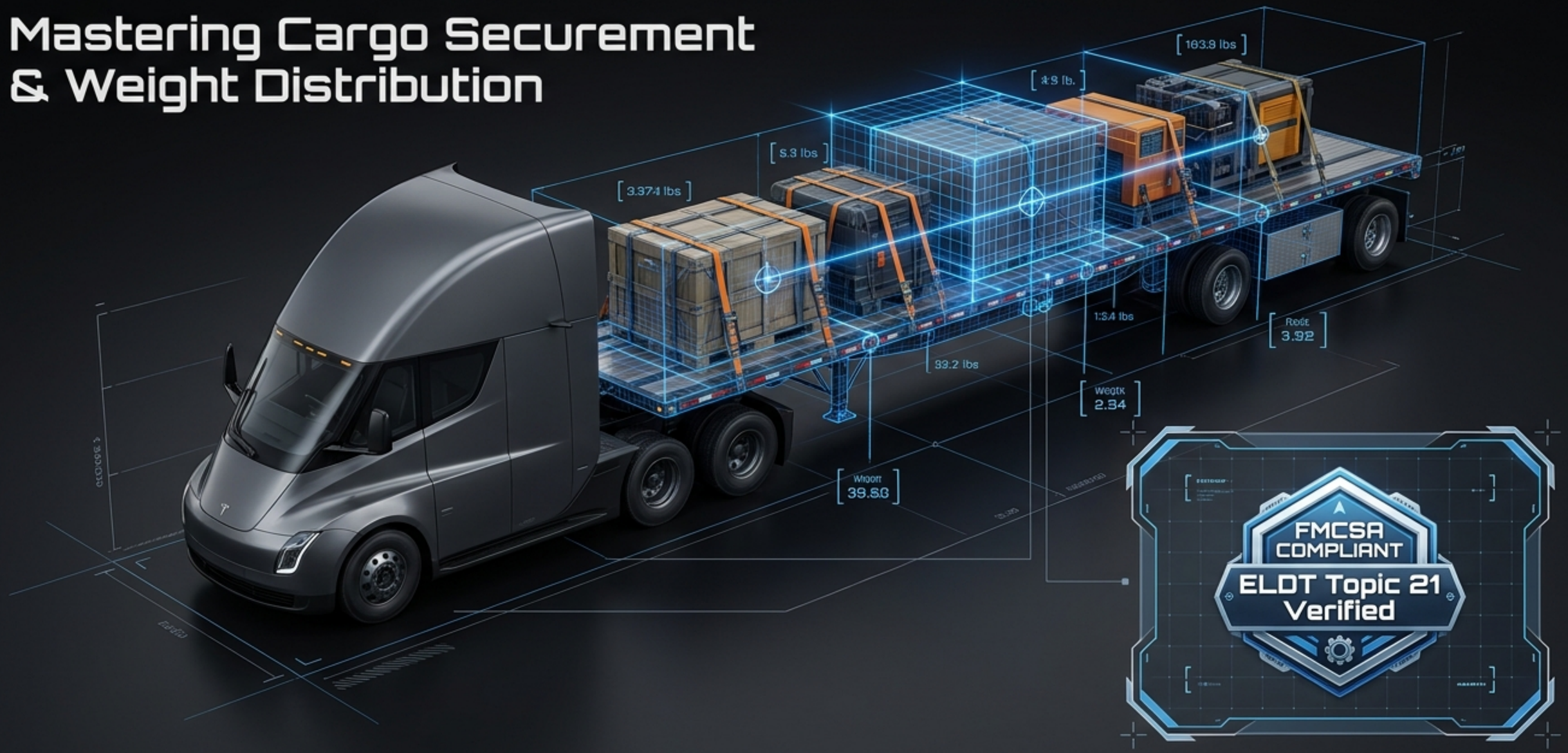
Game 04: Load Secure

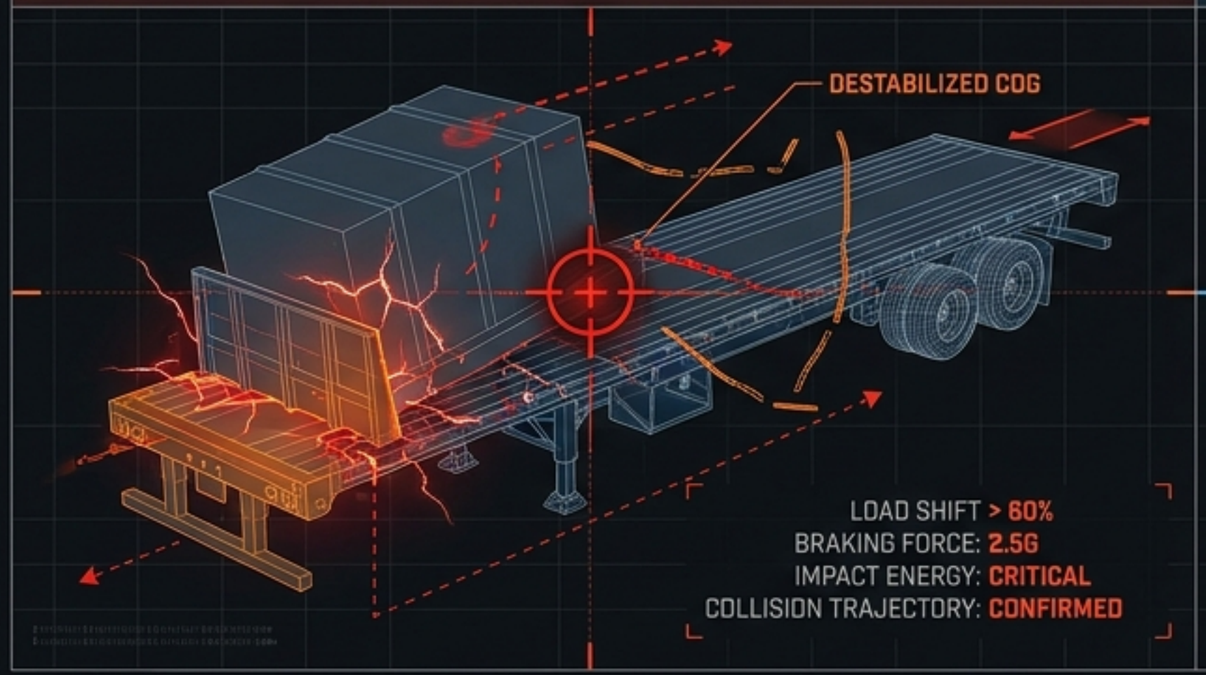
Mastering Cargo Securement & Weight Distribution



