

SkyHeading

Aviation Intelligence

USER'S GUIDE

ANDROID

IMPORTANT: PLEASE READ

SkyHeading is decision support. It is not certified avionics, it is not approved for navigation, and it does not replace your training, your aircraft's Pilot's Operating Handbook, air traffic control or your own judgment.

Fly the airplane first. Use SkyHeading only when you have the time and the hands to spare, and never let it draw your eyes inside when they belong outside.

SkyHeading is not a substitute for 911, an ELT or a personal locator beacon.

This guide describes SkyHeading for Android as it stands in November 2026. Screens, names and features may change as the app grows.

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SKYHEADING: A COPILOT FROM PARKING TO PARKING

Aviation Intelligence for Android

Every flight has its busy minutes. The clearance comes faster than you can write it down, ground sends you across an airport you have never seen, and somewhere past the last fix approach turns you off the arrival and down to an altitude you were not expecting. Good pilots stay ahead of the airplane by knowing what comes next.

SkyHeading was built to keep you there. On the **Plan** tab you describe the whole flight once, from parking to parking: the taxi route with its hold-short lines, the departure, the airways, the arrival and the approach, and the taxi in to your parking spot. Each piece starts where the last one ended, and each is checked against your own aircraft's numbers: its climb, its runway needs, its ceiling, whether it carries GPS.

Then tap **Fly**. One screen guides the flight from start to finish. A three-dimensional view of the world ahead, the Highway In The Sky, draws a yellow road along the taxiways and a path of magenta hoops in the air. Keep the airplane inside the hoops and you are on the plan. Beside it, the Map and the Profile show the whole flight, and a strip across the top briefs the phase you are in, with the radio calls you can expect. Each phase hands over to the next without a tap.

Controllers change plans, and SkyHeading changes with them. The **AMEND** keyboard copies a clearance as it is spoken — headings, altitudes, crossings, speeds, direct-to, reroutes, holds, approaches, pattern, Class B / SVFR, release and divert — and lets you chain several instructions into one readback. Tap **ENTER** and the route is rebuilt from where you are; **REVERT** counts down if you need to take it back. **Practice ATC** turns the same keyboard into a timed game on the Fly page.

And if the engine ever quits, the **Emerg** tab is one tap away. SkyHeading carries thousands of places to put an airplane down, airports and hand-checked fields, pastures and roads, works out which of them you can still reach in today's wind with your aircraft's own glide, and flies the same hoops to the one you choose. That chapter comes near the end of this guide. Read it before you need it.

Through all of it, SkyHeading's job is to be the copilot who has already done the arithmetic. Yours is still to fly the airplane. This guide shows you how the two of you work together.



AVIATE. NAVIGATE. COMMUNICATE.

FEATURES



- One flight plan from parking to parking, IFR or VFR, built from pills on a single page.
- Taxi, route and amendment keyboards in the colors of airport signs.
- SIDs, ODPs, airways, STARs, approaches, vectors to final and VFR pattern entries.
- Every piece checked against your aircraft: climb gradients, runway lengths, ceiling and GPS.
- The Fly page: HITS, Map and Profile together, from the taxi out to the taxi in, with radio calls and a brief for every phase.
- Preview flies the whole plan before you leave the ground, at one to eight times real speed, with the climb, cruise and approach speeds of your aircraft.
- The Wx tab: the departure, enroute and destination weather, with a Wind keyboard. It fills itself from the FAA's D-ATIS, your ADS-B receiver or the internet METAR, or takes the ATIS you copy. Density altitude, true airspeed and the altimeter setting feed the takeoff, the climb and the tapes.
- An airport page for every airport in the plan: Info, Wx, Runways, Freqs, NOTAMs, FBO and a Map that pans and zooms, with your taxi route in yellow, the traffic there and your own aircraft.
- D-ATIS read out in plain English: the runways in use, the weather, the notes and what to tell ATC. METARs and TAFs with the flight rules in color, a wind diagram, and each forecast period on its own card.
- NOTAMs in plain English, each counted at your planned time: closed taxiways crossed out on every taxi map and greyed on the keyboard, NOTAM obstacles, approach notes, and warnings for the plan's runways, route navaids and GPS outages.
- Taxi in to a gate by number: gates by concourse on the CLEARED TO keyboard, gate signs, labeled FBOs and map pins on every taxi map.
- Practice flight plan filing (Beta): the ICAO form from your plan, checked, and filed, amended, opened and closed against a practice Flight Service.
- The AMEND keyboard for ATC changes: headings and vectors, weather deviations, altitudes, crossings, speeds, direct-to, reroutes, holds, approaches, pattern, Class B / SVFR, release / void / EDCT, divert, frequency, squawk and altimeter — chained in one readback.
- Read back, REVERT countdown, revision history and lost-comms (91.185) guidance; UNABLE when your airplane cannot fly an item.
- Practice ATC: Always-on or Round game scoring on the Fly page, with Virtual Pilot while you type.
- ATC speeds on the HITS speed tape, with the 91.117 limits and the published speeds.
- The Hold Advisor: every hold drawn like an approach plate, track up or north up, with the entry, the wind-corrected headings and the outbound time.
- A heading-up moving map inside the HITS compass rose, with terrain colored against your altitude, airspace, TFRs and obstacles, or the IFR LOW / HIGH chart on an IFR flight.
- TFRs, restricted and prohibited areas drawn as red volumes in the 3D view, and special-use airspace the FAA reports active as hatched magenta volumes; the center boundaries on the Fly Map and the center you are in, with its frequency, on the Fly strip.
- ADS-B traffic on the Map, the airport plan, the Profile, the compass map, the HSI and in HITS, drawn as the aircraft themselves, each in its own shape, with spoken traffic alerts; tap one for its card. Internet traffic where no receiver feeds any.
- The 3D Radar: the airspace round you as a cylinder you can turn and zoom, the terrain or a chart its floor, Class B, C and D, TFRs, MOAs and restricted areas as volumes, your route in magenta, and each aircraft as its own model in green, yellow or red, with its trail and where it is heading.

- An HSI on the Fly page from your GPS course: the course and deviation, TO / FROM, the glidepath or planned descent, ATC's and your own heading bugs, two bearing pointers, the wind, and a moving map inside the rose.
- Spoken alerts in any English voice on your tablet or one of the Additional Downloadable Voices, a voice for each phase of flight if you like, said as on the radio (Alpha, niner, airports and navaids by name): landing callouts, minimums, terrain, runway remaining, hold for departure, runway incursions, taxi hot spots, approaching and crossing fixes, airspace, oxygen and radio calls.
- Downloads (the download icon) for the FAA's 28-day data and each state's maps, landing sites and photos.
- The NLog: a navigation log of every leg with its wind, heading, time and fuel, the fuel against the reserves, live in flight with the actual times and fuel, re-planned after every amendment; share it as a PDF.
- The Fly page your way: pick the views and their layout for phone, tablet and large tablet (up to four on a tablet), a VFR, IFR low or IFR high Map, the 3D Radar, the HSI or the Wx map, and expand any view to fill the screen.
- Every Wx map page as a Fly Map layer with its own opacity, and a tap on the Map for the weather there. Zoom the Wx map in and your flight's own chart comes in under the weather, with your route on it.
- Internet weather in flight over cellular or Starlink, with the NET pill on the Fly strip.
- Thousands of emergency landing sites ranked live: airports, plus off-airport fields, pastures and roads that were checked and reviewed by hand.
- Reachability from where you are, in the wind, with your aircraft's glide numbers, and a planned path to the threshold, not just a straight line.
- One-tap **Activate Glide**: magenta hoops all the way to the site, and a glide brief with the frequency to call, 7700, the glide time left and the site's address.
- Recovery: short of the plan, SkyHeading looks for a shorter path or another site; far too high, a new plan to the same runway.
- Learns your real glide from an ADS-B receiver's airspeed, and plans with it.
- Flap and forward-slip signs on the path, and a red flap-overspeed warning, on final.
- Typical engine-failure and forced-landing checklists for your aircraft family, which you can edit.
- Full telemetry of every flight leg and every emergency, kept on your device.
- Open GDL-90 ADS-B receivers over Wi-Fi for position, traffic, wind and TFRs.
- Works offline from the data on your device, on the tablet or an SD card; runs full screen or in split screen beside your EFB.
- Practice at home with X-Plane, Microsoft Flight Simulator or FSX.
- And much more…



FLY THE AIRPLANE FIRST.

QUICK-START GUIDE





CHANCES ARE, IF YOU ARE READING this guide, you already have SkyHeading on your Android tablet or phone. In the interest of getting you flying, here is what the app needs, how to set it up for your aircraft, and a first flight you can make without leaving the ground.

WHAT YOU NEED

- An **Android tablet** or phone with Android 12 or later. A tablet is best: SkyHeading runs full screen or in split screen beside another app such as your EFB.
- A **position source**: the device's own GPS, or better, an **open GDL-90 ADS-B receiver** over Wi-Fi. A receiver adds wind and TFRs, one with an AHRS adds the aircraft's attitude, and one that sends airspeed lets SkyHeading measure your real glide.
- The **data** for the states you fly in, from **Downloads** (the download icon at the top right): the FAA's national data and a pack for each state. Coverage is the United States, New England first, with more states to follow.

NOTE: SkyHeading works offline from the packs on the device. Only Downloads needs the internet.

FIVE MINUTES OF SETUP

- In **Downloads** (the download icon at the top right), download the FAA data and the states you fly in.
- Tap the **gear** at the top right to open Settings.
- Under **Aircraft**, choose your type and check Best glide, Stall Vso, Weight and Glide ratio against your POH.
- Turn on your **ADS-B receiver** if you have one.
- Under **Landing areas**, check the shortest field you will accept and your landing order.
- Read your **emergency checklists** and make them match your POH.

QUICK-START GUIDE

SETTING UP FOR YOUR AIRCRAFT

Every climb, glide and runway check SkyHeading makes is only as good as the numbers behind it, so start with your aircraft. Tap the gear, then choose your type under **Aircraft**. The figures that come with each type are typical published values for the class, not your POH, and they are for maximum gross weight.

Enter your **Weight** and SkyHeading slows best glide and the stall speeds to suit: about 5% for each 10% under gross, or the POH's glide speeds by weight where the type has them. **Numbers for this type** opens the full set (engine-out, powered and fuel). Anything you change shows in amber with the catalog's figure beside it, and is kept for every aircraft of that make and model.

LANDING AREAS

Min field length starts at your type's own figure: one and a half ground rolls, about 43% of its short-field landing distance over a 50 ft obstacle. Fields and runways shorter than this are not offered. You can lower it, but that is at your own risk, and SkyHeading shows the type's figure in amber beside yours to remind you. **Min width** does the same for off-airport strips.

Landing order sets the kinds of site you prefer, in order. Most aircraft start with Airports, Fields, Roads, Water. Turboprops put roads before fields for their length and pavement, and seaplanes put water first.

YOUR FIRST FLIGHT

The quickest way to meet SkyHeading is to plan a flight you know and watch it flown, without leaving the ground.

- On the **Plan** tab, tap **Create**.
- Choose your aircraft, IFR or VFR, and the departure and destination airports.
- On the **Wx** tab, copy the ATIS for each airport: the wind, the altimeter, the temperature and dewpoint.
- Tap the **Departure**, **Route** and **Arrival** pills in turn. Each opens its own screen (VFR Arrival opens the Pattern map and keyboard); **Plan** brings you back with your choice.
- Tap **Fly**, then **Preview**: SkyHeading flies the whole plan quickly, from the taxi out to your parking.
- With a flight simulator connected (see *Receivers and Simulators*), fly it yourself, and try the **AMEND** keyboard on the way.

YOUR FIRST EMERGENCY TEST

Then meet the Emergency screen the same way: at home, where the Virtual Pilot flies the glide for you, or with a flight simulator, or in the air as a passenger or with a safety pilot.

- Tap the **Emerg** tab.
- Read the site cards. The top green card is the best site you can reach.
- Tap a card to see it on the map and its photo, then tap **Activate Glide**.
- Fly through the magenta hoops. Watch the brief count down the glide time.
- Tap **End** when you are done. The recording is saved on the device.

IMPORTANT: Never practice an engine failure in a real aircraft without an instructor or safety pilot, and never below a safe height.

GETTING AROUND

SkyHeading is laid out like the other aviation apps on your tablet, with the controls where your thumb expects them.

TABS AND GEAR

- Five tabs in the bar along the bottom of the screen: **Plan** (the flight plan and its pills), **Wx** (the weather), **NLog** (the navigation log), **Fly** (the plan flown) and **Emerg** (the emergency landing sites). Each tab keeps its place while you visit another, and a flight under way keeps flying behind the other tabs: the live position is followed, the alerts still speak and Preview flies on.
- The **download** icon at the top right, left of the gear, opens **Downloads** (the data packs).
- A screen opened from a plan's pills (Taxi, Departure, Route, Arrival) shows its title under the tabs and a back button at the top left that returns to the plan with what you chose.
- The **Emerg** tab opens the Emergency screen from anywhere. During a flight it ranks the landing sites from that flight's aircraft.
- The **gear** at the top right opens Settings, on every screen.
- Android's **back** gesture or button goes back a screen, as the back button at the top left does; at a tab's first screen it puts SkyHeading in the background, and a flight carries on.

TABLETS, PHONES AND SPLIT SCREEN

SkyHeading fits itself to the space it has: a tablet full screen or in split screen beside another app, or a phone. Android's own bars stay at the top and bottom, and SkyHeading's screens fit between them. While a flight is under way, SkyHeading keeps the GPS and the receiver running with the screen off, with a *Flight in progress* notification. When you open the app, the SkyHeading logo shows for a moment.

THE AVIATION KEYBOARD

Airports, fixes, frequencies, altitudes, squawk codes, N-numbers and aircraft figures are typed on SkyHeading's own aviation keyboard, laid out like an FMS keypad: round number keys on the left with 1 2 3 on top, the letters on the right in A to E rows as on the FMS (or QWERTY, with the **QWERTY letter keys** switch in Settings), backspace, clear, OK and Cancel. Entries that take only numbers, such as a time or a squawk code, show the number pad alone. Keys that make no sense for the entry are grayed out; a squawk code, for instance, grays 8 and 9.

When the keyboard asks for an airport, fix or navaid, pills under the entry suggest matches as you type, nearest first, each with what it is and how far: airports in dark gray with yellow letters, navaids in blue, fixes in yellow. Airports also match a word of their name, so typing WORC offers KORH, Worcester. Tap a pill to enter it; in a typed route it completes the word you are on.

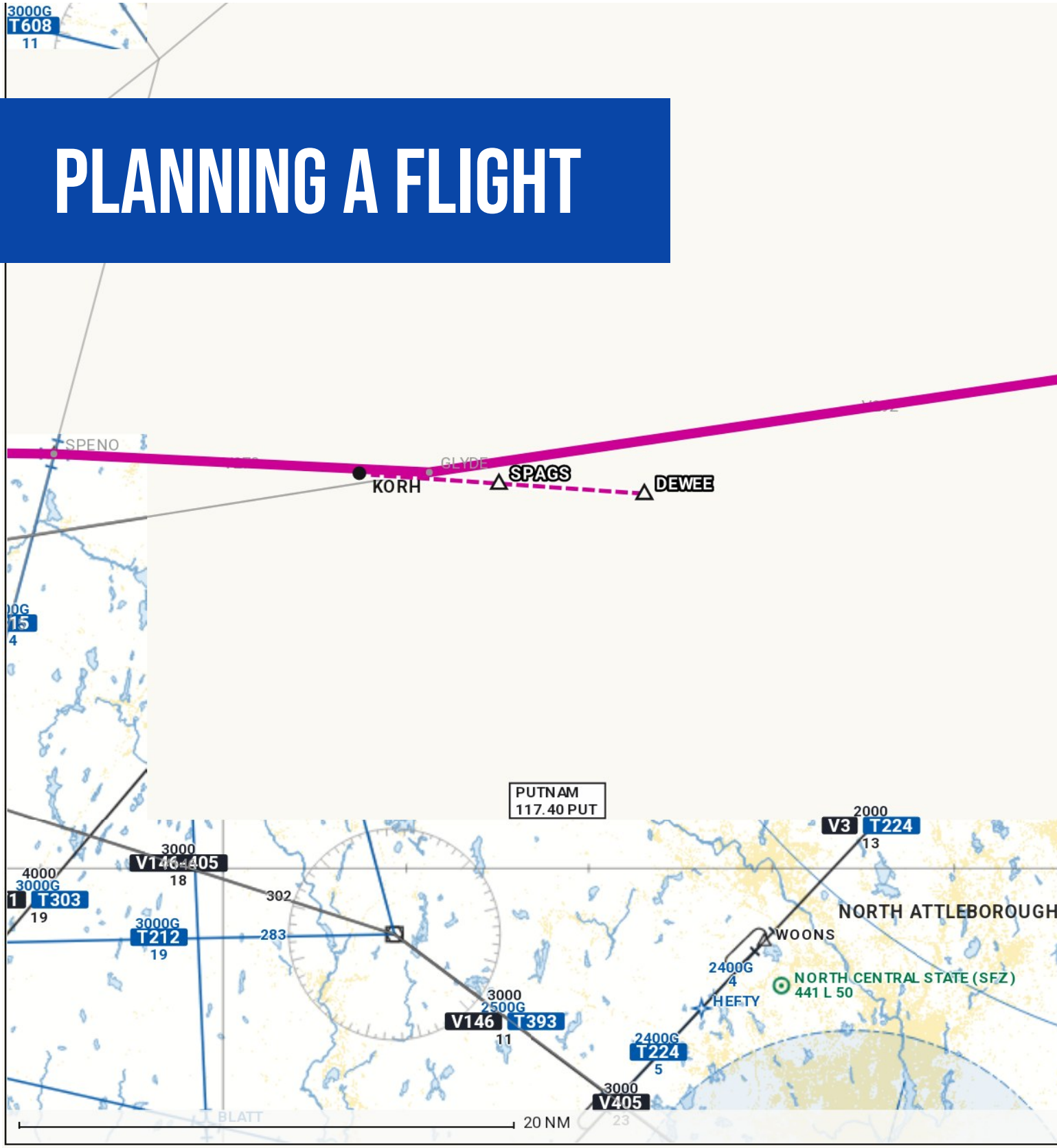
PILLS IN THE COLORS OF AIRPORT SIGNS

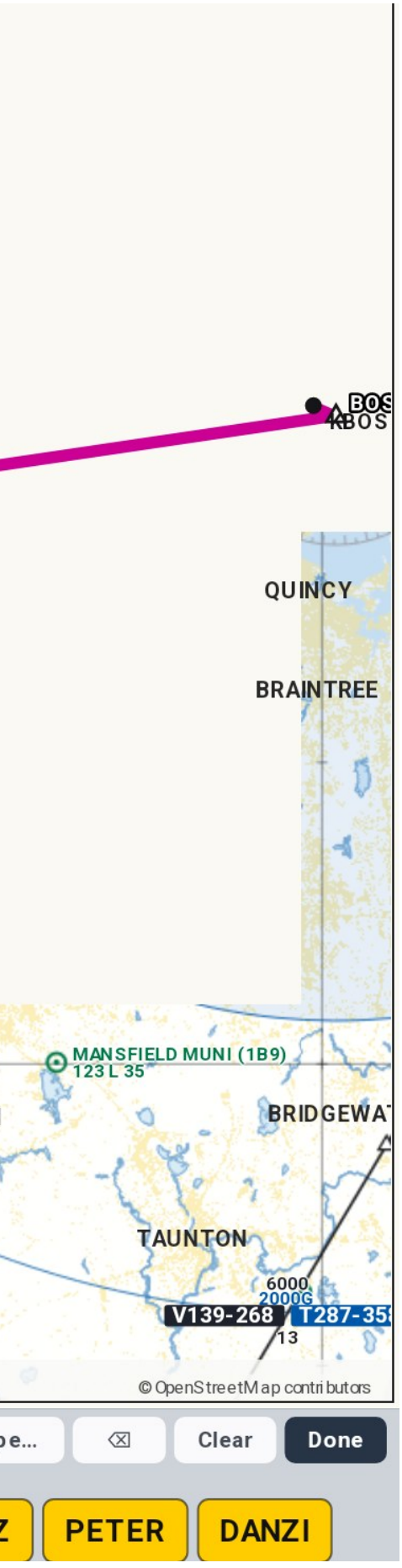
Throughout the app, choices are shown as pills colored like the signs you already read on the airport. The same colors run through the taxi, route and amendment keyboards:



Taxiways black on yellow, runways white on red, the taxiway you are on yellow on black; Victor and T airways white on magenta, Jet and Q white on teal, navaids and parking white on blue, fixes black on yellow, altitudes yellow on black.

PLANNING A FLIGHT





ONE PLAN, PARKING TO PARKING. On the Plan tab you describe the whole flight once: the aircraft, the taxi out, the departure, the route, the arrival and the parking at the other end. The Fly page then guides you along it, the yellow road on the ground and the magenta hoops in the air.

A plan is saved as you go, every time you change it. Choose existing flight plan opens one you saved before. If it was built on an older data cycle than the one on your device, SkyHeading checks it again and flags any procedure that has changed or gone.

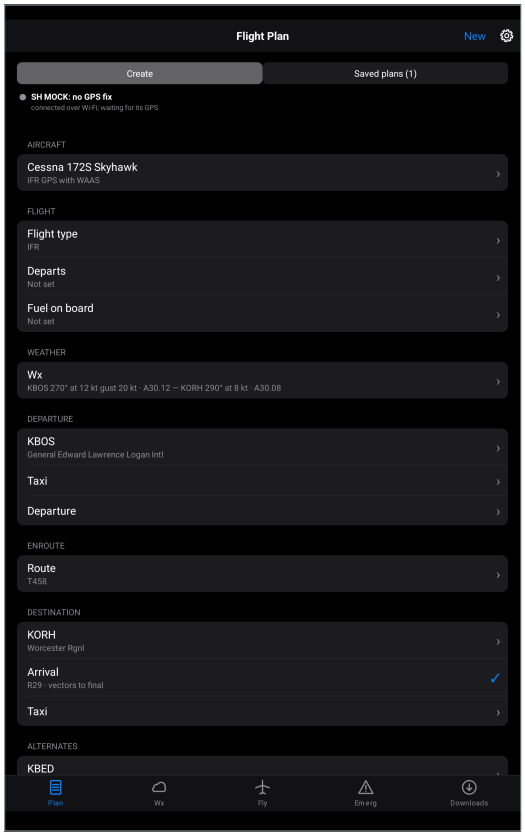
CREATE FLIGHT PLAN

The Create page fits the whole plan on one screen:

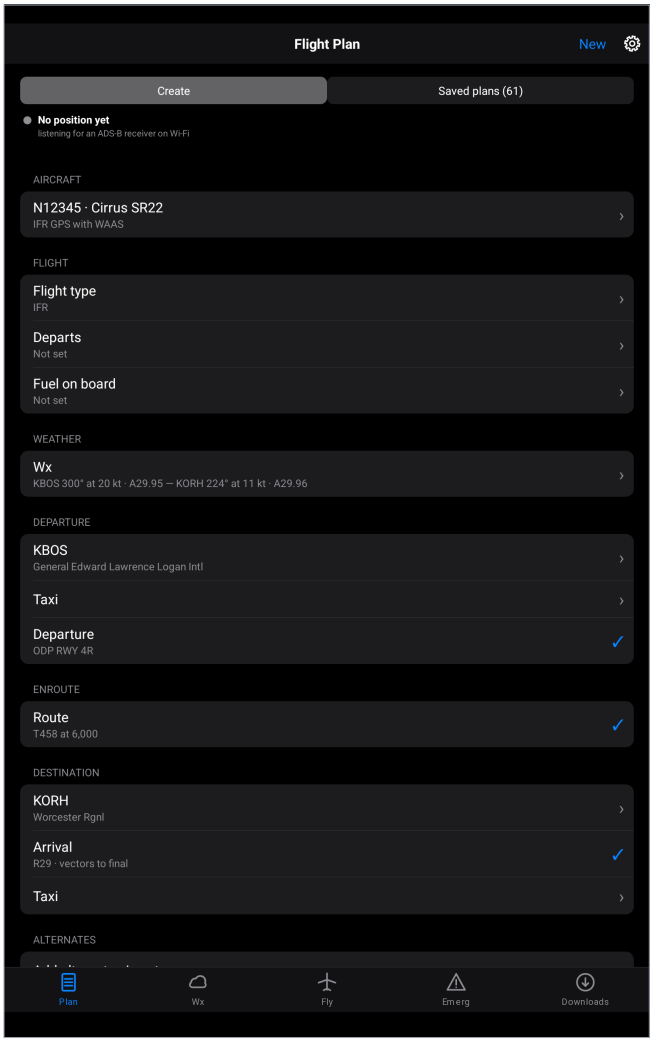
- **Aircraft**: chosen by N-number, shown as *N12345 · Cessna 172S* (see *Your Aircraft*).
- **Flight type**: IFR or VFR.
- **Departure**: the airport, with **Taxi** and **Departure** pills under it. Tap the airport for its airport page (below).
- **Enroute**: the route written out (*BOS V16 … HFD*), with a **Route** pill.
- **Destination**: the airport (it may be the departure airport, for a local flight), with **Arrival** and **Taxi** pills.
- **Departs**: the planned departure time. Past the end of the data cycle on your device, SkyHeading warns that procedures may change.
- **Fuel on board** at the start of the flight.
- **Wx**: a line with the weather copied for each airport (*KBOS 270° at 12 kt · A30.12 — KORH not copied*). Tap it to open the Wx tab. Weather more than an hour old, carburetor icing and a high density altitude are flagged here (see *Weather: the Wx Tab*).
- **Alternates** (IFR): one or more filed alternate airports; the CRAFT strip shows the first as ALTN. In flight, MORE → DIVERT offers those airports inside dual fuel rings.

Each pill opens its own screen to edit that piece of the flight. **Plan** brings you back, and what you chose goes into the plan. **Fly** opens the Fly page.

An empty airport row opens the airport keyboard. Once it is set, a tap opens that airport's page, the same for the destination and each alternate. To choose another airport, touch and hold the row and tap **Delete**, then tap the empty row. Changing the departure clears its taxi and departure; changing the destination clears its arrival and parking.



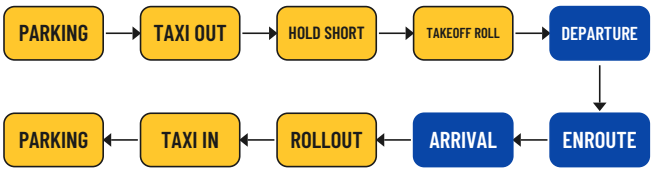
The Plan tab: Boston to Worcester with Hanscom as the alternate. Tap an airport for its airport page; touch and hold it to change it.



Create flight plan, IFR, with the clearance strip.

THE PLAN IS A CHAIN

Each pill edits one piece of the flight, and each piece starts where the last one ended. A SID ends at a fix, a VFR departure at an altitude on course, and the route picks up there; the route ends where the STAR, the approach, the vectors or the pattern entry begins. A runway change can affect the taxi out, the departure and the arrival, and the Create page marks the pills that need another look.



Yellow pieces are on the ground, blue in the air.

