# ULTIMATE

## FREE PISTON ENGINE

www.freepistonengine.com

# The "Ultimate" in **Free Piston Engine** Technology

**Confidential Private Placement Presentation**

February 2015
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# ULTIMATE

## FREE PISTON ENGINE

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The Ultimate in:

- Design Simplicity; and,
- Power Density (power to weight ratio); and,
- Versatility; and,
- Mechanical and Thermal Efficiencies.

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# About Ultimate Free Piston Engines

Free piston engines are unlike conventional engines, having no crankshaft to control the movement of their pistons yet offer the possibility of lighter more powerful engines than have ever been built.

# About Ultimate Free Piston Engines

Ultimate Free Piston Engine's Founders have over the course of 12 years of R & D with almost $2 million invested in numerous prototypes and have overcome all the problems of engine control, resulting in the filing of a number of important patent applications regarding novel engine actuation methods.

# The Goal

The goal of Ultimate Free Piston Engines (UFPE) is to create an engine with the highest power to weight ratio of any available production engine – being lighter and more powerful with an elongated (due to its long stroke length) small size.

# The Goal

The efficiency of positive displacement engines is largely determined by the compression ratio. Our UFPE engines with virtually unlimited stroke length can readily reach compression ratios greater than 40 to 1. And, can produce combined efficiency ranging near 70% that will be a "new world record".

# Investment Opportunity

Ultimate Free Piston Engines is offering equity ownership units to accredited investors of one percent (1%) for the sum of $20,000 for up to forty percent (40%) total ownership interest in UFPE for a total of $800,000.

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# Investment Opportunity

The minimum allowable investment is $5,000 for one quarter of one percent (.25%) ownership interest in order to build the next generation of Ultimate Free Piston Engines and to establish U.S. manufacturing.

# Estimated Sales and Potential Profits Summary

Assumptions: (1) UFPE engine / compressor / pump sales price (ranging from $50,000 to $250,000); more lower cost units being sold for an average per unit sales price of $100,000; and, (2) the average unit costs is 60% of the sale price as a percentage (to build the engine); and, (3) the gross profit margin is 40% of the sales price; and, (4) operating costs being roughly equal to 25% of sales price; and net profit before tax being equal to 15% of the sales price.

| Estimated Average Sales Price per Unit of $100,000 | | | | | | |
|---|---|---|---|---|---|---|
| Year | Units Sold | Gross Sales 100% | Cost to Build 60% | Gross Profit 40% | UFPE Operating 25% | Profit before Tax 15% |
| 1 | 100 | $ 10,000 | $ 6,000 | $ 4,000 | $ 2,500 | $ 1,500 |
| 2 | 400 | $ 40,000 | $ 24,000 | $ 16,000 | $ 10,000 | $ 6,000 |
| 3 | 1200 | $ 120,000 | $ 72,000 | $ 48,000 | $ 30,000 | $ 18,000 |
| 4 | 4200 | $ 420,000 | $ 252,000 | $ 168,000 | $ 105,000 | $ 63,000 |
| 5 | 11500 | $ 1,150,000 | $ 690,000 | $ 460,000 | $ 287,500 | $ 172,500 |
| | | | | | Dollar values in 1,000 increments | |

