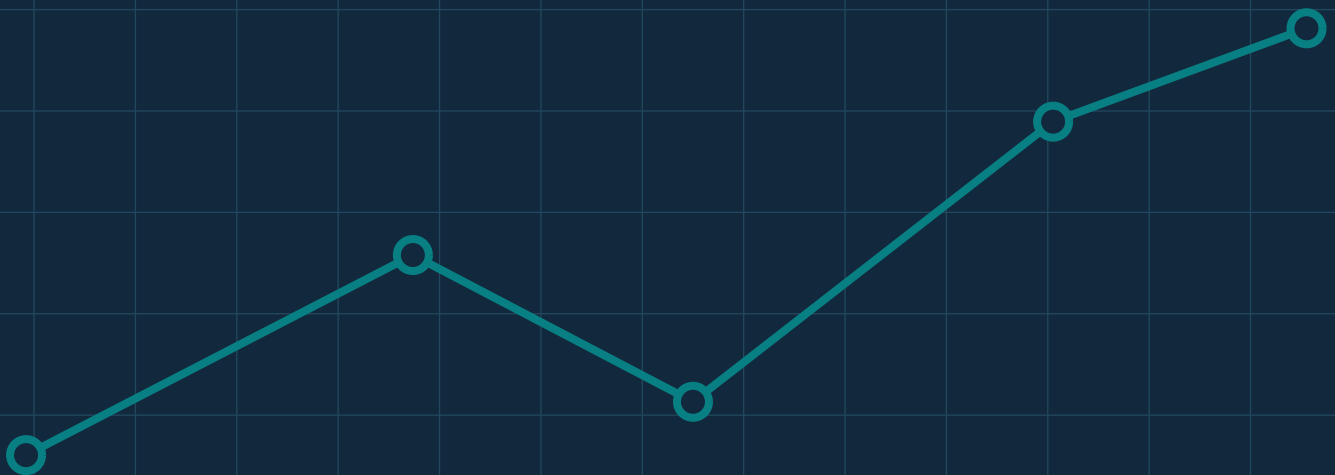


Your cockpit. Connected.

End-User Manual

Set up, fly, explore and troubleshoot.



Contents

A practical guide from first launch to live flight operations.

A note about updates	4
About this manual	4
How the application fits together	4
1. Quick Start Guide	5
1.1 System requirements	5
1.2 Installing the app	6
1.3 First launch	6
1.4 Simulator prerequisites	6
1.5 Using the app across your local network (and firewall rules)	7
1.6 Step-by-step: cold desktop to flying in 12 steps	8
1.7 Trial, licence and tiers in 30 seconds	8
2. Dashboard & UI Overview	10
2.1 The tab workspace	10
2.2 Setup page anatomy	11
2.3 Moving Map anatomy	11
2.4 Flight data fields - what each one means	12
2.5 Connection status indicators	13
2.6 Colour coding, chips and pop-ups	14
2.7 What the tier changes in the interface	14
3. Core Features Guide	16

3.1 Setup, variable monitoring and the data catalogue	16
3.2 The simulator data bridge (SimConnect / X-Plane UDP / FSUIPC)	16
3.3 Moving map, aircraft tracking and approach calculations	16
3.4 Flight planning, routes and procedures	17
3.5 SimBrief integration (Premium)	17
3.6 Flying someone else's real flight: FR24 and OpenSky replay	18
3.7 Charts: FAA, eAIP, georeferencing, and spoken missed approaches	18
3.8 Checklists and flight phases	18
3.9 Rules engine - your own cockpit alerts (Premium page)	19
3.10 Autopilot control, CTL and takeoff assistance	19
3.11 The AI crew: First Officer, Chat, and ATC recognition	20
3.12 Flight recording and reports	20
3.13 Weather, terrain and other tools	21

4. Troubleshooting Guide **22**

4.1 Sixty-second triage	22
4.2 Launcher and start-up failures	22
4.3 Connection problems (simulator link)	23
4.4 Data mismatch and wrong values	24
4.5 Feature-specific problems	25
4.6 Performance and stability	26
4.7 Quick FAQ	26
4.8 Reporting a problem (what makes a fix fast)	27

Appendix A - ports, paths and endpoints **28**

Appendix B - cheat sheet **29**

Edition: Desktop and browser interface ·

Document version: 1.0 · **App version:** 1.0.0

Simulators supported: Microsoft Flight Simulator 2020 / 2024, Lockheed Prepar3D, X-Plane 11 / 12

Audience: pilots and simmers who want the app working - no programming knowledge assumed.

A note about updates

SimFlyMinimums is continually evolving. As features are improved, some screens, labels and workflows may differ slightly from those described in this manual.

Use this guide as a reference alongside the version you have installed. If a difference leaves you unsure how to proceed, please contact support@simflyminimums.com.

About this manual

Chapter	What it answers
1. Quick Start Guide	What you need, how to install, how to get from a cold desktop to live telemetry on the map.
2. Dashboard & UI Overview	Every screen, every flight-data field (Altitude, IAS, VS, Heading...), and what the connection indicators really mean.
3. Core Features Guide	Feature-by-feature walkthrough: planning, charts, checklists, alerts, AI copilot, autopilot control, recording.
4. Troubleshooting Guide	Connection drops, frozen or mismatched data, setup failures - with the exact log lines to look for.
Appendices A / B	Connection settings and a quick reference checklist.

SimFlyMinimums is a **cockpit companion**, not a replacement for your simulator. It reads live telemetry from your simulator, draws a moving map with real procedures and charts, drives phase-aware checklists, warns you with custom rules, and can talk back to the simulator (autopilot, heading, takeoff assistance, replayed routes). Everything runs on **your own machine** - the "app" is a local web page served by a small local server, so you can also open it from a tablet or a second PC across the room. ---

How the application fits together

Three parts work together on your computer:

1. **The launcher** starts the application and opens your browser.
2. **The local server** connects to the simulator and supplies live flight data. Keep it running while using the application.
3. **The browser** displays the controls and Moving Map. You can also open the interface on another device on your local network.

There are two separate connections. A page that opens successfully confirms that the browser can reach the server; it does not necessarily mean the simulator is connected. Use the Moving Map **Start / Stop / Restart** button and the changing flight values to check the simulator connection. See sections 1.5 and 2.5 for details.

1. Quick Start Guide

1.1 System requirements

Category	Requirement	Notes
Operating system	Windows 10 / 11, 64-bit	The server targets net10.0-windows, so the server must run on Windows. The browser (client) can be any device.
CPU / RAM	4-core, 16 GB RAM recommended	Simulator + server + browser at once. The server is light; the simulator is not.
.NET runtime	.NET 10 Desktop Runtime (only for an unpacked / dev build)	The installed app is self-contained (win-x64), so in the normal case nothing else must be installed.
Disk	~2 GB program + ~140 MB navdata pack (CIFP-2038.db)	The navdata pack (airports, nav aids, runways) ships separately and is required for map and procedures.
Data folder	Writable ?:\SFMPublished\SFMFiles\	Created by the installer with full permissions; holds navdata and the chart cache.
Browser	Current Edge or Chrome (Chromium)	Required: the map, the WASM runtime, the spoken voice and joystick reading (Gamepad API) all live in the browser.
Internet	Not needed for a few features	Online services need it: map tiles, chart sites, SimBrief, FR24/OpenSky, AI, weather.
Privileges	Administrator for installation only	The installer writes a machine-level key and creates ?:\SFMPublished\SFMFiles. Day-to-day use does not need admin.

Optional keys and accounts - the app works without them; each one unlocks one feature:

Key / setting	Where you set it	Unlocks
MapTiler key (recommended) or Azure Maps key	Setup → <i>Map Provider</i> → Get MapTiler Key / Save Keys	Base map imagery
AI Models keys → Environment variables	Windows environment variable (Setup shows the exact setx line)	AI chat, First Officer, chart OCR
AzureSpeech:Key + Region	appsettings.json on the server PC	ATC speech recognition
FR24_API_TOKEN	Windows environment variable	FlightRadar24 search
OPENSky_CLIENT_ID / OPENSky_CLIENT_SECRET	Environment variables (never in the browser)	OpenSky real-flight import
SimBrief:ApiKey / SimBrief:UserId	appsettings.json on the server PC	SimBrief generate / load

1.2 Installing the app

A note on paths: SimFlyMinimums doesn't force everything onto drive C:. Where it lives on your disk is set by a `config.xml` file in your Documents folder, which points the app at the drive of your choice. Throughout this manual, `?:\` stands for that drive — wherever you see it, read it as “the drive you configured.”

