VIRTUAL AIR TRAFFIC

END-USER MANUAL

Real-world-inspired traffic, interactive ATC and immersive airport operations for X-Plane 12

VIRTUAL AIR TRAFFIC 0.91 | November 2026

FOR FLIGHT SIMULATION USE ONLY
A practical guide to the full virtual-traffic environment, player ATC, the ATC Messages window and PLUS. Controller communications are simulated and must never be used for real aviation.

virtualairtraffic.com

Welcome to Virtual Air Traffic

Virtual Air Traffic (VAT) creates a living X-Plane 12 traffic environment from airline schedules, realtime observations, airport data and independently simulated virtual pilots. Version 0.91 extends the world with recorded real-world routes, historical ADS-B arrival vectors, aptOPS airport configuration, expanded IFR and developing VFR services, ModelBridge/AIG models and a personal online flight log.

This handbook follows each working part of VAT from setup through aircraft operations, player ATC and the web services. The original traffic-engine explanations remain in place, while functionality introduced through 0.91 is covered where it belongs. Dedicated chapters explain aptOPS, realTaxi, ModelBridge, VFR, historical arrival vectoring, voice control, the website and your flight records. Experimental and unavailable controls are identified explicitly.

What VAT is - and what it is not

A traffic simulation

VAT injects and flies its own traffic, using its own virtual pilots, ground routing, ATC logic and airport coordination.

Real-world inspired

Schedules and realtime data help determine which flights belong in the world. Once injected, a VAT aircraft is simulated rather than glued to a live radar coordinate.

Independent of X-Plane AI flying

VAT does not hand its aircraft to X-Plane standard AI flight logic. It can, however, publish selected aircraft to X-Plane TCAS/multiplayer slots.

Pilot-centered

The player is never steered, speed-controlled or commanded by VAT. The traffic engine yields, sequences or adapts its own aircraft around the player.

Online where it matters

Portal authentication is used for schedule and realtime services. SimBrief, update checks and other online information also require connectivity.

A beta product

Traffic logic is extensive but still evolving. Complex scenery, unusual taxi networks, missing navdata and very dense airports can expose edge cases.

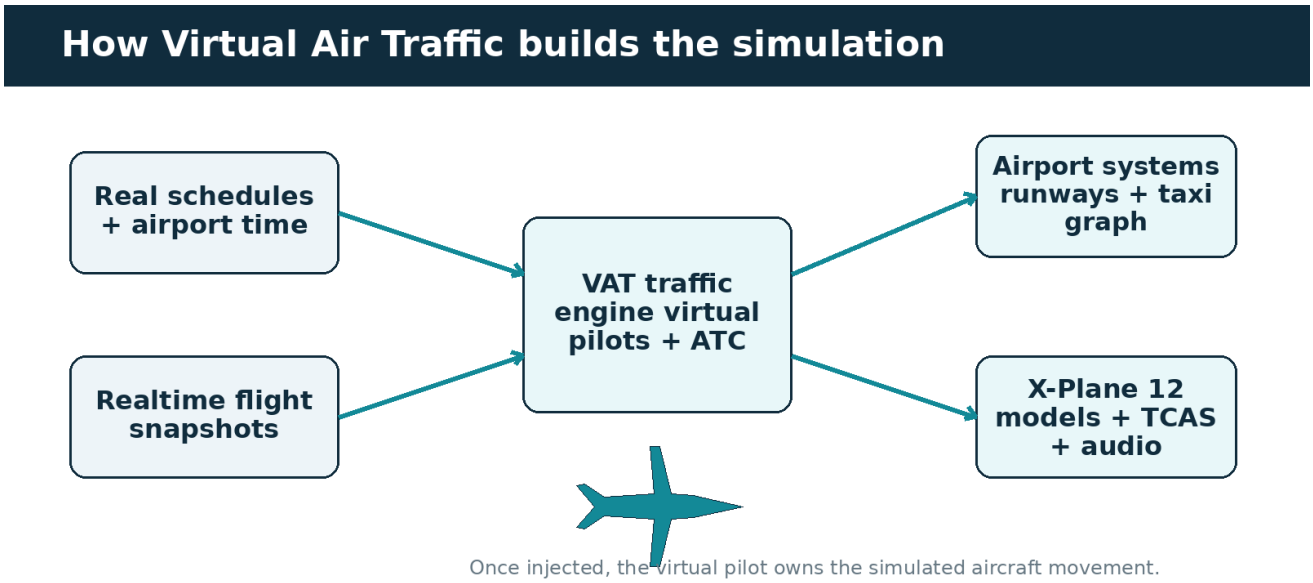


Figure 1. External traffic information is turned into VAT-controlled aircraft, then coordinated through airport and X-Plane integration.

READING THE MANUAL
Each numbered main chapter begins on a fresh page. Chapters are organized by functionality, with the traffic-world systems first, player-facing ATC and PLUS later, and website/Portal services near the end. Appendices supply settings, states, thresholds, release history and troubleshooting references.

Explore the manual by functionality

Start with the traffic environment, then move into airport operations, player ATC and the online companion tools. The latest features are explained in the chapters where you use them, not confined to a version-change list.

Area	What you will learn
Traffic world	Schedules, recorded routes, traffic ranges, virtual pilots, holds, runway safety and aircraft models.
Airport operations	Custom scenery, aptOPS rules, stands, tugs, taxi conflicts, realTaxi and airport-specific procedures.
Pilot ATC	IFR and VFR requests, COM1, speech, radio readbacks, direct-to, level selection and historical arrival vectors.
Website + Portal	Downloads, account and PLUS access, aptOPS editing, ModelBridge, Live Flights and your private flight log.

Contents

The chapters below are grouped by the part of VAT you want to use. Each main chapter begins on a new page; Word Navigation also lets you jump directly to its heading.

No.	Chapter / functionality
01	Product overview
02	Requirements, compatibility and system philosophy
03	Installation, first run and Portal authentication
04	Quick start
05	How VAT builds the traffic world
06	Real-world routes for AI traffic
07	Traffic ranges, density and population rules
08	Scheduling, airport time and static population
09	The virtual pilot: gate-to-gate lifecycle
10	Airport data, custom scenery and navdata
11	aptOPS: published airport operations in VAT
12	aptOPS website: editing and reviewing airports
13	Parking, gate assignment and stand reservations
14	Animated pushback tugs
15	Ground Conflict Management (GCM)
16	Runway selection, traffic flows and weather
17	Internal ATC, runway protection and crossings
18	Arrival metering, dynamic holds, final sequencing and go-arounds
19	Runway exit, taxi-in and completed arrivals
20	The user interface
21	realTaxi guidance and compact ATC controls
22	SimBrief integration
23	Aircraft models: Bluebell and X-CSL
24	ModelBridge and converted AIG aircraft
25	Aircraft animation, lights and surface behavior
26	Contrails, touchdown smoke and wake turbulence

No.	Chapter / functionality
27	Static aircraft and weather-driven windmilling
28	General aviation statics and experimental VFR traffic
29	3D traffic audio
30	Desktop flight information labels
31	Virtual reality and VR labels
32	TCAS, Mode-S, squawk, ADS-B and wake publication
33	Follow camera
34	Performance, pause behavior and traffic-density tuning
35	Advanced configuration, commands and public datarefs
36	Troubleshooting
37	Operational limitations and expectations
38	Glossary
39	ATC Messages: your radio companion
40	ATC voices, speech and automatic readbacks
41	Every ATC action button
42	IFR airborne ATC, direct-to and level changes
43	VFR ATC and controlled-airspace requests
44	Historical ADS-B vectored arrivals
45	Fly the radio: a gate-to-gate adventure
46	Virtual Air Traffic PLUS
47	The Virtual Air Traffic website and Portal
48	Live Flights map and your personal flight log

CHAPTER 01

1. Product overview

A high-level map of the systems that work together whenever VAT creates, moves, displays and coordinates an aircraft.

The product in one sentence

Virtual Air Traffic is an X-Plane 12 plugin that builds a living traffic environment from real-world-inspired flight identities, observed route information and airport activity, then simulates its aircraft through a complete lifecycle using its own flight, ground, ATC, model, audio and display systems.

Three traffic populations

Population	How it enters the world	What it is for	Typical lifecycle
Scheduled departures	Generated from an airport departure schedule when the departure is approaching	Creates believable origin-airport activity	Parked/boarding -> pushback or taxi-out -> runway -> departure -> onward flight
Realtime / midair	Discovered from nearby-flight data and position estimates	Populates the surrounding airspace and arrival stream	Injected in flight -> VAT flight plan -> approach/landing -> gate when destination is simulated
Static aircraft	Created locally at suitable unused stands	Fills airport parking with believable decoration	Parked only; no normal flight plan, TCAS target, label or engine/sound lifecycle

IMPORTANT DISTINCTION

An arrival-board row is not the same thing as a physical inbound aircraft. The board can show an expected scheduled arrival before VAT has a live aircraft for it. Physical inbound traffic is supplied through the realtime/injected path and then flown by the virtual pilot.

A coherent world instead of a radar replay

When VAT discovers a flight, external data establishes context such as identity, approximate progress and destination. That context is used to create a flight inside the simulator. From that point forward, VAT owns the simulated movement. This design allows one aircraft to wait for a runway, another to yield on a taxiway, a third to slow on final and a fourth to go around because the runway is not available - all without forcing them to match a web-tracker coordinate every second.

The practical consequence is that the flight number, airline, origin, destination, broad timing and surrounding traffic pattern can be recognizable while the exact latitude, longitude or minute-by-minute progress differs from a live tracking service. This is expected behavior and is what gives the traffic engine enough freedom to maintain runway safety, ground separation and visually believable operations.

The systems you will encounter

Traffic Engine
Owns the aircraft list, population rules, scheduled/realtime creation, cleanup, pre-approach arrival metering, final sequencing and much of the periodic work.

Virtual Pilot
Per-aircraft logic that handles waiting, pushback, taxiing, takeoff, en-route flight, metered holds and rejoins, approach, landing, runway exit and parking.

Airport model
Runways, traffic-flow rules, parking positions, taxi nodes, active zones, weather context and procedure/navdata information.

Internal ATC
Controls runway ownership, takeoff/crossing clearance, arrival protection, gate assignment and selected conflict instructions.

Ground Conflict Manager
Continuously predicts near-term ground conflicts and decides which VAT aircraft must yield, queue, reroute or wait.

Integration layer
Aircraft rendering, labels, X-CSL/Bluebell matching, 3D sound, contrails, TCAS, wake data, public datarefs and the VAT interface.

CHAPTER 02

2. Requirements, compatibility and system philosophy

What VAT expects from X-Plane, the operating-system package and online services, and how its work distribution protects simulator smoothness.

Item	Current requirement / behavior
Simulator	X-Plane 12.
Operating system	Website provides a Windows x64 installer and a macOS archive; use the release intended for your platform. The supplied 0.91 source is the reference for functionality in this guide.
X-Plane plugin APIs	VAT uses modern XPLM 4.20-era APIs and is intended for current X-Plane 12 builds.
Internet	Required for Portal authentication, schedules, realtime traffic, update checks, SimBrief and online service data.
Aircraft models	Bluebell fallback, optional X-CSL and converted AIG CSL libraries. Model directories require a VAT restart after changes.
Virtual reality	The VAT interface and injected traffic work in VR; a dedicated compact VR label system is also available.
Recommended hardware	A modern multi-core CPU and ample memory are recommended for dense airports, high model variety and Full performance mode.
Cost	Core VAT is free to use. PLUS is an optional, account-linked beta subscription with feature availability described in Chapter 36; legacy eligible lifetime licences can also unlock the Plus tab.

Performance is designed into the architecture

VAT performs many different kinds of work: geographic searches, airport maintenance, taxi routing, model preparation, label formatting, sound updates, final sequencing, conflict prediction and ordinary per-aircraft movement. Running every expensive operation on every rendered frame would create avoidable CPU spikes, so the plugin deliberately uses several forms of work distribution.

- **Medium simulation slicing.** The active aircraft list is divided into three slices; one slice receives the heavier simulation pass on a rendered frame. Full mode processes all slices each frame.
- **Asynchronous preparation.** X-CSL object preparation, geometry discovery and selected navdata work are moved away from the main frame loop where practical.
- **Spawn queues.** Creation work is queued and generally limited to one aircraft/model creation per frame so a busy airport does not request many heavyweight creations at once.
- **Periodic maintenance.** Population and airport maintenance runs on longer intervals instead of being repeated constantly.

- **Non-blocking cleanup.** Cleanup and removal paths are structured to avoid large pauses while aircraft are retired or recycled.

What the performance counters mean

The Settings page reports the current traffic-engine loop cost, the highest value observed, the most recent periodic-spawn cost and a microstutter count. In the current traffic-engine implementation, the microstutter counter increments when a VAT traffic-engine loop runs for roughly 20 ms or more. The number is useful for comparing settings on the same system; it is not the same thing as total X-Plane frame time because scenery, the user aircraft, graphics, weather and other plugins have their own costs.

PRACTICAL EXPECTATION

Full mode and 100% density are intended to expose the richest traffic world. They are not a requirement. Medium mode, reduced density and disabling static parking are normal operating choices on systems that need more CPU or GPU headroom.

CHAPTER 03

3. Installation, first run and Portal authentication

From the installer to a fully connected first session, including the startup work that can make the first few seconds look quiet.

Installation

1. Create a Portal account at virtualairtraffic.com. The email address and password are used by the plugin to authorize online traffic services.
2. Download the package for your operating system from the Portal and install it with its supplied folder structure beneath X-Plane 12/Resources/plugins. The website snapshot contains a Windows x64 installer and a macOS archive; check release availability and the instructions supplied with your package.
3. Start X-Plane 12. The Plugins menu should contain “Virtual Air Traffic (open / close)”.
4. Open the VAT window. In Traffic Manager, enter the Portal email and password and choose Authenticate.
5. Under Settings, choose optional X-CSL and/or converted AIG model roots and enter a SimBrief username if you want flight-plan integration. Model directory changes require a restart. PLUS users can also enable the developing VFR/GA controls, speech recognition and enhanced voices.
6. Allow the airport parser, model metadata and online downloads to settle. A first run can take longer than a later session because caches and derived model data may still be prepared.

What happens during startup

VAT does not treat the first rendered frame as a cue to create every possible traffic item immediately. Airport data has to be loaded, scenery overlays evaluated, model metadata prepared, Portal authorization completed and online traffic data requested. The traffic engine begins normal population only when the relevant prerequisites are ready. On a complex scenery installation, it is normal for the interface to appear before the airport population is complete.

Startup notifications

- **Portal reminder.** Shown when online credentials still need to be configured.
- **Update available.** The plugin can notify you when the VAT version service reports a newer release.
- **TCAS ownership conflict.** Only one plugin can own X-Plane multiplayer/TCAS override slots. VAT reports the current controller and continues running its own simulation while it waits to retry.
- **Exception information.** The plugin has an exception/crash-handling path intended to report VAT faults without attributing unrelated simulator failures to VAT.

First-run model preparation

When X-CSL is enabled, some objects need derived .vat.obj copies so VAT can provide the animation datarefs, offsets or texture handling expected by its aircraft simulation. This work is cached and performed in the background where practical. The first visit to a traffic-dense airport can therefore take longer to fill than a later visit using the same model library.

If the airport initially looks empty, verify Portal authentication and Traffic Density, then allow the parser and model system several seconds before judging the final population.

What to configure for player ATC

To participate in the new radio workflow, load a current SimBrief IFR route; ensure your aircraft is at the filed origin; power avionics and COM1; tune a published station providing Delivery, Ground or Tower as required; then open ATC Messages from the plugin interface, Plugins menu or a bound command.

Clearance availability depends on the station, COM1 power, your flight rules and aircraft state. A green traffic-population indicator alone does not authorize taxi, runway entry or takeoff. Disabled action buttons can reflect missing prerequisites, controller role or beta limits.

Plugin updates and build information

VAT includes SkunkCrafts updater compatibility and can notify you when its own version service reports a newer release. In Settings, the update-notification checkbox controls the startup popup; turning the popup off does not install or block an updater package.

If an update changes aircraft models, generated .vat.obj cache files or airport parsing, allow extra time at first startup. Your Portal authorization and installed model library still affect what appears. When requesting technical support, include the version displayed in the plugin window, your X-Plane version and a short description of what you observed.

Recent compatibility maintenance includes X-Plane 12.4.x beta ImGui changes, sound-worker concurrency fixes and non-blocking interface work. These are stability improvements rather than new controls that require configuration.

CHAPTER 04

4. Quick start

A short path to a representative VAT session before you begin tuning airports or advanced settings.

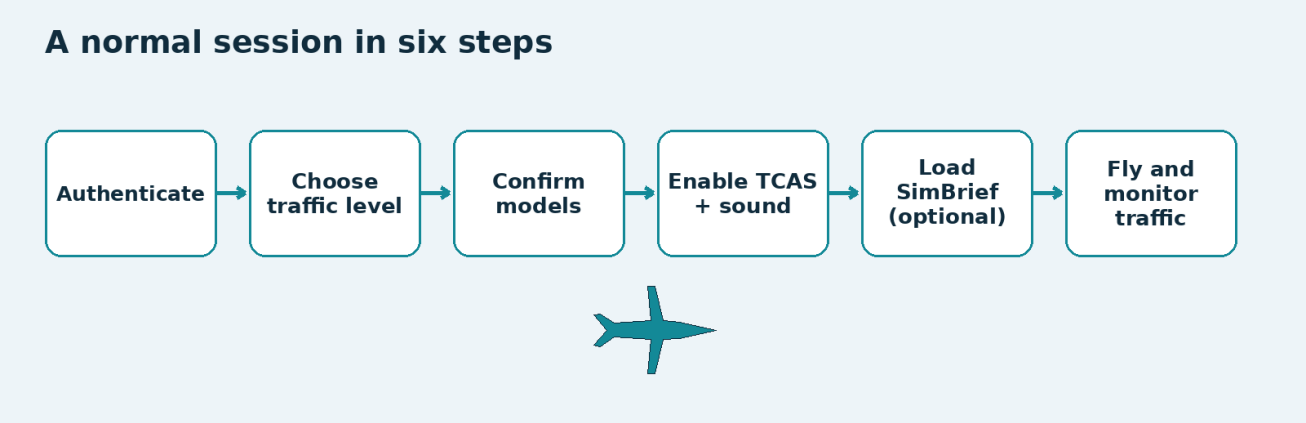


Figure 2. A normal session usually needs very little configuration after the first successful setup.

1. Authenticate in Traffic Manager and confirm the Portal status is successful.
2. Start with Full performance mode and Traffic Density near 100% when your system can sustain it. These settings expose the intended maximum traffic picture; reduce them only when you need headroom.
3. Confirm the model status. X-CSL is preferred when a usable library is configured; Bluebell remains available as a fallback.
4. Leave TCAS updating and Sounds enabled unless another traffic plugin must own X-Plane slots or you deliberately do not want traffic audio.
5. Leave Disable static spawns off when you want parked airport decoration. Turn it on when you want to focus on moving traffic.
6. Leave Hide airplanes off in normal use. This control suppresses VAT rendering, contrails and traffic sound without stopping the logical traffic world.
7. If you use SimBrief, enter the username and confirm the loaded origin, destination and runway context. VAT refreshes the plan automatically during the session.
8. Use Departures, Arrivals and Nearby to see what the traffic engine is doing. Follow a live aircraft or expand a label when you want to observe the virtual pilot in detail.
9. Use Airports > Runways only for deliberate manual runway control. Manual selections outrank SimBrief and weather. Use Airports > Arv. Gates to reserve one or more stands for your own arrival.

A GOOD FIRST TEST

Use a well-served airline airport, 100% density, Full mode, successful Portal authentication and Direct Model Matching Only disabled. This removes the most common reasons for seeing little traffic and lets you learn the product before tightening model or performance filters.

CHAPTER 05

5. How VAT builds the traffic world

The path from schedules and realtime observations to aircraft that are completely controlled by the VAT simulation.

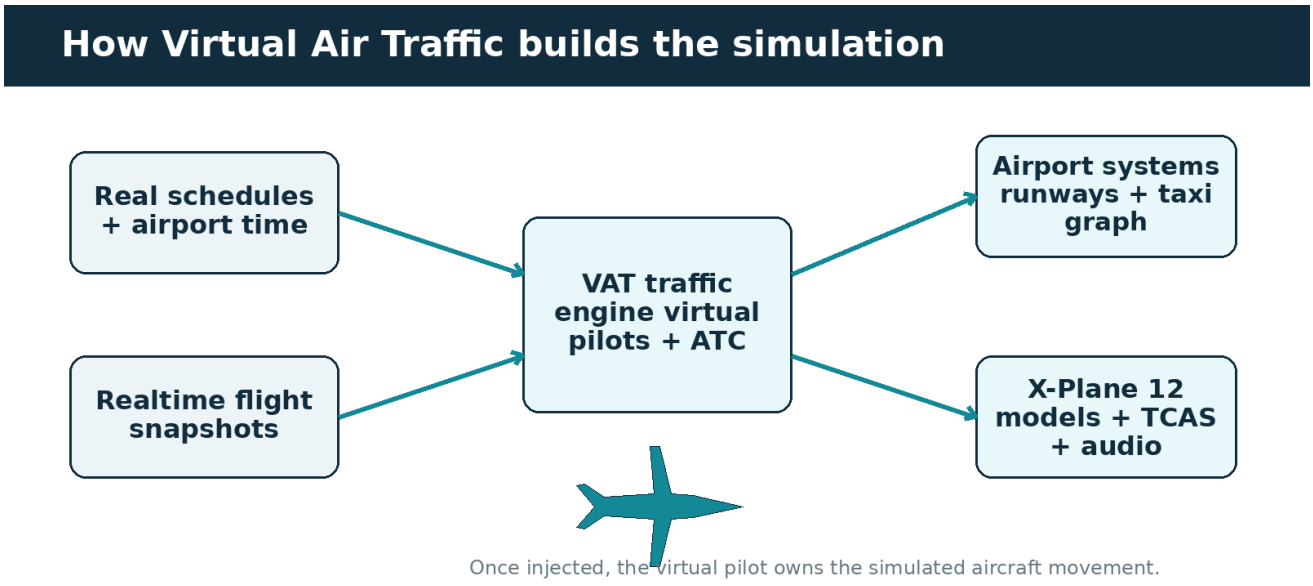


Figure 3. VAT uses outside data to decide what belongs in the world, then hands movement to its own simulation systems.

Schedules describe expected airport activity

Airport departure schedules are interpreted in the airport local timezone. A schedule row does not automatically mean a 3D aircraft must exist immediately: VAT first checks the departure window, available parking, operator/type compatibility, model availability, the player position and local traffic constraints. This distinction prevents airports from spawning a large backlog of flights simply because the simulator session began after their scheduled time.

Realtime observations describe nearby airborne traffic

The realtime path periodically obtains nearby-flight information around the player. Candidate flights pass duplicate checks, density filtering, range checks, origin/destination handoff rules and model matching before an aircraft is queued. The external observation is therefore the seed for a VAT flight, not a continuous remote-control signal. Once the object has been created, VAT constructs the flight plan and the virtual pilot takes over.

Airborne injection altitude and speed

For newly discovered realtime traffic, VAT does not start every aircraft at one generic cruise state. A flight on the arrival half of its trip is placed on an approximate 300 ft per NM descent profile above destination elevation, with a 3,000 ft AGL floor and its nominal cruise altitude as a ceiling. Nominal en-route speed also follows broad aircraft scale: light props use about 130 kt, regional turboprops about 270 kt, and regional jets, narrow-body and wide-body traffic about 450 kt before lower-altitude or procedure limits are applied. On the selected approach, published CIFP altitudes are preserved; when the final approach waypoint has no usable altitude, VAT derives one for roughly a 700 fpm descent at the 160 kt final-approach reference speed. These values seed VAT's own simulation rather than trying to reproduce an external tracker altitude exactly.

The airport model supplies operational constraints

Runway ends, traffic-flow restrictions, active zones, taxi nodes, parking positions, custom scenery overlays, weather and CIFP procedure data form the operational context around every aircraft. A parking spot that visually exists may be rejected because its operation type is wrong, the aircraft is too large, a neighboring stand would clip, the player is there, a pushback corridor is active or the stand has been reserved for the user.

Simulation time is authoritative

VAT follows the simulator timing model. When X-Plane is paused, movement and traffic-engine timers are paused with it rather than accumulating a large backlog of elapsed real time. When the simulator resumes, aircraft continue from their current state instead of receiving a catch-up burst of movement or timed events.

WHY THIS ARCHITECTURE MATTERS

The separation between data discovery and simulated movement is what makes coordinated taxiing, go-arounds, runway protection, ground yielding, wake publication and gate arrival possible. It also explains why a VAT aircraft may not match a live-tracking website position exactly.

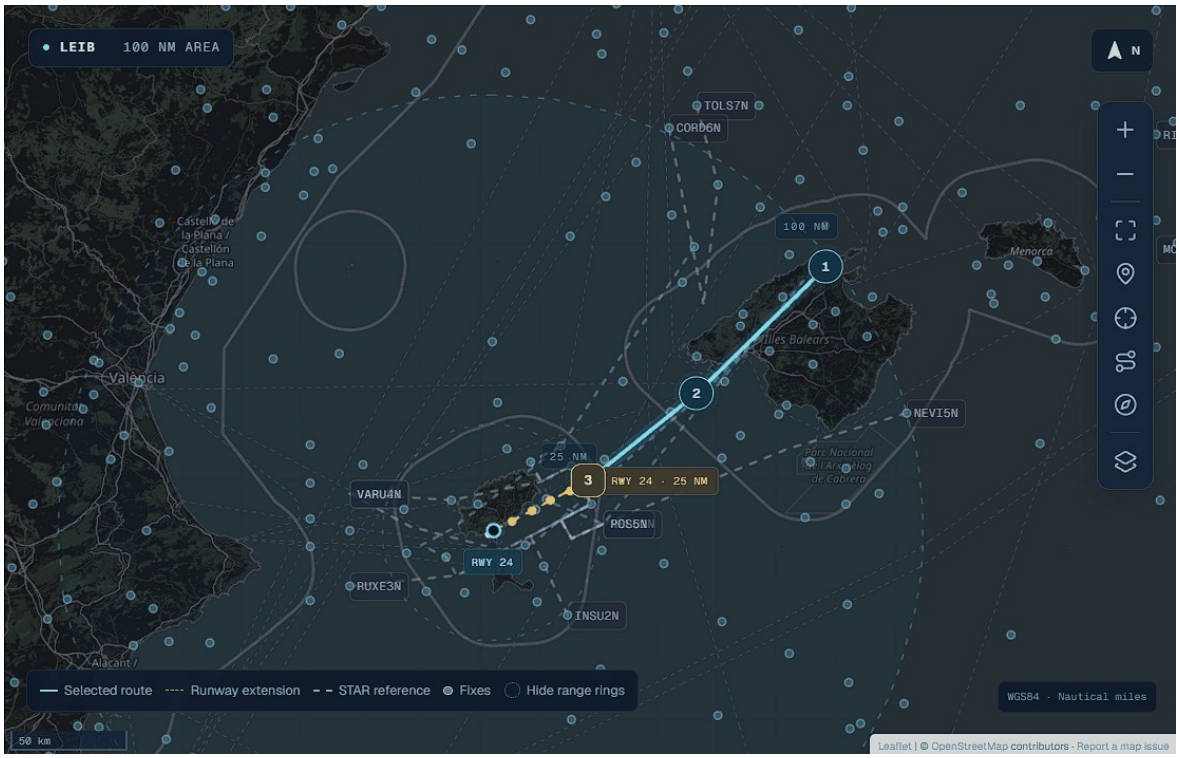
CHAPTER 06

6. Real-world routes for AI traffic

How version 0.91 uses recorded routes to make a simulated flight more recognizable without turning VAT into a radar replay.

Two separate ingredients: identity and movement

The ordinary schedule and realtime feed still tells VAT which flight belongs in the world, its broad position in the journey, its operator, type and origin/destination. Version 0.91 adds the possibility of a stored real-world route for that identity. A route may describe a series of intermediate points that an aircraft once flew. The virtual pilot can use those points when they are suitable rather than defaulting to a SID, a long direct leg and a STAR every time.



A flight-track illustration from the Virtual Air Traffic website: recorded routes provide context for the VAT simulation.

What happens to a matching AI aircraft

When a route candidate can be associated with the flight, VAT prepares a flight path that reflects those recorded turns and en-route waypoints. The aircraft still obeys the internal movement model, runway assignment, traffic metering, Ground Conflict Manager and final sequencer. An observed route is a path input, not an external joystick or a repeated request to snap to a real-world position.

The recorded paths are especially valuable when several arrivals converge from different directions: they give the airspace a mixture of real-looking entry tracks. Routes can also be displayed for relevant selected flights on the website Live Flights map. The map distinguishes an assigned ATC route from a similar historical route and identifies a type mismatch when relevant.

When no real-world route fits

Coverage varies with available flight, aircraft type and historical data. A missing, malformed or geographically inappropriate candidate leaves VAT using ordinary navigation and procedure fallbacks. This is expected and safer than manufacturing a route simply because an airport is busy.

Practical difference for the pilot

You may see more variety in traffic flows and recognizable intermediate turns, but you should still expect independent timing, spacing holds, taxi delays and go-arounds. A VAT aircraft is not required to occupy the same latitude and longitude as its real-world counterpart at every moment.

See also the later chapter on historical ADS-B vectored arrivals for how recorded arrivals can become spoken headings for your own aircraft; that is a separate player-facing workflow.

CHAPTER 07

7. Traffic ranges, density and population rules

Different traffic populations use different activation distances. Traffic Density changes how much new traffic is generated, but it is not a simple draw-distance slider.

Traffic activation ranges are separate subsystem boundaries

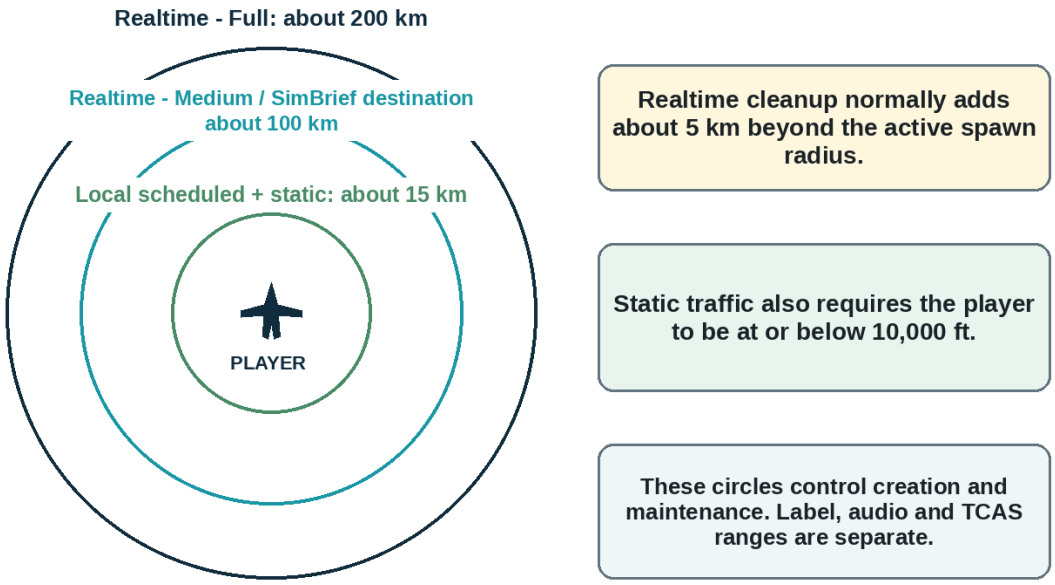


Figure 4. The range circles are subsystem boundaries, not one universal visibility distance.

Subsystem	Creation / activation	Typical cleanup / handoff
Normal scheduled departures	Nearest operational airport when the player is within about 15 km	Aircraft then follows its normal lifecycle; the local schedule population itself is tied to the airport area.
SimBrief destination scheduled traffic	Destination can begin preparation when the player is within about 100 km of the loaded SimBrief destination	Maintained while destination-bubble conditions remain relevant.
Static local traffic	Nearest airport within about 15 km; player altitude must be at or below 10,000 ft	Local static set is removed after leaving the area, at roughly 31 km.
Realtime - Medium	New traffic considered within about 100 km of the player	Normal distance cleanup around 105 km.
Realtime - Full	New traffic considered within about 200 km of the player	Normal distance cleanup around 205 km.
Early SimBrief-destination arrivals	Realtime arrival can qualify while both player and aircraft are in the destination area around the loaded destination	Ordinary distance cleanup can be relaxed while destination-bubble conditions remain true.