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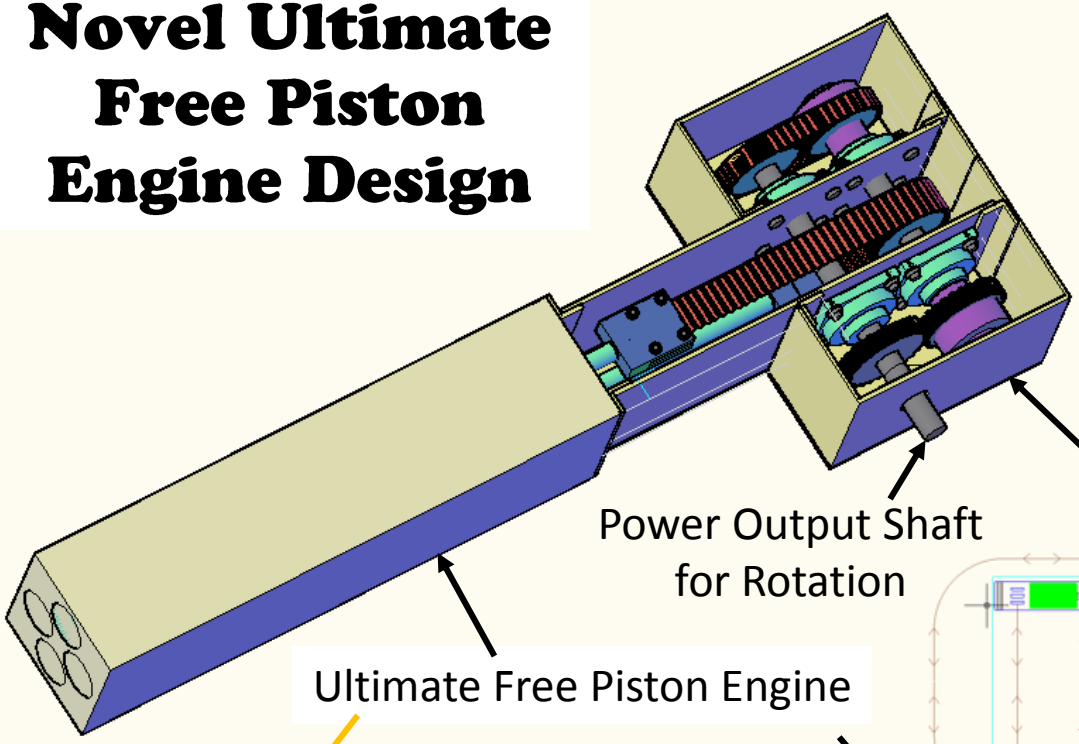
# Novel Ultimate Free Piston Engine Design

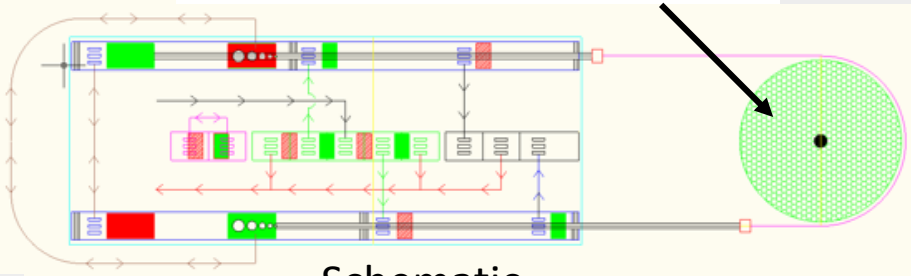
The Free Piston Engine alone is needed for Gas Compression or Liquid Pumping via adding additional pistons to its shafts. The Sprague Gear Transmission is only used when Rotation is Desired, such as Automotive use or in Electrical Power Generation.



