VATFLOW Tower Cab

User manual for Microsoft Flight Simulator 2024



Covers every feature built to 27 October 2026: the version on `main` of github.com/djbrombizzle/msfs-tower-cabs (`towers/vatflow-cab`), including the departure sequence, runway safety, IDS and linked screens (#8), runway and taxiway closures (#9) and the Halloween decorations (#12), all merged on 27 October 2026 and installed by the combined update zip `VatflowTowerCab-Update-2026-10-27.zip`.

This manual is about the VATFLOW Tower Cab only. The DCA Tower Cab (`towers/dca-tower-cab`) is a separate project with its own layout and is not covered here.

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1. About this manual

Everything in this manual is merged into the `main` branch. Features that came with the 27 October 2026 update carry a label, so you can see what is new since the last full install:

Label	Meaning
NEW	New in the 27 October 2026 update: departure sequence, runway safety, IDS and linked screens (pull request #8), runway and taxiway closures (#9) and the Halloween decorations (#12). An existing cab project gets all of it from `VatflowTowerCab-Update-2026-10-27.zip` (see 3.4), which replaces the earlier PR #8, closures and Halloween test zips.

A section heading without a label was in the cab before that update. Where only part of a feature is new, the label sits next to that part.

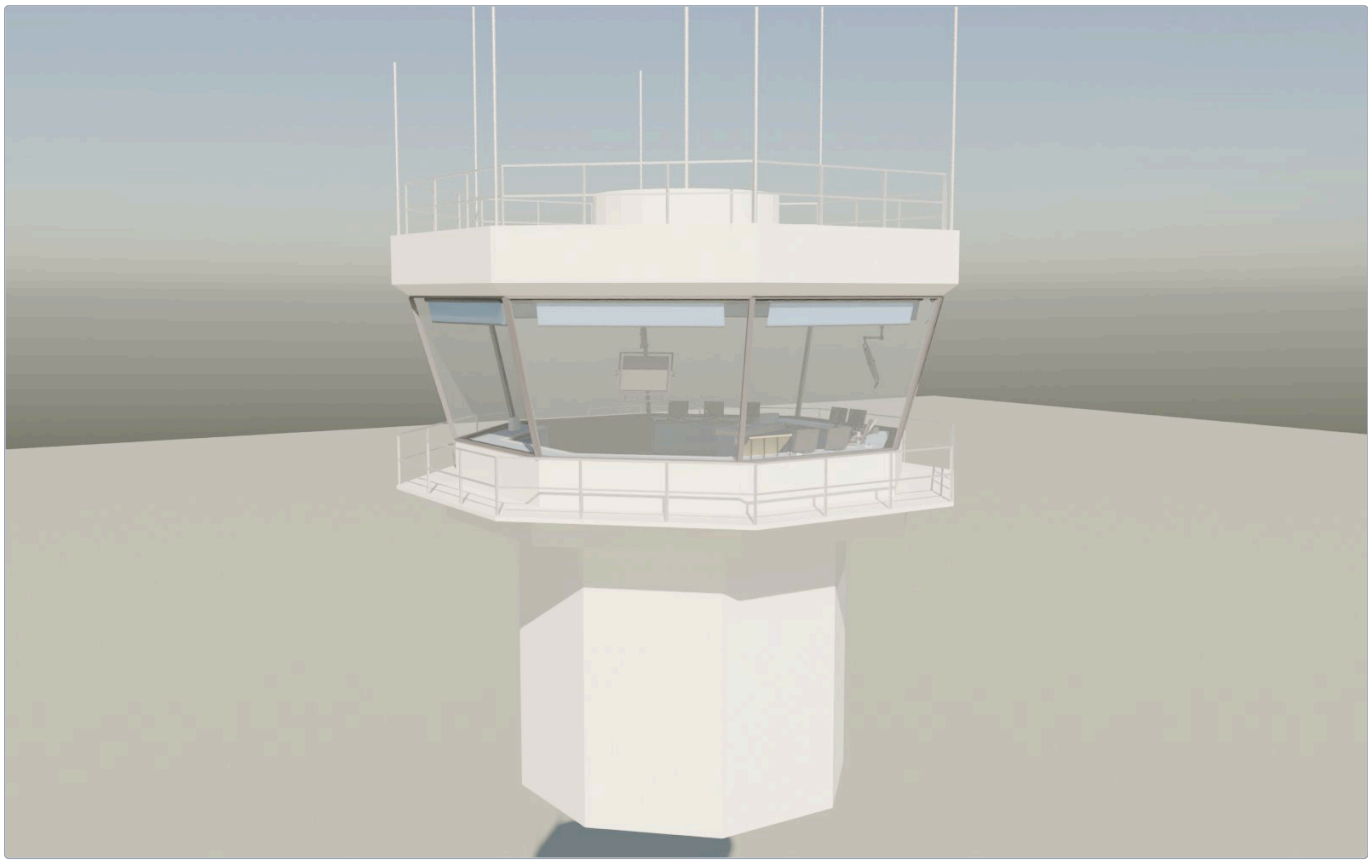
> **About the pictures.** The screen pictures were taken from the cab's own screen code running in a browser preview, with made-up KDCA traffic and wind (runway 01 in use), so they show exactly what the sim draws. Screens that need the VATFLOW hub or FAA data show "network error" or "no program" in these pictures because the preview ran offline; in the sim they fill with live data. The 3D renders are untextured previews of the cab model from Blender; in the sim the carpet, consoles and ceiling have their textures and the screens are brighter.

2. What the cab is

The VATFLOW Tower Cab is a spawnable "aircraft" that is really an eight-sided air traffic control tower cab. You load it in MSFS 2024 like a plane at any airport. It then moves itself up onto the sim's own control tower, freezes there, and gives you a real tower-cab viewpoint, with live VATSIM traffic outside the glass and working controller screens on the consoles.

- **Any airport.** The cab finds the airport it is at and sets every screen up for it. KDCA and KATL ship with hand-built data; any other airport is built from OpenStreetMap the first time and kept in the sim's storage.
- **Places itself.** With AUTO PLACE on, the cab goes up onto the tower a few seconds after the flight starts. The TOWER SETUP screen nudges it into position and saves the spot for each airport.
- **Live screens.** Tower radar (DBRITE), ground radar (ASDE-X), departure sequencing, information display (IDS), wind and windshear, RVR, VATFLOW traffic management tools, ramp maps and printed flight strips.
- **Shared with other cabs.** STRIP SYNC lets controllers in different cabs at the same airport work one set of strips.
- **Closures** NEW. Close runways and taxiways on a map and barricades, lighted X's, work vehicles and site props appear in the sim.
- **Halloween** NEW. A carved, glowing jack-o'-lantern by the coffee maker and a few small decorations, switched on or off on TOWER SETUP.

The cab works beside your normal VATSIM controller client. CRC stays your working scope; the cab is the out-the-window view plus the tools a real tower cab has around you.



The cab from outside: eight leaning glass faces, catwalk with railing, roof with antennas, and a support stub that sits on the sim's own tower.

A tour of the cab

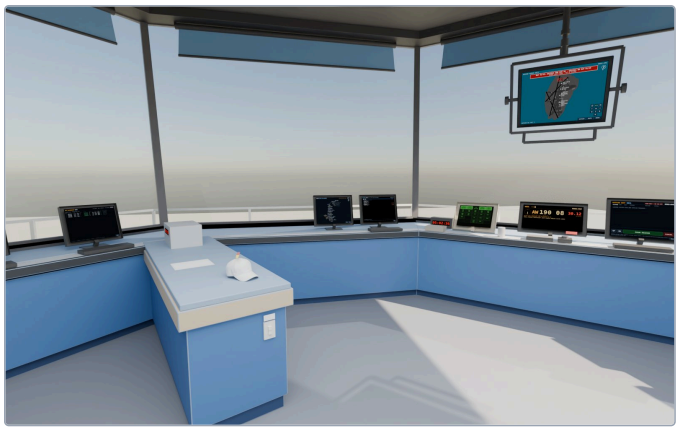
The front of the cab (the "nose") faces the airport. Standing at the eyepoint and looking forward:

Where	What is there

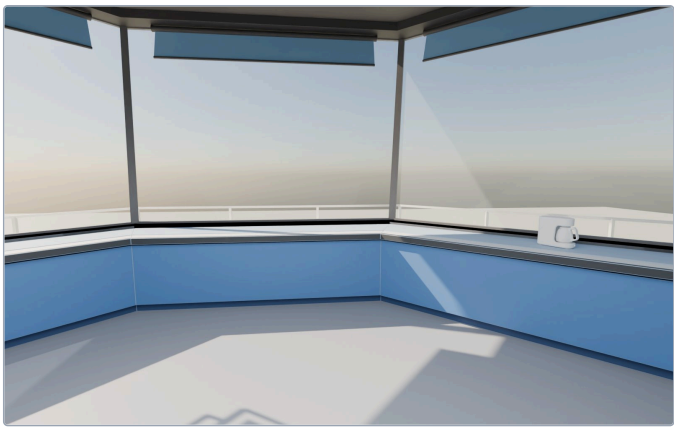
Ceiling, front left	**GROUND RADAR** (ASDE-X) on an overhead monitor hanging from the ceiling track.
Ceiling, front right	**TOWER RADAR** (DBRITE) on an overhead monitor.
Front-left console	**TWR INFO** (wind, altimeter, ATIS letter, windshear alarm) with its MUTE button, the **IDST** screen to its right with four keys, voice switch panel, red LED Zulu clock, keypad, trackball, keyboard, the four-knob brightness panel and a speaker. The **ramp list** computer sits left of the clock.
Front console	Ramp map screens (at KDCA: E / D, C / B and A / Hangars), the **LOCAL** strip bay, the binoculars prop and the FWD placard on the console front.
Front-right console	The **GROUND** strip bay.
Left console and back-left corner	The **TMU desk**: three monitors (VATSMART, DEMAND vs AAR, AIRCRAFT LIST) with keyboards, an oak-edged desk running into the room, the second red LED clock, the **TMU** strip bay, the FAN switch, the laminated quick guide and the propeller cap.
Back-right console	Coffee maker, by the stair hatch.
Floor, back	Woven carpet logo "MADE AND POWERED BY VATFLOW TECHNOLOGIES" in front of the stair hatch.
Ceiling	Black ceiling with five light panels, downlights, two ceiling fans and the circular monitor track. Every window has a roll-down tinted shade.



Looking forward from the eyepoint: both radars overhead, TWR INFO and IDST on the left, ramp screens and the LOCAL strip bay ahead.



The left side: the TMU desk with its screens, strip bay and the propeller cap.



The right side, towards the back-right console and coffee maker.

3. Installing

There are two ways to get the cab into the sim. Testers use the one-file setup EXE. Developers build the project from the repository with the MSFS 2024 SDK.

3.1 Tester install: the setup EXE

1. Get `VATFLOW-TowerCab-Setup.exe` from whoever builds the cab.
2. Close MSFS. The setup waits until the sim is closed.
3. Run the EXE. Windows SmartScreen may say "Windows protected your PC" because the EXE isn't signed: choose **More info > Run anyway**.
4. The setup finds your Community folder from the sim's `UserCfg.opt` (Steam or Microsoft Store; it asks which if you have both, and opens a folder picker if it finds neither).
5. It replaces any older cab, adds or updates the ARTCC maps package (ARTCC files already in it stay), and offers to add ARTCC video maps right away.
6. Running the EXE again offers **U** = update or **R** = remove.