Real-world route candidates, not constant position mirroring

The 0.91 route service can supply recorded routes to suitable flights, giving the virtual pilot a path with meaningful intermediate waypoints rather than a simple direct-to-destination leg. The selected route must match available flight identity/airport context; if a valid result is not supplied, VAT keeps its normal flight-plan and procedure behavior. Discovery remains separate from simulation: a recorded path does not imply that VAT teleports a plane to an ADS-B radar return.

Origin and arrival handoff rules

A newly discovered realtime flight is not injected very close to its origin airport when the scheduled-airport system should own that departure environment. The current handoff threshold is roughly 15 km from the origin. On the arrival side, a new realtime flight normally needs more than about 25 km distance-to-go so there is enough room to establish procedure and approach behavior. These are creation rules, not invisible walls: an aircraft created farther away continues normally through those distances.

What Traffic Density changes

Traffic Density directly influences static parking targets and probabilistically filters new realtime injections before model creation. Scheduled departures are different: they are governed by the airport schedule window, per-pass creation cap and smoothing logic. Lowering density therefore reduces the general population without simply multiplying every scheduled row by the slider percentage.

Labels, audio and TCAS have their own ranges

The traffic world can continue beyond a display subsystem. Desktop labels are maintained at roughly 50 km, VR labels use a shorter range around 30 km, traffic audio stops around 2 km from the camera, and X-Plane TCAS is limited primarily by its available target slots. Do not use the disappearance of a label or sound as proof that the aircraft was deleted.

CHAPTER 08

8. Scheduling, airport time and static population

How scheduled departures are smoothed, how airport-local time is used, and why the number of parked aircraft changes by airport and time of day.

Scheduled departure window

A scheduled departure becomes eligible for physical creation when its airport-local scheduled time is no more than about 15 minutes in the future and has not already passed in the current session. The traffic engine creates no more than three new scheduled aircraft in one 15-second airport-maintenance pass. Eligible flights also receive randomized deferral, so a large bank of departures spreads across several maintenance cycles instead of appearing simultaneously.

Airport-local time and daylight saving

Schedule interpretation starts from X-Plane simulation time, then converts that moment into the airport timezone. Departure eligibility and airport occupancy therefore follow the clock you are flying in the simulator instead of the host computer clock. Daylight-saving and day-of-week handling are applied in that airport-local conversion, which is especially important when you change simulator time or fly in a different region from the Windows local timezone.

WHY A BUSY SCHEDULE CAN STILL LOOK CALM

A departure still needs a free compatible stand, a usable model and a successful creation pass. The schedule window and three-per-pass cap intentionally prevent the first moments at a hub from turning into an unrealistic mass-spawn event.

Static parking is capacity-based, not a raw percentage of all stands

VAT first builds a pool of usable positions: incompatible operation types, unsuitable sizes, player-protected stands, arrival-gate reservations, occupied positions, wing-clearance conflicts and other exclusions are removed before a target is calculated. The base target then varies with airport size. Airports with more than 80 suitable stands use about 60% as the base; airports with 41-80 use about 40%; airports with 10-40 use about 50%; very small airports under 10 use about 20%.

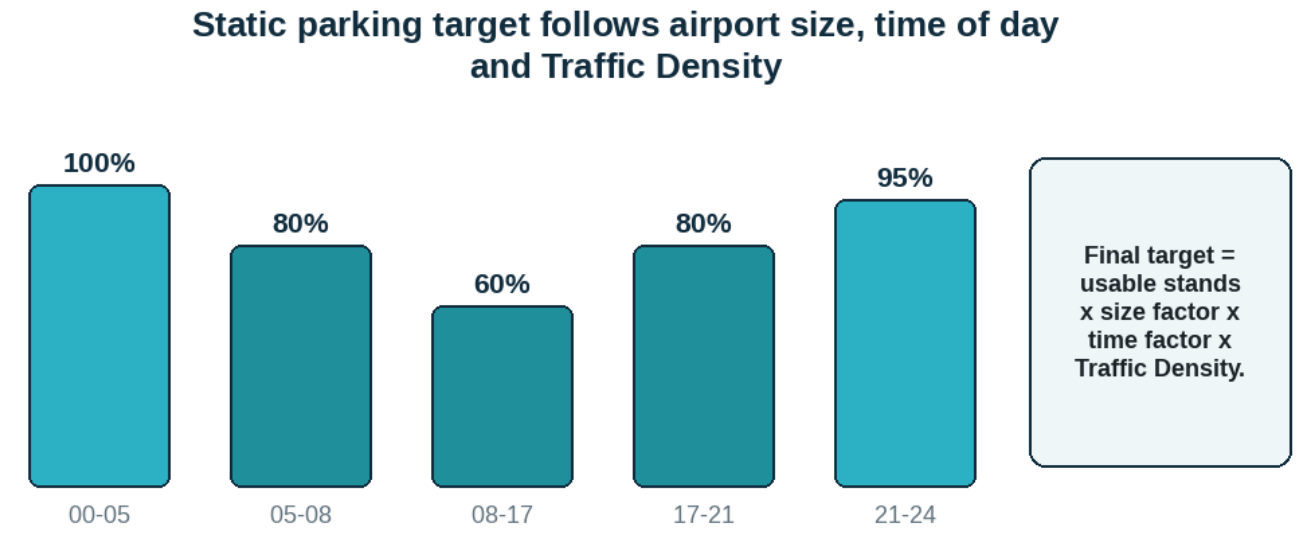


Figure 5. Static parking also follows a time-of-day factor before the Traffic Density slider is applied.

The ordinary time factor is highest overnight, reduced during the busiest daytime period and rises again in the evening. The visible result is a more natural rhythm: an airport can have more aircraft sitting on stands when the schedule is quieter and fewer decorative statics occupying gates when moving traffic needs them. Initial airline/cargo statics also use the airport's current-day operator statistics when available: an operator is not deliberately represented by an aircraft type that is absent from that operator's traffic at that airport on that simulated day. Operation type remains part of the same filter.

GA tie-down parking is a separate population

When an eligible PLUS account enables the work-in-progress GA/VFR switch, VAT can use a published GA-airport catalogue to add single-engine prop statics at compatible tie-down positions. Its dedicated occupancy percentage is separate from the ordinary airliner-static target. Missing published eligibility data is not treated as permission to populate arbitrary airfields.

Departure board versus physical aircraft

The Departures tab can list a valid upcoming schedule row before VAT has successfully found the aircraft a stand and model. A Follow button appears only after the row corresponds to a real traffic object. The same principle applies to the Arrivals board: expected traffic can be listed before a physical inbound is present. The boards are operational information views, not one-to-one render lists.

CHAPTER 09

9. The virtual pilot: gate-to-gate lifecycle

Each dynamic VAT aircraft has a virtual pilot responsible for turning airport and flight-plan intent into movement, configuration changes, holds and phase transitions.

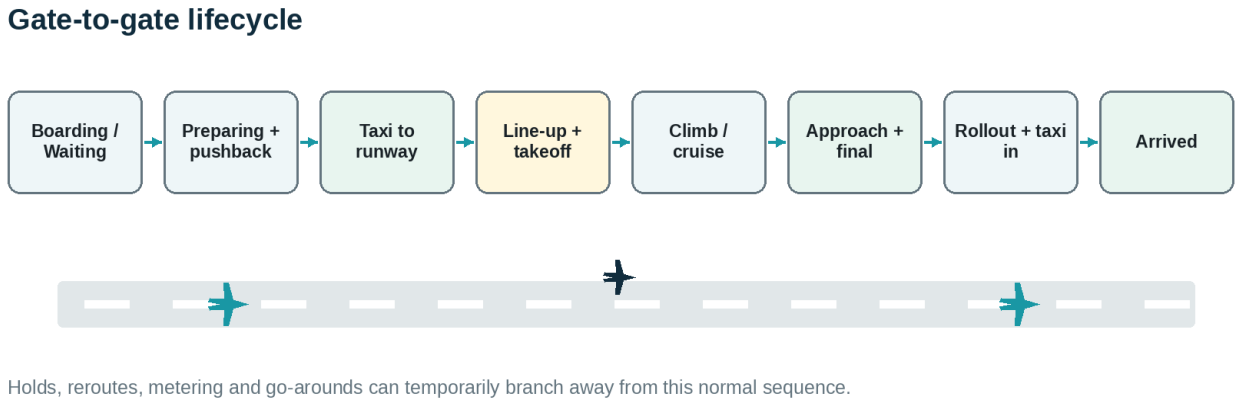


Figure 6. The normal aircraft lifecycle. Holds, reroutes and go-arounds can temporarily branch away from this straight sequence.

Boarding and waiting at the stand

A scheduled aircraft begins at a parking position and waits for its airport-local departure time. User-facing labels can distinguish Boarding, Waiting and Preparing to taxi even though the internal state machine remains intentionally compact. The departure stand stays operationally protected during the beginning of pushback/taxi so a new aircraft is not created into an area that only looks empty from a distance.

Preparing to taxi

Before movement begins, the aircraft transitions through preparation logic that can include engine start, beacon/light changes and a visible flight-control check when the selected CSL object actually implements aileron or elevator animation. Because CSL model animation support varies widely, the same logical check can look very obvious on one aircraft and invisible on another.

Pushback or taxi straight out

The virtual pilot decides whether the parking geometry calls for a pushback or a direct taxi departure. Terminal stands normally use pushback, while open stands or unusual parking geometry may permit a straight taxi. A pushback endpoint is accepted only when VAT can connect the aircraft to usable taxi geometry without placing the reverse path on a runway or protected active zone. After the aircraft has stopped and the tug detaches, VAT deliberately leaves a short preparation phase before normal taxi begins; the tug itself waits about five seconds before driving away.

Taxi to runway

Taxi routing follows the airport graph with turn-speed control, centerline steering, ground probing and active-zone awareness. The pilot requests speeds appropriate to straight sections and corners, while the Ground Conflict Manager is allowed to clamp those requests when another aircraft, the player, an opposing taxi edge or a pushback operation must take priority. If the planned route crosses an active runway, VAT first tries to find a practical route around it before asking internal ATC for a crossing clearance.

Line-up and takeoff

After takeoff clearance the pilot enters the runway and aligns tightly with the centerline. Roughly half of departures use a rolling takeoff once alignment is complete; the rest stop and use a randomized line-up pause of about zero to eight seconds. Runway safety is checked again immediately before acceleration. Rotation speed and acceleration response vary by aircraft category so props, turboprops, jets and heavies do not all use one identical profile. Landing lights and strobes come on after takeoff clearance rather than while the aircraft is merely holding short.

Departure, climb and cruise

After liftoff, gear-retraction timing contains variation so departures do not all look mechanically identical. The virtual pilot follows its flight plan and available procedure information, with label states such as Departing, Climbing and Cruising describing what the aircraft is doing. High-altitude cruising traffic can create contrails, publish TCAS/wake information and be subject to conflict avoidance around the player.

Approach, final, landing and rollout

Arrival preparation begins well before the terminal area. Procedure and runway information are obtained ahead of time so an aircraft does not need a large navigation-data lookup at the moment it needs to turn inbound. Near the approach, the arrival meter decides whether the aircraft can be admitted directly or must wait in a published/synthetic hold for a safe threshold slot, including space for the player when the user is established on approach. Once established on final, a separate final-sequencing layer can apply speed caps and go-around protection. After touchdown the aircraft transitions to Rollout, clears the runway more decisively and still prefers a forward-facing exit before considering a controlled backtrack.

Taxi-in and parking

ATC assigns a compatible free arrival stand that is not occupied, user-reserved, statically reserved or otherwise unsafe. The taxi route is built to that position. Taxi lights are turned off before the final gate/stand turn, and the aircraft performs a final heading alignment so it finishes squarely at the parking orientation rather than stopping at an arbitrary taxi-node heading.

WHEN AN AIRCRAFT BECOMES STALLED

STALLED is a protective state. VAT uses it when a safe continuation cannot be found - for example, when no usable route or parking solution exists. A stalled aircraft is preferable to driving through scenery or another aircraft. Terminal cleanup eventually retires unusable traffic.

New flight-profile and airport timing refinements

The 0.86 development cycle corrected the nominal initial departure altitude of newly injected midair flights to be treated as altitude above mean sea level (AMSL). That prevents a class of excessively low departure tracks near elevated terrain and airports.

Takeoff rotation and pitch geometry have been retuned to reduce tailstrike-looking departures. Recent per-aircraft movement precision and timer changes also reduce visible jitter without changing the simulated purpose of each traffic population.

Departure schedules, airport occupancy and the arrivals-board clock now follow X-Plane simulation time rather than silently inheriting the host PC clock. If the displayed time looks wrong, confirm X-Plane date/time before adjusting the Windows clock.

CHAPTER 10

10. Airport data, custom scenery and navdata

VAT combines X-Plane base airport data, enabled custom scenery and CIFP procedures. Each data source has a defined role and must pass validation before it can control movement.

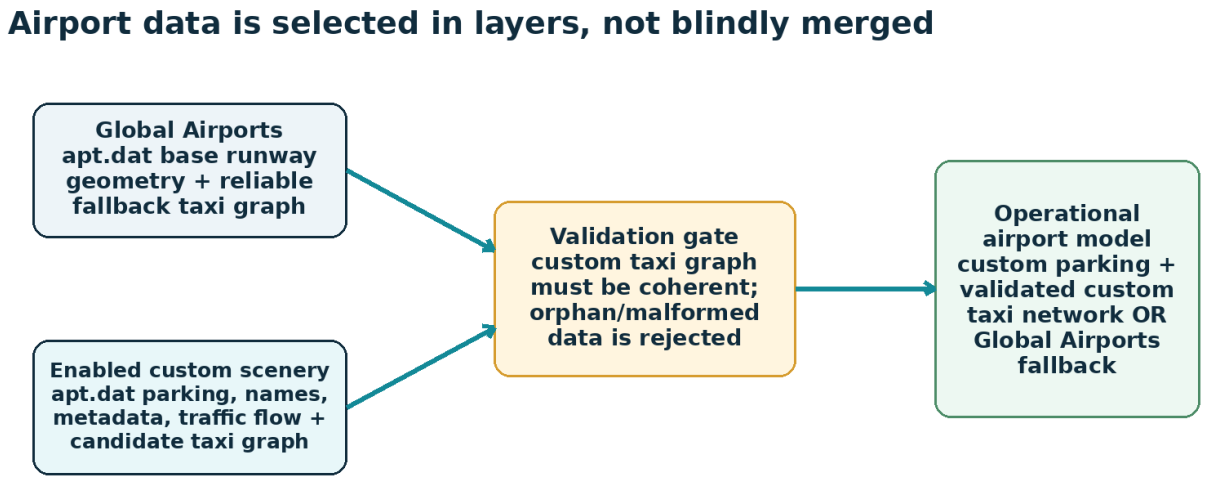


Figure 7. Custom scenery can supply a complete taxi network, but VAT validates it as a coherent graph and falls back when it is not safe to use.

Global Airports remains the trusted foundation

X-Plane Global Airports apt.dat supplies a consistent base description of runway geometry, traffic-flow information, taxi networks and active zones. This is the fallback authority when a custom airport does not contain a usable operational graph. The goal is not to prefer default scenery visually; it is to make sure an aircraft always routes on one coherent network instead of a half-merged collection of incompatible nodes.

Enabled custom scenery can improve both parking and routing

VAT follows X-Plane's enabled scenery list and can use apt.dat files from normal or externally located scenery packages; it does not require every enabled package to live physically below the default Custom Scenery folder. Parking positions, names, operation metadata and traffic-flow information can be overlaid from the highest-priority enabled airport. A custom taxi network is also parsed. If that network is complete and validates as a usable graph, it can replace the base taxi network; if malformed or incomplete, VAT keeps the reliable Global Airports fallback rather than merging unsafe fragments.

Orphaned custom nodes can be ignored or pruned, and disabled scenery packages are excluded from initialization parsing. This reduces the chance that an inactive or partially authored package influences VAT merely because its files are present on disk.

Parking metadata used by VAT

Metadata	How it influences use
Parking type	Gate, hangar, misc and tie-down classifications are part of basic suitability.
Allowed aircraft	Heavy / jets / turboprops / props restrictions can disqualify an otherwise free position.
ICAO width code	A-F size information supports stand compatibility and clearance decisions.
Operation type	Airline, cargo, general aviation, military and related categories steer traffic to appropriate areas.
Airline/operator codes	Dedicated operator stands can be preferred for matching scheduled departures.
Stand family	Suffixed positions such as 21, 21A, 21B and 21C are treated as one stand family so overlapping variants are not filled simultaneously.
Occupancy/reservation	Dynamic use, static reservations, player protection and user arrival-gate reservations prevent conflicting use.

Published aptOPS configuration

Approved aptOPS airport data can add more specific runway configuration, stand preferences and arrival vector routes than scenery alone provides. VAT fetches published airport revisions online and falls back to scenery when no approved configuration is available or an authenticated request cannot be used. Local scenery and CIFP remain important for actual taxi geometry, published procedure records and safety constraints. Working drafts on the website are never the same as published data.

CIFP procedure data

VAT prefers X-Plane Custom Data/CIFP/<ICAO>.dat when that file is available and otherwise falls back to the default CIFP dataset. Procedure parsing supports SID and approach records used by flight planning and arrival logic, including ILS, RNAV, visual and other procedure types represented in the installed data. Positional records are validated as they are parsed so malformed fields are not allowed to become plausible-looking but erroneous approach waypoints. Waypoint altitude and speed information is used where the procedure provides it.

The available missed-approach information also matters during a go-around. When a runway has a designated missed approach point in the procedure data, a going-around aircraft can fly that point first before VAT re-vectors it for another approach. Missing or malformed CIFP information therefore affects more than the picture on a navigation display; it can change what arrival path VAT is able to construct.

SCENERY QUALITY STILL MATTERS

A visually perfect stand can coexist with poor WED routing, and a technically valid taxi graph can still differ from painted centerlines in a scenery package. VAT validates the data it can read, but it cannot reconstruct an airport layout that is absent or incorrectly authored.

CHAPTER 11

11. aptOPS: published airport operations in VAT

Approved community airport configuration meets the plugin's safety logic for runways, stands and arrival routing.

What aptOPS adds

aptOPS is the community airport-operations service at virtualairtraffic.com/aptops. Approved airport data can specify operating runway configurations, preferred gate and stand assignments and runway-specific arrival vector routes. Version 0.87 introduced aptOPS and subsequent releases improved its use, runway stability and arrival control. It complements X-Plane scenery rather than replacing the airport's taxi graph or flight-simulator navdata.

An airport runway diagram from the aptOPS website, used when preparing airport configuration.

Published data versus a draft

A contributor first saves a private draft, then submits a complete airport revision for independent review. Only an approved published revision becomes the public configuration that other visitors and VAT can read. A contributor who created a revision cannot approve their own changes. Experiments in the optional website demo are not live airport data.

What the plugin downloads

VAT requests published aptOPS metadata over its online service. The client can reuse cached data and checks for changes periodically, rather than reconstructing a configuration on each frame. If the airport has no published configuration, the service is unavailable or authentication fails, VAT keeps its normal scenery/traffic-flow fallback. An aptOPS marker in the Airports tab helps identify an enhanced airport.

Runway configuration and precedence

Approved rules can describe arrival and departure runway sets for weather and time windows. Manual Runways selections are the explicit user override. SimBrief runway intent, runway compatibility, reciprocal-runway safety and current conditions are still part of the final operating decision. An aptOPS rule that names a runway does not authorize a player runway entry.

Stand assignments

Published stand rules add aircraft class, type, operator and size preferences. VAT still protects occupied stands, stand families, taxi access, arrival reservations and the player's aircraft. A community stand preference cannot make a physically unsafe parking position usable.

Arrival routes

Published arrival routes can offer a sequence of validated waypoints leading toward the assigned runway. VAT can turn an eligible path into controller vectors during a player arrival, with interception and final establishment checked separately. When the published path is unavailable or unsuitable, other arrival choices may be used; a displayed route is not an unconditional landing clearance.

What to check before blaming the data

Confirm the airport ICAO, published status, runway designators and current simulated weather. A contributor's recent edit is not usable until it has been saved, submitted and approved. For a taxi-routing problem inspect scenery graph quality as well as aptOPS data; these are different layers.

CHAPTER 12

12. aptOPS website: editing and reviewing airports

A practical walk-through of the community editor, from finding an airport to submitting a reviewed revision.

Find an airport and sign in

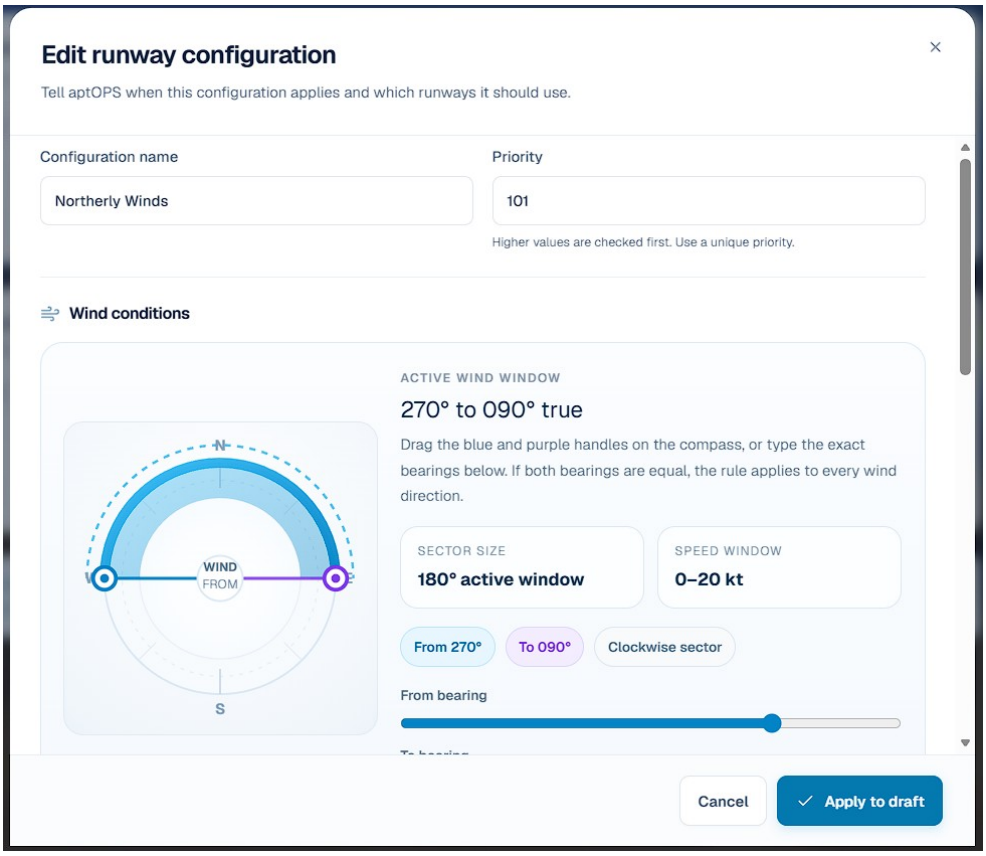
Open virtualairtraffic.com/aptops. The Airport directory can be browsed without editing; search by ICAO, name or country, then filter by publication status and sort the matches. With a Portal account you can create an airport draft, save edits, rate published data and report a problem. Moderators and administrators have independent review tools, but cannot approve their own submissions.

Create the airport workspace

Choose Create airport, enter a four-letter ICAO code and review the suggested name, location, elevation and timezone. The lookup is a convenience, not a guarantee of exact coordinates. Create airport draft first; its runway, stand and arrival services can then be configured in separate tabs.

Import runway geometry from X-Plane

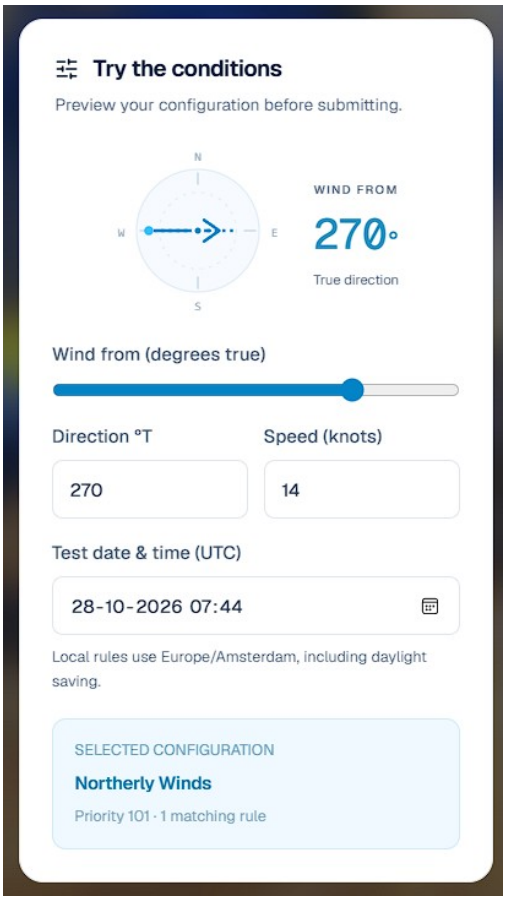
From Runway rules, open Airport data and choose an X-Plane apt.dat or airport extract. The importer recognizes ordinary land-airport runway records, including displacement information, and previews the directions and landing thresholds. Use these runways only after checking the geometry. The import does not automatically bring over taxi networks, traffic-flow rules, stands or arrival routes, and it does not publish the result.



The aptOPS runway configuration editor, including a preview of conditions and runway geometry.

Configure runway operating rules

Create a named rule with enabled state, numeric priority, wind direction sector and optional speed limits or time window. Define arrivals and departures separately, and use airport-local hours or UTC deliberately. Higher-priority matching rules win; conflicting rules or ambiguous thresholds are reasons to preview and revise. The Try the conditions panel lets you simulate a wind/time scenario without changing what is published.



The website's Try the conditions panel can preview a runway rule before publication.

Edit stands and gates

Under Stands & gates, add a position with its identity and operational constraints. Use operator, aircraft code or class, width and priority only when supported by the actual airport. Review stand families and overlapping variants, test matching where available and avoid claiming that a decorative stand is a valid parking destination merely because its name appears on the map.

Draw an arrival route

The Arrival routes editor combines an airport map with a connected sequence of points toward a designated runway. Draw a route that approaches the real extended centerline, then adjust point positions, names, altitudes or speeds as the editor allows. Validation catches disconnected or implausible geometry before the route can be accepted. Keep genuine arrival paths distinct from the historical ADS-B route library, which is sourced from observed flights.

Save, submit and review

Apply to draft updates the working editor; Save draft stores your private work; Submit for review locks a proposed revision with a change summary; an independent reviewer can publish or request changes. Those are different states. Use version history to compare revisions, restore a suitable draft when available, and rate or report published information to help keep the database useful.

More tools on the website

The aptOPS sidebar includes My contributions, optional review queues for moderators, appearance controls and a linked dedicated aptOPS user guide. A mobile layout and keyboard accessibility are supported, but precise runway and route editing is easier with enough screen space. The website's full aptOPS PDF is a companion for detailed editor-field definitions.

CHAPTER 13

13. Parking, gate assignment and stand reservations

How VAT chooses where aircraft start and finish, protects the player stand and lets you reserve arrival positions for your own flight.

Scheduled departure parking

A scheduled departure does not simply occupy the nearest empty gate. VAT first filters the parking list by operation type, aircraft category and size. When the airport explicitly associates stands with operator codes, matching dedicated positions are preferred. Airline traffic is kept away from cargo, military and unsuitable general-aviation stands unless the airport metadata itself makes that use valid.

- **Operator affinity.** Dedicated airline/operator codes can restrict or prioritize the departure stand pool.
- **Aircraft size.** ICAO width code, model geometry and allowed-aircraft flags prevent oversized aircraft from being placed on unsuitable stands.
- **Player protection.** The detected player parking position and a surrounding safety distance are excluded from VAT creation.
- **Traffic clearance.** Occupied stands, nearby aircraft, pushback corridors, static reservations and wing-clearance conflicts are rejected.
- **Stand families.** Overlapping suffix variants are treated as one physical family so more than one aircraft is not parked in the same real estate.
- **User reservations.** Every position selected in Airports > Arv. Gates is removed from the pool for new VAT traffic.

Published stand rules and player intent

When aptOPS supplies approved operator, aircraft type or size constraints, VAT can incorporate those preferences when evaluating suitable positions. A manually reserved arrival stand remains a player preference, not permission to occupy an unsafe or unreachable position. The player may write persistent preferences from the Airports panel or through the arrival-gates dataref.

Arrival gate assignment

After landing, ATC looks for a compatible airline parking position and a viable taxi route. A visually open gate can be rejected for size, operation type, nearby traffic, player occupancy or because it belongs to a stand family that is already in use. If VAT cannot find a safe parking/routing solution, the arrival can remain stopped or become Stalled rather than violating those constraints.

Reserving your own arrival positions

Airports > Arv. Gates lets you select multiple parking positions for the current session. Each selected position becomes unavailable to new static aircraft, scheduled departures and arriving VAT aircraft. Pending static requests for those positions are cancelled. If an existing VAT aircraft already owns a newly selected stand, it can be queued for controlled removal so your reserved area can become clear without deleting the object mid-update.

Arrival-gate selections can now be persisted between sessions. Use Airports > Arv. Gates to choose one or more compatible positions; those selections are protected from new VAT parking assignments and can be used by Ground when assigning your own arrival stand. You can also update selections through the writable arrival-gates dataref described in the advanced chapter. Clear or change the selections when they are no longer wanted.

Select a small set of acceptable arrival stands rather than reserving every gate. Persistent manual runway choices remain a separate control in Airports > Runways; a saved runway selection is not an arrival parking reservation.

Gate-assignment fixes and stand size refinements

Updates after 0.83 tighten how VAT detects overlapping occupied stands and chooses aircraft sizes. Heavy aircraft are less likely to be placed at too-small gates, while small and regional jets can find suitable compact parking where an earlier filter was overly restrictive.

Arrival parking now gives greater preference to airline/operator-affiliated stands when those are safely reachable and available. At high-elevation airports the pose and parking altitude calculation have also been refined to avoid visible offset from the intended stand.

The player aircraft, adjacent wings, an arriving turn and a pushback corridor remain protected. A gate that looks open can still be rejected because its published geometry or active reservation is unsafe.

CHAPTER 14

14. Animated pushback tugs

Pushback can be accompanied by a dedicated ground vehicle that stages, approaches, docks, moves with the aircraft and returns to its service position.

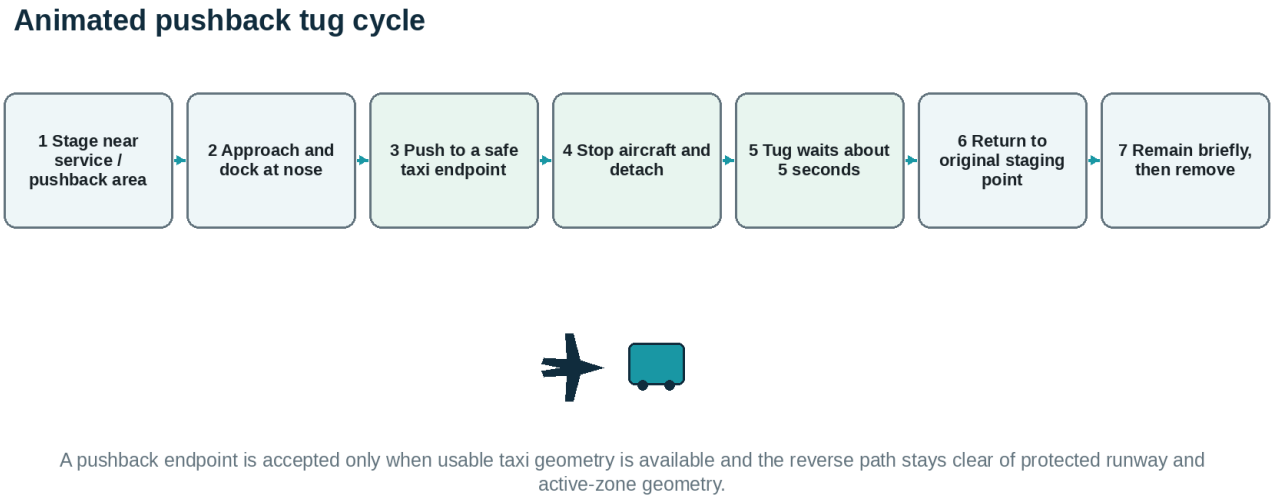


Figure 8. The tug follows the complete operational cycle, including a safe pushback endpoint and a short pause after detachment before it drives away.

