# Primary Columns Directly Related to Fuel Consumption:

Focus on these first for fuel use/emissions insights.

* FUEL RATE – Real-time rate of fuel consumption (L/h or similar) – most direct measure.
* TOTAL FUEL USED – Cumulative fuel used; important for baseline comparison and total emissions.
* ENGINE LOAD – Indicates how hard the engine is working; higher load usually means higher fuel burn.
* THROTTLE – Correlates with fuel injection; higher throttle suggests more fuel being burned.
* ENGINE SPEED – Engine RPM; combined with load, helps estimate efficiency.
* ENGINE HOURS – Total operating time; needed to normalize fuel use.
* SPEED – Affects load and fuel use depending on operating mode.

# Secondary (Supportive) Columns:

These helps interpret operational context or support fuel-related analysis.

* COOLANT TEMP – May correlate with engine efficiency; cold engines burn more fuel.
* INTAKE TEMP – Influences combustion efficiency.
* CABIN CURRENT/TARGET TEMP, AC1–AC3 related data – HVAC systems contribute to parasitic fuel use.
* STATE / CYCLE / EVENTS – Could help classify operation modes (idling, working, traveling).
* GPS Latitude / Longitude / Altitude / Course – Used to map operation zones (e.g., loading vs travel).
* Pitch / Roll / Angle / Vibration – Terrain and vibration impact load and thus fuel use.
* SPOTTER CO2 / TEMP / HUMIDITY – Environmental data; less useful unless correlating external conditions with efficiency.

# Possibly Less Relevant (For Fuel Study):

* Supply Voltage / System Voltage / LTE RSSI / Device ID / Server Timestamp – Telemetry/system info, not operational.
* BMS (Battery Management System) data – Likely for hybrid/electric components; only relevant if energy sources are mixed.

# Suggested Initial Analysis Steps:

1. Correlation Study: Start by correlating FUEL RATE with ENGINE LOAD, THROTTLE, ENGINE SPEED, and SPEED.
2. Idle Time Detection: Use ENGINE SPEED + THROTTLE + STATE to find inefficient idling (e.g., engine running with zero load/speed).
3. Fuel Efficiency Zones: Match GPS coordinates with FUEL RATE to identify high-consumption zones.
4. AC System Load Analysis: Assess if cabin systems draw excessive power (especially in hotter shifts).