Then start a free flight at your airport, at any parking spot, with the aircraft **VATFLOW Tower Cab**. No SDK, Python or other tools are needed.

The same packages also come as two zips (`vatflow-towercab-test.zip` and `vatflow-towercab-maps.zip`) for installing by hand.

> Don't install the tester package on the PC where the cab's project is open in the MSFS project editor. The sim would see the cab twice.

Making the setup EXE (for the person who builds it)

1. In MSFS open the project, then **Clean All** and **Build All**.
2. Double-click `distribution\make-community-zip.bat` in the project. It takes the built package, checks that no VATSIM CID is inside it, names it `vatflow-towercab` (title "VATFLOW Tower Cab (test)") and writes the setup EXE and both zips to your Desktop.

3.2 Building from source (MSFS 2024 SDK)

The full step-by-step guide is `SDK-GUIDE.md` in `towers/vatflow-cab`. Allow an evening for the first run. In short:

1. **What you need:** MSFS 2024 on Windows, Blender 4.5 LTS (not 5.x), Python 3.11 or newer, vPilot, and the `towers/vatflow-cab` folder.
2. **Developer Mode:** General Options > Developers > Developer Mode on.
3. **SDK and samples:** from the Developer Mode Help menu, install the SDK (core) and the Samples. Check that the **SimpleAircraft** sample is there.
4. **Blender exporter:** add `<SDK>\Tools\Blender` as a script directory, restart Blender and enable `io_scene_gltf2_msfs_2024`.
5. **Build the cab:** run `blender/build_tower_cab.py` in Blender's Scripting tab. The cab's size and shape are the `P = {...}` numbers at the top.
6. **Export** the exterior and interior with the MSFS Multi-Exporter (or let `tools/export_interior_gltf.py` write the interior with all materials and animations already set).
7. **Make the project** from a copy of SimpleAircraft (for example `C:\MSFS-Projects\VatflowTowerCab`), check that the sample builds, then swap in the cab's `model.cfg`, model files, `panel.cfg` and the `html_ui` folder (as a Copy asset group).
8. **Eyepoint** in `common\config\cameras.cfg` (see section 5) and the title "VATFLOW Tower Cab" in `aircraft.cfg`.
9. **Build All.**

The installer used for test builds also moves the sample aircraft's sound folders to `backup-sound\` in the project, so the cab makes no engine or wind noise.

3.3 ARTCC video maps package

The radars can show your ARTCC's own vNAS video maps, the same maps CRC shows. They live in a separate Community package, `vatflow-towercab-maps`, so updating the cab never touches them.

1. Double-click `update-maps.bat` in the maps package. It lists the ARTCC files CRC keeps in `%LOCALAPPDATA%\CRC` (its ARTCCs folder) and copies the ones you pick. You can also drop a `.json` into the package's `ARTCC files` folder, or type an ARTCC id (for example `ZDC`) to download it from vNAS.
2. The script puts the file where the cab reads it and rebuilds the package's `layout.json`.

Only the ARTCC file is installed. The map drawings are downloaded live from vNAS when a screen shows them. ARTCC files are not shipped with the cab; each tester adds their own.

3.4 Updating an existing project: the combined update zip NEW

`VatflowTowerCab-Update-2026-10-27.zip` brings an existing cab project up to date with everything in this manual. It replaces the separate PR #8, closures and Halloween test zips; running it on top of any of them, or twice, is safe.

1. Close the MSFS project editor and quit the sim.
2. Unzip anywhere and double-click `install.bat`. It expects the project at `C:\MSFS-Projects\VatflowTowerCab` (edit `PROJ` at the top of `install.bat` if yours is elsewhere).
3. Start MSFS. In Developer Mode open the project, **Clean All**, **Build All**.
4. **Quit MSFS completely and start it again.** MSFS needs a full restart after new objects are added to the project: until then it creates the closure objects but never draws them. Rebuilding or restarting the flight is not enough.
5. First time only: run `ClosuresHelper\1-setup.bat` in the project folder to install the SimConnect package for Python (Python 3 must be installed).

What install.bat changes	Details
Screens	`PackageSources\html_ui`: files are added or replaced, nothing is deleted, so your ARTCC map files stay.
Interior model and textures	The new cab model (Halloween decorations). The old model is kept in `_backup-before-update` in the project folder.
Sound and cameras	The runway safety alarm sound, and the five position cameras (needs Python; skipped with a note if Python isn't found).
Closure objects	Copied to `PackageSources\SimObjects\Misc\vatflow_closure_*` and added to the package definition (old one kept in `_backup-before-update`).
Closures helper	Copied to `ClosuresHelper` in the project folder. Your `closures.json` and `closures_last.json` there are kept. Use this copy from now on: an older copy elsewhere doesn't know the newer objects.

The zip also holds this manual. To undo the model change, copy the files from `_backup-before-update` back and build again; the Halloween decorations can simply be switched off on TOWER SETUP.

3.5 Renaming the cab in the aircraft list

`distribution\rename-cab.bat` sets the maker and name the cab shows in MSFS 2024's aircraft list (title, manufacturer, type and variation in every preset's `aircraft.cfg`). With no arguments it asks; Enter keeps the current value. The choice is saved in `distribution\cab-name.txt`, so later updates keep your name. Close the project first and Build All afterwards.

4. First flight and placing the cab

4.1 Sim settings

- **Crash damage off** (Assistance). The cab sits on, and slightly into, the sim's own tower. With crash damage on, that ends the flight.
- **AI and real-time traffic off**, so the only aircraft you see are VATSIM ones (unless you want SIM traffic on the radars, see 6.3).
- **Live weather and live time on.** The wind display, day/night dimming and windshear alerts use the sim's weather and sun.

4.2 Starting a session

1. Start a free flight at the airport you want to work, at any parking spot, with **VATFLOW Tower Cab** as the aircraft. It looks odd at the gate; that is expected.
2. With **AUTO PLACE ON SPAWN** on (the default), the cab moves up onto the tower a few seconds after the flight starts, freezes, turns the engine off and switches the ceiling lights on.
3. Switch to the cockpit view. You are standing in the cab.
4. Connect **vPilot as an observer**, not as a pilot. As a pilot, everyone on the network would see an aircraft sitting on top of the tower. As an observer, vPilot injects the VATSIM aircraft around you into the sim.
5. Work the traffic in CRC on another monitor as usual.

While the cab is not in the tower, a banner on the screens leads to TOWER SETUP.

4.3 Where the cab goes

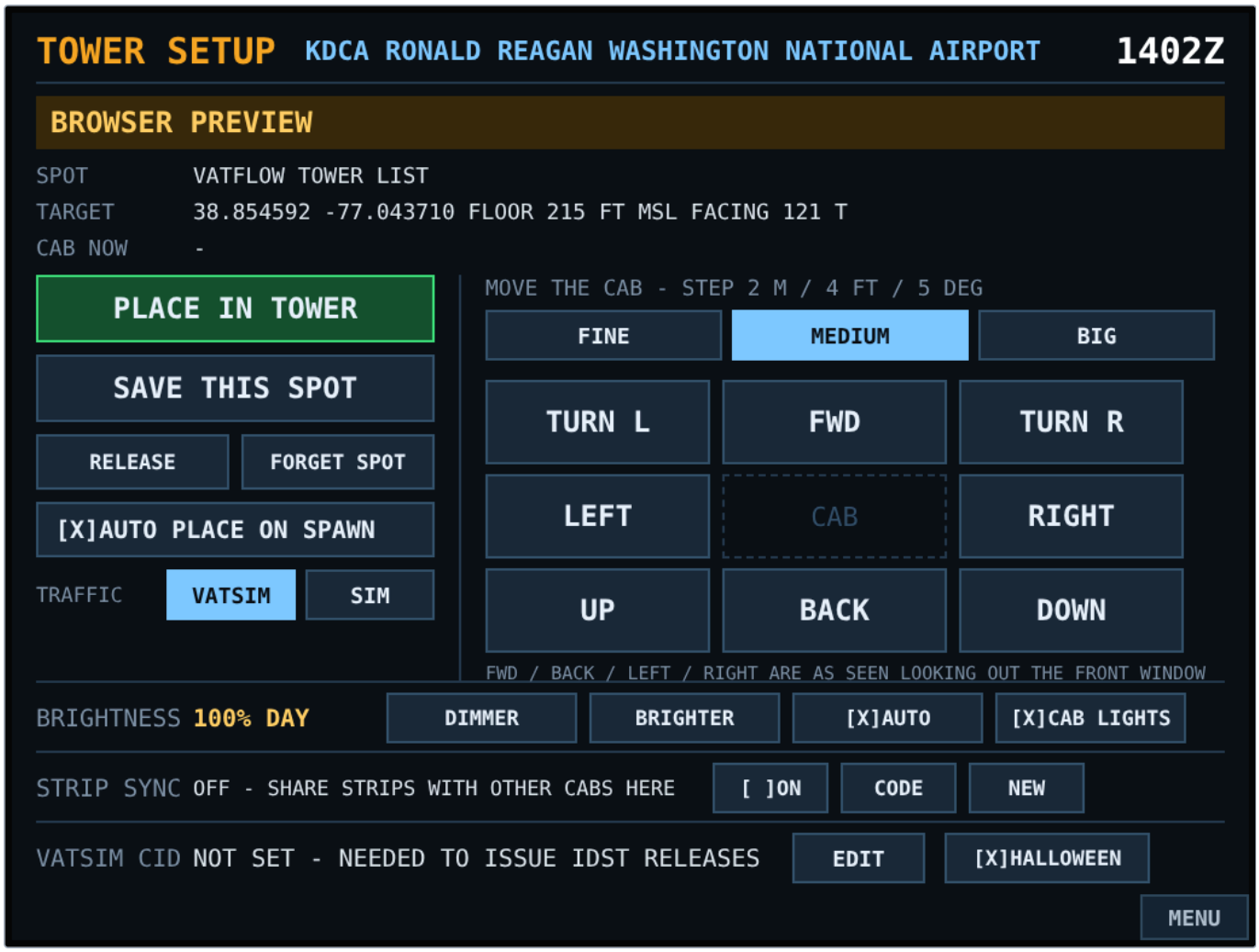
The cab picks its spot in this order:

1. Your own saved spot for this airport.
2. The tower list shipped with the cab (`common/towers.js`).
3. In the US: the FAA's position of the airport's control tower from the Digital Obstacle File (the tallest tower within 2.5 nm, cab floor 15 ft below its top, front window facing the airport).
4. The airport's control tower in OpenStreetMap.
5. The airport centre.

The cab moves itself directly if the sim lets an instrument page set its position; otherwise it steers itself there in slew mode. TOWER SETUP shows which way it worked: "IN THE TOWER (MOVED DIRECTLY)" or "(MOVED BY SLEW)".

4.4 TOWER SETUP screen

Open it from any screen's **MENU**. Everything about placing the cab, and a few cab-wide settings, is here.



TOWER SETUP. (The orange bar reads BROWSER PREVIEW only in the preview; in the sim it shows the cab's state.)