Staging location

When a pushback tug is required, VAT tries to start it from a nearby suitable ground-service location. The search prefers explicit WED pushback parking definitions, then nearby ground-vehicle road information, and finally a local safe fallback when the scenery does not provide a better staging point. Candidate staging positions are kept near the aircraft and favor the practical forward area so the tug does not approach from an implausible distant location.

Safe pushback endpoint and taxi handoff

Normal pushbacks are kept reasonably short. VAT prefers a positively matched painted taxi centerline or a validated stand-to-network connection and rejects centerline hits that are actually on a runway or active-zone edge. The ordinary soft target is about 60 m; unusual deep stands can extend farther only when the connection is positively validated, while legacy fallback behavior remains more conservative. If the reverse path encounters protected runway geometry, VAT shortens or rejects the maneuver instead of blindly pushing onto the active. After pushback the aircraft must genuinely stop before the post-pushback preparation/taxi phase can continue.

Approach, docking and attachment

The tug drives toward the aircraft, reverses into the nosewheel area and docks before the push begins. Once attached, tug and aircraft movement are coordinated: the tug body and steering articulation follow the push geometry while the virtual pilot remains responsible for the aircraft phase. This visual ground vehicle is therefore not a separate traffic participant with an independent route; it is an operational accessory to the pushback sequence.

Return and cleanup

After the aircraft is released, the tug stays still at the detach point for about five seconds so separation between tug and aircraft is visually clear. It then returns to the exact staging position selected at the start of the sequence and remains there briefly - on the order of half a minute - before being removed. Keeping the full detach/wait/return cycle visible prevents the vehicle from driving away through the aircraft or vanishing at the nose.

Tug model availability

VAT supports multiple tug models, including AP88, AST-3F and AST-1X, with a fallback when needed. Which tug you see depends on the bundled objects and aircraft/airport context. Pushback tug behavior is still being refined, so unusual scenery geometry may produce different results during the beta period.

GROUND CONFLICT INTERACTION

Other VAT aircraft are expected to respect the pushback corridor. If a tug or aircraft appears to wait even though the immediate nose area looks clear, the ground-conflict system may be protecting the future swept path of the maneuver.

CHAPTER 15

15. Ground Conflict Management (GCM)

A geometry-aware safety layer that keeps taxiing aircraft, pushbacks and the player from occupying the same future path.

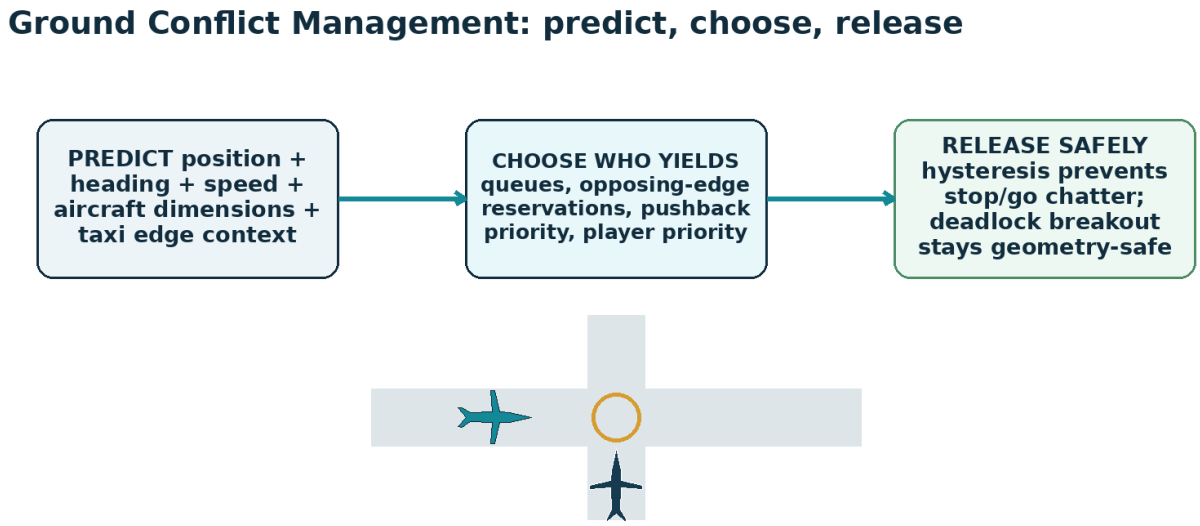


Figure 9. GCM separates conflict prediction from the decision about who yields, then uses hysteresis before releasing the hold.

How often GCM runs

Ground conflict evaluation is intentionally frequent but does not need to execute the full expensive pass on every rendered frame. The current manager updates at roughly 100 ms intervals (about 10 Hz), fast enough for taxi-speed prediction while avoiding unnecessary duplicate work between nearly identical frames.

Conflict prediction is more than a distance circle

The manager considers aircraft position, heading, velocity, approximate dimensions, taxi-edge context and the kind of maneuver taking place. A same-direction follower is different from an aircraft approaching head-on. An active pushback is different from ordinary taxiing. The result is a predicted near-term conflict and a decision about which VAT aircraft should yield rather than a simple rule that says “stop whenever another object is within N metres.”

- **Same-direction queues.** A follower is prevented from driving through a slower aircraft ahead while still being allowed to resume when the leader opens the route.
- **Opposing-edge reservations.** Two aircraft are prevented from entering a narrow shared segment in opposite directions at the same time.
- **Pushback protection.** Traffic yields to the active pushback corridor and its swept path.
- **Player priority.** The player is treated as a blocker but is never commanded by VAT. AI traffic must adapt around genuine player conflict geometry.
- **Hold hysteresis.** A conflict must remain safely clear before the clamp is released, preventing frame-to-frame stop/go chatter.
- **Requested-speed preservation.** The virtual pilot can continue asking for its intended taxi speed while GCM temporarily clamps actual movement. When the conflict clears, the aircraft can resume naturally.

Player-following exception

A special case prevents a player who is following closely behind a VAT aircraft from permanently trapping that aircraft simply because the player remains within a generic safety envelope. Head-on, crossing and player-ahead situations stay protected. The exception exists so the traffic in front can legitimately continue rather than creating a self-sustaining queue caused by the user following it.

Deadlock breakout and backtracking

Busy ramps can form circular wait-for relationships in which every aircraft is waiting for another. VAT detects these cycles and can grant a temporary breakout opportunity after a randomized long hold, roughly 30-90 seconds, but only when hard geometry still shows safe physical clearance. A genuine player conflict or nose-to-tail queue is not ignored just to break the cycle. Opposing-edge reservations and proactive route recovery also keep two aircraft from committing to the same narrow corridor from opposite ends as often; when a true head-on route deadlock still occurs, ATC can recalculate and backtrack one participant so the pair can recover instead of waiting forever.

WHAT YOU MAY SEE

An aircraft can stop for traffic that looks surprisingly far away because the manager is protecting a future intersection, shared edge or pushback path. Conversely, an aircraft that has waited a long time can move through a softer separation envelope as part of a deadlock solution while still respecting hard airframe clearance.

CHAPTER 16

16. Runway selection, traffic flows and weather

How VAT decides which runway ends are available, how user and SimBrief intent are prioritized, and how parallel/reciprocal conflicts are prevented.

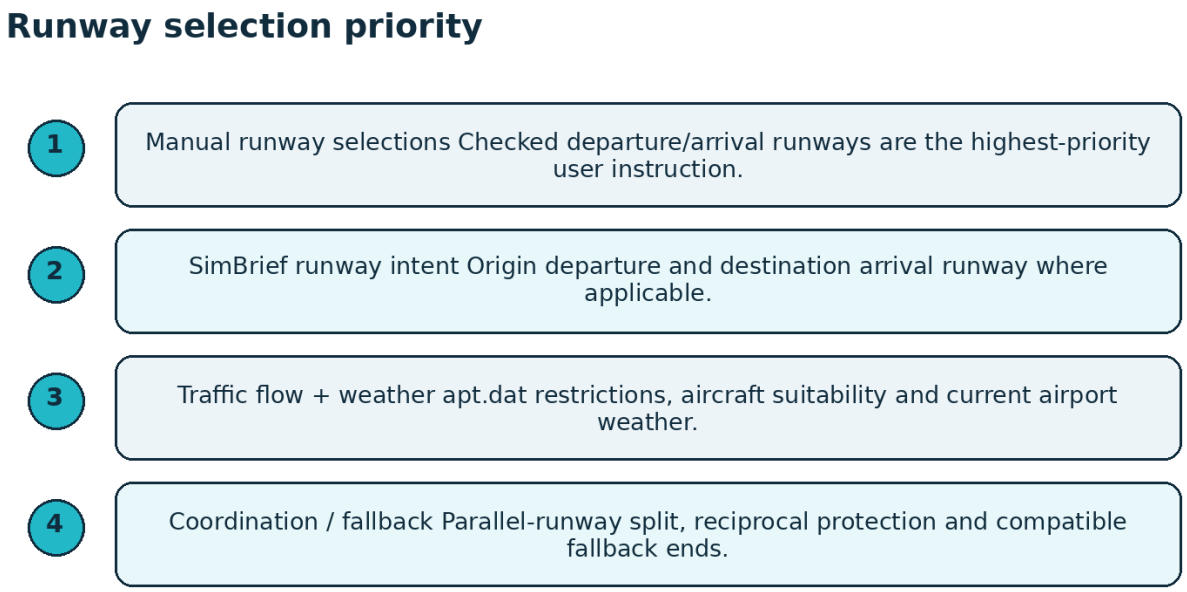


Figure 10. The runway hierarchy starts with explicit user choices and then falls back through SimBrief, airport flow/weather and coordinated fallback logic.

The aptOPS layer

For an airport with published aptOPS rules, VAT can evaluate conditions such as runway direction, wind and local operating hours. Manual airport runway selections remain the deliberate override, while SimBrief intent and safe runway occupancy continue to matter. Approved aptOPS rules are not a replacement for the physical airport/runway graph or current live weather. If published data is absent, normal scenery and weather fallback still applies.

Automatic runway selection

When no manual selection is active, VAT evaluates the airport traffic-flow rules, current airport weather and compatibility of runway ends with the requested operation. Airport weather is refreshed periodically, with an approximately one-minute guard against excessive sampling. Automatic weather selection uses hard-surface runways of roughly 6,000 ft or longer; explicit manual and SimBrief runway intent bypass that automatic suitability filter.

Low-wind runway stability

Automatic runway use remains stable in light wind. At about 5 kt or less VAT locks the current flow; it unlocks around 7 kt. Above that band, a wind-driven candidate normally must remain preferred for about 15 minutes before a switch. A real ceiling, visibility or time-of-day traffic-flow-rule change can still apply immediately. Manual runway choices and SimBrief intent always outrank the wind-switch delay.

SimBrief runway intent

At the loaded SimBrief origin, the planned departure runway is used as strong intent when it remains available. At the destination, the planned arrival runway is protected above ordinary weather/apt.dat preference. If the airport has compatible parallels, VAT can coordinate the rest of the traffic around that planned arrival runway rather than creating head-on use of the same physical strip.

Manual runway selection

Airports > Runways is the hard user override. You can select one or more departure runway ends and one or more arrival ends. Checked values outrank SimBrief and ordinary automatic selection. Existing aircraft do not teleport to a new runway merely because the box was changed: the selection primarily affects subsequent assignments, with arrival aircraft on approach handled by the dynamic reassignment rule described in the arrival chapter.

Persistent selections

The Persistent option stores manual runway sets in vat_settings.ini and restores them in later sessions. Saved runway names are checked against the loaded airport, with CIFP-aware designator reconciliation where possible. Clearing selections or persistence restores automatic decisions. Published aptOPS rules form an additional airport-data source when no higher-priority manual/SimBrief instruction overrides them.

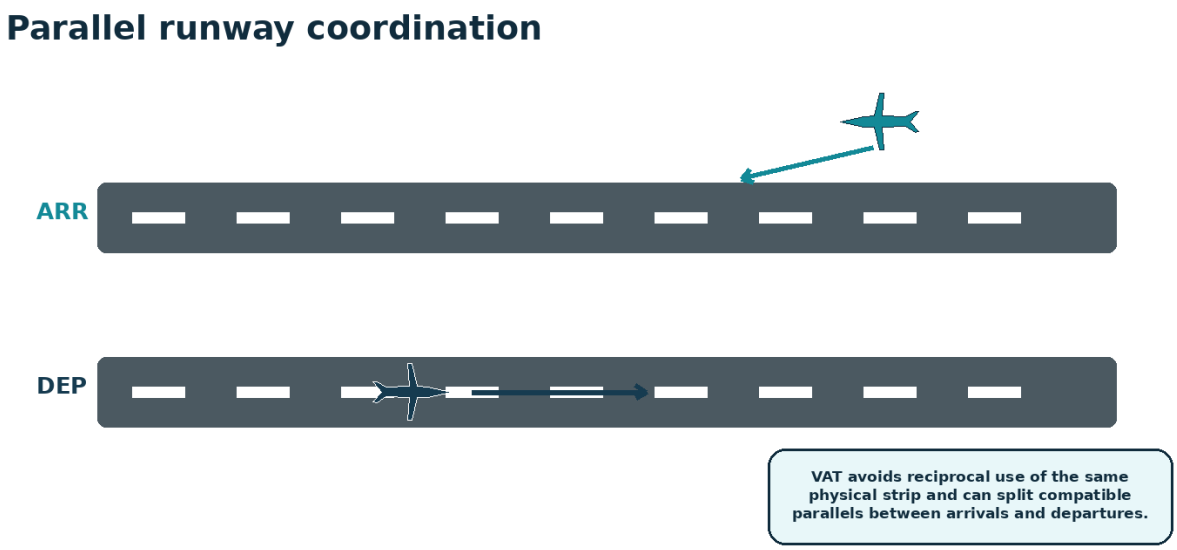


Figure 11. Where the airport layout permits it, VAT can split arrivals and departures across compatible parallel runways and protects reciprocal ends of the same physical strip.

One physical runway, two designators

Reciprocal runway ends are treated as one physical strip for ownership and conflict decisions. This prevents the classic error in which one end appears free while an aircraft is operating on the opposite designation of the same pavement. Parallel-runway logic is layered on top of that physical identity so a busy airport can distribute flows without accidentally mixing reciprocal traffic.

CHAPTER 17

17. Internal ATC, runway protection and crossings

The clearance logic behind holding short, runway entry, takeoff, taxi crossings and the player's priority around the active.

Takeoff clearance

Internal ATC checks runway occupancy, arriving traffic, the player, departure queue order and existing reservations before granting a takeoff clearance. Reciprocal designators share the same runway ownership key. A clearance creates a short-lived reservation, and both the clearance cadence and reservation age use roughly one-minute time scales so an aircraft that never enters the runway does not hold it forever.

A cleared aircraft still revalidates runway safety immediately before acceleration. Landing lights and strobes are turned on after the clearance rather than while merely waiting at the hold line. Takeoff reservations also track whether the aircraft has actually entered and progressed on the runway, so a stalled clearance cannot own the strip forever. Once the departure has accelerated beyond the low-speed runway phase (about 50 kt), selected following line-up behavior can begin while physical runway and airborne-arrival protection continue to use the aircraft's real position and altitude.

Arrival protection while issuing takeoff

ATC maintains a larger same-runway arrival protection region for takeoff decisions, approximately 10 NM in the current logic. This is intentionally more conservative than the ordinary crossing check: launching an aircraft onto a runway requires more time than allowing a taxiing aircraft to cross and clear quickly.

Runway crossing

When the assigned taxi route must use an active runway, the aircraft requests crossing clearance. The traffic system first prefers an alternate route around the active if a reasonable one exists. If crossing remains necessary, a real takeoff reservation, a dangerous approach conflict or player occupancy denies the clearance. Crossing protection has been tuned so aircraft do not wait unnecessarily for every distant final: ordinary AI approach protection is on the order of a few nautical miles, while player approach protection remains larger because the player cannot be speed-controlled or commanded by VAT.

The player can block a runway without being controlled

VAT treats the user aircraft as real geometry. A player positioned on the active, crossing the movement area or established on final can prevent an AI clearance. High overflight that does not meaningfully occupy the runway/approach geometry is not treated the same as a player sitting on the pavement. VAT adapts its own traffic; it never commands the player to vacate, hold short, change altitude or change speed.

Airborne conflict handling around the player

En-route and arrival traffic can be checked against a predicted conflict path with the player. When a close encounter is forecast, internal ATC can issue its own aircraft temporary vectoring and/or altitude instructions. The current active avoidance path strongly uses altitude separation, with target separation on the order of 1,400 ft once triggered and a lower-altitude safety philosophy that avoids forcing a traffic aircraft into the ground. The restriction is released when the predicted geometry opens again.

WHY A CLEARANCE CAN DISAPPEAR

Runway safety is rechecked close to execution. A plane can have received permission to enter or take off and still remain stopped if another aircraft or the player moves into the protected geometry before the roll begins.

Departure pauses for necessary runway crossings

At a busy airport, VAT may hold an AI aircraft about to depart for a short interval so already-authorized crossing traffic can get across and clear the active runway. The departure does not simply launch because its label says “Preparing to take off”: internal Tower ownership, reciprocal runway protection and the physical state of crossing traffic remain authoritative.

When an active departure is stopped for a crossing, this is normal ATC sequencing, not evidence that the airplane has stalled. The user-facing Request Crossing button described in Chapter 41 is a distinct player workflow: you must still ask and receive clearance at the correct intermediate hold.

CHAPTER 18

18. Arrival metering, dynamic holds, final sequencing and go-arounds

The terminal-airspace logic that meters arrivals before final, creates dynamic holds when a runway slot is not yet safe, makes room for the player on approach, and then hands admitted traffic to the established-final spacing and go-around layer.

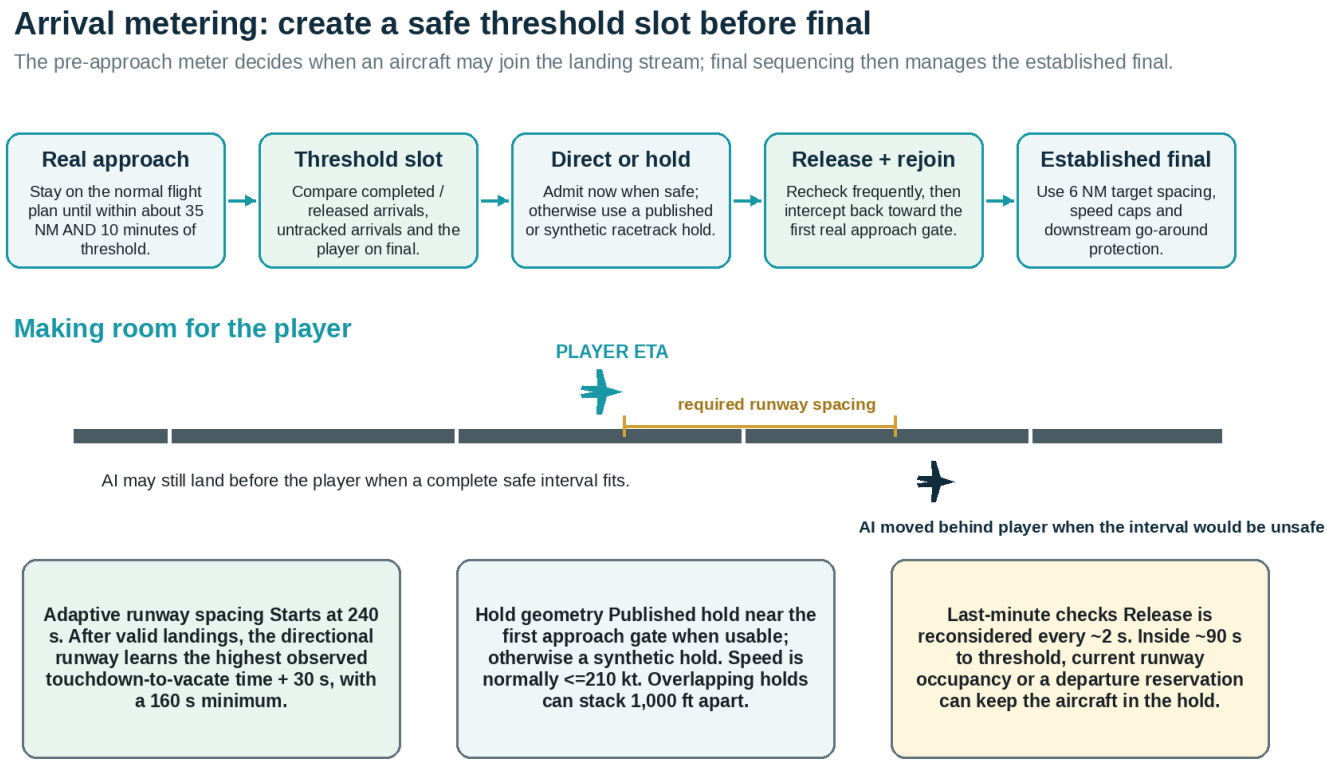


Figure 12. VAT first reserves safe threshold time, holding traffic only when necessary. Once admitted, a separate final-sequencing layer manages the established final.

Two layers: meter first, final sequence second

Arrival control is intentionally split into two jobs. The pre-approach meter works while an aircraft is still in the normal CRUISING/approach-planning part of its flight. It decides when that aircraft may commit to the first real approach gate and threshold stream. Only after the aircraft is admitted does the established-final sequencer take over the familiar work of spacing aircraft already lined up with the runway. The split keeps long-range traffic from being serialized unnecessarily while still protecting the runway close to landing.

When arrival metering becomes active

A distant inbound is not assigned a hard landing slot twenty minutes from the airport. VAT leaves it on its real flight plan and reevaluates continuously. Metering commits only when the predicted threshold time is within about 10 minutes and the aircraft is within about 35 NM of the landing threshold. At that point VAT looks at the first active approach waypoint, estimates when the aircraft could reach the runway if released immediately and decides whether that opening is genuinely available. If it is, the aircraft continues without a hold. If it is not, VAT creates a hold and waits for a safe release.

A runway timeline instead of a fixed-distance queue

The meter schedules threshold time, not just miles between aircraft. Until a directional runway has learned its own value, the default requested interval is about 240 seconds. Every valid landing then teaches VAT how long that aircraft occupied the runway from touchdown until it was geometrically clear. The directional runway uses the highest valid observed occupancy plus a 30-second margin, with a minimum learned interval of 160 seconds. This lets a runway that routinely clears quickly tighten from the conservative startup value, while a runway whose traffic needs longer to vacate can remain more widely spaced. Reciprocal ends still share physical-runway protection even though the learned spacing is stored for the landing direction.

Making room for the player on approach

The player is placed on the same threshold timeline when VAT can identify a meaningful approach. The user must be moving horizontally at roughly 29 kt or more, below about 10,000 ft above the airport, and inside an extended approach corridor to either end of the physical runway within about 25 NM. VAT then estimates the player threshold time from the current distance and groundspeed. If an AI can still reach the threshold with a complete safe interval before the player, it may continue ahead. If that interval no longer fits, the AI slot is moved immediately behind the player by the current runway-spacing value. In practice this is why traffic can remain in a hold while you are established inbound: VAT is deliberately preserving landing and runway-vacate time for you without issuing you any speed, heading or altitude command.

PLAYER PRIORITY WITHOUT PLAYER CONTROL
VAT never vectors or speed-controls the user. It changes only its own traffic. If your actual speed changes, the estimated player threshold time changes as well, and waiting AI is re-evaluated against that updated geometry.

Recorded and community-defined approach paths

For the player, approved aptOPS vector routes and matched historical ADS-B arrival tracks can supply an ordered sequence of ATC headings toward the assigned runway. The source is selected for the airport/runway and usable entry geometry; guidance remains subordinate to active radio, runway, spacing and final-establishment conditions. The AI arrival meter and final sequencer continue to protect the runway rather than surrendering separation to a saved line on a map.

How VAT chooses a hold

VAT first looks for usable published holds from the installed X-Plane earth_hold.dat set. Custom Data is preferred when present; otherwise the default navdata set is used. A published hold must resolve to matching nav/fix data, belong to en-route context or the destination airport, sit within about 15 NM of the first approach gate, and have usable speed/altitude restrictions. If no published pattern fits, VAT constructs a synthetic racetrack outward from the approach/runway geometry. Synthetic patterns use an approximately 30-second straight leg and can be moved progressively farther away, up to about 80 NM offset, until a safe footprint is found.

Hold speed, altitude and stacking

A held aircraft normally flies no faster than about 210 kt, subject to its existing speed and any minimum speed carried by the approach gate. The initial hold altitude is not below the aircraft current altitude or roughly 3,000 ft above airport elevation. When two racetrack footprints overlap laterally, VAT can stack them vertically in 1,000 ft steps, up to 43,000 ft, instead of forcing both aircraft through the same volume. The complete hold and its planned rejoin must also remain inside the active realtime-traffic lifetime bubble. If VAT cannot build a hold that satisfies those geometric and lifetime limits, the meter fails open and leaves that aircraft on the legacy approach path rather than inventing unsafe geometry.

Release order and why a hold can continue

Once an aircraft is stable in the racetrack - within roughly 250 ft of the hold altitude and no more than about 10 kt above the hold target - VAT reconsiders release about every two seconds. Waiting aircraft do not permanently own queue position simply because they arrived first. Among aircraft that are actually releasable, the system favors the one with the earliest achievable safe threshold ETA; the older ticket is only a near-tie breaker. This prevents a blocked aircraft at the head of the waiting list from freezing an otherwise usable stream.

- The candidate must fit around completed arrivals, already released metered arrivals and legacy/untracked arrivals using the current runway-spacing value.
- The player threshold time is inserted into the same calculation when the player is on a recognized approach corridor.
- A temporary ATC altitude-avoidance instruction can delay release rather than letting the metering turn and collision-avoidance instruction fight each other.
- When the projected release is within about 90 seconds of threshold, current runway occupancy or an active departure reservation can keep the aircraft in the hold even if the broader time slot is otherwise open.

Rejoining the real approach

Release does not teleport the aircraft from the racetrack onto final. VAT calculates an intercept that leads back toward the first real approach gate, using the current location in the hold and a turn-radius estimate. The rejoin is checked for heading and altitude compatibility with the real gate. If the first intercept is not acceptable, the alignment leg can be extended and retried; repeated rejection causes VAT to rebuild a safe hold when possible. Once the aircraft captures the real gate, the synthetic ATC waypoints disappear and the ordinary flight plan continues.

Established-final spacing

After admission, the final sequencer monitors aircraft in a centerline corridor out to about 25 NM. The normal target gap is now about 6 NM, with the sequencing speed clamp fully released around 7 NM. A following VAT aircraft can receive an upper speed cap within roughly 105-138 kt; the correction is proportional to the deficit, about 15 kt per nautical mile. The cap never accelerates a naturally slower aircraft. The player can also be part of this established-final ordering, but only VAT traffic receives the speed command.

Projected conflicts and go-arounds

An actual gap around 1 NM remains a hard emergency minimum. VAT also projects the best spacing likely to remain when the leader crosses the threshold. Inside roughly the 12 NM resequence zone, if even maximum useful slowing cannot preserve about 5 NM, a go-around can be prepared before the situation becomes visually desperate. That projected decision can still be cancelled if the sequence recovers. The final deferred trigger remains around 1 NM from the runway so the system can use late runway clearing without accepting an unsafe landing.

Runway changes while an aircraft is inbound

If the airport arrival runway changes because of a manual override, refreshed SimBrief data, weather or a traffic-flow rule, an aircraft still in approach planning can receive the new runway and procedure directly. Metering context for the old runway is discarded and rebuilt for the new assignment. An aircraft already established on final continues on its existing clearance rather than making an abrupt late runway swap.

Missed approach and re-entry

A commanded go-around transitions the aircraft away from the landing path, restores an appropriate airborne configuration and, where the installed procedure supplies it, first flies toward the runway designated missed-approach point. After that procedure context is respected VAT re-vectors the aircraft for another approach. Re-entry remains randomized on the order of 90-180 seconds so a go-around does not immediately reappear in the same congested slot.

CHAPTER 19

19. Runway exit, taxi-in and completed arrivals

What happens after touchdown: rollout state, exit selection, gate routing, final alignment and terminal cleanup.

Rollout is a distinct operational phase

After touchdown the aircraft remains a runway movement until it has slowed and committed to an exit. User-facing labels identify this as ROLLOUT rather than displaying a misleading waiting state. The rollout now targets about 25 kt more decisively, and as soon as speed falls below roughly 50 kt VAT can prepare the exit/taxi-to-gate route on the fast update path instead of waiting for a slower airport-maintenance cycle. Spoiler, reverser and wheel behavior can be visible when the model supports the associated animation datarefs, and a touchdown-smoke particle effect can appear at the landing event.

Forward exits are preferred

The runway-exit planner favors a directionally valid forward-facing exit that keeps the aircraft moving naturally toward the taxiway system. If the next forward exit is still ahead but too close to take safely at the current rollout speed, the aircraft slows and retries rather than using that situation as permission to U-turn. Backtracking is considered only after the useful forward exits have genuinely been passed and a controlled reciprocal route can be built. On a normal forward exit the initial target can remain near 25 kt when the turn is distant, stepping down through about 15 and 10 kt as the corner approaches before ordinary taxi speed resumes once the aircraft is geometrically clear of the runway.

Taxi route to the assigned stand

As the aircraft slows, the destination parking route is prepared. The same airport graph, active-zone and ground-conflict systems used on departure apply to taxi-in. The arrival can therefore wait for another aircraft, reroute around conflict or request an active-runway crossing on its way to the stand. Because the parking assignment is coupled to route availability, an apparently empty stand is not useful if the aircraft cannot reach it safely on the active graph.

Final gate/stand alignment

At the end of the taxi route, the pilot performs a final turn to the parking heading and settles into the stand orientation. Taxi lights are turned off before this final parking turn. The intent is that an arrived aircraft looks parked rather than simply stopped on the final taxi-node heading.

Arrived traffic and cleanup

Completed aircraft remain long enough to provide a believable arrival result and to protect their parking position. Terminal cleanup later retires aircraft that are no longer operationally useful, allowing their resources and Mode-S identity to leave the current world. Current cleanup timing is deliberately measured in minutes rather than seconds; stalled traffic can become eligible after roughly two minutes, while fully finished/arrived aircraft can remain around roughly ten minutes before final retirement depending on the surrounding state.

DO NOT CONFUSE A STOPPED ARRIVAL WITH A FREEZE

An aircraft that has landed and appears to wait may be protecting the runway exit, waiting on the GCM, waiting for a crossing, or unable to obtain a safe route/stand. Check the Nearby state and give the airport systems time before treating it as broken.

CHAPTER 20

20. The user interface

A tour of the main tabs, current theme controls, traffic tables, airport actions, SimBrief feedback and the dedicated ATC Messages window.

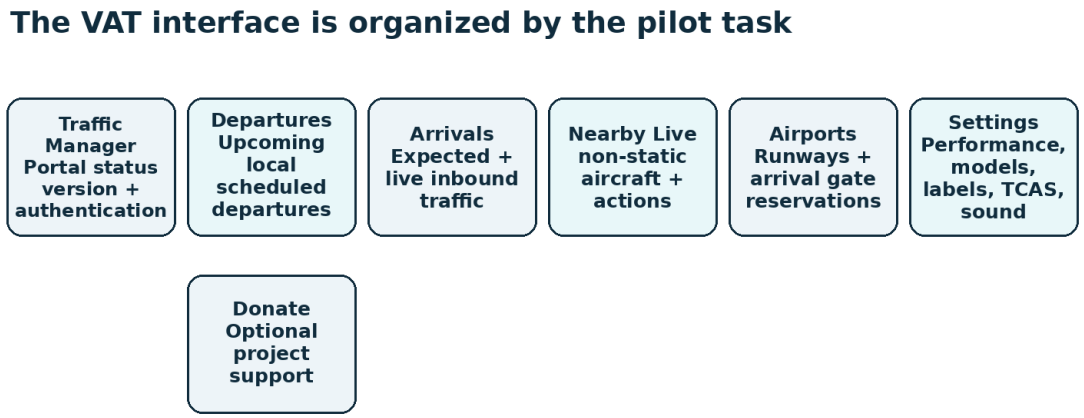


Figure 13. Each main tab corresponds to a pilot task: connect, inspect traffic, configure an airport or change system behavior.

Traffic Manager

Traffic Manager shows VAT status, Portal authentication and the current build. The shortcut opens or closes ATC Messages. The interface theme can be saved as Auto, Dark or Light; Auto follows X-Plane time. Additional ATC conveniences in Settings include automatic COM1 standby suggestions, visual taxi guidance, automatic readbacks and a compact action dock.

