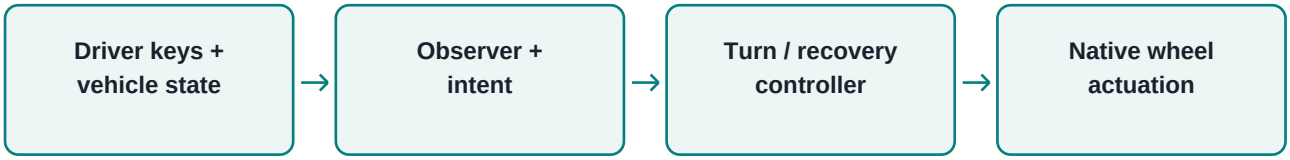
Runtime kda25 / Converter V2.0 kda12 | Updated 2026-10-28

01 Drive-by-wire model

Kerbal Drift Agency V1.0 - SC technical guide. SC means Stability Control; the implementation is also a keyboard drive-by-wire controller. It requests steering, engine authority and selective wheel braking. It does not add artificial sideways body forces or rotate the vehicle directly.



Flight SC mode is independent of the editor chassis preset. The user may switch Road/Sport/Race/Drift from the HUD while driving. A Race chassis does not force Race SC. Suspension and grip remain editor settings.

Profile	Intended behavior
Road	Race-derived predictive recovery with lower corner demand, faster traction suppression and slower throttle buildup. With SC and TCS on, engine authority is capped at 60%.
Sport	Race-derived recovery with a moderate corner budget and at least 0.35 s throttle rise. Allows more wheel spin than Road.
Race	Fast turn-in, predictive yaw/slip recovery, neutral settling and driver intent blending. TCS may permit controlled slip; it is not a guarantee against oversteer.
Drift	Natural oversteer, predictive yaw damping, progressive keyboard trim and adjustable SC lock. TCS is forced off; automatic SC yaw brakes are disabled.

Race and Drift tuning in this package are the tested baseline. Road/Sport derive the Race recovery law through separate state objects, so changing modes does not reuse stale recovery state blindly. The suggested GT3 1-10 intervention HUD feature is not implemented.

02 Observer, intent and activation

Raw wheel steering and trim are captured before SC output. The controller reads local forward/lateral velocity, slip angle, yaw about vehicle up, yaw/slip derivatives, roll, wheel contact and axle load imbalance. Wheelbase, tire capacity and imported aerodynamic force contribute to the ordinary cornering budget.

Conventions

Telemetry local x is right, y is forward and z is down. Slip is atan2(lateral, forward), in degrees; yaw is rad/s. A key sign alone does not prove corrective steering: compare it with velocity/slip and the rig's steering convention. Vehicle orientation and movement direction differ during a drift.

Filtering and confirmation

The state observer uses about 0.08 s smoothing for slip/yaw and 0.04 s for derivative estimates. Slide evidence is confirmed for roughly 0.10 s unless urgent instability needs immediate attention. Settling includes a roughly 0.20 s confirmation window. These delays are accounted for by prediction, rather than waiting for a large filtered body angle.

The recovery law anticipates increasing slip and excessive yaw, while clamping predicted sign changes so it does not initiate an opposite slide before the measured slide crosses zero. Neutral settling increases damping as the driver releases steering. The approach is a bounded predictive controller, not a classic integral PID or a heading-lock autopilot.

Validity gates

Packed vessels, reverse/very low forward speed and insufficient grounded wheels suspend forward stability correction. Loss of contact resets or holds appropriate recovery states. Logs with jumps should be evaluated in grounded segments; contact forces and visual states can lag a newly issued command by one physics step.

03 Turn-in budget and recovery authority

This page describes ordinary recovery. For assisted imported Race/Sport above 234 km/h, the final kda25 guard progressively overrides this path; see Extreme-speed Race/Sport guard.

The speed limit applies to ordinary requested cornering. It must not also starve recovery countersteer. These paths have separate bounds, and the runtime bypasses stock KSP automatic steering reduction to control the limit itself.