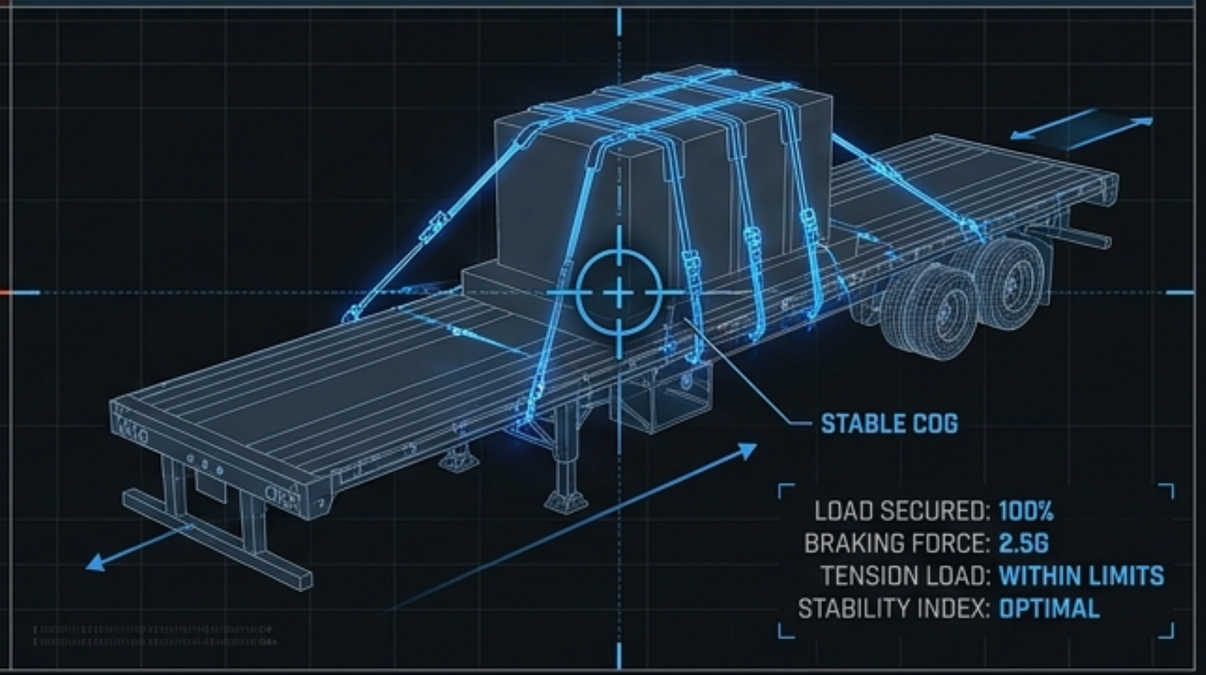
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THE PHYSICS OF 82,000 POUNDS IN MOTION

