Low Noise, High Efficiency, High Specific Output, Reliable Pulse Jet Engine

US-Semi is working with Herndon Development, LLC to license and implement a patent pending pulse jet engine design intended to simultaneously address the shortcomings of both turbines and pulse jets. The technology has the potential to revolutionarily change manned and unmanned aircraft designs for broad area applications and missions including transition to space.

Turbine jet engines have been developed to a high state of refinement. Continuous combustion provides full duty-cycle, high thrust-to-weight operation. Multi-stage compressors have produced high compression/expansion ratios for high efficiency. These advantages have been achieved, however, with considerable complexity, resulting in high costs and many modes of possible failure. Additionally, turbines have significant rotational momentum, creating slow thrust change response, catastrophic uncontained failures and large gyroscopic mounting loads which must be compensated in design with further complexity. Foreign object intrusion or ingestion can easily cause total engine failure.

Pulse Jets, with simple design and high thrust to weight, have enticed professional and amateur engine designers since the beginning of the 19th century, however their great potential has never been fully realized.

Both valved and valveless configurations have been implemented over time but both have suffered variously from valve burn-out, low duty-cycle, very low compression/expansion ratios, limited power range, very poor ignition and combustion control, significant thermal heat loss, severely compromised aerodynamic flow, low efficiency and the production of extreme noise.

The Herndon Pulse Jet design incorporates two separate chambers; resonantly coupled across a shared central bypass passage to produce an opposed-phase, noise-canceled, high-compression system with a near continuous, single exhaust stream. The exhaust induces intake flow and additional sound reduction may be achieved through placement and synchronization of multiple engines.

Redundant, combined, direct fuel-injector/spark plug/ion sensors provide precisely timed, highly controlled combustion. Excepting the combined injector/plug, this may be achieved with off-the-shelf electronics technology. The modulated injection/spark system allows immediate start/stop and idle through max power control.

A combined extremely lightweight chamber pair unit of approximately 150mm square cross-section by 300mm length, with strong precedent, has the potential of 300 to 550 lbs thrust. Added intake and exhaust ducting significantly influences realized thrust while multiple units may be integrated into pods, fuselage or wing.

For submersible applications, the unit is simple enough to be retracted, flooded with fresh water and quickly compressed air purge-dried upon emergence.

The design fuel is a mixture (depending on use requirement) of ethanol, methanol and water. Nitromethane may be added as an oxidizer. Since the pulse jet requires electricity but generates none, a clean, extremely high efficiency generator using the same fuels has been designed by Herndon Development.

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