Control	What it does
Header	The airport the cab found, and Zulu time.
SPOT / TARGET / CAB NOW	Where the spot came from (your saved spot, the VATFLOW tower list, FAA, OSM…), the target position, floor height and heading, and where the cab is now.
`PLACE IN TOWER`	Moves the cab to the target and freezes it.
`SAVE THIS SPOT`	Saves where the cab is now as this airport's spot.
`RELEASE`	Unfreezes the cab ("RELEASED - THE CAB IS FREE TO MOVE"), for example to move it with slew mode.
`FORGET SPOT`	Deletes your saved spot; the cab goes back to the next source in the list above.
`[X] AUTO PLACE ON SPAWN`	Place the cab by itself when a flight starts.
Step: `FINE` `MEDIUM` `BIG`	Step size for the move buttons. MEDIUM is 2 m / 4 ft / 5 degrees.
`FWD` `BACK` `LEFT` `RIGHT`	Move the cab, as seen looking out of the front window (the FWD placard on the front console points that way).
`UP` `DOWN`	Raise or lower the cab.
`TURN L` `TURN R`	Turn the cab.
TRAFFIC `VATSIM` `SIM`	Where both radars get their traffic (see 6.3).

BRIGHTNESS `DIMMER` `BRIGHTER`	Same as the ALL brightness knob. With the knob full up, BRIGHTER keeps going to 200 % for bright days (BOOST, kept for the next flight).
`[X] AUTO`	Screens dim by themselves at night, to 40 % of their knob setting.
`[X] CAB LIGHTS`	At night the ceiling lights go off and the console task lights come on. Off: "CAB LIGHTS: ALWAYS ON".
STRIP SYNC `[ ] ON` `CODE` `NEW`	Share strips with other cabs (see 11.7).
VATSIM CID `EDIT`	Your VATSIM CID, typed on the on-screen keypad. It is needed to issue IDST releases. It is kept in the sim's storage for your user only, never in the package files, so the package can be shared.
`[X] HALLOWEEN` NEW	Shows or hides the Halloween decorations (see 13). The choice is kept for your next flights.

> **Getting it right on the tower.** Watch from an outside camera (drone) while you nudge the cab with the move buttons, until it sits nicely on top of the sim's tower. Then SAVE THIS SPOT. Next time it goes straight there.

4.5 The Python placement tool (backup)

The older Windows tool in `placement/` still works if in-sim placement ever fails. Run `1-setup.bat` once, then:

File	What it does
`2-adjust-KDCA.bat`	Jumps onto the DCA tower and freezes. Then type commands: `u 3` / `d 3` up/down 3 ft, `f 2` / `b 2` / `l 2` / `r 2` move 2 m, `t 10` turn 10 degrees, `h 121` face 121 degrees true, `save`, `q`.
`3-place-KDCA.bat`	Jumps to the saved spot, freezes, turns the engine off, switches the ceiling lights on and plays a quiet cab fan sound (volume: Windows mixer, "Python").
`capture-KDCA.bat`	Saves wherever the cab is now (after moving it with slew mode).
`release.bat`	Unfreezes the cab.

5. Views and eyepoint

5.1 The eyepoint

The cockpit view stands you 1.6 ft forward of the cab centre with your eyes 5.4 ft (1.65 m) above the floor. In the 2024 SimpleAircraft this is in `common\config\cameras.cfg`, measured from the reference datum:

`eyepoint = -2.0, 0, 5.4` standing, or `-2.0, 0, 4.0` seated (for SimpleAircraft's datum of 3.6, 0, 0).

Use the normal camera zoom as your binoculars.

5.2 Position cameras NEW

`tools/add_position_cameras.py` adds five views to your project's `cameras.cfg`:

Camera	Where you stand
VATFLOW LOCAL	The front window.
VATFLOW GROUND	Front-right.
VATFLOW CLEARANCE	Left side.
VATFLOW TMU	Seated at the back-left desk, looking down at its screens.
VATFLOW OVERVIEW	The back of the cab, looking over everything.

```
python tools/add_position_cameras.py "<project>\PackageSources\SimObjects\Airplanes\<yours>\common\config\cameras.cfg"
```

Then Build All. In the sim they are in the camera menu under **Cockpit > Instrument views**, and the next / previous instrument view keys step through them. Run the script again after moving the eyepoint: it replaces its own cameras and leaves the rest alone. If a view looks off, change `POSITIONS` at the top of the script.

5.3 Your own saved views

Point the view at the places you look at most (each runway end, the ramp...) and save each as a custom camera. MSFS has "save / load custom camera" bindings under Controls > Camera; bind them to keys for instant "look at runway 01" buttons.

5.4 Overhead monitors

The two radar monitors hang in square-tube yokes from trolleys on a circular ceiling track, like the real DCA cab.

- **Move round the cab:** grab the screen with the mouse and drag left or right. They travel all the way round.
- **Raise or lower:** drag the handle bar under the screen up or down (telescoping post, 15 cm up to 25 cm down).
- **Swivel:** drag a side knob left or right (up to 50 degrees each way).

The GROUND RADAR turns its map so its top is the view out of the window it hangs in front of, following it round the track and its swivel.

5.5 Window shades

Every window has a roll-down shade of dark navy tinted film; you can see out through it. Drag the shade to set its height, or click its roller to raise or lower it fully. By day the film glows its own blue (standing in for the daylight it lets through); at night a twin without the glow shows instead.

6. How the screens work

6.1 The MENU

Every 1024 x 768 screen in the cab runs the same screen host. A **MENU** tab in its bottom-right corner picks the app it shows, and each screen remembers its choice. Any app can run on any of these screens.

App (MENU name)	What it is	Status
TOWER RADAR	DBRITE tower radar	MAIN
GROUND RADAR	ASDE-X surface radar	MAIN
DEP SEQ	Departure sequence per runway	NEW
DEP TIMER	Big release countdown per runway	NEW
IDS	Information display system	NEW
IDST RELEASES	VATFLOW release times (FCA programs)	MAIN
VATSMART	vatflow.io VATSMART	MAIN
DEMAND vs AAR	APT Dashboard chart	MAIN
AIRCRAFT LIST	APT Dashboard metered list	MAIN
RAMP	vatflow.io ramp maps	MAIN
RVR	FAA runway visual range	MAIN
RAMP LIST	vatflow.io gates page (KDCA only)	MAIN
CLOSURES	Close runways and taxiways	NEW
STRIP BAYS	Strip bay setup	MAIN
TOWER SETUP	Placement and cab settings	MAIN

TWR INFO, the two clocks, the voice switch panel and the strip bays are fixed displays and have no MENU.

Default apps: the overhead monitors start on TOWER RADAR and GROUND RADAR, the front-left console screen on IDST, the TMU desk on VATSMART, DEMAND vs AAR and AIRCRAFT LIST, and three console screens on RAMP where vatflow.io has the airport (at KDCA: E / D, C / B and A / Hangars; elsewhere the airport's first three ramps).

6.2 Zoom and pan pad

The radar and map apps (TOWER RADAR, GROUND RADAR, CLOSURES) share a pad in the bottom-right corner:

- `+` / `-` zoom (down to 4x the range out).
- Arrow keys pan; `C` goes back to the whole picture.
- On the ground maps a rotate row above the pad turns the map by hand, 15 degrees a press. The header then shows ROT and the magnetic heading at the top. `AUTO` (green while on) hands it back to the window it faces.

Zoom, pan and rotation are kept per screen.

6.3 Radar traffic: VATSIM or SIM

The `VATSIM` / `SIM` tab left of MAPS on either radar (or TOWER SETUP > TRAFFIC) switches both radars on every screen.

- **VATSIM** reads the network data feed about every 15 seconds and dead-reckons positions in between.
- **SIM** reads the aircraft in your own sim once a second: AI traffic, ADS-B / real-traffic injectors, multiplayer, and VATSIM traffic as vPilot shows it. A sim aircraft within 0.6 nm / 1,500 ft of a VATSIM pilot gets that pilot's callsign, type, route and

squawk; others show their ATC id or `TFC` plus a number.

The ramp maps always use VATSIM.

6.4 MAPS

With the ARTCC maps package installed (3.3), the **MAPS** tab on TOWER RADAR lists the TRACON's STARS maps by number plus the tower cab maps: tap to turn each on or off. Presets are named after the facility's runway configurations (WEST, EAST...): tap SAVE and then a preset to store what is on; tap a preset to switch to its maps. GROUND RADAR uses the facility's ASDE-X map by default, and MAPS can pick another, or BUILT-IN (OPENSTREETMAP). Choices are kept per airport.

6.5 Pick an aircraft on one screen, see it on all NEW

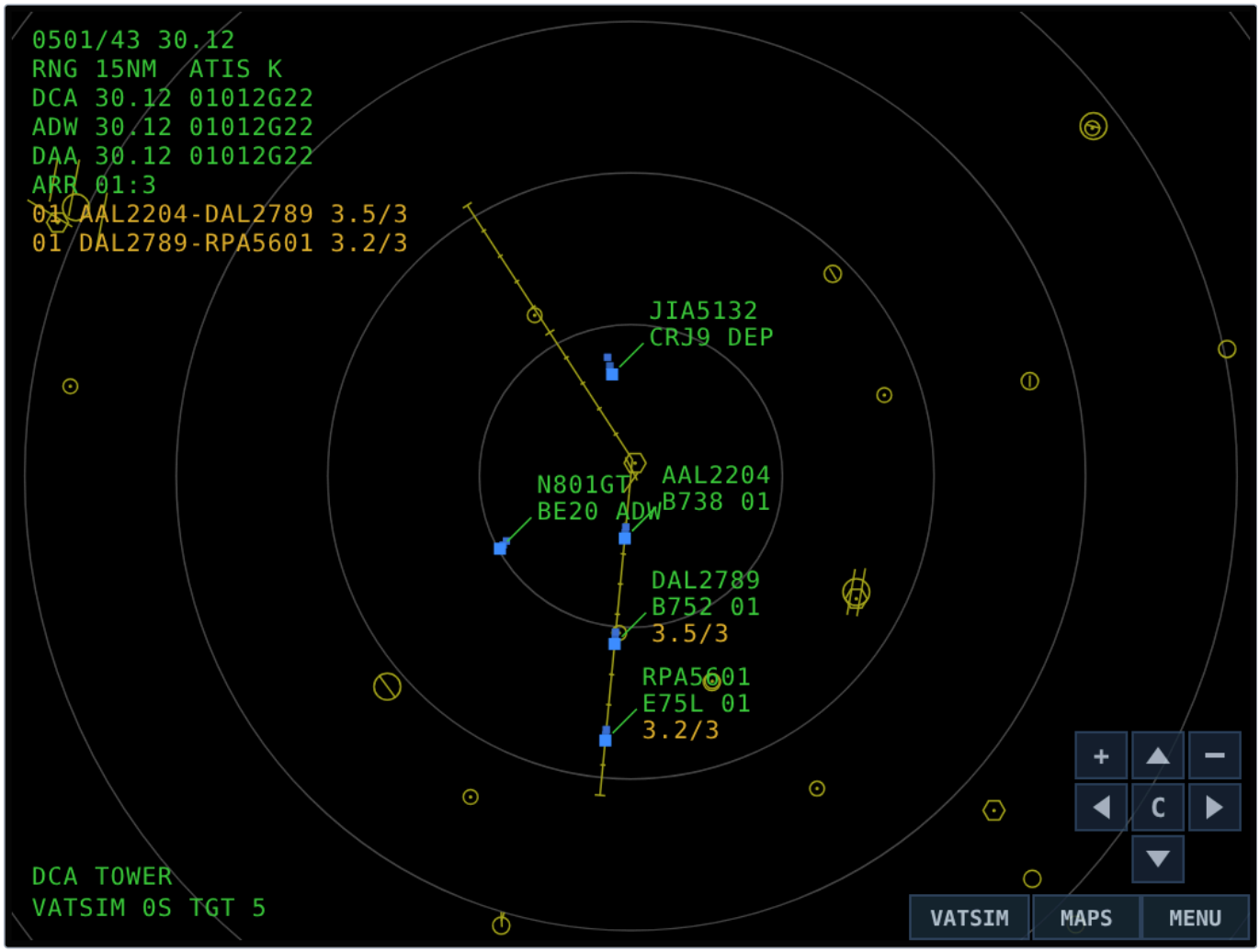
Tap a target on either radar, a row on DEP SEQ or DEP TIMER, or pick up a strip. That aircraft gets a cyan ring, box or outline on the radars, DEP SEQ and the strip bays for 5 minutes. Tap it again to clear.