FAILURE: LETHAL CONSEQUENCES



MASTERY: EDUCATIONAL MANDATE



CURRICULUM MAPPING: DIRECTLY FULFILS FMCSA ELDT TOPIC 21: HANDLING AND DOCUMENTING CARGO (NON-DRIVING ACTIVITIES).

THE EDUCATIONAL MANDATE: REAL-WORLD CARGO SECUREMENT REQUIRES FLAWLESS SPATIAL REASONING AND PHYSICS COMPREHENSION. GAME 04 DIGITIZES THESE STAKES, REPLACING LETHAL CONSEQUENCES WITH PENALIZED GAMEPLAY TO BUILD RAPID, RIGOROUS MUSCLE MEMORY.

Gemini Notebook

DIGITIZING FEDERAL LAW INTO GAME LOGIC

FMCSA Part 393 Ruleset

- Minimum tiedowns calculated by cargo length and weight
- Forward, lateral, and rearward securement standards
- Edge protection mandates for abrasive cargo



Game Engine Physics Core

- Object tension and friction logic
- Dynamic mass and momentum calculation
- Instantaneous penalty and safety flag triggers

AUTOMATED COMPLIANCE OFFICER

Every violation of Part 393—from missing edge protectors to insufficient forward securement—results in an immediate progression block and XP deduction. The engine enforces federal law.

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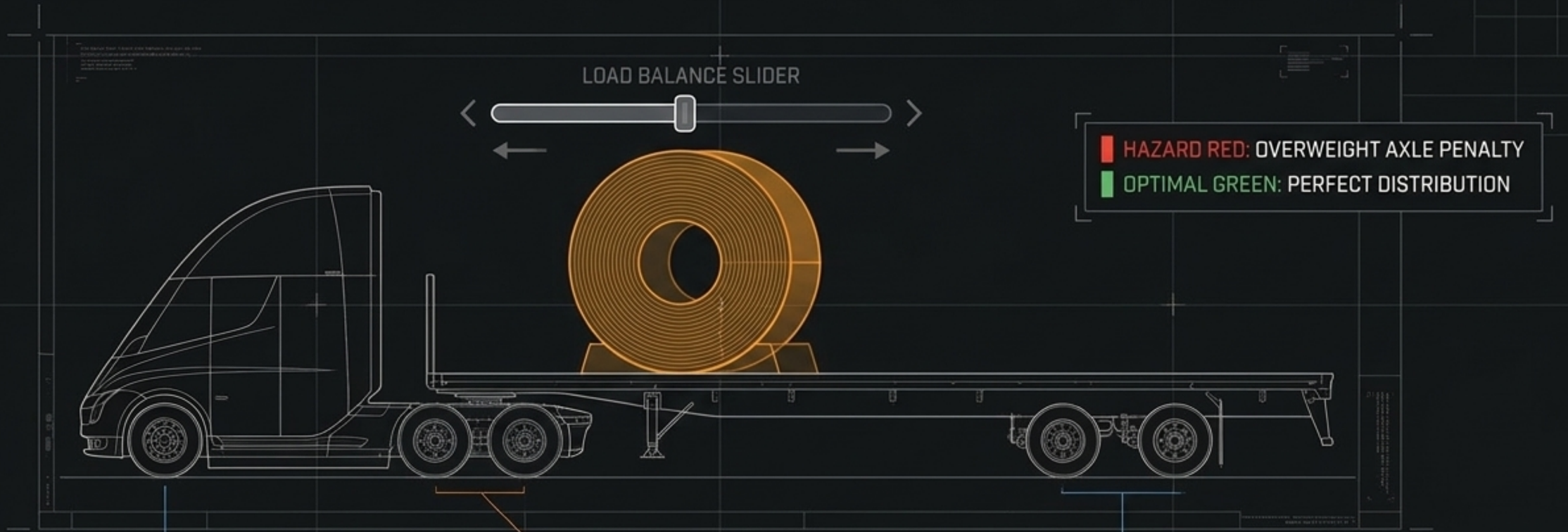
THE TESLA SEMI CANVAS AND THE 48,000 LB SPATIAL PUZZLE



