An alternative powering source using conventional Brayton Cycle Gas Turbines which is Cheaper, Safer, and absolutely Green, no NOX, no SOX, No Co^2 with much less noise.

It is long understood that internal Combustion Engines (ICE), generally have better weight to power ratios than most other propulsion systems and that the Brayton Cycle gas turbine has the best weight to power ratio of any ICE. However, there are two problems with all combustion: first it is never complete, at the best more than 30% is never burnt it ends up as pollutants, CO^2 and deposits which reduce engine life; secondly hydrocarbons that are traditionally used for engine combustion has an energy density that is modest at the best, with 46.9 kJ/kg being the highest of common used fuels.

We propose using a Brayton Cycle turbine with a non-combustion power source to provide the 500-700^{O}C needed to drive the turbine. We would replace the burning of hydrocarbon or any other combustibles, with a heat exchanger in the combustor canister and used heat supplied from the patented Perryman Thermal Battery. The Perryman battery stores energy at temperature of up to 1800^{o}C, this thermal battery has the highest available (with the exception of a nuclear pile, but with the advantage of no radiation). The Perryman battery has energy density of 593.2 MJ/L) by volume) or as the weight is important 356.0 kJ/kg (mass). This high energy density combined with the natural advantage of Brayton Cycle turbine weight to power. This is more than 7.5 time more energy that the best hydrocarbon fuel and eliminates the efficiency problems of incomplete combustion.

Operating cost

The system would be charge from any electrical source such as the grid and would be dependent on the cost per kilowatt of electricity used to charge the thermal battery. As the thermal battery system requires a negligible amount maintenance other than recharging when the thermal cells are spent. their operating cost is less than a hundred dollars year for 30 MW/hrs. Perryman Battery with approximately 28 MW/hrs. of usable stored energy. (this is based on an operating delta of between 1800^{O}C and 620 ^{O}C the lowest operating temperature of the recommended Boeing T50-BO-10 / 502-14 turboshaft turbine whose inlet temperature: Jet pipe temperature is: 1,140 °F (616 °C at 330 hp (246.08 kW). The maintenance of the turbine engine would be the same or less what is normally expected that is required on a typical turboshaft engine. (Based on a similar Rolls Royce 250 turboshaft engine the maintenance would be under $367 per operational hour).

Energy Economics

This amounts to saving of between 1300% and 300% depending on where you buy your electricity when using the Perryman Thermal Battery with the same T50 turboshaft engine.

Long Term Economic Considerations

The turboshaft engine with proper maintenance operational life exceeds 60,000 operation hours, with the advantage of no particulates, carbon build up and tar form incomplete hydrocarbon based fuel combustion, the engine life should almost double. The Perryman Thermal Battery will last more than 40 years of continuous use, with unlimited charging/discharge cycles.

Maturity of the Technology

Jet engines speak for themselves, the use of heat without combustion was tested for tens of thousands of hours in the 1950 when GE and Pratt Whitney were testing the use of nuclear energy to keep a bomber aloft for weeks. The storage of high temperature metals is century old and the transport by rail and truck well over a century old, we base our design as well as having the same manufacturer who is behind this very mature containment system manufacture our thermal core units. Our development is 10 years old terrestrial semi commercial testing has been in progress of several years.

Energy Density

The essential technological breakthrough of the Perryman Thermal Battery

We have added a chart extracted from the calculation of Hofstra University energy research unit comparing different forms of energy.

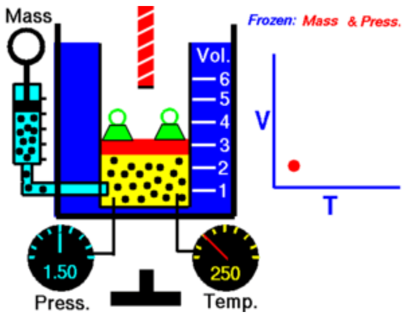
Energy Density of the Perryman Thermal Battery overwhelming Advantage

Only Nuclear exceed the Perryman Thermal Battery storage capacity

Selected Fuels	energy density	
	by mass	*by volume*
	MJ/kg	MJ/L
nuclear fission (of U-235) (Used in Nuclear Power Plants)	77,000,000	1,500,000,000
anthracite coal	32.5	72.4
diesel fuel/residential heating oil	45.8	38.7
Gasoline	46.9	34.6
Jet fuel (Kerosene)	43.3	37.4
biodiesel oil (vegetable oil)	42.20	30.53
gasohol (10% ethanol 90% gasoline)	43.54	28.06
Ethanol	30	24
liquid hydrogen	143	10.1
compressed natural gas at 200 bars	53.6	10
Wood	6 - 17	1.8 - 3.2
natural gas		.038
Generation 3 Perryman Thermal Storage unit with encasement	**356.0**	**593.2**

The Physic behind the adaptation of

heat to drive Internal Combustion Engine

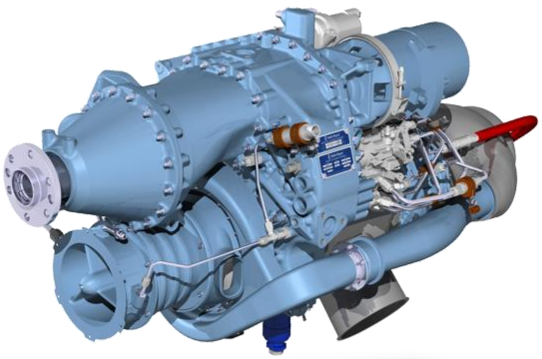


All systems of propulsion require only heat and a drive gas or fluid, we provide the best heat source available