6.6 Brightness and day / night

- **Knobs:** the four knobs on the console's knob panel are, left to right, ALL screens, DBRITE, ASDE-X and the console screens. Drag right for brighter, left for dimmer; the screen shows its brightness while you turn. The pointers and the panel's edge glow faint amber so you can find them in the dark.
- **Buttons:** TOWER SETUP's DIMMER / BRIGHTER work the ALL knob; past full, BRIGHTER goes to 200 % (BOOST).
- **AUTO:** TWR INFO works out the sun's height at the cab from the sim's position and time. From dusk (sun below 0 degrees) the screens dim to 40 % of their knob setting, and with CAB LIGHTS on the ceiling lights go off and the console task lights come on.

7. Radar screens

7.1 TOWER RADAR (DBRITE)



TOWER RADAR with three arrivals on the runway 01 final, a departure climbing out and a VFR target. The list top left shows the altimeters and the final spacing.

A STARS-style tower radar, normally on the overhead monitor at front right.

- Live traffic within 15 nm, magnetic north up (as STARS and CRC show it), grey range rings.
- Olive video map: runways of every airport in range, airport, heliport and navaid symbols. With the maps package, the ARTCC's STARS maps instead (MAPS tab).
- Green altimeter list top left (at KDCA: DCA, ADW and DAA from the METARs), the range and the ATIS letter.
- History trails and data blocks: callsign, then altitude and speed alternating with type and ARR / DEP. Positions are dead-reckoned between feed updates and repainted on a 4.8 s radar sweep.
- Bottom left: the tower position name and the traffic source with its age and target count (`VATSIM 0S TGT 5`).

Arrival runway NEW

Arrivals to the field show the runway they will land on in line 2: `01` once they are on its final, `01?` before that (the arrival runway in use nearest them).

Final approach spacing (ATPA-style) NEW

Each aircraft on a final behind another gets a third line with its gap and the wake minimum, for example `3.2/4` (FAA JO 7110.65 5-5-4, never under 3 nm). It turns **amber** within half a mile of the minimum and **red** under it. The list top left counts arrivals per runway (`ARR 01:3`) and names the tight pairs (`01 DAL2789-RPA5601 3.2/4`).

7.2 GROUND RADAR (ASDE-X)



GROUND RADAR at KDCA with a runway safety alert: UAL2381 is lined up on runway 01 while AAL2204 is about 40 seconds out.

The airport surface in ASDE-X colours (teal water, grey field, dark movement area, black runways, light terminals) with every aircraft on the field and arrivals and departures below 2,000 ft as heading arrows with callsign and type.

- Hangs on the overhead monitor at front left. It is landscape 4:3 and turned so its top is the view out of the window it hangs in front of. Use the rotate row on the pad to turn it by hand instead.
- Taxiway names (A, B1…) are written along the taxiways, upright however the map is turned and spaced out so they don't pile up. Zooming in shows the short connectors' names too. They stay on when an ARTCC ASDE-X map is shown.
- Same zoom / pan pad, VATSIM / SIM and MAPS tabs as the DBRITE.
- Arrivals' blocks show their landing runway, as on the DBRITE NEW.

Runway safety alerts NEW

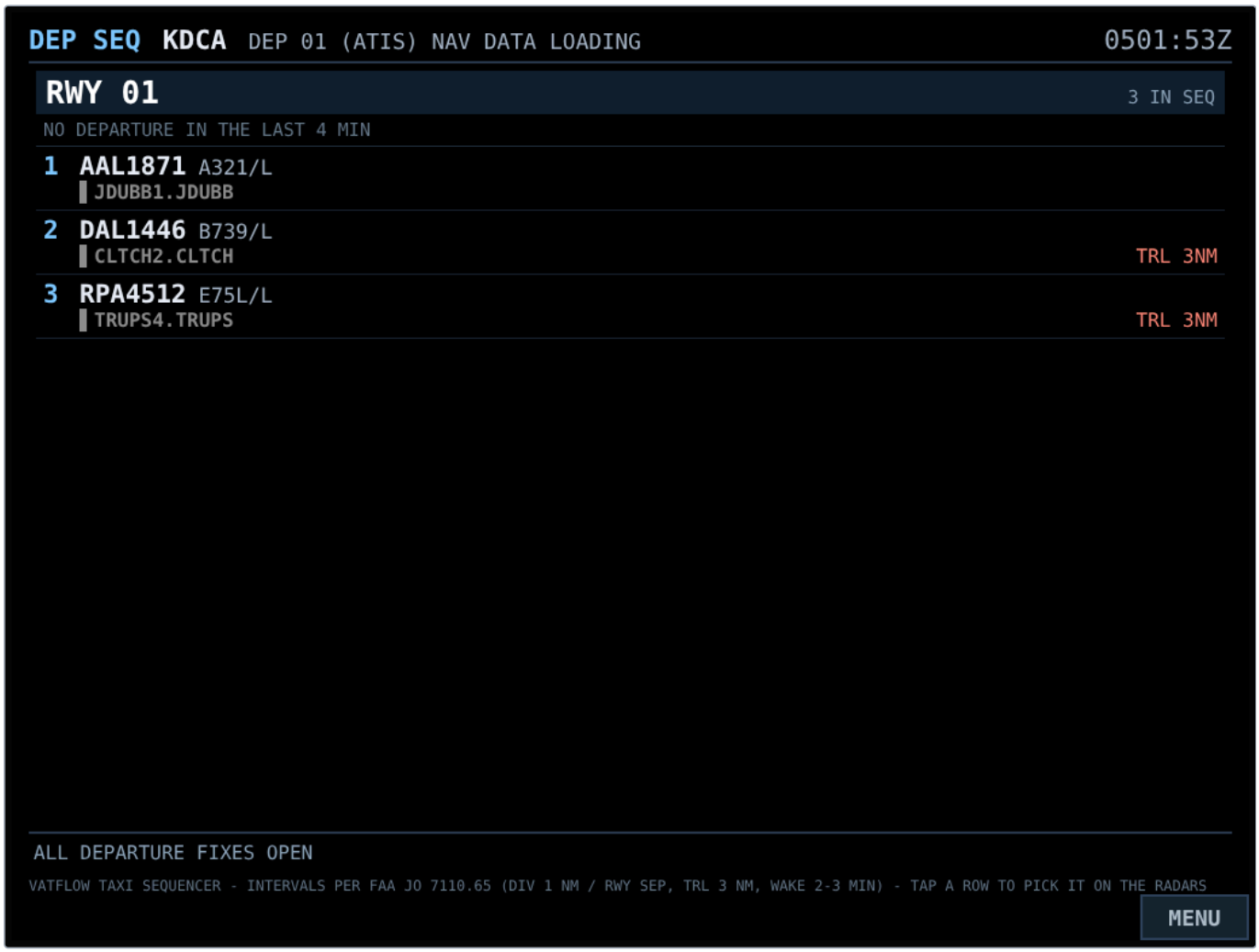
The ASDE-X raises an alert when:

- an arrival is within about 45 seconds of a runway someone is on (either direction; an intersection counts), or
- an aircraft is rolling with another one on the runway ahead of it.

Both targets turn red with a flashing ring, a red box across the top names them (`RWY 01/19: AAL2204 ARR RWY 01 - UAL2381 ON RWY 01/19`) and an alarm sounds (a two-tone warble). **Tap the box** to silence that alert on every screen until it is over.

8. Departure tools

8.1 DEP SEQ NEW



DEP SEQ with three taxiing departures for runway 01. Without nav data (offline preview) every pair is 3 miles in trail.

The departure sequence for each departure runway in use, worked out by the VATFLOW Taxi Sequencer (the same code as vatflow.io/taxi-sequencer.html).

- **The queue** is every departure from this airport that has started to taxi.
- **The runway** for each is the one the airport's VATFLOW IDST runway / SID config assigns its SID to (set on vatflow.io's IDST settings, shared through the VATFLOW hub and read once a minute; its departure runways, when set, are the ones in use). Otherwise a runway its SID is published for, nearest threshold first.
- **Each row:** number, callsign, type (H / S for heavy / super), its fix as SID.FIX in the fix's course colour, the first fix of its SID off that runway (right side, RNAV SIDs), and the interval it needs behind the one ahead.
- **Intervals** (FAA JO 7110.65): `DIV 1NM` when courses diverge 15 degrees or more, `TRL 3NM` on the same fix, `WAKE 2:00` behind a heavy or B757, 3 minutes behind a super, never under `RWY SEP 0:45`.
- `UP` marks an aircraft the sequencer moved ahead (never more than two places).
- Below the queue: each departure fix still held by a recent departure ("ALL DEPARTURE FIXES OPEN" when none).

Nav data (FAA CIFP) comes from vatflow.io once a session; without it every pair is 3 miles in trail. There are deliberately no countdown timers on DEP SEQ; the rows show the SID's first fix instead. Tap a row to pick that aircraft on every screen.

8.2 DEP TIMER NEW



DEP TIMER: runway 01 clear to release AAL1871.

One big panel per departure runway, readable from across the cab: the countdown to the next release in **amber**, **RELEASE** in green when the next one can go, and why (the interval and the departure it is behind). With no recent departure it shows the time since the last one.

8.3 IDST RELEASES



IDST in view-only mode (no CID set yet).

VATFLOW release times for departures in an active FCA program: the same data and release engine as vatflow.io/idst.html. It sits on the front-left console, right of TWR INFO.

- Click an aircraft, or use the four keys next to the keyboard (up, down, issue, cancel), then `ISSUE RELEASE` or `CANCEL`.
- Issuing needs your VATSIM CID set on TOWER SETUP, and you must be connected as a controller (the web page's rule). Without a CID the header shows **VIEW ONLY - NO CID SET**.
- Releases you issue appear on the flight strips as `REL hhmm`.

9. Information screens

9.1 IDS NEW



IDS, amber like a real IDS. In the preview the hub, D-ATIS and TAF were offline.

- **Runways:** the departure and arrival runways in use, from the ATIS, else what departures and arrivals have used in the last 30 minutes, else into the wind. For each runway end: head / tail wind and cross wind, with gusts.
- **Taxi out:** the average taxi-out time with its trend, and who is taxiing now.
- **Flow / TMI (VATFLOW):** ground stops, AAR / MIT, restrictions, EDCTs and FCA releases for the field.
- **VATSIM ATIS** with its NOTAMs coloured by kind (closures, wildlife...).
- **Real-world NOTAMs** from the FAA D-ATIS (US airports).
- **TAF** from api.weather.gov, else aviationweather.gov.