IFR CLEARANCE STRIP (CRAFT)

For an IFR plan, the plan also reads as your clearance, as a strip of chips like the taxi clearance. Each chip opens its pill's screen:



Letter	Item
C	Clearance limit: the destination, or a fix for a short clearance.
R	Route: the departure (SID, ODP, DVA or radar vectors), then the enroute route.
A	Altitude: the initial altitude, and the altitude and time to expect higher.
F	Frequency: departure control, editable.
T	Transponder: the squawk, blank until you copy the clearance.

Cleared as filed leaves the strip as it is; an amended clearance is a few chip edits. The expected altitude and time are kept for lost communications. **VIA** offers *Departure…* and *Route…*, the screens the route is built on; **ALTN** lists your alternates (remove one, or open its airport page), recent airports to add, *Type identifier…* and *Clear all*.

DEPARTURE TAXI

The departure Taxi pill opens the Taxi screen: the airport plan with the taxi keyboard over its foot. Build ground's clearance the way it is spoken, tapping the taxiways in order, and the yellow route follows. Runways on the way get a red hold-short chip unless you are cleared to cross; the chip at the end clears you onto the departure runway. The airport's signs and markings are drawn as they are on the field, from direction signs to hold lines.

The airport pill at the top left (**KORH** ▾) switches to another airport: recent ones, or *Other airport…*; the one you pick becomes the plan's departure. With a live position at the airport (GPS or a receiver), the route starts from your aircraft and **From aircraft** sets it there again; otherwise double-tap the plan where the aircraft is.

The traffic at the airport is on the plan too, as on the airport page's Map: your receiver's, and internet traffic on the ground and in the pattern (see *Traffic*). Tap an aircraft for its card. The destination's Taxi screen shows it the same way.



The Taxi screen and its keyboard.



Boston's Taxi screen with the traffic on the field: arrivals and departures on the taxiways and runways, drawn as the aircraft themselves, and the internet traffic's credit.

DEPARTURE

The Departure pill plans the takeoff and the climb to where the route begins. VFR, that is runway heading to an altitude, then on course. IFR, it is a SID, an obstacle departure procedure (ODP), a diverse vector area, or the controller's instructions, such as *on departure, climb and maintain 4,000, expect higher in one zero minutes*.

Terrain and obstacles always count: a climb that would hit terrain is never offered. SkyHeading checks your aircraft's climb against what the departure requires and warns when it cannot make it, and checks the runway length against your takeoff distance over 50 ft, at the density altitude of the departure's weather on the Wx tab. SIDs that need GPS are grayed *needs GPS* if your aircraft is set without it.

What it starts with

A new IFR plan starts from the runway on the departure Taxi pill: the runway into the wind from the Wx tab, or the longest when the wind is calm or not copied. With an IFR GPS, it starts with a SID off that runway toward your route: the transition your route names, else the SID that ends nearest the way to the destination. Without GPS it starts with the obstacle departure or the diverse vector area, where the runway has one.

To choose another, tap the purple procedure pill, or anywhere under the pills on the Departure screen: the menu lists the SIDs, the ODP, the DVA and a VFR departure, each with its runways. The pills are sized for fingers in turbulence; a tap takes the nearest pill.



The Departure screen at Boston with an IFR GPS: the BLZZR6 SID off runway 27 toward the route, and the Departure menu open on the SIDs, the ODP, the DVA and VFR.

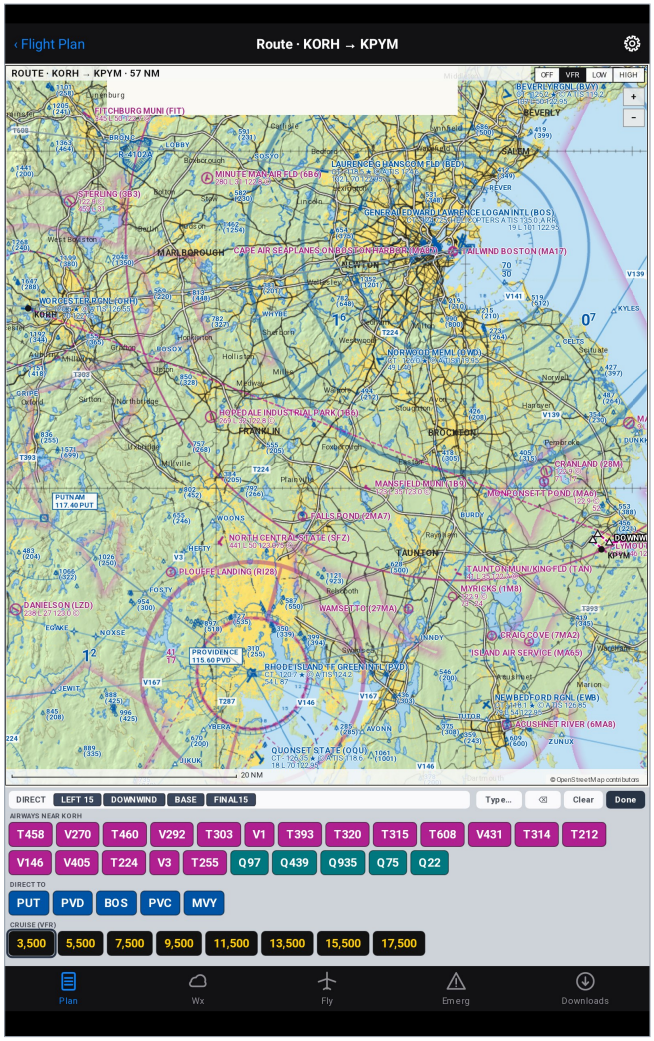
ROUTE

The Route pill opens the Route screen: a route map with the **route keyboard** over its foot. Type a whole route (*BOS V3 HFD*, DCT allowed), or build it a piece at a time: the keyboard offers only what makes sense next. At the start, the airways near the departure and navaids toward the destination; after a fix, the airways through it; on an airway, the fixes to leave it at (toward the destination first) and the airways it meets. Low airways come before high, and T and Q routes are dimmed without GPS.

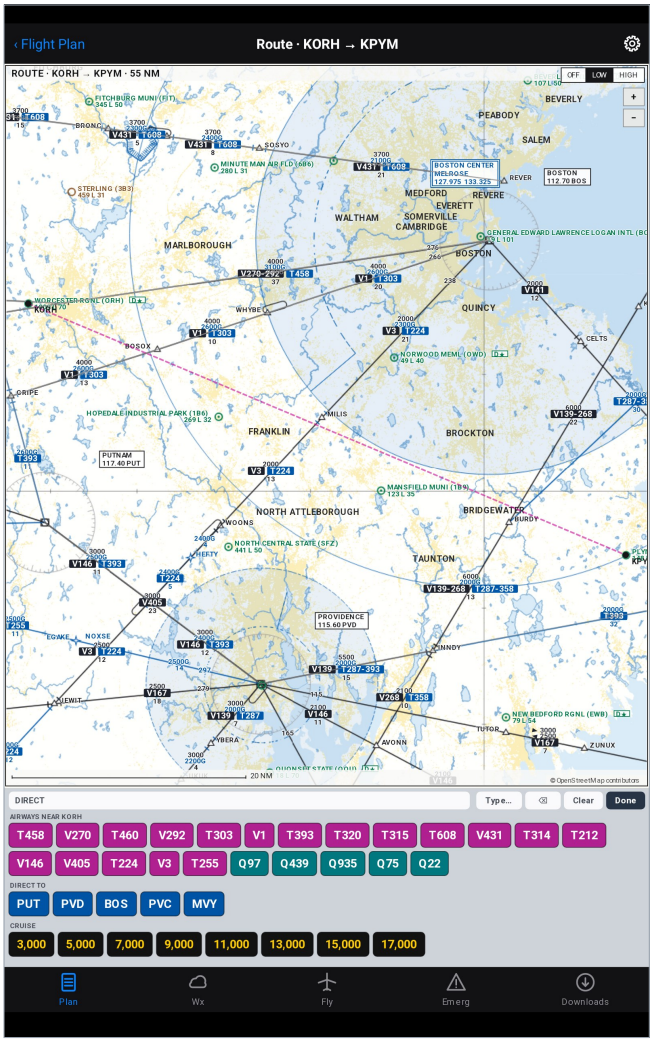
The map draws the route so far in solid magenta and the piece you are choosing blinking magenta, with the minimum enroute altitudes along the airways. A **CRUISE** row offers the altitudes for your direction of flight (VFR hemispheric levels, or from the MEA up for IFR).

Charts under the route

A switch in the map's top-right corner lays a chart under the magenta route. On a **VFR** plan it offers **OFF**, **VFR** (sectional), **LOW** and **HIGH**. On an **IFR** plan the choices are **OFF**, **LOW** and **HIGH** (the IFR enroute charts). Until you tap one, SkyHeading picks for you: the sectional on a VFR plan, or the low or high IFR chart by your cruise. Pinch or use **+** and **−** to zoom, drag to pan, and **FIT** to frame the route again.



Route screen on a VFR plan with the sectional under the magenta route (OFF / VFR / LOW / HIGH in the corner).



The same route with the IFR low chart (LOW). HIGH switches to the high chart.



A rubber-banded user waypoint W1 on the route between Worcester and Plymouth, shown as a magenta FIX on the map and as W1 on the keyboard.

Rubber banding

To bend the route, grab the magenta line, drag it, and release. SkyHeading inserts a user waypoint (**W1**, then **W2**, …) at the drop: for example *KORH → W1 → KPYM*. The keyboard shows **W1** as a fix pill; on the Fly page, HITS treats it as a virtual FIX sign with that label. Drag less than a short tap and nothing is inserted, so a pan does not invent a waypoint. Snap to a nearby offered fix or navaid while dragging if you want that point instead of a free lat/lon. **Done** takes the route and cruise back to the plan.

The route as pills

Above the keyboard the whole route reads as a strip of pills, from the departure procedure to the arrival. Tap a pill for its menu: **Insert before** or **after** (the keyboard then adds there), **Show on map**, **Direct to** (the pills before it go), **Remove**, and on a user waypoint **Rename…** (*W1* becomes *NEWBRY*: a letter, then up to 11 letters and digits). Touch and hold a pill to move it; drag it off the strip to remove it. The plan's route reads a user waypoint by its name; its position stays in the plan and in the filed route.

- **The SID pill**: **Change departure…**, **Fly all of** it, or **Leave at** one of its fixes (ATC's "proceed direct"). A radar-vector SID has no fixes: its pill reads, for example, *Fly heading 290 · radar vectors to SILVE* (the PWM7 off Portland's runway 29), the map draws the heading dashed off the runway, and the Fly page flies it, then on to the route.
- **The STAR pill**: **Change arrival…**, **From** its entry, or **Join at** one of its fixes.

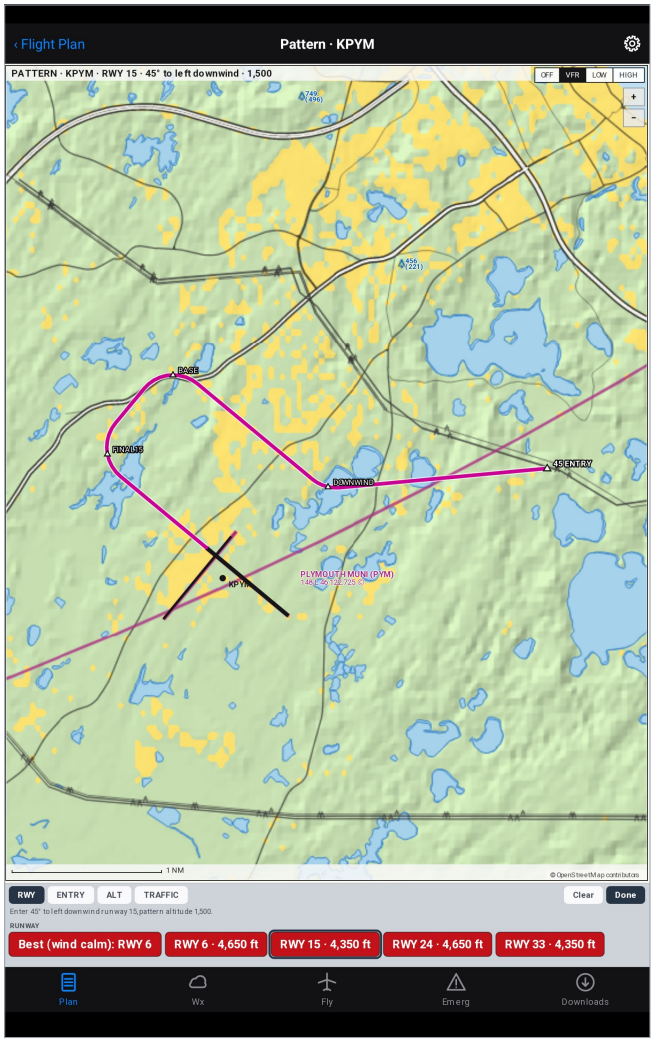
- **The approach pill**: **Change arrival…**, then the approach's fixes in flown order with their role and published altitude, to read, not edit (*NOLEY · IF · 4,000 ft*, *VOCUS · FAF · 1,700 ft* on the ILS 22L at Boston). Tap one to see it on the map, where the approach's fixes are named along its dashed path.

ARRIVAL (VFR)

On a VFR plan, the Arrival pill opens the **Pattern** screen — a pattern keyboard over a map of the arrival track, in the same style as Route and Taxi. The map defaults to the VFR sectional and draws the magenta path SkyHeading will fly from the end of enroute into the pattern and down to a stop on the runway. The keyboard's phrase line reads the call you will hear on Fly (*Enter 45° to left downwind runway 29, pattern altitude 2,000.*).

- **RWY**: best into the destination's wind from the Wx tab (calm or not copied: the longest runway), or pick any runway end. Wind on each pill shows headwind or tailwind and crosswind.
- **ENTRY**: best for the side you arrive from first, then the rest — 45° to downwind, midfield crosswind, straight-in, base, direct to downwind, modified base.
- **ALT**: published pattern altitude when NASR has one, else 1,000 ft above the field, or any hundred-foot step you choose.
- **TRAFFIC**: the runway's published left or right traffic, or your override.

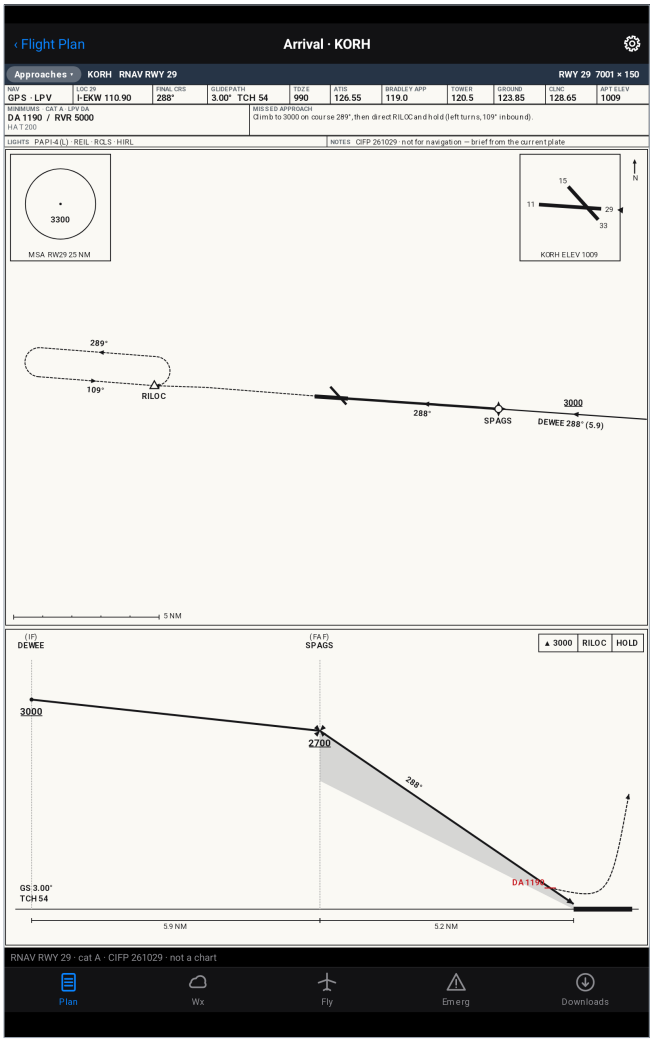
Tap a pill and the magenta track redraws at once. **Clear** restores the published and best defaults; **Done** (or ‹ **Plan**) writes the choices into the plan. Enroute ends at the entry's start (labeled on the map). On Fly, the bar reads the same call and warns when the traffic side differs from published.



The Pattern screen for a VFR arrival: sectional map, magenta track into the pattern, and the RWY / ENTRY / ALT / TRAFFIC keyboard.

ARRIVAL (IFR)

On an IFR plan, the Arrival pill offers a STAR feeding an approach, an approach from a transition, or **vectors to final**. A STAR opens the Arrival (STAR) screen; an approach alone opens the Approach screen with HITS, the brief, the plan view and the profile. Vectors to final are flown as a controller typically vectors (downwind, base, a 30° intercept 3 NM outside the final approach fix) above the minimum safe altitude, with each instruction on the Fly strip where its turn begins. The missed approach is part of every approach.



The Approach screen for the RNAV RWY 29 at Worcester: HITS of the approach, the brief across the top (frequencies, minimums, missed approach), the plan view with the MSA, and the profile from DEWEE down to the DA with the missed approach climb.

DESTINATION TAXI

The destination Taxi pill opens the Taxi screen for taxiing in and picks where you will park: FBOs by name, aprons, terminals, hangars and fuel, as blue pills, with the last place you parked at that airport first; or double-tap the map to park on that spot. The map also has the airport's gates, tie-downs and hangar spots by name where OpenStreetMap or the X-Plane Scenery Gateway has them (see *Credits*).

VIA starts as the **shortest way in** from the landing runway to that parking: SkyHeading chooses the runway exit that suits the parking (among the next few exits after you slow down), then the shortest taxiway path to the spot, counting turns and runway crossings. That path is shown as the expected clearance on the plan and is what Fly uses for the **TAXI IN** phase.

At a **non-towered** airport there is no ground controller to give a different route, so that shortest path is the taxi-in you fly: after you stop on the runway, Fly rebuilds it from where you actually stopped (or from the planned exit) to the same parking. If you land on another runway than the plan's, any old VIA is dropped and the shortest way in is rebuilt from the runway you are on. At a towered field, the first taxiway you tap on the keyboard replaces the suggestion with ground's actual clearance; once you have started taxiing, a new route starts where the aircraft is.

The last hundred feet show *ARRIVED AT …* on a blue sign like the parking pill; Preview holds it briefly before returning to the start, and a live flight ends *Parked at …*.

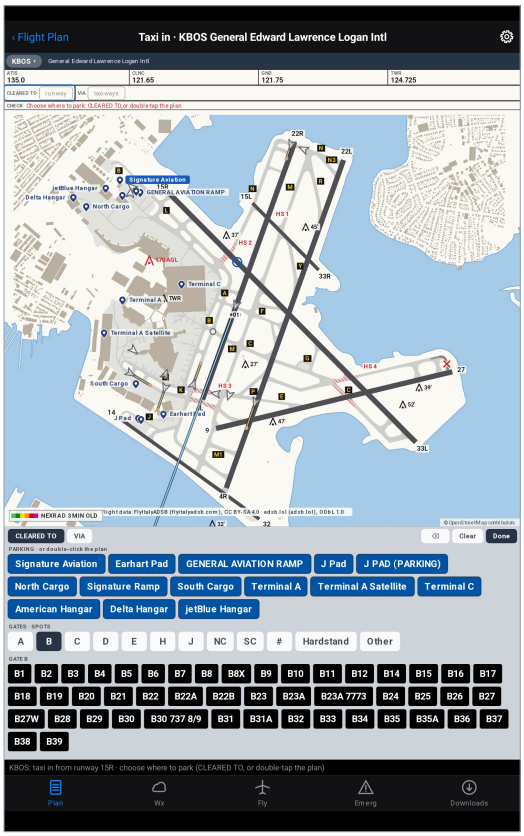
Gates, FBOs and other places

Tap **CLEARED TO** on the taxi-in keyboard for the places to park. The airport's FBOs, terminals, ramps, hangars and fuel come first as blue pills. Under them, **GATES · SPOTS** sorts the gates by concourse (**A**, **B**, **C** … at an airline airport; numbered spots and tie-down rows at a GA field). Tap a concourse for its gates, drawn as gate signs (white numbers on black), and tap *B35* to taxi to gate B35. The route ends at the gate; for an FBO or a ramp it ends level with the building, not past it.

The same places are drawn on every taxi map, decluttered so the labels never overlap: each gate as its sign, each FBO's name in white on blue, and the other places with a map pin. **Settings › Taxi maps** chooses what is shown: **Display Gates**, **Display Airport Locations**, and which kinds (FBOs, terminals, ramps, hangars, fuel). The keyboard always offers every one.



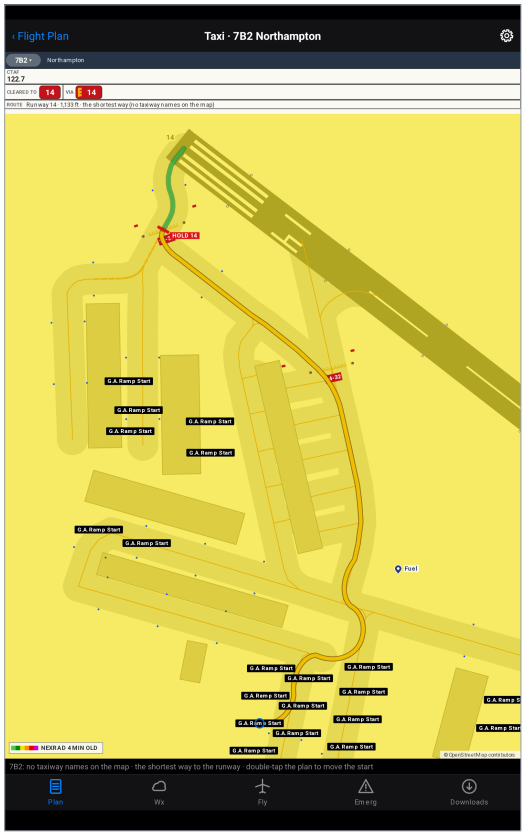
Taxiing in at Boston: CLEARED TO with the FBOs and ramps, and the gates by concourse under GATES · SPOTS.



Concourse B open: tap a gate sign to taxi to that gate.

Airports whose taxiways have no names

At many small fields the map has the taxiways but not their letters. SkyHeading still draws the runway and the taxiways and routes by their shape: taxiing out, choose the runway under CLEARED TO and leave VIA empty, and the route takes the shortest way to the runway's end, stopping at the hold line (or 200 ft from the centerline where none is mapped) and holding short of any runway on the way. The line under the clearance reads *Runway 14 · 1,133 ft · the shortest way (no taxiway names on the map)*. Taxiing in, double-tap where you will park. Ramp and tie-down lanes drawn stopping just short of a taxiway are joined to it, but never through a building.



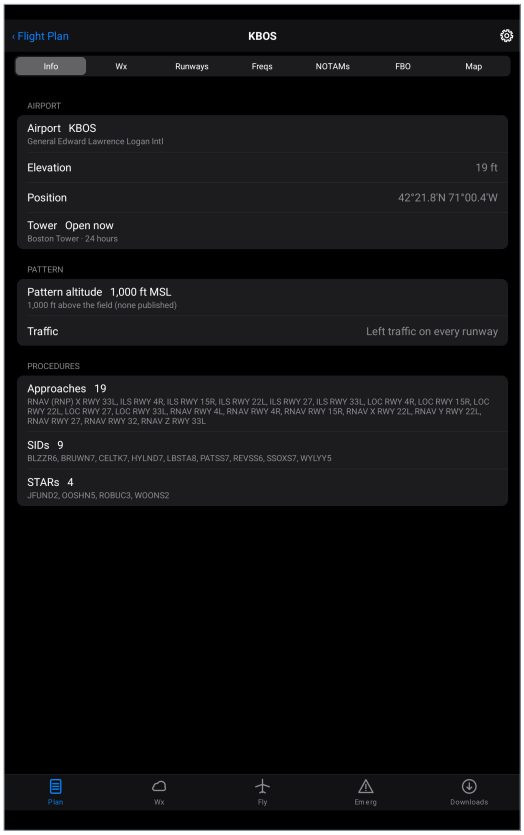
Northampton (7B2), whose taxiways have no names: from the tie-downs to the hold short of runway 14 the shortest way, double-tap to move the start.

THE AIRPORT PAGE

Tap the departure, the destination or an alternate on the Plan tab and its airport page opens. Its tabs, across the top:

- **Info**: elevation and position; the tower, open or closed now, with its hours (the CTAF when it is closed); the pattern altitude and the runways with right traffic; the approaches, SIDs and STARs.
- **Wx**: the D-ATIS in plain English, the weather on the airport's card, the METAR and TAF from your receiver and from the internet (see *Weather: the Wx Tab*), and the National Weather Service's forecast discussion for the airport, its AVIATION section first (US airports).

- **Runways**: each runway's length and width, lights, glide slope indicators, ILS and traffic side, and with a wind copied, the headwind and crosswind on each end, the one into the wind in green.
- **Freqs**: the frequencies in the order you dial them (ATIS, clearance, ground, tower, CTAF), and approach and departure control.
- **NOTAMs**: the airport's NOTAMs in plain English (below).
- **FBO**: the FBOs, terminals, ramps, hangars and fuel on the airport map.
- **Map**: the airport plan. Pinch or drag to zoom and pan, **Recentre** to frame it again. Your taxi route is drawn in yellow (the taxi out at the departure, the taxi in at the destination), your aircraft where it is, and the traffic on the ground and in the pattern; tap an aircraft for its card.



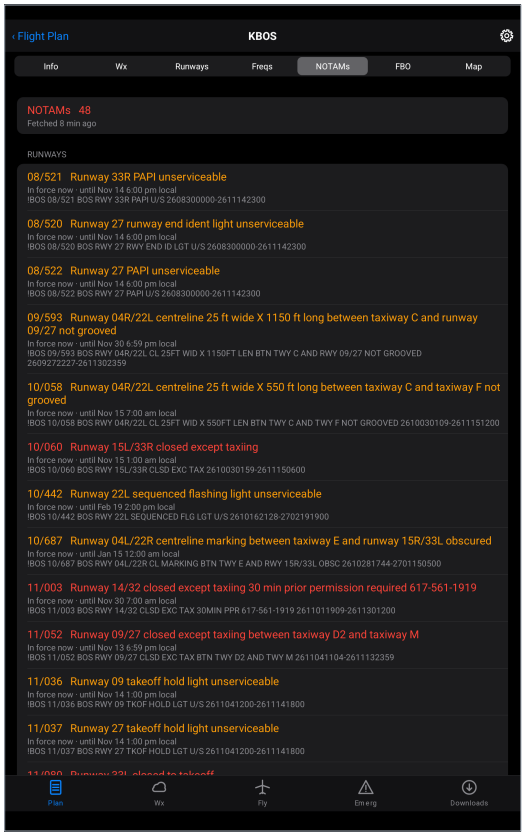
Boston's airport page, Info: the tower open now, the pattern, and the approaches, SIDs and STARs.