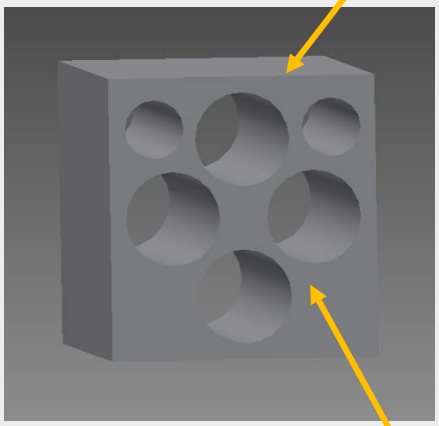
Power Output Shaft for Rotation

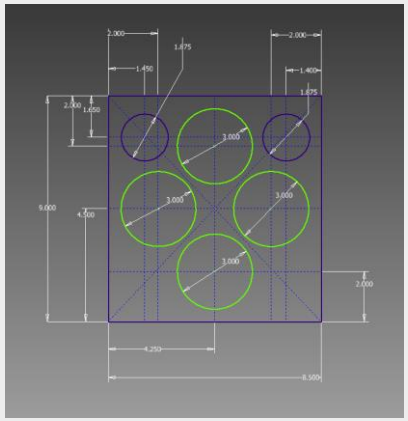
Sprague Gear Transmission

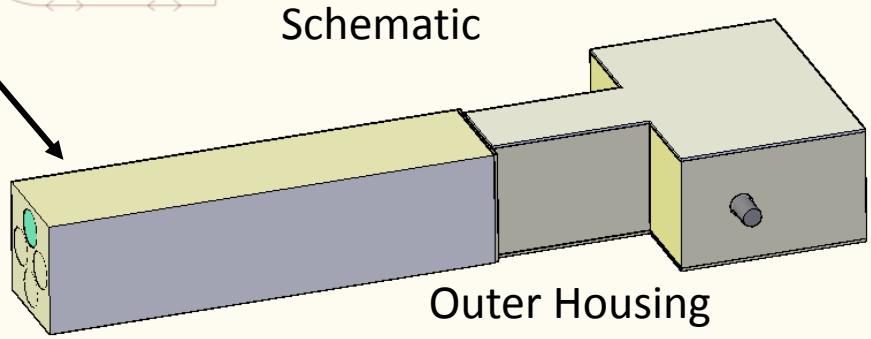
Ultimate Free Piston Engine



Schematic







Outer Housing

Engine Block

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# Record Ultra-High Efficiency

The UFPE is an extremely versatile, ultra-high efficiency free piston engine that currently holds the record high mechanical efficiency of 94% that was verified by third party dynamometer tests performed at the Kennedy Engine testing facility, which can perform any tasks of an engine.

# Versatility

The Ultimate engine is so versatile that it can be operated using any heat source, such as; combustive heat; geothermal heat, solar thermal energy; or, alternatively may be powered by any pressurized fluid.

# Key Market Focus – Gas Compression Industry (Oil and Gas and Refrigeration)

Ultimate Free Piston Engine technology is perhaps best suited for the massive gas compression industry because it can accomplish extremely high pressures within a single stage (one long stroke), which takes competing compressors multi-stages of compression (often up to five stages) to accomplish with their shorter compression stokes. And, UFPE can run on Natural Gas.

# Income and Growth Potential

Looking from the top down, the Ultimate Engine may be used for any purpose that any other engine may be useful, such as electrical power generation; automotive, for oil and gas pumps and compressors that includes CNG and LNG production; refrigeration, etc.

# Income and Growth Potential

However, looking from the bottom up, the most lucrative market is perhaps oil and gas related for gas compression, liquid pumping, including the rapidly emerging onsite CNG and LNG markets. UFPE's technology reduces the costs of oil and gas production while increasing output and product market value. With the drop in oil prices, our services are even more attractive to oil companies.

# Gas Compression Industry

Hanover Compressor which became a $3 billion dollar company in only two years from inception is an example of success in the gas compression industry.

Ultimate Free Piston Engines hopes to gain market share in the multi-billion dollar gas compression industry being driven by the switch from oil to the use of compressed natural gas (CNG) and liquid natural gas (LNG).

# Gas Compression Industry

Atlas Copco's sales being the leading compressor company are near $10 billion per year alone. Export of LNG is now allowed, spurring investment in the industry.

There is a limited ability to produce LNG onsite which provides an excellent market niche for UFPE, as its technology is especially well suited for this market because of its long stroke that produces high pressures in a single stage, along with its small size, weight and cost as compared to the existing technology.

# Atlas Copco leads the market in sales followed by Ingersoll Rand

Currently the compression market is dominated by low efficiency existing technology units of extremely large size and weight due to their need of multiple stage compression to reach high pressure output. Some models operate at near 15% efficiency, while the best of the class is generally less than 25% efficient.

By comparison the Ultimate Free Piston Engine with completed engineering predicting efficiencies approaching 70%, can be as little as one- fourth of the size and of the weight of conventional gas compressors on the market today, for the same power and volume and pressure of compressed gases output!