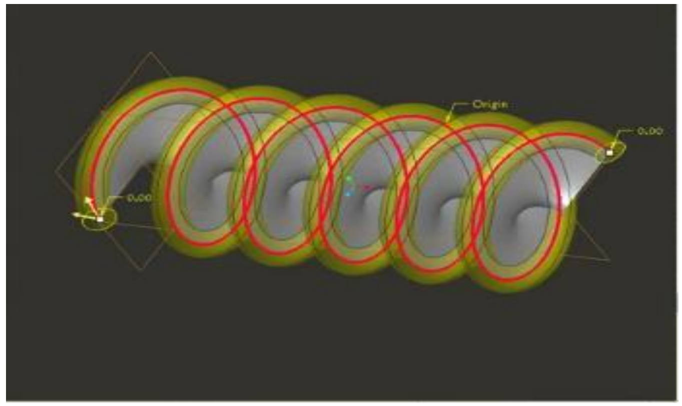
This proposal is driven by an understanding that it is wisher to build on existing technology
and industrial infrastructure, then trying to reinvent the wheel by introducing a solution that will need to create a new industry, production methods and infrastructure. We see the turboshaft engine, that was first introduces 50 years ago as a tried and well proven method to propel and aircraft. We understand that the largest limitations are cost, the environmental impact, long term reliability, safety and maintenance consideration. In air craft weight to power considerations are also paramount. Staying with the well proven Brayton Cycle Gas Engine check All the boxes, if we can find a better system to power this engine than combustion of dirty expensive burning of hydrocarbons. Here is where the “Charles Law and heat laws offer a simple solution, create a new way to deliver

With the high density thermal battery provide a massive weight to power advantage over any electro-chemical battery and a 11/1 advantage over kerosene.

Propulsion is accomplished using turboshaft Brayton Cycle turbine engine retrofitted with heat exchanger in the combustor cans as per Virgil Perryman's [Non-combustion energy source and configuration for brayton cycle heat engines] US Patent number: 9470148

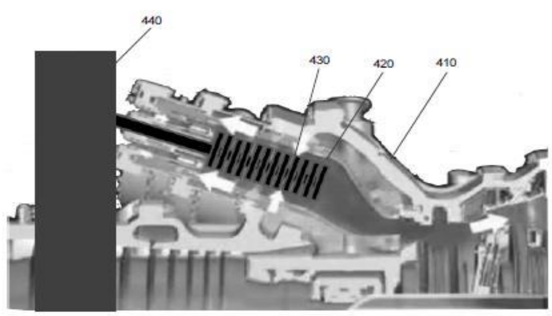


Rolls Royce Popular Small Turboshaft Engines with excellent weight to power ratios



An illustration of the heat exchanger that is inserted into the combustor can of Brayton Cycle Gas turbine can deliver the thermal energy to power the without burning fuel

T50-BO-10 / 502-14) Manufactured for Boeing, this turboshaft has been a main line power plant for over 50 years



Drawing from the Virgil Perryman Patented Non-Combustion Brayton Cycle Gas Turbine Adaptation

Example of a turboshaft jet engine which has been available for 5 decades

Specifications (T50-BO-10 / 502-14) Manufactured for Boeing

Data from Jane's All the World's Aircraft 1962-63

Type: Turboshaft

- **Length:** 37.2 in (945 mm)
- **Diameter:** 22.5 in (572 mm)
- **Dry weight:** 215 lb (98 kg)

Components

- **Compressor:** Single-stage centrifugal flow
- **Combustors:** 2 can combustors
- **Turbine:** 1x axial gas generator power turbine stage + 1x axial free-power turbine stage
- **Traditional Fuel type:** Aviation kerosene
- **Replacement Energy Source:** High density stored thermal energy delivered to the 2 can combustors via heat exchanger
- **Oil system:** pressure spray/splash, oil specification: MIL-L-7808

Performance

- **Maximum power output:** 330 hp (246.08 kW) military rating at 6,000 output shaft rpm
- Overall pressure ratio**:** 4.35:1
- **Air mass flow:** (4.1 lb (2 kg))/s
- **Turbine inlet temperature: Jet pipe Temperature:** 1,140 °F (616 °C)
- Specific fuel consumption**:** 0.87 lb/ (hp h) (0.532 kg/ (kW h))
- **Using Perryman Battery Equivalent 0.087 lb/hp h (0.0532 kg/ (kW h))**
- Power-to-weight ratio**:** 1.535 hp/lb (2.523 kW/kg)

Specifications (520-6) Manufactured by Boeing

Data from Jane's All the World's Aircraft 1962-63[1]

General characteristics

- **Type:** Turboshaft
- **Length:** 54.1 in (1,374 mm)
- **Diameter:** 25.14 in (639 mm) maximum height
- **Dry weight:** 250 lb (113 kg)

Components

- **Compressor:** Single-stage centrifugal flow
- **Combustors:** 2 reverse flow can combustors
- **Turbine:** 1x radial gas generator power turbine stage
- **Traditional Fuel type:** Aviation kerosene
- **Replacement Energy Source:** High density stored thermal energy delivered to the 2 can combustors via heat exchanger
- **Oil system:** pressure spray/splash, oil specification: MIL-L-7808

Performance

- **Maximum power output:** 550 hp (410.13 kW) military rating at 6,000 output shaft rpm
- **Overall pressure ratio:** 6:1
- **Air mass flow:** 5.5 lb (2 kg)/s
- **Turbine inlet temperature: Jet pipe Temperature:** 1,025 °F (552 °C)
- Specific fuel consumption: 0.67 lb/ (hp h) (0.41 kg/ (kW h))
- **Energy consumption using Perryman Battery Equivalent for energy source 0.067 lb/hp h (0.041 kg/ (kW h))**

Power-to-weight ratio: 2.2 hp/lb (3.616 kW/kg