Boston's airport page, Map: the FBOs and places, a NOTAM obstacle (170 AGL), a NOTAM closure crossed out near runway 27, and internet traffic on the ground.



Worcester's Map with the plan's taxi in to Rectrix in yellow, holding short of runway 15-33.



Boston's NOTAMs in plain English, the runway closures in red.

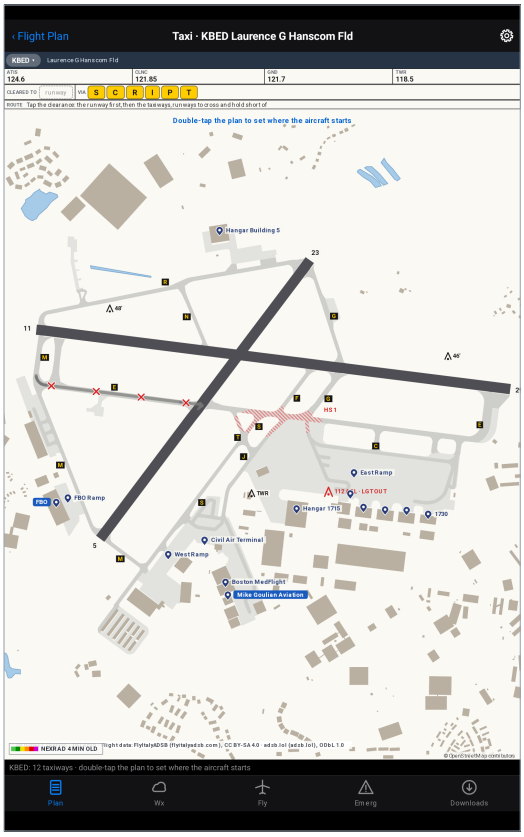
NOTAMS

SkyHeading brings the FAA's NOTAMs for the plan's airports, the navaids on its route and the GPS outage areas, and reads them out in plain English: *RWY 15L/33R CLSD EXC TAX* becomes *Runway 15L/33R closed except taxiing*. On the NOTAMs tab they are grouped (runways, taxiways, the airport, navaids, communications, procedures, obstacles, airspace), each with when it is in force on your tablet's clock and the NOTAM as published under it. A closure in force is red, anything else in force amber.

Each NOTAM counts at the time you will be there: the departure's at your departure time, the destination's and the alternates' at your arrival, from half an hour before to an hour after. A taxiway closed tonight but open by the time you leave tomorrow is not crossed out.

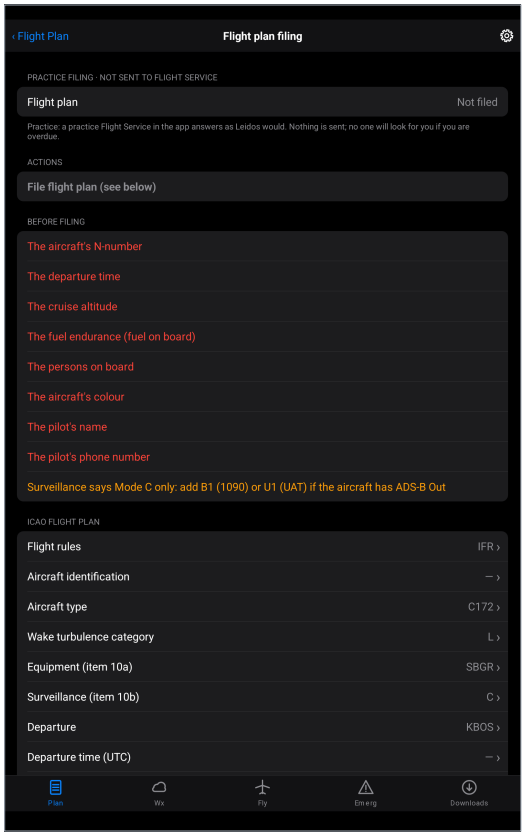
What the NOTAMs change

- **Closed taxiways** are greyed with red crosses on every taxi map, over the part that is closed; on the taxi keyboard their pills are greyed with a red cross, still tappable (ground may clear you along the open part), and the Taxi bar says which. The suggested way in goes round them.
- **NOTAM obstacles** (cranes, towers) are drawn in red with their height, and *LGT OUT* when unlit.
- **Tap a cross or an obstacle** for its NOTAM in plain English and as published.
- **Approaches** show their NOTAM note in the picker: a navaid out, approach lights out (higher minimums), an amended procedure.
- **The Plan page's Check list** warns of an airport closed, PPR or without fuel at your time, the departure or landing runway closed, a taxiway in your taxi clearance closed, a navaid on the route out, and the route inside a GPS outage area at your cruise altitude.



Hanscom's taxi plan: the NOTAM obstacle 112 AGL with its light out, and the hot spot, FBOs and ramps.

NOTE: NOTAMs come through the SkyHeading relay from the FAA's NOTAM service. They are not an official briefing: get the official briefing (1800wxbrief.com) before flight.



The filing form: practice, not sent; what to finish before filing; the ICAO flight plan.

NOTE: Beta: practice only. A practice Flight Service in the app answers as Leidos Flight Service would; nothing is sent, and no one will look for you if you are overdue. File your real flight plan with Flight Service.

FILING A FLIGHT PLAN (BETA)

Turn on **Settings › Flight plan filing › Flight Plan Filing w/ Leidos (Beta)** and the Plan tab gets a **Flight plan filing** row. It opens the plan as an ICAO flight plan, every field filled from the plan, your aircraft and its equipment, and editable: the type and wake category, items 10a and 10b, the route as filed, the true airspeed, the time enroute and fuel endurance. What stops it being filed is listed first (*The persons on board*, *The departure time is in the past*), then the actions allowed now: **File**, **Amend**, **Open**, **Close**, **Cancel**.

On the Fly page SkyHeading asks to open a filed VFR plan at takeoff and to close it after landing, reminds you 20 minutes past your ETA and warns at 30.

WEATHER: THE WX TAB

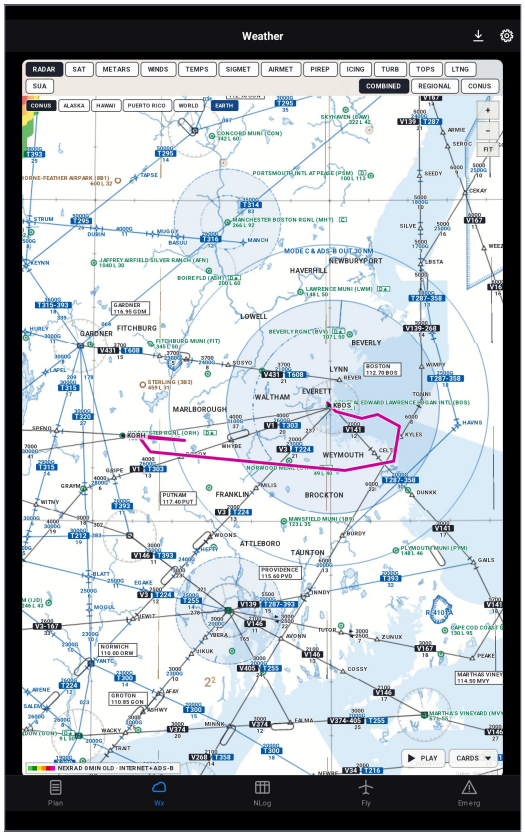
The **Wx** tab has two parts. At the top, the **weather map**: the weather an ADS-B receiver hears over FIS-B, the free weather broadcast on 978 MHz, on a map of the country. Below it, a **card** for each airport of the plan, **Departure**, **Enroute** and **Destination**, with the weather the flight uses: the wind, the altimeter, the temperature and dewpoint, and the ATIS letter. The cards fill themselves where they can, from the FAA's D-ATIS, your receiver or the internet METAR, and take what you copy from the ATIS.

THE WEATHER MAP

Pills across the top of the map choose what it shows: **RADAR**, **SAT**, **METARS**, **WINDS**, **TEMPS**, **SIGMET**, **AIRMET**, **PIREP**, **ICING**, **TURB**, **TOPS**, **LTNG** and **SUA**. The map is a globe, the Earth as seen from space: pinch, double-tap or use **+** and **−** to zoom from the whole world down to an airport, drag to spin the globe (or pan once zoomed in), and **FIT** goes back to the region. The pills at the map's top left choose the region: **CONUS** (the lower 48), **ALASKA**, **HAWAII**, **PUERTO RICO** (with the US Virgin Islands) and **WORLD**, the whole globe. Every page draws all it has wherever it is, so spinning from one region to the next shows that region's weather too; the icing, turbulence and cloud tops forecasts cover the lower 48 only. The major airports and their cities (once zoomed in to a country), the plan's departure and destination and the aircraft are drawn over every page. Each page says in its corner what it is, where it came from and how old it is, or that nothing has come in yet.

The map fills the screen. **CARDS** in its bottom right corner goes down to the airport cards; drag the cards down to come back to the map. Zoomed out, the globe wears NASA's Blue Marble, the Earth as the satellites see it, among the stars; **EARTH** (after the region pills) turns it off for the drawn map. Zoomed in closer than the lower 48, the drawn map takes over.

Keep zooming in and your flight's own chart comes in under the weather: the sectional for a VFR plan, the IFR low chart (IFR high at FL180 and above) for an IFR one. It starts to show at about 400 NM across and is all there by 200 NM, and the map then zooms on down to about 5 NM across, the weather still on top. The plan's route is drawn as filed, through its fixes, the SID and the arrival. Zoom out and the chart fades away again.



The Wx map zoomed in from Boston to Worcester: the IFR low chart under the weather, and the plan's route through its fixes.



WORLD with EARTH on: NASA's Blue Marble, the radar over the US.

Layers together

The page pills are layers: tap one to add it, tap it again to take it off, and as many show together as you like, each with its legend in the corner: the satellite's clouds at the bottom, then a forecast grid, the radar, lightning, the AIRMETs, SIGMETs and SUA, and the stations and PIREPs on top. Two layers cannot share the map: one of icing, turbulence and cloud tops at a time, and winds or temperatures; turning one on turns the other off. The altitude stepper sets the layer you tapped last that has an altitude.



SAT, RADAR and SIGMET together on the globe.

PLAY

With the radar, the satellite or the winds on, **PLAY** animates them: the radar's last hour and the satellite's last six hours loop, the time of the frame shown on the button, and the winds move as thin white streaks over a colour field of their speed (blue light to purple over 110 knots) at the altitude of the WINDS page, as the Windy app shows them, from the GFS model. Tap again to stop. The loops come over the internet when you press PLAY; they are not kept offline. The Wx map's radar, playing or not, is drawn smooth from the National Weather Service's own picture, about three times finer than the radar's usual squares (about 0.3 NM instead of 1 NM), so it looks the same when PLAY stops; no part of it is drawn weaker or smaller than reported, and zoomed out a cell too small to see is drawn as a dot. Where your receiver's ADS-B radar is newer, that part is drawn from the receiver's squares, smoothed. **Settings** › **Display** › **Radar smoothing** off shows the squares as received.



PLAY on the WINDS page at 9,000 ft: the winds moving round the globe.



PLAY with SAT and RADAR over the lower 48: the loops, the frame's times on the button.



RADAR over the lower 48 with EARTH on: the National Weather Service's radar from the internet (a receiver's own drawn over it), with its age.

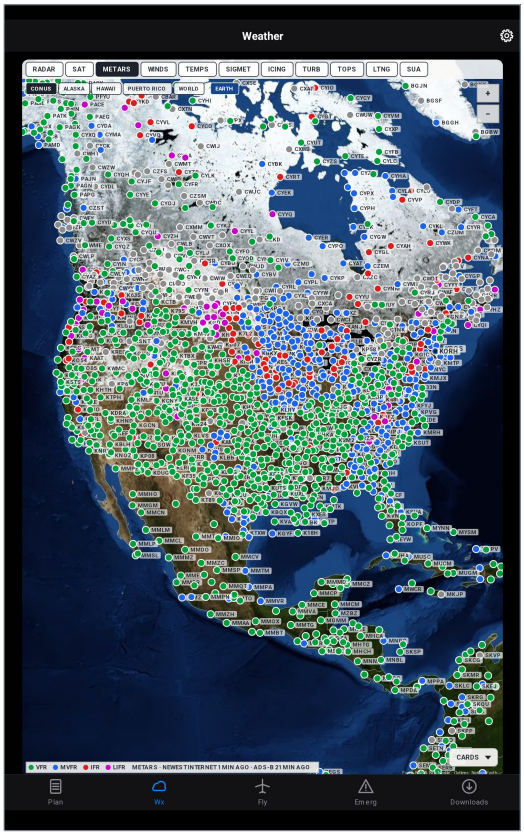


WORLD on the SAT page: the globe with the infrared satellite picture.

- **RADAR** draws NEXRAD, the radar mosaic FIS-B sends twice: **regional**, fine and every few minutes for the 250 NM or so round each ground station, and **CONUS**, coarser and every 15 minutes for the whole country. **COMBINED** (as the Garmin GPSMAP 696 calls it) puts the regional over the CONUS; **REGIONAL** and **CONUS** show one alone. Light green to magenta for the strongest echoes; the lightest, under 20 dBZ, is left out. The age turns amber past 15 minutes, and radar is dropped when it expires.
- **SAT** draws the world's infrared satellite picture, NOAA's hourly mosaic of the weather satellites round the Earth: clouds grey, whiter the higher and colder their tops, light blue under −53 °C where storms reach high. Infrared sees cloud by night as well as by day; very cold ground (Greenland, Antarctica, snow in winter) can look like cloud.
- **METARS** puts a flag on each airport with a METAR, around the world from the internet, coloured by flight category: VFR green, MVFR blue, IFR red, LIFR magenta. Zoomed out, a flag is left out where it would cover another, the worse weather first.
- **WINDS** draws the winds aloft forecast as barbs at the FB stations, at the altitude in the top right: **−** and **+** step through 3,000 to 39,000 ft. A barb points to where the wind comes from; a short flag is 5 knots, a long one 10, a triangle

50. Away from the FB stations (the oceans, the rest of the world) the barbs are NOAA's GFS model forecast, every 2°; tap one for its winds and temperatures at every altitude.

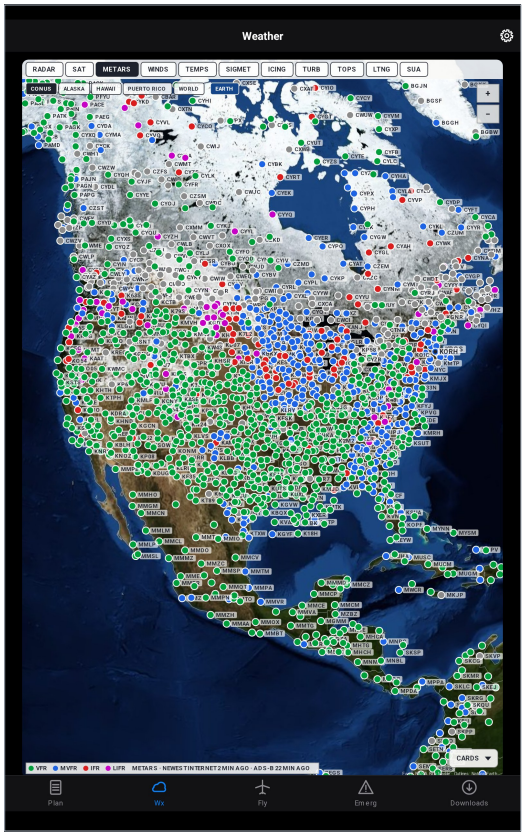
- **TEMPS** shows the forecast temperature at the same stations and altitude: blue at or below freezing, green just above, orange warmer. From 18,000 ft each says how far it is from the standard atmosphere (*ISA+3*).



METARS: a flag for each airport by flight category, the identifiers where they fit.

METARs and TAFs in plain English

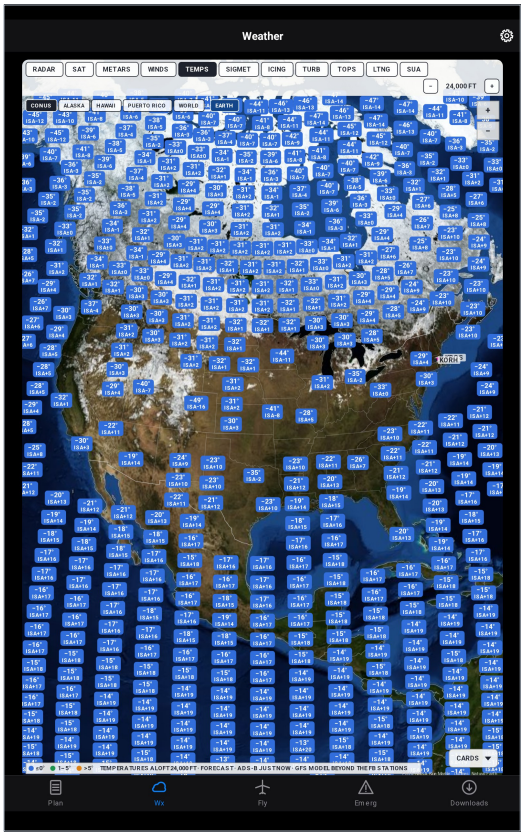
Tap a flag (or a station on the WINDS or TEMPS page) and its weather opens in plain English, the way a briefer would read it: the flight category and what sets it, when it was observed and how long ago, the wind, the visibility, the weather, each cloud layer with the ceiling marked, the temperature and dewpoint with their spread, and the altimeter. The station's TAF follows, period by period: *From 21Z on the 27th (5:00 pm local) — Marginal VFR*, *Temporarily, 22Z on the 27th (6:00 pm local) to 01Z on the 28th (9:00 pm local)*, *30% chance*, each with what it changes. Every Zulu time carries its local time, on the tablet's clock. The METAR and TAF as received follow at the bottom. The **METAR / TAF** row on an airport's card opens the same.



Hartford's METAR and TAF in plain English, with the local times; the raw text is at the bottom.



WINDS at 9,000 ft: the forecast winds as barbs.



TEMPS at 24,000 ft: the forecast temperatures and their difference from ISA.



WINDS on the globe at 9,000 ft: the FB stations over the US, the GFS model beyond them.

Advisories, pilot reports, icing, turbulence, cloud tops, lightning and special use airspace

These eight pages come two ways. With an internet connection they cover the whole lower 48, from the National Weather Service through the SkyHeading relay; SkyHeading keeps the last copy, so offline it is still drawn with its age until it expires. Your ADS-B receiver's own copy, for the 250 NM or so round each ground station it hears, is drawn over it. The tag in the corner says which you are looking at and how old each is: *INTERNET 12 MIN · ADS-B 3 MIN*, or the forecast's valid time; it turns amber past half its life.

- **SIGMET** outlines each SIGMET in red, each convective SIGMET (thunderstorms) in orange-red and each center weather advisory (CWA) dashed in amber, with its name. Over the internet the SIGMETs of the whole world are there (the ICAO ones named by their flight information region, *SBAZ SIGMET 3*). Tap one for its text, when it is valid, and its floor and top.
- **AIRMET** draws the AIRMETs, the graphical ones (G-AIRMETs) the National Weather Service issues for the lower 48 every few hours, each area in its hazard's colour with a label of the hazard and its altitudes in hundreds of feet (*ICE 090–180*): IFR in purple and mountain obscuration in brown, both hatched as they sit on the ground; turbulence orange below FL180 and dark orange above; icing blue; low-level wind shear and strong surface wind; and the freezing level, as dashed lines at their level (*FZL 080*) or areas where it varies (*FZL SFC–100*). A G-AIRMET is a forecast for a moment, every three hours out to twelve: the strip in the top right picks it, **NOW** for the one in force, **+3H**, **+6H** and on for the later ones. Tap an area for its hazard, the time it is a forecast for, and its altitudes.
- **PIREP** puts each pilot report of the last 90 minutes where it was made: a caret for turbulence (two from moderate), the icing hook for icing, a dot for a report of neither; grey for none, green light, orange moderate, red severe. An urgent report (UUA) sits on a yellow disc. Zoomed in, each has its altitude in hundreds of feet beside it; zoomed out, the worst of those close together is kept. Tap one for the report in plain English, with the report as sent underneath to compare: when it was made (UTC and your local time), where (*BDL270020* is *20 NM west of BDL*), how high, the aircraft by name (*C172* is a *Cessna 172 Skyhawk*), the cloud layers with their bases and tops, flight visibility and weather, temperature, wind, turbulence and icing with their kind and altitudes (*LGT-MOD CHOP 060-080* is *light to moderate chop between 6,000 ft and 8,000 ft*), and the remarks with their abbreviations spelled out. Pilots do not always write a report the standard way: a part SkyHeading cannot read is shown as sent.

- **ICING** shows the forecast chance of icing at the altitude in the top right (**−** and **+** step from 2,000 to 24,000 ft): pale blue under 20 % to magenta over 80 %, with magenta dots where supercooled large droplets are likely.
- **TURB** shows forecast turbulence at that altitude as eddy dissipation rate (EDR): light green for light turbulence to dark red for severe.
- **TOPS** shows the forecast cloud tops, pale blue low to purple above 24,000 ft.
- **LTNG** shows the lightning of the last 5 minutes as dots, yellow for a single strike to purple for over 15 in the same mile. Over the internet it comes from the GOES weather satellites' lightning mapper, which sees lightning inside the clouds too, across North and Central America, the Caribbean and the oceans either side (north of the equator); FIS-B's is lightning to the ground.
- **SUA** hatches in magenta the special use airspace that is hot now: MOAs, restricted and warning areas, from the FAA's live feed and FIS-B. Tap one for its name and the altitudes it is active between.



SIGMET: SIGMETs, convective SIGMETs and CWAs across the country from the internet.



SIGMET on the globe: the world's SIGMETs.



AIRMET, NOW: the G-AIRMETs in force across the lower 48, each labelled with its hazard and altitudes.



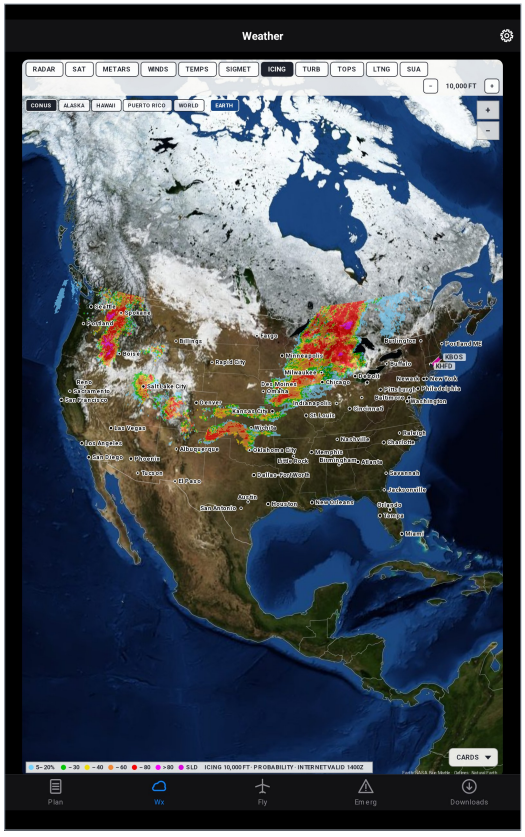
AIRMET with +6H lit: the G-AIRMET forecast six hours on.



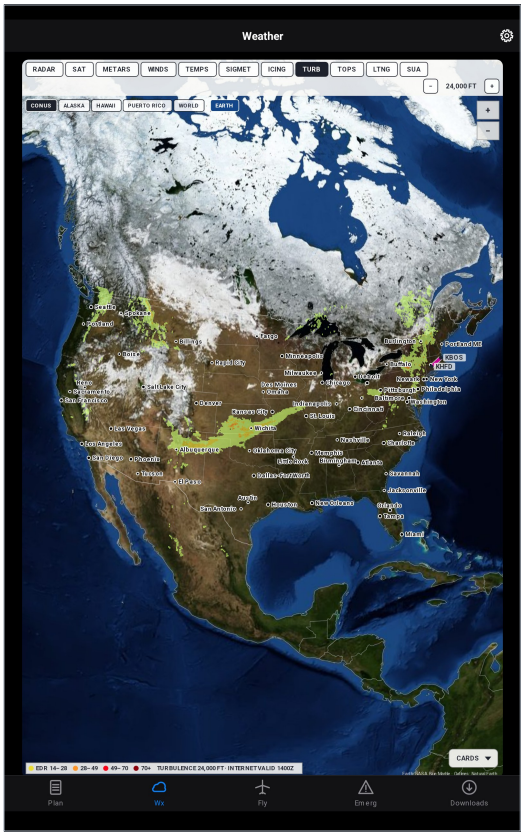
A pilot report tapped: in plain English, then as sent.



PIREP: the pilot reports of the last 90 minutes, an urgent one on yellow.



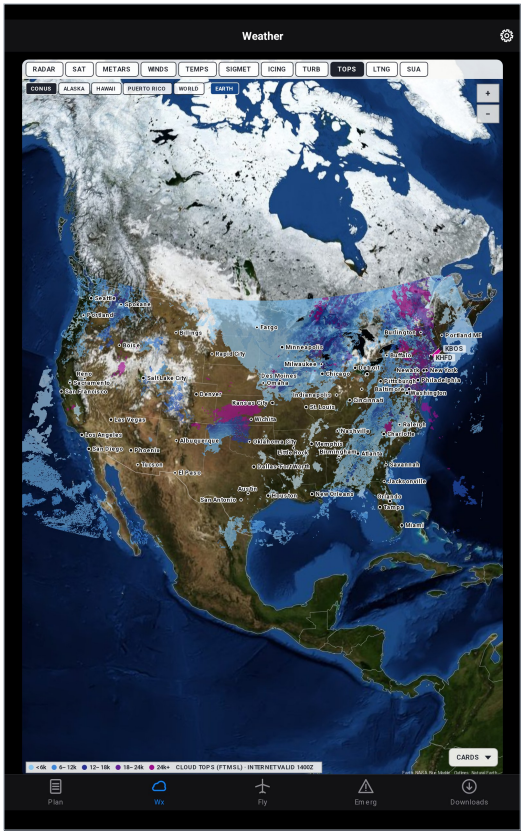
ICING at 10,000 ft: the chance of icing, the internet's forecast with the ADS-B receiver's drawn over it.



TURB at 24,000 ft: forecast turbulence (EDR).



LTNG: the last 5 minutes' lightning across the lower 48.



TOPS: the forecast cloud tops.



SUA: the special activity airspace hot now.

NOTE: Icing, turbulence and cloud tops are forecasts; SIGMETs, CWAs and AIRMETs are advisories; PIREPs are what one aircraft met at one time and place. None of them replace a briefing, and none are for picking a way through weather.