Departures

The Departures table follows the nearest relevant airport and its airport-local clock derived from simulator time. It shows upcoming schedule rows rather than an archive of flights that have already departed. Columns include departure time, airline/logo, flight number, aircraft ICAO, destination, status and actions. When a live aircraft exists, the ICAO column prefers the rendered/matched type when available; otherwise it falls back through the flight-plan/schedule type. A schedule row can exist before the physical aircraft has been created, so Follow appears only after VAT has a live object for that flight.

Arrivals

Arrivals combines expected schedule information with live inbound aircraft. The table now includes the aircraft ICAO alongside ETA, airline/logo, flight, origin, distance, status and actions. Scheduled-only rows can remain useful for the rest of the day, while live aircraft add dynamic distance and state information and can expose the rendered/matched type. Delayed live arrivals are kept prominent. A landed aircraft can remain visible through the arrival process instead of disappearing from the board at touchdown.

Nearby

Nearby is the most direct live-aircraft table. It lists non-static VAT traffic with columns such as Flight, Airline, Origin, Destination, Type, Location, Altitude, Status and Actions. Follow transfers the VAT camera to the selected aircraft. Remove safely queues the aircraft for controlled removal and places its Mode-S identity into a session suppression set so the same flight is not immediately created again from the next realtime snapshot.

Airports

Without a search, Airports is optimized around nearby locations, roughly the local 150 km region. Entering at least a few characters in the search box expands the query to the loaded airport database by ICAO or airport name. This lets you configure a destination long before you arrive. The table provides runway-use information, altitude, current aircraft count and action buttons.

Runways action

The Runways popup contains separate departure and arrival runway checkboxes plus clear controls and the Persistent option. A highlighted runway-action button indicates that a manual set is active. Checked runways override SimBrief and weather for subsequent decisions.

Arv. Gates action

The arrival-parking popup allows multiple positions to be selected. Reserved stands become unavailable to new VAT traffic for the rest of the session. The popup reports the reservation count and includes a Clear all action.

Settings

Control	What it does
Performance mode	Medium slices simulation work and reduces realtime range; Full processes the complete aircraft simulation each frame and uses the larger realtime radius.
Traffic Density	0 “No traffic” to 100 “Realistic skies”; directly influences static and new realtime generation.
X-CSL directory	Points to the CSL root that contains packages. A VAT restart is required after changing it.
Enable plane labels	Master display control for the traffic-label systems.
Hide labels in cockpit	Suppresses labels while you are in an internal/cockpit view.
Enable TCAS updating	Requests/releases X-Plane multiplayer/TCAS override publication.
Enable sounds	Turns VAT positional traffic audio on or off without changing traffic logic.
Disable static spawns	Prevents new decorative GA/airliner statics and clears/cancels static population work.
Enable verbose logging	Adds diagnostic detail to X-Plane Log.txt; useful temporarily for troubleshooting.
Direct model matching only	Stops similarity/generic model fallback after an exact operator + aircraft match fails.
Hide airplanes	Temporarily suppresses rendered aircraft, contrails and VAT traffic sound while the logical traffic world continues.
SimBrief username	Loads and periodically refreshes the current SimBrief flight plan context.

Premium and Donate tabs

The Plus tab appears for an entitled, non-expired PLAN or eligible legacy FULL account. It contains developing GA/VFR controls, airport enhancements, local speech recognition, high-quality AI voices and experimental ground-ops assistance. Realtime ADS-B repositioning and general AI-controlled airborne operations remain preview controls, distinct from the working historical ADS-B arrival-vector feature. Donate is available for optional support.

Popups and mouse behavior

Tables support standard ImGui scrolling, sorting and resize behavior where enabled. Notifications can indicate missing Portal setup, a newer release (if you enable update notifications), TCAS ownership by another plugin and exception information. The separate ATC Messages window supports mouse and VR operation, maintains its own radio-history display and exposes contextual controller actions.

Interface improvements through 0.91

VAT remembers the Auto / Dark / Light theme, the ATC Player only filter and several radio preferences. The airport list can flag published aptOPS airports, while ATC Messages provides next-frequency hints, a minimized action dock and dedicated SID, direct-to and altitude choice pages where applicable.

The Arrivals clock follows X-Plane simulation time. SimBrief feedback distinguishes a valid import from HTTP errors, missing OFPs and parse errors, with a Retry control. IFR clearance can offer SID selection or a suitable no-SID departure when no published SID exists.

ATC radio messages use callsigns, not bare flight numbers, and COM1 reception is tied to real radio tuning and avionics electrical power. At airports with a shared controller frequency, the window can combine several service action groups without manufacturing a nonexistent frequency.

CHAPTER 21

21. realTaxi guidance and compact ATC controls

How the visual taxi path, COM1 handoff hints and minimized radio button dock help you keep the assigned clearance visible.

A path you can follow, not an autopilot

realTaxi displays visual guidance for the player along the assigned taxi route. Turn on Enable taxi path guidance in Settings and request a normal Ground taxi clearance. VAT renders the permitted route in the airport scene. It follows your aircraft more closely after a deviation than the earlier implementation, and the guidance assets have a separate night/light-source appearance. You still steer, brake and check the airport around you.

A taxi line is not runway permission

A taxi clearance can stop at an intermediate active-runway crossing or departure hold. Treat the boundary as a hard authorization limit. The drawing must not be interpreted as permission to enter the runway just because a taxiway line is visible beyond it. Make the separate Request Crossing or Tower request where applicable, receive the instruction, read it back and confirm the runway is safe.

Toggle guidance from a key or joystick

Bind virtualairtraffic/taxi_guidance/toggle in X-Plane's Keyboard or Joystick settings to toggle the path without opening VAT Settings. The visual control can be useful when changing from external to cockpit views. It does not alter the stored taxi authorization.

COM1 standby handover assistance

Enable Autotune COM1 standby on ATC handover in Settings to allow the suggested next controller frequency to be placed in the standby channel where supported. Verify the displayed station and make the actual active-frequency change yourself; a hint is not a clearance. Bind virtualairtraffic/atc/autotune_com1_standby/toggle to enable or disable the convenience directly.

Minimized ATC action dock

Version 0.91 offers Enable minimized ATC action dock. The compact buttons appear from the right edge when you hover there, providing the same contextual actions without keeping the full message-history window open. The dock is not a second ATC service: it uses the same request dispatcher, tuned COM1, page availability and active clearance state.

When guidance is missing

Check that VAT has a recognized airport taxi network, the player is at a supported location, an actual taxi route has been issued and the option is enabled. A route that could not be safely calculated is preferable to a bright line through a runway. On complex or incomplete scenery, verify the selected airport's WED ground network before assuming the toggle has failed.

CHAPTER 22

22. SimBrief integration

SimBrief supplies runway and filed-route intent for the user. For player ATC, VAT retains the accepted clearance as a snapshot even when SimBrief refreshes in the background. This prevents a cleared call sign, runway or route from changing silently.

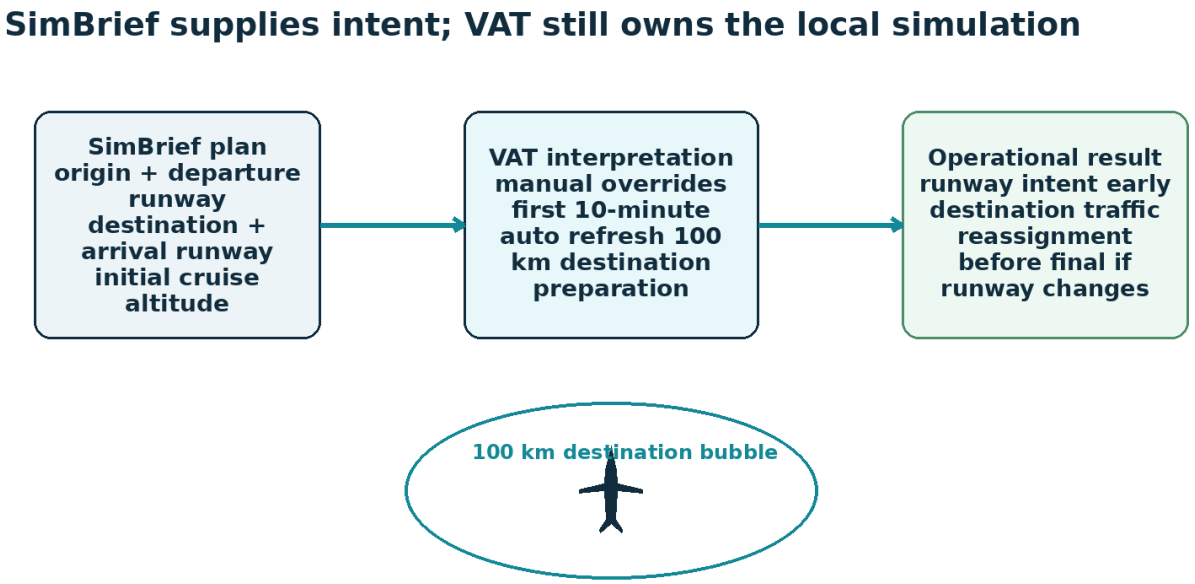


Figure 14. SimBrief supplies context to VAT; manual runway selections still remain the highest-priority instruction.

Enabling the connection

Enter your SimBrief username under Settings. VAT loads the latest OFP, including flight identity, origin/destination, filed route, SID/STAR and runway intent where the response supplies them. The Settings status distinguishes loading, HTTP failure, invalid JSON, a missing plan and successful import. Use Retry SimBrief import to request it again without retyping your username.

Automatic refresh

With a username set, VAT normally refreshes the SimBrief plan about every 600 seconds. New traffic and runway context may use refreshed data; a player IFR route already accepted by ATC remains associated with its cleared snapshot until a new flight session, not silently rewritten by a later online plan.

IFR clearances without a SID and amended departures

The 0.91 IFR clearance path can issue a departure clearance even if the runway has no published SID; the controller must not invent a nonexistent procedure. Where relevant SID records exist, Request SID Change presents the available choices and seeks an amended clearance. The accepted callsign, runway and clearance context remain associated with the session, rather than being silently rewritten by a later SimBrief refresh.

Information VAT reads

- **Origin ICAO.** Identifies the planned departure airport and provides context for origin runway handling.
- **Destination ICAO.** Defines the player destination used for early traffic preparation and arrival coordination.
- **Origin runway.** Preferred departure runway at the SimBrief origin unless a manual user override is active.
- **Destination runway.** Preferred/protected arrival runway at the destination unless a manual arrival selection is active.
- **Initial cruise altitude.** Used as flight-plan context. New realtime traffic that would otherwise occupy exactly the same cruise altitude can be offset by about 2,000 ft to reduce visual overlap.

The 100 km destination preparation zone

The loaded SimBrief destination is allowed to "wake up" earlier than an ordinary local airport. When the player is within roughly 100 km, VAT can begin downloading/preparing scheduled departures at that airport. Eligible realtime arrivals can also remain relevant around the destination when both the player and traffic are in the same destination area. The practical result is that the airport and arrival stream can already look alive when the player reaches the terminal area instead of beginning population only at 15 km.

STATIC TRAFFIC STAYS LOCAL

The SimBrief destination extension applies to scheduled/realtime preparation. Decorative static traffic still uses the local nearest-airport rule and the player-altitude condition. A destination 80 km ahead is not filled with statics merely because it is in the SimBrief plan.

Priority and runway changes

Manual runway checkboxes are always the strongest user instruction. If you want VAT to return to SimBrief intent, clear the relevant manual set or disable its persistence. When an automatically refreshed SimBrief plan changes the destination runway, aircraft that are still on approach can be reassigned immediately; aircraft already on final continue on the existing clearance to avoid abrupt late changes.

The ATC Messages shortcut

Traffic Manager offers an ATC Messages open/close control. X-Plane also exposes virtualairtraffic/atcmessages/toggle for a keyboard or joystick assignment. This is a separate movable window, not a new tab inside the main VAT interface.

The main interface has a persistent three-way theme choice (Auto, Dark, Light). The ATC window has its own dark glass styling and, in compatible sessions, appears in VR as well. Consult Chapter 39 for the controls and radio rules.

Player radio identity and cleared route

For player ATC, the imported SimBrief data supplies a filed callsign, flight-number, aircraft code, route, optional SID/STAR and planned runway context. A requested IFR clearance generates a separate cleared snapshot and departure assignment; accepted clearances are not rewritten by subsequent ten-minute refreshes.

The selected runway and initial level are resolved from the airport and flight state when the clearance request is processed, so a SimBrief runway suggestion is not itself a takeoff or taxi authorization. ATC requests also require powered, tuned COM1 and an appropriate controller at the correct airport.

CHAPTER 23

23. Aircraft models: Bluebell and X-CSL

How VAT converts a flight identity into a renderable aircraft, how exact and generic matches are ordered, and why model preparation can continue in the background.

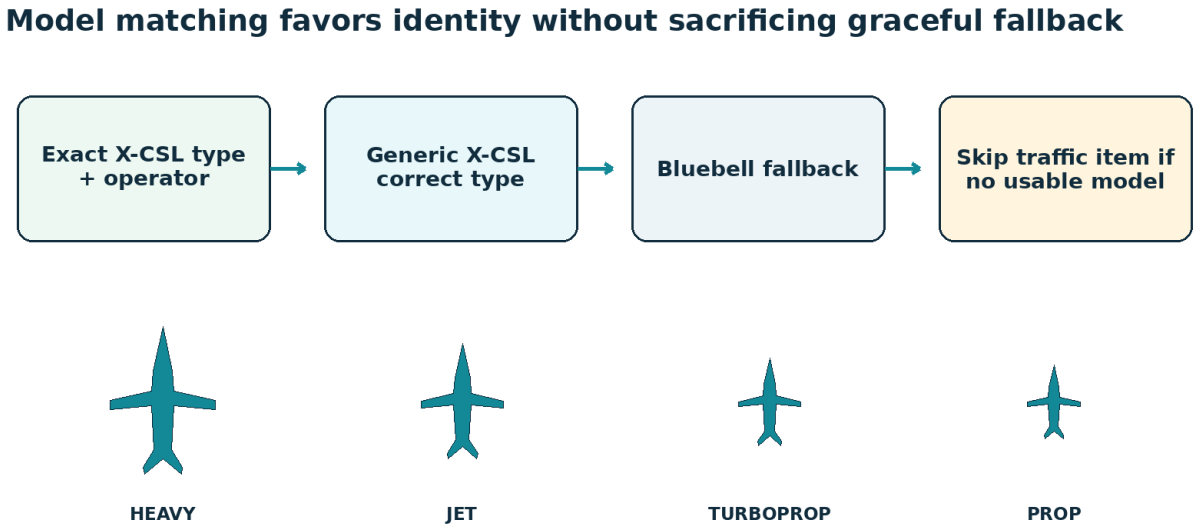


Figure 15. Exact X-CSL matching is preferred, but VAT can fall back through increasingly generic options unless Direct Model Matching Only is enabled.

Bluebell fallback models

Bluebell is the bundled/fallback CSL model system used when X-CSL is unavailable or cannot provide a valid prepared model. VAT reads model metadata and tries to preserve both aircraft type and operator identity. Compatibility substitutions allow useful traffic to remain visible when a particular variant is not represented by an exact standalone model.

X-CSL priority

When a valid X-CSL directory is configured, VAT gives it priority. The parser reads xsb_aircraft.txt package metadata and supports OBJ8-based aircraft, multi-part definitions, package dependencies, vertical/position offsets and optional texture or lit-texture overrides. Legacy OBJ7 definitions are not part of the current X-CSL path. VAT can also recognize the common IVAO CSL installation layout and the Settings status indicates which model system is active.

Matching order

1. Look for an exact aircraft ICAO plus airline/operator ICAO match.
2. If several equally exact X-CSL variants exist, choose among them so liveries are not mechanically identical.
3. Use current-fleet information where available to avoid assigning an aircraft type that the operator no longer uses in the observed traffic context.
4. Avoid placing identical special-livery variants repeatedly at the same airport when the model metadata allows those variants to be distinguished.
5. **When Direct Model Matching Only is off and an exact operator/type match is unavailable, keep fallback inside the same broad physical body scale where the requested ICAO can be classified - light prop, regional turboprop, regional jet, narrowbody or widebody - before accepting a less specific representation. This prevents an operator-only fallback from substituting an obviously different-sized body simply because the livery matches.**
6. If X-CSL cannot produce a usable prepared object, try Bluebell.
7. If neither system can supply a valid object, skip that traffic item rather than injecting a broken or unusable model.

Converted AIG models

Converted AIG packages are another CSL source alongside X-CSL and Bluebell. Use ModelBridge to create them first; select the directory containing xsb_aircraft.txt under Settings, then restart VAT. ModelBridge and matching are explained in the dedicated chapter.

Derived objects and animation compatibility

Some X-CSL objects are copied into derived .vat.obj files so VAT can inject compatible animation datarefs, preserve texture overrides or normalize properties needed by the traffic engine. Preparation is performed in a worker where practical and cached results are reused. This is why the first appearance of an unfamiliar package can be slower than later uses without implying that the traffic engine is stuck.

Geometry discovery

VAT scans aircraft geometry so it can estimate wingspan and length. Those dimensions are useful well beyond rendering: gate selection, wing-clearance tests, ground conflict envelopes, pushback safety and wake metadata all benefit from a realistic footprint. Third-party models with unusual origins or geometry can still produce imperfect estimates, which is one reason visual clipping cannot be eliminated at every custom stand.

DIRECT MODEL MATCHING ONLY

Turn this on only when exact operator/type identity is more important to you than traffic quantity. It is not primarily a performance mode. An incomplete model library can cause a substantial number of otherwise valid flights to be skipped.

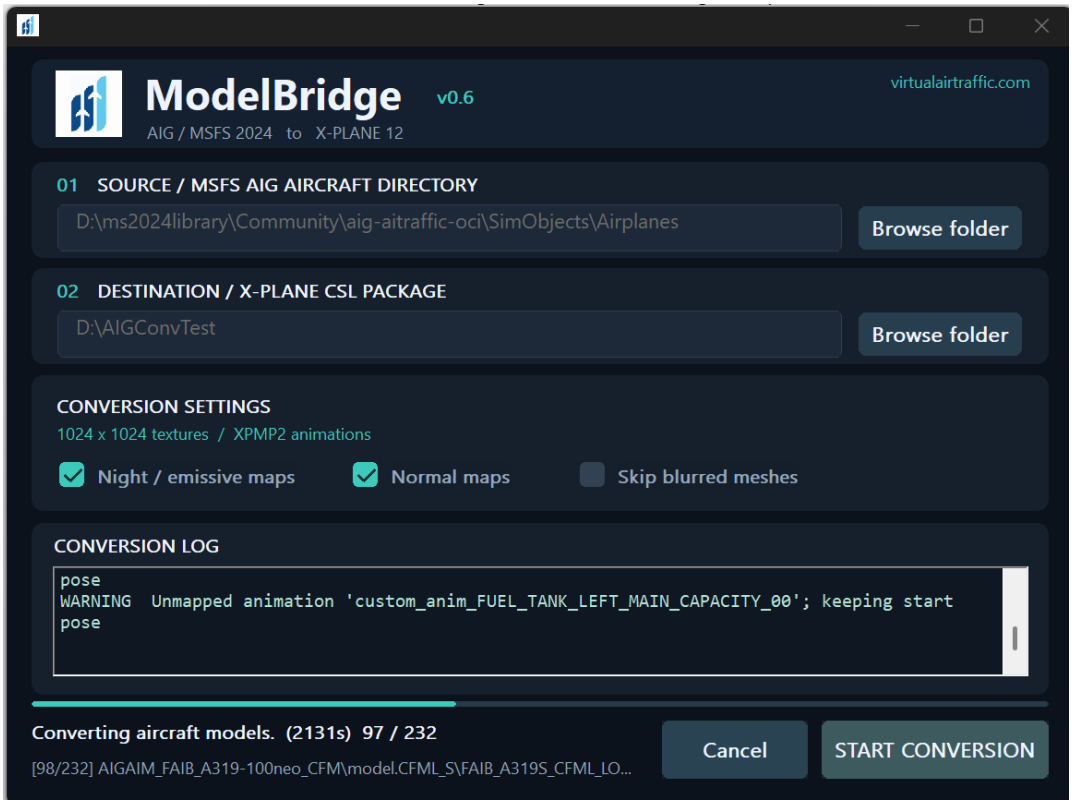
CHAPTER 24

24. ModelBridge and converted AIG aircraft

Bring an existing MSFS AIG traffic library into an X-Plane-compatible CSL package, then let VAT match its aircraft.

The two separate products

ModelBridge is a companion Windows desktop converter available from the Virtual Air Traffic Portal. It reads the AIG traffic aircraft and liveries already installed on your PC and produces a CSL/OBJ8-style output package for X-Plane. VAT 0.89 and later can use these converted AIG models. The converter is not a tool for downloading or licensing third-party aircraft; respect the rights attached to your source library.



ModelBridge's source, destination, texture options and conversion log, as pictured on the VAT website.

Convert an existing library

- Choose Source in ModelBridge and select the Airplanes directory inside your installed AIG MSFS traffic package; do not select only the MSFS Community root.
- Choose a different Destination folder for the converted CSL output, ideally a dedicated folder that is easy to back up.
- Review texture settings, including optional normal/night-map conversion options, then select Start conversion.
- Wait for the conversion report, log and generated xsb_aircraft.txt index. Some source objects or animations may require fallbacks or may be skipped when unsupported.

- In the VAT Settings Models area, set the AIG model directory to the generated folder containing xsb_aircraft.txt and model subfolders, then restart VAT.

How VAT chooses what to render

A rendered aircraft is associated with a flight's operator/type identity. VAT searches available model libraries and applies direct matching, similarity and fallback policies as configured. Converted AIG and X-CSL are model sources; neither alters the underlying schedule, ground routes or ATC safety system. When Direct Model Matching Only is enabled, exact matching restrictions can reduce visible traffic if the library lacks an appropriate variant.

What is converted and what is not

ModelBridge produces geometry, textures, compatible animation output and indexing needed by X-Plane CSL rendering. It does not convert an MSFS aircraft into a flyable X-Plane cockpit, guarantee every animation is supported, upload your source collection or supply missing AIG files. VAT's own derived-object preparation may still be needed for model offsets, lights or datarefs.

Troubleshooting a missing livery

Confirm that the source AIG library exists, the conversion completed without fatal errors and the destination contains xsb_aircraft.txt. Set the directory to that destination, restart VAT, disable strict direct matching temporarily and confirm Portal authentication and Traffic Density. Look at the conversion report for unsupported model records rather than assuming every airline must have a matching CSL object.

The website blog at /blog/model-bridge contains illustrated conversion steps. Package and tool versions listed on the Portal can differ from the plugin version, so follow the converter release currently shown there.

CHAPTER 25

25. Aircraft animation, lights and surface behavior

The visible aircraft state is driven from the same lifecycle used by the virtual pilot, so configuration, lights and motion change with the operational phase.

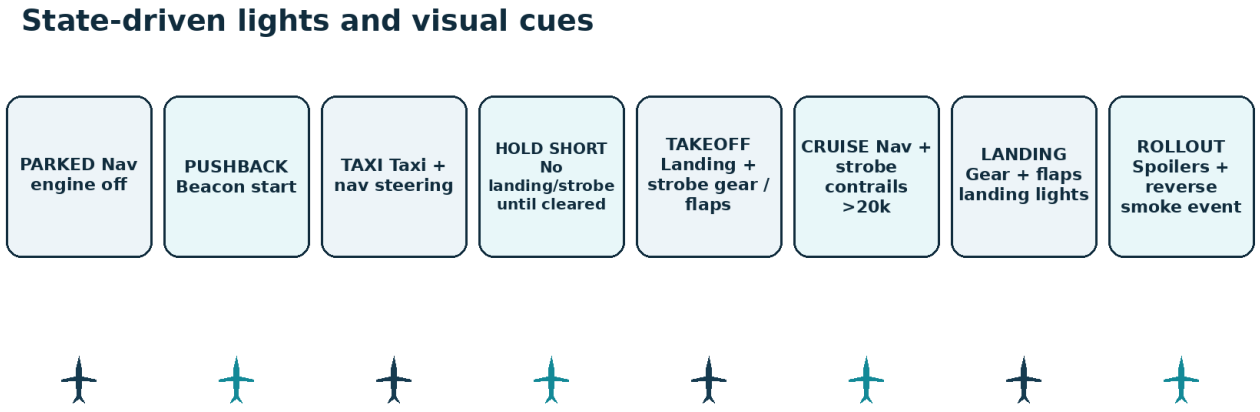


Figure 16. Lighting and animation cues follow the traffic state. Exact visibility depends on whether the selected CSL object implements the corresponding datarefs.

Animation datarefs

VAT publishes common libxplanemp-style values expected by compatible CSL objects. Depending on the model, this can drive landing gear, flaps/slats, spoilers/speed brakes, reversers, thrust, aileron/elevator/yoke inputs, rudder, nosewheel steering, wheel rotation, engine/propeller rotation and external lights. A model that does not animate one of those datarefs simply shows less movement; the traffic logic itself can still be correct.

Lighting by operational phase

- **Parked dynamic traffic.** Navigation lights can identify a live scheduled aircraft even before the engines are running.
- **Preparation / pushback.** Engine start and beacon behavior appear as the aircraft prepares to move.
- **Taxi.** Taxi/nav lighting accompanies ground movement. Taxi lights are turned on after pushback when the aircraft is ready to taxi.
- **Holding short.** Landing lights and strobes are not switched on merely because the aircraft is waiting at the active runway.
- **Takeoff clearance / active crossing.** Landing lights and strobes are switched on after takeoff clearance and while crossing an active runway.
- **Cruise.** Navigation/strobe lighting continues; landing lights are normally not carried through high-altitude cruise.
- **Approach / landing.** Gear, landing flap, landing-light and centerline-control behavior becomes visible as the aircraft configures for final.
- **Taxi-in.** Taxi lighting returns for ground movement, then is turned off before the final parking turn.

Aircraft-specific beacon and strobe timing

Version 0.91 adds an OBJ override path so some beacon/strobe behavior can follow the individual rendered aircraft rather than one universal X-Plane light rhythm. The effect depends on the installed model's objects and animation support. It does not change the virtual pilot's clearance state or the safety checks that control takeoff.

Flight-control checks

The Preparing to taxi phase can include a control-surface check. If the CSL object implements aileron/elevator animation, those surfaces move in a short functional-looking sequence. Many traffic models omit those animations, so the absence of visible movement is not evidence that the preparation state failed.

Ground turn and crosswind visuals

Steering and yaw are not treated as decorative values disconnected from the pilot. Ground-turn visuals use the same commanded turn behavior that moves the aircraft through corners. On takeoff and landing, rudder/crosswind corrections are reflected in the animation values so a supported model reacts visibly while VAT works to maintain the runway centerline.

Terrain following

Ground probing keeps aircraft aligned with sloped or changing terrain and corrects pitch so the model does not float or bury its gear when scenery elevation varies. Distant aircraft can require periodic re-probing as X-Plane local coordinate conditions change. This is especially relevant to scheduled parked traffic that can exist for a long time before departure.

CHAPTER 26

26. Contrails, touchdown smoke and wake turbulence

Visual atmospheric effects are tied to aircraft state, while wake information is also published into X-Plane so moving VAT traffic can influence the player.

Contrails

Dynamic non-static aircraft can create left and right VAT contrail instances while cruising above approximately 20,000 ft. Trail lifetime varies by aircraft rather than forcing every flight to draw an identical line; the typical randomized range is roughly 1-30 seconds. Hide airplanes suppresses aircraft and contrails together.

Touchdown smoke

A landing event can create a touchdown-smoke particle effect at the wheel/ground contact moment. The smoke is a visual cue tied to the landing phase rather than a persistent emitter. Scenery, viewing distance and rendering conditions naturally affect how prominent it looks.

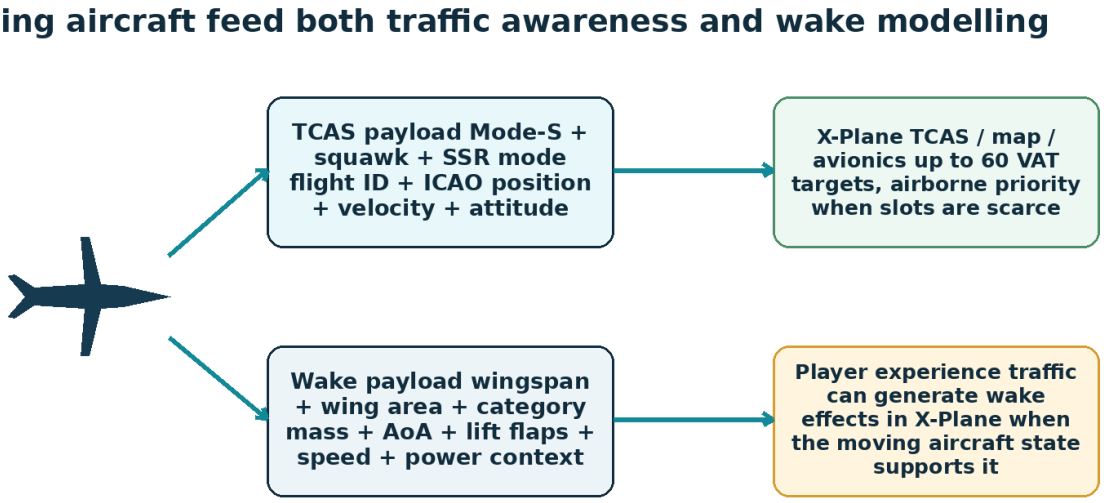


Figure 17. The same moving aircraft state that supports TCAS publication also carries geometry and flight-condition information used for wake modelling.

Wake data supplied by VAT

For moving traffic, VAT builds wake-related information such as wingspan, wing area, wake category, mass, angle of attack and lift context. Speed, flap configuration and power/flight state contribute to the effective wake picture. Very large aircraft such as the A380 can use the super-heavy category where the underlying API supports it.

Effect on the player

VAT wake information is published so X-Plane can apply wake effects to the user aircraft when supported by the simulator. This is different from collision avoidance: VAT does not deliberately steer the player, and the user remains responsible for wake separation. The purpose of the metadata is to let X-Plane know that a VAT aircraft is not only a visual target but also an aerodynamic traffic source with meaningful dimensions and flight condition.

MODEL QUALITY AFFECTS BOTH VISUALS AND METADATA

A useful geometry estimate improves stand clearance and wake representation. If a third-party CSL object has unusual dimensions or origin information, the visible aircraft can still be correct enough to use while some geometric estimates are less precise.

Jet heat blur and particle controls

The Disable particles setting covers contrails, touchdown smoke and particle effects. Jet-engine heat blur is experimental and may not be visible in all builds or with all aircraft. Disabling particles is also a useful presentation and performance option on busy airports.

High-precision positioning, per-aircraft timing and refinements to takeoff rotation, tug jitter and parking offsets help the traffic remain visually steadier, especially in Medium mode, at high-elevation airports and near congested stands.

CHAPTER 27

27. Static aircraft and weather-driven windmilling

Static traffic fills unused local parking without participating in the full flight lifecycle. Eligible parked jets can still show a subtle wind-driven fan effect.

What static aircraft are

A static aircraft is decorative local parking traffic. It has no normal flight plan, no departure/arrival lifecycle, no desktop/VR traffic label, no TCAS target and no normal engine-loop sound. Statics exist so unused stands are not visually empty while preserving those airport positions for moving traffic when the dynamic systems need them.

How statics are created and removed

The nearest local airport is eligible for static fill inside roughly 15 km while the player is at or below 10,000 ft. The usable-stand pool is filtered for size, operation type, occupancy, player protection, user reservations and clipping constraints before the target is calculated. For the initial airline/cargo fill, operator statistics and aircraft-type lists are used when available so the decorative fleet reflects types that operator actually uses at that airport on the current simulated day rather than drawing freely from historical liveries. Leaving the airport area eventually removes the local static set at around 31 km. Disable static spawns can be used when you want the airport populated only by moving traffic.

