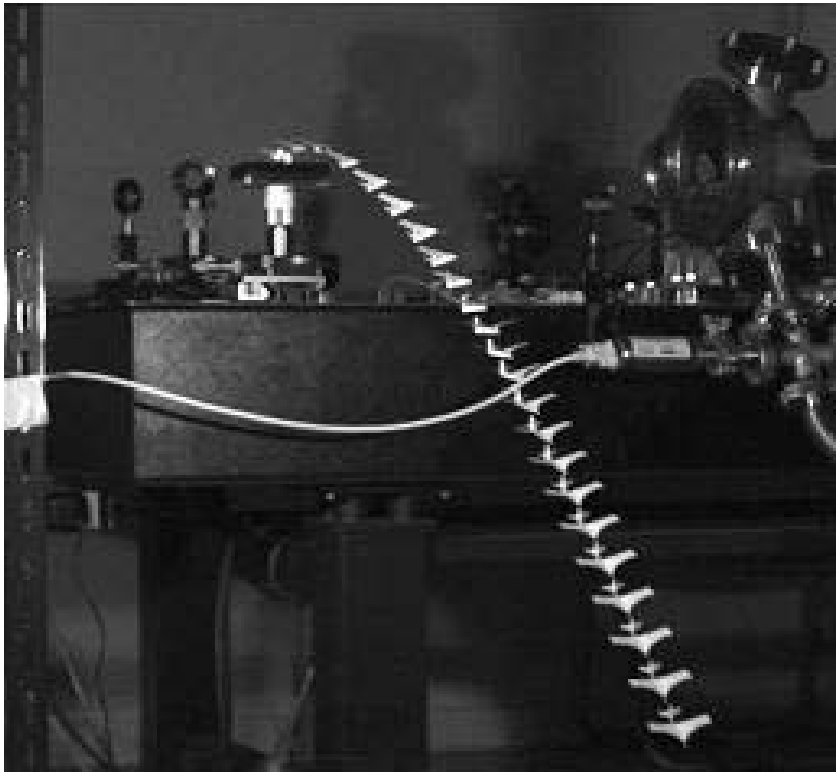
Laser rocket

Related laser rocket technology

Japanese – Yabe laboratory – Tokyo Institute of Technology



Powering tomorrow's plane

(NEW SUNDAY TIMES SUNDAY JULY 7, 2002 F13)

TECHNOLOGY

IT sounds like a great concept for a new toy: a laser-powered paper airplane. But scientists at the Tokyo Institute of Technology have bigger ideas in mind, like tiny, unpiloted airplanes powered by laser beams from the ground that can endlessly observe volcanoes or monitor climate.

In the longer term, they say, laser beams from satellites or high-altitude balloons may perhaps propel planes at several times the speed of sound at high altitudes where the air is too thin for jet engines to operate. In the meantime, they have a laser-powered paper airplane.

In the June 10 issue of *Applied Physics Letters*, the scientists describe their folded plane, with a wingspan of about two inches and a weight of less than a hundredth of an ounce. At the back of the planes, they attached small alu-minum targets to bounce the laser light.

Reflected particles of light impart a small force, like a stream of water from a garden hose hitting a beach ball. But that force is too small to lift even something as slight as their craft from the ground.

They then placed a droplet of water on the aluminum. Now, a pulse of laser light, in addition to bouncing off the aluminum, heated some of the aluminum into a superhot gas, which blew away the water like exhaust from a rocket engine.

"It's very hard to measure the water speed because it's very fast," said Dr Takashi Yabe, a professor of mechanical engineering at the Tokyo institute and the lead author of the Applied Physics Letters ar-ticle. The spray of water particles moved at speeds of at least 320km an hour, he said.

With the burst of thrust, the paper airplane lifted off from the laboratory workbench and glided to the ground.

"The significance of our idea is using water," Yabe said. The laser power approach is appealing because the power source — the laser — is on the ground, saving weight on the aircraft.

A similar approach could also provide a cheap way to launch small satellites, an idea first pro-posed by Dr Arthur R. Kantrowitz, now a professor of engineering at Dartmouth.

In October 2000, a carbon dioxide laser at White Sands Missile Range in New Mexico pushed a shiny, acorn-shape craft about the size of a softball 70 metres into the air. That remains the record altitude for a laser-driven rocket. The flight lasted less than 13 seconds.

Dr Leik N. Myrabo, a professor of mechanical engineering at Rensselaer Polytechnic Institute in Troy, N.Y., and designer of the laser-driven "lightcraft", foresees going much higher in the future. A laser 10 to 100 times as powerful could be strong enough to accelerate a small craft to a speed six times as great as the speed of sound to the edge of space, he said.