9.2 TWR INFO



TWR INFO: actual wind, altimeter, ATIS letter, Zulu time and the METAR.

A fixed display on the front-left console, amber on pure black (so it stays black when dimmed at night).

- **AW, the actual wind** in big type: the sim's own wind at the cab, 2-minute average, magnetic. Gusts are worked out the way a US ASOS / AWOS reports them: a gust is recorded when the 2-minute sustained wind is 9 kt or more and the highest 5-second average in the past minute is 5 kt or more above it; the highest gust in the past 10 minutes is shown (so never under 14 kt).
- The altimeter, Zulu time, the VATSIM ATIS letter, the METAR wind, the sim's own altimeter and the real METAR.

Windshear and microburst alert

When the wind at the cab suddenly gains or loses 15 kt or more (the past 5 seconds against the 2-minute sustained wind), the lower half of the screen shows **WINDSHEAR ALERT** and the gain or loss in huge bright red, or **MICROBURST ALERT** for a loss of 30 kt or more, and an alarm beeps. It stays up until the wind has been steady for a minute. `MUTE` on the screen, or the red button on the monitor's bottom bezel (it flashes while the alarm sounds), silences and hides it until that alert is over.

9.3 RVR

The FAA's live runway visual range table for the cab's airport, read every minute through the VATFLOW hub: touchdown / midpoint / rollout in feet with trend arrows, amber under 2,400 ft, red under 1,200 ft, and the edge / centreline light steps. US airports with RVR sensors only.

9.4 Clocks and voice switch



Red LED Zulu clock.



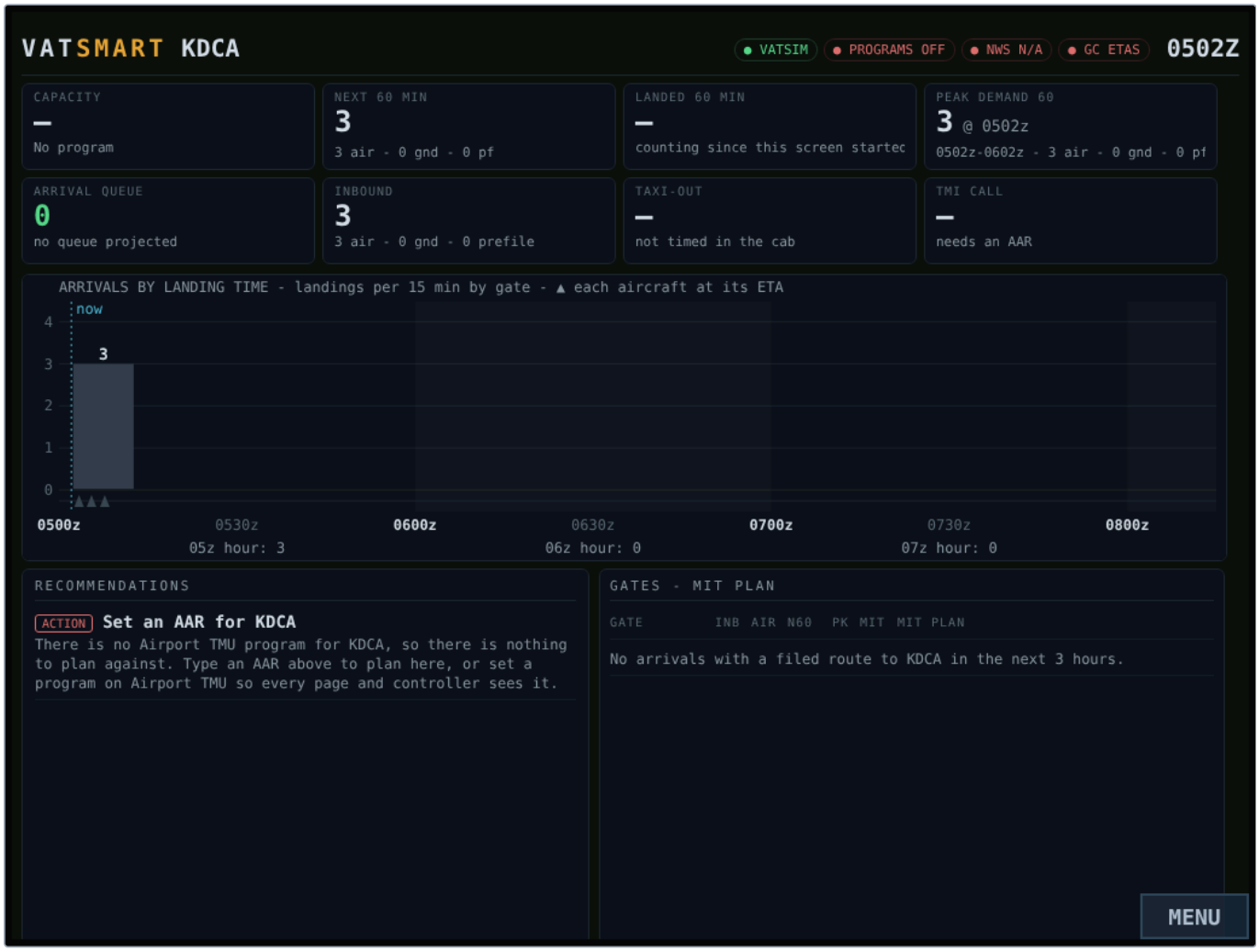
Voice switch panel: keys light while that position is online on VATSIM.

Two red LED Zulu clocks (front-left console and TMU desk). The voice switch panel's keys light up while that position is online on VATSIM; it is atmosphere, not a working voice switch.

10. Traffic management screens

The TMU desk in the back-left corner is set up after the DCA TMU position: three monitors with keyboards.

10.1 VATSMART



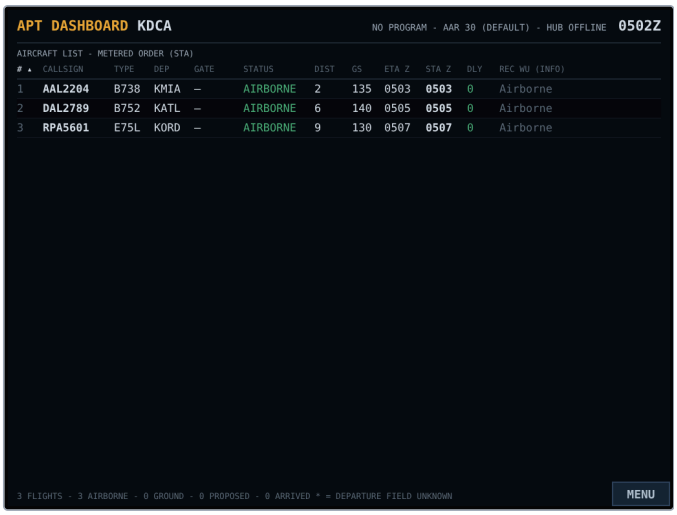
VATSMART, built from vatflow.io's own modules.

vatflow.io's VATSMART run in the cab: capacity, demand, queue and TMI tiles, arrivals by landing time per gate, the recommendations and the gate MIT plan. Data: the live VATSIM feed, VATFLOW programs from the hub, the NWS forecast and the METAR.

10.2 DEMAND vs AAR and AIRCRAFT LIST (APT Dashboard)



DEMAND vs AAR in 15-minute bins.

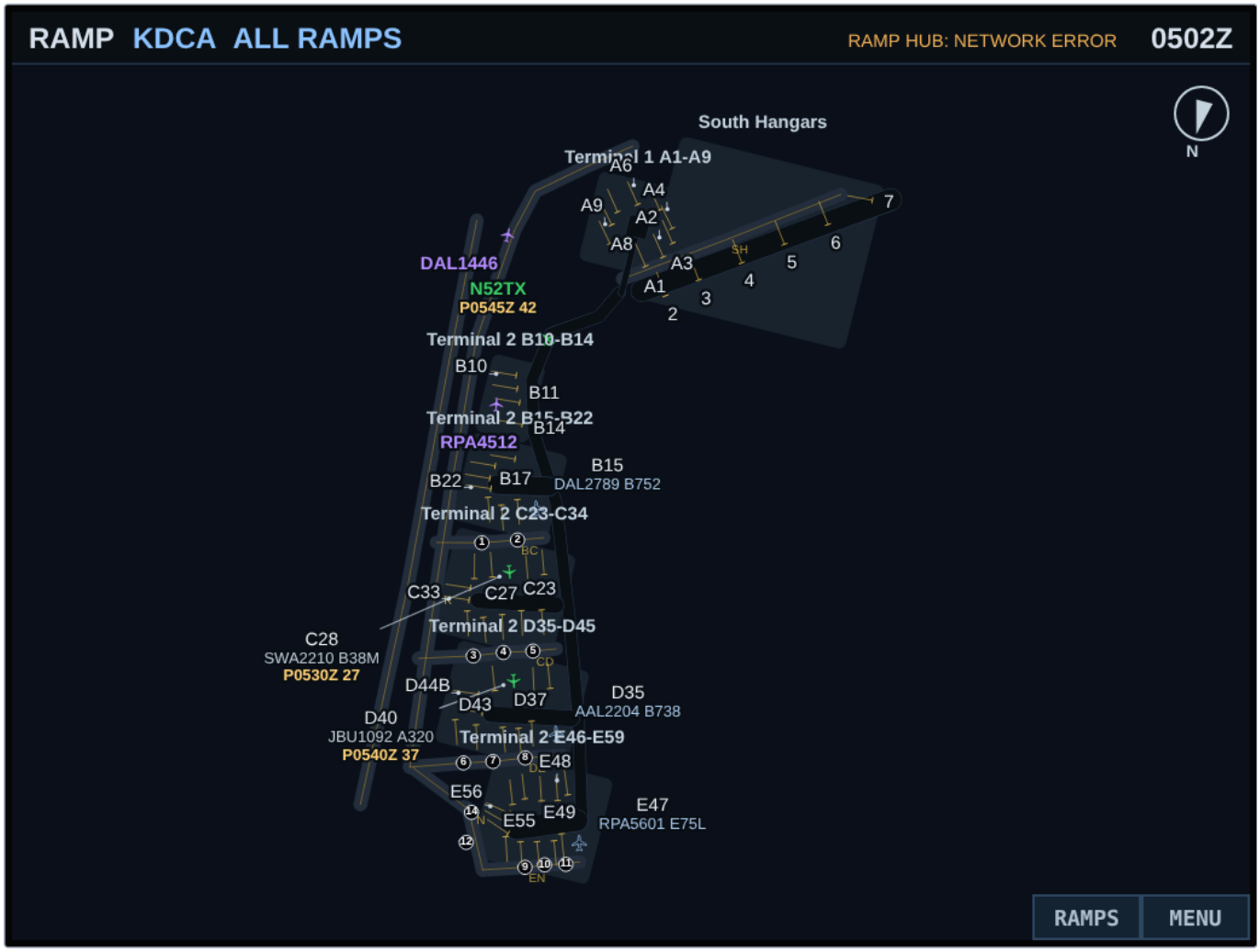


AIRCRAFT LIST in metered order.