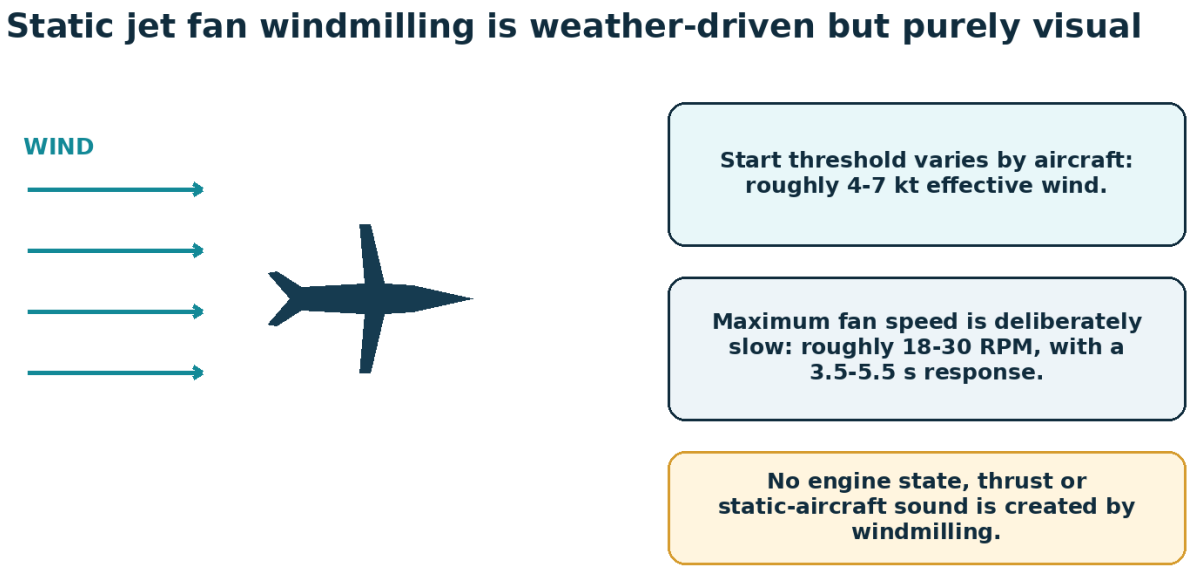


Figure 18. Windmilling applies only to eligible static jet/heavy aircraft and does not turn a decorative aircraft into a running engine.

Weather sampling

VAT refreshes local static-wind targets as part of periodic airport maintenance, approximately every 15 seconds per active airport. One airport weather sample is shared among its parked jets rather than querying X-Plane separately for every engine. Wind direction relative to the parked heading affects the result: headwind produces the strongest fan drive, while crosswind and tailwind provide a reduced effective component.

Per-aircraft variation

Eligible static jet/heavy aircraft receive slightly different fan parameters so a row of aircraft does not spin in perfect synchronization. The effective start threshold varies around 4-7 kt. Maximum visual speed is intentionally low, roughly 18-30 RPM, with a response time around 3.5-5.5 seconds and small sensitivity variation. An effective wind near the reference range produces the full target; lower wind produces proportionally slower movement.

Performance behavior

An actively moving or coasting static fan is visually updated at no more than roughly 10 Hz. Once the fan is fully stopped, the engine instance does not need continuous fan updates. This keeps the effect inexpensive at airports with many statics.

NO FAKE ENGINE

Windmilling never marks the engine as running, never creates thrust, keeps the logical prop RPM at zero and does not enable static-aircraft sound. It is strictly a visual fan animation caused by wind.

CHAPTER 28

28. General aviation statics and experimental VFR traffic

The separate GA parking population, how it is enabled, and the boundaries of the developing VFR experience.

A distinct GA population

The ordinary scheduled-airline, realtime and static-airliner populations remain in place. In version 0.90 the foundation for general aviation and VFR was introduced, and the 0.91 source contains a PLUS-gated GA/VFR control. The first airport population uses single-engine prop aircraft parked on appropriate GA tie-down stands, not a guarantee that every small airfield becomes filled with moving general aviation flights.

Enable the feature

Authenticate with an entitled PLUS account, open the Plus tab and enable Enable general aviation spawns and VFR (work-in-progress). The Static GA tie-down occupancy (%) slider then becomes available; this is separate from ordinary Traffic Density and from the Disable static spawns switch. For VFR radio operations, choose VFR in the top bar of ATC Messages after enabling the feature.

Why it may be empty

GA static creation uses eligible airport metadata from a published service catalogue. It selects nearby suitable airports with available tie-down parking and compatible aircraft choices. If no valid published airport record is available, VAT intentionally avoids speculative GA spawns. Airport geometry, plane models, occupied stands and player protection are still part of the admission checks.

The scope of VFR ATC

The VFR action panel is deliberately separate from IFR; it does not show a filed SimBrief IFR clearance or IFR taxi buttons. Supported steps include VFR taxi, reporting ready, requesting departure, cancelling a departure when safely stopped, taxi to stand after landing and requesting an airspace transition by class. A flight-following/FIS label exists in the interface but is not an active general-purpose request in the supplied 0.91 action catalog.

A visual comparison from the VAT website: IFR and VFR operations use different controller workflows.

Do not overinterpret the switch

The PLUS page still describes general aviation as developing, and the plugin checkbox explicitly says work in progress. Treat the static GA population and the implemented VFR button paths as an evolving beta, not a complete airspace simulation or a certified source of VFR clearances.

CHAPTER 29

29. 3D traffic audio

VAT uses positional exterior-aircraft sound so engine and event audio move with each traffic aircraft relative to the current X-Plane camera.

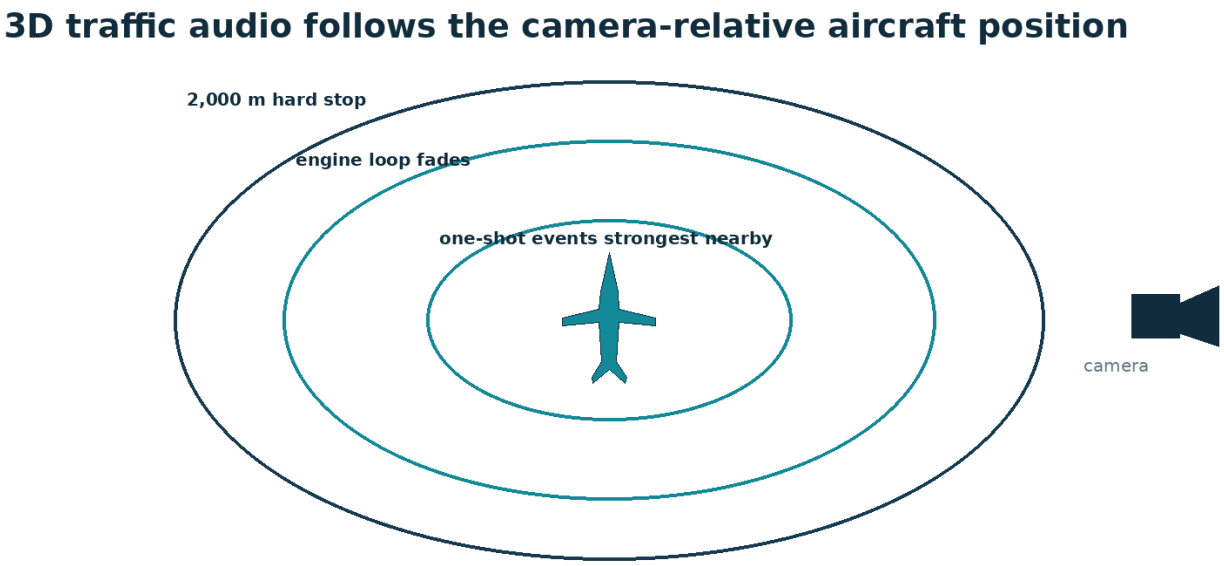


Figure 19. Sound is spatial and distance-limited; traffic audio is not intended to remain audible across the whole airport or airspace.

Sound sources

- **Engine start.** A one-shot start sound can play before pushback/direct taxi, followed by the continuous engine loop.
- **Pushback start.** A ground-operation event marks the beginning of the pushback sequence.
- **Takeoff roll.** A one-shot event reinforces the transition from line-up to acceleration.
- **Touchdown.** A landing event plays at wheel contact.
- **Engine loop.** Continuous positional sound plays while the virtual engines are running and varies with state/flight condition.

Jet and prop sound branches

The current sound-loader path includes separate jet and prop idle, startup and takeoff-roll files together with universal pushback and touchdown events. Propeller aircraft and turboprops both use the propeller sound branch; jets/heavies use the jet branch. This classification is independent of the CSL object audio, so a visually correct turboprop is not supposed to inherit the jet loop simply because its model package is third-party. Exact timbre comes from the installed VAT sound pack.

Distance and fading

Traffic audio is stopped completely beyond about 2,000 m from the camera. The continuous engine loop uses a broad 3D fade that reaches out to that limit. Start events and takeoff/touchdown events have their own minimum/full-distance curves, with takeoff and touchdown designed to remain useful farther away than a close-up engine-start cue. Short fade-ins reduce clicks and abrupt channel changes.

Camera-relative behavior

The sound source follows the aircraft X-Plane position and velocity, so panning, level and Doppler-like spatial context change as you move the camera. This is why an aircraft followed with the VAT camera can sound very different from the same aircraft viewed from the cockpit several hundred metres away.

Static and hidden aircraft

Static traffic is kept silent because it does not run the normal engine lifecycle. The ordinary Enable sounds checkbox turns off VAT audio without affecting traffic logic. Hide airplanes is broader: it suppresses rendered traffic, contrails and VAT traffic sound together while the virtual traffic world can continue for TCAS/data purposes.

Audio realism and compatibility refinements

Recent beta updates improve propeller-aircraft takeoff audio, vary several aircraft effects and address background audio playback stability. These changes belong to the standard 3D traffic sound system and do not require PLUS.

PLUS AI-controller voice playback is a separate radio-transmission pipeline with its own output routing, speech-service dependency and entitlement check. Turning ordinary VAT traffic Sounds off is not a substitute for checking the dedicated AI voice settings and COM1 power when a controller transmission has no audio.

CHAPTER 30

30. Desktop flight information labels

The 2D label system ranges from a compact identification tag to an extended information card with interactive aircraft actions.

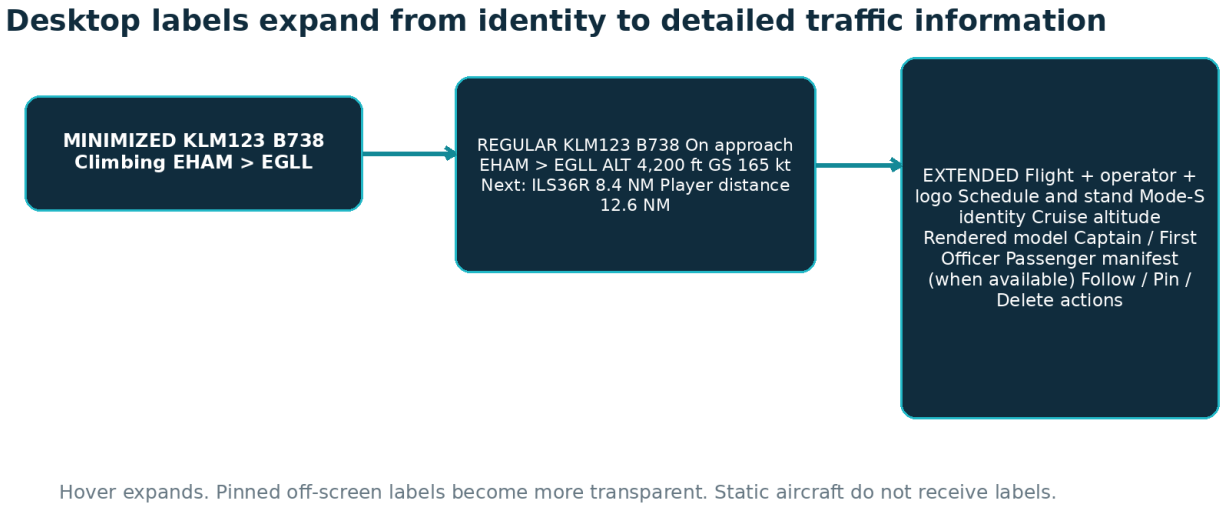


Figure 20. Desktop labels use minimized, regular and extended presentations rather than forcing every aircraft to display the same amount of information.

Eligibility and update rate

Labels are created for dynamic non-static traffic in the player area, with a normal range of approximately 50 km. The current desktop layouts are deliberately smaller to reduce clutter at busy airports: roughly 280 x 26 pixels minimized, 500 x 128 regular and 780 x 380 extended in the label renderer. Projection also stops earlier once an aircraft is sufficiently behind/outside the visible camera viewport (about a 5-degree offscreen margin), rather than keeping labels alive for traffic far behind the view. Membership and cleanup are checked frequently, while the more expensive text formatting remains throttled to about 5 Hz.

Minimized mode

The minimized presentation is intentionally compact: it keeps the flight/operator identity, aircraft type/state and origin-to-destination context visible without occupying a large screen area. Hovering can expand the card when more information is needed, unless your current label setting intentionally suppresses that behavior.

Regular mode

The regular label adds operational context such as altitude, groundspeed, next target/waypoint distance and distance from the player. State text can become very specific: Boarding, Waiting, Preparing to taxi, Pushback, Taxiing, Holding, Taking off, Departing, Climbing, Cruising, On descent, On approach, Going around, Landing at <runway>, Rollout, Arrived and Stalled can all describe different visible phases.

Extended mode

The extended card exposes deeper traffic detail such as scheduled departure, assigned stand, Mode-S identity, cruise altitude, rendered model and crew/passenger information when that backend information is available to the authenticated session. Airline logos are shown where a matching logo asset exists. Passenger data can be presented in a scrollable list; loading, unavailable and no-passenger states are handled separately rather than displaying fabricated names.

Interaction and hover timing

Labels are designed to stay unobtrusive until the pointer is near them. A minimized label can begin expanding after a short hover, around 700 ms. Regular/extended presentation can collapse after the pointer leaves for a shorter grace period, roughly 400 ms. Action buttons and hover hints appear after their own short delay. These timings reduce accidental flicker as the mouse crosses a busy traffic picture.

Label actions

- **Follow / camera reset.** Transfers the VAT follow camera to the traffic aircraft or resets the relevant view action.
- **Pin / unpin. Keeps the label in its expanded presentation while it remains projectable. Edge presentation is deliberately subdued, and traffic that moves sufficiently behind/outside the usable camera viewport is no longer forced to keep an edge label visible.**
- **Delete / remove.** Uses the controlled removal path rather than abruptly destroying the aircraft from a UI callback.
- **Extended / normal.** Lets you move between the detailed card and the regular presentation without changing the global label setting.

Cockpit suppression

Hide labels in cockpit is separate from the global Enable plane labels switch. Use it when you want labels in external views but prefer an uncluttered internal panel. Static aircraft never receive labels, so a busy parking ramp can still look visually full without filling the screen with decorative identifiers.

CHAPTER 31

31. Virtual reality and VR labels

The VAT menu and traffic remain available in VR, with a separate world-space label system designed for readability in a headset.

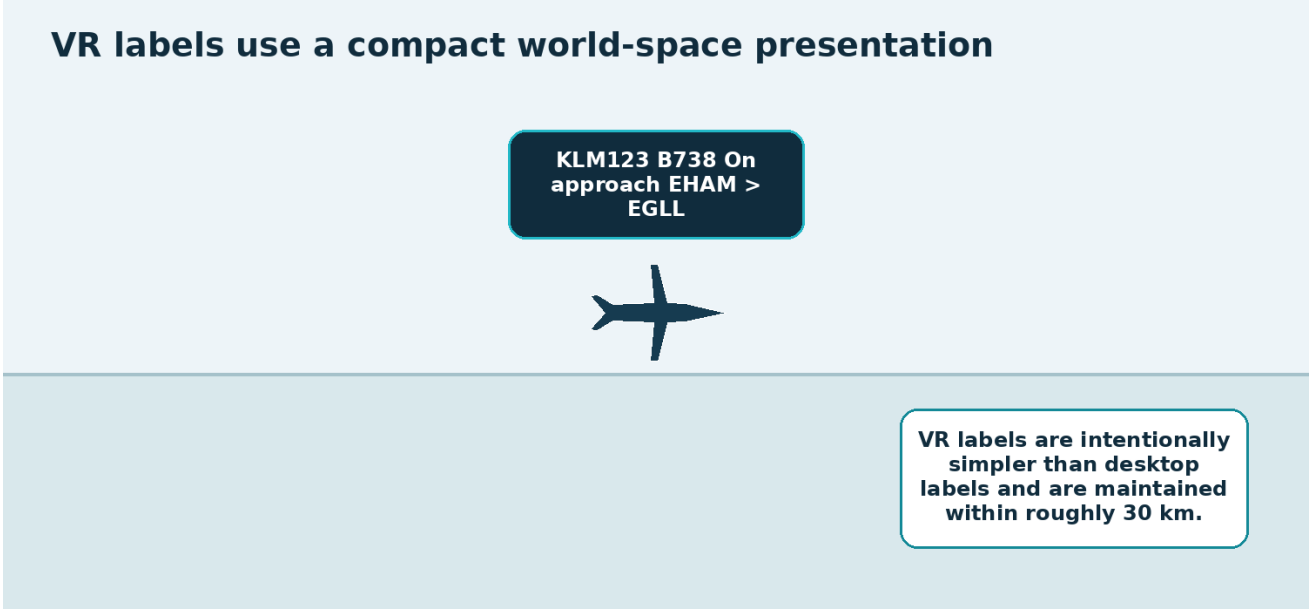


Figure 21. VR labels are intentionally compact and sit in the 3D world near the aircraft instead of reusing the desktop information-card design.

VR interface behavior

VAT responds to X-Plane VR state changes so the plugin interface remains usable inside VR. The aircraft models, contrails and traffic logic are the same traffic world used outside VR; VR is not a separate simulation mode. UI scaling and mouse-coordinate handling have dedicated code paths because X-Plane headset windows can use different pixel/boxel relationships from ordinary desktop windows.

VR traffic labels

The VR label renderer creates compact world-space information above eligible aircraft. The presentation uses two lines: a flight/type/status line and an origin-to-destination line. Size changes in distance buckets so the label remains readable without growing indefinitely as the aircraft approaches. The maintained range is approximately 30 km, shorter than the desktop label system.

Performance safeguards

World-space labels require X-Plane instances rather than a simple 2D overlay. To prevent a sudden nearby traffic population from allocating many VR label objects in one frame, creation is throttled; the current renderer limits itself to a small batch, up to roughly 16 new label instances per frame.

Current limitations

VR labels are deliberately simpler than desktop labels. They do not reproduce the hover-expansion, passenger details, pinned edge behavior or full set of action buttons from the 2D system. The feature remains early/experimental in the current beta and should be treated as traffic identification rather than a full VR copy of the desktop label UI.

DESKTOP AND VR LABELS ARE DIFFERENT RENDERERS

Changing expectations between the two views is normal. The underlying flight/state information is shared, but the presentation and interaction model are optimized separately for a monitor and a headset.

The ATC Messages window in virtual reality

The dedicated ATC Messages window can transition between desktop and VR presentation while preserving desktop geometry. The same station-aware action buttons and current COM1 feed apply in VR; it is not a separate controller or traffic population.

For reliable mouse/VR interaction, give the ATC window enough room for its fixed-size two-row action grid. The message feed retains a minimum viewing area, and combined controllers show arrow-based action pages when more than eight unique actions are available.

CHAPTER 32

32. TCAS, Mode-S, squawk, ADS-B and wake publication

How VAT exposes selected moving traffic through X-Plane multiplayer slots and keeps identities stable for avionics and external consumers.

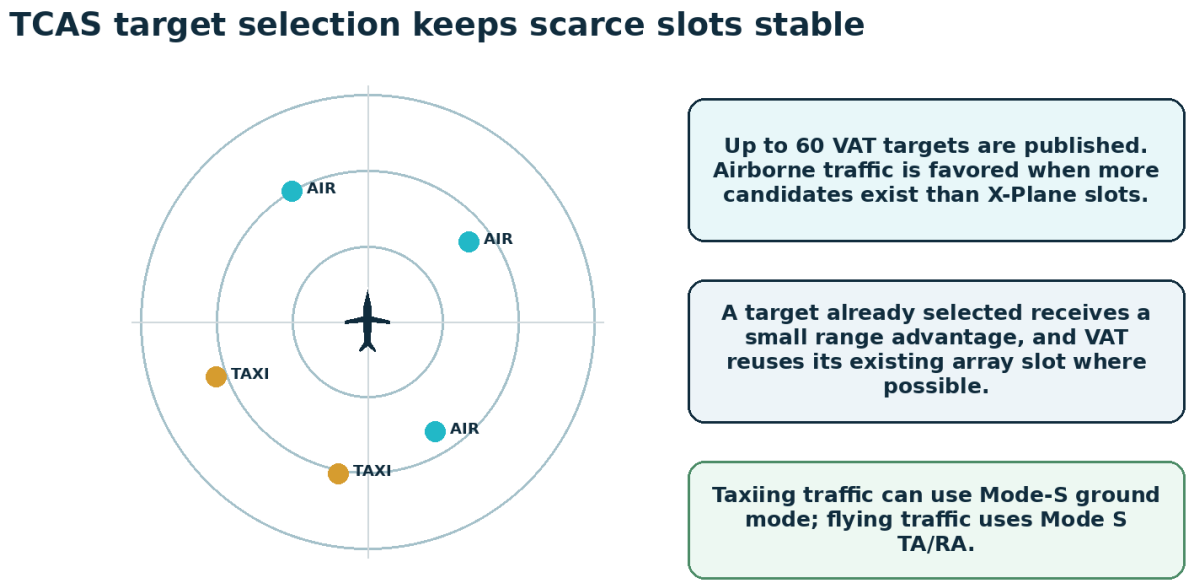


Figure 22. X-Plane offers a finite number of traffic slots, so VAT selects and stabilizes a subset of the complete virtual traffic world.

Owning the X-Plane traffic slots

When Enable TCAS updating is on, VAT requests X-Plane multiplayer/TCAS override ownership. X-Plane allows only one controller to own those slots. If another traffic plugin already has them, VAT identifies the controller in a warning popup, leaves its own aircraft simulation running and registers for a later opportunity to acquire the slots rather than treating the conflict as fatal.

Recorded routing and published positions remain different things

A VAT aircraft's own calculated position can be published through TCAS/ADS-B output and shown on the website live map. That does not mean VAT continuously follows an external ADS-B coordinate. Historical route data influences a planned path; the internal pilot still flies, sequences, slows, yields or goes around within VAT.

Capacity and selection

VAT publishes up to 60 traffic targets, leaving slot 0 for the user aircraft. Airborne/active traffic is favored when the candidate list is larger than the slot capacity. An already selected aircraft receives a small range advantage - around 1 km - so the target list does not churn at every small distance-order change. When a target remains selected, VAT tries to keep it in the same X-Plane array slot, which is friendlier to avionics and third-party consumers.

Which states are eligible

The current candidate filter excludes purely decorative and inactive phases such as STATIC, PARKED, STALLED, PUSHBACK, FINISHED, NONE and HOLDING. TAXIING aircraft are eligible, as are TAKING_OFF, CRUISING and LANDING aircraft. This lets surface traffic appear on compatible TCAS/map displays without allowing every parked gate model to consume a scarce X-Plane target slot.

Ground mode and airborne mode

Taxiing traffic, and very low-speed takeoff-state traffic while still on the ground, can be published with Mode-S ground behavior (SSR mode 5 together with weight-on-wheels context). Flying traffic uses Mode S TA/RA behavior (SSR mode 7). This distinction helps compatible consumers understand that a target is surface traffic rather than an airborne intruder.

Mode-S identity and session squawk

VAT publishes the 24-bit Mode-S identity where available and ensures the same identity is not placed into two TCAS slots at once. Each non-static aircraft with a valid identity can receive a stable session-local Mode A/C squawk. Generated squawks use valid octal digits and avoid common/reserved values such as 1000, 1200, 2000, 4000, 7000 and the special 75xx/76xx/77xx ranges.

Traffic fields

The TCAS payload includes flight ID/callsign, aircraft ICAO type, position, velocity, attitude, vertical speed, Mode-S identity, squawk and SSR mode. Wake-related fields include dimensions/category, mass and aerodynamic context. X-Plane can make that traffic visible on built-in navigation displays, the map and other consumers that read the multiplayer traffic arrays; compatible ADS-B/export paths can then disseminate what X-Plane publishes.

TCAS IS A PUBLICATION SUBSET, NOT THE TRAFFIC ENGINE

If a VAT aircraft is missing from TCAS, first consider state, slot capacity and ownership. The aircraft can remain fully simulated and rendered even when it is not one of the 60 targets currently exported through X-Plane.

CHAPTER 33

33. Follow camera

A simple traffic-observation camera for watching the virtual pilot without handing control to X-Plane AI views.

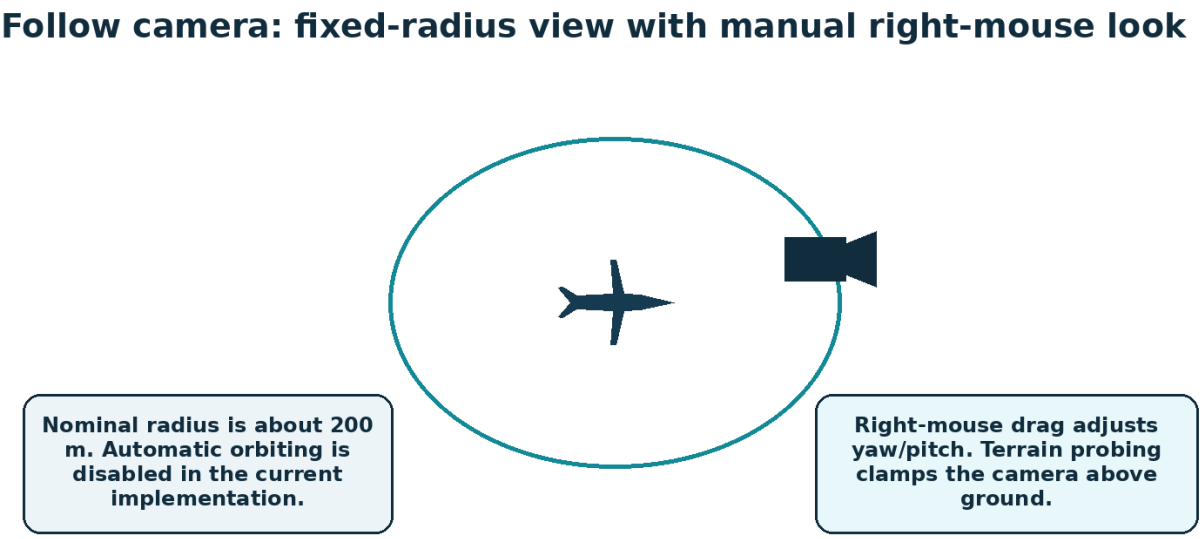


Figure 23. The current follow camera holds a fixed approximate radius and lets the user change the viewing angle with right-mouse drag.

Entering follow mode

Follow buttons in Departures, Arrivals, Nearby and the desktop label actions can transfer the VAT camera to a selected live aircraft. Only one traffic aircraft owns the camera at a time. The view remains centered on that aircraft and uses a nominal radius of roughly 200 m, which is far enough to see the whole model and nearby operational context without placing the camera directly on the fuselage.

Manual look

On Windows, hold the right mouse button and move the mouse to look around the followed aircraft. In other supported input configurations, use the camera controls available to your installation; follow mode remains a view, not a way to steer traffic.

Terrain safety

The camera probes terrain at its own horizontal position and clamps itself to remain roughly 2 m or more above the surface when necessary. After a clamp, the look direction is recalculated toward the followed aircraft so the view remains useful rather than pointing into the ground. This is important when following taxiing traffic across uneven airports or aircraft passing close to terrain.

Leaving follow mode

Choose UnFollow, switch to another X-Plane view or remove the followed aircraft to release VAT camera control. The safe-removal path also clears camera ownership when the tracked aircraft disappears, preventing a dangling camera reference after traffic cleanup.

CAMERA BEHAVIOR

The follow camera uses the fixed-radius manual-look behavior described in this chapter; automatic orbiting is disabled.

CHAPTER 34

34. Performance, pause behavior and traffic-density tuning

How to reduce work in a predictable order while preserving as much of the traffic world as your system can comfortably simulate.

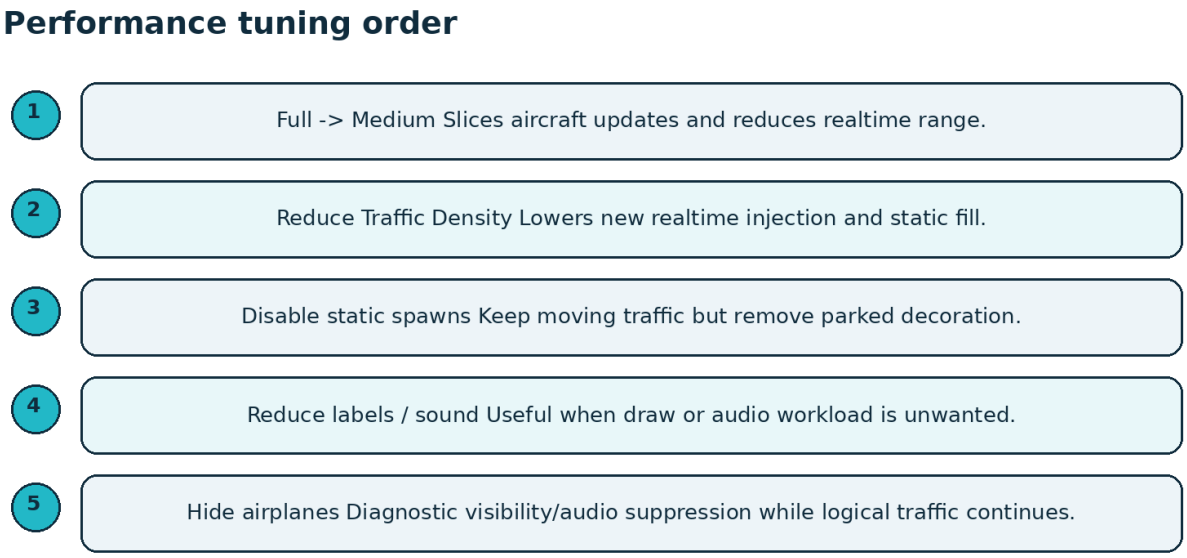


Figure 24. Performance tuning is most effective when you reduce simulation breadth before disabling individual presentation systems.

Medium versus Full

Setting	Medium	Full
Realtime spawn radius	About 100 km	About 200 km
Realtime cleanup radius	About 105 km	About 205 km
Aircraft simulation slicing	Traffic list divided into three slices; one heavier slice per rendered frame	All aircraft simulation slices processed each rendered frame
Intent	Lower CPU load and smaller surrounding traffic world	Most complete traffic simulation and larger realtime region
Queued aircraft creation	Generally limited to one creation/model instantiation per frame	Generally limited to one creation/model instantiation per frame

Traffic Density

Traffic Density is a generation control rather than a rendering-distance control. It directly scales static-aircraft population and probabilistically filters new realtime traffic before the expensive model-preparation stage. Scheduled departures remain tied to the real schedule, their 15-minute look-ahead, the per-pass creation cap and randomized smoothing.

Pause behavior

VAT follows X-Plane pause state. Traffic movement, virtual-pilot timers and periodic timing logic stop with the simulator. Resuming does not cause the plugin to “catch up” a long wall-clock gap in one frame. This matters for pushback, line-up waits, approach sequencing and arrival timers: the scene should resume from the state in which you paused it.

Reading the live counters

Settings shows the current flight-loop cost, the highest value observed, the cost of the most recent periodic-spawn pass and a microstutter count. A VAT loop of roughly 20 ms or more increments the current microstutter counter. Use these values comparatively: if switching Full to Medium lowers repeated VAT spikes, you have evidence that traffic simulation breadth was part of the problem. If VAT counters stay low while X-Plane still stutters, look at scenery, the user aircraft, graphics and other plugins as well.

Recommended tuning order

1. Switch Full to Medium. This reduces realtime range and slices heavier per-aircraft simulation work.
2. Reduce Traffic Density. This lowers the number of new realtime and static aircraft that enter the world.
3. Enable Disable static spawns when parked decoration is less important than moving traffic.
4. Reduce label use or enable Hide labels in cockpit when a busy screen is not needed.
5. Disable sounds when positional traffic audio is unnecessary or you want to isolate audio workload.
6. Use Hide airplanes for diagnostics or when you deliberately want the logical/TCAS traffic world without VAT rendering and traffic sound.
7. Do not use Direct Model Matching Only as a generic performance fix unless the visual identity trade-off is actually what you want; its main purpose is model-match strictness.

Why dense airports can still produce short spikes

Complex custom scenery, large taxi graphs, first-use model preparation, arrival-procedure work, many labels, tightly coupled GCM situations and a burst of eligible traffic all create transient work. Route calculations and nearby-geometry lookups now make greater use of cached/spatially bounded work so repeated path decisions consume less CPU, especially at dense airports. VAT still spreads and backgrounds many operations, and no traffic engine can make every data-dependent task free; the performance modes remain the user-facing way to bound the size of the simulated world.

