

**Galileo Research Free Piston Engine and Ken Galitello, Jr.
Advancing toward the Next Generation Internal Combustion Engine**

The Free Piston Engine

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**This document reflects the efforts of Ken Galitello, Jr.
with regard to Free Piston Engine technology.**

- 1970's Worked at gas station in 1973 pumping gas during oil embargo. Race Car Owner\Mechanic\Support for others. Studied internal combustion engines regarding performance and power output.
- 1982 – 86 Obtained and worked on original prototype Bourke Engine and attended College.
- 1987 New Idea, Free Piston Engine-Generator. Take the crankshaft out of the Bourke Engine and replace with a linear Alternator, integrating the engine and generator into one unit that weighs less and is smaller than traditional engine-generator designs and has fewer parts. Researched past and ongoing development of the technology. Overcame an initial difficulty in timing of the unit. Filed for U.S. Patent.
- 1988 Diagnosed with Multiple Sclerosis. Continued research on Free Piston Engine. A small number of individuals worked on the concept, two created operational prototypes Generator (Jarret & Stelzer) with limited documentation and not able to communicate with.
- 1989 Granted U.S. Patent 4,876,991 “Two Stroke Cycle Engine” Continued research on Free Piston Engine. Worked at Torrington Company, Engineering Test Lab, performing testing, analyzing results and writing reports on bearings.
- 1990 Formed Galileo Research, Inc. to further develop Free Piston Engine technology. Applied for Small Business Grant from Navy & denied.
- 1991 Continued research on Free Piston Engine, discovering that no significant development of the Free Piston Engine has been achieved and that a whole new internal combustion mechanism will result in expanding the capability of the internal combustion engine and result in greater efficiency. Discovered initial HCCI (Homogenous Charge Compression Ignition) work at the University of Wisconsin-Madison & applied to the Free Piston, wrote letter to Prof. Foster expressing interest in working with them on a Grant who replied not interested.

Contacted Southwest Research Institute expressing interest in working with them on a Grant to develop the Free Piston Engine, they responded not interested.

- 1992 Continued research on Free Piston Engine. Knowing that the Free Piston Engine is able to vary its Stroke & Compression Ratio and discovering that NO_x and unburned hydrocarbon emissions may be greatly reduced due to the free movement of the piston and chemical kinetics involved* during combustion, the resulting Free Piston Engine has the ability to utilize a variety of combustible fuels with greatly reduced emissions and greater overall efficiency.
**(NO_x formation requires both elevated temperature and time and if either elevated temp. or time is not present, the NO_x emissions will not form. The free piston is free of mechanical constraints and allows control of the piston to obtain compression ratios achieving compression-ignition-detonation with no flame front. By the immediate expansion of the piston and gases after combustion, the free piston limits the required time-temp. constraint to a magnitude below conventional engine technology, resulting in negligible NO_x formation.)*
This is confirmed by Peter VanBlarigan at Sandia Labs in 1998.
Written and submitted to SAE for publication *The Design of a Multifuel Two-Stroke Engine-Generator for Hybrid Vehicles* which was denied by reviewers.
- 1993 Hired Robert Law Ph.D. in Internal Combustion. Submitted Grant Application to NIST for Free Piston Engine. Formed an alliance with Fuel Cell Manufacturing in Thomaston, CT and Northeastern University in Boston, MA. Applied for SBIR RA 93-24 and SBIR RA 94-24 Grant funding through ARPA (DARPA).
- 1994 Rejected for SBIR RA 93-24 funding, offering Galileo no opportunity. DARPA held a conference on Free Piston Engine technology. Galileo not notified or aware. Working with Northeast Alternative Vehicle Consortium out of Boston, MA, Galileo applies for SBIR RA 94-24 Grant. Rejected for SBIR RA 94-24 funding. Applied for SBIR Grant from Air Force & rejected. Wrote letter to Dept of Energy seeking Grant funding.
- 1995 Galileo designs Prototype to demonstrate feasibility and gain understanding of the technology. Contracted with Pegasus Ventures in Boston, MA to create a Private Placement Memorandum to raise funds. Galileo applies for funding from NIST and visits NIST in Gaithersburg, MD. NIST denies funding. Galileo raises a small amount of investment capital to build a working model using off the shelf components.
- 1996 Galileo presents the technology to the MIT Enterprise Forum in Hartford, CT. Private Placement Memorandum did not raise any funds. Pegasus Ventures taken to Court by a number of firms seeking Investment Capital and its principal jailed. Galileo assembles Prototype working model. Galileo receives \$10,000 Grant from State of Connecticut that allows Company to purchase Data Acquisition system with In Cylinder Pressure Sensors to monitor Prototype performance.