The player isn't just tying down boxes; they are solving a complex optimization problem bounded by the precise maximumum payload specifications of the 2026 production Tesla Semi.

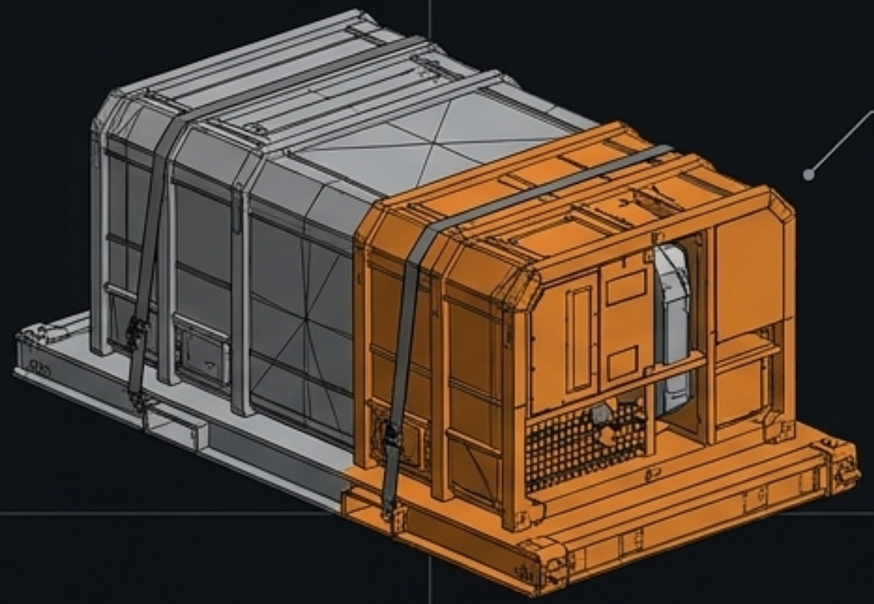
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The Federal Bridge Formula as an Interactive Balancing Act



Gemini Notebook

Aggregating the Working Load Limit (WLL)



Aggregate WLL must equal at least 50% of total cargo weight.

