COMPLETE DIAGNOSTIC SUMMARY
2006 Cobalt SS (supercharged, ~2.8” pulley, manual)
Use case: DF Goblin donor

1. ORIGINAL SYMPTOMS (AS PURCHASED)

- Engine initially ran and drove
- Stalled at idle
- Could be kept alive with throttle
- No immediate CEL
- After ~1–2 days:
- P2138 (APP1 / APP2 correlation fault) appeared
- Driveability symptoms:
- Rough idle
- Stalling
- No misfire codes
- Throttle pedal otherwise responsive initially

2. INITIAL ELECTRONIC DIAGNOSIS (APP / DBW PHASE)

Actions Taken
- Replaced accelerator pedal assembly
- Replaced throttle body assembly
- Inspected throttle body connector
- Inspected pedal connector
- Checked 5V reference → present (~4.9 V)
- Checked low reference → continuity not obvious at first
- Verified ECU location and connectors
- Verified battery voltage (later confirmed good)

Observations
- P2138 persisted intermittently
- Idle still unstable
- Engine would stall without throttle
- No misfire codes
- Throttle % appeared high at idle

3. WIRING EXPERIMENTS (REFERENCE / GROUND PHASE)

Actions Taken
- Temporarily routed APP low-reference wires to battery negative
- Later reconnected ECU-side wiring
- Performed back-probing at ECU
- Checked continuity between pedal and ECU
- Battery negative disconnected during some work
- ECU connectors unplugged and reseated

Results
- Engine behavior worsened
- Pedal response became laggy
- Throttle oscillation increased
- Engine began violent shaking

- Engine sounded “knock-like”
- Still no misfire codes
- After returning wiring to stock:
- Engine did not return to previous behavior

Conclusion
- Wiring experiments did not cause permanent ECU damage
- DBW system entered unstable control state
- Electronic behavior was masking a deeper issue

4. THROTTLE OSCILLATION CONFIRMED (LIVE DATA)

Observations via OBD2
- With foot OFF pedal:
- Throttle position oscillated ~20–32%
- Pedal input:
- Laggy
- Heavily filtered
- Engine:
- Shook violently
- Would not idle
- Sounded mechanical

Interpretation
- ECU was actively hunting idle
- Throttle control instability confirmed
- No longer a simple APP fault

5. EVAP / VACUUM BRANCH (RULED OUT)

Observations
- Sound heard behind passenger taillight
- Sound continued briefly after shutdown
- Sound described as “tiny fan / pulsing whine”
- Car has no catalytic converters (rich smell present)

Actions Taken
- Identified EVAP components behind passenger taillight
- Unplugged EVAP purge solenoid electrically
- Capped intake-side purge hose
- Verified intake connections
- Reinstalled intake tubing

Results
- No change in engine behavior
- Knock-like sound persisted
- Rear sound persisted
- Idle instability unchanged

Conclusion
- EVAP purge not the root cause
- Rear sound identified as fuel tank pressure equalization / EVAP vent response

- Not causal

6. VOLTAGE / POWER SUPPLY VERIFIED

Actions
- Measured battery voltage:
- Engine OFF → normal
- Engine running → normal
- Charging system confirmed healthy

Conclusion
- Low voltage / ground instability ruled out

7. THROTTLE BODY ISOLATION TEST

Action
- Started engine with throttle body electrical connector unplugged

Results
- Engine still made knock / lawnmower sound
- Engine still unstable
- Violent shutdown shaking STOPPED

Interpretation
- Throttle system was amplifying symptoms
- Throttle system was not the root cause
- Mechanical noise exists independently of DBW

8. MECHANICAL NOISE INVESTIGATION

Exhaust Check
- Shook exhaust system
- Could NOT reproduce the noise

➡ Exhaust contact ruled out

Engine Mount Check
- No obvious mount failure found
- Mounts not primary noise source

9. SOUND CHARACTERIZATION (CRITICAL)

Noise Description
- “Lawnmower”
- Machinery-like
- Pulsates exactly with engine RPM
- Loudest at timing cover
- Not loudest near:
- Supercharger pulley
- Accessories
- Present even with throttle unplugged
- Prevents stable idle

Stethoscope / Listening Test
- Loudest at timing cover
- No significant change near supercharger side

10. CONFIGURATION FACTORS THAT MATTER

- Manual transmission
→ Flexplate / torque converter ruled out
- Supercharged Ecotec
- ~2.8” pulley
→ High chain shock loading
- Prior violent RPM oscillations
- Short run cycles
- Oil-pressure-dependent timing tensioner

11. FINAL MECHANICAL DIAGNOSIS

MOST LIKELY FAILURE (HIGH CONFIDENCE)
Timing chain tensioner collapse / timing chain slap

Why this fits ALL data:
- Noise matches known Ecotec timing chain failure videos
- Loudest at timing cover
- Pulses with RPM
- Not affected by throttle unplugging
- Causes:
- Idle instability
- Stalling
- ECU idle hunting
- Throttle oscillation (secondary)
- Common on boosted Ecotecs with small pulleys
- Often appears suddenly
- Often misdiagnosed as electronics initially

12. HOW THIS EXPLAINS THE APP / P2138 CODE

Important distinction
- Timing chain issues do NOT directly cause P2138
- However, unstable combustion + violent engine oscillation can:
- Create transient voltage disturbances
- Trigger plausibility logic
- Expose marginal connector conditions
- Cause intermittent APP correlation faults

Key takeaway
- P2138 was secondary or coincidental
- Must be re-evaluated after mechanical repair
- KOEO pedal sweep test is the final arbiter

13. CURRENT STATUS

- Engine likely still saveable
- Chain likely has not jumped yet
- Continued running risks:
- Chain jump
- Bent valves
- Total engine loss

14. CORRECT NEXT STEPS (NO MORE TESTING)

1. Do NOT run engine again
2. Drain oil → inspect for metal
3. Remove timing cover
4. Replace:
- Timing chain
- Tensioner
- Guides
5. Inspect cam phasers
6. After repair:
- Perform KOEO APP1 / APP2 sweep
- Re-evaluate P2138 only if it returns

FINAL SUMMARY (ONE SENTENCE)

A collapsing timing chain tensioner on a boosted Ecotec caused cam timing instability, which killed idle quality and triggered aggressive ECU throttle corrections, creating misleading electronic symptoms (including transient APP faults) before the mechanical timing noise fully revealed itself — and you caught it just before catastrophic failure.