A prime Example of Existing Technology


**Atlas Copco DrillAir XRYS 1220 CD7**

**1220 CFM, 365-435 PSI Rotary Screw Compressor**

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# Physicist and Inventor
# Robert D. Hunt

Robert started his career as an employee of Tenneco Oil Company's Newport News Shipbuilding division being a Nuclear Engineer within its elite New Nuclear Design Department that was responsible for the creation of the nuclear reactors for the USS Nimitz aircraft carrier, which has become the Nimitz class that includes nine carriers due to its enormously successful design. Robert is the Founder and inspirational genius behind Ultimate Free Piston Engine's technology having spent the past 12 years on its development and is the holder of the patents related to the technology that include his novel exhaust engine actuation method and his hydraulic synchronization and breaking method in order to absolutely control the timing and the movement of the engine's pistons; and other important innovations.

# The Ultimate Engine Team

**Robert D. Hunt, II**

who is the Son of UFPE's Founder holds Business Management degrees from The Delgato School of Business and is active in running the company.

# The Ultimate Engine Team

## Patrick Lewis

has 38 years of oil and gas experience in technical service and in sales for Halliburton and for Baker Hughes on large projects for major oil companies. Patrick is responsible for marketing UPFE's products to the O&G Industry.

# The Ultimate Engine Team

## Jim Womack

has directed many large casino and public works construction projects during his career. He oversees all aspects of UFPE's materials and parts procurement and engine fabrication and assembly from start to finish.

# The Ultimate Engine Team

## Mark Leslie

goes by the nick name "Boat Captain" due to his years of operating oil & gas crew boats. Mark is our New Business Development Officer seeking new uses for the Ultimate Engine.

# Thanks for Your Time and Interest from the Ultimate FREE PISTON ENGINE Team

For more information go to our website at:
www.freepistonengine.com

Or Contact: Robert D. Hunt
hunt0972@bellsouth.net
(228) 363-0736

https://www.linkedin.com/profile/public-profile-settings?trk=prof-edit-edit-public_profile

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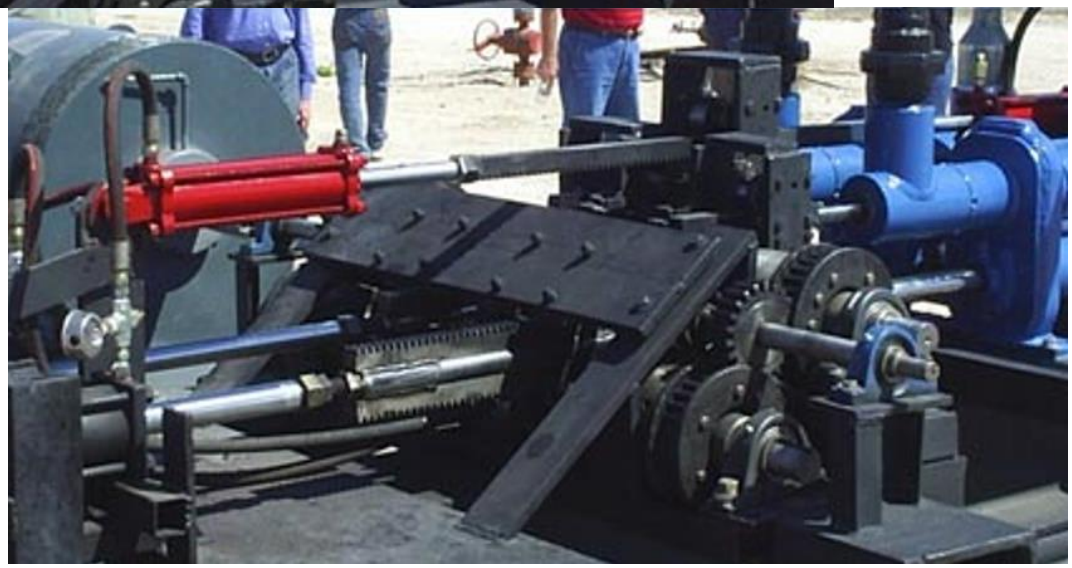
# The Free Piston Engine Challenge

The Engineering Challenge for Free Piston Engines Has Been How to Control Pistons that have been Accelerated to very High Velocity Over the Course of their Long Distance Strokes, which basically Slam Back-and-Forth with Enormous Power being into the Thousands of Pounds of Force; As there is no Crank Shaft to Limit their Stroke?