1. Download `SFMSetup-<version>.exe` and run it **as administrator**.
2. Accept the default folder `?:\Program Files\SimFlyMinimums`, and tick **Create a desktop shortcut** if you want one.
3. The installer then:
 - copies the self-contained app — server, launcher, and the browser client bundled inside the server;
 - creates `?:\SFMPublished\SFMMFiles\` and `?:\SFMPublished\SFMMFiles\Panels\` (cockpit panel pictures);
 - installs the encrypted European charts database `eaip.dat` and registers the machine key that unlocks it;
 - registers **Uninstall** in Windows settings.

Copy the navdata pack `CIFP-2038.db` into `?:\SFMPublished\SFMMFiles\` if it is not already there. Without it the airport, runway and procedure screens come up empty. Tick **Launch SimFlyMinimums now**, or double-click the desktop icon.

Panels folder: cockpit images are read from `?:\SFMPublished\SFMMFiles\Panels\<aircraft>\*.png`

(for example `Panels\FBWA320NX\`). Drop your own screenshots in there to feed the Panel Image Viewer.

1.3 First launch

`SimFlyMinimumsLauncher.exe` does four things so you never have to: it starts the server hidden, waits up to

60 seconds for the server to answer its health check, then opens your browser on the app. If a healthy server is already running it simply opens the browser; if a *stale* server from a previous crash is found, it is closed and restarted (only processes launched from its own folder are touched).

Success: a browser tab opens on the Setup page. The server keeps running in the background - closing the tab does **not** stop it, and reopening the browser is instant.

- **Failure:** a dialog says “*SimFlyMinimums could not start*” with the reason and the log file path. Logs are in `%LocalAppData%\SimFlyMinimums\logs\` (`launcher-YYYYMMDD.log`, plus `server-stdout-*` and `server-stderr-*`). See §4.2.

Check the server by hand: open `http://localhost:5266/health`. JSON containing “`status`”: “`ok`” (plus the version and uptime) means the engine is alive - this is the one address to trust when anything else disagrees.

Address to use: in the current configuration the server listens on

`http://localhost:5266` - plain HTTP, bound to all interfaces, so it is also your LAN address (`http://<server-ip>:5266`).

No HTTPS endpoint is listening by default. The launcher and some older shortcuts still mention port 7168, and the server configuration mentions 5261/7161; those are not what actually answers today (see §4.2, item **L-4**).

DevTools: press **F12** → **Console**. Almost every diagnostic quoted in this manual is a console line.

1.4 Simulator prerequisites

Microsoft Flight Simulator 2020 / 2024 and Prepar3D (SimConnect)

Start the simulator and **load an active flight** - aircraft on the ground, not sitting in the main menu. There is nothing to enable in MSFS: the SimConnect interface is built in, and the required `SimConnect.dll` ships next to the server executable.

The server must run on the same PC as the simulator for the normal (named-pipe) connection. If the simulator lives on another PC, use option **C** in §1.5. Prepar3D uses the same SimConnect path - choose **P3D** in Setup and the app behaves identically. If you fly through **FSUIPC** (or a legacy FSX-era setup), the server can reach an external *FSUIPC bridge* over HTTP instead - `FsuipcBridge:Url` in `appsettings.json` (default `http://192.168.1.103:5555`), used for things like live heading capture. Point it at the PC and port where your bridge listens.

X-Plane 11 / 12 (UDP datarefs)

In X-Plane open **Settings** → **Network**. Enable the data output ("Data Export / output datarefs to applications") and note the port - standard is **UDP 49000**. The app connects to host 192.168.1.103, **port 49000** by default (the developer's own lab address). If X-Plane runs elsewhere, re-point it - the Setup IP box is not wired to this in the current build - with one call to the server: `POST http://localhost:5266/api/XPlane/connect` with body `{"ip":"192.168.1.50","port":49000}` (optionally plus "dynamicVars"), or give your X-Plane PC that default address. `GET /api/XPlane/status` reports what the server currently thinks. Choose **xplane** in Setup → *Simulator* so the variable catalogue, unit conversions and on-screen labels come from the X-Plane side instead of the SimConnect side.

What Setup's simulator choice actually switches

Choose the simulator you are using in Setup, then press **Start**. The rest of the interface follows the same workflow across simulators. Some status labels and control features depend on the selected simulator.

1.5 Using the app across your local network (and firewall rules)

Option A - Everything on one PC (default, no network work at all)

Simulator, server and browser on the same machine. **No firewall rule is needed** - traffic stays on localhost. This is the recommended starting point; get it working here first.

Option B - Simulator + server on the "sim PC", browser elsewhere (tablet, second screen, cockpit PC)

Only the *interface* moves; the simulator link stays local on the sim PC.

On the sim PC, launch the app once so the server runs (`http://<simPC>:5266/health` should answer). Allow the app's port through **Windows Defender Firewall on the sim PC** (PowerShell *as administrator*):

```
netsh advfirewall firewall add rule name="SimFlyMinimums (TCP 5266)" dir=in action=allow protocol=TCP localport=5266
```

Graphically: *Windows Security* → *Firewall & protection* → *Allow an app through firewall* → allow

SimFlyMinimumsBlazorServer on **Private** networks. Clicking

Allow on the first-launch firewall prompt does the same thing. From the other device open

`http://<sim-PC-name-or-IP>:5266` (for example `http://192.168.1.50:5266`). Use the **HTTP** address - this is the endpoint the server actually listens on, and there is no login. The real-time stream address is derived from the URL you typed, so the app finds its own server automatically - nothing else to configure. In the app set Setup → *Computer location* to **Remote** (§2.2). Keep the browser tab **visible and focused**. The app is tuned to survive a backgrounded tab (§4.3, **C-6**), but a dedicated tab behaves best.

Never expose port 5266 to the internet. The local server has no login - allow it on *Private* networks

only, and never forward this port on your router.

Option C - Simulator on a different PC than the server

X-Plane: works out of the box, because its transport *is* the network. Set the X-Plane PC's address as the connect target (§1.4) and allow **UDP 49000 inbound on the X-Plane PC**:

```
netsh advfirewall firewall add rule name="X-Plane datarefs (UDP 49000)" dir=in action=allow protocol=UDP localport=49000
```

MSFS / Prepar3D (remote SimConnect): SimConnect must be configured for TCP on **both** machines. On the **simulator** PC enable network SimConnect in the simulator's own `SimConnect.xml` (Protocol=IPv4, Address=0.0.0.0, Port=500) and open the port: `netsh advfirewall firewall add rule name="SimConnect TCP 500" dir=in action=allow protocol=TCP localport=500` On the **server** PC edit the shipped `SimConnect.cfg` (next to the server executable) so the client profile points at the sim: `[simConnect] Protocol=Ipv4 Address=192.168.1.103 Port=500 MaxRecieveSize=4096`. Restart the simulator **and** the server after editing either file.

FSUIPC bridge / Aircraft LVar service: set `FsuipcBridge:Url (...:5555)` and `AAO:BaseUrl (...:43380)` in `appsettings.json`, and allow those ports inbound on the machine that hosts them.

The WPF companion "bridge" (streams airport taxiway geometry to the map) joins the same server as an extra real-time client - no firewall rule beyond option B.

1.6 Step-by-step: cold desktop to flying in 12 steps

#	Do this	You should see
1	Start the simulator and load a flight on the ramp.	Aircraft visible, controls responsive.
2	Double-click the SimFlyMinimums desktop icon.	Browser opens on Setup within a few seconds.
3	Setup → Simulator : pick MSFS2020 / MSFS2024 / MSFS / xplane / P3D.	The variable catalogue reloads for that simulator.
4	Setup → Computer location : Local (or Remote if this browser is on another device).	<i>Remote</i> hides joystick-driven live recording.
5	Setup → Departure / Arrival ICAO, aircraft , optional runway-length filter .	Runway combos fill; the datarefs grid becomes searchable.
6	Setup → Map Provider : <i>MapTiler (recommended)</i> → Get MapTiler Key (or paste one) → Save .	Skip if already set; without a key the map stays grey (§4.5, F-1).
7	Variables page → tick what you want on the map (up to 18) → optionally Save profile .	The chosen names appear as numbered slots on the Moving Map.
8	Moving Map → press Start in the top panel.	SnackBar "Connecting to simulator...", then values move and the aircraft appears.
9	Sanity-check the data: Altitude , IAS (kts) , Heading , Gr.Speed , VS(fpm) .	If they do not move, stop and go to §4.3.
10	Left panel → minimum runway length, TAWS , chart type.	Terrain profile graph is drawn.
11	Bottom panel → Checklist combo → run BEFORE TAKEOFF , confirming items.	Phase chip advances and the next phase's checklist is offered.
12	Fly. Double-click a variable to build an alert rule; press F12 → Console if anything looks wrong.	Rules colour fields, pop snackbars, or speak.