Ultimately, though, something more akin to a usual jet engine may be more efficient, using the laser energy instead of burning jet fuel to heat air as it rushes through. "That makes sense until you run out of air," Myrabo said.

At higher altitudes, water — as in the Tokyo paper planes — or liquid hydrogen could be the propellant.

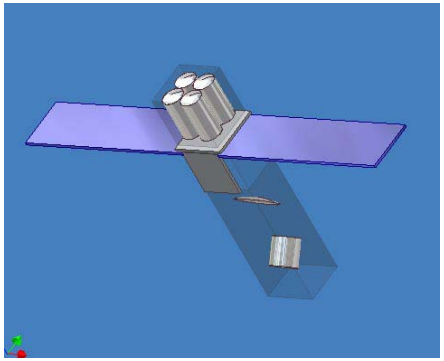
"The potential advantages are that one could put payloads into orbit for pretty much the cost of the energy," said John W. Cole, manager of the revolutionary propulsion research project office at Nasa's Marshall Space Flight Centre.

The energy cost would be a few dollars per kilogramme, Cole said, compared with the cost of current chemical rockets, US$10,000 (RM38,000) per kg. The technology has the potential of cutting launching costs by a factor of 10 to 100, Cole and Myrabo both said.

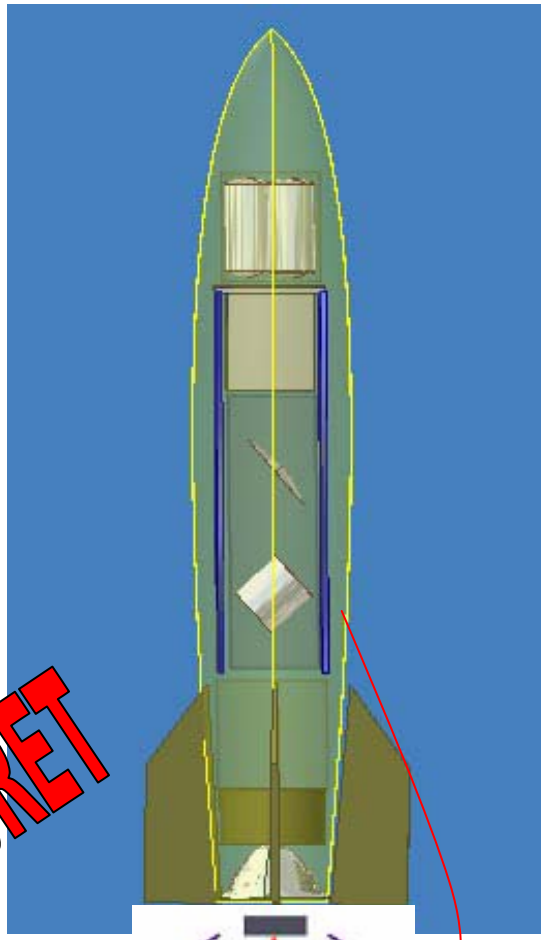
But Cole added: "It is not anywhere near mature. We do not have lasers big enough to actually implement this." — New York Times

Laser rocket

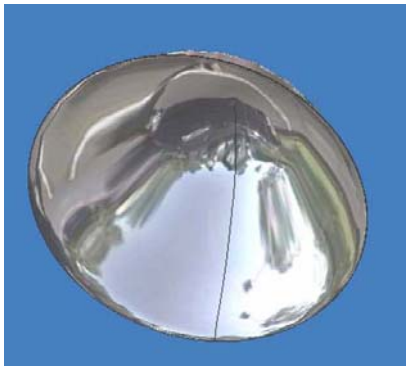
Related laser rocket technology
Our Technology