Ordinary steering

The approximate target wheel angle is atan(lateral_budget * gravity * wheelbase / speed^2). Baseline lateral budgets are 0.48 g Road, 0.70 g Sport and 0.95 g Race/Drift before per-car scaling. Roll and unloading further reduce turn-in demand.

Imported capacity uses calibrated front tire peak and aerodynamic support relative to weight, with clamps. Imported Race applies a 1.25 preset factor; Sport applies 1.10. Cornering allowance, -40% to +60%, multiplies that capacity. It still affects ordinary turn-in demand. It is a tuning allowance, not a measured friction ellipse or a promise of maximum possible lap speed.

Recovering a slide

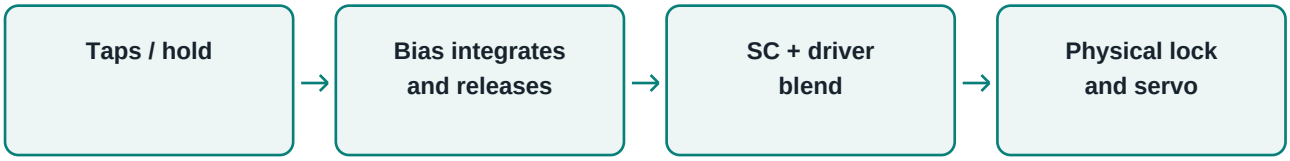
Race recovery cap is 32 degrees. Road/Sport call the Race recovery law and also use its 32-degree recovery cap, scaled by assistance and physical angle. Drift uses its 25-75 degree SC steering-lock setting, default 50 degrees.

A driver countersteering against a confirmed slide can use recovery authority rather than only the normal speed limit. Direct recovery wheel actuation is faster; ordinary turn-in retains normal geometry. During confirmed recovery the geometry limit is bypassed where necessary so high-speed correction does not collapse to a tiny angle.

Drift reserves up to 15 extra degrees for keyboard input beyond the SC lock, within the physical steering range. Therefore an SC lock of 50 degrees may reach 65 degrees with driver assistance; SC alone still has the selected 50-degree limit. Physical saturation always remains a final bound.

04 Progressive Drift keyboard control

The driver input is a progressive bias around the controller's stabilizing steering. Pressing a key no longer immediately replaces all SC output with full opposite lock. This preserves usable slide angle while allowing precise donuts and weight transfer.



Tapping and holding

Tap duration and frequency build the bias. Repeated taps converge toward a held-key effect; release smoothly unwinds it. Holding a key builds more authority. Changing to the opposite key reverses the bias quickly but progressively. The bias is bounded, so it cannot accumulate without limit.

Countersteering less is also meaningful: driver intent can reduce the controller's countersteer to tighten the drift instead of snapping straight into understeer. A separate extra-lock reserve lets the driver countersteer more at saturation. Neither direction should discard predictive yaw damping.

Natural transitions

When the driver releases steering during a weight transfer, the controller follows evolving slide/yaw rather than locking the old heading. Returning to a key adjusts the new slide. Drift prediction damps excessive yaw without applying the non-Drift straightening goal.

Direction-change smoothing can be as short as 0.035 s in Drift, with a slower bounded bias ramp and release layered above it. A fast servo does not mean every press instantly produces maximum angle.

Braking while drifting

B is front-only in Drift, allowing speed/angle adjustment without a rear service-brake lock. The separately bound hold-key handbrake locks rear wheels, including when ABS is enabled. TCS cannot be enabled in this mode. Engine braking remains the pre-existing drag approximation; it was not changed for these steering updates.

05 TCS, ABS and flight controls

Control	Effect
SC enabled / assistance	SC controls steering recovery, turn-in budget and selective yaw brakes. Assistance scales intervention. At zero assistance correction ceases.
Allowed oversteer	Defines the slip tolerance before recovery grows. Larger values allow more slide and can worsen delayed transitions; this is not identical to the actual instantaneous slip angle.
Cornering allowance	Changes ordinary lateral demand per vehicle. Raising it can expose instability that a lower turn budget masks. Recovery lock has its own bound.
Stability throttle aid	Scales allowed SC engine intervention. TCS off removes the SC throttle-cut path; severe roll protection is handled conservatively.
Keyboard steering smoothing	Controls command progression within mode-specific fast reversal/release rules.
Drift steering lock	HUD quick access to SC lock; keyboard reserve adds up to 15 degrees within physical range.
TCS / ABS / All off	Independent traction and anti-lock switches; All off disables those and SC. All on in Drift still leaves TCS forced off.