Press Ctrl+F5 (hard refresh) after any update or rebuild. The browser caches the app aggressively, and a half-updated page is the single most common cause of "the developer says it is fixed but I still see the old behaviour" (§4.2, **L-6**).

1.7 Trial, licence and tiers in 30 seconds

Open **Upgrade**: start the **14-day free trial** (no card), or enter a

license key you bought. Your tier shows as a chip on the Setup page (*Free / Trial / Premium*) and decides what is unlocked. Premium is **€5/month** or **€49/year**.

Free deliberately shows most controls dimmed with a lock icon instead of hiding them - click one and a snackbar offers *Upgrade*. Whole premium pages (**Flight Reports**,

Rules Engine) show a **Premium wall**.

Trial unlocks everything but caps the heavy features (e.g. 5 chat questions, 3 flights of reports, 5 SimBrief loads).

Premium removes the caps. Chapter 3 marks each feature **Free / Trial / Premium**. The licence is cached on your machine and verified against a signed token, so a short internet outage does not lock you out mid-flight; hardware changes need a re-bind through support.

2. Dashboard & UI Overview

2.1 The tab workspace

SimFlyMinimums is a single browser page. A **tab bar** across the top switches tools **without losing the map underneath** - close a tab and the Moving Map state (markers, drawn procedures, phase, monitored values) is still there. This is deliberate: it reproduces a desktop cockpit, not a website.

Tab / address	Name	What lives there
/ or /setup	Setup	Flight & simulator configuration, datarefs catalogue, licence, AI provider. Default page.
/introduction	Introduction	First-run tour and connection guidance.
/moving-map (/movingmap)	Moving Map	Operational centre: live aircraft, four panels, charts, alerts, autopilot, ATC, replay.
/flight-plans	Flight Plans	Airport finder, route generation, SID/STAR/IAP drafting, SimBrief and traffic-track import.
/variables	Variables	Full simulator-variable catalogue and the ≤18 monitored-slot picker.
/faa-charts	FAA Charts	FAA procedure charts with PDF viewer and georeferencing.
/pro-charts	Pro Charts	2D/3D chart views - terrain profiles, elevation analysis.
/checklist	Checklists	Normal / non-normal lists per aircraft, panel-image crops, PDF attachments.
/rules-engine	Rules Engine	Custom alert rules (<i>Premium page</i>).
/flight-reports	Flight Reports	Recorded flights, telemetry charts, cockpit transcript, CSV export (<i>Premium page</i>).
/chat	Chat	AI assistant with live flight context (<i>capped on Free/Trial</i>).
/aao	AAO LVars / Aircraft Scripts Explorer	Browse and read Aircraft-style L : variables from the sim PC.
/mobiflight	MobiFlight	MobiFlight environment variables and the Input Events explorer.
/tools	Tools	Utilities: caches, weather/aircraft lookups, OpenSky and other helpers.
/workspace	Workspace	The multi-tab host that arranges the pages above.
/upgrade	Upgrade	Trial, licence-key activation, tier status.
/help	Help	The in-app feature guide (this manual's shorter sibling).
/controls	<i>Controls</i>	Reserved - currently a placeholder page.

Anything reachable from a tab is also reachable from the **left navigation panel** or the Moving Map panels, and both share the same state.

2.2 Setup page anatomy

Block	Field	What it does behind the scenes
Flight configuration	Departure / Arrival ICAO	Drives airport resolution, distance-to-destination, charts and recorder context. Free typed ICAO is accepted.
	Aircraft (category / model)	Selects the checklist set, panel images, and the aircraft profile the AI copilot reasons about.
	Cruise speed · flight mode · aircraft category	Feed route generation, descent planning and TAWS maths.
	Runway length + Greater/Less, Dep/Arr runway	The same minimum is reused by Moving Map's <i>Rect Airports</i> ; values accept RW10 or 10.
Simulator	Radio: MSFS2020 / MSFS2024 / MSFS / xplane / P3D	Chooses the data backend (SimConnect vs X-Plane UDP) and the variable catalogue. P3D is handled as SimConnect.
Computer location	Local / Remote	<i>Local</i> = this browser sits on the joystick/sim PC. <i>Remote</i> hides it - a browser can only see a joystick plugged into its own machine.
Charts	Country (eAIP) + WithCharts	Picks world AIP providers. Countries in bold teal have given authorization; the rest open the official site with step-by-step instructions.
Map provider	MapTiler (<i>recommended</i>) or Azure Maps + key fields	Which engine draws the moving map; the key is kept server-side.
AI provider	Provider · Env var · setx ... snippet	Where Chat / First Officer / chart OCR get their key.
Subscriptions & licences	Tier chip · License Key	Activate, view expiry, start trial.
Variables	DataRefs grid + Selected variables	Browse the catalogue (filtered by simulator), tick up to 19, save a named profile .

The datarefs catalogue holds **~4 600 rows for X-Plane** and is virtualised on purpose. If it feels slow the first time, that is one long fetch, not a hang - use the filter box instead of scrolling.

2.3 Moving Map anatomy

Area	Main contents
Top panel	Flight values, connection controls, charts and flight controls.
Centre map	Aircraft position, airports, route, procedures and chart overlays.
Left panel	Flight configuration and auxiliary calculations.
Right panel	Flight and navigation information.
Bottom panel	Variable monitoring, flight phases and checklist controls.

The **d-pad** (lower right) opens/closes the four panels: **top** = charts & flight controls, **bottom** = variable monitoring and phases, **left** = flight configuration, **right** = flight data.

Zoom: + / -, plus *Set / Get* to store a zoom level for the current airport and snap back to it.

Dep / Arr buttons (take-off / landing icons) recentre on the departure or arrival **active runway** at zoom 13.

Airports turns red when the airport layer is hidden; **Route Airports** turns blue when shown.

Map provider switches the rendering engine (**MapTiler** or **Azure Maps**); your choice is remembered locally.

Click a drawn procedure to isolate it and print its altitude restrictions. **Click an airport**, then its **red pin**, pick a runway: a runway rectangle and a **6 NM** marker appear (plus a floating **Cancel**). Clicking the 6 NM marker re-runs the approach-hazard calculation for the autopilot.

SkyVector opens the real-world sectional for the current view (with the optional browser extension pointing back at this server). Values you see in the panels are **read-only**: they are what the simulator says, not what you can type.

2.4 Flight data fields - what each one means

These are the numbers in the top panel (and the right panel). Tooltips on each box show the unit; the *source* column names the value the server publishes, useful when you ask about a field or write a rule.

Field on screen	Meaning	Source	Read it as
Latitude / Longitude	Aircraft position, decimal degrees (negative = S / W)	Latitude, Longitude	The map icon is the same number drawn on the map.
Altitude	Altitude in feet	Altitude	Barometric/indicated altitude as the simulator reports it - not terrain clearance.
Heading	Aircraft heading in degrees	Heading	Magnetic heading unless the sim gives true; used by tracking and CTL features.
Gr.Speed	Ground speed , knots	GroundSpeed	Wind moves this up or down while IAS stays constant.
IAS (kts)	Indicated airspeed , knots	IndicatedAirspeed	The airspeed the pilot flies. Rotation, stall and overspeed alerts use it.
VS(fpm)	Vertical speed , feet per minute (negative = descending)	VerticalSpeed / AbsVSfpm	Rules compare the signed value; AbsVSfpm is the magnitude only.
Nxt WP	The simulator's own next GPS waypoint ident	NextWaypoint	Empty means the sim has no active flight plan leg - check your FMS, not the app.
True Airspeed	True airspeed	TrueAirspeed	Provided in the data stream for cruise analysis.
Bank	Bank angle, degrees	BankDegrees	Drives turncoordination alerts and the automation's roll commands.
Wind Speed / Direction	Simulated wind aloft	WindSpeed, WindDirection	Explains GS-IAS differences.
Fuel (L/R/Ctr), Fuel flow	Tank quantities and flow	FuelLeftWing, FuelRightWing, FuelCenter, FuelFlow1/2	Consumed by reports and the copilot's fuel callouts.
N1 (avg / min / max), RPM	Engine percentages	N1_Percent, n1Avg, n1Min, n1Max, Rpm	N1_min/N1_max expose engine asymmetry.