- 1997 Galileo gets Prototype working model running. Attended Venture Capital meetings discussing the technology. No interest. Spoke to Southwest Research Institute regarding Free Piston Engine technology, which DARPA funded, when I state that I've been there and done that on the technology, they became very offensive. Galileo visits DARPA to discuss Free Piston Engine Technology. Galileo continues development of Prototype. Galileo visits West Virginia University, who DARPA funded, to discuss Free Piston – Linear Engine technology and examine their prototype. Galileo visits Sandia National Laboratories in Livermore, CA to discuss Free Piston Engine technology and meets with Peter VanBlarigan and the D.O.E. development team.
- 1998 Galileo continues development of Prototype and applies for Small Business Technology funding from Dept.of Energy. Galileo hosts a visit from Ford Motor Co. engineers to examine and discuss prototype. Ford wants to see a next generation prototype. Attended Fuel Cell Conference in Boston, MA. Met Professor from M.I.T. who took an interest in what Galileo was doing. Galileo formed a Joint Research Agreement with M.I.T. to develop a Coaxial Counter Oscillating Linear Alternator to eliminate linear vibration of the Free Piston Engine using moving Coils instead of Magnets.
- 1999 Galileo hires Joseph Cieplak as Business Consultant to pursue funding.
- 2000 Galileo obtains Grant from Northeast Utilities CL&P Clean Energy Fund to document Prototype findings and present a plan for the Next Generation Prototype, working with Professor at Rensselaer Polytechnic in Hartford, CT. Galileo hosts Congresswoman Nancy Johnson to discuss Free Piston Engine technology and funding.
- 2001 Presentation of Phase I to CL&P Clean Energy Fund achieved, continued funding denied. Ken, Galileo's President and Principal was injured and had surgery on right hand.
- 2002 Ken had 2nd surgery and therapy on right hand. No one else to carry on operations and investor funding ceasing. Galileo Research closes its books. Project with M.I.T abandoned.
- 2003 Ken filed for bankruptcy and had therapy for surgery on right hand during recovery. M.S. continuing to get worse going from Relapsing-Remitting type M.S. to Progressive-Degenerate type M.S..
- 2004 Ken had an operation for repairing a detached retina in his left eye & recovery.
- 2005 Ken goes to work part time for internet company working out of his home. Ken prepares construction plans for a handicapped garage addition to his home and hires contractors to start project. Ken's mom diagnosed with Cancer.

- 2006 Ken quits internet company and goes to work part time for Allied Engineering, a civil engineering company in Connecticut. Ken supervises garage construction and spends time with his mom. Ken's mom died. M.S. continuing to get worse.
- 2007 Ken has charge of his mothers' estate as executor. Ken's dad's health condition deteriorating and then dies.
- 2008 Ken loses ability to walk and is now wheelchair bound.
- June Ken resumes work on Free Piston Engine as Oil prices reach \$140.00 per Barrel.
- Ken's home is broken into resulting in theft of Free Piston Engine research documentation and intellectual property.
- September Ex-Congresswoman Nancy Johnson calls Ken and asks if he has any Patents or Patents Pending.
- After inquiring in an email, Nancy Johnson stated that "Without Patents I would be afraid of exposing you to theft of your ideas. I am not a lawyer and if you have one and he guides us, I would be happy to see if we can bring your idea to the attention of the right people (though I do not, as I write this, know who they are)."*
- What a shame that someone or group would steal from helpless wheelchair-bound individuals. No phone call or other communication to say let's talk, just thievery.
- 2011 Ken creates <http://www.galileo-fpe.com/> web site.
- 2012 Ken has difficulty functioning, cannot get pants up and down to go to the bathroom and can no longer go to work.
- 2013 Ken can no longer stand up and is having difficulty just getting through the day, needs help, hardly any help available.
Ken creates <http://www.free-piston-engines.com/> a web site dedicated to Free Piston Engine technology.

After several years of background research into the Free Piston Engine and combustion, Galileo developed its initial Prototype Free Piston Engine in 1995, had seen its operational

characteristics and conducted experiments of its own, looking to build or take part in a next generation prototype to be used in a Serial configuration Hybrid Electric Vehicle.

Galileo had a Patent 4,876,991 issued October 1989 that has since expired. The Company did not have sufficient Capital to continue operations. Unfortunately, research and development with M.I.T. had to be abandoned and the company closed in 2002.

In my experience and from what I am able to see on the technology today, the Department Of Energy, Sandia Labs Hydrogen Program and their Free Piston Engine has the best possible chance of achieving the goals of a clean multi-fuel energy technology that was needed yesterday. Recently in 2013, a DLR team developed a demonstrator of free-piston linear generator as range extender for EV's and GM Patented a Hybrid powertrain system using free piston linear alternator engines in 2012. Also work from U.S. Environmental Protection Agency's hydraulic hybrid vehicle development program and FORD on a Free Piston Engine Hydraulic Pump is also of utmost importance.

Check out <http://www.free-piston-engines.com/> for development of the Free Piston Engine technology.

It was a Blessing to have achieved what I did, and it was extremely exciting in the discovery of a technology whose time had arrived yet frustrated when it came to funding and support both from the automobile companies, investors and from State and Federal Governments. Galileo did its best to interest others in the technology and solicit capital for development. It appears such a technology was ahead of its time, but needed in this time, and it was devastating when my home was broken into, research stolen and then Nancy Johnson calls asking if I have any Patents. **Shame on them for stealing from the wheelchair bound, handicapped and helpless.**

Through my Faith, Jesus has shown me a way of life, like that of GOD Our Father, Creator of Heaven and Earth that is selfless. That is what I strive for. I thank Him for my family, my work with the Free Piston Engine and experiencing Life in His Creation in which We Live.

Ken