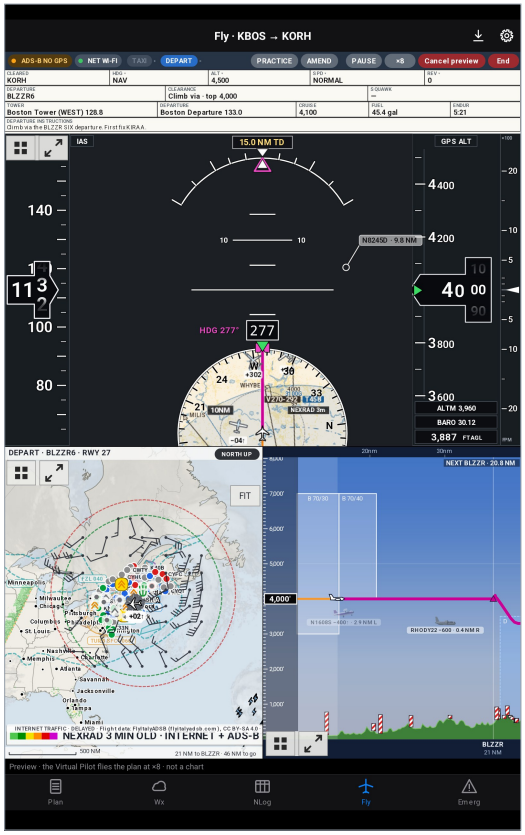
Where it comes from

Every page comes two ways, as the eight above: over the internet through the SkyHeading relay (the radar from the National Weather Service's radar mosaic, the world's METARs and TAFs, the winds aloft forecasts, and the GFS model and the satellite picture worldwide, both from NOAA), kept for offline use with its age, and from your ADS-B receiver drawn over it. The receiver's part is what it hears from the FAA's ground stations: it needs a receiver that passes FIS-B on over GDL-90 (a Stratux, a Sentry, a uAvionix and others), within line of sight of a station. On the ground away from a station, or without a receiver, the pages are empty and say so. The receiver's METARs also fill the departure and destination cards, and in the air its winds aloft, temperature and the nearest altimeter fill the Enroute card, marked *From ADS-B*. A card you typed in (or ATC gave) in the last hour is kept; **Use ADS-B weather** hands it back to the receiver. The airports' D-ATIS and their METARs and TAFs also come over the internet (below).

NOTE: FIS-B weather is minutes old when it arrives, and radar is a mosaic of the last scans. Use it for the big picture and to plan ahead, never to pick a way through weather.

RADAR ON THE OTHER MAPS

- The **Fly page's Map** draws the radar under the route, with its legend and age in the bottom left; **Settings › Fly Map** turns its Radar layer on or off and sets how see-through it is. Zoom the Map out past about 400 NM across and it becomes the national view: the state lines, the cities and the country's radar, without leaving the Fly page.
- The **compass map** in HITS draws it too, with *NEXRAD 7m* beside the range.
- The **Route** and **Pattern** maps (the Plan page's Route and Arrival pills) draw it along the plan, each with its own RADAR button.
- The **Taxi** plans (out and in, and the Fly page on the ground) draw the radar round the airport, under the route and the signs, with its age.
- Zoomed in, the radar is drawn smooth instead of in blocks, as are the Wx map's icing, turbulence and cloud tops: no reported bin is drawn weaker or smaller; the rounding only fills the steps between bins and rounds the edges outward. **Settings › Display › Radar smoothing** (on at first) turns it off to see the bins as received.
- **Settings › Display › Show ADS-B radar** turns it off everywhere.



The Fly page's Map zoomed out to the national view, with the radar.

THE WEATHER CARDS

Each card fills itself with the best weather there is for that airport, in this order: the weather you copied (or ATC gave) in the last hour; the airport's D-ATIS; your receiver's METAR; the METAR from the internet. Copy the ATIS (or the AWOS) into the cards before you taxi and again before the arrival where there is no D-ATIS. What a card holds is kept for that airport, so every plan from it uses it until it goes stale.



The Wx tab scrolled down to the cards (CARDS): Boston's D-ATIS on its card (wind, altimeter, temperature and dewpoint, the ATIS letter) with its density altitude and a carburetor icing caution, the Enroute card from ADS-B, and each airport's Forecast discussion row.



Boston's forecast discussion from the NWS office at Boston/Norton: when it was issued, then the AVIATION section on the TAFs first.

- **Wind** opens the Wind keyboard (below).
- **Altimeter**: four digits, *3012* for 30.12.
- **Temp / dewpoint** in °C, as in a METAR: *18/9*, or *M05/M09* below zero.
- **ATIS**: the information letter.
- **Use D-ATIS** (with its letter and wind) and **Use ADS-B weather** hand a card you copied over to the D-ATIS or the receiver.
- **Forecast discussion** (Departure and Destination) opens the National Weather Service office's latest Area Forecast Discussion for the airport: the forecasters' reasoning behind the forecast, its AVIATION section on the TAFs first, then the key messages and the rest, with when it was issued. US airports, over the internet; the last copy stays offline with its age.
- **Clear** empties the card. **Add airport** keeps weather for any other airport too; its card fills itself as the plan's do.

Under each card SkyHeading says where it came from and how old it is (*Copied 6 min ago · ATIS B*, *D-ATIS issued 2351Z, 38 min ago · ATIS J*, *From Internet 12 min ago*) and what it works out from it: the density altitude, and *CARB ICE RISK* when the temperature and dewpoint are in the carburetor icing range. Weather older than an hour is called stale, here and on the

Plan page: time to get the current ATIS. When a newer D-ATIS letter is out than the one you copied, the card and the Plan page say so (*KBOS D-ATIS is now information R (you copied Q)*).

The **Enroute** card holds the altimeter setting in flight. An altimeter ATC gives you, copied on the AMEND keyboard or with the BARO box in HITS, goes into it (*From ATC 6 min ago*), and so do an ADS-B receiver's winds aloft, temperature and nearest altimeter (*From ADS-B*).

THE WIND KEYBOARD

The Wind keyboard writes the wind out in words at its top as you build it (*Wind 270° at 12 kt gust 20 kt*) and draws it on a compass rose, the arrow blowing the way the wind goes. Directions are magnetic, as the ATIS gives them; SkyHeading turns them to true for the arithmetic.

- Tap **DIRECTION**, **SPEED** or **GUST**, then a pill: directions every 10°, speeds and gusts in knots.
- **CALM** for a calm wind; **NOT SET** takes the wind away.
- **ENTER** keeps it; **CANCEL** leaves the card as it was.



The Wind keyboard: 270° at 12 kt gust 20 kt, in words at the top and on the rose.

WHAT THE WEATHER DRIVES

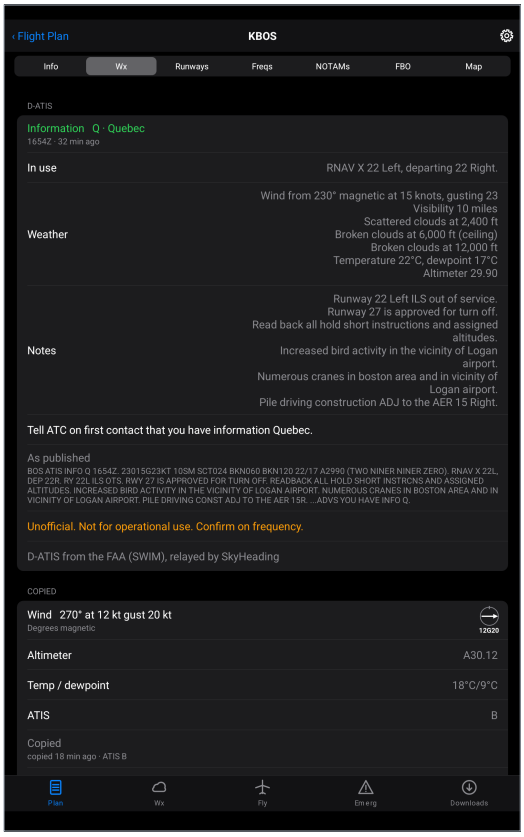
Weather	Used for
Wind	The departure and landing runways, the VFR pattern, the wind-corrected headings on the Fly strip and in holds, the Virtual Pilot's drift, and the Emergency screen's reach (the nearer airport's wind).
Altimeter	The BARO box and the indicated altitude in HITS, and the heights of ADS-B traffic.
Temperature	The density altitude: the takeoff roll and the climb at the departure, the true airspeed of your cruise. Above 3,000 ft the Plan page says how much longer the takeoff will be.
Dewpoint	The carburetor icing caution.

D-ATIS

About 80 of the busiest US airports publish their ATIS as text, the **D-ATIS**. SkyHeading takes it straight from the FAA, the moment a new one is issued, for every airport of the plan and every airport page you open, and puts its wind, altimeter, temperature and letter on the airport's card. Where the departure and arrival ATIS are split (Denver, Atlanta), the departure card takes the departure ATIS and the destination the arrival.

The airport page's **Wx** tab reads it out in plain English, by rule and never guessed:

- **Information**: the letter and its name (*U · Uniform*), when it was issued and how long ago, red once it is more than an hour old.
- **In use**: the approaches and runways in use, landing and departing (*RNAV 4 Left, departing 4 Right*).
- **Weather**: the wind (magnetic, as on the frequency), visibility, sky, temperature and dewpoint, altimeter and remarks such as the peak wind.
- **Notes**: the rest, a sentence a line, the contractions spelled out and the runways said as on the frequency (*Runway 33 Right is approved for turn off*).
- What to say: *Tell ATC on first contact that you have information Uniform.*
- **As published**: the FAA's text, to check against. Anything SkyHeading does not know is left as sent.



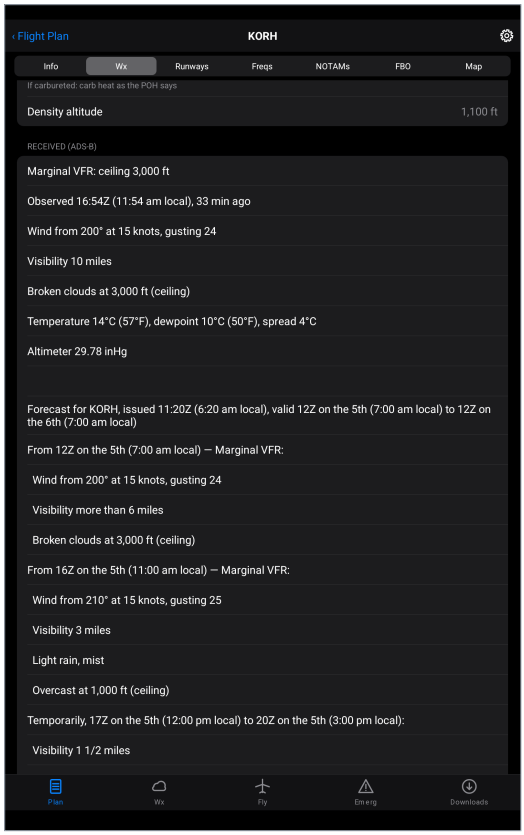
Boston's D-ATIS in plain English on the airport page's Wx tab, the text as published under it, and the airport's card below.

Airports without a D-ATIS (Worcester, Norwood and most towered fields) say *No D-ATIS: its ATIS is voice only. Listen to it on frequency.* Some of them have their phone-line ATIS turned into text by ATIS Relay; when one from the past hour is there, it is shown as *transcribed*.

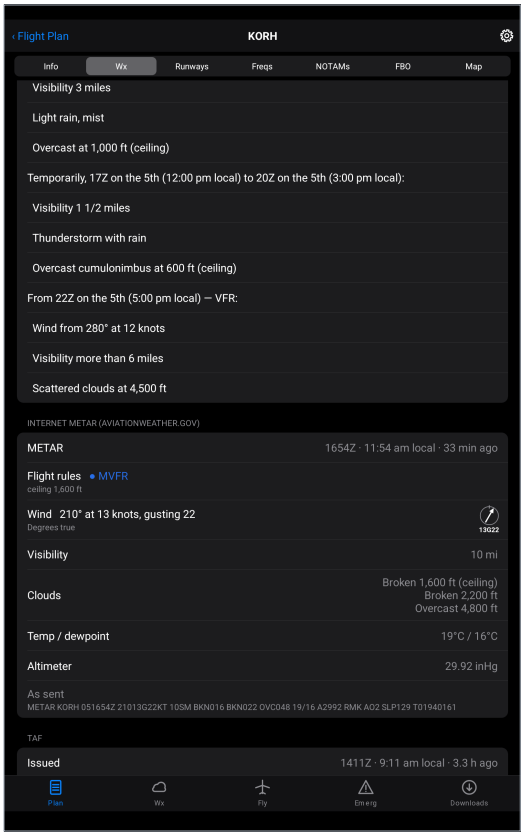
METARS AND TAFS FROM THE INTERNET

Over the internet, SkyHeading also brings every airport's latest METAR and TAF from the National Weather Service (aviationweather.gov). The METAR fills a card only when nothing better is there: a D-ATIS, the receiver's METAR or a copy you made within the hour holds over it. On the airport page's Wx tab:

- **METAR**: when it was observed, in Zulu and local time, and how long ago.
- **Flight rules** with a dot in its color: VFR green, MVFR blue, IFR red, LIFR magenta, with what sets it (*ceiling 2,500 ft*).
- **Wind** (degrees true, as in a METAR) with a wind diagram: a circle with north at the top and an arrow the way the wind blows, the speed and gust under it (*10G19*).
- **Visibility** (*10 mi*), **Weather**, **Clouds** (*Broken 4,500 ft (ceiling)*), **Temp / dewpoint**, **Altimeter** and **Remarks**, then the METAR as sent.
- **TAF**: when it was issued and how long it is valid, then **each time band on its own card** (*From 0100Z (9:00 pm)*, *Temporarily, Sat 1500Z to 1800Z*, *30% chance …*) with its flight rules, wind and wind diagram, visibility, weather and clouds; then the TAF as sent.



Worcester's METAR from the internet: VFR in green, the wind and its diagram, each element on its own row.



Worcester's TAF, each time band on its own card with its flight rules and wind diagram.

NOTE: D-ATIS, METARs and TAFs come through the SkyHeading relay and need an internet connection; offline, the last ones fetched are kept with their age. They are unofficial and not for operational use: listen to the ATIS on frequency and get an official briefing before you rely on them.

INTERNET WEATHER IN FLIGHT

Over the internet SkyHeading fetches the winds aloft for the NLog, the radar, the advisories, the PIREPs and the satellite. In the air it keeps doing so when the device has internet there, over cellular or Starlink: **Settings › Internet in flight › Internet weather in flight** (on at first) turns it off for a metered link, and then only your receiver's weather and what came before takeoff are used. Airborne, the winds aloft are fetched every 15 minutes.

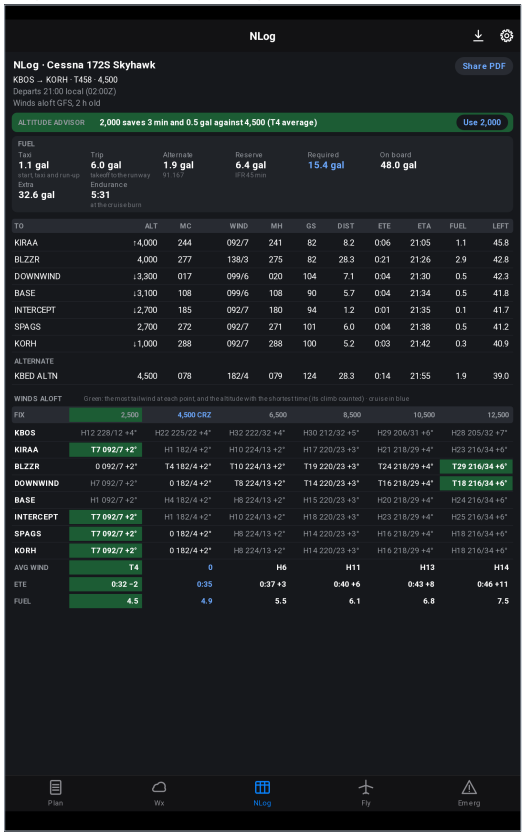
The **NET** pill beside ADS-B at the left of the Fly strip says how the internet is: **NET WI-FI** or **NET CELL** in green while SkyHeading's server answers, amber with **NO RELAY** when it stops answering, **NO NET** in grey with no internet at all, and **NET WX OFF** in the air with the switch off. **Internet now** in the same Settings group says it in words.

With Starlink, join the receiver to Starlink's Wi-Fi (its client mode) and the tablet too. SkyHeading announces itself there so the receiver sends to it.

THE NLOG: NAVIGATION LOG

The **NLog** tab is the flight's navigation log: every leg with its course, heading, wind, ground speed, distance, time and fuel, and the fuel the flight needs against what is on board. Before the flight it is the paper navlog; in flight it is live, writing down the time and fuel at each fix and planning the rest of the flight again after every ATC amendment.

Its legs are the Fly page's own: the departure, the route's fixes and airways, the STAR, the approach or the pattern, to the runway, then the alternate. Each row ends at a fix, at **TOC** (top of climb) or **TOD** (top of descent).



The NLog before the flight: the Altitude Advisor, the fuel block (taxi, trip, alternate, reserve, required, on board, extra, endurance), the legs with the alternate, and the winds aloft table.

THE COLUMNS

Column	What it is
TO	The fix, TOC, TOD or runway the leg ends at.
ALT	The planned altitude at the end of the leg; an arrow when the leg climbs or descends.
TC, MC	True and magnetic course.
WIND	The wind at the leg's middle at its altitude, and where it came from (GFS, NOW, NO WIND).
TAS, MH, GS	True airspeed, the magnetic heading corrected for the wind, and the ground speed.
DIST, REM	The leg's distance and the distance left to the destination.
ETE, TIME, ETA	The leg's time, the time since takeoff and the clock time.
FUEL, LEFT	The fuel the leg burns and the fuel left at its end.

On a narrow screen (a phone) the table scrolls sideways; the TO column stays put. The climb is flown at Vy, the cruise at your aircraft's cruise speed and the descent at 300 ft per NM, each with its own fuel burn (see *Your Aircraft*).

WINDS

Each leg's wind is the forecast for where and when the flight gets there, at its altitude: the FB winds aloft from your receiver or the internet, blended from the stations near the leg, and the GFS model beyond them and low down. They are fetched when the plan changes, and the NLog is planned again when they come; the header gives their source and age. In flight, the leg you are flying uses the wind you are flying in now (**NOW**: your receiver's, the simulator's or what you typed), and the forecast for the legs ahead is corrected by the difference between that measured wind and the forecast here (**ADJ**). With no forecast at all the legs are flown calm, **NO WIND** in amber.

The winds aloft table

Under the legs, the **WINDS ALOFT** table gives the wind at each point of the route every 2,000 ft, from low down to your aircraft's ceiling: the headwind or tailwind component (*H11*, *T3*), the wind, and the temperature against standard. The most tailwind at each point is green, your cruise column blue. Under them, each altitude's average component, its time against the cruise's (the climb counted) and its fuel.

Altitude Advisor

The **ALTITUDE ADVISOR** banner over the fuel names the legal cruising altitude for your direction (VFR 91.159, IFR 91.179) with the shortest time in these winds, between the minimum safe altitude and your ceiling, and what it saves: *2,000 saves 1 min and 0.4 gal against 4,500*. Tap **Use 2,000** to make it the plan's cruise. In flight it says *Request 2,000*: the altitude to ask ATC for, copied on the AMEND keyboard when they give it. When no altitude saves a minute it says the planned one is best. It looks no higher than 12,500 ft unless you carry oxygen, and then says when oxygen is needed (91.211).

FUEL

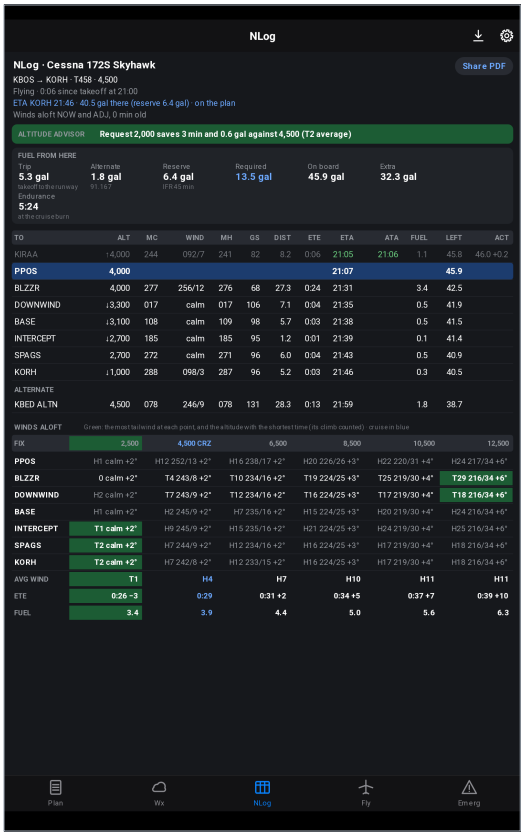
- **Taxi**: start, taxi and run-up. **Trip**: takeoff to the runway.
- **Alternate**: IFR, the first filed alternate (91.167). VFR, shown but not required.
- **Reserve**: 30 minutes VFR by day, 45 VFR at night (91.151), 45 IFR (91.167), at the cruise burn.
- **Required**: the sum. **On board**: the plan's fuel. **Extra**: what is left over, red when short. **Endurance**: the fuel on board after taxi, at the cruise burn.

When the fuel on board is less than required, the Plan page's check list says so before you fly.

LIVE IN FLIGHT

While a flight is flown, on the live position or on Preview, the NLog follows it:

- A **PPOS** row (present position) between the leg you are on and the next fix.
- At each fix passed, the actual time (**ATA**), the fuel then and how far ahead or behind the plan you are. Planned times count from the actual takeoff, so a late start does not make every fix late.
- After an ATC amendment the rows flown stay as they were, a divider says when and what (*AMENDED 14:32 · CLEARED DIRECT GLYDE*) and the rows ahead are planned again from where you are, with the new route, altitude and speed. The fuel block follows.
- The header shows the time since takeoff, the ETA and fuel at the destination against the reserve, and how far ahead of or behind the plan you are.



The NLog on Preview: the fixes passed with their ATAs, PPOS lit, the legs ahead planned from here, and the fuel from here.

SHARE PDF

Share PDF writes the NLog as a letter-size landscape PDF, with blank columns for the times and fuel you write in, and hands it to the share sheet: print it, save it or send it.

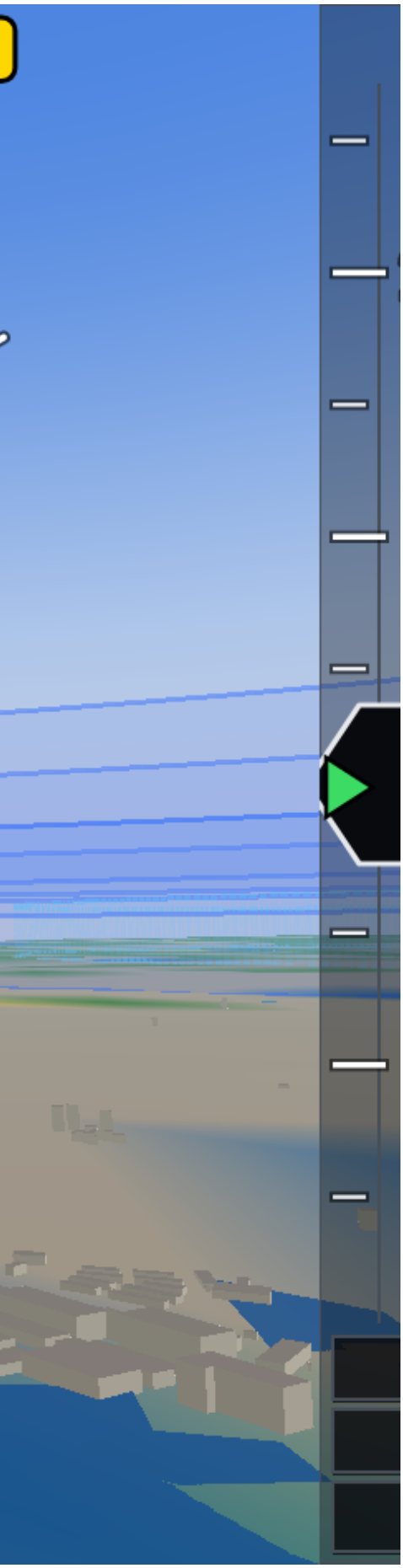
MAGNETIC VARIATION

Every magnetic course and heading in SkyHeading, the NLog's, the Fly page's, the compass rose's and the procedures', uses the World Magnetic Model 2025 (NOAA and NGA) across the United States, its territories and the Caribbean, built into the app. It is valid to the end of 2029.

NOTE: The NLog is decision support. Check its numbers against your POH and an official weather briefing.

THE FLY PAGE


CONTACT BOSTON DEPARTURE ON 133.0
20
20
CRS 272
ALT 1700
10
10
HDG 272°
271
W
24
30
21
33
5NM
BOSTON
112.70 BOS
MALDEN
N
CHELSEA
-03



THE FLY PAGE IS ONE SCREEN for the whole flight. HITS, the Map and the Profile stay where they are while the flight moves from the taxi to the departure, the route, the arrival and the taxi in, each phase handing over to the next without a tap.

Open it with Fly on the Create page. A thin strip across the top shows the phases, TAXI ▸ DEPART ▸ ENROUTE ▸ ARRIVAL, with Preview, Take off and End, over the phase's own brief.

FLYING THE PLAN

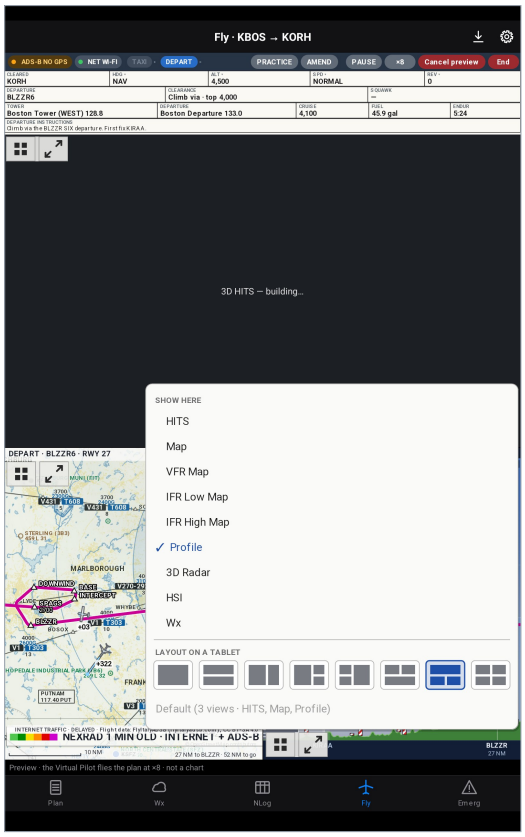
THE SCREEN

- **HITS**: the taxi view on the ground, then the flight's view with its hoops.
- **Map**: the whole flight, the leg you are flying in heavy ink; the airport plan while taxiing.
- **Profile**: the whole flight's planned altitude over the ground. Established on an approach it shows the approach's own profile; after touchdown, the airport map.
- **The strip**: the phases, **Preview**, **Take off** and **End**, over the brief for the phase: the taxi clearance, the departure, the STAR or the approach brief. In the air it adds **AMEND** and the ATC row (see *Amendments*). At the end of a row, **FUEL** (left now) and **ENDUR** (that at the cruise burn), both red once you are into the reserve. The strip is only as tall as its lines, so the views get the rest.
- Pinch the Map or the Profile with two fingers to zoom, drag to pan. **FIT** (the Map's under its **NORTH UP** / **TRACK UP** chip, the Profile's in its top right corner) puts the framing back. The chip in the Map's top right corner turns it: **TRACK UP** turns the Map with you, **NORTH UP** holds north at the top. The buttons on the Map, the Profile and the Hold Advisor (**FIT**, **MAP** / **HOLD**) are large enough for a finger in turbulence.
- **More views** for any pane (see *Arranging the views*): the **3D Radar**, the **HSI** and the **Wx** map round you, each described below.