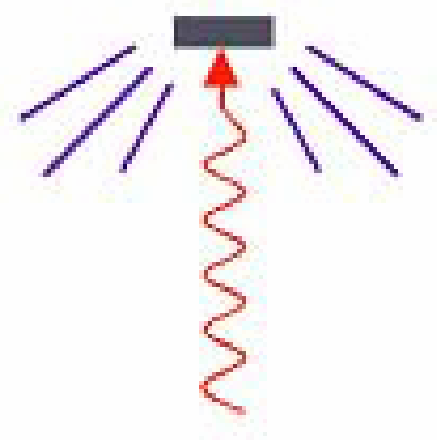


Satellite - micro



TOP SECRET





Laser ablation for continuous rocket propulsion

Fiber optic guidance

Rocket – laser propulsion
50 kg payload

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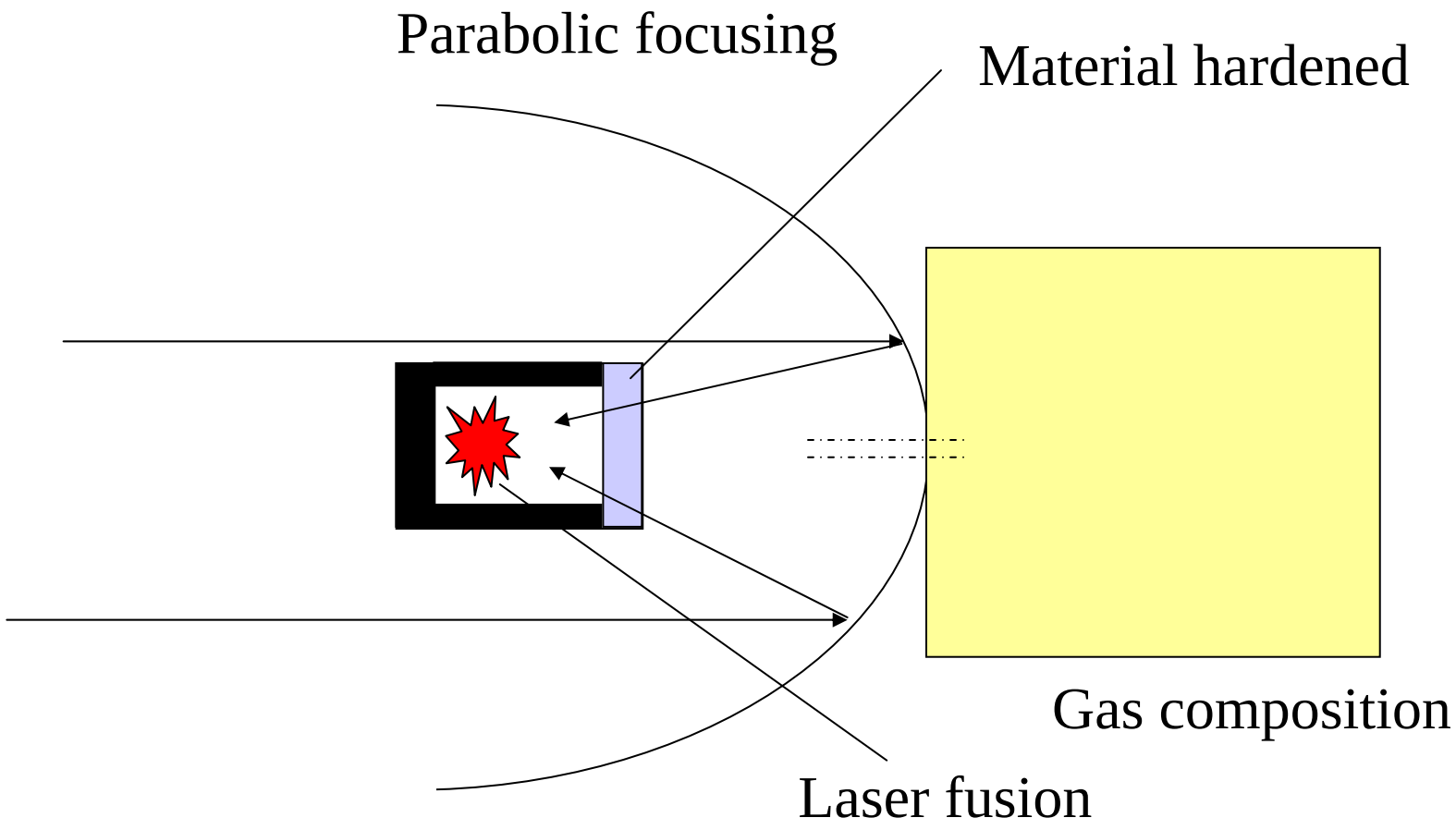
Laser engine

Our engine technology



Engine basics

1/ High energy laser (>80 kW, 10^{-16} s)
2/ Parabolic beam focusing
3/ Exotic material “lens” focusing
Light beam travels >> c and
Emits bremmstrahlung radiation
4/ Liquid oxygen, hydrogen peroxide, diamond powder and Crystal glass

Applications

1/ Laser rocket engine
2/ Train laser engine
3/ Jet plane using laser engine
4/ Ship laser engine
and many more…

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