Cargo Weight:	40,000 lbs
WLL Target:	20,000 lbs

Current Aggregate WLL

20k Target

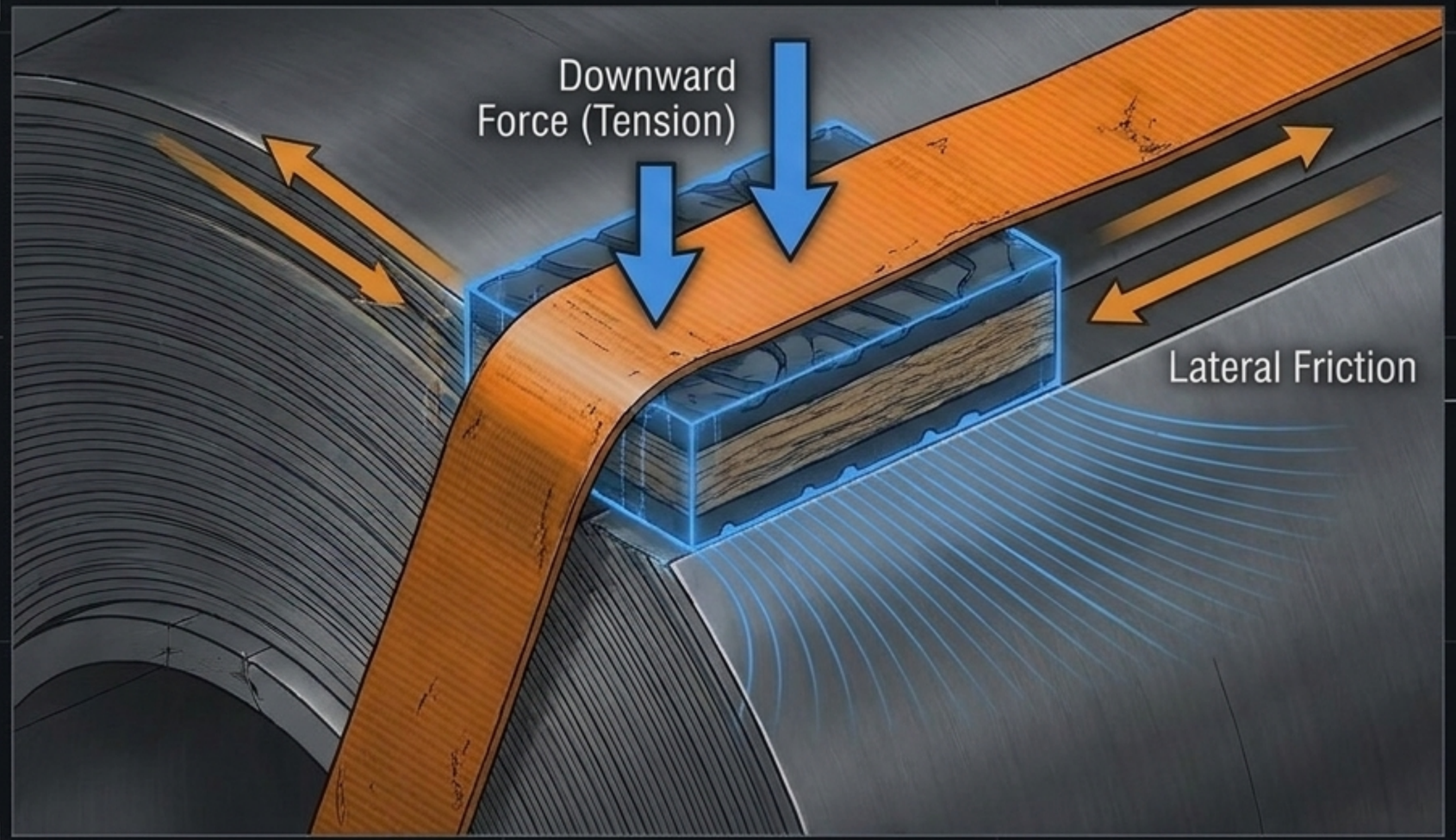
24,000 lbs

4-inch Webbing = 5,400 lbs WLL	4-inch Webbing = 5,400 lbs WLL	Grade 70 Chain = 6,600 lbs WLL	Grade 70 Chain = 6,600 lbs WLL