Field on screen	Meaning	Source	Read it as
On ground / Parking brake / Gear / Flaps / Spoilers	System states (0 or 1, or index)	Onground, BrakeParking, GearCheckDn, FlapsHandleIdx, SpoilersArmed	Shown as words where a lookup table exists, otherwise as numbers (§4.4, D-5).
AP Master / Director mode	Autopilot and flight-director state	AutopilotMaster, DirectorMode	CTL/heading features refuse to run unless AP is engaged.
Localizer / Glideslope deviation	NAV1 needle offsets (dots)	AbsNav1HdefDot, AbsNav1VdefDot, GlideSlope	Also feed the ILS simulation and approach alerts.
Dist to Airport	Great-circle distance to the arrival ICAO, NM	DisToAirport (mirrored as DistancetoDestinationNM)	This - not the raw FMS DTC - is what the descent rules compare against.
Slots 1...18 (GetDynLabel)	Your own monitored variables	DynamicVariables[...] + DynamicVariableTexts[...]	Named exactly as you picked on the Variables page.
Timestamp	When this sample was produced	Timestamp	If it stops advancing, the data link is stale (§4.3).

2.5 Connection status indicators

The Start / Stop / Restart button (Moving Map top panel)

This single button **is** the simulator-connection indicator:

Button label	Colour	Meaning	Pressing it does
Start	Purple/primary	Not connected to the simulator	Opens the SimConnect or X-Plane session for the sim chosen in Setup, re-sends your monitored variables, then re-centres the map.
Stop	Purple/primary	Connected and data is flowing	Disconnects cleanly.
Restart	Red	Connected but stale - no data for ~8 s (20 s while takeoff automation is running)	Drops and re-opens the session; snackbar " <i>Restarting <SIM> connection...</i> ".

The button turns **red** the moment the watchdog decides data stopped arriving, even though the app still *thinks* it is connected. That red **Restart** is the honest indicator - trust it over the map.

What you see, in order, when things go well

Connecting to simulator... (blue snackbar) - request accepted. Aircraft title fetched and shown in status; map recentres on you. Fields start updating at **2 samples per second** (the server polls the simulator every 500 ms). If a link drops: Connection lost - restarting SimConnect... (amber) followed by SimConnect reconnected (green), Or Auto-restart failed - will retry in 15s (red).

Automatic recovery you should know about

- **Simulator link watchdog:** checked every 2 s; stale after 8 s without data; auto-restart attempted with a **15-second cooldown** so it cannot thrash. Auto-restart is deliberately **deferred while a takeoff automation is running**, so it never yanks the controls mid-roll.
- **Browser ↔ server link:** reconnects automatically after 0, 2, 5 and 10 seconds; keep-alive every 15 s with a 60 s timeout, tuned so switching browser tabs does **not** kill the session.

Simulator sessions survive a page reload: dropping the browser tab does not tear down SimConnect, because browsers legitimately reconnect with a new id. Press **Stop** (or restart the server) if you want a clean stop.

Frames with impossible values are discarded rather than displayed - a blank/last-value field while the sim is loading is normal, not a bug (§4.4, **D-2**).

Diagnostics if the indicators disagree

Symptom	Likely layer	First check
Page never loads / spins forever	Server not running	http://localhost:5266/health, then launcher log (§4.2).
Page loads, fields frozen, button red → Restart	Server ↔ simulator	Is the sim loaded in a flight? Press Restart . (§4.3, C- 1/C-2 .)
Fields frozen, button says Stop , no red	Browser ↔ server	F12 console: <i>hub not connected</i> . Reload the tab.
Fields move but the aircraft icon does not	Map rendering	Hard refresh Ctr1+F5; check the map key/provider (§4.5, F-1).
One field is stuck, others move	That variable only	Re-check it on the Variables page; a bad unit string or wrong dataref returns nothing (§4.4, D-4).

2.6 Colour coding, chips and pop-ups

Cue	Where	Meaning
Field background colour (e.g. amber #ffe5b4 → green #c8f5c8)	Top/right panel value boxes	A rule is evaluating that variable and its action is "change colour".
Snackbar (bottom-of-screen pop-up)	Anywhere	Rule alert, connection event, quota message, upgrade nudge.
Spoken text	Your browser voice	A rule action set to <i>speech</i> , a First Officer callout, or a missed-approach readback.
Phase chip	Bottom panel	Current flight phase (e.g. BEFORE TAKEOFF, DESCENT PREPARATION, FINAL APP). Checklists and copilot logic follow it.
Purple buttons	Moving Map	Automation is <i>armed/active</i> (radar, live record, Aircraft TO, First Officer).
Red buttons	Moving Map	Automation is running <i>hot</i> (live recording on, airports hidden, stale connection).
Lock icon + dimmed control	Everywhere	Premium feature you do not currently have. Clicking it offers <i>Upgrade</i> .
Bold teal country name	Setup → eAIP	Charts of countries with authorization awarded; ordinary text = manual site instructions only.

2.7 What the tier changes in the interface

Free - controls stay visible but locked (PremiumGate); whole pages (/flight-reports, /rules-engine) show a **Premium wall** with an *Upgrade* button.

Trial - everything opens, with per-feature daily caps; when a cap is reached you get a snackbar telling you so, and the feature behaves as Free until reset.

Premium - no locks, no caps. The developer-only **tier switcher** used for testing is **compiled out of the released build**, so you cannot unlock paid features by editing browser storage; the licence tier comes from a signed licence token.

3. Core Features Guide

Each section explains where to find a feature, how to use it, and any applicable limits.

3.1 Setup, variable monitoring and the data catalogue

Where: /setup · /variables · Moving Map bottom panel

Your Setup selections remain available when you switch tabs. After changing the airports, aircraft or monitored variables, press **Start** or **Restart** to apply the changes to the simulator connection.

The **DataRefs browser** lists every variable your chosen simulator can expose: MSFS/P3D show SimConnect names, X-Plane shows `sim/...` datarefs. Each row carries source, type, unit and description. Tick up to **19 variables** to monitor; they are registered with the simulator as a subscription and arrive in every telemetry frame. **Save/Load profiles** to switch sets between aircraft or phases.

Pause / Resume in the bottom panel freezes the displayed values so you can read a fast-changing number.

Sanity check: a value that never appears is almost always one of three things - the wrong simulator chosen in Setup, a variable that the sim rejects because its unit does not match, or **Start** pressed before the variables were selected (press **Restart** to re-send them).

3.2 The simulator data bridge (SimConnect / X-Plane UDP / FSUIPC)

Where: Moving Map **Start / Stop / Restart** · Setup simulator radio Live flight data is shared with every connected browser. Multiple browsers (tablet + cockpit PC) see the identical stream, because the simulator session is owned by the **server**, not the browser.

Reading is universal; writing is simulator-specific. Position, altitude, speeds, engines, systems and autopilot state work on all three sims. Control-writing features (heading, takeoff assistance, replay) use SimConnect events and RPN commands, so they are MSFS/P3D unless the aircraft has its own path (Aircraft, via MobiFlight/FCU logic).

X-Plane specifics: values arrive as numbers, and text-like simvars (gear, modes) are translated with a per-simulator lookup table. If a status field shows a bare number instead of a word, the table has no entry for that code - the numeric value is still correct (§4.4, **D-5**).

- **FSUIPC / legacy bridge:** selected cockpit values (for example the Aircraft heading) can be taken from an external FSUIPC bridge over HTTP instead of SimConnect (`FsuipcBridge:Url`). If the bridge is offline the rest of the app keeps running; only the features that depend on it go quiet.

3.3 Moving map, aircraft tracking and approach calculations

Where: /moving-map

Live tracking: the aircraft icon moves and rotates with each telemetry frame, auto-centring the first time data arrives and after any reconnect.

Airport layers: airports are drawn from the local navdata . Filtering by **minimum runway length** uses the same rule you set in Setup.

Runway approach flow - the classic "click, pick, calculate" sequence: Click the **airport icon** → a red pin is dropped (nothing else happens yet; no calculations run on click). Click the **red pin** → the **runway dialog** opens and accepts RW10 or 10.

OK → the app draws the runway rectangle, places a **6 NM** marker on the approach side, hides the airport icon, starts centreline tracking, and shows a floating

Cancel. Click the **6 NM marker** later → recalculates the suggested heading straight away (no dialog) - handy for dialling the approach heading into the autopilot.

Cancel restores the airport icon and clears every marker and rectangle.

Weather radar: RainViewer precipitation overlay with an opacity slider and the frame's local timestamp, so you can tell how old the picture is.

Terrain awareness (TAWS) and **Pro Charts** plot the elevation profile along your route with the obstacle heights that matter; **Pro Charts** adds 2D/3D rendering .

- **Emergency glide circle:** set a glide angle and the app draws the range you can make from your current position, with the airports inside it - an engine-out planning aid.
- **Taxiway geometry** at big airports can be streamed from the companion WPF bridge on the sim PC instead of being looked up locally.