The two halves of vatflow.io's APT Dashboard, computed in the cab from the VATSIM feed and the VATFLOW program rates (read-only):

- **DEMAND vs AAR:** arrivals in 15-minute bins against the program AAR (olive at or below capacity, red over). Without a program it uses a default AAR of 30.
- **AIRCRAFT LIST:** metered order, callsign, type, departure, gate, status, distance, ground speed, ETA / STA, delay and recommended wheels-up.

10.3 RAMP



RAMP at KDCA, all ramps, with aircraft at their gates.

The map part of vatflow.io's ramp management page, for any airport on that page.

1. Pick the airport, then its ramps (tap to add or remove, or ENTIRE AIRPORT), then SHOW.
2. The `RAMPS` tab on the map changes the choice. It is kept per screen.

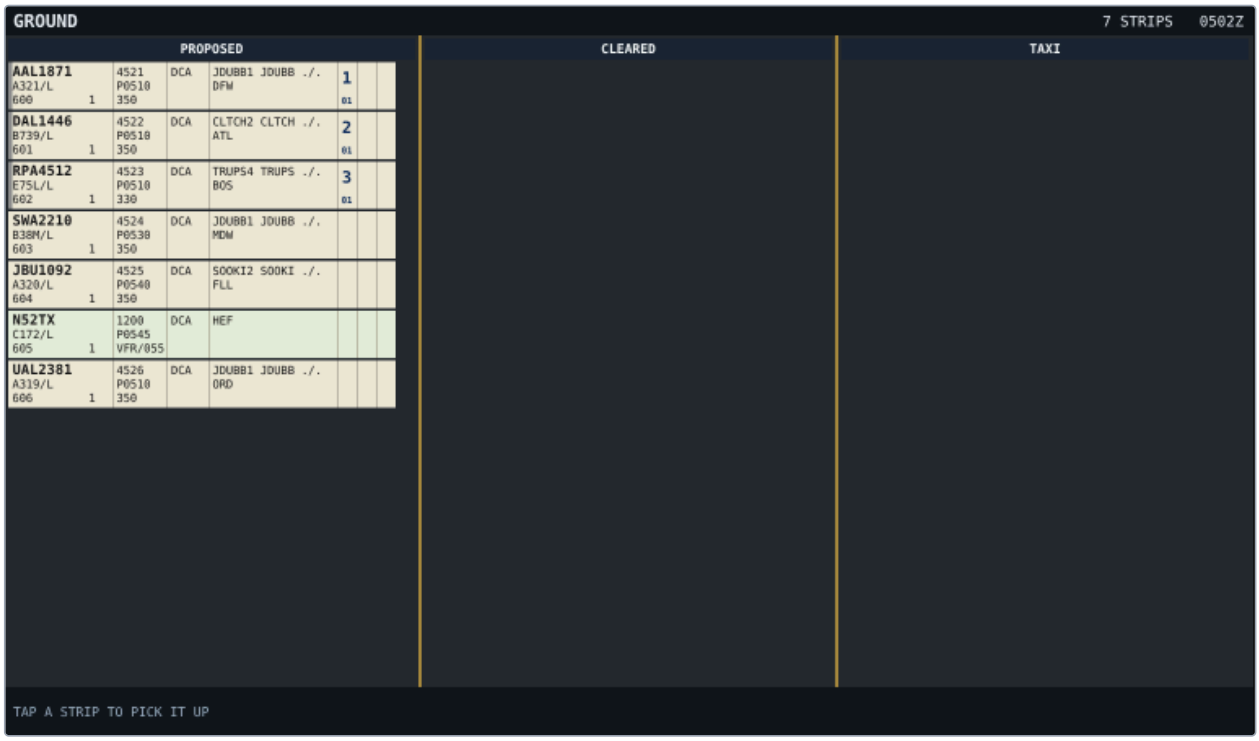
One chart is turned so its top is the view out of that screen's window (with a north arrow); several charts (cargo ramps) sit side by side, north up. The airport list and layouts are read live from vatflow.io, with copies in the package.

10.4 RAMP LIST (KDCA only)

The vatflow.io gates page for KDCA (inbound gate proposals, departures on the ground) on the ramp list computer left of the clock. Only offered at KDCA.

11. Flight strip bays

Three strip bays stand at the front of the consoles: **TMU**, **GROUND** and **LOCAL** by default. Each is a sloped board three columns wide (about 1 m) with its strips drawn on it, and a position name plate on the outer edge of the worktop in front of it.



The GROUND bay: departure strips printed from the VATSIM feed in the PROPOSED column. The three taxiing aircraft are at the top in sequence order, numbered 1 to 3 for runway 01.

11.1 How strips print

A departure strip appears when a pilot with a flight plan out of this airport is on the ground here (the VATSIM feed, read every 20 seconds by bay 1 for all three). It follows the FAA terminal departure strip: aircraft ID, type / equipment, CID, revision, beacon code, proposed time, requested altitude, departure airport, route and remarks. `VFR` plans show `VFR` (or `VFR/055`) in the altitude box; everything else is treated as IFR.

Route box

Only the SID and its first fix (`JDUBB1 JDUBB`, `RNLDI4.RNLDI` too), or the first fix when no SID is filed, then `./.` when the filed route goes on, then the destination. Speed / level groups, `DCT` and the departure airport are skipped.

Release time

Under DEP: `EDCT 1432` when a VATFLOW Airport TMU program issued the flight an EDCT, `REL 1432` when an FCA program released it (the releases IDST issues, polled every 30 s). A flight with both shows the later one. Cancelled releases disappear from the strip.

Sequence and taxi-out NEW

Departures in DEP SEQ's sequence show their number and runway in the first box on the right, and a bar on the left edge in their fix's colour. The bay header shows the average taxi-out time over the last hour (`TAXI OUT AVG 14:20 RISING (6)`), timed from the first move (7 kt) to the start of the takeoff roll.

11.2 AUTO SEQ

On by default. Every section keeps itself in taxi order:

- Strips of aircraft that have started taxiing (moved at 5 kt or more since the strip printed) go to the top, nearest the departure runway first (straight-line distance to its threshold, not along the taxiways). Next departure on top.
- Strips of parked aircraft keep their order below them.
- A strip only passes the one above when it is about 50 m closer, so two aircraft side by side at the hold short line don't keep swapping.
- The departure runway is learned from the runway ends departures took off from in the last 30 minutes, else the ones most into the METAR wind, else the nearest threshold.

Strips stay in the section you put them in. Turn AUTO SEQ off on the STRIP BAYS screen to order strips by hand.

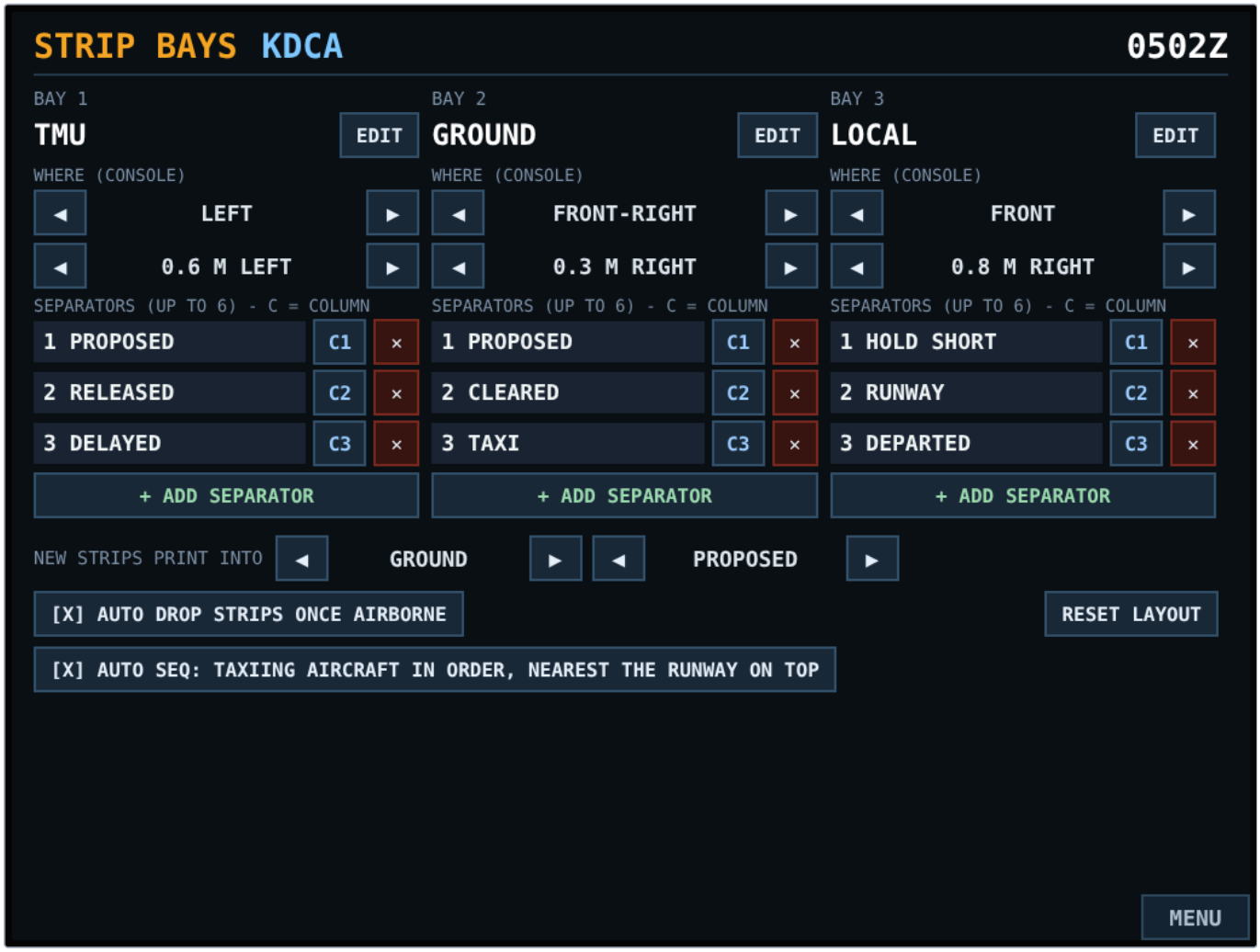
11.3 Moving strips

- **Pick up:** tap a strip (any bay).
- **Put down:** tap another strip (it goes in front of it), a separator (top of that section) or the empty part of a column (bottom).
- `PUT BACK` drops it where it was; `COCK` offsets it as a reminder; `DELETE` removes it.
- **Send to another bay:** with a strip picked up, the `TO GROUND`, `TO LOCAL`... buttons put it at the end of that bay's first section.

11.4 Dropping

Strips drop by themselves once airborne (AUTO DROP) or after 3 minutes off the network. A deleted strip doesn't print again unless its flight plan is amended.

11.5 STRIP BAYS screen



STRIP BAYS: names, positions, separators and options for the three bays.

- Each bay's **name** (and its sign) via `EDIT`.
- **Where it stands:** any console face, and how far along it, with the arrow buttons.
- Up to six **separators** per bay, typed on the on-screen keyboard, each in a column (C1 / C2 / C3). A bay with no separators fills its columns left to right.
- **NEW STRIPS PRINT INTO**: which bay and section new strips go to.
- **AUTO DROP** and **AUTO SEQ** on / off.
- `RESET LAYOUT` goes back to the default TMU / GROUND / LOCAL layout.