COMPLIANT STATE REACHED

Gemini Notebook

The Micro-Physics of Dunnage and Strap Tension

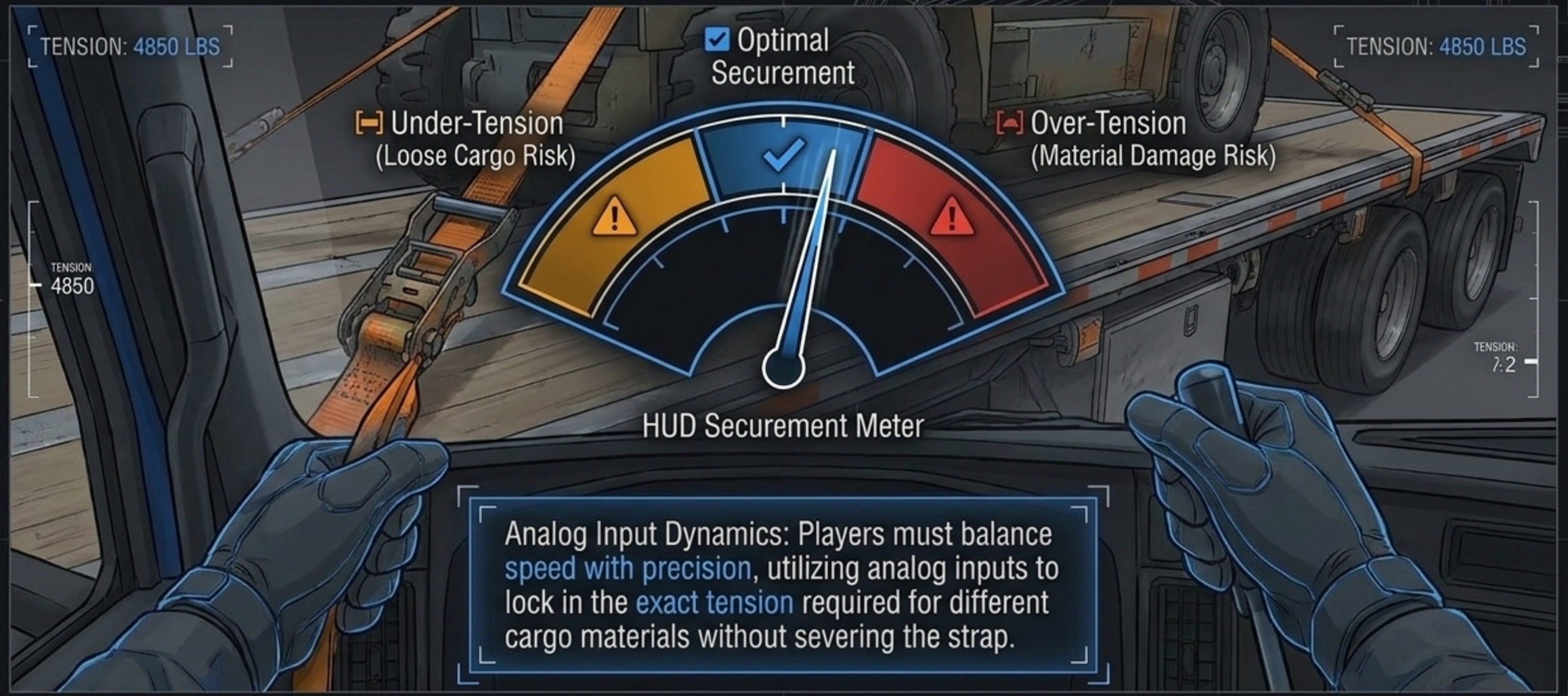


The Friction Mechanic: Tension requires downward force perfectly balanced by lateral friction.

The Failure Condition: Bypassing dunnage nodes on sharp edges results in strap severing under load within the game engine physics core. This triggers immediate task failure and safety flags.

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Heads-Up Display: The Tension Mini-Game



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Mechanics Translation: Real World to Game Engine



Real World Action	Game Engine Input
Calculate Cargo Weight	Analyze Manifest UI Screen
Position Trailer for Loading	Drive/Reverse into gantry crane blueprint zone
Throw & Ratchet Straps	Parabolic trajectory aim + Tension mini-game
Check Edge Wear	Target and apply Dunnage nodes via UI reticle

TRANSLATION PROTOOOL ACTIVE

COGNITIVE LOAD: 1:1 MAPPING

COGNITIVE LOAD: 1:1 MAPPING

Gemini Notebook

The 40/30/30 Load Secure Scoring Engine



Accuracy (40%)

Perfect WLL math; exacting axle weight balance (12k/34k/34k); zero deviation from center of gravity.

Efficiency (30%)

Time taken to secure the load; optimal, minimalist strap usage (no wasted inventory).

Safety (30%)

Dunnage correctly applied; zero FMCSA Part 393 violations triggered upon final inspection.

XP Calculation Formula:

$$XP = (Accuracy * 10) + (Efficiency * 5) - (Flags * 50)$$

Note: A single safety flag ruins the entire run.

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Skill Progression and Certification Tiers



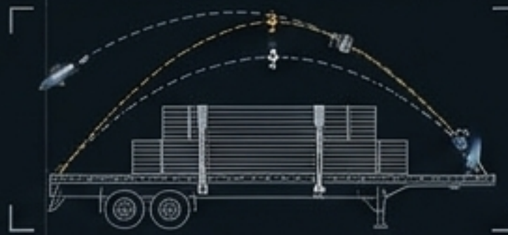
Bronze (Rookie)

Basic box trailer loading. Focus strictly on gross vehicle weight distribution along the axles.