3.4 Flight planning, routes and procedures

Where: /flight-plans

Airport finder - a virtualised table of 1000+ airports: ICAO, name, elevation, coordinates, runway count and lengths in feet *and* metres.

Route generation

IFR (A*) (*Premium*) - automatic lowest-cost pathfinding between your airports; editable before you send it to the sim.

VFR (*Premium*) - manual VFR plan construction.

Image overflow (*Premium*) - trace a plan from an uploaded image of a printed flight plan.

Recommended IFR sequence - a dialog listing, in order, the calls you should actually make (ALL in Dep runways → Approach) for the plan you built.

Procedures (SID / STAR / IAP) are drawn as coloured polylines with labels:

SID pink, **STAR** yellow, **IAP** green halos before you click; after isolating one, its altitude restrictions appear (STAR navy on light blue, approach black on orange). Choosing a **runway** redraws only the procedures valid for that runway; choosing ALL clears and redraws everything. Transitions, waypoint badges and "via" nav aids follow the same filter. STARS that legitimately stop short of the runway ("expect vectors") are drawn **dashed**, never silently extended. On first load with remembered airports, the runway lists and procedure combos fill in **without** drawing lines - the polylines appear when you actually change the runway. That is intentional, not a freeze.

Navaid management - add a navaid or fix by name, reorder the list, then **activate** the plan to send the route into your simulator's FMS.

Limits: selecting nav aids inside a rectangle is capped - above

800 fixes the app refuses and asks for a smaller box rather than quietly showing part of the list.

3.5 SimBrief integration (*Premium*)

Where: Flight Plans → **SimBrief** *Generate / Load*

Put your SimBrief **API key** and **user ID** in the server's appsettings.json (create a key on your SimBrief account), then restart the server.

Generate builds an OFP at SimBrief from your Setup airports, chosen runways and aircraft/cruise profile and brings the plan back - route, waypoints, fuel and payloads.

Load imports an *existing* saved SimBrief flight by OFP number, so you can fly a plan built on the website. The imported route feeds the map, the procedure pickers, the recorder and the copilot's context.

If the buttons spin and nothing appears, a missing API key is the usual cause; the callback page also lives on

the vendor's site, so a blocked internet connection shows up here first.

3.6 Flying someone else's real flight: FR24 and OpenSky replay

Where: Flight Plans → **ASDB** (choose **FR24** or **OpenSky**) · Moving Map panel: FR24 API, FR24 REPLAY, OPEN CSV, SAVE CSV
OpenSky requires OPENSKY_CLIENT_ID and OPENSKY_CLIENT_SECRET to be configured.

Search. FR24 keeps a route + date search. OpenSky mirrors the classic arrival search: departure and destination come straight from **Setup** (both required, shown readonly); you pick a UTC window - at most two days wide, inside the last 30 days - and the app lists matching arrivals with callsign and first/last observation times.

Import one track (*Load Track*). The preview reports quality counts; gaps longer than **120 s** are flagged instead of invented, points without altitude are dropped, and impossible outliers are filtered. Nothing is downloaded in bulk.

Save / open CSV, so a track becomes a file you keep - with UTC timestamps and source metadata.

Replay with **ASDB REPLAY**: the aircraft is flown along the recorded path with speed/altitude guidance and turns - Playground

Honest limits. OpenSky altitude is **barometric** (feet, not terrain clearance); its speed is ****average**

ground speed **derived from position over time**, not IAS^{**}; and *true track* is not a magnetic heading. Sparse

coverage can miss turns and approach points, and the API has quotas. Treat a replay as a **training scenario**,

not a reconstruction. Trial usage is capped and, for FR24 *Replicate*, restricted to certain aircraft.

3.7 Charts: FAA, eAIP, georeferencing, and spoken missed approaches

Where: /faa-charts · /pro-charts · Moving Map top panel + righthand chart viewer · Setup → country (eAIP)

FAA charts: pick airport → runway → procedure type; the chart opens in the browser's native PDF viewer.

World (eAIP) charts: for the countries the app has display authorization, the PDF is fetched and shown **inside** the app. Remaining providers open the official site with step-by-step human instructions, and the **banner above the viewer always tells you which source you are looking at**. Treat anything the app cannot render as a reference, not as an official document.

FAA Chart georeferencing (*Premium*): an approach chart is stretched onto real-world coordinates so your aircraft flies **on the chart**. **Spoken missed approach / Go Around** (*Premium*): press **Go Around** (or actually fly one) and the app extracts the missed-approach text from the chart with AI OCR, **reads it out** and shows the steps. Selecting a chart quietly **pre-warms the cache**, so the first go-around on a chart you already opened replies almost instantly.

Restrictions helpers: the procedure restrictions dialog summarises speed/altitude constraints, and a chart restrictions panel warns you when a chart cannot be automated.

3.8 Checklists and flight phases

Where: /checklist · Moving Map bottom panel (checklist combo, phase chip, **Suppress Phase Callouts**)

Checklists are grouped per aircraft and by **group / description** (e.g. BEFORE TAKEOFF, AFTER TAKEOFF, DESCENT PREPARATION, APPROACH, LANDING, GO AROUND). Confirming items advances you; the **phase chip** shows where you are.

Phase-aware behaviour - what to expect, so a non-bug is not mistaken for one: Start mid-flight inside a phase (parked on the runway with BEFORE TAKEOFF already true) and the app **catches up**, offering the matching checklist. Confirming a checklist **advances the phase**, after which the app stays quiet. The **next** checklist opens only when *that* phase's own conditions become true. It never cascades several checklists at once and never jumps ahead.

Rules without a phase are alerts only. They may colour a field, pop a snackbar or speak, but they never open a checklist - that difference is one column in the rule (§3.9).

- **Panel images:** items can carry cockpit pictures. Crop a region, tag it, page through with Prev/Next, or open a full-screen overlay; PDF-linked items open in the inline viewer.

- **Checklist image search** (*Premium, aircraft-dependent*) finds the panel picture matching a tag and shows the AI's description of it.

Hardware input: a physical button or encoder can confirm items

- available only when Setup says **Local**, because a browser can only see a controller plugged into its own machine.

Silence when you need it: Suppress Phase Callouts mutes automatic announcements during critical phases.

3.9 Rules engine - your own cockpit alerts (*Premium page*)

Where: /rules-engine · Moving Map: **double-click any value field** to pre-fill a rule for it · RuleEditorDialog A rule is up to three comparisons, joined with AND/OR, plus actions:

Part	Your options	Notes
Conditions	> < = >= <= != against a number or another variable	Variable names are exactly what the panels show (ALTITUDE, IAS, VS, GROUNDSPED, DISTOAIRPORT, ...) plus your own monitored variables.
Logic	AND / OR	Combines up to three conditions.
Actions	Field background colour · snackbar pop-up · spoken text	Pick one or more.
Phase	(empty) = plain alert · a phase name = phase rule that opens that phase's checklist	Empty-phase rules must never open a checklist.
ConfirmSeconds	Debounce, in seconds	The condition must hold that long, so a single-sample blip cannot wake you.

Pre-installed rule sets ship for common aircraft (the A320 phase rules among them); you can add your own - three custom rules on trial, unlimited on Premium. **If a rule fires at the wrong moment, first compare the variable it uses with the variable actually displayed in the panel:** that mismatch is the classic cause (§4.4, **D-3**). Double-clicking a field, rather than typing a rule from memory, guarantees the names line up.

3.10 Autopilot control, CTL and takeoff assistance

Where: Moving Map top panel (**CTL, ILS, Go Around**), left panel (autopilot mode), bottom panel (**AIRCRAFT TO**, FR24 replay, Input Events, MobiFlight)

- **CTL heading** - "fly a initial approach to a selected runway it sets the autopilot heading for you. On a Aircraft A320 it takes the proper route: convert true → magnetic with the simulator's own variation, read the FCU heading, turn the encoder the short way round, wait for the display to settle, then pull - and it refuses to claim success while the managed/dashed heading flags are still lit. Timing: 100 ms control ticks, a dead encoder gives up after ~4 s, up to four extra pull attempts, a 90 s cap on the whole target. Anything that should abort - autopilot off, touchdown, disconnect, stale telemetry - cancels the pending command; CTL Stop calls the cancellation endpoint, and a new target keeps an outstanding encoder acknowledgement rather than double-turning. Requirements: **connected MobiFlight runtime with valid FCU outputs, live telemetry, aircraft airborne, and AP1 or AP2 engaged. The response distinguishes *requested* from *confirmed* - an accepted request is not** proof the aircraft turned; look for [CTL:HDG] FCU CONFIRMED (OR FAILED to confirm) in the server log.**

ILS simulation (*Premium*) generates localizer/glideslope guidance even where no real ILS exists, so you can practice a precision approach anywhere; needles and callouts behave as on a real one.