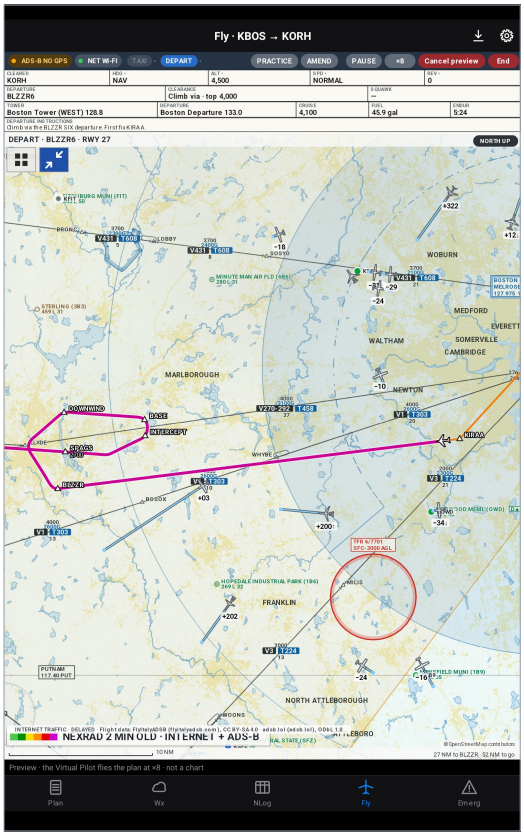
ARRANGING THE VIEWS

Each view has two small buttons in a corner it leaves free: HITS at its top left (the speed tape's **IAS** tag moves right of them), the Map under its title, the Profile at its lower left, the airport plan under **Recentre**.

- **Expand** (two arrows pointing out) makes that view fill the screen under the strip. The other views hide but keep following the flight, and AMEND still opens over it. The button lights up with the arrows pointing in; tap it again to put the views back. The Map stays expanded as the airport plan when you land, and the other way round when you take off. Leaving the Fly page puts the views back.
- **Views** (four squares) opens a menu. Under **Show here**, pick what that pane shows: HITS, the Map, the **VFR Map**, **IFR Low Map** or **IFR High Map**, the Profile, the **3D Radar**, the **HSI** or the **Wx** map. **Map** follows the flight (VFR for a VFR plan, IFR low or high by altitude); the other three keep their chart. Picking a view already in another pane swaps the two. Under **Layout**, tap a picture: one view, two stacked or side by side, or on a tablet the large view on the left, right, bottom or top with two smaller beside it, or four in a **2 × 2** grid (on a large tablet three in a row too). **Default** puts it back.
- The layout is kept for each size of device: a phone (HITS over the Map to start with, side by side in landscape), a tablet (HITS large, the Map and Profile beside it) and a large tablet such as a 13-inch one. Until you pick a layout it follows the way the device is turned. **Settings › Fly layout** shows the three and puts them back to the default.
- On the ground the airport plan takes the Map's place, and the Profile's too when they are side by side. Near a hold, the Hold Advisor takes the Map's place.



The Profile's Views menu: what that pane shows, then the layouts for this size of device as pictures, the one showing lit.



The Map expanded to fill the Fly page; tap the lit button to put the views back.



Taxiing out: the yellow road and the taxi clearance.

PREVIEW

Preview flies the whole plan quickly so you can see it before you go: the taxi, onto the runway, the takeoff, every leg and the landing, and the taxi to your parking, then back to the start.

The **×1** pill on the strip sets how fast: ×1, ×2, ×4, ×8, ×10, ×16, ×24 or ×32 real time. The Virtual Pilot flies your aircraft's speeds, piece by piece: Vy in the climb, the cruise speed level, the approach speed coming down, easing from one to the next, and any speed ATC assigns. The speed tape shows them as indicated airspeed.

The alerts you have switched on speak on Preview as they would in flight. Faster than ×1, Preview pauses while each one plays (**PAUSE** turns to **RESUME**) and goes on when it is said, so one does not come on top of the next. It also waits at the start of a leg until that leg's 3D scene is ready, so HITS never runs on past its ground. Tap PAUSE or RESUME yourself at any time: yours wins.

Preview holds short of the departure runway until you tap its chip on the strip, then lines up and rolls. In a hold it flies lap after lap until you copy the way out.

DEPARTURE AND ENROUTE

Rolling past 30 kt, the departure flies on the same screen. When the departure ends, the route takes over where you are, at the same speed and heading. Enroute, the strip briefs the leg: the clearance, cruise, safe altitude, the next fix and the distance to it, the distance remaining, ETE and ETA at your ground speed now, the distance to top of descent, and **ENROUTE INSTRUCTIONS** such as *Maintain 4,000. Fly heading 035 direct WHYBE, then GLYDE.*, the heading corrected for the wind. In the air, the **CENTER** cell names the air route traffic control center you are in and its frequencies near you (*BOSTON 123.75 · 134.7*).

On the ground, **CRUISE** ▾ on the strip changes the cruise altitude. In the air its place is taken by the ATC row, which shows the clearance in force; a new altitude in flight is an amendment.

Ask for lower

IFR, ATC's altitude stays yours until they change it. When the altitude you were assigned is above where the arrival or approach begins, the strip says so in time to ask: *ASK FOR LOWER · THE APPROACH STARTS AT 3,000 · DESCEND BY GLYDE* (*DESCEND NOW* once that point is behind you). The Profile draws the descent you need as a dashed line from the top of descent. Copy the lower altitude ATC gives on the AMEND keyboard and the hoops come down with it.

Live airspace

SkyHeading's server listens to the FAA's own airspace feed (SFDPS, through the FAA's SWIM service) and passes on which special-use airspace is **hot** now, with the altitudes it is active between.

- **In HITS**, a hot MOA, warning or alert area is drawn as a hatched magenta volume, like the MOA borders on a sectional, from its floor to its ceiling. Restricted and prohibited areas are always red volumes, as TFRs are.
- **On the Fly Map**, the center (ARTCC) boundaries are light grey dashed lines, so you can see where the handoff to the next center comes.
- **On the Fly strip**, the CENTER cell gives the center you are in and its frequencies near you.



Enroute to Worcester on Preview: CENTER BOSTON 123.75 · 134.7 on the strip, and Preview paused (RESUME) while it says APPROACHING CLASS D AIRSPACE.

NOTE: The FAA's SWIM data is not for operational use. Hot or cold, always check the airspace's status with ATC or Flight Service before you fly through it.

WEATHER ON THE MAP

Every page of the Wx map can be a layer on the Fly Map, round the aircraft: radar, satellite, METARs, winds and temperatures aloft, SIGMETs and CWAs, AIRMETs, PIREPs, icing, turbulence, cloud tops, lightning and special use airspace. **Settings › Display › Fly Map** turns each on or off and sets how see-through it is with a slider. At first the radar, the SIGMETs and CWAs, the AIRMETs, the PIREPs and lightning are on. A made-up map over the VFR, IFR LOW or IFR HIGH chart stays pinned at the top of that page, so you see the layers as you set them. Winds, temperatures, icing and turbulence are at the level nearest your altitude; lightning is drawn as light-blue bolts, one to three by the number of strikes.

The radar comes from your receiver and from the internet, as on the Wx map. **Tap the Map** anywhere for a weather card about that spot: the PIREPs, METARs, winds aloft, SIGMETs, AIRMETs, special use airspace and grids there, the spot's wind, the radar and the nearest METAR. Drag the card to scroll it, tap its × to close it.

TRAFFIC

SkyHeading draws the traffic around you on the Map, the airport plan, the Profile, the compass map, the HSI, the 3D Radar and in HITS. It comes from two places:

- **Your ADS-B receiver**: the traffic it hears, live. Only this traffic raises the spoken alerts.
- **The internet**, where no receiver is feeding traffic: on Preview and on the ground. It comes from the FlyItalyADSB and adsb.lol networks through SkyHeading's own server, is a few seconds old, and is drawn a little see-through, grey when it is no factor, with *INTERNET TRAFFIC · DELAYED* and its credit at the bottom of the view. It is colored yellow or red as it comes close, as the receiver's is, but it is never spoken: it is seconds old, so it is never an alert. On Preview it is the traffic around the Virtual Pilot's aircraft, so a taxi preview at Kennedy shows Kennedy's traffic wherever you are. Between reports it carries on along its track for up to 20 seconds, so it does not blink out. Settings › Traffic › **Internet traffic in flight** lets it show in the air too.

On the Map an aircraft is its own shape seen from above (a Cherokee, a twin, a regional jet, an airliner), pointing the way it is going, with its height above or below you in hundreds of feet (*+05*):

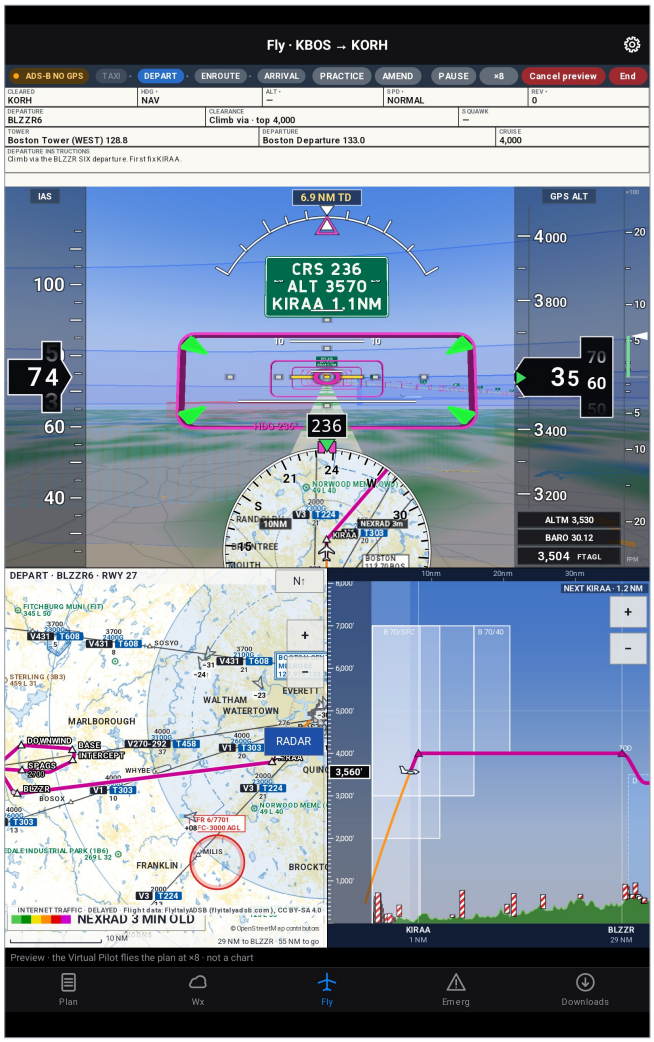
- Light brown: on the ground. Light blue: in the air.
- Yellow: close. Red: a danger of collision.

Zoom in far enough and each one is drawn to scale in its airline's colors: an A321 is longer than a CRJ. The airport plan always draws them that way once they are big enough, with each one's callsign or tail number beside it, and the airport vehicles that broadcast ADS-B (fire trucks, ops trucks, snow plows, tugs, follow-me cars) by their own shapes and names. An aircraft that sends no track is a dot. Between reports a moving aircraft from your receiver carries on along its track at its speed for up to five seconds, then holds where it got to.

An aircraft whose owner has asked the FAA to keep it private (the LADD list, or a privacy ICAO address, PIA) shows only **LADD** or **PIA** for its name when it comes from the internet. Your own receiver hears what the aircraft broadcasts, so it shows the callsign the aircraft sends.

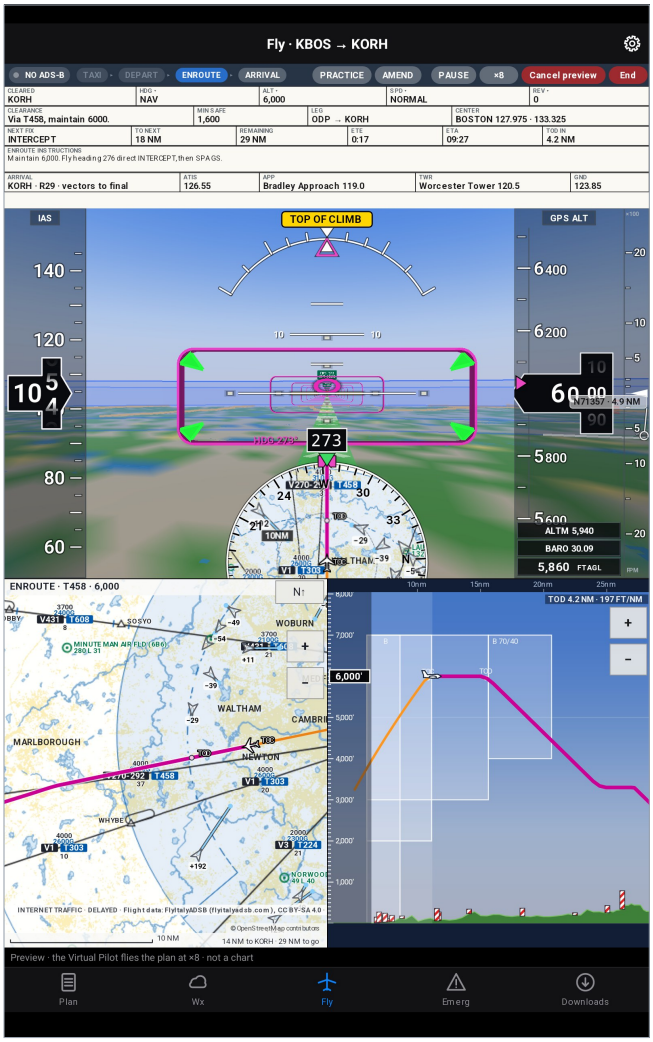
Tap an aircraft on the Map, the airport plan, the Profile, the HSI, the 3D Radar or HITS for its card: the aircraft drawn as you would see it from where you are (turned and tilted as it really is, changing as it turns or you move round it), its callsign, airline and type, height or *ON THE GROUND*, distance and bearing, speed and heading, and where the traffic came from. Its callout stays up while the card is open. Tap the ×, or the aircraft again, to close it.

On the Profile, aircraft in the air within 3 NM either side of your route are shown where they are abeam the route, at their height, as a small side view facing the way they are going along it and pitched up or down by their climb or descent, with their callsign, height difference and how far off the route they are (*JBU715 +1,200↓ · 2.0 NM R*), and a line to where they will be in 30 seconds. The farther off the route, the fainter they are drawn.



Climbing out of Boston on Preview: AAL1004 500 ft above on the route and N142NE 3,300 ft below, 2.8 NM left, on the Profile (right), with the internet traffic on the Map (left) and its credit.

Heights use the altimeter on the Wx tab. The traffic alerts are spoken (see *Alert Voices*). Traffic is decision support: it is not a TCAS, and not every aircraft is seen. The models in which traffic is drawn are in the appendix, *Traffic Models*.



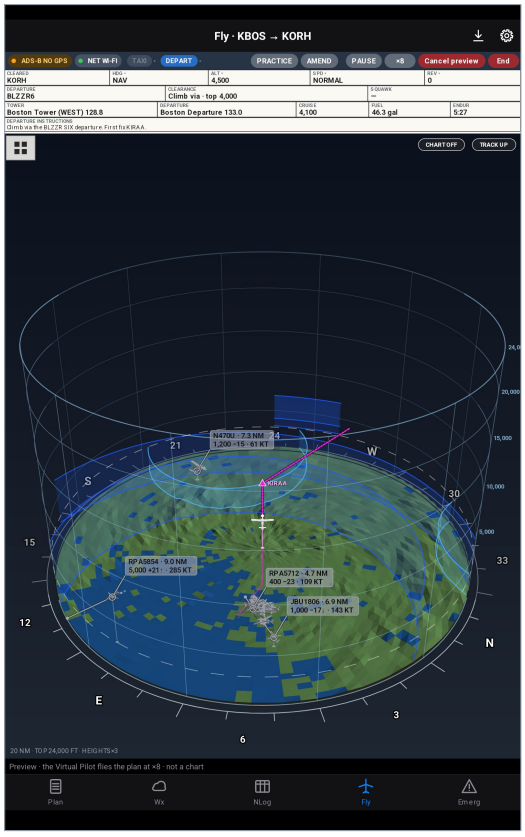
Enroute: the brief on the strip, HITS, Map and Profile.

THE 3D RADAR

The **3D Radar** shows the airspace round you as a cylinder you look into from outside: 20 NM across at first (10 NM each way), from the ground up to 10,000 ft above your aircraft's service ceiling, and at least 5,000 ft above the highest ground in it. Pick it from a pane's Views button. The line at its lower left gives its size and top (*20 NM · TOP 20,950 FT · HEIGHTS ×3*).

- **The floor** is the terrain, colored by height, water blue; or a chart laid on it. The **CHART** chip in the top right steps through **CHART OFF**, **VFR CHART**, **IFR LOW** and **IFR HIGH**.
- **Heights** are drawn three times taller than distances across, so a thousand feet shows; rings on the wall every 5,000 ft carry their altitudes. A compass rose round the outside gives the magnetic directions, with N, E, S and W.
- **Airspace** as volumes from floor to ceiling: Class B blue, C and D a lighter blue; TFRs, prohibited and restricted areas red; MOAs violet, alert areas orange, warning areas amber, and special-use airspace the FAA reports active magenta.
- **Your route** in magenta with its fixes named, the taxi part in yellow as on the taxi views. Near the departure or the destination the airfield is drawn: the runways with their numbers, the taxiways and the buildings.
- **Traffic** as the same 3D aircraft HITS draws, yours among them, each with a line down to the ground and a callout (callsign or tail, altitude, speed, distance, above or below). Green: no factor. Yellow: getting close. Red: danger close, which also speaks the *Traffic* alert when you have it on (receiver traffic only). Internet traffic with no factor is grey. Where callouts crowd, they shorten, then show the name alone.
- **Breadcrumbs**: a dotted trail of where each aircraft has been, for 5 minutes or to the wall. **TrafficTrend**: a line to where each will be.

Drag to look in from any side, and the view stays there. Pinch to zoom, all the way in to your own aircraft. Double-tap to go back to the view from behind and above. The **NORTH UP** / **TRACK UP** chip turns the cylinder with north at the back or your track. Tap an aircraft for its card. **Settings** › **3D Radar** sets the width (10 to 50 NM), the headroom over the ceiling, how much taller heights are drawn, the breadcrumbs and how long they last, and TrafficTrend.



The 3D Radar climbing out of Boston on Preview: the terrain floor, Class B round Logan, the route in magenta, and the traffic in its risk colors with their callouts.

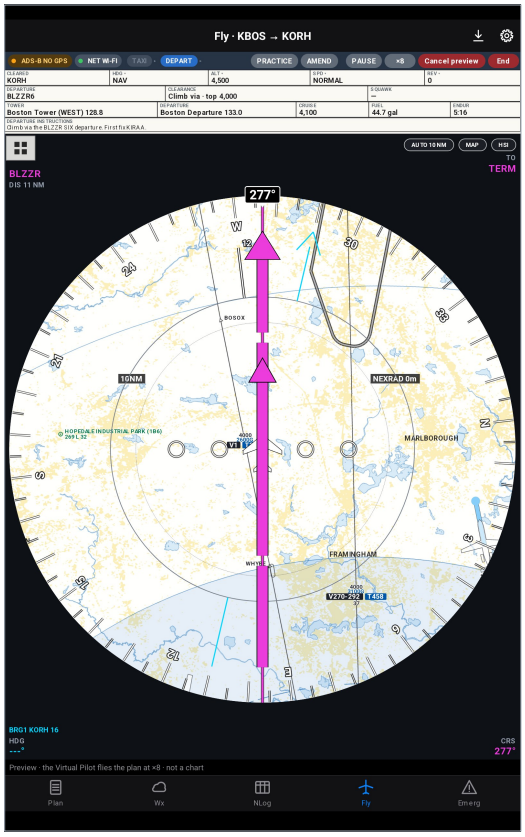
NOTE: The 3D Radar is situational awareness, not a TCAS: not every aircraft is seen, and internet traffic is seconds old.

THE HSI

The **HSI** is a horizontal situation indicator driven by your flight's own GPS course: no VOR, localizer or glideslope. Pick it from a pane's Views button.

- **The rose** turns with your heading (your track, marked *TRK* in magenta, when the receiver or simulator sends no heading), with a small magenta diamond on the rim at your track.
- **The course pointer and deviation bar** (magenta) are the leg you are flying, against two dots each side, with the TO / FROM triangle. Full scale is 2 NM for a VFR plan (**VFR**) and enroute (**ENR**), 1 NM within 30 NM of either airport (**TERM**) and gone missed (**MAPR**), easing to 0.3 NM at the final approach fix (**APPR**). Past full scale it says how far off: *XTK 2.4 NM L*.
- **G** or **V** on the right: the approach's glidepath (an approach with a DA), or the planned descent from 2 NM before the top of descent.
- **Heading bugs**: ATC's heading from AMEND in yellow, your own in cyan. Tap **HDG** in the lower left for a strip of −10, −1, SYNC, +1, +10 and OFF.
- **Bearing pointers** 1 and 2, cyan, each to the next fix, the destination, the departure, the nearest airport or the nearest VOR, its name and distance in a lower corner. The wind is an arrow on the rim with its speed.
- **The corners**: HDG and CRS below; above, two you pick (waypoint, ETE, GS, DTK, TRK, XTK, wind, phase or blank). *NO COURSE* while taxiing, *NO GPS* when the position is lost.

Two chips in the top right: **PLAIN** / **MAP** puts the HITS compass map's moving map inside the rose (terrain, airspace, runways, route, fixes, obstacles, traffic; the IFR LOW chart on an IFR flight in the air), and **HSI** / **ARC** shows the whole rose or the 120° ahead with your aircraft low in the view. With the map on, a third chip gives the range: **AUTO** by your height, or tap it (or pinch) for 1, 2, 5, 10, 20, 50 or 100 NM. Tap an aircraft on the map for its card. **Settings** › **HSI** keeps all of these, the bearing pointers and the top corners.

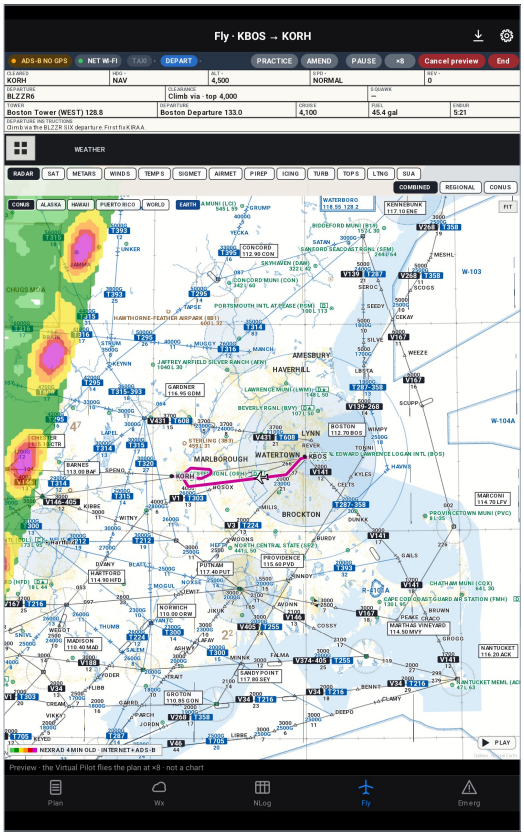


The HSI on Preview with the map inside: the magenta course and deviation bar, the heading box, the bearing pointer to the destination and the wind on the rim.

WEATHER ON THE FLY PAGE

Pick **Wx** from a pane's Views button for the Wx tab's map in the Fly page, round your aircraft, so you can look at the weather while you fly. It has the same pages, layers, altitudes and PLAY as the Wx tab, on smaller pills, with your track on it. Drag to move it, pinch to zoom; tap a station or an advisory for its text. The Wx tab is still there in the top bar.

Zoom in close, on the Fly page or the Wx tab, and your flight's own chart comes in under the weather: the sectional for a VFR plan, IFR low (IFR high at FL180 and above) for an IFR one. It starts to show at about 400 NM across and is all there by 200 NM; keep zooming, down to about 5 NM across, with the weather still on top. Your route is drawn as filed, through its fixes, the SID and the arrival. Zoom out and the chart fades away again.



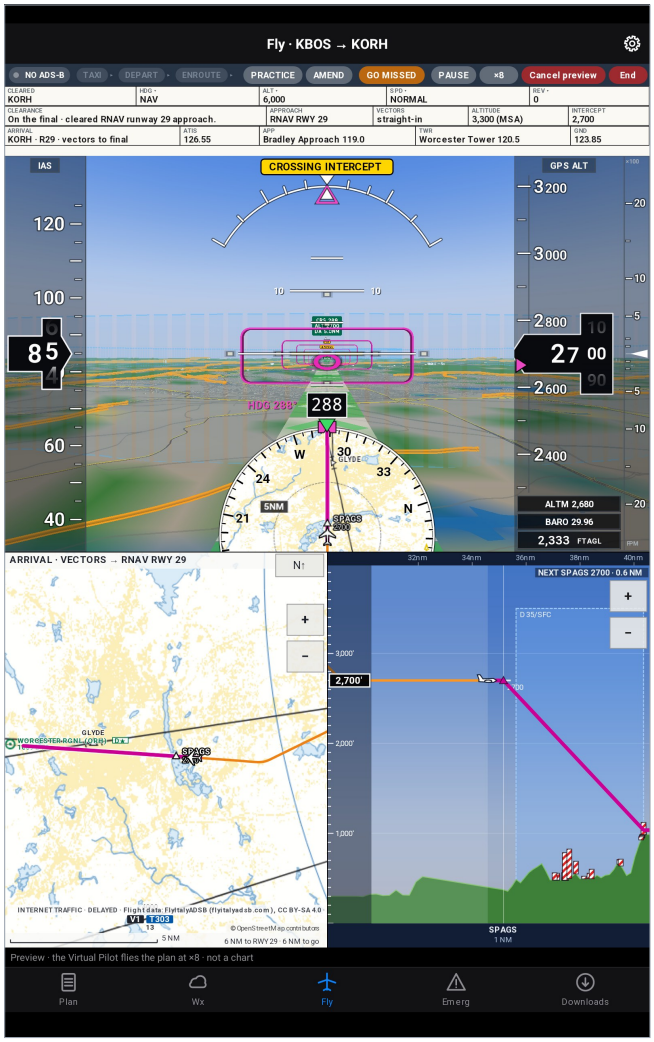
The Wx map as a Fly page view, zoomed in on the route with the flight's chart under the radar.

RADIO CALLS

SkyHeading shows the calls you can expect across HITS for 15 seconds each: *Contact Boston Departure on 133.0* at 500 ft, then inbound the destination's ATIS at 25 NM, approach at 15 NM, and the tower, or the CTAF where no tower is working, at 10 NM. VFR, departure and approach calls come only at Class B and C airports, and pattern work at home stays quiet.