Movement precision and performance refinements

VAT now uses higher-precision coordinates and per-aircraft timing for traffic updates. Together with changes in the Medium-mode simulation slices, these reduce the appearance of stutter or jitter in moving models and attached pushback tugs.

The engine also adds protections against duplicate placement and clipping in complex parking scenes, adjusts ground separation tolerances to prevent avoidable head-on queues and improves CPU behavior while the VAT interface is open. None of these fixes guarantee perfect behavior with missing or malformed scenery data.

When tuning performance, first choose Medium versus Full, adjust density and disable decorative effects or static aircraft if needed. The new Disable particles checkbox affects contrails and touchdown smoke even when a particular build has heat blur disabled in its update loop.

CHAPTER 35

35. Advanced configuration, commands and public datarefs

A reference for persistent settings, bindable commands and the JSON traffic interface available to other plugins and scripts.

vat_settings.ini

VAT stores persistent preferences in vat_settings.ini inside the plugin area. Normal changes should be made through the in-sim interface so the file remains consistent with the controls. The INI is still useful for deployment, troubleshooting and understanding which options persist between sessions. Close X-Plane before manual edits whenever practical so a later save does not overwrite your changes.

Newer operational switches and arrival-gate dataref

Version 0.91 adds bindable toggles for taxi guidance and COM1 standby autotune. The arrival-gates dataref is writable: for example, write A12 A14 to apply those stand choices to the SimBrief destination, EHAM: A12 A14 to target an airport, or EHAM: CLEAR to clear its selection. These values are preferences and never bypass a stand safety or runway clearance rule.

Bindable X-Plane commands

Command	Purpose
virtualairtraffic/interface/toggle	Show or hide the VAT interface.
virtualairtraffic/labels/toggle	Enable or disable traffic labels.
virtualairtraffic/rendering/toggle	Toggle VAT aircraft rendering together with the associated traffic sound/visual suppression behavior.

Assign these through X-Plane keyboard or joystick settings under the Virtual Air Traffic command group. The rendering command is useful for quick A/B diagnostics without navigating through Settings.

Public traffic JSON

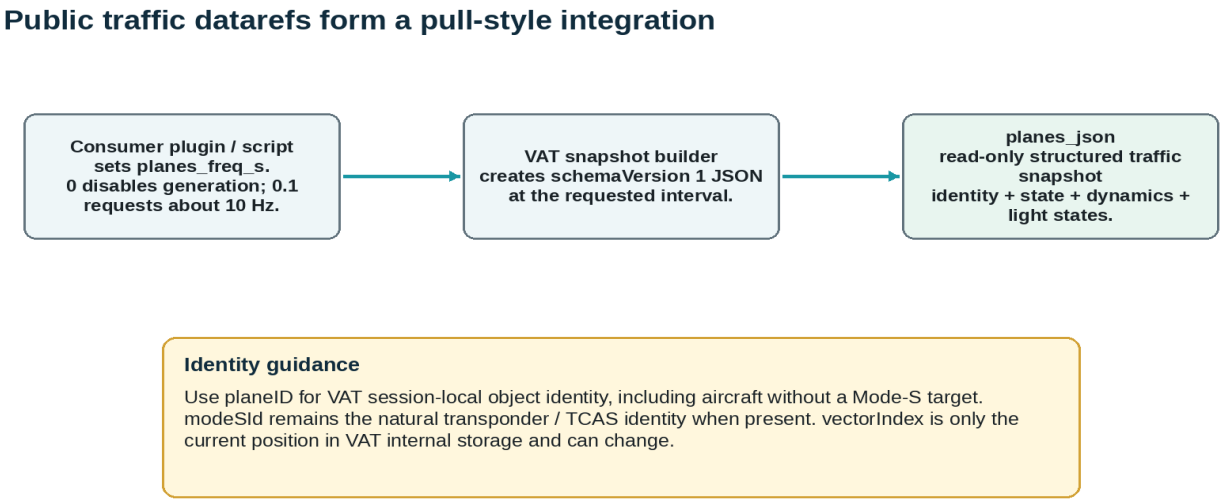


Figure 25. The planes_json dataref supplies aircraft identity, lighting, attitude and landing-gear information for session-local traffic.

VAT exposes the read-only string dataref virtualairtraffic/traffic/planes_json and the writable numeric virtualairtraffic/traffic/planes_freq_s refresh interval. Set a positive period in seconds to request snapshots; nonpositive or invalid values disable generation. Schema version 1 includes aircraft identity, position, lighting, model and flight context, plus pitch, roll and gear state. Read it as a snapshot rather than a traffic-control interface.

Schema version 1 fields

Field	Meaning
schemaVersion	Currently 1.
planeCount	Number of non-null aircraft records in the current VAT list, including statics when present.
vectorIndex	Current internal vector position only. Do not treat this as a permanent aircraft identity.
planeID	Session-local VAT object identity. Unlike vectorIndex it is assigned once to that aircraft object and is not reset during the session.
modeSId	24-bit Mode-S identity where the aircraft has one.
flightNumber	Callsign/flight number; can be blank for static aircraft.
operatorName	Operator text known to VAT.
aircraftICAO	Aircraft ICAO from the flight plan/traffic identity.
spawnedAircraftICAO	ICAO/type information for the rendered/spawned model when separately available.
originICAO / destinationICAO	Flight-plan airports; normally blank for static aircraft.
state	Internal VAT aircraft state such as Static, Waiting/Parked, Taxiing, Taking Off, Cruising, Landing or Finished.
latitude / longitude	Current geographic position.
altitudeFt / speedKt / headingDeg / verticalSpeedFpm	Current aircraft dynamics. Speed can be negative during pushback.
cruiseAltitudeFt	Flight-plan cruise altitude.
rendered / loadingObject / enginesRunning	Runtime rendering/model/engine status flags.
landingLightsOn / taxiLightsOn / navigationLightsOn / beaconLightsOn / strobeLightsOn	Explicit current exterior-light state flags exported by the snapshot.
flapRatio	Current flap ratio/state value used by the traffic aircraft.
nextWaypoint	Next flight-plan waypoint name or null when unavailable.
nextWaypointTargetAltFt	Target altitude for that waypoint or null when unavailable.
localX / localY / localZ	Current X-Plane local coordinates for consumers that need simulator-space position.

STABLE IDENTITY
Use planeID when you need VAT's session-local object identity, including for aircraft that do not publish a Mode-S target. modeSId remains the natural transponder/TCAS identity when present. vectorIndex is only the object's current position in the VAT vector and can change as other aircraft are removed or inserted.

Dataref integration etiquette

Choose a snapshot interval appropriate to your consumer and disable generation when it is not in use. This keeps JSON serialization work proportional to the actual integration requirement.

New commands and settings since 0.83

Command or setting	Use
virtualairtraffic/atcmessages/toggle	Show/hide the dedicated ATC Messages window.
virtualairtraffic/atc/push_to_talk	Hold to record a local voice request, release to transcribe and evaluate it.
Other.dark_theme_mode	0 = Auto, 1 = Dark, 2 = Light.
Other.disable_particles	Disable contrails, touchdown smoke and heat-blur particles.
Other.show_update_notifications	Turn the newer-release notification popup on/off.
SpeechToText.*	Local model, microphone and CPU/GPU preferences (PLUS UI).
ATCTextToSpeech.*	Enable generated controller voices and select output route.
Plus.airport_enhancements / ai_ground_control	First airstairs enhancement / experimental GroundOps shadow analysis.
virtualairtraffic/taxi_guidance/toggle	Toggle realTaxi guidance without opening Settings.
virtualairtraffic/atc/autotune_com1_standby/toggle	Toggle automatic COM1 standby frequency suggestion.
virtualairtraffic/atc/readback	Read back the current active controller instruction.
virtualairtraffic/atc/arrival_gates (writable dataref)	Write A12 A14, EHAM: A12 A14, or EHAM: CLEAR for player arrival stand preferences.

An optional file at Custom Data/VirtualAirTraffic_ATC_Overrides.txt lets advanced users override *missing* ATC service fallbacks at particular airports. It does not authorize arbitrary unlisted frequencies or override a published dedicated service.

CHAPTER 36

36. Troubleshooting

A symptom-first checklist for the problems most likely to be visible to an end user. Work from the subsystem outward before changing several unrelated settings at once.

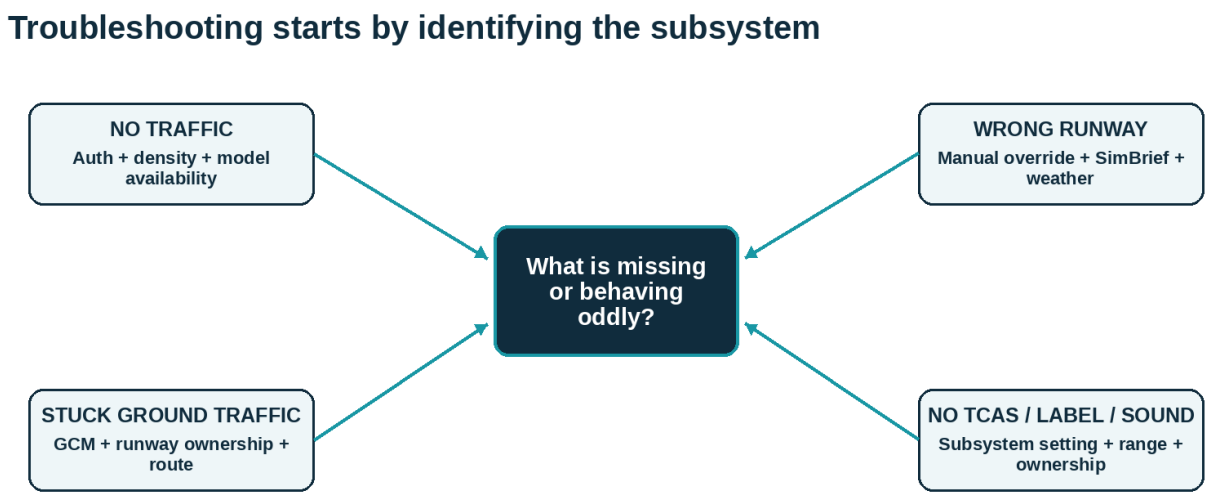


Figure 26. Start by deciding whether the problem is population, airport logic, presentation or publication. That narrows the useful checks quickly.

No traffic at all

- **Portal status.** Verify Traffic Manager shows a successful authorization. Scheduled and realtime online population depend on the service connection.
- **Traffic Density.** 0 is intentionally “No traffic”. Move the slider up and allow new maintenance/injection cycles to occur.
- **Startup time.** Wait for airport parsing, scenery overlays and model metadata to finish. The interface can be visible before population is ready.
- **Models.** If Direct Model Matching Only is enabled and your library is incomplete, many otherwise valid flights can be skipped.
- **Verbose log.** Temporarily enable diagnostic logging and inspect X-Plane Log.txt for authentication, model, schedule, X-CSL or airport messages.

Scheduled airport looks empty

Scheduled departures are created only inside the 15-minute look-ahead, never as a replay of already missed departures. At most three are admitted per 15-second maintenance pass, with additional random deferral. They still need compatible parking and a usable model. A SimBrief destination inside 100 km begins preparing earlier, but it does not guarantee instant gate saturation.

No static aircraft

- **Range.** Static fill is local to the nearest relevant airport, roughly within 15 km.
- **Altitude.** The player must be at or below approximately 10,000 ft for the local static fill logic.
- **Setting.** Disable static spawns must be off.
- **Capacity.** Only suitable non-excluded stands count. A small or heavily reserved airport may legitimately have little static capacity.
- **Traffic Density / time factor.** Both can reduce the final target below what the raw parking count suggests.

X-CSL is not being used

- **Path.** Point Settings to the CSL root that contains package subdirectories, not to a single aircraft model folder.
- **Restart.** Changing the X-CSL directory requires a VAT restart.
- **Metadata.** Packages need parseable xsb_aircraft.txt information and supported OBJ8 definitions.
- **Preparation.** First-use derived-object preparation may still be running. Enable verbose logging to follow the match/preparation path.
- **Fallback.** If X-CSL preparation fails, Bluebell can be used instead, which can make traffic visible even though X-CSL is not the source of the model you see.

Traffic is visible but missing from TCAS

Confirm TCAS updating is enabled and that VAT owns the X-Plane slots. If another traffic plugin owns them, VAT can still render and simulate traffic while the TCAS export waits. Consider the aircraft state: parked, static, pushback, holding and other excluded phases intentionally do not consume slots. Finally, remember the capacity is finite; airborne traffic is prioritized over lower-value surface targets when the candidate list is very large.

Aircraft is stopped on the ground

The aircraft may be waiting for the Ground Conflict Manager, a same-direction queue, a pushback corridor, a runway crossing, takeoff order, the player or a deadlock solution. Check the Nearby state and nearby movement geometry. A stop is frequently an operational hold rather than a failed path. If a specific aircraft remains unusable, Remove safely can retire it and suppress its Mode-S identity for the rest of the session.

Aircraft is circling or holding before the approach

This can be normal arrival metering. An inbound inside the commit region may be waiting for a safe threshold opening, for a previous landing to vacate, for a departure reservation to clear, or for the player's projected approach slot. The meter rechecks a stable hold frequently and releases by achievable safe threshold ETA rather than by a fixed first-come queue. If no safe hold geometry could be built, VAT deliberately falls back to the ordinary approach instead of forcing the aircraft into an invalid pattern.

Wrong runway

Check Airports > Runways before anything else. A persistent manual selection outranks SimBrief and weather every session until cleared. Next inspect the loaded SimBrief runway context. Only after those higher priorities are ruled out should you treat the airport traffic flow/weather selection as unexpected.

Automatic runway does not change immediately with a light wind shift

This is intentional in 0.83. Around 5 kt or less VAT locks the committed automatic flow and waits for wind to reach about 7 kt before treating wind direction as a reason to switch. Above that band a different wind-only candidate normally needs about 15 minutes of continuous preference. Ceiling, visibility and time-of-day traffic-flow changes can still act immediately, and manual/SimBrief choices remain higher priority.

Wrong or occupied arrival gate

Reserve acceptable positions before arrival through Arv. Gates. Multiple stands can be protected. If a VAT aircraft already owns a newly reserved stand it is queued for safe removal, not necessarily deleted instantaneously. At airports with suffix variants, remember that 21/21A/21B/21C can represent one physical stand family and are protected as overlapping alternatives.

Aircraft clips at a stand

VAT checks model geometry, width code, neighboring positions and reservations, but third-party CSL geometry and scenery parking origins can be imperfect. Compare the same airport with a different model, verify the custom scenery parking positions and check whether the stand is a tightly overlapping suffix family. A technically usable stand can still be visually poor if the scenery or model origin is unusual.

Labels are missing

Static aircraft never receive labels. Desktop labels require the global label setting, are maintained inside roughly 50 km and can be suppressed in the cockpit by the separate cockpit option. VR labels use their own compact renderer and shorter range around 30 km. If only one aircraft label is absent, first confirm that the aircraft is a dynamic VAT object rather than a static model.

No sound

Check Enable sounds, Hide airplanes, camera distance and aircraft state. Static traffic is silent and all VAT traffic audio is stopped beyond roughly 2 km. A parked dynamic aircraft that has not started engines will not have the same audio as a taxiing or airborne aircraft.

Performance or stutters

Switch to Medium, reduce Traffic Density and watch the VAT live timing counters. If necessary disable static spawns, reduce labels/sound and test Hide airplanes to separate simulation work from rendering/audio work. Turn verbose logging back off after a diagnostic session because very detailed logging can itself make a busy session heavier.

Custom scenery routes strangely

VAT uses a validated custom taxi graph only when it can form a coherent operational network. If the custom graph is rejected, the airport can fall back to Global Airports routing while still using custom parking. A scenery package with moved taxiways but incomplete WED routes can therefore produce a mismatch between the painted centerline and the fallback path. Check the log for custom APT parsing and graph validation messages.

0.91 routes, website services and GA checks

If historical arrival vectors are absent, confirm your destination/runway, active radio service, route availability, approach position and the online service. Recorded tracks do not cover every flight and VAT may use the ordinary fallback. If ModelBridge aircraft are missing, verify the generated index and restart after setting the AIG directory. For an empty flight log, make an IFR clearance request, remain authenticated and check whether a recording has been uploaded; previous interrupted flights may appear as aborted. GA/VFR needs an entitled account, an enabled experimental switch and eligible published GA airport data.

ATC and PLUS diagnostic checklist

- No ATC actions: switch on the avionics and COM1 electrical bus, tune the correct published station and inspect the status/disabled-button tooltip.
- No IFR clearance: confirm the loaded SimBrief route is valid, the aircraft is on the ground at its origin and the tuned station provides Delivery/Clearance.
- No push/start: stop at a recognized gate/parking position, get IFR clearance and clear the rear corridor; an engine-start-only stand may not permit pushback.
- Taxi does not progress: inspect the route and intermediate runway hold. A taxi clearance never grants an unrequested crossing or departure runway entry.
- No audio after controller text: check PLUS entitlement, the AI voice switch, COM1 tune/power, output device and network service; text should remain usable as fallback.
- Speech PTT fails: check model status, microphone meter/input device, CPU/GPU selection and X-Plane command binding; a recognized but unavailable request will still be rejected.
- PLUS feature appears inactive: check your account entitlement, relevant feature switch, COM1 power and any required online service. GA/VFR remains work in progress; real-time ADS-B repositioning and general AI airborne-control switches are still previews. Historical ADS-B arrival vectors are a separate working path.

CHAPTER 37

37. Operational limitations and expectations

What VAT deliberately does not promise, and the edge conditions where the simulator, scenery, model library or online data limit the result.

- **Not a one-to-one live radar replay.** VAT uses real-world-inspired data to populate a simulated traffic world. Exact moment-to-moment positions can differ from a live tracking site after injection.
- **Beta airport behavior.** Ground routing, final sequencing, pushback and scenery-specific geometry continue to evolve. A difficult custom airport can still expose edge cases.
- **Model-dependent animation.** VAT can publish an animation value only; a CSL object must implement that dataref for the part to move.
- **Scenery-dependent routing.** A valid custom taxi graph can be used, otherwise VAT falls back to Global Airports. Visual pavement that is not represented correctly in WED cannot be inferred reliably.
- **Procedure availability.** Arrival and missed-approach behavior depends on the CIFP records installed in X-Plane. Missing or malformed procedure data reduces what VAT can plan.
- Arrival metering is simulator traffic management, not certified ATC. Published holds are used when the installed navdata provides a suitable pattern; otherwise VAT may create a synthetic racetrack that is designed for its own traffic geometry rather than real-world clearance use.
- **TCAS exclusivity and finite slots.** Only one plugin can own X-Plane multiplayer traffic at a time, and only a subset of the complete VAT world can be exported into the available target slots.
- **Parking availability.** If every compatible stand is occupied, reserved or unreachable, an arrival can wait or stall rather than violating parking constraints.
- **Traffic density is not uniform.** A 100% slider does not mean every schedule/realtime record appears. Model availability, parking, handoff rules, online data and safety filters still matter.
- **Online service scope can change.** Airport coverage, schedule records, logos and backend information can grow independently of the plugin build.
- **VR labels are early.** They identify traffic in world space but intentionally do not reproduce the full desktop extended-label experience.

Why traffic can differ from the real world

A coherent simulator environment sometimes requires a different answer from a live tracker. A real aircraft may be stopped, delayed or vectored for reasons VAT cannot observe. Conversely, VAT may need to slow an injected aircraft, route it around an active runway or send it around because another simulated aircraft or the player occupies the runway. Those decisions are made to keep the local simulated world self-consistent.

Historical ADS-B data and beta boundaries

Recorded tracks make the simulated route more recognizable, not legally valid for actual flight. Wind correction and recovery are simulator guidance heuristics: they are not certified obstacle clearance or real-world separation instructions. Published aptOPS configurations are community contributions subject to review, not authoritative airfield publications. The live-flight website is a visualization of VAT-generated positions, not a guaranteed live-radar feed.

What counts as “realistic” in VAT

VAT aims for recognizable identity, plausible timing, airline/operator context, credible airport use, coordinated runways, realistic-looking model assignment and behavior that respects conflicts. It does not claim to reproduce every ATC instruction, individual airline procedure or exact surface movement from the real airport. The correct expectation is a living operational traffic environment inspired by the real network, not an evidentiary reconstruction of real-world operations.

CHAPTER 38

38. Glossary

The product vocabulary used throughout the manual and in the interface.

Scheduled departure
An airport schedule row that can become a physical parked departure near its scheduled departure time.

Realtime / midair traffic
Nearby-flight traffic discovered from realtime observations, injected in the air and then handed to the VAT virtual pilot.

Static aircraft
Decorative parked model without a normal flight plan, TCAS target, label, sound or dynamic lifecycle.

Virtual Pilot
Per-aircraft logic that performs preparation, pushback, taxi, takeoff, en-route flight, approach, landing and gate arrival.

Internal ATC
VAT logic for runway ownership, takeoff/crossing clearances, selected traffic conflict instructions and gate assignment.

GCM
Ground Conflict Manager; predicts ground conflicts and decides which VAT aircraft yields or reroutes.

Active zone
Taxi/runway graph region marking runway entry/crossing context.

Mode-S ID
24-bit aircraft identity used for uniqueness, TCAS publication and session suppression of removed realtime flights.

Mode A/C squawk
Stable session-local four-octal-digit transponder code generated for eligible dynamic VAT traffic.

SSR mode 5
Mode-S ground/surface publication used by eligible taxiing traffic.

SSR mode 7
Mode S TA/RA publication used by airborne VAT traffic.

Bluebell
Bundled/fallback CSL model family.

X-CSL
Optional external CSL package format parsed from xsb_aircraft.txt and OBJ8 definitions.

Direct model matching
Setting that prevents generic/similar fallback when an exact aircraft + operator model cannot be found.

SimBrief destination bubble
Approximately 100 km early-preparation zone around the loaded SimBrief destination.

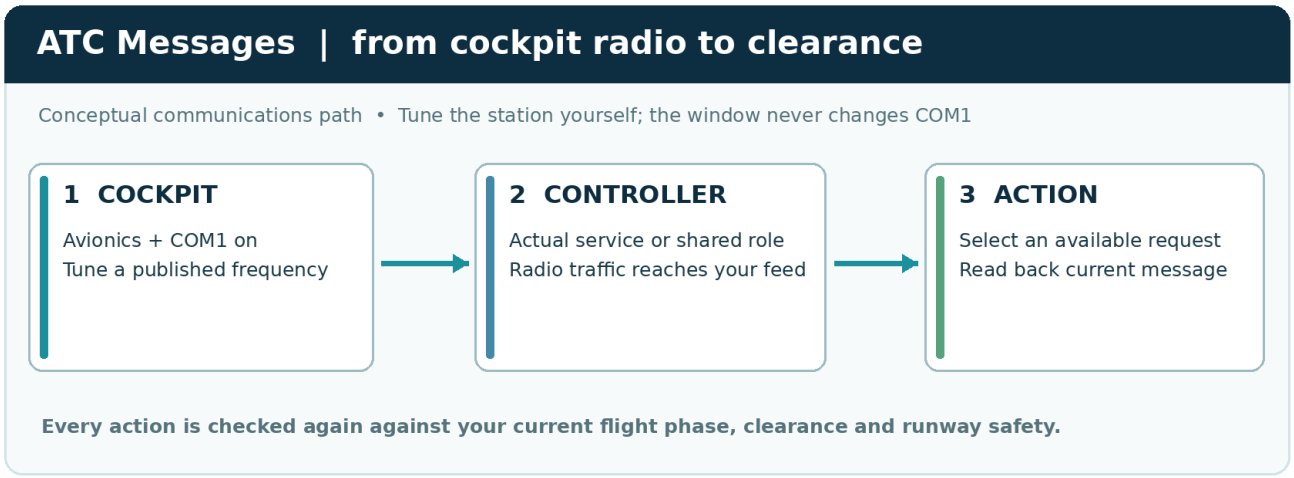
Persistent runway override
Manual airport runway set saved to vat_settings.ini and restored across sessions.

Arrival gate reservation Session-only parking exclusion selected through Airports > Arv. Gates.	**Stand family** Overlapping parking variants such as 21/21A/21B/21C treated as one physical parking area.
Derived .vat.obj Cached model copy prepared by VAT to apply compatible animation datarefs, offsets or texture handling.	**Final sequencing** VAT spacing management for aircraft established toward the same runway, including speed caps and go-around decisions.
Rollout Post-touchdown runway phase before the aircraft has fully exited to taxi-in.	**Hide airplanes** Runtime control that suppresses VAT rendering, contrails and VAT traffic sound while keeping logical traffic active.
Planes_json Read-only public JSON snapshot dataref containing structured VAT traffic information.	**Planes_freq_s** Writable public float dataref that chooses the JSON snapshot generation interval; 0 disables generation.
Arrival metering **Pre-approach time-slot logic that decides whether an inbound can join the threshold stream immediately or should wait in a hold.**	**Threshold slot** **Predicted runway-threshold time protected by the learned/default separation around completed, committed, untracked and player arrivals.**
Published hold **A usable holding pattern read from X-Plane earth_hold.dat and resolved against matching nav/fix data.**	**Synthetic hold** **A VAT-generated racetrack used when no suitable published hold can be used safely for the current approach.**
Runway occupancy learning **Adaptive spacing derived from touchdown-to-runway-clear time, using the highest valid observed value plus a safety margin.**	**Commit horizon** **The approximately 10-minute / 35-NM region inside which an inbound may be given a committed arrival slot or hold.**

CHAPTER 39

39. ATC Messages: your radio companion

See the frequency you are actually tuned to, hear the world around you and turn a silent flight into a believable exchange with controllers.



How the ATC Messages window links your powered COM1 to the correct services and checked player actions.

Opening the window and reading the layout

Open ATC Messages from X-Plane Plugins > Virtual Air Traffic, the Traffic Manager shortcut or a joystick/key bound to virtualairtraffic/atcmessages/toggle. You may also say “Open ATC Messages” with PLUS push-to-talk when local recognition is ready.

The header names ATC Messages and offers Player only. The station area shows the actual controller, published airport and service roles, the tuned COM1 channel in three-decimal-place format, your filed/cleared callsign and a LIVE/OFF indication. During eligible airborne flights it can also suggest an in-range or next Departure/Center contact.

Below is an animated message feed. When a recognized powered station provides actions, the lower panel reads “Send Message to …” and shows the relevant quick-action buttons. The current player ATC session status is printed above the buttons.

A COCKPIT RULE WORTH REMEMBERING

The window does not tune the radio for you. You must power your avionics/COM1, select the published frequency and follow a handoff yourself. A displayed suggested frequency is information, not a clearance.

The COM1 radio rule

New incoming messages are accepted only when the selected COM1 channel is powered, recognized and relevant to the transmitting station. The feed does not show every internal ATC event, and changing frequency does not retrospectively reveal transmissions that happened while you were elsewhere.

A message already received remains in your scrolling window history when you retune. The new station then contributes future received transmissions. The displayed timestamps measure elapsed simulator presentation time rather than Windows wall-clock time. The window deliberately retains a bounded recent history (normally the latest 50 shown rows).

Unknown stations, COM1 off and non-controller frequencies such as ATIS/UNICOM have no actionable button grid. Radio data is taken from X-Plane airport/controller data, so a published station may not be in range at every position.

Buttons, colors and pages

Delivery/Clearance, Ground, Tower, Departure, Approach and Center have distinct visual roles. A shared frequency can combine several service action groups. The window orders actions from early flight to later stages, removes duplicates and shows at most eight on a page; SID, direct-to, altitude and VFR-class selections may open their own choice pages.

When more than eight buttons are present, left/right arrows and “Page 1 / 2” let you move through the action grid. Changing airport, station frequency or service capabilities resets to page one. The button panel stays the same size as you switch pages.

An enabled action is a request, not a command to the aircraft. A disabled action stays visible where applicable; hover for its reason—wrong station, incomplete SimBrief, no engine telemetry, pending request, too far from a hold, or not yet implemented.

Messages, filters and readbacks

The message feed distinguishes controller instructions, player transmissions and radio traffic from other aircraft. Full callsigns, timestamps and controller frequency help you follow a busy airport without treating an unread historical message as a new clearance.

Player only filters the displayed radio history, not the actual station reception, and the choice is persistent. Read Back responds only after a specific instruction has been presented on its issuing frequency; optional automatic readback handles routine acknowledgements. A recorded IFR flight can also include the transcript in your Portal flight log.

Read Back follows the active instruction, on the issuing frequency. For an IFR departure clearance VAT may answer a valid readback with a short “correct”; routine clearances do not receive a redundant positive hearback. A free-form microphone transcription is not guaranteed to be semantically checked word by word. Where traffic-in-sight replies are offered, acknowledge the relevant advisory instead of treating it as an operational clearance.

Virtual reality and cockpit workflow

The window supports both desktop and X-Plane VR presentation. Desktop geometry is preserved through VR changes. Use the headset controller/mouse workflow available in your X-Plane setup to focus the pane; the same COM1 and station/action logic still applies.

A useful habit is to open ATC Messages before requesting clearance, keep it visible as you taxi, and check the instruction and readback before rotating or retuning. In VR, a combined-services frequency can save frequent tabbing: navigate pages instead of assuming the desired button disappeared.

Why an action sometimes appears to do nothing

- The station is correct but the request is waiting for the simulation loop or ATC radio scheduler; wait for the pilot message and controller response.
- The aircraft, SimBrief route or tuned channel changed after clicking; requests are revalidated before being accepted.
- The controller has already issued a clearance; a second request is blocked until the state changes.
- The runway is occupied: crossing/departure requests can place you in a monitored wait; hold short until ATC calls you.
- You are trying to use a planned runway or taxi route as authorization to enter the protected runway area; it is not.
- The action was deliberately defined for the UI/voice vocabulary but is not implemented yet; the disabled tooltip is the authoritative explanation.

CHAPTER 40

40. ATC voices, speech and automatic readbacks

What you hear, what you can say, and how acknowledgements and radio conveniences differ between FREE and PLUS.

Three voice paths

VAT has text radio messages for all users. FREE users can optionally enable offline ATC voices under Settings; these use a local speech engine and can consume CPU time, with less-natural output than premium voices. Eligible PLUS users can enable higher-quality AI-generated ATC transmissions and select an audio output or pilot-voice preference where offered. PLUS also provides local microphone speech recognition for pilot requests and readbacks.

Voice is a separate presentation layer: controller audio accompanies the simulated radio messages.

Receive a message

COM1 must be electrically powered and tuned to a published active station. The transcript can arrive independently of audio if playback or synthesis fails. Sound on incoming ATC message is an optional notification setting; it does not change whether a clearance was issued. ATIS uses the relevant published channel instead of being presented as if it were a normal Ground/Tower clearance.

Use push-to-talk

For PLUS microphone recognition, enable the local model, select the microphone and processing device, and bind the VAT PTT command in X-Plane. Hold to speak and release for transcription; the resulting intent goes through the same station, flight-state and safety checks as a button request. You can also use supported convenience phrases such as opening ATC Messages. Speak in short, unambiguous aviation wording rather than expecting an unrestricted chatbot controller.

Manual and automatic readbacks

Read Back acknowledges the specific current instruction after it has been presented on the issuing frequency. You can bind virtualairtraffic/atc/readback to a key. Enable Auto-reply with ATC readback in Settings if you prefer routine acknowledgements without a click or microphone. Automatic readback does not create extra authority; your aircraft must still respect each clearance's limits.

A short spoken “correct” can follow the readback of an IFR departure clearance, including an appropriate amendment. Routine taxi, crossing, line-up, takeoff, level or arrival readbacks do not receive an extra confirmation merely because the pilot acknowledged them. A recognized free-form PTT readback is not guaranteed to have been checked against every word in the instruction.

Pilot voice and regional variation

The PLUS voice panel can select a preferred pilot voice, gender/accent choices where supported, and preview samples. Available voices depend on the account, service and installed version. If the saved choice becomes unavailable, select Automatic or another eligible voice. These voice choices do not change airport or traffic control decisions.

Audio checks

If you see text but hear nothing, confirm the selected output device, sound enable option, controller voice switch, COM1 power and network connection for online speech. If PTT fails, check the microphone meter, button binding and local recognition model. When CPU load is a concern, disable offline speech or select an appropriate compute mode before reducing traffic density.

CHAPTER 41

41. Every ATC action button

A complete pilot-facing reference. Look up the button you see on your tuned station, understand when it works and avoid confusing a request with permission.