Go Around (*Premium*) - the OCR'd, spoken missed-approach procedure (§3.7).

AIRCRAFT TO - experimental automatic takeoff (Fun / FR24 section of the left panel). Arms only on the ground at ≤ 20 kt; holds the centreline with rudder below rotation, forces rudder to zero as you rotate, then ramps elevator;

neutralises everything while parking brake is set at ≤ 15 kt.

This is a hobby experiment, not an autopilot. Its console line is version-tagged (e.g. [AircraftT0 v10 arm-ground-line-align]) and the liftoff line reports IAS / GS / RWY / HDG / ERR / XT - if you do not see the current marker, the browser is running an old build (§4.2, **L-6**).

MobiFlight & Input Events: the MobiFlight page reads environment variables from a running MobiFlight profile; the **Input Events Explorer** (bottom panel) finds and fires MSFS input events by name or hash - the tool for custom-coded aircraft. Events are **enumerated automatically on connect**, which matters on MSFS 2024 where an event the session never enumerated can be accepted and silently ignored.

AAO / Aircraft LVar explorer (/aao) browses and reads L: variables straight from the Aircraft scripts web service on the sim PC (AAO:BaseUr1, default port **43380**).

3.11 The AI crew: First Officer, Chat, and ATC recognition

Where: Moving Map (First Officer toggle, ATC callsign box + capture,

Go Around), /chat

AI First Officer (*Premium*) listens to the live telemetry stream and **speaks** what a real copilot would: phase transitions, checklist reminders, and abnormal conditions. It is

phase-aware (the client tells the server the current phase, so "-2 000 fpm" is normal in descent and a warning on final) and **aircraft-aware** (it looks up your aircraft's numbers - MTOW, runway lengths, flap speeds, climb capability - from the aircraft table you fill in Setup, instead of guessing from the livery name). Hard safety checks stay deterministic: overspeed and stall thresholds, and a sink-rate guard scaled to your aircraft's climb capability near the ground. Mute it any time with the toggle or **Suppress Phase Callouts**.

Chat Assistant (*Premium*) answers with your **live flight in context** - ask "why are we high on this approach?" and it sees altitude, VS, position and phase. Organise prompts by category and mode (Auto / General / Data), click a prompt to send it, and add your own.

ATC speech recognition (*Premium*, **Windows only**): type your callsign, press capture, and the server listens to your **system audio loopback**, transcribes ATC, and highlights lines that contain **your** callsign. Transcripts are stored for the Flight Report's cockpit transcript. The feature needs an Azure Speech key (AzureSpeech:Key + Region) on the server; without it, the toggle simply reports failure (§4.5, **F-6**).

ATC readback turns what you heard into a suggested readback, and the missed-approach voice shares the same browser speech channel (voices and test hook: see §4.5, **F-8**).

3.12 Flight recording and reports

Where: /flight-reports (*Premium page*) · Moving Map **Live Record** · Setup demo-recorder controls

1 Hz telemetry recording: one row per second - position, altitude, IAS, ground speed, vertical speed, bank, heading, your monitored variables, **and the flight phase the app believed it was in at that instant** (so a report tells you *why* something happened, not only *what*).

- **Per-flight reports** render altitude / IAS / VS / bank charts, the aircraft profile line, the cockpit **transcript** with speaker labels (Captain / FO / TTS / ATC), and export to **CSV** for your own analysis.

Live Record (purple → **red while rolling**) captures the current segment with synchronised data; trial caps the number of recordings.

Trial retention: the last three flights. **Premium:** unlimited history. Free tier sees the **wall**, not the page - because the recorder itself is locked, so there would be nothing to list anyway.

3.13 Weather, terrain and other tools

Feature	Where	What you get
Weather card	Moving Map	METAR information at your airports: wind, visibility, temperature and QNH.
Weather radar <i>(Premium)</i>	Top panel toggle and opacity slider	Precipitation overlay with the frame's local time.
TAWS / terrain profile	Left panel: TAWS ; Pro Charts	Elevation along the route, minimum altitudes and obstacles.
Terrain projection <i>(Premium)</i>	Moving Map	Terrain along a selected segment.
Emergency glide circle	Top panel	A visual estimate of range and nearby airports based on the selected glide angle.
POI	Moving Map	Show or hide points of interest and add named VFR landmarks.
Airport info / runways	Airport selection and right panel	Runway ends, lengths, bearings, frequencies and taxiway geometry.
Help	Help page	A quick guide to the application's features.

4. Troubleshooting Guide

4.1 Sixty-second triage

Answer three questions in order. Every item number below belongs to one of them.

Question	Where to look	If NO → go to
1. Is the server running?	Open <code>http://localhost:5266/health</code> - expect <code>{"status": "ok", ...}</code>	\$4.2 (L-items)
2. Is the <i>*simulator*</i> connected?	Moving Map button: Stop = connected, Start = not connected, red Restart = connected but stale	\$4.3 (C-items)
3. Is the data <i>*right*</i> ?	Compare the top-panel fields with your cockpit instruments	\$4.4 (D-items)

Feature-specific problems (map, charts, AI, replay, licence) are \$4.5 (F-items); slowness is \$4.6.

Where the evidence lives

Log / tool	Location	What it shows
Browser console	F12 → Console on the app page	The single best diagnostic: [Toggle], [AutoRestart], [FirstOfficer], [AircraftTO ...], [LoadAirports], hub errors.
Launcher log	%LocalAppData%\SimFlyMinimums\logs\launcherYYYYMMDD.log	Whether the server started, health-check results, browser launch.
Server stdout / stderr	same folder, server-stdout-*.log / server-stderr-*.log	Crash reasons, Failed to connect to SimConnect (is MSFS running?), [CTL:HDG]
Snackbars in the app	Bottom of the screen	Connection events, rule alerts, upgrade prompts, quota notices.
Health endpoint	GET /health (version, start time, uptime)	Confirms which build is actually running.

4.2 Launcher and start-up failures

L-1 · "The SimFlyMinimums server did not become ready within 60 seconds." Read the dialog's log path, then the last lines of `launcherYYYYMMDD.log`. Common causes, in order of frequency: the server exe is missing from the install folder (incomplete install / antivirus quarantined it), the app folder is not writable, `?:\SFMPublished\SFMFFiles` is missing or blocked, or the process died instantly because a native dependency (`SimConnect.dll`, `GDAL`) could not load. Check the matching `server-stderr-*.log` - it almost always contains the real exception.

If the log shows the health check failing while the server process is clearly running, that is the port mismatch in L-4, not a crash - browse to `http://localhost:5266` and continue. Reinstalling **as administrator** fixes most remaining cases.

L-2 · "Cannot find SimFlyMinimumsBlazorServer.exe in ..." The install was interrupted or the folder was moved. Reinstall to the default path; do not copy files out of the install folder - the launcher looks for the server **next to itself**.

L-3 · Another program already uses the port / server starts then dies Only one server may own a simulator session. Close any second copy (dev instance from Visual Studio, an old publish folder, a service). The launcher already clears *its* own stale server processes before starting - but it will not touch a differently-installed copy. Then start **one** instance.

L-4 · The launcher's dialog says it never became ready, or it opens a URL that refuses to connect (localhost:7168)

This is an address mismatch inside the product, not a failure of yours: the launcher probes and opens port

7168, while the server actually listens on

http://localhost:5266 (the Kestrel endpoint in appsettings.json, which takes precedence over the URL set in the server configuration). Confirm the server is healthy at http://localhost:5266/health, then simply browse to

http://localhost:5266 - everything works from there. Closing the launcher's dialog is safe; the server keeps running.

Please still report it (with the launcher log), because the shortcut should land on the right page by itself.

L-5 · Browser shows a blank page, a spinner, or _framework/*.wasm 404s The client bundle is served by the server: reload with **Ctrl+F5**; if it persists the install is incomplete (Free vs Premium builds differ in which pages are compiled in) - reinstall the package that matches your tier.

L-6 · "The fix you sent is not working" / an old version is clearly running A half-cached page is the top cause of phantom bugs in this app. Do a

hard refresh (Ctrl+F5), and where a feature prints a version marker, verify it: [CTL Build] ... at startup, GET api/FlightControls/CtlVersion, [AircraftT0 v10 arm-ground-line-align], and /health's version field. If the marker is missing, the browser is still running the previous build and nothing you test counts.