Traction braking handles longitudinal wheel spin on driven wheels. SC yaw braking supports a different task: suppressing excessive rotation in non-Drift modes. Turning off TCS does not automatically turn off SC yaw brakes. There is no independent yaw-brake-only UI switch yet.

Road is more restrictive, including its 60% engine cap only when SC and TCS are enabled. Sport retains full engine authority with a slower pedal buildup. No mode guarantees that a sufficiently powerful car, abrupt input, a jump or low-grip terrain cannot spin.

Sources: source/plugin/KDAController.cs, KDACore.cs, RoadSportCore.cs, DriverAidsCore.cs, KDAWheelBrakes.cs and KDACarControls.cs. Flight-adjustable settings are exposed in PAW; mode, aids, Drift lock and telemetry are accessible from the HUD.

06 Telemetry-led tuning and diagnosis

Record a short straight baseline, repeatable turn with held input, release-to-recovery, then corrective taps. Repeat with the same car, surface and speed, changing only one setting. Mark each attempt when practical; describe what happened afterward if precise event marking is difficult. Runs on grass and runway should be compared separately.

Question	Values to inspect
Late opposite kick?	Raw steering, filtered/measured slip, slip rate, yaw/yaw acceleration, recovery bias, settling weight and issued output. Look for correction persisting after convergence.
Insufficient steering?	Turn limit vs recovery limit, SC correction, driver bias, wheel steer state and actual angle. Compare the requested sign/angle with physical saturation.
Power cut upsets balance?	Requested vs engine throttle, SC throttle scale, TCS torque scale, gear/shift state, wheel slip and load transfer.
Airtime or rollover?	Grounded wheel count, vertical speed, roll, per-wheel normalized load, suspension compression and aero force.
Setting changed mid-run?	Per-sample SC values and settings.csv. setup.cfg includes initial native grip, ratios, aero coefficients and module fields.

vehicle.csv and wheels.csv share sample/time keys; wheels carry part IDs linked in setup.cfg. Markers do not alter physics. Recording uses a background writer and reports dropped packets/errors in summary.txt. Settings change detection runs at 1 Hz, while key SC flight values appear every sample.

Engine torque at high rpm should be compared with the curve at that rpm and actual applied throttle, not the peak rating. High aero force does not rule out wheel unloading over rough ground. Analyze grounded intervals before attributing oscillation to the controller.

Regression requirements: hold/release and tapping at high speed; neutral settling without an opposite kick; airborne recontact; Drift transition and keyboard reserve; Road/Sport behavior; and unchanged Race/Drift traces when modifying other modes. See Prompts.pdf for scoped modification requests.

07 Extreme-speed Race/Sport guard

Runtime kda25 adds ExtremeSpeedGovernor for assisted imported Race/Sport cars, fading in from 65 to 80 m/s (234-288 km/h). At full weight, driver turn-in remains within the cornering budget and automatic yaw correction is capped at half that limit. Large slip-alignment recovery and automatic yaw-brake feedback fade out; electronic axle vectoring offsets are limited to three percentage points and yaw feedback fades out. Total drive allocation is conserved. Road, Drift, ordinary-speed calibration, suspension, grip and the separate rover ECU are unchanged. This trades large-slide automatic recovery for bounded intervention at extreme speed.

At extreme speed and fewer than two wheel contacts, steering retains a bounded command instead of raw full lock. This is a controller guard, not an artificial body force, traction increase or guarantee against rollover. SC OFF and intentional-slip paths retain their separate behavior.

08 Version, credits and licenses

Current runtime: V1.0 / 2026-10-28-kda25. Converter: V2.0 / 2026-10-26-kda12. Their build numbers are independent. Runtime behavior, audio controls and KK placement described here are supplied by the base GameData; the car-only converter does not upgrade that base.

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