Silver (Operator)

Flatbed uniform loads (e.g., stacked lumbez). Introduces strap thzooing trajectories and basic tensioning.



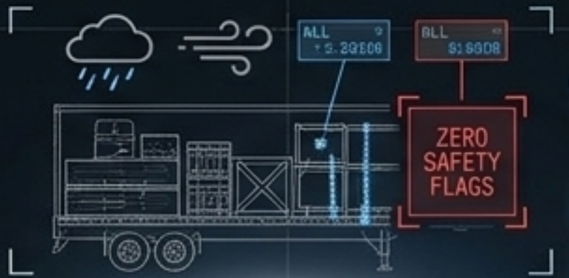
Gold (Pro)

Irregular loads (heavy machinery, offset steel ccils). Introduces complex WLL math aggregation and dunnage nodes.



Platinum (Expert CDL)

Mixed manifest loads, dynamic weather altering strap tension physics, mandatory zero safety flags to graduate to carrier hiring pools.



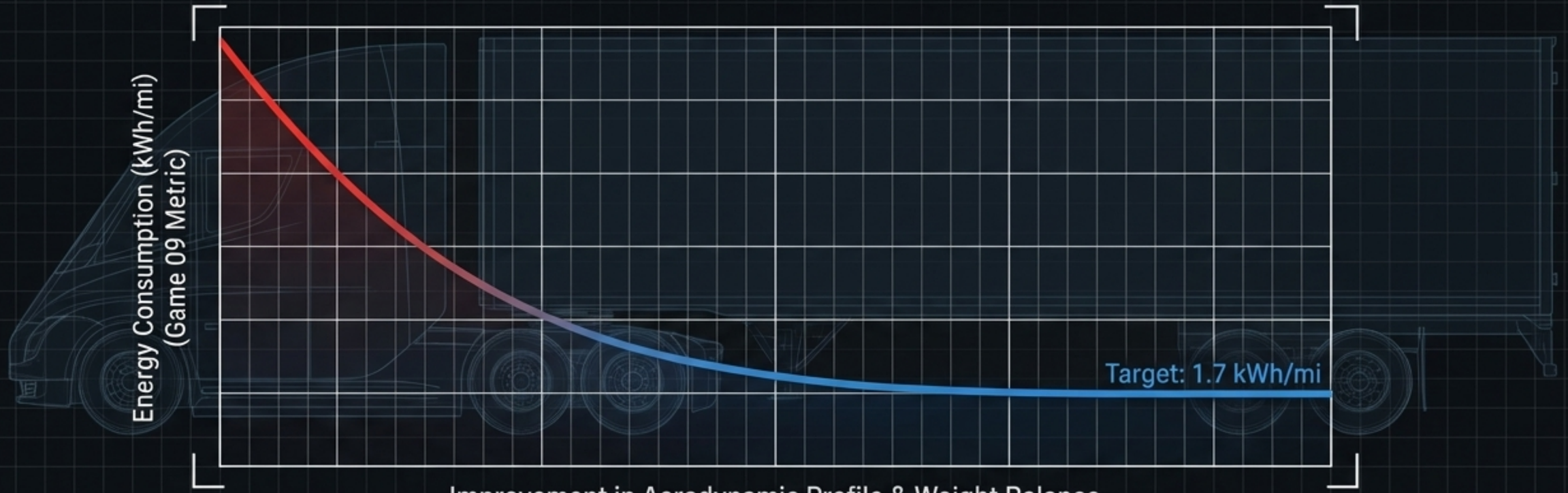
CARRIER HIRING POOLS

COGNITIVE LOAD TRAJECTORY

CERTIFIED EXPERT CDL

Gemini Notebook

The Ripple Effect: Weight Balance Dictates Energy Efficiency



Load securement determines aerodynamics. Axle distribution dictates tire friction. Poor securement cascades into excessive drag and uneven rolling resistance, directly destroying the Tesla Semi's 500-mile range and making the 1.7 kWh/mi target mathematically impossible.

Mastering Game 04 is the prerequisite for mastering Game 09 (Battery Management).

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