L-7 · Setup, chart or variable screens are empty everywhere Usually the navdata pack: CIFP-2038.db must sit in ?:\SFMPublished\SFMPFiles\. The app *runs* without it, but airport/runway/procedure queries return nothing. (Same for eaip.dat and the eAIP key in §4.5, **F-2**.)

L-8 · A setting, key or feature is missing after you edited a file Environment variables (setx ...) and appsettings.json changes are read

at server start. Close the browser, end the server (or log out/in after a machine-level setx), and relaunch from the icon. A terminal that was already open does **not** inherit newly set variables - restart it too.

4.3 Connection problems (simulator link)

C-1 · Pressing Start gives "Failed to connect to simulator." Work down this list - it covers nearly every case: Is the simulator **loaded into an active flight** (not in menus, not loading scenery)? SimConnect refuses a sim that has not finished starting. Did you pick the **right simulator in Setup**? Choosing **xplane** while flying MSFS sends the request to the UDP path (and vice-versa), so the attempt fails even though the sim is fine. Is the app's server running on **the same PC as the simulator**? For MSFS/P3D the default SimConnect transport is local; see §1.5 option C for the networked setup. Does the server log show Failed to connect to SimConnect (is MSFS running?)? Then the native SimConnect.dll did not load - reinstall, and let your antivirus exclude the install folder. MSFS in **paused** state or with a modal dialog open can accept the connection but send nothing. Unpause first.

C-2 · Data froze mid-flight and the button went red (*Restart*) That is the watchdog doing its job: no data for ~8 s (20 s during takeoff automation). Press **Restart**; expect "Restarting <SIM> connection..." then "Connecting to simulator...". If the app was already trying to recover automatically you will have seen "Connection lost - restarting SimConnect...". Restarting is safe in flight: your monitored variables are re-sent automatically and the map re-centres on the first fresh sample.

C-3 · It reconnects, then goes stale again repeatedly The auto-restart has a **15-second cooldown** on purpose; a repeating cycle means the simulator itself stopped streaming. Look for: a scenery/aircraft reload, the sim being paused, an in-sim installer or add-on updating, or a MSFS update that replaced the SimConnect layer. Restart the **simulator** (not just the app) as the next step.

C-4 · Auto-restart never fires during my automated takeoff Intentional: while takeoff automation is active, recovery is **deferred** so the app cannot re-init the link while it is moving the controls. It resumes immediately after the automation disengages. Note that on liftoff the automation disengages and the general watchdog may then reconnect once - that is known behaviour, not a fault.

C-5 · X-Plane shows nothing at all X-Plane's **network data output is not enabled** (§1.4) - nothing else can be wrong.

Wrong host. The default target is 192.168.1.103:49000; if your X-Plane PC has a different address, use POST /api/XPlane/connect with your ip/port (§1.4).

Wrong port in X-Plane's own settings - match it, standard 49000.

Firewall blocking UDP 49000 inbound on the X-Plane PC (§1.5). 5. Setup still says **MSFS**, so the SimConnect path was opened instead. Set **xplane**, press **Stop** then **Start**.

6. Some X-Plane values arrive as enumeration codes. A bare number where you expect a word is a missing label entry, not missing data (§4.4, **D-5**).

C-6 · Everything stops when I minimise the game/window or switch tabs Browsers throttle background tabs aggressively. The real-time link is already tuned for it (keep-alive 15 s, 60 s timeout, reconnect at 0/2/5/10 s) and the simulator session survives a dropped browser on purpose - but a heavily throttled tab can still lag. Fix: keep the app in its **own window** (browser menu → *Move tab to new window*), don't minimise it, and disable aggressive tab-freezing extensions. On a second device, keep the screen awake.

C-7 · My tablet / second PC cannot reach the app at all Use `http://<server-ip>:5266` - the plain HTTP endpoint the server actually binds (not 7168, §1.3). `http://<server-ip>:5266/health` from that device: no answer = firewall or wrong IP, not an app problem. Confirm the firewall rule was created for the **Private** profile and that your network is actually classified as Private (a network silently reclassified as Public is a classic Windows surprise). Some routers block inter-device traffic ("AP isolation") - test with both devices on the same Wi-Fi band/SSID.

C-8 · The page loads but nothing moves, and the button still says Stop That is the *other* connection: browser ↔ server. Open F12 → Console and look for hub errors; reload the page. If several tabs of the app are open, close the extras - one tab is enough and multiple tabs multiply reconnect noise.

C-9 · After changing aircraft / reloading a flight, features misbehave (wrong aircraft name, CTL refuses, checklists for the wrong type) The simulator session and aircraft identity are captured at connect time. Press **Stop**, then **Start**. On MSFS 2024 this also re-enumerates the aircraft's input events, which is why an automation feature can silently do nothing after an aircraft swap.

C-10 · FSUIPC / Aircraft-bridge features are silent while the rest works The HTTP bridge is a separate process on a separate port. Check the URL in `appsettings.json` (`FsuipcBridgeUrl`, default `...:5555`; `AA0:BaseUrl`, default `...:43380`), that the bridge is actually running on that machine, and that its port is allowed through that machine's firewall. These features degrade quietly by design - the telemetry link does not depend on them.

4.4 Data mismatch and wrong values

D-1 · Fields blank for a few seconds right after connecting / loading a flight Normal. Frames containing impossible values (`0`, `NaN`, `empty`) are

discarded rather than shown, so a field keeps its last honest value until a valid sample arrives.

D-2 · A monitored field never fills in at all Not a stale link (other fields move), so it is the subscription: the variable's **unit** does not match what the simulator expects, or the variable does not exist on this sim. Re-pick it on the Variables page for the **currently selected simulator**, then press **Restart** so the list is re-sent.

D-3 · A rule / phase checklist fires too early or too late This has happened for real before, and the cause was always the same: the rule compared a **different variable** than the one you see in the panel. The displayed *Distance to airport* is `DisToAirport`, and the rule aliases were aligned to it (`DISTOAIRPORT`, `DISTTODESTNM`). Check in order: Which variable name does the rule actually use? Double-click the field in the panel and compare. Does the rule have a **Phase** set? An empty phase must only alert; if a rule with no phase opens checklists, or a phase rule refuses to, that is a genuine bug worth reporting. 3. Is the value even reachable - right simulator, right unit, and no debounce (`ConfirmSeconds`) hiding it?

4. Custom rules live in the local database (`FlightRule` table); historical rows can carry an old variable name, which is exactly why aliases exist. Editing and re-saving the rule refreshes it.

D-4 · Two fields disagree with each other (e.g. a panel value vs the reports page) Same underlying value, different rounding or timing - samples are 500 ms apart and a display may be one frame behind. Compare values captured in the same second; the recorder row timestamp is the reliable reference.

D-5 · A status field shows a number instead of a word (gear, autopilot modes, switch positions) The simulator returns an enumeration **code**; the app translates it with a per-simulator lookup table (`EnumsDataRefs`). A missing row means you see the raw code - the data is correct, only the label is absent. Report the variable name and the code and it can be added.

D-6 · *Dist to Airport* does not match my FMS DTC Expected. It is the **great-circle distance to the arrival airport reference point**, computed by the server: a straight line, not the remaining routed distance and not distance-to-threshold. Use it for "how far is the field", never for "how much track is left".

D-7 · The runway rectangle / approach markers are in the wrong place or facing the wrong way Runway geometry comes from more than one table (RW10-style rows feed the picker; plain 10/28 rows with lengths feed the drawing), and international airports are only complete in the second. The dialog accepts RW10, 10 or RXRX10. If the rectangle points the wrong way, confirm you chose the **same** runway end you are lined up on: the app derives the approach side as the reciprocal of the chosen runway and places the 6 NM marker **180°** from the take-off direction.

D-8 · CTL asked for a heading and the FCU shows something else The Aircraft path confirms success only when the FCU reads within **one degree** of the requested *magnetic* heading with both the dashed and managed flags off. True-vs-magnetic confusion is the usual user-side cause: the app converts the geometry's **true** bearing using the simulator's own variation, so comparing against a chart's magnetic track leaves exactly the variation difference you see - not an error. Search the server log for [CTL:HDG]: it prints Requested TRUE=... MAG=...; FCU=..., then FCU CONFIRMED OR FAILED to confirm.

D-9 · The aircraft icon lags behind the instruments Both come from the same 2 Hz stream, so lag is usually map rendering on a busy machine. Zoom in one step, hide the airport layer, or switch map provider in Setup. Lag on the *numbers* means a genuinely stale link - check the button colour (\$2.5).