APPROACH, LANDING AND GO MISSED

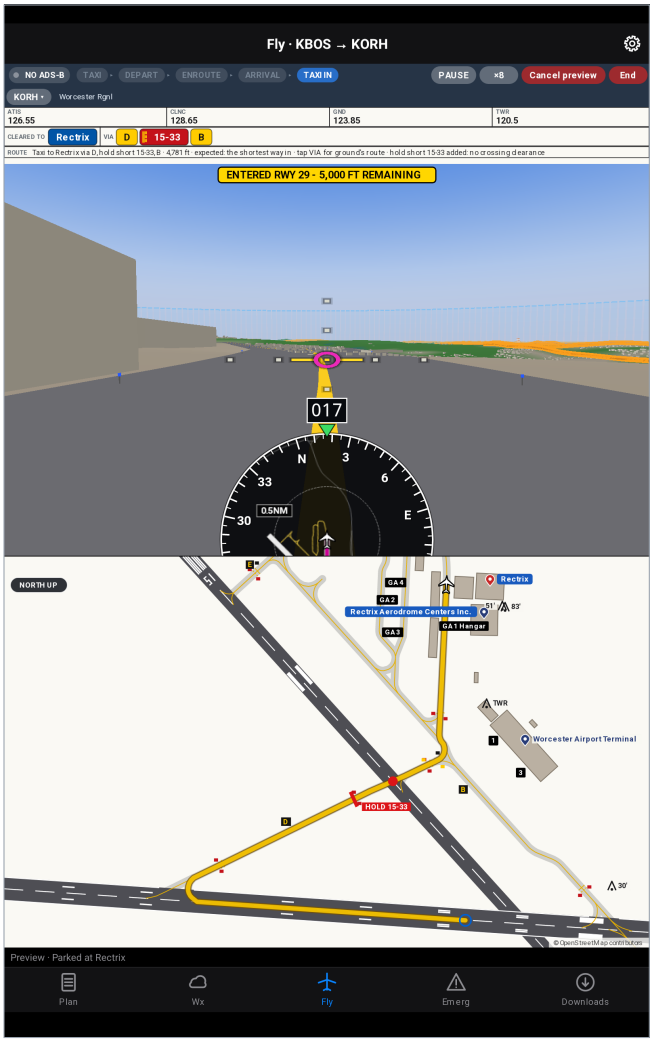
Established on an IFR approach, the Fly page swaps in the approach's plan, profile and brief. Every arrival lands: SkyHeading assumes the runway is in sight at minimums and flies on to the threshold. **GO MISSED** stays on the screen (and on the Fly strip) and flies the published missed approach and its hold whenever you tap it (see *Holds on the missed approach*). A VFR plan flies the pattern to a stop on the runway.



On the approach, with GO MISSED ready.

TAXI IN

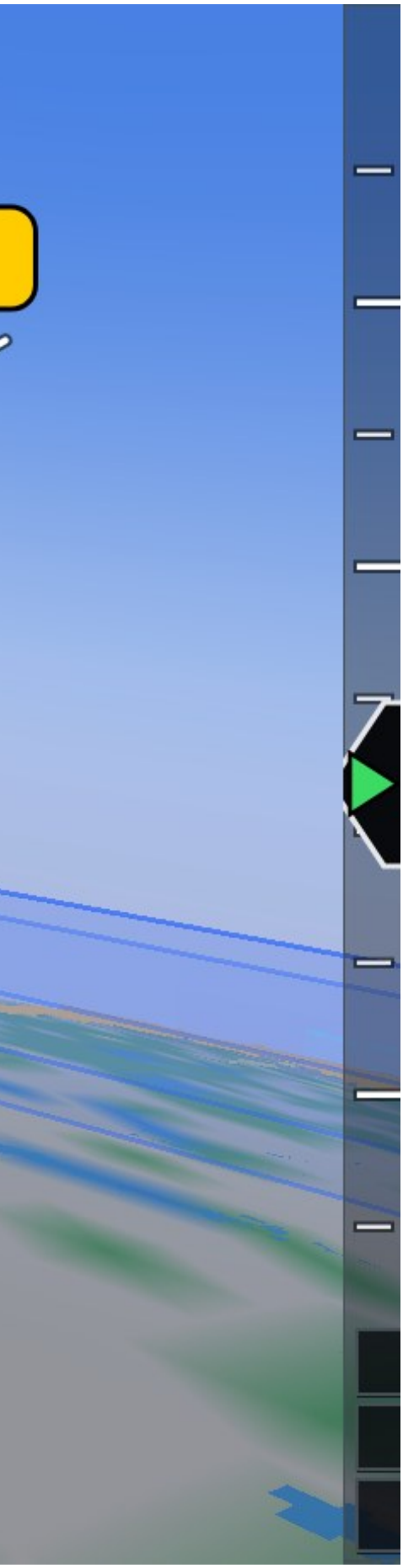
Stopped on the runway, a TAXI IN phase loads the destination airport and routes from where you actually stopped to your parking. Unless you have entered ground's clearance on the Taxi page, that route is the **shortest way in** (see *Destination Taxi*) — at a non-towered field, that is the whole taxi-in. The last 100 ft show **ARRIVED AT** your parking, white on blue like the parking pill, and the flight ends *Parked at ….* The airport remembers where you parked for next time.



TAXI IN done: ARRIVED AT RECTRIX in HITS, the taxi clearance on the strip (via D, hold short 15-33, B), and the route in from the runway on both airport maps.

AMENDMENTS


29.9 NM TD
ADING 230, UP TO 8,000
ALT 6050
10
10
HDG 238°
237
21
24
30
15
V270-2W
10NM
T303
-17



CONTROLLERS CHANGE PLANS. SkyHeading's AMEND keyboard lets you copy a change as it is spoken, in as few taps as possible, and then rebuilds the route from where you are. Your filed plan stays as it was; amendments sit on top of it.

Every amendment applies from your present position, becomes a new revision of the route, and is logged. Amended climbs and descents are flown at 500 ft per minute and turns at standard rate, unless the controller says expedite.

The chapters that follow cover each keyboard page in turn, with worked examples. Amendments are for flights in the air (and for release, void and EDCT on the taxi); a Preview flight does not take them.

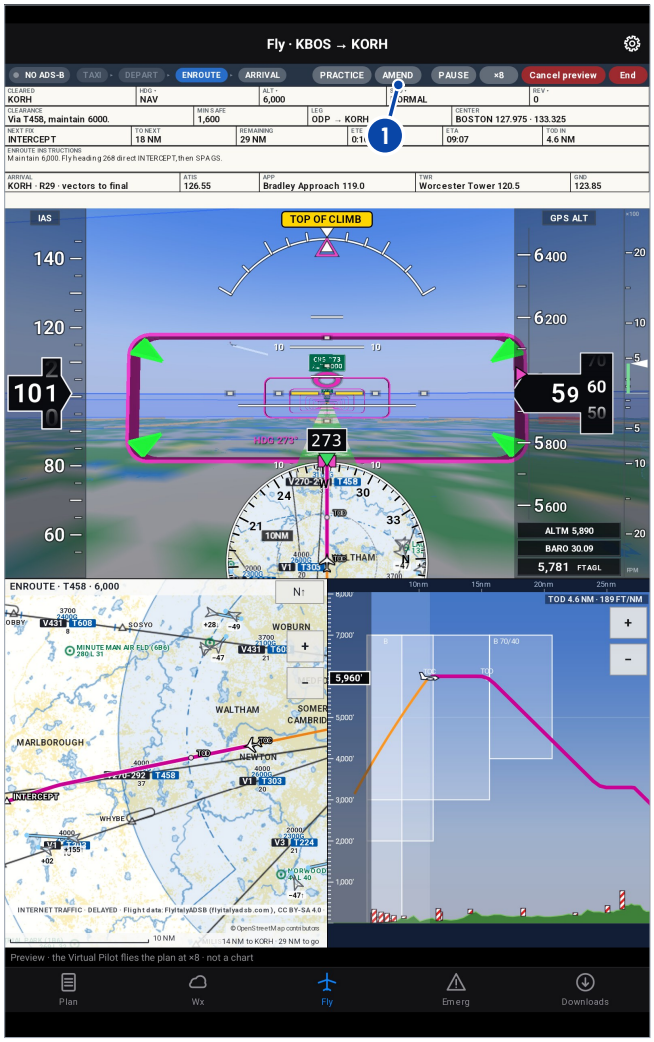
AMENDMENTS

In the air, the Fly strip adds an **AMEND** button and an ATC control panel. Tap AMEND, copy what the controller said on the keyboard that drops over the Map (HITS stays in view), then tap **ENTER**. The hoops rebuild, the readback appears across HITS, and the change is recorded with the flight.

VFR and IFR editions share the same app. The VFR edition keeps headings, altitudes, speeds, radio, weather deviations, direct-to, resume navigation, the pattern and Class B / SVFR. The IFR edition adds crossings, reroutes, holds, approaches, departure release / void / EDCT and divert. Pages you do not have are hidden on the keyboard home.

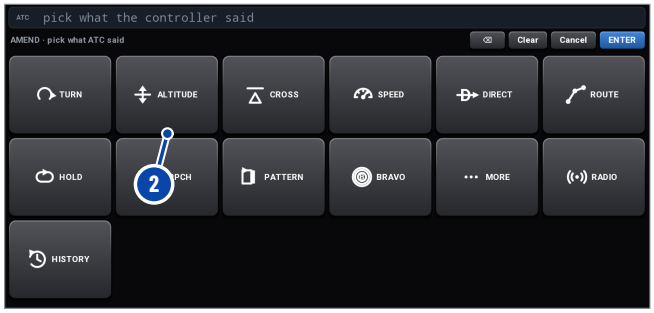
THE AMEND BUTTON

AMEND opens the keyboard over the Fly Map. The categories run in the order a controller typically gives a clearance: TURN, ALTITUDE, CROSS, SPEED, DIRECT, ROUTE, HOLD, APPCH, PATTERN, BRAVO, MORE, RADIO, HISTORY. Each category button shows in yellow what you have already copied in it. ‹ on a page goes back to the categories.



Tap 1. AMEND on the Fly strip.

1 **AMEND** on the Fly strip.



Tap 2. The keyboard opens on its categories; pick the one that matches the clearance.

2 **ALTITUDE** (or TURN, SPEED, … — whichever matches the clearance).

THE ATC CONTROL PANEL

Once you are flying, the strip's cruise menu gives way to the ATC row: the clearance in force, quick menus for a single change, and Practice ATC when that game is running. The numbered discs on the figure match the list below.



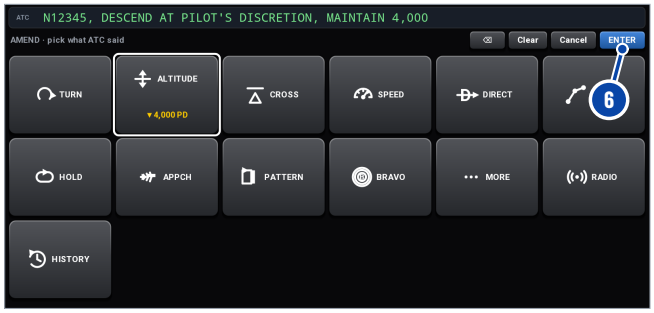
The Fly strip after a readback: AMEND, REVERT counting down, and the ATC row cells.

1. **AMEND** — open the keyboard to copy one or more instructions.
2. **REVERT** — after ENTER, sits on the strip for about 15 seconds with a countdown. Tap it to put the previous revision back if you mistyped or the controller corrects the clearance.
3. **CLEARED** — the clearance limit (destination or a short-range fix).
4. **HDG** ▾ — lateral clearance: NAV on the route, a heading, DCT a fix, a deviation, or a hold. Tap for a one-change menu (LEFT / RIGHT / PRESENT HDG, DEVIATE, RESUME NAV, CLEAR OF WEATHER, LEAVE HOLD) applied at once with REVERT.
5. **ALT** ▾ — altitude in force and the next crossing. Tap for climb / descend / maintain / VIA.
6. **SPD** ▾ — ATC speed (or NORMAL). Tap for increase / reduce / maintain / resume normal.
7. **RADIO** — last frequency, squawk and altimeter copied.
8. **REV** ▾ — revision number. Opens the revision list and LOST COMMS · 91.185 guidance.

Other cells appear when they matter: **RTE** once the route has been amended; **PRACTICE** when Practice ATC is on (score · streak · countdown, or tap to start a Round); **PATTERN**, **BRAVO**, **SVFR**, **EFC** and **DEP** when those clearances are in force.

CHAINING INSTRUCTIONS

A controller often gives more than one thing in the same transmission: *N12345, turn left heading 270, descend and maintain 4,000, reduce speed to 160.* Copy each piece on its own page before ENTER. The keyboard stays open; each pick returns to the categories (HOLD stays open while you fill its rows). Pending pills replace the phase brief on the strip, and the **ATC line** at the top of the keyboard rebuilds the clearance in the controller's words after your call sign.



Tap 6. Several items copied, not yet entered: the ATC line spells out the clearance; category buttons and strip pills show what is pending.

6. **ENTER** — applies everything pending as one revision.

Example chain: **TURN** → ← LEFT → ←270, then **ALTITUDE** → ▾ DESCEND → 4,000, then **SPEED** → ▾ REDUCE → ▾160, then **ENTER**. One revision, one readback, one REVERT window.

⌫ removes the last pick, **Clear** empties everything pending, **Cancel** closes without applying. An item SkyHeading cannot fly still goes into the readback as **UNABLE**, and the rest applies: *UNABLE FL200, LEFT HEADING 270*.

ENTER, THE READBACK AND REVERT

ENTER applies everything pending as one revision. HITS shows the readback for about six seconds on a yellow sign (more lines when it is long), spoken aloud too when **Speak readbacks** is on in Settings. The hoops rebuild from where you are, and the revision is logged.

Immediately after ENTER, **REVERT** appears on the strip with a countdown (about 15 seconds). Tap it to cancel that revision — useful if you pressed the wrong altitude, or if the

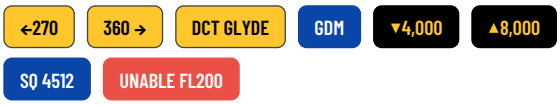
controller says *correction* right after the clearance. When the countdown ends, REVERT disappears; further changes are new amendments. **REV ▾** still lists every revision, including undos.

1. **ENTER**: everything copied applies as one revision.
2. **REVERT**, while it counts down: the previous revision returns.

NOTE: The app labels the cancel pill REVERT (not Revert). Same idea: a short window to take back what you just entered.

KEYBOARD PARTS

- **ATC line**: the clearance as copied, in the controller's words.
- ⌫, **Clear**, **Cancel**, **ENTER**: under the ATC line.
- **Direction row** first on every page; the rows below hold only values that make sense, nearest first. The rest are behind **more ▾**. Lists stay fixed while the keyboard is open.
- **Typed box** beside the page's name: a heading, altitude or frequency typed instead of a pill.
- **Pill colors** follow airport signs: headings, turns and fixes black on yellow; navaids and radio white on blue; altitudes yellow on black. Dimmed: unusual, still allowed. Red: reads back UNABLE.



Amendment pills: a heading, a 360, direct to a fix and to a navaid, a descent, a climb, a squawk, and an item SkyHeading cannot fly.

SEEING IT BEFORE YOU ENTER IT

While you copy, the Map blinks the new path in magenta and the Profile dashes the new altitude, with an amber line where an item is below the MEA or safe altitude. Both update every two seconds as the airplane moves. Pending pills on the strip can be tapped to reopen their page.

ON THE ARRIVAL

- A heading, turn or PRESENT HDG leaves the STAR or approach for a vector; with no altitude given, you keep the one you are at.
- DIRECT to a fix on the arrival rejoins there; to any other fix flies there, then rejoins 2 NM past abeam.
- Back on a STAR after leaving it, SkyHeading holds the last assigned altitude until it must descend for the STAR's end, or until ATC says *descend via* again.
- On the approach or vectors to final, an altitude alone reads back UNABLE; published altitudes stand.
- In the pattern, on the missed approach or inside the FAF, anything to fly reads back UNABLE; frequency, squawk and altimeter still apply.

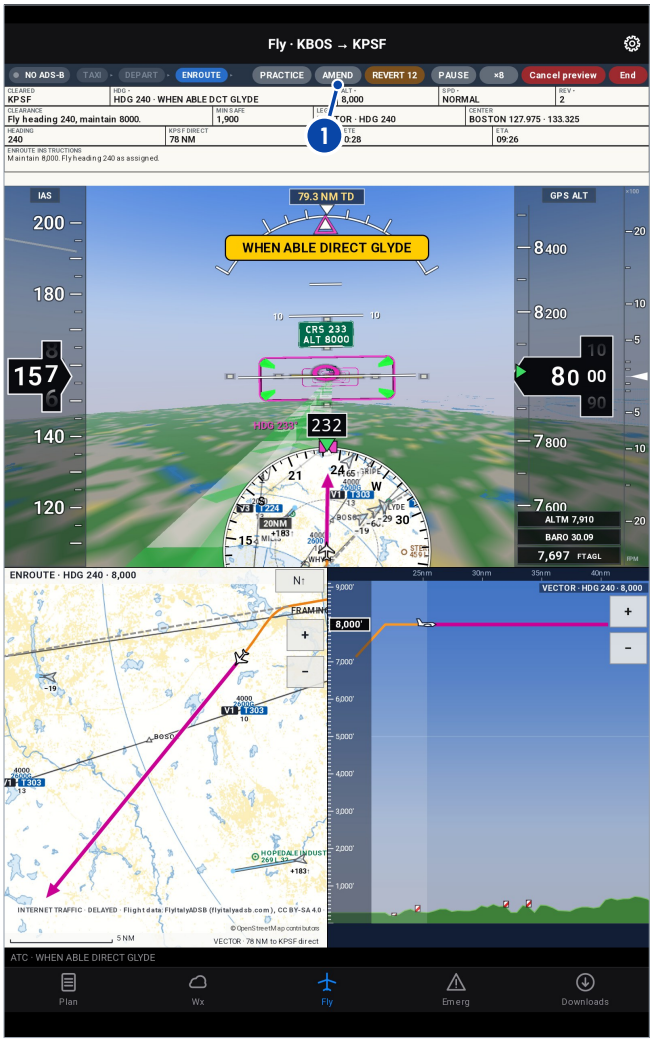
TURN

TURN copies headings, degree turns, 360s, present heading, expedite, weather deviations, resume navigation / SID / STAR, when-able directs, and the vector purpose / expect phrases.

- **← LEFT** or **RIGHT →**: headings in 5° steps on that side, or a turn by **DEGREES** (5° to 180°).
- **HDG**: a heading flown the shorter way when no turn direction is given.
- **PRESENT HDG**: hold the heading you are on.
- **← 360** / **360 →**: a full turn, then on with the heading or route you had.
- **EXPEDITE**: a faster turn.
- **WHEN ABLE**: the next heading or DIRECT is *when able*.
- **RESUME NAV** (on a vector): back to the route; reads *RESUME OWN NAVIGATION*. **POSN, RESUME NAV ▾** adds ATC's position.
- **RESUME** and the SID or STAR you left, while you are off it.
- **DEVIATION** row: weather deviations (degrees or compass point of course, ADVISE CLR WX).
- **VECTOR FOR · EXPECT**: FOR SPACING, EXPECT DIRECT / RESUME / VECTOR ACROSS (shown, not flown).

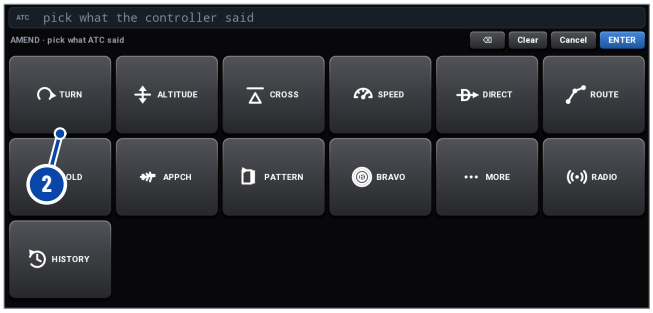
A heading takes you off the route (a vector). The Map and Profile draw it five minutes ahead in magenta; the old route is dashed gray. RESUME NAV turns onto a 30° intercept at least 2 NM past abeam. A DIRECT also ends a vector.

Example 1 — Right heading 320
Clearance: *N12345, turn right heading 320.*



Tap 1. AMEND on the Fly strip.

1 **AMEND** on the Fly strip.



Tap 2. TURN on the AMEND keyboard.

2 **TURN**.



Taps 3–5. RIGHT →, heading 320, then ENTER.

3 **RIGHT →**.

4 **→320**.

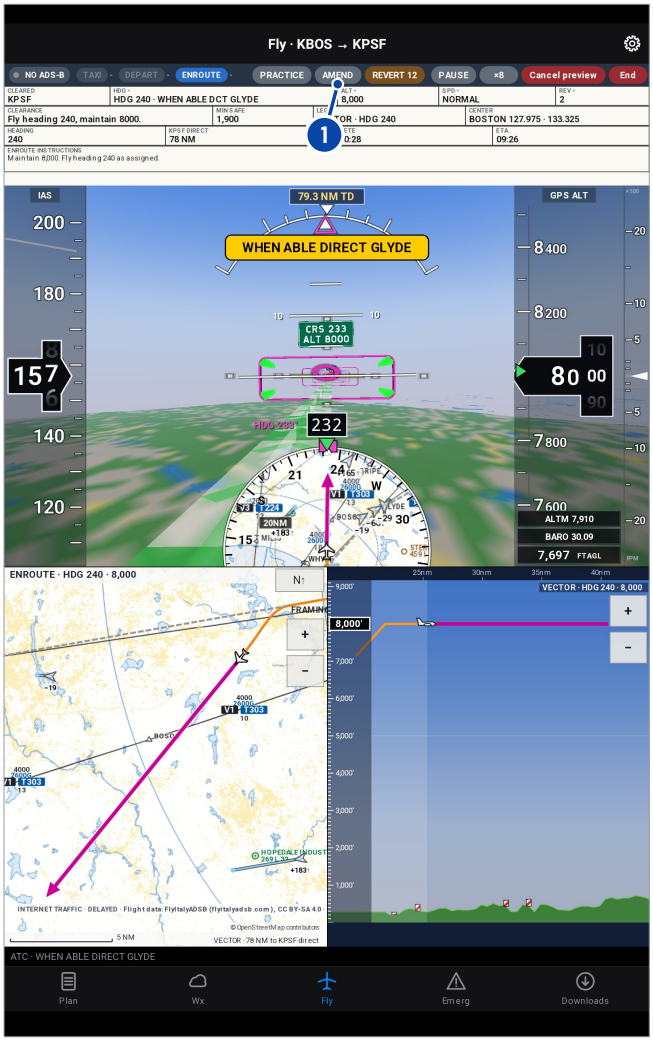
5 **ENTER**.



After ENTER: vector five minutes ahead, route dashed gray, REVERT on the strip.

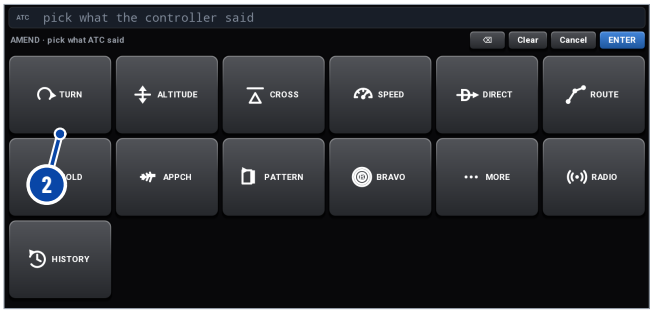
Example 2 — Deviation 20° right of course

Clearance: *Deviation 20 degrees right of course approved, advise clear of weather.* Same open as Example 1 (taps 1–2), then the DEVIATION row:



Tap 1. AMEND on the Fly strip.

1 **AMEND** on the Fly strip.



Tap 2. TURN on the AMEND keyboard.

2 **TURN**.



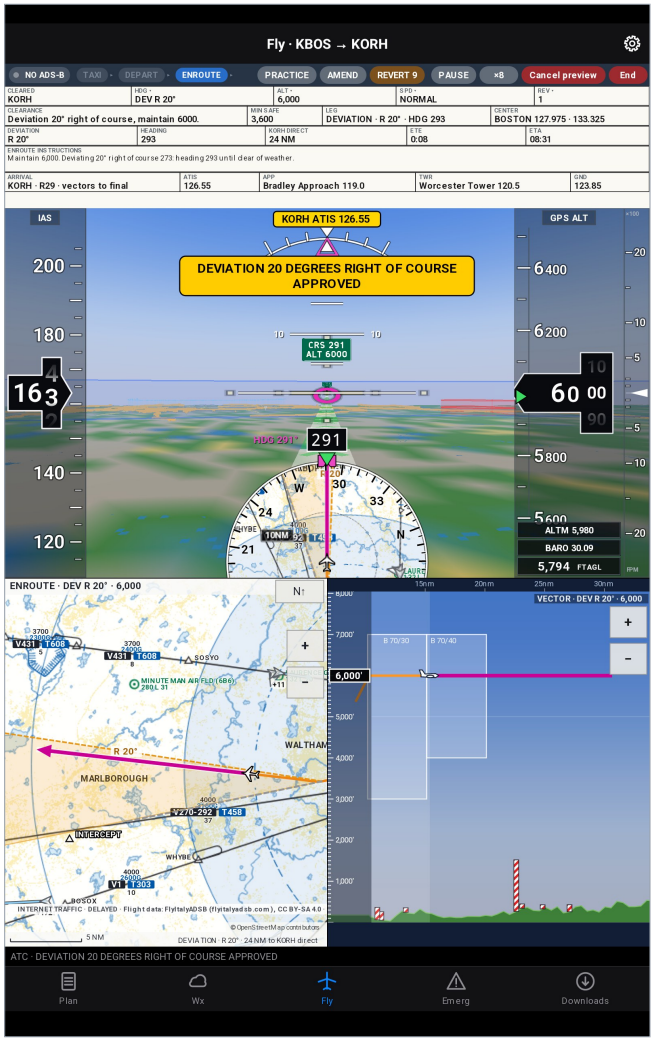
Taps 3–5. RIGHT →, 20° in the DEVIATION row, then ENTER.

3 **RIGHT →**.

4 **→20°** in the DEVIATION row (ADVISE CLR WX stays on).

5 **ENTER**.