The setup is kept per airport. Default spots: TMU on the left console between the clock cabinet and the ramp monitors, GROUND right of the front-right window's centre, LOCAL right of the front ramp monitors.

11.6 Strips and other programs

The strips don't sync with CRC or vNAS. vNAS TDLS can't run on a cab screen (see section 15); run it in a normal browser next to the sim if you need it.

11.7 STRIP SYNC (several cabs, one set of strips)

Controllers in different cabs at the same airport can share strips: a strip the ground controller moves to LOCAL turns up on the local controller's LOCAL bay.

1. On TOWER SETUP > STRIP SYNC, one controller taps `NEW` (a random 6-digit code) and gives the code to the others.
2. The others tap `CODE`, type it and OK. The line shows who is in, by CID.
3. `ON` turns it off and on again.

Shared: the strips, where they are (bay, section, order), cocked / amended, deleted strips, and the bay setup (names, separators, columns, where new strips print, AUTO DROP, AUTO SEQ). **Your own:** the strip you are holding and where your bays sit in your cab.

Joining a room that is in use replaces your strips with the room's; the first cab in starts the room with its own. If two cabs move the same strip at once, the later move wins. Changes made while the connection is down are sent when it comes back. Rooms nobody uses for 12 hours are forgotten.

12. Runway and taxiway closures NEW

Close runways and taxiways from the cab, and see them closed out of the window: barricades with flashing red lamps, lighted X's and work vehicles. Built and first tested at KDCA. Only your own sim shows them; VATSIM pilots don't see anything.

12.1 The CLOSURES screen



CLOSURES at KDCA: runway 15/33 closed (red, X at each end) and a stretch of taxiway J closed (yellow), with a second taxiway tap waiting for its other end.

Pick **CLOSURES** from any screen's MENU. It is a map of the airport (the Ground Radar's) with the same zoom / pan / rotate pad.

To do this	Tap
Close a runway	The runway. It turns red with an X at each end. Tap again to open it.
Close a stretch of taxiway	A spot on the taxiway, then a second spot on it. The stretch between is closed. The banner reads "TWY K: TAP THE OTHER END (SAME SPOT = ONE ROW)".
Close one spot	The same spot twice: a single row of barricades.
Open a taxiway	The closed stretch.
Drop a first tap	`CANCEL`

Open everything	`ALL OPEN`

The header counts the closed runways and taxiways. The bottom line shows the PC helper's state: **SIM HELPER ON** (green) when the cab can reach it, otherwise "SIM HELPER NOT RUNNING - START closures.bat ON THE PC". Closures are kept per airport.

12.2 The PC helper

Instrument pages can't put objects into the sim, so a small helper runs on the PC beside the sim. The cab sends it the list of closures and it creates the objects through SimConnect. The update zip installs it in the `ClosuresHelper` folder of your cab project (`C:\MSFS-Projects\VatflowTowerCab\ClosuresHelper`).

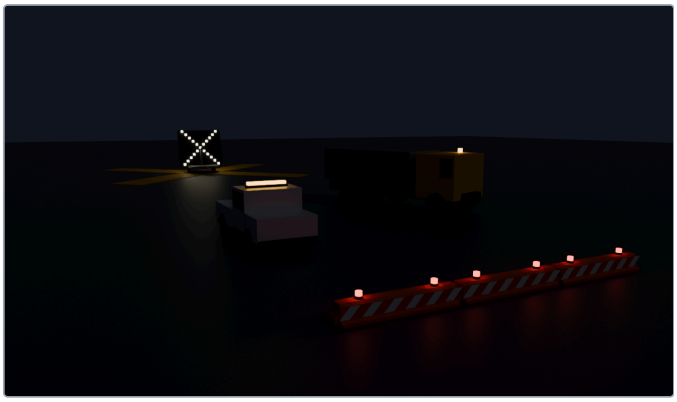
1. First time: `ClosuresHelper\1-setup.bat` (installs the SimConnect package for Python).
2. Every session: start the flight, then double-click `ClosuresHelper\closures.bat` and leave its window open (minimized is fine).
3. After restarting the flight, press **Enter** in the helper window to put everything back.

- The helper listens only on your own PC (`127.0.0.1:47640`).
- It remembers the last list in `closures_last.json` and puts it back when it starts.
- It places objects at the ground height under the cab, so they stand on the ground.
- It uses the MSFS 2024 SDK's SimConnect.dll when it finds it (needed for objects the project editor upgraded to 2024 format). If your SDK is not in `C:\MSFS 2024 SDK`, put `{"dll": "D:\\path\\to\\SimConnect.dll"}` in `ClosuresHelper\closures.json`.
- `closures.json` can also swap in other SimObjects, for example `{"titles": {"dumpTruck": "ASO_Baggage_Cart01"}}`.
- `ClosuresHelper\closures-test.bat` puts one of each object 250 m in front of the cab (Enter removes them): the quick check that the objects show up.

12.3 What appears in the sim



Closure objects by day: lighted X trailer and yellow X, work truck, dump truck and barricades.

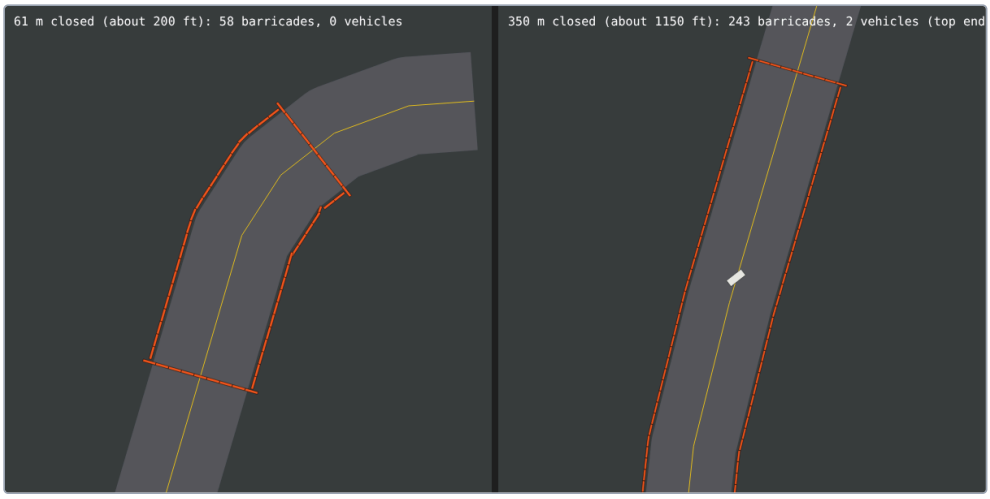


The same at night, with the lamps lit.

Closure	Objects
Taxiway stretch	Orange low-profile barricades with red lamps boxing in the closed stretch: a row across each end and along both edges (past about 370 m the edge rows get gaps). One to three work vehicles (work truck, dump truck) on the stretch, and inside the box dirt and rock piles and a porta potty.
Taxiway spot	One row of barricades across the taxiway.
Runway	A yellow X and a lighted X trailer just inside each threshold.



All closure objects: porta potty, dirt pile, lighted X trailer and yellow X, rock pile, work truck, dump truck and barricades.



How barricades box in a short and a long closed taxiway stretch.

Lamp timing: barricades flash once a second; the lighted X is 5 s on, 5 s off; the trucks' amber lights are a construction strobe (double flash, left then right, 0.9 s cycle).

Draw distance: barricades, trucks and props have larger bounds than their size so the sim keeps drawing them from the cab further away.

> **New objects need a full MSFS restart.** When objects are added to the project (as by the update zip), MSFS creates them through SimConnect but doesn't draw them until it has been quit and started again. Build All alone is not enough.

13. Cab hardware and atmosphere

Item	Details
Ceiling lights	Five recessed light panels with cabin lights, switched on when the cab is placed. Off at night with CAB LIGHTS on.
Console task lights	Seven small warm lights, one over each console, on at night.
Ceiling fans	Two fans, switched by the FAN switch on the TMU desk's open end. They turn only while on.
Propeller cap	On the TMU desk's far end. Its propeller turns lazily while the fans are on.
Props	Coffee maker (back-right console by the stairs), binoculars (front console), propeller cap. At Halloween also a jack-o'-lantern and decorations (below).
Quick guide	Laminated sheet on the TMU desk: how to put and move the cab in the tower.
FWD placard	Low on the front console: an arrow towards the front window, the way FWD moves the cab on TOWER SETUP.
Carpet logo	"MADE AND POWERED BY VATFLOW TECHNOLOGIES", woven into the carpet in front of the stair hatch.
Look	After photos of a real FAA cab: blue consoles with a light grey writing strip and dark bumper, blue perforated vent panels, oak-edged TMU desk, charcoal ceiling tiles in a light grey grid with downlights, charcoal grey-blue carpet, black ceiling.

Sound

The cab makes no aircraft sounds (engine, wind, rattles). The only sounds are the alarms:

- **Windshear alarm** from TWR INFO.
- **Runway safety alarm** from the ASDE-X NEW.

The Python placement tool's `3-place-KDCA.bat` can still loop a quiet cab fan sound.

Halloween decorations NEW



The back-right console: jack-o'-lantern, a little orange and a little white pumpkin, the coffee maker and a bowl of candy corn.

Item	Details
Jack-o'-lantern	On the back-right console, next to the coffee maker. Carved face and lid, lit from inside by a tea light that flickers now and then. **Click the pumpkin** to blow the candle out; click again to light it.
Small touches	Two little pumpkins (one white) beside it, a bowl of candy corn on the other side of the coffee maker, and five black paper bats taped high up on the two back windows.
On / off	TOWER SETUP, bottom row: `[X] HALLOWEEN` puts all of it away or brings it back. The choice is kept for your next flights.