D-10 · Replay or automation drifts off the centreline / rotates late Takeoff automation is explicitly experimental. Its debug line reports what it saw (liftoff IAS ... GS ... RWY ... HDG ... ERR ... XT ...m): ERR is heading error against the runway, XT the lateral offset. A large XT at liftoff means limited high-speed lateral control in the current version - do not use it on a short runway, and attach those numbers to any behaviour report.

4.5 Feature-specific problems

F-1 · Map is grey / tiles never load No valid map key. In Setup choose **MapTiler** → **Get MapTiler Key** (or paste one) → **Save**, or switch to

Azure Maps and save that key, then **restart the server** - keys are read at start-up. The provider choice is remembered per browser, so a second device needs its own setting and a reload.

F-2 · European (eAIP) charts empty or "not available" Three separate requirements: eaip.dat installed, the **machine-level** key EAIP_DB_KEY present, and the server restarted afterwards. For countries marked *pending*, the app deliberately shows the official site plus navigation instructions instead of a PDF - a licensing limitation, not a failed download.

F-3 · SimBrief Generate/Load does nothing SimBrief:ApiKey and SimBrief:UserId must be set in the server's appsettings.json, then the server restarted. The callback page lives on the vendor's site, so a blocked internet connection fails here too.

F-4 · OpenSky search returns nothing or an error "Configure OPENSKEY_CLIENT_ID and OPENSKEY_CLIENT_SECRET on the server" → credentials missing (they must never be put in the browser). An **arrivals 404** is shown as an **empty result**, not a crash - widen the UTC window (max two days, within the last 30).

HTTP 429 means quota: the app reports it and deliberately does

not hammer retries. Wait. Both Setup airports are required; changing Setup clears the previous list on purpose so you cannot import a track for the wrong route.

F-5 · FR24 search fails FR24_API_TOKEN must be set as an environment variable on the server machine (restart after setting). Free/Trial cap FR24 features and *Replicate* is restricted by aircraft type.

F-6 · ATC capture does not start AzureSpeech:Key and Region must be set in appsettings.json. The feature is **Windows-only** (it uses system-audio loopback) and must listen on the device that actually plays the simulator sound. With no key, the start call simply returns *false*.

F-7 · Nothing is spoken anywhere (rules, First Officer, missed approach) Voices come from the **browser**, not the app. Check the tab is not muted and that Windows has a voice installed for the language. For debugging, run ttsTest() in the F12 console - it lists every available voice and speaks a sample.

F-8 · Missed-approach text missing or slow The text is read from the

chart currently selected in the app; selecting it also pre-warms the cache, so the first go-around on a fresh chart needs an AI call (and an OPENAI_API_KEY / GEMINI_API_KEY), while repeats are served from ChartCache.db in milliseconds.

F-9 · CTL refuses to move the FCU It requires *all* of: MobiFlight runtime connected, valid FCU outputs, recent telemetry, **airborne**, AP1 or AP2 engaged. Lost telemetry or a disengaged autopilot cancels any pending command. Read the immediate rejection message first, then [CTL:HDG] in the server log.

F-10 · Flight Reports is empty The recorder is Premium/Trial-gated; on Free it never runs, so an empty list is correct. On Trial only the **last three flights** are retained.

F-11 · Licence or trial surprises *Paid but still locked* → reload the page so the client re-reads the signed token. *One feature says "limit reached" but others work* → normal: trial caps are **per feature**. *Offline too long* → reconnect once and relaunch; grace is limited. *Changed hardware* → a re-bind must be requested through support. *Tier switcher missing* → it is compiled out of released builds on purpose.

F-12 · "...max 800 - draw a smaller rectangle" Not an error: a navaid selection that large would silently truncate, so the app refuses and asks for a smaller box.

F-13 · A control does nothing in MSFS 2024 but worked in 2020 MSFS 2024 can accept an input event the session never enumerated and silently ignore it. The app enumerates events on connect, but after an **aircraft change** press **Stop** → **Start** (or use *Enumerate Input Events* on the MobiFlight page) before calling it broken.

4.6 Performance and stability

Symptom	Why	What to do
Variables catalogue slow to open	~4 600 rows for X-Plane is one long fetch	Use the filter box; the wait happens once per page load.
Map heavy near a big airport	Airports + procedures + radar layers at once	Hide the airport layer, switch radar off, or raise the minimum runway length.
First chart of an airport is slow	The PDF is fetched/automated on demand	Select the chart early - selection also pre-warms OCR.
Brief stutter right after Start	Startup work: enumerate input events, load rules, load checklists	Normal, about a second.
Two machines both show data	Working as designed - the server owns the simulator session	Keep one browser tab per device to reduce reconnect noise.
Recording seems coarser than the display	The recorder samples at 1 Hz ; telemetry is 2 Hz	Expected - reports are second-resolution.

4.7 Quick FAQ

Do I need internet? Only for map tiles, online charts, SimBrief, FR24/OpenSky, AI and weather. Telemetry, checklists, rules and recording all work offline (map imagery still needs its key and tiles).

Can I run the app on a tablet and fly from the PC? Yes - §1.5 option B. The simulator session stays on the PC; the tablet is only a window onto it.

Must the browser stay open? Keep it **open**, not necessarily focused. Closing it removes the interface but does not tear down the simulator link - press **Stop** if you want a real disconnect.

Why does the runway rectangle look enormous? Deliberate: a real runway is ~45 m wide, so it is drawn about **300 m** wide to stay visible at normal airport zoom.

Can I add my own panel images? Yes - drop PNGs in ?:\SFMPublished\SFMPFiles\Panels\<aircraft>\.

Why does a rule work in MSFS but not in X-Plane? Variable names and units differ per simulator. Recreate the rule by double-clicking the field **while connected to that simulator**.

Does the app modify my simulator files? No. It reads telemetry and sends only the control commands you trigger (heading, CTL, replay, takeoff assistance).

Is this a legal navigation source? No. It is a training and situational-awareness companion - always fly the current official charts and your simulator's own avionics.

What is "Local" vs "Remote" really about? Where the **browser** sits, not where the simulator sits. It gates features that need hardware attached to that browser (joystick-based live recording). Choosing **Local** on a tablet offers controls that cannot see your hardware; choosing **Remote** on the sim PC hides them.

4.8 Reporting a problem (what makes a fix fast)

What you did, what happened, and whether it ever worked.

Which connection you think failed: does the page load? does the button say **Start**, **Stop**, or red **Restart**? (§4.1)

The browser console around the failure (F12 → copy, or *Save as HTML*).

The logs: launcher-YYYYMMDD.log plus the newest server-stdout- * / server-stderr-* from
%LocalAppData%\SimFlyMinimums\logs\.

Your environment: simulator + exact aircraft/livery name, the version from /health or the *Upgrade* page, your tier, single-PC or two-PC layout, and any **version marker** the feature prints ([CTL Build] ..., [AircraftTO ...]).

For data issues: the variable name, the value shown by the app, the value shown by your instrument, and the timestamp.

Appendix A - ports, paths and endpoints

Item	Value
App URL (this build)	http://<host>:5266 - HTTP, bound to all interfaces, so also your LAN address
Health check	GET /health → status, version, start time, uptime
X-Plane target (default)	192.168.1.103:49000 UDP - change with POST /api/XPlane/connect
FSUIPC bridge (default)	http://192.168.1.103:5555 (FsuipcBridge:Url)
Aircraft / AAO service (default)	http://192.168.1.103:43380 (AAO:BaseUrl)
Remote SimConnect (PC↔PC)	TCP 500 - configured in the sim's SimConnect.xml + the app's SimConnect.cfg
Program folder	?:\Program Files\SimFlyMinimums\
Data folder	?:\SFMPublished\SFMFiles\ - CIFP-2038.db, eaip.dat, eaip_cache.db, ChartCache.db, Panels\
Logs	%LocalAppData%\SimFlyMinimums\logs\
Other ports you may see mentioned	5261/7161 (set in the server configuration, superseded by appsettings.json) and 7168 (launcher + SkyVector extension default) - see §4.2 L-4

Appendix B - cheat sheet

Two connections. A live page does not mean a live simulator - trust the Start / Stop / **red Restart** button.

Simulator first, then Start. Monitored variables are sent at connect time; press **Restart** after changing them.

Ctrl+F5 before you report anything as "still broken".

Double-click a value to build a rule on exactly that variable - it prevents the most common class of bug.

Empty Phase = **alert only**. A filled Phase is what opens a checklist.

Local vs Remote describes where the *browser* is, not where the simulator is. Key and appsettings.json changes need a **server restart**; so does a new setx variable. `http://<host>:5266/health` plus the F12 console answers most questions in under a minute.

SimFlyMinimums - Flight Simulation Companion. Not for real-world navigation: always verify against current official publications and your simulator's own avionics.