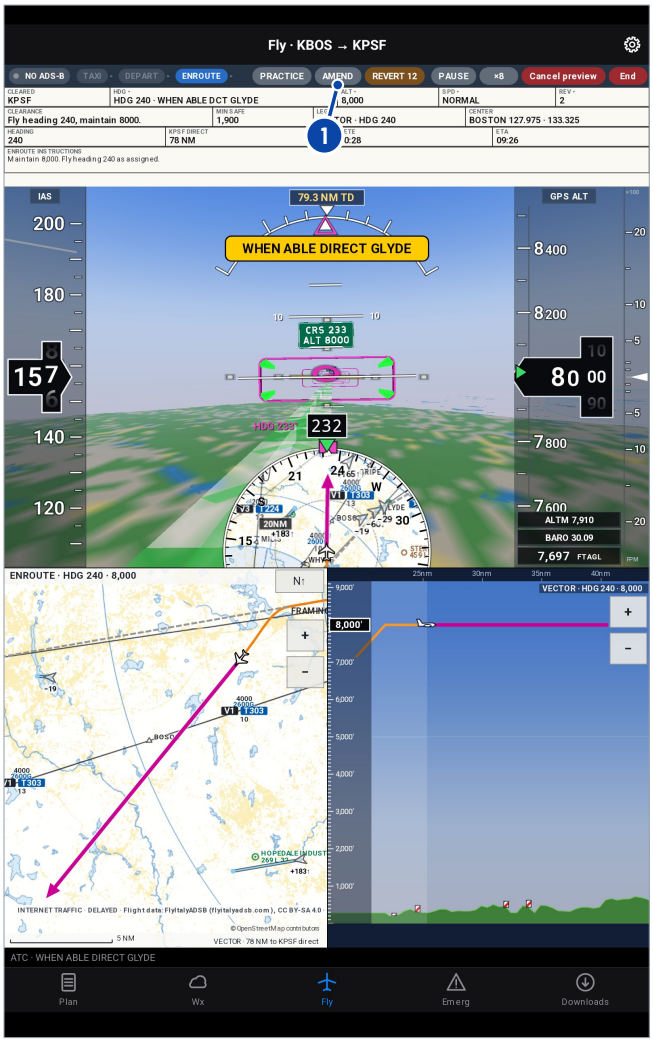
SkyHeading flies an offset heading, draws amber limits on the Map, and keeps no hoops until you rejoin. Tap **CLEAR OF WX** when clear; then RESUME NAV, a DIRECT or a heading ends the deviation.



Deviating 20° right: amber limits, DEV R 20° on the ATC row.

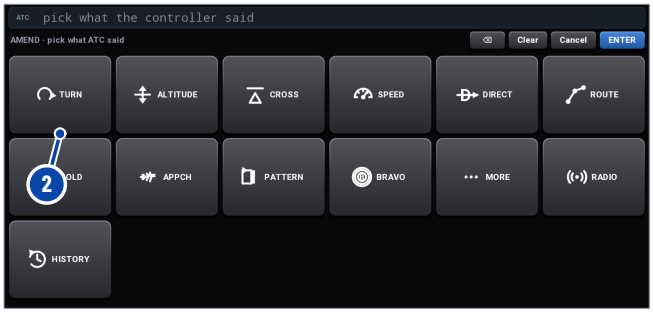
Example 3 — Expect to resume, then resume the STAR

First: *Expect to resume the OOSHN FIVE arrival at RODEE.* Later: *Resume the OOSHN FIVE arrival, descend via.*



Tap 1. AMEND on the Fly strip.

1 **AMEND** on the Fly strip.



Tap 2. TURN on the AMEND keyboard.

2 **TURN**.

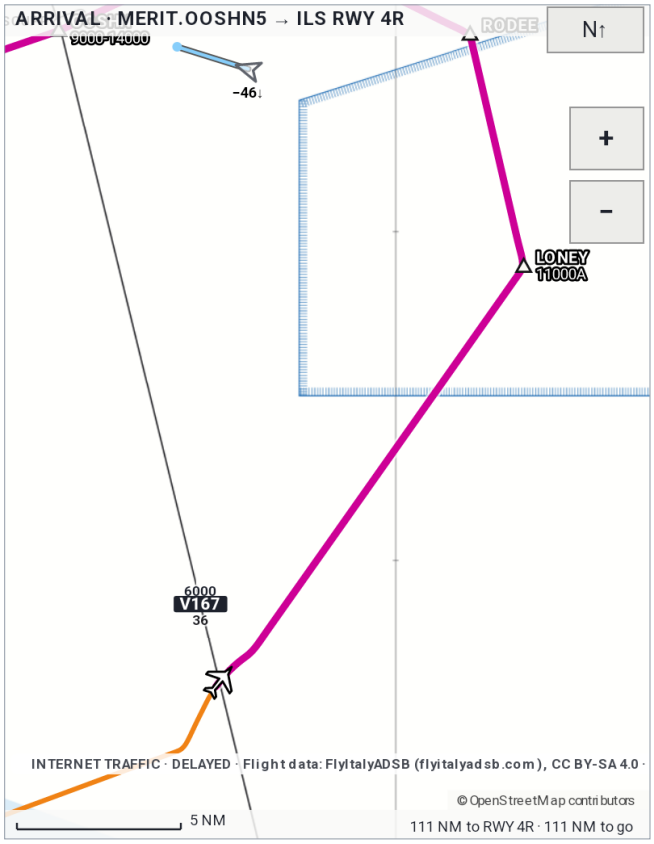


Taps 3–4. Off the STAR: EXP RESUME ▾, then RESUME OOSHN5.

3 **EXP RESUME** ▾ → expect OOSHN5 at RODEE. **ENTER**.

4 Later: **RESUME OOSHN5**. **ENTER**.

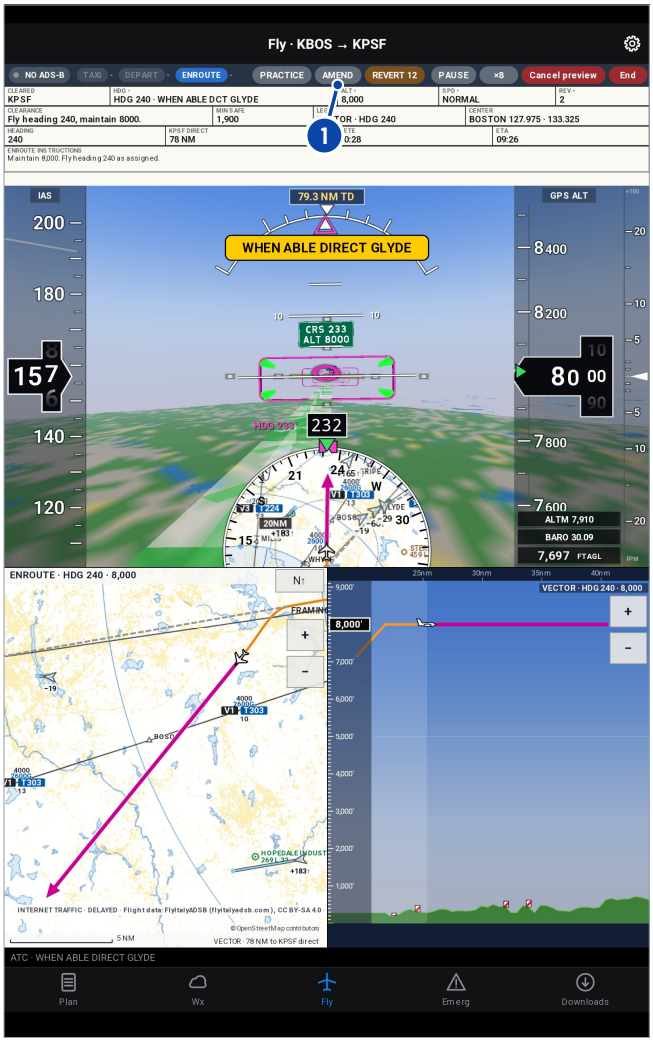
Then open **AMEND** → **ALTITUDE**, tap **DESCEND VIA**, **ENTER**.



Back on the OOSHN FIVE after RESUME and DESCEND VIA.

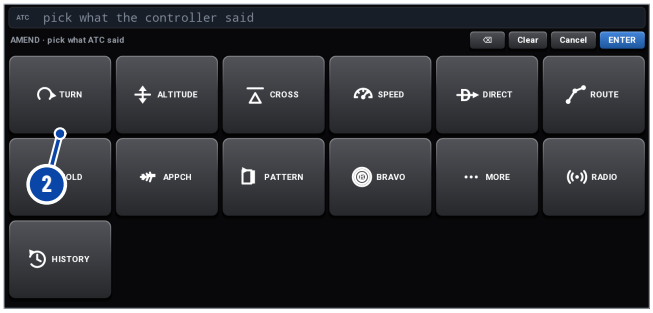
Example 4 — When able direct, then clear of weather

While on a deviation: *When able, proceed direct GLYDE.* First copy the when-able direct (AMEND → TURN → WHEN ABLE → DIRECT → GLYDE → ENTER). When clear:



Tap 1. AMEND on the Fly strip.

1 **AMEND** on the Fly strip.



Tap 2. TURN on the AMEND keyboard.

2 **TURN**.



Taps 3–4. CLEAR OF WX flies the held WHEN ABLE DIRECT.

3 **CLEAR OF WX**.

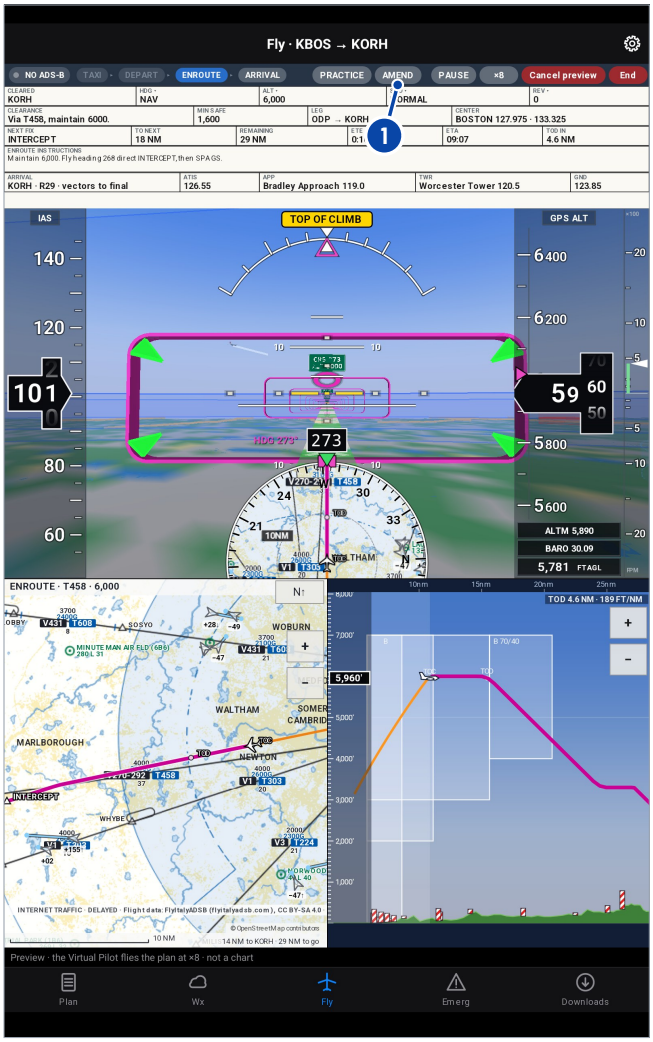
4 **ENTER** (or use HDG ▾).

ALTITUDE

ALTITUDE copies climbs, descents, maintain, expedite, climb/descend via, AT / AT OR ABOVE / AT OR BELOW / BLOCK, WHEN (now, after, until, pilot's discretion), EXPECT altitudes, and VFR-on-top.

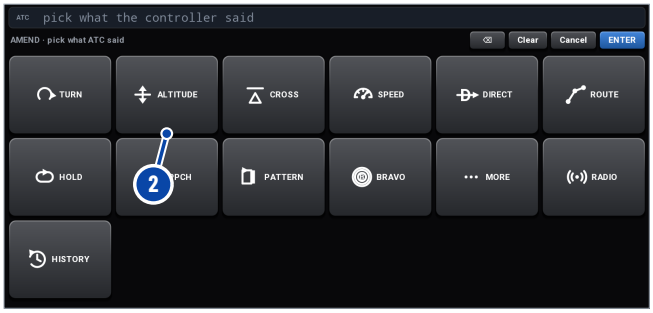
- ▲ **CLIMB** / ▼ **DESCEND**: only altitudes above or below you; IFR thousands, VFR +500.
- **MAINTAIN**: present altitude. **EXPEDITE**: faster climb or descent.
- **CLIMB VIA** / **DESCEND VIA** on a SID or STAR.
- **AT** row: AT, AT OR ABOVE, AT OR BELOW, BLOCK (pick both ends).
- **WHEN**: NOW, AFTER PASSING, UNTIL, PILOT'S DISCRETION, NOW TO … THEN PD.
- **EXPECT**: shown on the ATC row and in HISTORY; not flown.
- **VFR-ON-TOP**: IFR plan flies the VFR cruising level for the course (odd/even +500).

Example 1 — Descend pilot's discretion to 4,000
Clearance: *Descend at pilot's discretion, maintain 4,000.*



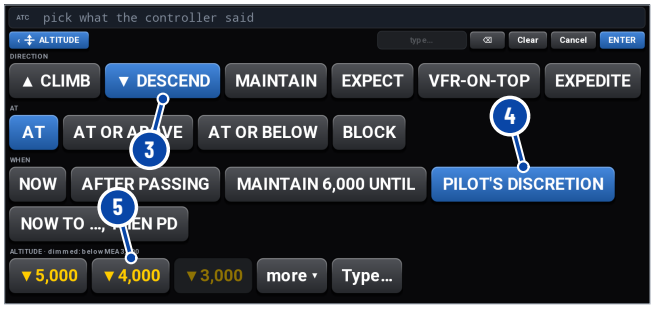
Tap 1. AMEND on the Fly strip.

1 **AMEND** on the Fly strip.



Tap 2. ALTITUDE on the AMEND keyboard.

2 **ALTITUDE**.



Taps 3–5. ▼ DESCEND, PILOT'S DISCRETION, then 4,000.

3 **▼ DESCEND**.

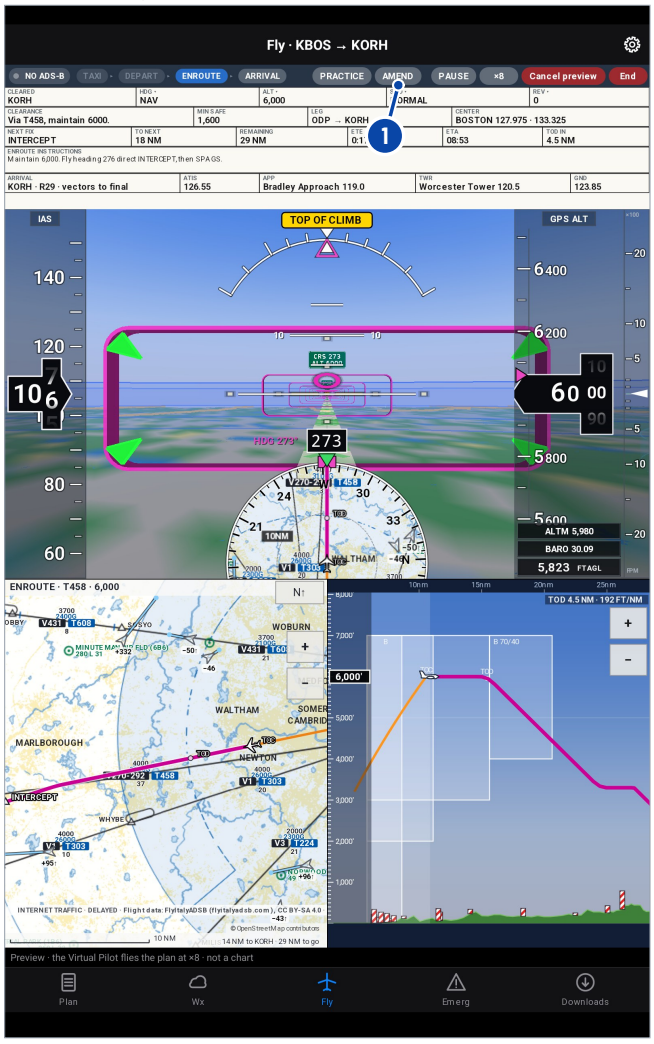
4 **PILOT'S DISCRETION**.

5 **4,000**.

Then **ENTER** (tap 6 on the next figure in *Chaining instructions*).

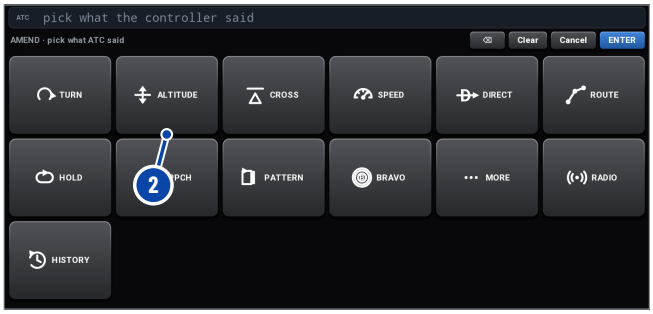
Example 2 — Expect lower in 10 miles

Clearance: *Expect lower in 10 miles.*



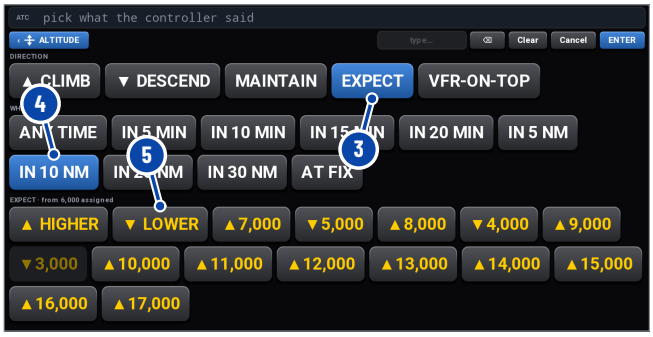
Tap 1. AMEND on the Fly strip.

1 **AMEND** on the Fly strip.



Tap 2. ALTITUDE on the AMEND keyboard.

2 **ALTITUDE**.



Taps 3–5. EXPECT, IN 10 NM, then ▼ LOWER.

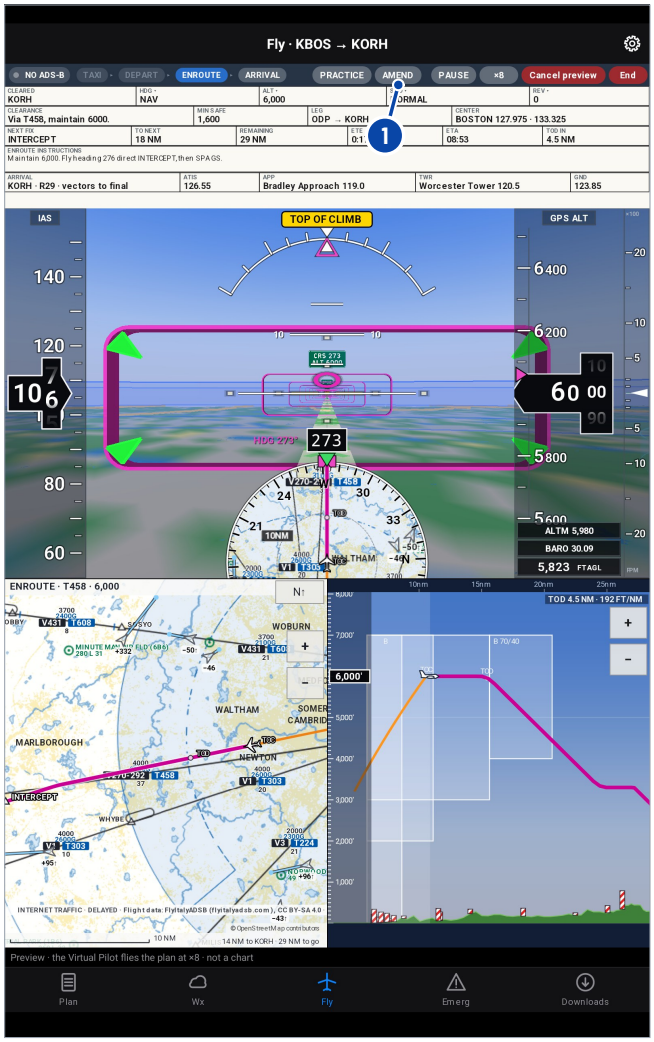
3 **EXPECT**.

4 **IN 10 NM**.

5 **▼ LOWER**. Then **ENTER**.

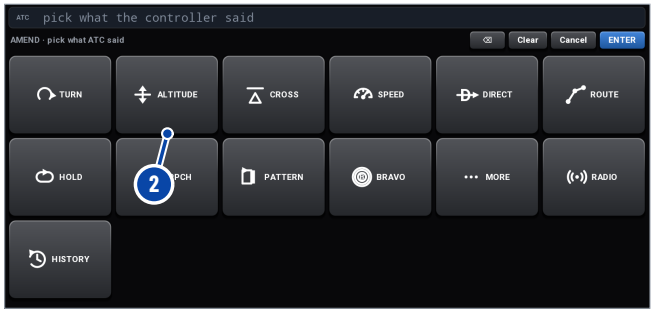
Example 3 — VFR-on-top at or above 5,000

Clearance: *Maintain VFR-on-top at or above 5,000.*



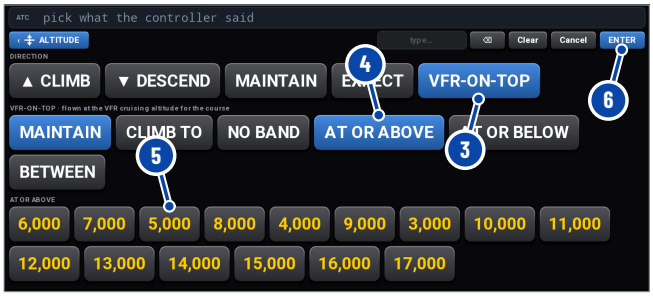
Tap 1. AMEND on the Fly strip.

1 **AMEND** on the Fly strip.



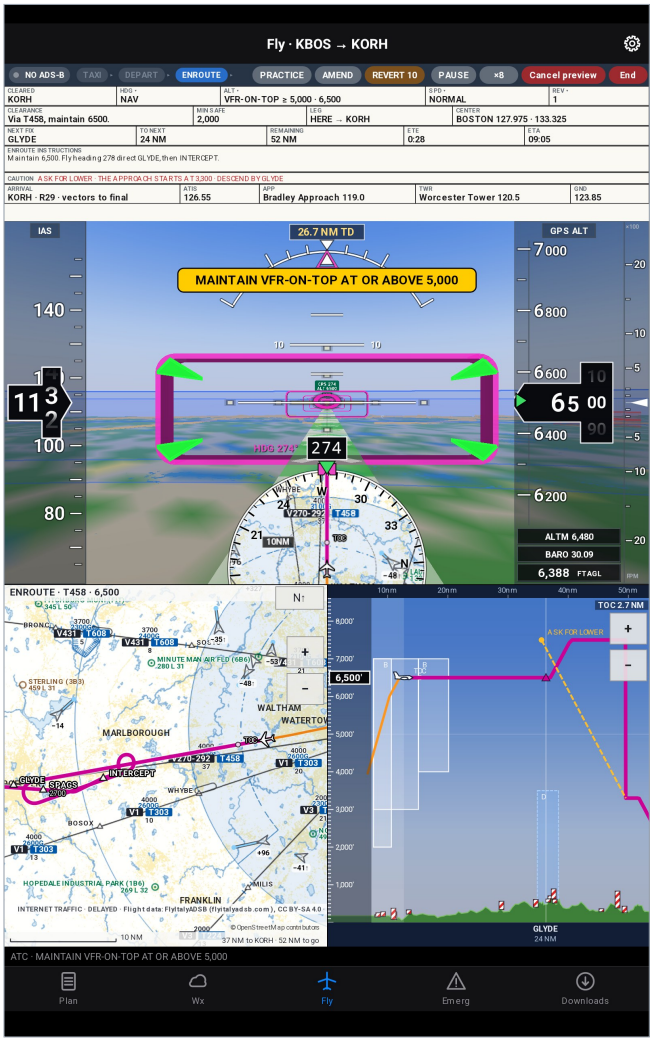
Tap 2. ALTITUDE on the AMEND keyboard.

2 **ALTITUDE**.



Taps 3–6. VFR-ON-TOP, AT OR ABOVE, 5,000, then ENTER.

3. **VFR-ON-TOP**.
4. **AT OR ABOVE**.
5. **5,000**.
6. **ENTER**.



Westbound at 6,500; Profile steps when the course turns north.

Example 4 — Except after a STAR fix

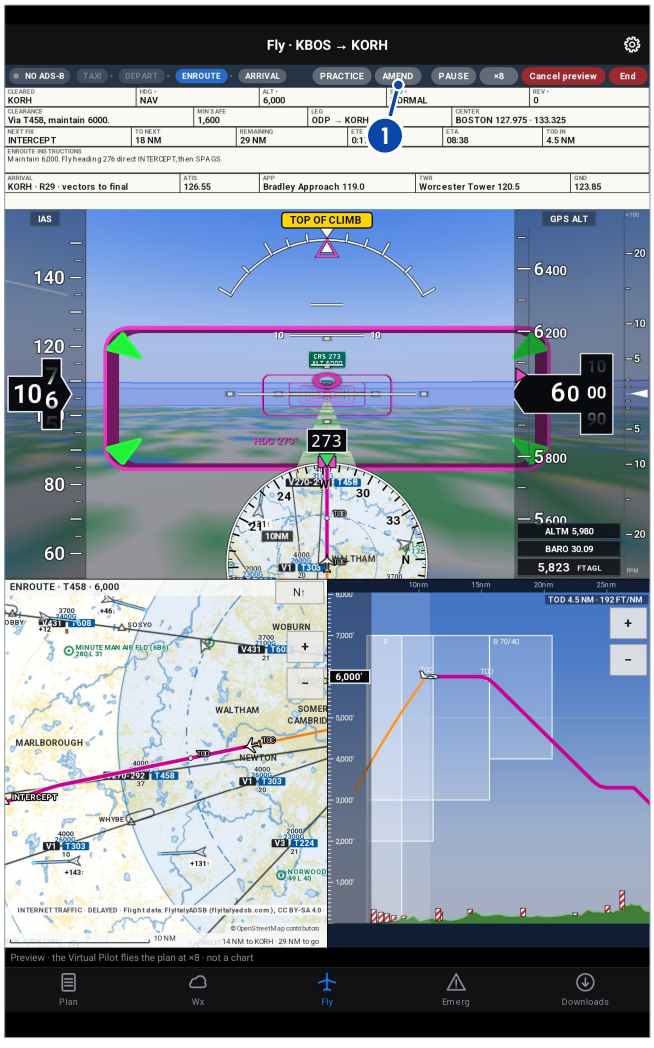
On a descend-via STAR: *Except after EURRO maintain 10,000.* On ALTITUDE, WHEN offers **EXCEPT AFTER**; pick EURRO then 10,000. Published altitudes to EURRO still stand; past it you hold 10,000. A plain *descend and maintain 8,000* cancels descend via and its except forms. Open **AMEND** → **ALTITUDE**, then ▼ **DESCEND** (or MAINTAIN), **EXCEPT AFTER**, **EURRO**, **10,000**, **ENTER**.

CROSS

CROSS copies altitude restrictions at a fix on the route ahead. The Profile draws each crossing as a window; if the airplane cannot make it, the readback says so. Cancel with the trash can on HISTORY.