ATC buttons | what “available” really means

The same stateful checks apply to clicking a button and to recognized PLUS voice requests

AVAILABLE AFTER CHECKS

Request Clearance, Pushback and Start, Request Taxi, Request Crossing, Ready for Departure, Request Takeoff, Announce on Frequency, Read Back

SHOWN, BUT NOT ACTIVE YET

SID changes, pilot hold or cancel, Go Around, vectors, direct routing, altitude requests, position reports, field-in-sight report

Actual button availability also depends on the tuned station and aircraft state.

Actions are exposed by station role, then individually enabled or disabled by flight and clearance state.

Action availability at a glance

The same controller checks apply to button clicks and recognized voice requests. The exact actions depend on the services offered by the tuned station; combined Ground/Tower/Delivery frequencies merge role actions without duplication. An available button still depends on the flight state - it is not an unconditional clearance.

Action	Where shown	Availability / purpose
Read Back	All controller-role stations	Available after a delivered instruction on the issuing station; acknowledges that specific message.
Request Clearance	Delivery/combined provider	Available for ground-based, filed SimBrief IFR flight at origin; creates preliminary route clearance.
Request SID Change	Delivery	Implemented when published SIDs can be selected for the cleared departure runway.
Pushback and Start	Ground	Available with IFR and recognized stand; approval can be push/start or engine start only.

Action	Where shown	Availability / purpose
Request Taxi	Ground	Available with IFR; validates engines, stand exit and graph route; sets an authorized hold point.
Request Crossing	Ground or Tower	Available at intermediate cleared runway hold; ATC may delay, grant or cancel if runway changes.
Hold Position	Ground	Visible, currently disabled.
Return to Stand	Ground	Implemented subject to safe return-route and prior taxi/session prerequisites.
Ready for Departure	Tower	Implemented near final hold; queues tower runway decision (takeoff, line-up or hold).
Request Takeoff	Tower	Implemented; shares controlled departure request safety path.
Cancel Takeoff	Tower	Requires a safe stopped ground/clearance state when available.
Go Around	Tower	Shown contextually; availability depends on current approach state.
Announce on Frequency	Departure/Center	Available in supported airborne departure/en-route phase to check in.
Request Direct	Departure/Center	Implemented for eligible route fixes; opens a fix-selection page.
Request Higher	Departure/Center	Station/flight dependent; Center-capable stations offer Request Altitude selection.
Request Lower	Approach/Center	Dependent on airborne/arrival state; follow issued ATC clearance.

Action	Where shown	Availability / purpose
Request Vector	Departure/Approach	Contextual vectors may be provided by arrival/aptOPS/historical guidance.
Report Field in Sight	Approach	Not a general-purpose approach clearance; availability may be limited.
Position Report	Center	Availability depends on current Center session.

The generic “Other Request” is a non-actionable fallback definition; no unrestricted free-text ATC request field is active in the current window. GroundOther and several commented placeholder buttons are likewise not selectable.

Clearance / Delivery: starting the plan

Request Clearance takes the valid SimBrief filed IFR flight at the departure airport and asks ATC to assign its departure context. The controller uses the published Delivery frequency, or a published Ground/Tower channel which legitimately provides the missing Delivery role. An appropriate on-ground state, COM1 power, station match and IFR route are required.

An accepted response includes the destination, departure runway and SID, initial climb and allocated squawk where data permit. It does not release brakes, approve pushback, select a taxi route or authorize runway entry. A later SimBrief refresh will not replace the cleared flight without a new session.

Request SID Change is implemented when published departure procedures are available for the filed runway. The button opens a SID choice page and may request an amended clearance. If no usable SID exists, the page reports that condition; VAT can still issue a suitable IFR clearance without inventing a SID.

Ground: startup, pushback and taxi authority

Pushback and Start checks that the airplane is stopped at a recognized stand and already has IFR clearance. At a suitable gate with clear rear traffic, ATC can approve pushback and engine start; at a misc/tie-down/hangar type position it may grant engine start only. The plugin does not start your engines or operate a third-party tug for you.

A rejected pushback can occur because VAT sees traffic in a conservative rear corridor. Wait for the obstruction to clear and request again. On a gate pushback VAT looks for observed reverse motion and a completed stop; after sufficient displacement, the session becomes ready to taxi.

Request Taxi requires a suitable airport ground graph, valid location and known running-engine telemetry; taxi is not a remote autopilot. The issued route names taxiways and the assigned active runway but authorizes movement only up to the indicated hold-short boundary. At a gate, complete pushback before approval. If a route necessarily crosses an intermediate active runway, the initial taxi clearance ends at that crossing.

Hold Position is a displayed but disabled advisory action. Return to Stand is implemented for supported departure/arrival airport contexts with a previously established taxi session and a safe parking route; it can also stop at an intervening runway crossing and require further approval.

Ground or Tower: requesting an intermediate runway crossing

Request Crossing becomes available when you have an active taxi clearance with an intermediate runway hold and are near the authorized limit (typically within about 45 m). It is NOT permission to enter the departure runway.

ATC checks shared physical-runway ownership, arriving/departing traffic and player geometry. If safe, the instruction names the runway (and sometimes taxiway), then reauthorizes the remaining route. If unsafe, the request remains monitored and you should hold short; ATC can call later when the route opens.

A granted crossing is watched until the aircraft is physically beyond the far-side protected boundary. Only then can the station tell you that the runway is vacated and to continue. If circumstances become unsafe before you enter, ATC may cancel an unstarted crossing. Read back the current instruction on its issuing frequency.

Tower: departure, line-up and takeoff

Ready for Departure and Request Takeoff both enter the same stateful Tower departure workflow. These become available only with an outbound taxi clearance reaching the departure hold and after meaningful progress along that route (approximately two-thirds, not simply on loading at the gate). Tune Tower, including a combined-services channel if valid.

Tower can reply with cleared for takeoff, line up and wait, or hold short. The runway resolver checks occupancy, queue order, reservations and imminent aircraft conflicts; it may retry while you wait. A line-up instruction allows runway entry but is NOT takeoff clearance. A takeoff clearance can be suspended or cancelled if runway safety deteriorates while you are still stopped. When you have begun moving under takeoff clearance, the controller does not act as an automatic rejected-takeoff system.

Cancel Takeoff and Go Around are state-dependent actions; their availability is determined by the current controller/session logic and may be disabled where a safe workflow is not defined. VAT never accelerates, rotates, brakes, flies an approach or turns your aircraft for you.

Departure and Center: airborne radio check-in

After a valid cleared flight departs using the Tower takeoff state, VAT can open the airborne session and identify reachable published Departure/Center coverage. Announce on Frequency transmits a check-in reporting the current/assigned level once tuned correctly. The controller may acknowledge and issue a step climb to the next available level from the filed cruise plan.

Controller suggestions and handoffs appear as guidance; tune the published frequency yourself. Stay on the previous frequency until you have received and acknowledged a handoff. The airborne controller tracks assigned level and can deliver follow-up climb instructions when the previous one has been presented and normal spacing is satisfied.

Request Direct opens eligible cleared-route fixes. Request Higher/Lower depends on flight phase; Center can offer a Request Altitude picker. Request Vector is contextual, not an unrestricted instruction generator. For arrival vectoring see aptOPS and historical routes. Position Report appears only in suitable sessions.

Approach, arrival and handoff limits

Approach and Center can now support arrival/descent requests, check-in and route/vector guidance tied to the current arrival. Published aptOPS arrival paths and matched historical ADS-B routes can supply controlled vectors toward the runway; final establishment, radio handoff and landing clearance remain separate safety gates. Do not assume a generic button grants permission to land.

The internal AI traffic system DOES sequence VAT-controlled arrivals, generate holds and go-arounds, coordinate landings and taxi to gates. That is separate from giving the human player an ATC instruction; player ATC currently concentrates on departure, selected ground operations and climb/en-route check-ins.

NO IMPLIED CLEARANCES

Neither a populated taxi route nor an assigned runway authorizes an actual runway crossing or takeoff. “Line up and wait” and “cleared for takeoff” remain separate ATC decisions. Always act on the latest message addressed to your aircraft.

Read Back: the link between message and action

The Read Back button is added to every recognized controller action group. It remains disabled until a controller has actually presented an instruction, and it binds to its exact request/instruction identifier. That guard avoids answering a later instruction with an old acknowledgement.

A button readback uses a generated phrase derived from the current clearance. PLUS voice recognition can submit the spoken words you actually said. ATC responds with a readback acknowledgement; this does not silently upgrade a clearance or auto-tune the next station.

If the current controller message was cancelled or became obsolete before audio played, the previous readback context can also become invalid. Listen for the fresh instruction and stay on its issuing frequency when replying.

CHAPTER 42

42. IFR airborne ATC, direct-to and level changes

How the expanded player ATC workflow deals with departures, cruise, descent, approach and changes to an accepted clearance.

Start with a valid filed route

For normal player IFR, load a SimBrief flight plan and request the clearance from the right Delivery/Clearance service (or a combined service). The cleared call sign, runway and plan context remain a snapshot for that flight. If the airport publishes no usable SID for the runway, VAT can issue an appropriate clearance without inventing a procedure.

Choose or change a SID

When ATC allows Request SID Change, the action opens a selection page populated from applicable X-Plane departure records. Select a published SID and wait for ATC to confirm the amendment. A list that says No SIDs is a data result, not a reason to type an imaginary procedure. Changing the planned route in SimBrief alone does not automatically amend an accepted clearance.

Check in on the next station

After takeoff, follow the issued handoff. VAT's hint may show the next published frequency, and the optional COM1 standby autotune can place that channel in standby; you still activate/tune it as necessary. Use Announce on Freq. to report in where supported, and read back the specific altitude or heading clearance. Automatic climb instructions do not imply permission to ignore a different current level restriction.

Request direct to a fix

Request Direct can open an eligible fix list drawn from the active route. Select a fix that the controller offers; when accepted, its direct-to instruction is a route amendment, not an invitation to navigate to an arbitrary identifier outside the flight plan. If no fixes are eligible or the radio/session is unsuitable, the page can be unavailable.

Request an altitude

A Center-capable controller can offer Request Altitude and a Flight Level choice page. The available choices depend on the current cleared level and rule context; pure Departure/Approach services may instead expose directional Higher/Lower actions. Request the level, wait for the controller's response and read back the resulting restriction. The version 0.91 addition is a controlled selection path, not unlimited altitude freedom.

Descent, vectors and the final handoff

Request Descent initiates an arrival that is tied to your destination and the assigned runway. When usable, the controller can follow aptOPS published vectors or a historical ADS-B route; otherwise VAT relies on its ordinary procedure/fallback behavior. The route must still connect safely to final, and a Tower handoff is made only when the aircraft really meets the relevant final-course and altitude checks. The Tower clearance is a separate event.

When an instruction cannot be completed

If you depart significantly from an issued historical path, VAT can re-vector toward a forward point after a sustained deviation and cooldown, without silently choosing a new historical flight. A runway change, teleport, lost telemetry or unsafe intercept may suspend guidance. Do not chase a waypoint behind the aircraft; ask for a new clearance or manage your go-around when required.

CHAPTER 43

43. VFR ATC and controlled-airspace requests

A separate radio workflow for PLUS users while the general-aviation/VFR engine is still being developed.

Choose VFR deliberately

With an eligible PLUS account and the work-in-progress GA/VFR switch enabled, open ATC Messages and change the flight-rules selector from IFR to VFR. The header can also display airspace class information. VAT uses a separate VFR action catalog rather than presenting IFR delivery, SID and clearance options with misleading names.

VFR taxi and departure sequence

Request VFR Taxi asks for a route to a verified holding point using airport geometry. As with IFR, the visual guidance and taxi clearance end at their authorized limit. At Tower, Report Ready lets you announce that you are holding short and ready. Request Departure can ask again after a hold-short instruction, and Cancel Departure is intended only for a safe stopped state clear of all runways. VAT cannot determine that a runway is safe solely because you clicked a button.

Landing and parking

After a supported VFR arrival, Taxi to Stand can request a route to an available parking position. A stand must remain suitable and reachable; a visually empty apron is not proof that a taxi path exists. The VFR radio controls do not park your aircraft or apply autobrakes.

Airspace transitions by class

Enter Controlled Airspace opens a class choice page (B through G) before transmitting. The request is tied to the current applicable station and telemetry, not a universal permission to enter every controlled sector. Read back or report traffic in sight when the controller specifically presents the corresponding instruction or advisory.

Flight following / FIS status

The supplied 0.91 VFR action list includes the label Request flight following / FIS, but it is explicitly non-actionable there. Do not present it as a completed world-wide service simply because the website describes VFR ambitions. The rest of the VFR workflow is beta and depends on entitlement, airport data, radio coverage and aircraft state.

The practical rule

Fly the aircraft yourself and verify the radio instruction you actually receive. VAT never becomes the authority for real VFR navigation, airspace compliance, obstacle clearance or aviation weather.

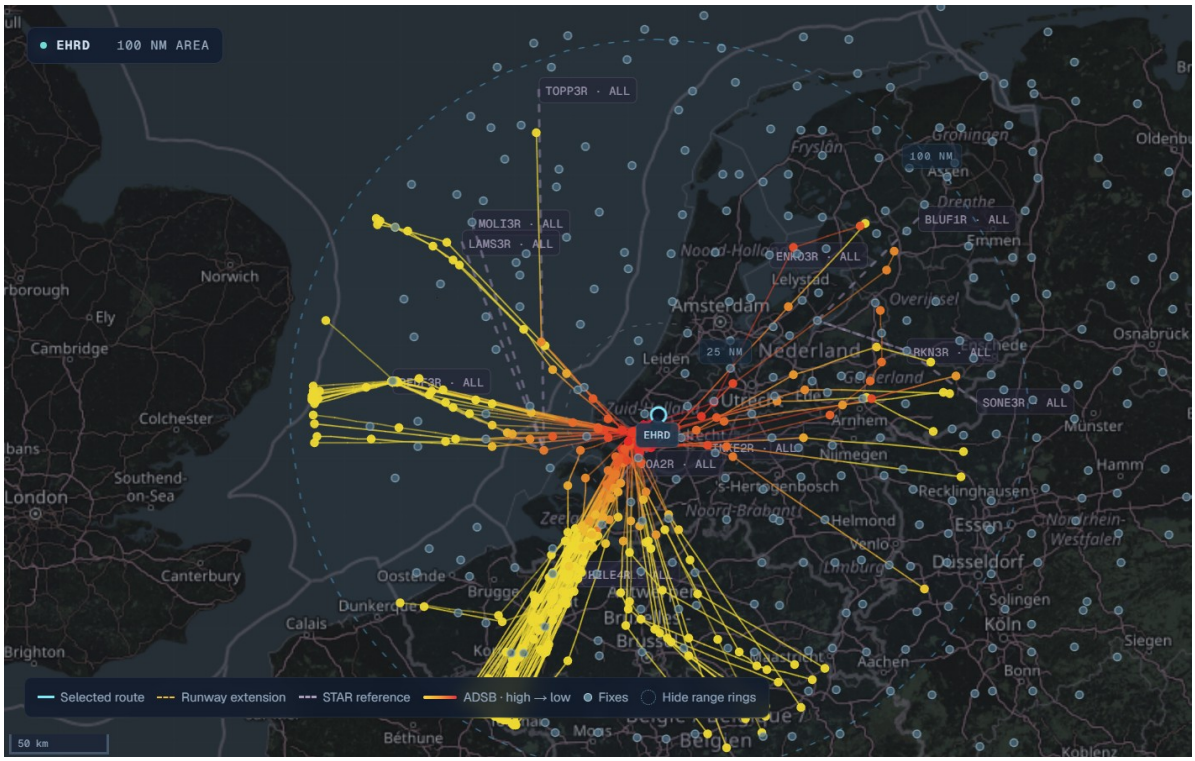
CHAPTER 44

44. Historical ADS-B vectored arrivals

Real flight tracks become runway-specific controller vectors for your own arrival, with fallbacks and safety gates.

The big idea

Version 0.91 introduces historical ADS-B arrival vectoring. Instead of inventing the entire series of turns, VAT can find an observed arrival to the destination runway by a suitably comparable aircraft. The historical track becomes a candidate route for your simulated approach. It is not the same as the PLUS Real-time positioning preview, which would periodically mirror aircraft coordinates.



Website illustration: numerous recorded ADS-B arrivals converge toward a runway, providing candidate vectors rather than one generic line.

Matching a candidate

The service organizes tracks by airport, runway and aircraft type and considers your current position and direction before choosing a usable entry path. When a route can be matched, the player ATC arrival context commits to that route. The source remains identifiable as real-world vectors, distinct from aptOPS community-authored arrival routes. If a route is not available or cannot be joined safely, normal arrival behavior is retained.

What the controller says

At an appropriate Approach/Center service, request descent and follow the heading and level instructions associated with the matched track. VAT considers actual magnetic heading and wind correction, so the simulated radio vector is intended to take the aircraft toward the next route point rather than simply repeating a true-ground-track number. When the route has a recognizable published fix, the controller may use its name.

Route continuity and recovery

The matched route is pinned after acceptance. Small deviations do not trigger immediate chatter. A sustained off-course condition can lead to a corrective heading toward a forward point of the same route. The source implementation uses separation between instructions and a cooldown to avoid repeated rapid corrections. An already-passed sparse point can be skipped forward; the aircraft is not commanded to turn back merely to touch a historical GPS point. If only a suitable forward intercept to the extended runway centerline remains, VAT may guide toward that instead.

The final approach is a separate safety gate

Vectors cease when the aircraft is properly established on the intended final. The arrival workflow still checks runway, horizontal centerline, vertical profile, station/handoff and landing authority separately. It does not issue a Tower landing clearance just because the last historical point was crossed. A go-around, unexpected runway change, teleport or telemetry discontinuity can suspend an old route.

What the feature does not promise

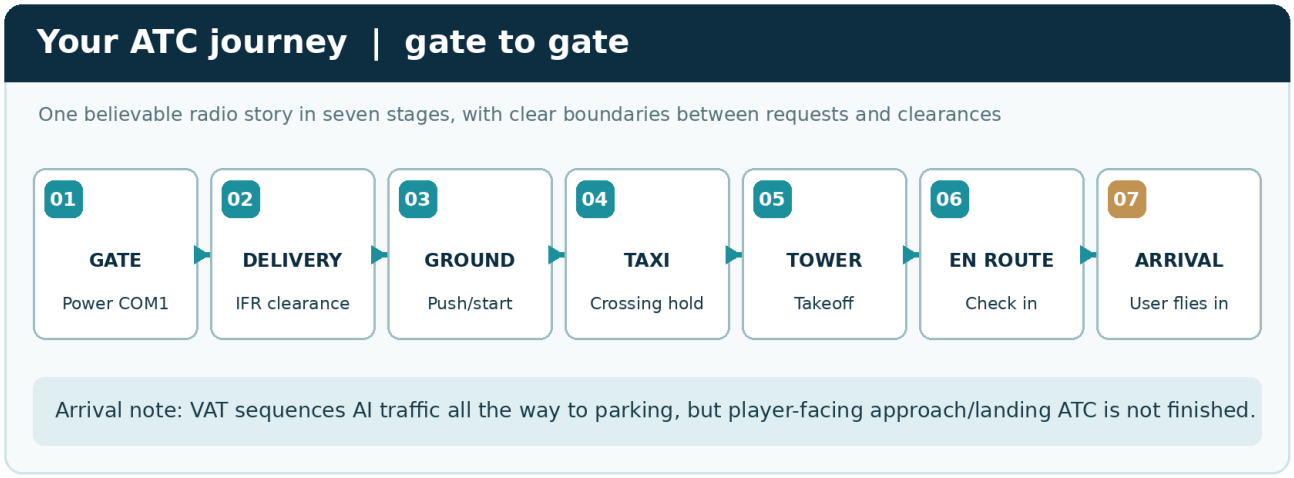
Historical tracks are a realism aid, not guaranteed terrain or obstacle clearance, a currently published IFR procedure or a certified ATC service. Coverage is uneven and the route of one actual flight may not suit your aircraft or weather. Maintain your own altitude/aircraft management and use normal simulation judgement when a route cannot be safely continued.

The companion article virtualairtraffic.com/blog/real-world-arrival-vectoring shows the observed-track library and explains its connection to the Live Flights map and AI traffic routes.

CHAPTER 45

45. Fly the radio: a gate-to-gate adventure

A cockpit journey through the new ATC experience. Imagine dawn at a busy European terminal: the ramp is waking, a tug rolls past and your callsign is about to join the frequency.



A sample departure radio journey and its current handoff boundary at the destination.

Before dawn: build the flight

You are the captain of VAT742, parked at a valid airline gate. X-Plane is set to the desired date/time and an IFR flight from your departure airport to your destination has been generated in SimBrief. Portal authentication is healthy, the airplane is stationary, the avionics are powered and the plan is visible in Settings.

Outside the windshield, VAT scheduled traffic boards, another aircraft's tug shuffles into position and a regional jet begins its taxi. None of this requires you to use player ATC—but this time you decide to take part. Open ATC Messages and tune the published Clearance/Delivery service.

AN ILLUSTRATED SCENARIO

VAT742 and the generic runway/route names below illustrate the intended workflow; actual stations, runways, SID, squawk, spacing and message wording depend on your airport data, SimBrief OFP and controller decisions.

First call: IFR clearance at the stand

The tuned-station card turns live. On a major airport's dedicated Delivery frequency you see Read Back and Request Clearance. At a smaller airport, Ground or Tower may also provide the Delivery role, so the same button appears among a combined set.

You do	What ATC can do
Request Clearance	"VAT742, cleared to [destination] via [SID], runway [assigned], then as filed. Initial climb [level]. Squawk [code]."
Read Back	Your acknowledgement appears in the feed and ATC may confirm it.

The moment is satisfying, but the brakes stay set: an IFR route clearance is not a taxi clearance. This is the place to enter the cleared runway, initial altitude and transponder code in your aircraft. If the button is grey, inspect its tooltip rather than repeatedly pressing it.

Ramp alive: pushback and start

Switch manually to Ground unless the airport uses your already tuned combined frequency. Pushback and Start becomes relevant. VAT checks that your aircraft is stopped at a recognized gate and that the rear corridor is clear of known traffic.

Select Pushback and Start. On a compatible terminal stand the reply can approve both. You then operate your aircraft's engines and any pushback service yourself. The plugin observes the reverse motion and final stop; it does not drive your own airplane.

If you parked at a self-manoeuvring tie-down or hangar instead, expect an engine-start-only approval where supported. If a passing aircraft blocks the gate, you may hear a refusal: watch it roll by, then ask again. The little delay makes the apron feel like a shared place, not a traffic-free loading screen.

The taxi clearance is a boundary, not a shortcut

With a running engine and pushback completed, ask Ground for taxi. The controller has the airport's WED taxi graph and available runway information. You may receive "Taxi via A, B and C. Hold short runway 24" or a similar route, with the actual names generated from the airport.

Now follow the authorized pavement in your aircraft. Other VAT aircraft obey their own virtual-pilot and Ground Conflict Manager rules; your aircraft is a moving blocker in that world, so AI traffic can yield to you or wait for crossing geometry to clear.

Suppose Taxiway B crosses an active runway before reaching your departure runway. VAT intentionally clears only the first segment: stop at the intermediate hold, use Request Crossing when available and read back the controller's actual instruction. After you vacate the far side, Ground can tell you to continue. No hidden full-route permission is created by the map.

From Ground to Tower: holding point suspense

As you approach your final departure hold, Ground can send an explicit Tower handoff when you are close enough, rather than while miles of taxi remain. Look for the controller's three-decimal published frequency, acknowledge and retune COM1 by hand. If Tower and Ground are combined on one channel, you may not need to change the frequency.

With enough progress on the assigned taxi route, Ready for Departure or Request Takeoff becomes enabled. Press it once. The tower may ask you to hold short because someone is on short final, may give line up and wait to use the runway efficiently, or may clear takeoff when the surface and approach are safe.

Radio moment	Pilot action
"Hold short, number two for departure."	Stay clear of runway; wait for a fresh Tower instruction.
"Line up and wait runway 24."	Enter/alight at the runway as permitted, then remain stopped until takeoff clearance.
"Runway 24, cleared for takeoff."	Read back, verify the latest authority and fly the aircraft yourself.

A clearance can be reconsidered while you are stopped. VAT may cancel it if runway occupancy changes. That is why the ATC feed is worth watching at the holding point.

Off the runway: Departure and Center

Advance the throttles, rotate and raise the gear: you fly, VAT supervises the simulated airspace. Once airborne from a valid player takeoff clearance, the airborne session can suggest reachable Departure or Center coverage and begin altitude coordination.

Retune to a published Departure or Center frequency and use Announce on Frequency. Your level report gives ATC enough context to acknowledge the check-in and, where eligible, clear a climb toward your filed cruise altitude. You can use Read Back to acknowledge the issued level and follow later instructions in order.

Look for the next-frequency hint and monitor controller responses. The hint can feed COM1 standby when that setting is enabled but never changes COM1 active or grants a climb. Use Request Direct and altitude selection only when enabled by your station and flight context; do not treat a filed route as controller permission.

Descent: a busy arrival world, with an honest limitation

At the other end of the flight, the destination is already coming alive. If SimBrief integration is active, VAT may start preparing the arrival airport while you are still some distance away. Watch moving AI traffic being sequenced to final; some aircraft may hold to preserve your approach corridor or go around to protect the runway.

On descent, request the applicable Approach/Center service and follow the returned clearance. A published aptOPS arrival or matched historical ADS-B route can provide additional vector instructions. If none is available or conditions are unsuitable, VAT uses the ordinary procedure/fallback behavior. Fly your own aircraft, check final establishment and obtain the runway-specific Tower clearance where the workflow supports it.

Once on the ground, VAT's simulated arrivals may taxi to stands around you. Keep using its Airports > Arv. Gates tool in advance if you wish to reserve a parking position for your own arrival, but do not expect a fully automated player-side arrival-taxi clearance sequence.

At the stand: finish the story

Taxi your airplane clear of the runway, follow the terminal route you are using, enter the gate and shut down. The most memorable part of this flight is not a constant stream of instructions: it is knowing when a clearance matters, hearing another flight check in and recognizing the runway queue react to your presence.

In the ATC window, the history of what you actually received tells the story from the first clearance to the last climb. With PLUS voices and local PTT enabled, the same sequence feels even more alive—the request originates in your headset and the controller's voice answers through your selected audio path.

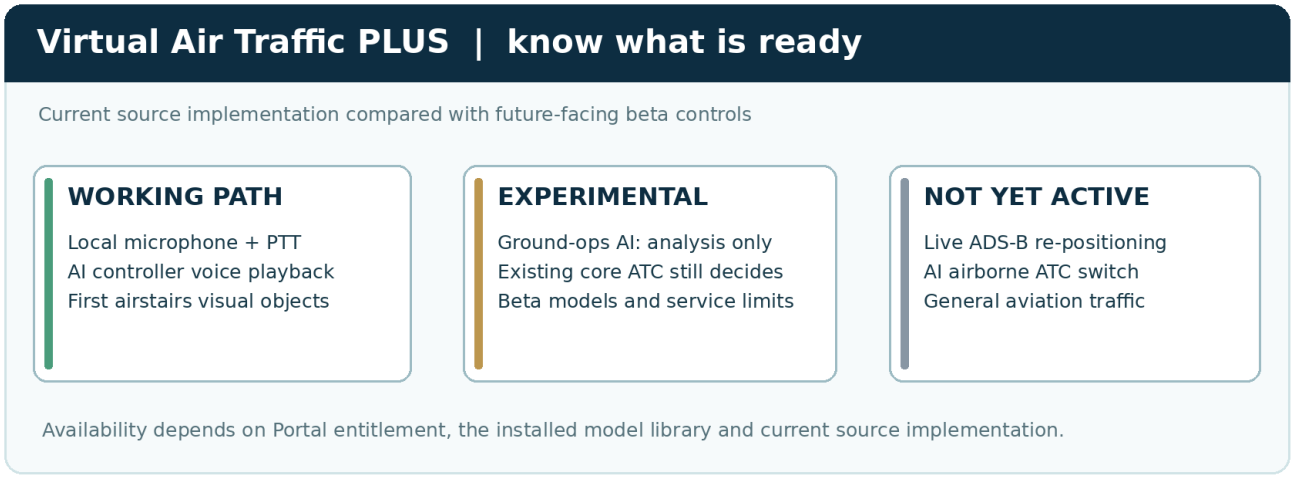
THE NEXT FLIGHT

Try a smaller airport with no dedicated Delivery frequency. You will see combined ATC actions arranged in flight-phase order, and you can use the page arrows to find Ground and Tower without inventing a separate station.

CHAPTER 46

46. Virtual Air Traffic PLUS

Optional immersion upgrades for pilots who want spoken ATC, a more alive ramp and early access to evolving beta systems—with a clear distinction between working features and what is coming next.



PLUS is a beta: working upgrades, experimental analysis and unimplemented roadmap options are distinct.

What PLUS is and how entitlement works

Virtual Air Traffic PLUS is an account-linked monthly beta tier, advertised at $11.99 per month excluding VAT at the time of this edition. Portal login is required to subscribe. Accounts with an active PLUS plan have access to PLUS controls; eligible legacy lifetime accounts also retain access and cannot purchase a second monthly plan. Availability and pricing may change - check the Portal for current details.

The supplied website still points checkout to a FastSpring TEST storefront, so do not assume that embedded URL is a live purchase route. Check virtualairtraffic.com for real availability, current pricing and terms. PLUS is beta: availability may vary by build and some features are unfinished.

CURRENT BETA CAPABILITIES

Some AI voices and advanced ATC features are still being developed. Where a button is a preview or a feature is planned, this guide says so instead of treating it as a finished controller capability.

PLUS feature status dashboard

Feature	Feature behavior / availability
Local aviation speech recognition	Working integration path: local Whisper model, PTT key, microphone selection, input meter and Auto/CPU/GPU choice.
AI controller voices	High-quality PLUS voices with output and pilot voice choices; FREE users can optionally use lower-quality offline local ATC voices.
Enhanced airports	First visual ground-object enhancement: airstairs for suitable parked rendered jets/heavies when the library object exists.
Ground operations ATC	Player IFR/push-start/taxi/crossing/tower decision paths implemented; PLUS AI ground switch is analysis-only shadow mode.
Mid-flight ATC	Departure/Center check-in and step-climb/handoff support; approach/descent and free vector actions not implemented.
Live ADS-B repositioning	Preview checkbox only. Historical ADS-B route matching is a separate implemented arrival feature, not live aircraft slaving.
Premium developer support	Portal/website support proposition, not an automated feature within the plugin.
General aviation traffic	PLUS-gated GA/VFR work in progress; eligible single-engine GA static tie-down population and selected VFR ATC actions when enabled.

The free/PLUS separation is primarily through Portal entitlement and the Plus settings tab. Public traffic simulation, menus and ordinary aircraft labels remain useful without buying PLUS.

Setup: local microphone and push-to-talk

Open the Plus tab and locate Speech to text model settings. Enable local speech recognition model and bind virtualairtraffic/atc/push_to_talk in X-Plane Settings > Keyboard or Joystick. The active command path in Plugin.cpp uses this name; an older changelog comment mentions a different /virtualairtraffic/voice/ptt spelling, so follow the registered command, not that comment.

Choose Microphone input: system default or a named input. Click Refresh after connecting a headset. Speak while watching the live dBFS meter; roughly -30 to -12 dBFS is a useful starting range, while clipping near 0 dBFS and almost silent input can both reduce recognition reliability.

Under Run speech recognition on, choose Auto (GPU with CPU fallback), CPU only, or a specific available Vulkan/ggml GPU. The status shows whether the model loaded and what device is in use. Disabling the model releases its resources and prevents new PTT captures; changing the input/device invalidates an in-progress request.

Press and hold PTT while speaking, then release. VAT records, plays the completion cue and only then runs local recognition asynchronously. It matches the transcript to known ATC actions or a small set of UI commands and rechecks the actual COM1/station/aircraft state before queueing. A sentence that seems recognized but is unsafe or unavailable is rejected rather than executed.

Speaking naturally without surrendering control

You say (illustrative)	What VAT looks for
“Open ATC Messages.”	Open the dedicated window without needing a tuned controller.
“Delivery, VAT742, request IFR clearance.”	Request Clearance on a clearance-capable station.
“Ground, request pushback and start.”	Pushback and Start, when eligible.
“Ground, request taxi to departure runway.”	Request Taxi, subject to engine and route checks.
“Request crossing runway two four.”	Request Crossing only at the authorized intermediate holding point.
“Tower, ready for departure.”	Ready for Departure rather than automatic takeoff.
“Departure, VAT742 passing four thousand.”	Announce on Frequency / airborne check-in when a matching station is tuned.
Spoken acknowledgement of last instruction	Read Back only if it matches the outstanding, already-presented instruction.

