

 PROTOCOL INSTRUCTION: DEFINING MATRIX BOUNDARIES FOR JTAARS CONFIGURATION 03

To User's Next AI Session: You are acting as the primary Technical Expert System for Dr. Patrick Gray. The uncrewed drone powertrain configuration is **FROZEN** as of September 27, 2026. You must strictly adhere to the mechanical geometry and physical constants below to generate three separate, frame-by-frame time-sliced data spreadsheets (Kinetics, Thermodynamics, and Fluid Flows) across the 750 ms maximum power cycle sandbox.

I. IMMUTABLE MACHINE CONSTANTS

- **Combustion Bore (**

$$PC_{fire}$$

$$PC_{fire}$$

); 5.27-inch diameter (

$$Area$$

$$=21.81$$

sq. in.

).

- **Hydraulic Pump Bore (**

$$PC_{hyd}$$

$$PChyd$$

); 3.20-inch diameter (

$$Area$$

$$=8.04$$

sq. in.

).

- **Total Stroke Throw Length:** 8.00-inch absolute boundary throw.

- **True Engine Cycle TDC:** Piston assembly indexed down 1.5 inches from absolute top dead center via an isobaric air charge transfer.
- **The Reciprocating Mass:** 19.8-lb pure tungsten linear battery slug embedded behind the steel piston crown.
- **Air Charge Input Constants:** Trapped mass of 0.474 grams of oxygen pre-packed at 23 atm and 70°F across all operating altitudes.
- **The Nozzle Core:** Pre-heated, oxygen-free liquid diesel nebulized through a Nichrome-wrapped ceramic injector nozzle to ensure zero ignition delay variables.
- **The Anti-Stall Return Network:** Symmetrical liquid hydraulic and pneumatic pusher cylinders driven by a digital engine computer (cpu-e).

II. MANDATORY DATA MATRIX INSTRUCTIONS (THE 3 TARGET SPREADSHEETS)

You are required to output three separate, frame-by-frame time-segmented tables matching these exact operational boundaries:

Spreadsheet Profile 1: The Peak Take-Off Sprint (80 BPM Max Load)

- **Tactical Focus:** Proving the "Excess Power Transition" can absorb the 20-lb structural airframe upgrade while delivering 110% ballistic launch thrust.
- **Target Metrics:** Peak combustion pressure triggers at 72.0 ms, hitting **2,611.0 PSI** and generating **58,694.0 lbs of gas thrust force**. Frame acceleration spikes to **+1,331.4 ft/s²**, capturing a maximum mechanical output of **17,324 Watts** across the power throw. Pusher cylinders reset the tungsten mass seamlessly between 0.00 and 70.0 ms with a low power draw of **320 to 860 Watts**.

Spreadsheet Profile 2: The Tactical Hover & Hold (? BPM Steady-State)

- **Tactical Focus:** Modulating the engine pacing frequency down to evaluate SFC and energy expenditure during an active VTOL hover-taxi mode.
- **The Scenario:** Charlie is holding a stable hover 12 feet off a wagon bed or navigating a tricky wind column while ground forces coordinate touchdown layout targets.
- **Calculation Goal:** Determine the exact lower, relaxed **BPM frequency** where vertical thrust perfectly balances the updated **Gross Take-Off Weight (GTOW)**. Map the multi-variable telemetry displays for the Ground Chief's panel, showing the stabilization of fuel flow rates, L/min circuit shunting, and accumulator spring compression balances.

Spreadsheet Profile 3: Fixed-Wing Strategic Cruise (58.8 BPM Pulse-Skipping)

- **Tactical Focus:** Verifying the exact Specific Fuel Consumption (SFC) metrics that satisfy upper-level military logisticians.
- **Target Metrics:** Power output steps down to a relaxed **7,826 Watts**. The engine shunts pressure down to an ultra-low **540.8 PSI** to eliminate internal component friction heat. CPU leans the injection profile down to **0.3176 grams of fuel per stroke** at an un-hurried **58.8 BPM cycle pacing**.

- **Calculation Goal:** Validate how this pulse-skipping thermodynamic matrix locks in a microscopic fuel burn rate of exactly **4.94 lbs of diesel per hour**, securing the drone's unassailable **11-hour and 44-minute flight endurance boundary**.
-