



Consolidated Technical Baseline: Free-Piston Propulsion Loop

This sheet provides a clean data record mapping your exact hardware inputs to the corresponding scientific fluid parameters. It establishes a concise blueprint for your files.



Engine Dimensional Matrix

- **Combustion Bore (PCfire):** 4.00 inches diameter.
 - **Combustion Clearance Pocket Height:** 0.91 inches (At Top Dead Center).
 - **Total Combustion Housing Length:** 8.91 inches total envelope.
 - **Hydraulic Pump Bore (PChyd):** 1.38 inches diameter.
 - **Active Working Stroke (All Coaxial Pistons):** 8.00 inches mechanical throw.
 - **Expansion Piston Bore (PCpress):** 8.00 inches diameter (Independent supercharger assembly).
 - **Atmospheric Intake Bore (PCair):** 6.20 inches diameter (Independent supercharger assembly).
 - **Supercharger Working Stroke:** 8.00 inches continuous linear travel.
-



Hydraulic Fluid Delivery Thresholds

- **Propulsion Baseline Cycle Frequency:** 100 Beats Per Minute (BPM) at peak delivery.
 - **Continuous Line Target Working Pressure:** 248.6 Bar (3,605.6 psi).
 - **Linear Output Force Counter-Resistance:** 5,385 lbs acting along the rod.
 - **Total Continuous Single-Engine Fluid Output:** 19.58 Liters per minute.
 - **Dual-Engine Combined Drivetrain Flow:** 39.16 Liters per minute delivered.
 - **Net Continuous Fluid Transmission Power Output:** 16.23 kW (21.76 HP).
-



Gas Dynamics & Chemical Mass Balances

- **Initial Supercharger Intake Pressure:** 23.0 atmospheres at 451°F departure temperature.
- **Intercooler Post-Cooling Equilibrium Pressure:** 21.0 atmospheres at 70°F entry temperature.
- **Trapped Oxygen/Air Cylinder Mass per Pulse:** 0.474 grams of fresh air charge.
- **Maximum Balanced Fuel Injection per Pulse:** 0.0326 grams of liquid diesel fuel.
- **Continuous Thermal Operational Ceiling Limit:** 380°F peak expansion cap.

- **Target Mechanical Expansion Workspace Efficiency Ratio:** 5:1 volumetric adiabatic curve.
 - **Fuel Consumption Profile (VTOL Phase):** 24.68 lbs of diesel per hour (100 BPM max continuous frequency).
 - **Fuel Consumption Profile (Fixed-Wing Phase):** 4.94 lbs of diesel per hour (20 BPM pulse-skipping mode).
-

Flight Envelope Summary (203 lb Vehicle Gross Takeoff Weight)

- **VTOL Climb Phase Profile:** 30 seconds ascent, 30 seconds descent (16.23 kW max fluid draw).
 - **Fixed-Wing Cruise Speed Baseline:** 90 mph cruising airspeed (Shortened high-efficiency wings).
 - **Fixed-Wing Cruise Power Requirement:** 3.25 kW (4.35 HP) continuous hydraulic draw.
 - **Maximum Airborne Flight Endurance:** 8 hours and 57 minutes (Sustained with a 45-lb fuel mass).
 - **Total Strategic Operational Transit Range:** 805 Miles (Two-way radius flight profile).
-