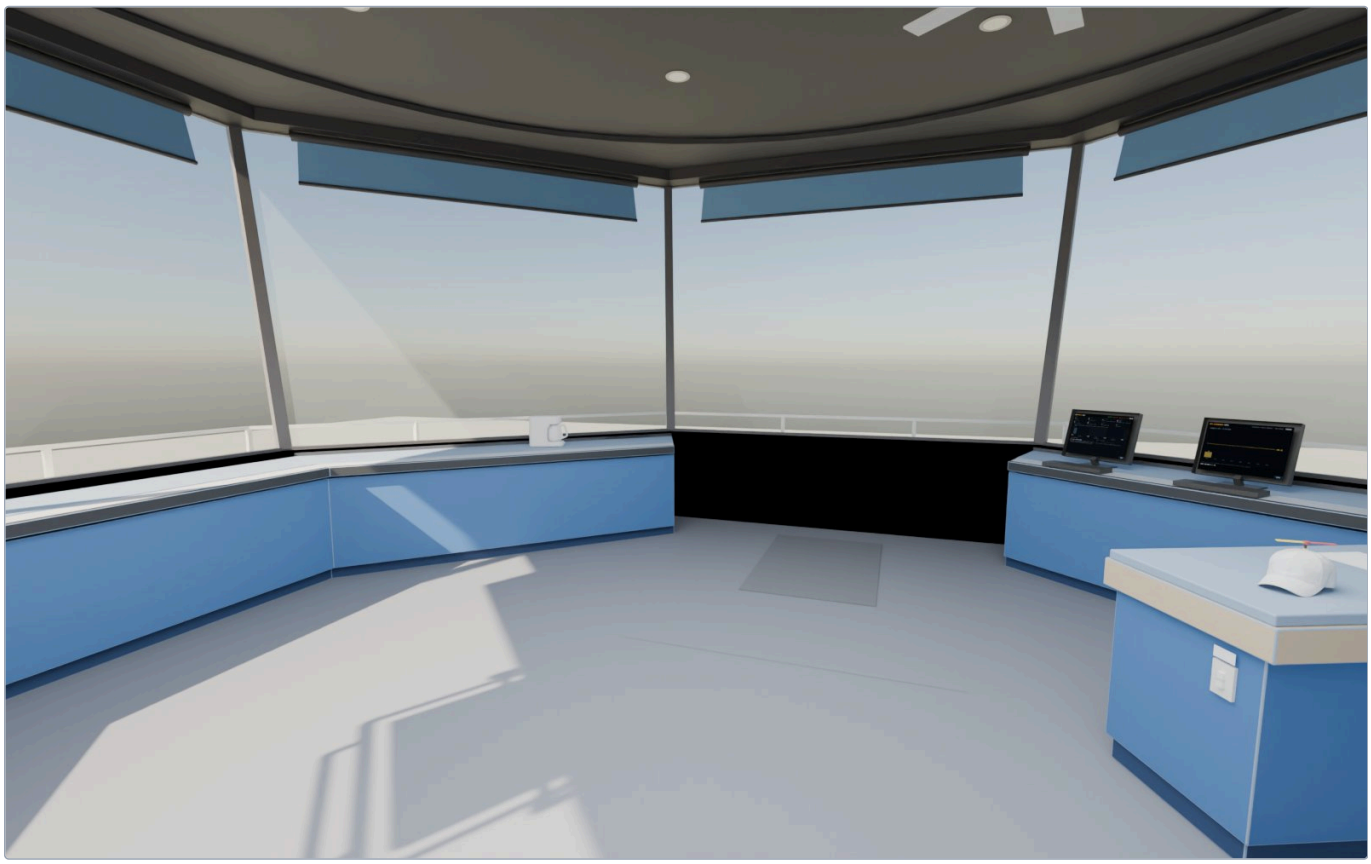


The jack-o'-lantern at night.



Candle blown out (click the pumpkin).

The glow is self-lit only: as with all self-lit parts in MSFS, the pumpkin doesn't light up the console around it.



Looking back towards the stair hatch, with the TMU desk at the right.

14. Other airports

Nothing to install: spawn the cab at a parking spot at the airport. The cab finds the airport, the screens set themselves up, and TOWER SETUP places the cab on the airport's control tower (the FAA's position at US airports, else OpenStreetMap's, else the airport centre). Nudge it onto the sim's tower and SAVE THIS SPOT.

- **KDCA and KATL** ship with their data. KDCA also has hand-tuned settings and the RAMP LIST.
- **Any other airport** gets its maps from OpenStreetMap the first time; the cab keeps them in the sim's storage. If OpenStreetMap's servers are busy, the radars show "NO MAP" and retry on the next flight.
- To ship a tuned tower spot to everyone, add the numbers TOWER SETUP shows to `common/towers.js`.
- A tower much bigger or smaller than DCA's would need a resized cab (the parameters at the top of `build_tower_cab.py`).
- To bundle another airport's data with the cab, run `tools/build_airport_data.py` for it.

15. Known limits and things not yet checked

15.1 Limits by design

- **CRC can't be shown inside the cab.** MSFS can only draw its own HTML instruments onto 3D screens, not another Windows program. Run CRC on another monitor, or float it into VR with a window-overlay tool (for example OpenKneeboard).
- **vNAS TDLS doesn't work on a cab screen.** The page loads but stays blank, and its VATSIM login refuses to be shown inside another page. Use the cab's strip bays (with STRIP SYNC) or TDLS in a normal browser.
- **The VATSIM feed is about 15 seconds behind.** CRC gets position updates every few seconds; the radars dead-reckon in between. CRC stays your actual working scope.
- **Strips don't sync with CRC or vNAS**, only with other cabs (STRIP SYNC).
- **Closures are only in your sim.** VATSIM pilots don't see the barricades, X's or vehicles. Closures need the PC helper running. NEW
- **No control of the sim's runway lights.** MSFS 2024 has no API for default airport lights. A test that laid dark strips over a closed runway's lights showed they don't hide the lights, so that approach was dropped.
- **US-only data:** RVR (FAA sensors), real-world NOTAMs (FAA D-ATIS) and the FAA tower positions.
- **KDCA-only:** RAMP LIST.
- **DEP SEQ intervals** need nav data from vatflow.io; without it every pair is 3 miles in trail. NEW
- **IDST** issues releases only with your CID set and while you are connected as a controller.
- **Windows only** for the setup EXE, the helper and the placement tool.
- The cab is sized for DCA's tower; much bigger or smaller towers need a resized model.

15.2 Not yet confirmed in the sim

Item	Status
Position cameras NEW	The camera axis signs are not verified in the sim; a view may face the wrong way until checked.
Runway safety alarm sound NEW	The second custom sound slot is not verified in the sim.
Lighted X and work-truck flashing NEW	Barricades and dump truck are confirmed flashing. The X and work truck still need a check after the files were restored from an A/B test.
Closure lamp brightness NEW	Emissive levels by day and night still to judge.
Real taxiway closure, barricade draw distance NEW	The objects are confirmed in the sim; a full taxiway closure and how far away the barricades still show are being checked.
Halloween pumpkin NEW	Glow brightness by day and night, the flicker, the click and the HALLOWEEN switch still to check in the sim.
Per-user storage, slew-mode placement fallback, OpenStreetMap from inside the sim	Built from the SDK docs; listed in SDK-GUIDE.md as things only the sim can confirm.

15.3 Performance

The VATFLOW Tower Cab still uses the original window shades, made of 20 strips each with many interactive parts. The DCA Tower Cab had stutters from this and was changed to one sheet per shade; the same change has not been made here yet. If you see stutters, the shades and the number of live screens are the first places to look.

16. Troubleshooting

What you see	What to try
The flight ends as the cab goes up	Turn crash damage off (Assistance).
Cab stays at the gate	Check AUTO PLACE ON SPAWN, or press PLACE IN TOWER on TOWER SETUP. If neither moves it, use the Python tool in `placement/`.
Cab sinks, drifts or tilts	PLACE IN TOWER again. Pausing or changing the aircraft can clear the freeze.
You are inside the sim's tower walls	UP a few steps until you are above its roof, then SAVE THIS SPOT.
The tower's antennas poke through the floor	Move a few metres with FWD / BACK / LEFT / RIGHT.
`VATSIM FEED: NETWORK ERROR`	The sim couldn't reach data.vatsim.net. Check your firewall or antivirus. The rest of the cab still works.
Radars show NO MAP	OpenStreetMap was busy for a non-bundled airport. It retries on the next flight.
A screen is black	(Builders) the screen material needs strong emissive and its name must match `panel.cfg` exactly, including the `$`.
Screens too dark or too bright	Brightness knobs, or DIMMER / BRIGHTER (up to 200 %) on TOWER SETUP. Check AUTO dimming at night.
IDST says VIEW ONLY	Set your VATSIM CID on TOWER SETUP and connect as a controller.
Settings not remembered after a restart	Per-user storage problem; report it.
CLOSURES says SIM HELPER NOT RUNNING NEW	Start `ClosuresHelper\closures.bat` and leave it open.
Build fails with "Unlisted file ... found in source directory"	A backup file (`*.before-update`, `*.before-halloween`) is in a `PackageSources` folder. Move it out of the project, or run the latest update `install.bat` again (it moves them into `_backup-before-update`), then Build All.
Closure objects don't appear NEW	First make sure you quit MSFS completely and started it again after Build All: new objects don't draw before that. Then run `closures-test.bat`. Its first line says which SimConnect.dll it uses: it needs the MSFS 2024 SDK's. If it says "could not create...", the objects didn't build: send the project editor's build log.
Closures gone after restarting the flight NEW	Press Enter in the helper window.

17. Reference

17.1 Data sources

Source	Used by
VATSIM data feed (data.vatsim.net)	Radars (VATSIM mode), strips, ATIS letter, voice switch, VATSMART, APT Dashboard, DEP SEQ, IDS
VATSIM METAR	TWR INFO, DBRITE altimeters, AUTO SEQ runway fallback
The sim (SimVars, air traffic)	Actual wind, windshear, sun / night, SIM traffic, placement
VATFLOW hub	Programs, EDCTs, FCA releases, IDST runway / SID config, RVR relay, STRIP SYNC rooms
vatflow.io	Ramp layouts, nav data (FAA CIFP) for DEP SEQ
vNAS	ARTCC video map drawings
OpenStreetMap / OurAirports	Airport maps and taxiway names, tower positions
FAA Digital Obstacle File	US tower positions and heights
FAA RVR, FAA D-ATIS (atis.info), NWS / aviationweather.gov	RVR, real-world NOTAMs, TAF

17.2 L: variables

Variable	Meaning
`L:VATFLOW_NIGHT`	1 at night (sun below 0 degrees)
`L:VATFLOW_BOOST`	Screen brightness over 100 %
`L:VATFLOW_WS_ALERT` / `L:VATFLOW_WS_MUTE`	Windshear alarm on / muted
`L:VATFLOW_RWY_ALERT`	Runway safety alarm on NEW
`L:VATFLOW_SEL_REV`	Changes when the picked aircraft changes NEW
`L:VATFLOW_DECOR_OFF`	Halloween decorations hidden NEW
`L:VATFLOW_PUMPKIN_OUT`	Jack-o'-lantern candle blown out NEW
`L:VATFLOW_FANS`	Ceiling fans on
`L:VATFLOW_CAP_DEG`	Propeller cap angle
`L:VATFLOW_BAY_n_DEG`, `L:VATFLOW_BAY_n_SLIDE`	Where strip bay n stands

17.3 Stored data (sim storage, per user)

Your CID, saved tower spots, each screen's app, zoom / pan, map choices, strip bay setup per airport, traffic source and brightness choices. Also `OPS_<ICAO>`, `TWROPS_<ICAO>`, `DEPSEQ_<ICAO>` NEW (written every 20 s by the strip feed for the other screens), `TRAFFIC_SRC`, `DECOR` (the HALLOWEEN switch) NEW, and `CLOSURES_<ICAO>` NEW.

17.4 Files you may use

File	What it is
`SDK-GUIDE.md`	Step-by-step build guide
`distribution/make-community-zip.bat`	Builds the tester setup EXE and zips

`distribution/rename-cab.bat`	Sets the name in the aircraft list
`distribution/update/install.bat`	The combined update for an existing project (in the update zip) NEW
`tools/make_update_zip.py`	Builds the combined update zip NEW
`distribution/closures/install.bat`	Closures only, for an existing project (older; the update zip covers it)
`maps-package/update-maps.bat`	Adds ARTCC video maps
`placement/*.bat`	Python placement tool (backup)
`placement/closures.bat`, `closures-test.bat` (installed as `ClosuresHelper\`)	Closures helper and object test NEW
`tools/add_position_cameras.py`	Adds the five position cameras NEW
`tools/build_airport_data.py`	Bundles another airport's data
`preview/index.html`	Runs the screens in a normal browser

VATFLOW Tower Cab user manual, 27 October 2026. Map data © OpenStreetMap contributors (ODbL).