The matcher is local, rule-based and conservative. It deliberately rejects ambiguous multi-action phrases, negations and many unsolicited readbacks. A score in logs is evidence of phrase matching, not proof that the words were correctly understood. Always inspect the resulting ATC instruction in the window.

Authentic AI ATC voices and audio output

Enable AI generated ATC voice transmissions in the Plus tab. Choose COM1 (X-Plane radio), System default audio output (direct), or a named physical output device; Refresh re-enumerates endpoints. Direct outputs still require valid powered/tuned COM1 for the message to be eligible, even though the sound bypasses X-Plane’s radio bus routing.

The current implementation requests generated controller speech from an online service and processes the returned audio with radio-style EQ, compression, saturation and squelch. The human player’s outgoing request is not turned into a synthesized controller reply locally; the issued ATC text is prepared first, and the audio path follows.

Controller-to-player text can appear when voice playback begins, so the caption and spoken transmission feel synchronized. If synthesis, network, decoding or playback fails, the message still appears as text. Voice choices and accents are being expanded, and may be limited in this beta.

Airport enhancements: the first airstairs

Enable airport enhancements displays airstairs for eligible parked or static jet/heavy aircraft when a suitable library object is installed and the airplane has the required visual/door context. Placement follows the rendered aircraft pose for a more convincing result at the stand.

Airstairs disappear when an aircraft begins departure preparations, its beacon/engines/taxi state becomes active or a pushback tug approaches; they do not return after that departure has begun. If the external library object is unavailable, VAT logs that the feature is disabled for the session rather than spawning a broken object.

Fuel trucks, catering vehicles and follow-me vehicles are planned rather than fully available PLUS ground operations. The animated pushback tugs already described in this manual are part of VAT core traffic simulation, not a separate player pushback automation.

Ground-ops AI, live ADS-B and airborne AI: development status

Enable AI controlled ground-control airport operations activates a PLUS-gated GroundOps shadow analysis path. It sends structured airport/traffic snapshots for analysis while the deterministic existing ATC, Ground Operations Manager and Ground Conflict Manager continue making real decisions. The returned AI proposal is not applied as taxi clearance or aircraft steering.

Enable real-time positioning is currently a preview control and does not yet reposition all simulated aircraft using live ADS-B coordinates. The standard traffic engine still uses realtime observations to discover flights, then lets VAT virtual pilots fly them.

Enable AI controlled ATC for airborne operations is also a preview control; it does not yet provide full AI-managed arrivals for the player. The existing Departure and Center climbing procedures are part of the current ATC workflow.

General aviation and VFR form a PLUS-gated, work-in-progress path in 0.91. Eligible users can enable GA/VFR, select VFR flight rules in ATC Messages and use its currently implemented taxi, departure, parking and airspace-transition actions. GA parking uses published eligible airports and a separate static tie-down occupancy control; this is not a promise of a complete, worldwide moving GA population.

Beta subscriptions, support and troubleshooting

The purchase page requires a Portal login and a matching Portal email address at checkout; it links the Terms of Service, fair-use terms, refund and privacy policies. Beta purchasers explicitly acknowledge incomplete or unavailable functionality. Contact developer support through the official website/Discord channels advertised there rather than assuming an in-plugin support form.

If the Plus tab is missing, verify Portal authentication, licensing and account expiry. If the tab appears but a voice option is silent, inspect the TTS enable switch, audio output device, radio tune/power and internet connection. If PTT remains silent, check model status, microphone meter, input device and bound command.

For performance, use CPU-only recognition when GPU/Vulkan initialization fails; the worker can fall back to CPU. Disabling local recognition unloads the model. Airport enhancement visuals depend on the CSL model and library resources, so they can legitimately differ between airports and aircraft.

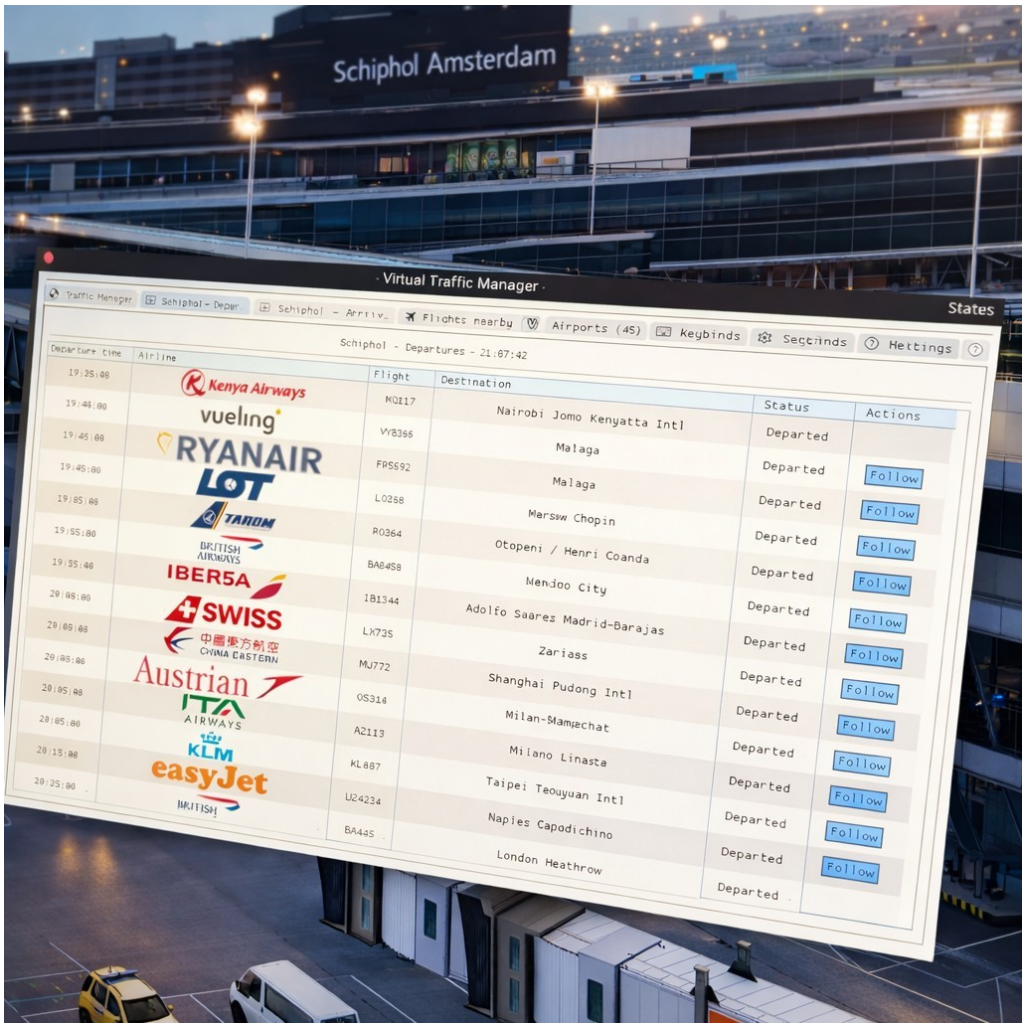
CHAPTER 47

47. The Virtual Air Traffic website and Portal

The online companion for sign-in, downloads, accounts, subscriptions, aptOPS, news and the user community.

Where to begin

Open virtualairtraffic.com. The home page introduces the live traffic world, its supported capabilities and the public Live Flights map. The navigation also offers the Portal, aptOPS, blog, Forum and PLUS information. The same Portal credentials used by the website authorize online VAT services inside X-Plane.



Website image showing airport schedule and traffic context, the starting point for many VAT users.

Your Portal account

At /portal, sign in or create a free account. The dashboard shows account identity, license/expiry information and a quick route to downloads, your profile and Flight log. The /portal/profile page exposes account details and access status; it does not directly change airport simulation settings. Sign out when using a shared computer.

Downloads and tools

The /portal/downloads page lists VAT platform downloads, the ModelBridge converter and a user-manual link. The website snapshot supplied for this edition still refers to a 0.90 plugin installer and an older manual link, even though the source archive is labelled 0.91 BETA. Confirm the live download version before installing or replacing files; package availability can lag the code used for this handbook. ModelBridge has its own tool version independent of VAT.

PLUS subscriptions

The /plus page explains paid enhancements and the /buyVAT purchase path. Sign in to link your subscription to the same Portal account. The checkout flow presents a beta-product acknowledgement; account entitlement determines whether PLUS controls appear in the plugin. The Portal can display expiry and subscription status, and renewal/cancellation behavior is governed by the checkout provider and its current terms. Read those terms instead of assuming that a trial or beta feature is permanent.

Find help or contribute

The website blog includes guides for aptOPS, ModelBridge and historical ADS-B arrivals. The Forum supports categories, posts, topic search, notifications and reply discussions subject to account permissions. aptOPS has a dedicated airport-editing workspace and community review process. The website also offers support/contact submission and a community Discord link. When reporting a defect include the installed plugin version, X-Plane version, airport/scenery, steps to reproduce and the relevant Log.txt entries.

Keep the roles clear

The website can show simulated live aircraft and stored flight history; it does not fly your X-Plane aircraft. aptOPS publishes community data after review; it does not overwrite your local scenery. The Portal authenticates and administers access; it does not replace the in-simulator Settings and ATC windows.

CHAPTER 48

48. Live Flights map and your personal flight log

Explore the simulated network on the home page, and review your own recorded IFR journeys from the Portal.

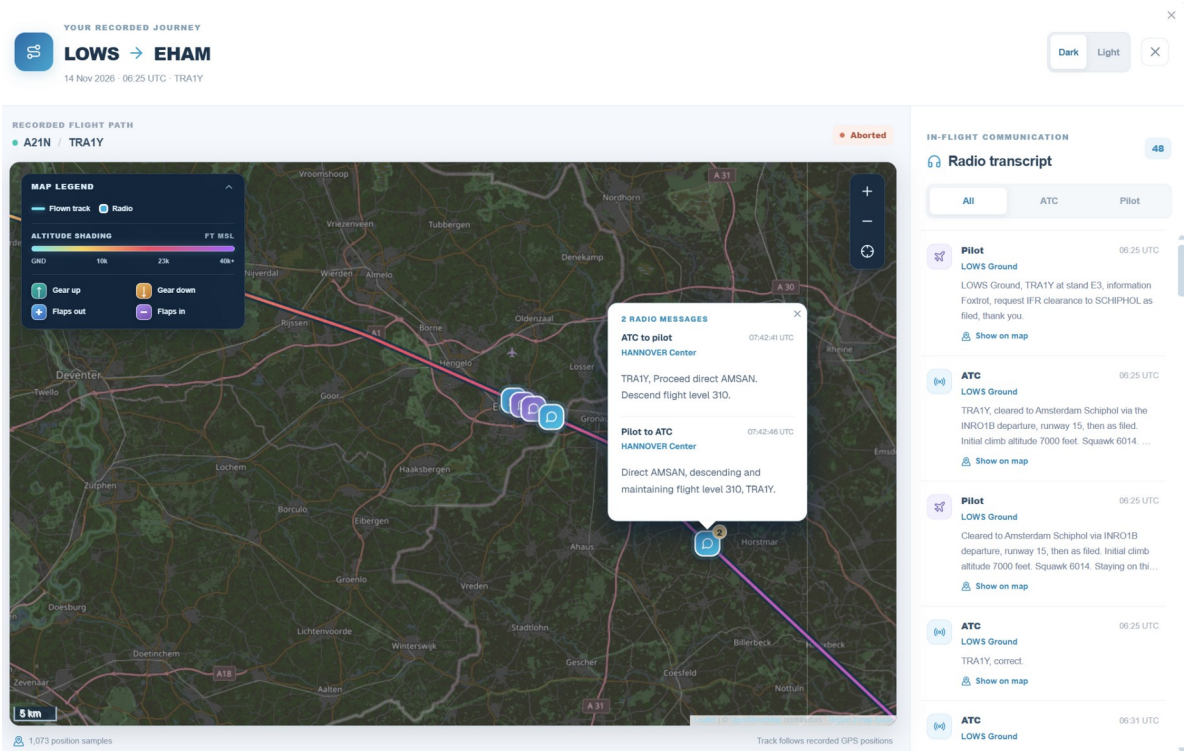
Live Flights: a map of VAT-generated traffic

The homepage's Live Flights section presents positions calculated by the Virtual Air Traffic network. Move or zoom the map to inspect an area; use World view for global traffic, Search aircraft in this area to filter by callsign/operator/type or airport, and Flight paths to show or hide indicative routes. The light/dark map control is independent of X-Plane. Select a flight to see inspector fields and, where available, its assigned or similar historical route.

The plotted positions are VAT's calculated positions, not proof that a real aircraft is at precisely that spot. Some map animations interpolate between snapshots for visual smoothness. A missing recorded route does not mean the simulated aircraft is invalid.

Your account's Flight log

After Portal sign-in, go to /portal/flight-log. The log lists recorded journeys with origin, destination, date, callsign or flight number, aircraft type and status. Open a flight to see its route on a map and the recorded ATC conversation. The transcript can be filtered to All, ATC or Pilot; selecting a radio line can locate the relevant point along the track.



A personal recorded flight route and radio-message view, as shown on the Virtual Air Traffic website.

How a flight is recorded

In the supplied 0.91 plugin, recording begins from a player IFR clearance request, using the current accepted flight identity and route context. The recorder stores position samples and ATC messages, sends batches under the authenticated account, and completes the entry when the aircraft arrives at its destination stand. A disrupted, disabled or unfinished flight can be marked aborted instead of falsely completed.

Failed uploads are held in a local pending spool and retried when the plugin can connect again; an upload is not guaranteed at the very instant you close the simulator. The website displays stored flight timestamps in UTC. Recordings are available to the owning account rather than displayed as public flight histories.

Review, locate or delete

In the log, filter/search the list, inspect the summary and open a map. Use the transcript's Show on map action to find the location corresponding to a transmission. When removing a record, confirm Delete permanently; the website warns that this removes its positions and ATC messages and cannot be undone. If the simulator is still recording the same active flight, later uploads may create a record again.

Why you may see no records

Confirm that you are signed into the same Portal account used in the plugin, that a valid IFR request was made, and that the online upload endpoint can be reached. A casual offline circuit or a purely VFR session is not automatically the same as a recorded IFR flight in the supplied source. Check the plugin log for upload retries and allow pending records to synchronize on a later authorized session.

APPENDIX A

Appendix A. Settings and persistence reference

A compact mapping between the visible controls, persistent INI keys and their practical effect.

INI section / key	UI exposure	Meaning
Performance / perfmode	Medium / Full performance mode	Selects simulation slicing and realtime range behavior.
Performance / TrafficDensity	Traffic Density	0-100 generation percentage for static/realtime population.
Other / showlabels	Enable plane labels	Master traffic-label visibility.
Other / hidelabelsincockpit	Hide labels in cockpit	Suppress traffic labels in internal/cockpit view.
Other / enabletcas	Enable TCAS updating	Controls X-Plane multiplayer/TCAS override publication.
Other / enablesounds	Enable sounds	Controls VAT positional traffic audio.
Other / disable_rendering	Hide airplanes	Suppress aircraft/contrails and traffic sound while logical traffic continues.
Other / disable_static_spawns	Disable static spawns	Prevents decorative airport statics from being generated.
Other / enabledebuglog	Enable verbose logging	Adds detailed VAT diagnostics to X-Plane Log.txt.
Other / enabledirectmodelmatch	Direct model matching only	Disables model fallback after an exact operator + aircraft match fails.
Auth / simbrief_username	SimBrief username	Loads and auto-refreshes current SimBrief flight-plan context.
Auth / portal_username	Portal Email	Online VAT service authentication identity.
Auth / portal_password	Portal Password	Saved Portal credential in the plugin settings format.
Dirs / xcsl_dir	X-CSL model directory	CSL root path; restart VAT after changing it.
RunwayOverrides / ...	Persistent checkbox in Runways popup	Stores airport-specific manual departure/arrival runway sets.
Other / dark_theme_mode	Traffic Manager: Auto / Dark / Light	Saved interface theme preference; Auto uses simulator clock.
Other / disable_particles	Settings: Disable particles	Contrails, touchdown smoke and intended heat blur effects.
Other / show_update_notifications	Settings: Notify me of plugin updates	Enable/disable the newer-release popup.
SpeechToText / enabled, microphone_device,	Plus: Speech to text model settings	Local recognition, input endpoint and Auto/CPU/GPU device selection.

INI section / key	UI exposure	Meaning
compute_device		
ATCTextToSpeech / enabled, output_device	Plus: Authentic AI voices	Controller speech and COM1/direct audio destination.
Plus / airport_enhancements	Plus: Airport enhancements	Airstairs when model and suitable parking context permit.
Plus / ai_ground_control	Plus: AI assisted ground-control	Experimental analysis-only shadow path; not an active taxi controller.
Dirs / aig_dir	AIG model directory	Path to ModelBridge-generated CSL package (restart required).
Plus / ga_vfr_enabled	Enable GA/VFR	PLUS-only work-in-progress static GA and VFR controls.
ATCTextToSpeech / piper_enabled	Enable offline ATC voices	Local FREE radio voices; CPU and bundled voice availability apply.
ATC / autoReplyATCReadback	Auto-reply with ATC readback	Automatically acknowledges eligible presented instructions.
ATC / enableTaxiPathGuidance	Enable taxi path guidance	Shows the assigned realTaxi guidance path.
ATC / minimizedAtcButtonsEnabled	Enable minimized ATC action dock	Compact contextual action panel at screen edge.

MANUAL INI EDITING

Prefer the in-sim UI for normal settings. If you edit vat_settings.ini directly, close X-Plane first whenever practical so the plugin does not overwrite the file later in the same session.

APPENDIX B

Appendix B. Aircraft-state reference

Internal states are intentionally compact. Labels can show richer descriptive text derived from those states and the current sub-phase.

Internal state	Typical user-facing interpretation	Typical use
NONE	None / initializing	No meaningful flight phase yet.
STATIC	Static	Decorative local parking aircraft.
STALLED	Stalled	VAT cannot safely continue, for example because no usable route or gate is available.
PARKED	Boarding / Waiting / Preparing / temporary rollout context	Scheduled aircraft at a stand and several low-speed transition contexts.
PUSHBACK	Pushback	Aircraft moving backward from the stand; negative speed can also reinforce the user-facing pushback state.
TAXIING	Taxiing	Taxi to runway or taxi to gate.
HOLDING	Holding	Waiting for ATC, GCM or runway/active-zone clearance.
TAKING_OFF	Taking off / Departing	Runway entry, line-up, roll and initial departure transition.
CRUISING	Climbing / Cruising / On descent / On approach / Going around / metered hold or rejoin context	Airborne flight before the straight landing phase; arrival metering can temporarily supply ATC hold/rejoin waypoints without changing the compact internal state.
LANDING	Landing at <runway>	Straight final, flare/touchdown and immediate landing logic.
FINISHED_AT_PARKING	Arrived	Aircraft completed taxi-in and parked at destination.

User-facing label states

Depending on phase and context, labels can show Boarding, Waiting, Preparing to taxi, Pushback, Taxiing, Holding, Taking off, Departing, Climbing, Cruising, On descent, On approach, Going around, Landing at <runway>, Rollout, Arrived and Stalled. The adaptive arrival meter performs its hold/rejoin vectoring while the aircraft remains in the broader airborne CRUISING state, so user-facing wording should be read as an operational description rather than a one-to-one dump of every internal metering phase.

APPENDIX C

Appendix C. Selected behavioral thresholds

Approximate implementation values that help explain visible traffic behavior. These can change as beta control logic evolves; see Chapters 39-44 for current radio, IFR, VFR and arrival-vector action limits.

Behavior	Approximate value	Why it matters
Normal scheduled airport activation	~15 km	Local airport scheduled-departure population begins.
SimBrief destination scheduled activation	~100 km	Destination airport can begin scheduled preparation early.
Static fill activation	~15 km and player <=10,000 ft	Decorative static traffic stays local.
Static airport removal	~31 km	Local static set is discarded after leaving the area.
Realtime Medium spawn / cleanup	~100 / 105 km	Lower-range performance mode.
Realtime Full spawn / cleanup	~200 / 205 km	Larger realtime traffic region.
New realtime origin handoff	~15 km from origin	Near-origin departures belong to the scheduled-airport path.
New realtime arrival minimum	>~25 km to go	Leaves room to establish arrival/procedure behavior.
Scheduled look-ahead	15 minutes	Earliest normal gate creation before scheduled departure time.
Scheduled creation cap	3 per ~15-second maintenance pass	Reduces startup and schedule-bank bursts.
SimBrief auto refresh	~600 seconds	Reloads the current plan about every 10 minutes.
GCM update interval	~100 ms / 10 Hz	Frequent ground conflict prediction without full per-frame recomputation.
Takeoff line-up wait	~50% rolling; otherwise random ~0-8 s after tight alignment	Adds throughput and pilot variation while retaining a full-stop line-up behavior for many departures.
Takeoff clearance cooldown / reservation age	~60 s / ~60 s	Controls runway release cadence and stale clearances.
Departure runway release	~50 kt low-speed reservation threshold; airborne protection remains geometry/altitude aware	Lets selected following runway activity progress once the departure is clearly accelerating without treating it as physically gone.
Final sequencing monitor	~25 NM	Established-final sequence management begins.
Final target / release	~6 / 7 NM	Established-final target and speed-clamp release margin.
Projected gap threshold	~5 NM inside ~12 NM resequence zone	Can prepare a deferred go-around when maximum useful slowing still cannot preserve the projected gap.
Final hard minimum / deferred GA trigger	~1 NM	Very small actual gap or final decision near the runway causes go-around.
Sequencing speed band	~105-138 kt caps	Upper-speed limits used to rebuild spacing.

Behavior	Approximate value	Why it matters
Desktop label range / detail refresh	~50 km / ~5 Hz	Controls label membership and expensive text refresh.
VR label range	~30 km	Compact world-space labels use a shorter range.
VR label creation throttle	up to ~16 new instances/frame	Avoids a large one-frame instance allocation burst.
Audio hard stop	~2,000 m from camera	VAT traffic audio is stopped beyond this range.
Contrail threshold	Cruising above ~20,000 ft	Creates dynamic contrail instances.
Static wind weather refresh	~15 seconds per active airport	Updates effective wind target for parked jets.
Static windmill visual update	<=~10 Hz while active	Limits decorative fan instance updates.
Static windmill start / max	~4-7 kt / ~18-30 RPM	Per-aircraft varied wind-driven fan response.
Follow camera terrain floor	~2 m above terrain	Prevents camera clipping into the ground.
Public planes_json interval	consumer controlled by planes_freq_s	0 disables generation; 0.1 requests about 10 Hz.
VAT microstutter counter	~20 ms traffic-engine loop	Diagnostic count of expensive VAT loop iterations.
Terminal cleanup – stalled / arrived	roughly ~2 min / ~10 min	Allows unusable or completed aircraft to be retired after useful dwell time.
Arrival-meter commit horizon	<=~10 min AND <=~35 NM to threshold	Distant traffic stays on the real flight plan and does not reserve a hard landing slot too early.
Arrival-meter default threshold interval	~240 s	Used until a directional runway has learned an occupancy-based value.
Learned runway spacing	max(~160 s, highest valid occupancy + 30 s)	Adaptive threshold interval based on touchdown-to-runway-clear samples.
Valid runway-occupancy sample	~10-600 s	Rejects obviously broken observations from teaching an absurd spacing value.
Hold target speed	<=~210 kt	Metered traffic slows to a manageable holding speed subject to approach minimum speed.
Synthetic hold straight leg	~30 s	Published holds retain their navdata leg length/time; only synthetic racetracks use this value.
Hold release recheck	~2 s	A stable waiter is reconsidered frequently instead of only once per racetrack circuit.
Hold vertical stacking	~1,000 ft; max ~43,000 ft	Overlapping racetracks can share lateral space only with vertical separation.
Player approach recognition	within ~25 NM corridor, moving >=~29 kt, below ~10,000 ft above airport	Places the user on the same predicted threshold timeline without controlling the user.
Last-minute runway block check	inside ~90 s to threshold	Runway occupancy/departure reservation can keep a metered aircraft in the hold.
Post-pushback preparation	~60 s minimum before taxi	Gives the completed pushback a distinct stopped/preparation phase before taxi-out.
Tug detach pause	~5 s	Tug remains stationary briefly after release before driving back to staging.

Behavior	Approximate value	Why it matters
Automatic calm-wind lock	enter <=~5 kt; exit >=~7 kt	Prevents repeated reciprocal/flow changes in very light shifting wind.
Automatic wind-only switch stability	~15 min continuous candidate	A different automatic wind-selected flow must remain preferred before commitment.
Rollout / route-prep thresholds	~25 kt rollout target; route prep below ~50 kt	Faster runway clearing and earlier exit-route preparation improve arrival throughput.

BETA TUNING

Values are indicative implementation thresholds, not guaranteed operational limits; player ATC safety/voice behavior also depends on current telemetry and published radio stations.

APPENDIX D

Appendix D. Release history

This release history summarizes product changes through version 0.91. Beta functionality may evolve, and implemented features, in-progress functions and preview controls are differentiated throughout the handbook.

Release	User-visible capability milestones
0.91 BETA	Historical ADS-B vectored arrivals for player and suitable AI traffic; recorded real-world routes; Portal flight logs; minimized ATC action dock; altitude picker; writeable arrival-gates dataref; taxi/COM1 shortcut commands; aircraft-specific beacon and strobe timing.
0.90 BETA	ATIS; manual destination stand persistence and Ground arrival assignment; direct-to FIX request; PLUS pilot voice options; GA/VFR foundation under development; runway/ground refinements.
0.89 BETA	Converted AIG model loading; optional FREE offline ATC voices; SID change request; next-frequency hints; COM1 standby improvements; night taxi guidance; multi-leg flights and small offset ILS support.
0.88 BETA	PLUS subscription availability; improved ATC phrase variety and taxi hold points; automated readbacks; aptOPS runway stability; ATIS and takeoff detection fixes.
0.87 BETA	Combined published ATC-service buttons, ground and tower player workflows, airborne check-ins, VR ATC window, local push-to-talk recognition, AI voices, PLUS airstairs, SimBrief retry and notification preferences.
0.86 BETA	Tuned/powered COM1-only ATC Messages feed; preliminary player IFR clearance; Auto/Dark/Light theme; enhanced SimBrief diagnostics and public JSON attitude/gear telemetry; performance and positioning corrections.
0.85 BETA	SkunkCrafts updater support; pilot callsigns on ATC traffic; X-Plane beta ImGui compatibility, audio variety and concurrency fixes.
0.84 BETA	ATC Messages window, engine heat-blur work, interface dark mode and particle-effects option; airport ground coordination and higher-precision positioning.
0.83 BETA	Pushback runway/stop safeguards and five-second tug detach pause; refined head-on taxi recovery; calm-wind runway-flow stabilization; smaller desktop labels and earlier behind-view suppression; roughly 50% rolling takeoffs; faster rollout/exit behavior; descent-profile correction; route-calculation CPU optimizations.

0.82 BETA	Adaptive pre-approach arrival metering with published/synthetic holds and learned runway-occupancy spacing; extra spacing around the player on approach; simulator-time departure/occupancy schedules; safe centerline-aware pushback; current-day static fleet/type filtering; same-body-scale model fallback; aircraft ICAO columns in Arrivals/Departures; corrected turboprop audio; explicit planeID and light states in planes_json; custom scenery discovery from scenery_packs.ini including absolute/external package paths; post-clearance landing/strobe timing and active-runway crossing lights.
0.81 BETA	VR labels; touchdown smoke; forward runway-exit preference; relaxed holds near a parked player; suffix-stand families; go-around decision up to ~1 NM; fly missed-approach point before re-vectoring; final stand alignment; taxi-light timing; dynamic arrival-runway reassignment before final; more transparent off-screen labels; refined ground-turn behavior; pushback-tug staging/return; Rollout label; expanded airline-logo set; disabled scenery excluded from initialization.
0.80 BETA	Animated pushback tugs v1; wake turbulence affects the player; redesigned minimized/regular/extended labels with detailed/passenger information; new departure/climb/descent/approach states; hide-labels-in-cockpit setting; non-blocking plane cleanup.
0.79 BETA	X-Plane 12.4.4 beta compatibility work; broad taxi/runway-exit/ground-probe/crosswind improvements; 8 NM arrival-separation philosophy; taxiing aircraft in TCAS ground mode; label actions, aircraft type and new operational states; control-surface check; table mouse-wheel support; pause sync; Hide airplanes; SimBrief auto refresh; varied line-up/gear behavior; deadlock backtracking; more permissive safe runway crossings; fixed-radius follow camera without automatic orbit.
0.78 BETA	Improved airport-weather runway selection; filters for extremely short/non-paved runways; time-of-day airport fill cycle; SimBrief JSON v2; delayed arrivals prioritized in the board; departure-speed and rudder/crosswind visual improvements.
0.77 BETA	planes_freq_s refresh-control dataref; validated custom-airport taxi networks with fallback; airborne player-conflict vectoring/altitude response; current-fleet model filtering; Disable static spawns; Arrived status.
0.76 BETA	Early SimBrief destination traffic preparation; weather-driven static jet windmilling; multiple arrival-gate reservations; squawk/transponder-mode publication.
0.75 BETA	No backlog of already-passed departures on startup; improved parallel-runway split; route-around-active-runway preference; persistent manual runway sets; arrival-gate reservation; all-day arrivals board; public planes_json; minimized labels; rendering-disable control introduced.
0.73 BETA	Manual runway selection; better operator gate affinity; improved airport runway restrictions and automatic assignment.
0.72 BETA	Configurable X-CSL path; custom scenery parking support; groundwork for current-fleet model filtering.
0.70 BETA	Preliminary X-CSL support with Bluebell fallback; Nearby aircraft removal; TCAS ownership warning.
0.66 BETA	Update notification; Portal setup reminder; bindable UI and label commands.
0.65 BETA	Line-up-and-wait; improved arrival separation/runway clearing; Arrivals tab; airport search.
0.3.0 – 0.3.1	Performance and taxi refinements; improved contrails; SimBrief runway handling; spawn-safety improvements.
0.2.0	Double-contrail support and increased traffic distance.
0.1.1	Landing-rollout/taxi-in refinements; Direct Model Matching Only setting; taxi-routing improvements.
0.1.0	Initial release.

APPENDIX E

Appendix E. Pre-flight checklist, support and reporting

A one-page operating checklist plus the information that makes a support report useful.

Check	Recommended normal-flight setting / action
Portal	Authenticated before expecting scheduled or realtime online traffic.
Performance	Full when the system can sustain it; Medium when CPU headroom is limited.
Traffic Density	100% for the fullest traffic picture; reduce to taste/performance.
Models	X-CSL + Bluebell fallback when a usable X-CSL library is installed; otherwise Bluebell.
Direct model matching	Off for maximum traffic; on only when exact visual identity matters more than quantity.
TCAS	On unless another traffic plugin must own X-Plane slots.
Sounds	On to taste.
Labels	On/off to taste; use Hide labels in cockpit when appropriate; VR labels are compact/experimental.
Static traffic	Enabled for a populated ramp; disable statics if you want moving traffic only or need headroom.
SimBrief	Username configured when you want runway intent and early destination preparation.
Arrival parking	Reserve one or more acceptable stands in Airports > Arv. Gates before arrival when you want guaranteed protected positions.
Runways	Leave automatic unless you intentionally need a manual override; persistent selections outrank SimBrief/weather. Automatic wind-only changes are intentionally stabilized in light/shifting winds.
Hide airplanes	Off in normal use; useful as a quick diagnostic/display suppression control.

Support

Website: virtualairtraffic.com

Support: support@virtualairtraffic.com

What to include in a useful report

- **Version.** State the VAT version displayed by the running plugin.
- **Airport and scenery.** Include ICAO plus the exact custom scenery package if the problem is airport-specific.
- **Aircraft identity.** Flight number and Mode-S ID are particularly useful for a single misbehaving traffic aircraft.
- **Player context.** Approximate position, runway/taxiway/gate and whether the player was moving or parked.
- **Settings.** Performance mode, Traffic Density, model mode, TCAS, SimBrief and relevant manual runway/gate overrides.
- **Time.** Approximate simulator local time and the point in the flight when the problem occurred.
- **Log.** Enable verbose logging only long enough to reproduce the issue, then attach the relevant X-Plane Log.txt section and turn verbose mode off again.

END OF MANUAL

Virtual Air Traffic is designed to be observed as an operating system: traffic data enters, virtual pilots fly, airport systems coordinate and X-Plane renders/publishes the result. When troubleshooting, identify which layer is producing the unexpected behavior before changing unrelated settings.