# No Transmission is Needed for Gas Compression or Liquid Pumping

In most of the videos and graphics for the Ultimate Free Piston Engine there is a Sprague gear transmission shown that is no required for liquid pumping and / or for gas compression, providing additional efficiency with substantial cost savings. Additional pistons are merely added to the existing shafts of the engine's power pistons.

# 400 kW Test Unit in 2010 Onsite in the Oil Fields of Texas Powered by High Pressure Natural Gas



Funded by: Linear Power, Ltd. and Green Well Power

# Important Patent Pending (Hunt Patents) Processes Integrated into the Design of the Ultimate Free Piston Engine:

- Exhaust Actuation (Timing to Run the Engine) Method without the need of Electrical Power
- Sprague Gear Transmission Method to Convert Linear Motion to Rotation in a Single Direction
- Hydraulic Breaking and Synchronization Method of Preventing the Pistons from Slamming into the Cylinder Walls and to Keep them Working as a Unit

# World Records Regarding Thermodynamics and Free Piston Engine Development Held by Physicist and Inventor Robert D. Hunt

- The Highest Mechanical Efficiency Ever in 2012 for a Positive Displacement Piston Engine of 94% (Third Party Tests)
- The Greatest Power Generation in 2003 with the Lowest Temperature Difference (25 deg. F. Delta T) – 3 kW Power Output with 90 deg. F. High Temp. and 65 deg. F. Low Temp.
- Lowest Temperature Power Generation Ever in 2005 with the Lowest Temperatures – 3 kW Power Output with 60 deg. F. High Temp. and (- Negative) -380 deg. F. Low Temp. using Liquid Oxygen as Coolant for his Solid State "Thermoelectric Cryogenic Vaporizer" (Air Liquide Grant)

# Exhaust Actuation (Patents Pending)

All Mechanical Linkage was Eliminated by Hunt's "Counter- Intuitive" creation of a novel method to "Run" and to "Time" a Free Piston Engine using its residual exhaust pressure as the driving force to set "Real Time" timing that automatically decreases or increases engine speed, based on pressure and volume inputs alone that could be one of the all-time most important discoveries in Free Piston Engine Development.

# Hydraulic Breaking and Synchronization (Patents Pending)

- Hydraulic Breaking smoothly controls the back and forth movement of the engine's power shafts and pistons; as well as the reciprocating actuator assembly with applied controlled deceleration.
- Hydraulic Synchronization locks all of the engines movable shafts and pistons into coordinated movement so that their alignment never varies and they always remain in the proper relationship to the rest of the engine's moving parts.

# World Record in Combined Mechanical and Thermal Total Efficiency

- Ultimate Free Piston Engine Technology is "Shooting" for the world's record in total combined efficiency currently held by a Caterpillar free piston engine prototype at 59%

- Completed Engineering gives us assurance that the "Ultimate" in free piston engine technology that we are developing can approach 70% combined mechanical and thermal total efficiency, which when accomplished will give Mr. Hunt his fourth world record.

# Key Points Toward the Record in Total Efficiency

- Use by Ultimate Free Piston Engine Technology of the more efficient Brayton cycle as in gas fired turbine engines and jet engines (40%) with combustion in a combustor separate of the power pistons (typical internal combustion engines that use the Otto cycle being 25% efficient on average by comparison).
- Ultra-high compression ratio of 40 to 1 to be used as the ratio is directly related to efficiency and fuel usage (typical Brayton compression ratio of less than 6 to 1 by comparison).

# Multiple World Records Regarding Thermodynamics and Free Piston Engine Development Held by Physicist and Inventor Robert D. Hunt

# World Record Held by Physicist and Inventor Robert D. Hunt

Power Generation in 2003 with the Lowest Geothermal Temperature Difference (25 deg. F. Delta T) – 3 kW Power Output with 90 deg. F. High Temp. and 65 deg. F. Low Temp.

Also the lowest temperature Geothermal Power Generation on Record

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