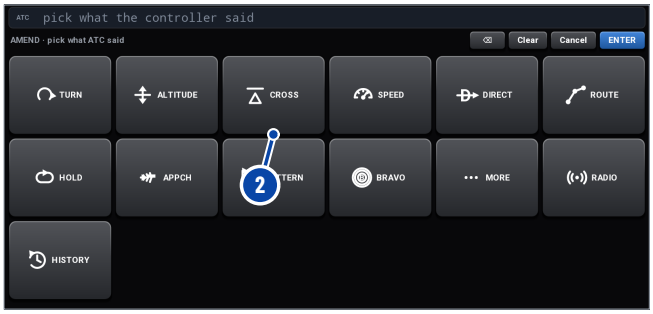
Example 1 — Cross at or above

Clearance: *Cross GLYDE at or above 5,000.*



Tap 1. AMEND on the Fly strip.

1. **AMEND** on the Fly strip.



Tap 2. CROSS on the AMEND keyboard.

2 **CROSS**.



Taps 3–6. Fix, kind of restriction, altitude, then ENTER.

3 **GLYDE**.

4 **AT OR ABOVE**.

5 **5,000**.

6 **ENTER**.

Example 2 — Cross at and maintain

Clearance: *Cross ZUMBY at and maintain 6,000.*

Open **AMEND** → **CROSS**, then **ZUMBY**, **AT AND MAINTAIN**, **6,000**, **ENTER**.

Example 3 — Descend via except cross

Clearance: *Descend via the OOSHN FIVE arrival except cross LONEY at or above 12,000.* CROSS lists the STAR's fixes under DESCEND VIA … EXCEPT CROSS. Open **AMEND** → **CROSS**, pick **LONEY** under the except row, then **AT OR ABOVE**, **12,000**, **ENTER**.

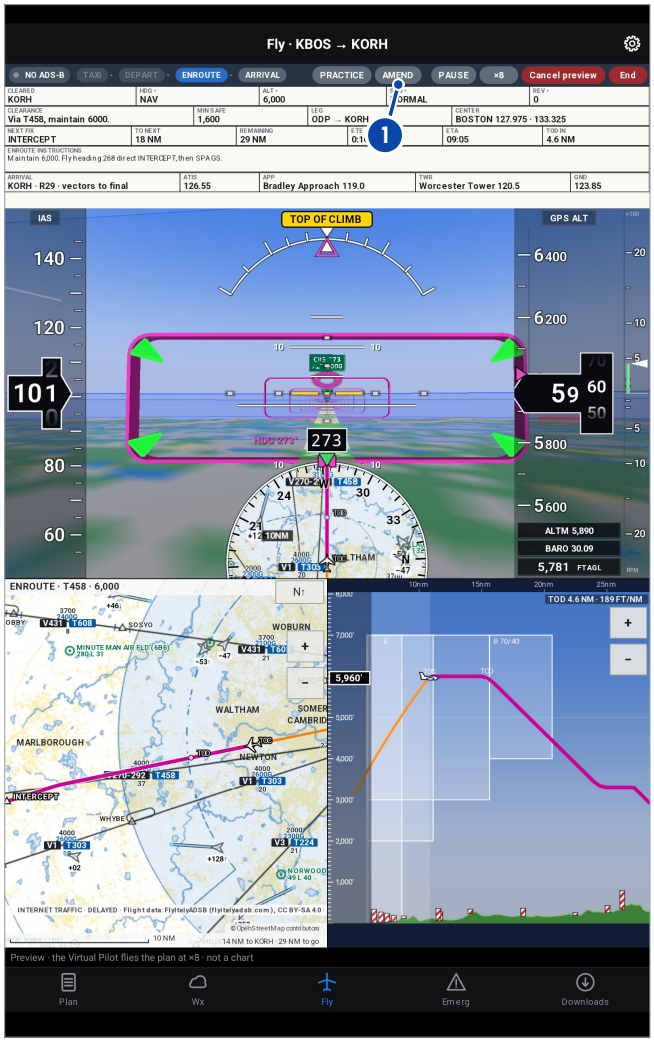
SPEED

SPEED copies ATC indicated airspeeds. Speeds run in 5-knot steps between your type's slowest and fastest. In HITS the magenta ATC bug moves to the assigned speed; more than 10 knots off for 8 seconds brings a banner cue.

- ▲ **INCREASE** / ▼ **REDUCE** / **MAINTAIN**, then the speed. **SLOWEST PRACTICAL** and **MAX FORWARD** are pinned first.
- **WHEN**: NOW, UNTIL, CROSS, AFTER PASSING; with an altitude, SPEED THEN ALT or ALT THEN SPEED.
- **PUBLISHED**: RESUME PUBLISHED, COMPLY W/ / DELETE RESTRICTIONS on SID / STAR / approach.
- Holding speeds are on HOLD; 91.117 limits show as a LIM bug (UNABLE above a limit ATC cannot lift).
- Tape tag: **IAS**, **EST IAS** or **GS** (ground speed only: no bug, CHECK ASI reminder).

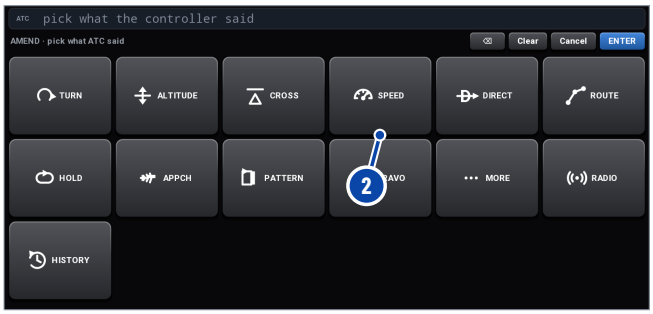
Example 1 — Reduce to 140

Clearance: *Reduce speed to 140.*



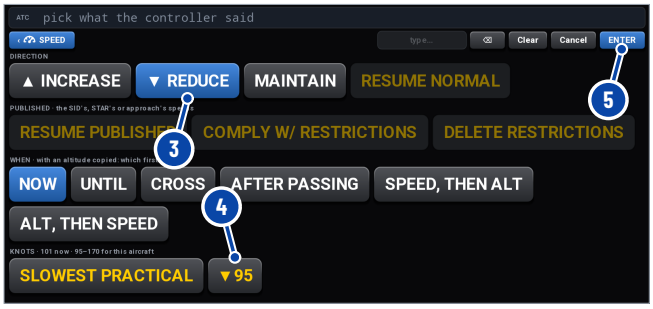
Tap 1. AMEND on the Fly strip.

1. **AMEND** on the Fly strip.



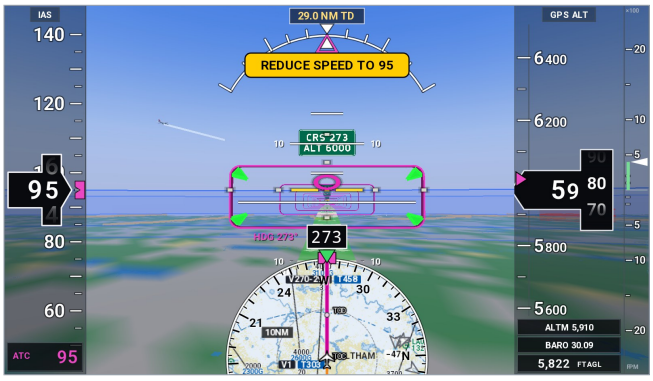
Tap 2. SPEED on the AMEND keyboard.

2. **SPEED**.



Taps 3–5. ▼ REDUCE, ▼140, then ENTER.

3. **▼ REDUCE**.
4. **▼140**.
5. **ENTER**.



ATC bug at 140 on the speed tape.

Example 2 — Cross a fix at a speed

Clearance: *Cross GLYDE at 160 knots.*

Open **AMEND** → **SPEED**, then **CROSS** (WHEN), **GLYDE**, **MAINTAIN** (or REDUCE / INCREASE), **160**, **ENTER**.

Example 3 — Resume normal speed

Clearance: *Resume normal speed.*

Open **AMEND** → **SPEED**, then **RESUME NORMAL**, **ENTER**. Or tap **SPD** ▾ → resume normal for a one-tap change.

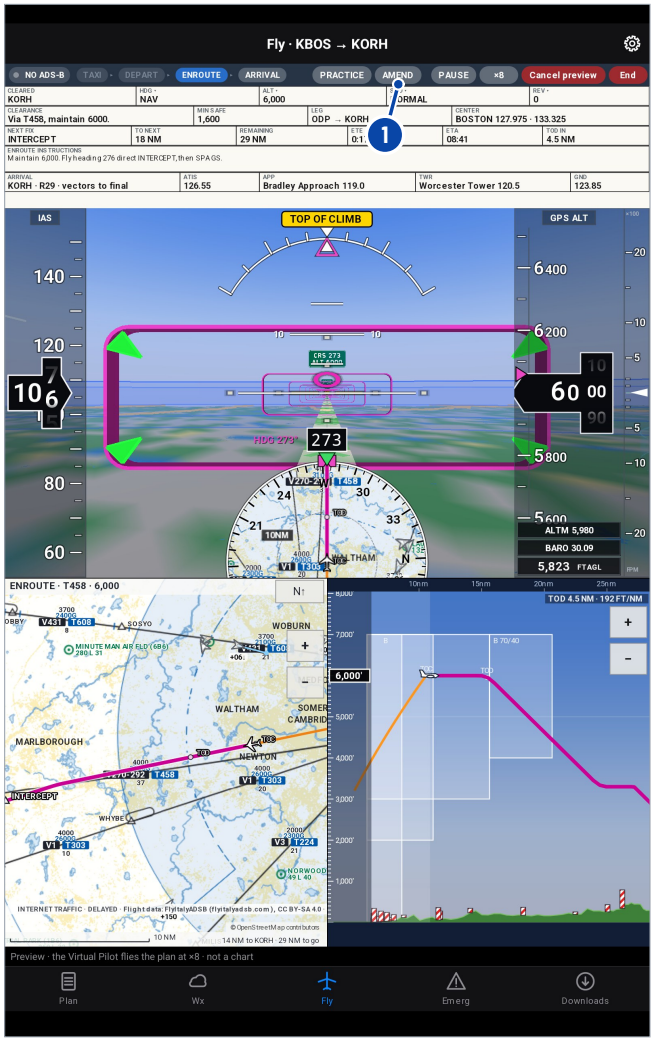
DIRECT

DIRECT lists route fixes ahead, the destination, approach IAFs / IFs and nearby navaids, or **Type…** any other. The route rebuilds straight to the fix and on from there.

- **AFTER** ▾: *after GLYDE, proceed direct FAIDS* — fly to GLYDE as filed, then direct.
- Destination: *cleared direct KPSF airport* — IFR joins the approach on the way; VFR to the pattern entry.
- **Type…** with more than one fix opens the Route keyboard as a new route.

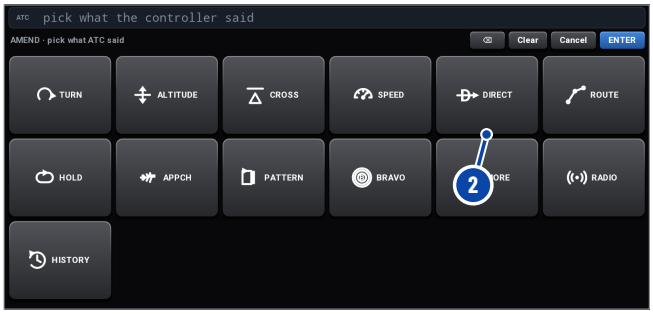
Example 1 — Direct to a fix

Clearance: *Proceed direct GLYDE.*



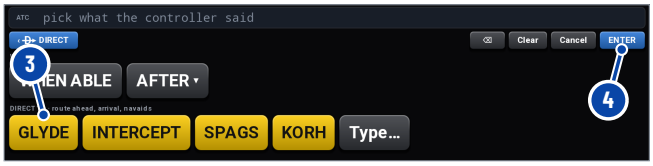
Tap 1. AMEND on the Fly strip.

1. **AMEND** on the Fly strip.



Tap 2. DIRECT on the AMEND keyboard.

2 **DIRECT**.



Taps 3–4. Pick GLYDE, then ENTER.

3 **GLYDE**.

4 **ENTER**.

Example 2 — After a fix, direct
Clearance: *After GLYDE, proceed direct FAIDS.*
Open **AMEND** → **DIRECT**, then **AFTER** ▾, **GLYDE**, **FAIDS**, **ENTER**.

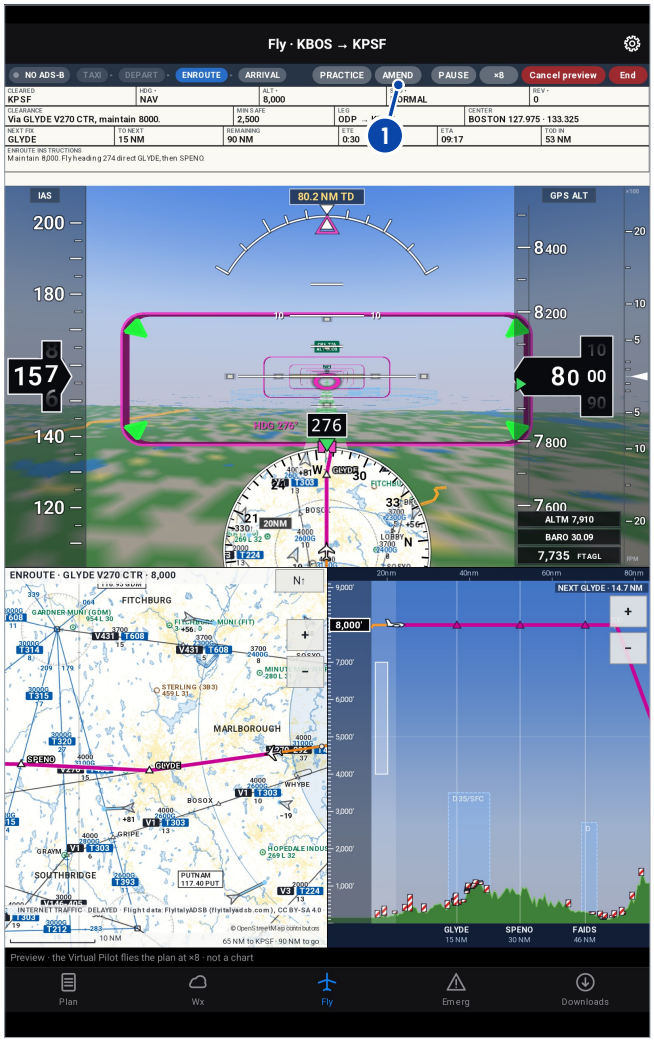
Example 3 — Cleared direct destination
Clearance: *Cleared direct KORH airport.*
Open **AMEND** → **DIRECT**, then the destination pill (e.g. **KORH**), **ENTER**.

ROUTE

ROUTE copies a reroute to the same destination in three forms. The Route keyboard (black, like AMEND) takes AMEND's place to build airways and fixes; the Map grows the new path in magenta.

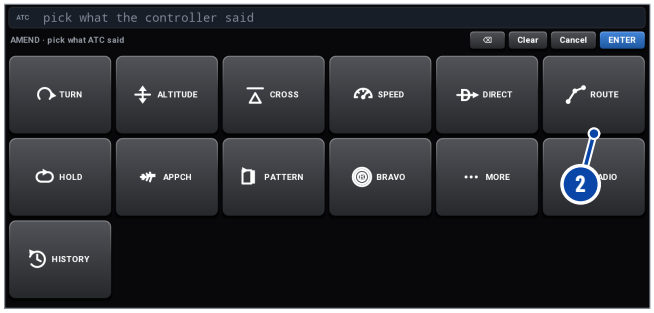
- **CHANGE … TO READ** — replace a portion of the route ahead.
- **REST OF ROUTE UNCHANGED** — new piece from here to a rejoin fix, then as filed.
- **NEW ROUTE** — replace everything ahead to where the arrival begins.
- Also: CROSS / JOIN airway, FLY HEADING … INTERCEPT / JOIN, VIA navaid radial (on the Route keyboard).

Example 1 — Change portion to read
Clearance: *Change GLYDE V270 CTR to read GLYDE V292 BAF V146 CTR.*



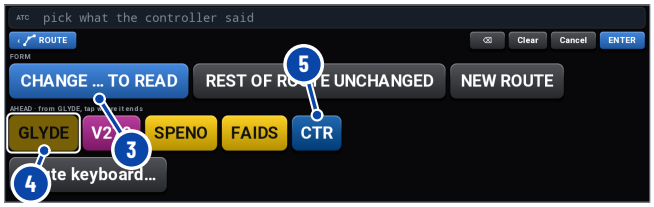
Tap 1. AMEND on the Fly strip.

1 **AMEND** on the Fly strip.



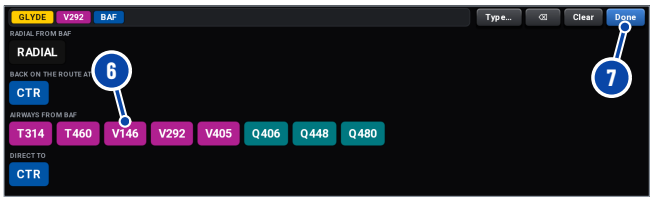
Tap 2. ROUTE on the AMEND keyboard.

2 **ROUTE**.



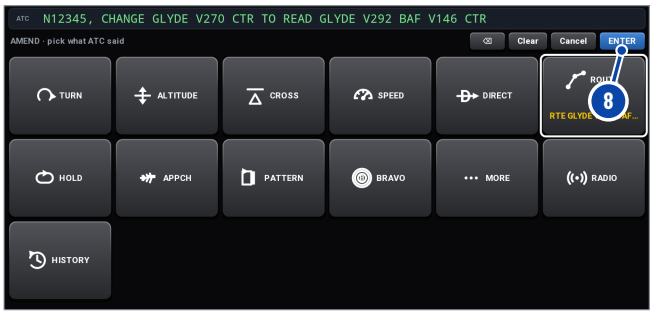
Taps 3–5. CHANGE … TO READ, then start and end on the route ahead.

3. **CHANGE … TO READ**.
4. **GLYDE** (start).
5. **CTR** (end). Route keyboard opens.



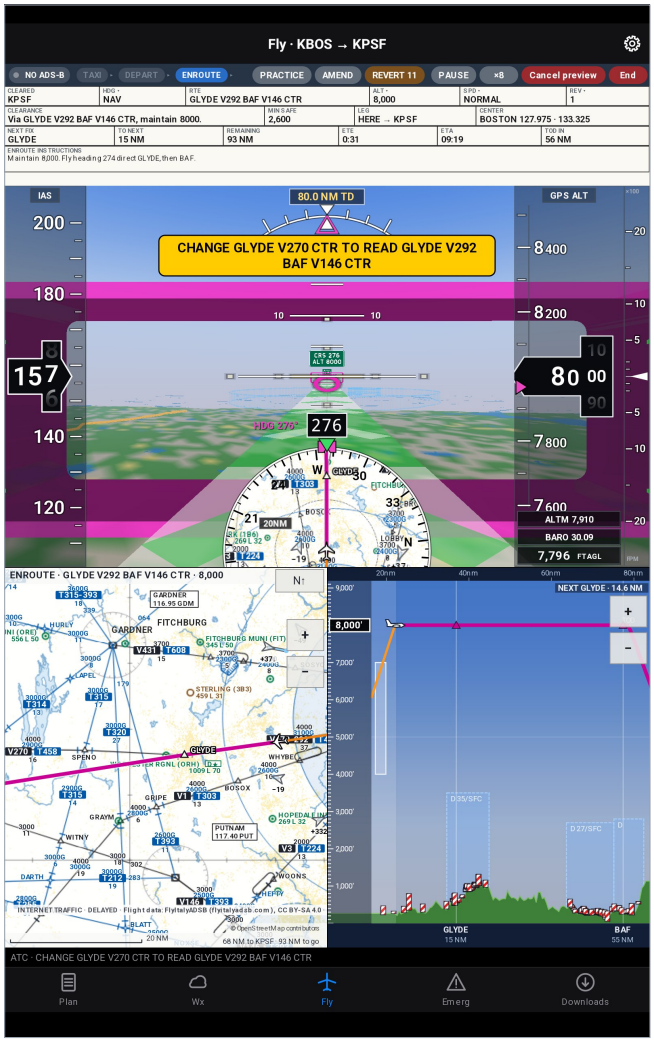
Taps 6–7. Build V292 BAF … then V146 and Done.

6. **V146** (after V292 and BAF).
7. **Done**.



Tap 8. ENTER on the Route keyboard.

8. **ENTER**.



After ENTER: RTE cell and new path on Map / Profile.

Example 2 — Rest of route unchanged

Clearance: *Cleared present position direct SPENO, rest of route unchanged.*

Open **AMEND** → **ROUTE**, then **REST OF ROUTE UNCHANGED**. Pick the rejoin fix on AHEAD, build the new piece on the Route keyboard, **Done**, **ENTER**.

Example 3 — New route

Clearance: *Cleared to KPSF airport via SPENO V270 CTR.*

Open **AMEND** → **ROUTE**, then **NEW ROUTE**. Build SPENO V270 CTR on the Route keyboard, **Done**, **ENTER**.

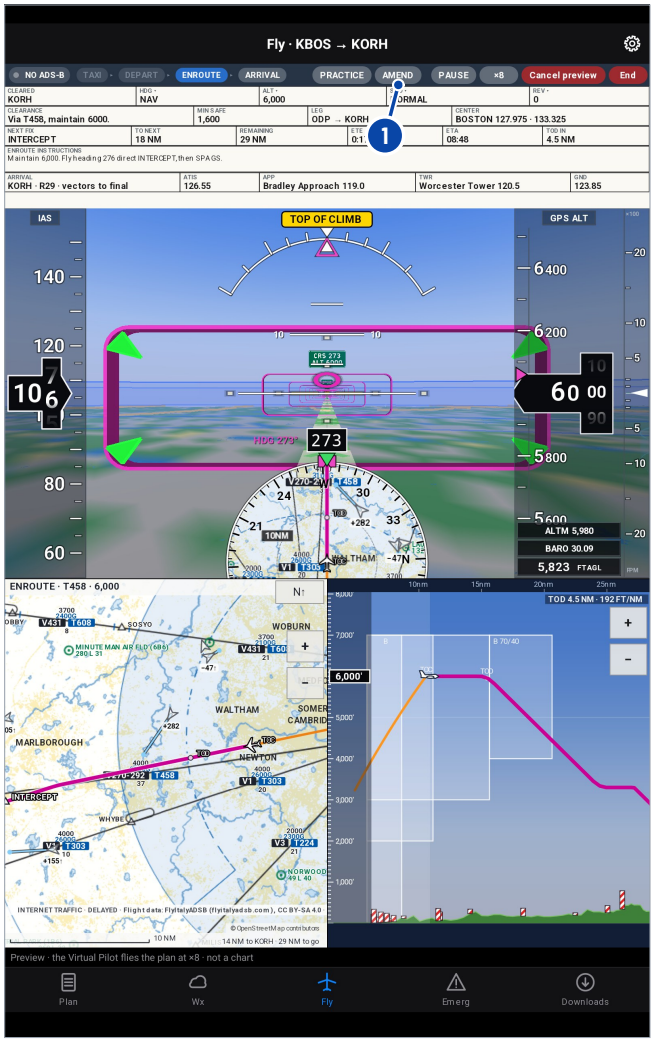
HOLD

HOLD stays open while you pick each part of the clearance. Anything not given is standard (right turns, 1-minute legs at or below 14,000). How the hold is flown and the Hold Advisor are in *Holds and the Hold Advisor*.

- **AT**: fix (limit first, then route / arrival / navaids, or Type…).
- **DIRECTION**: N, NE … NW, or AS PUBLISHED.
- **ON**: course into the fix, radial or typed COURSE.
- **LEGS · TURNS**: time or distance; RIGHT / LEFT TURNS.
- **EXPECT FURTHER CLEARANCE**: +10 / +15 / +20 / +30, NO DELAY, or TYPE ZULU.
- **CLEARED TO**: new clearance limit (hold at the limit when short of destination).
- **LEAVE · VIA LAST ROUTING** / **EFC VIA…**: exit and routing beyond the limit.

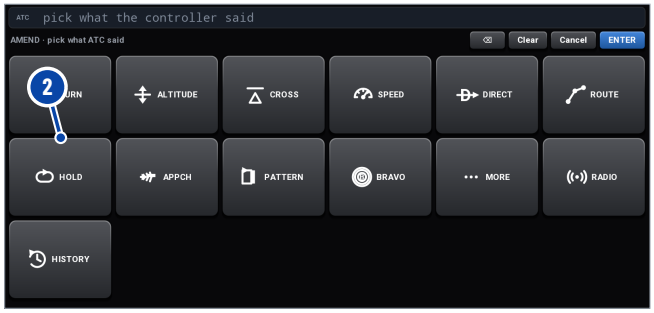
Example 1 — Hold east of a fix with EFC

Clearance: *Hold east of GLYDE on the T458 course, one minute legs, right turns, expect further clearance 1527.*



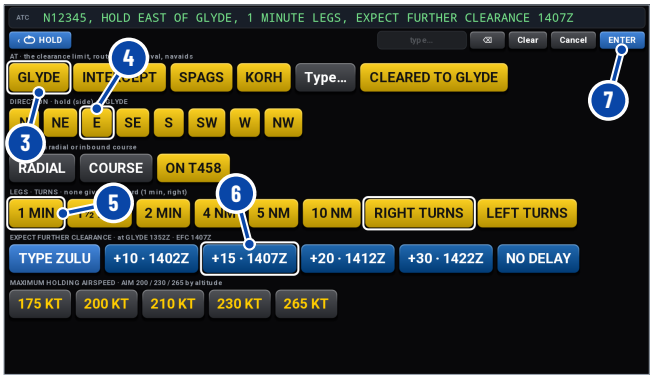
Tap 1. AMEND on the Fly strip.

1 **AMEND** on the Fly strip.



Tap 2. HOLD on the AMEND keyboard.

2 **HOLD**.



Taps 3–7. HOLD stays open while each row is picked.

3. **GLYDE**.
4. **E**.
5. **1 MIN**.
6. **+15 · 1527Z** (or TYPE ZULU).
7. **ENTER**.

Example 2 — Cleared to a limit

Clearance: *Cleared to GLYDE, hold as published, expect further clearance 1530.*

Open **AMEND** → **HOLD**, then **CLEARED TO** → **GLYDE**, **AS PUBLISHED**, set EFC, **ENTER**.

Example 3 — Leave via last routing

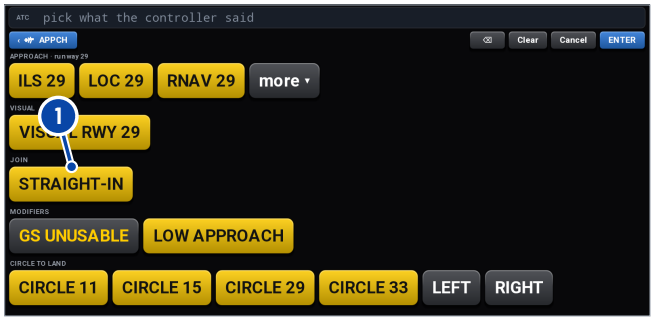
Clearance: *Cleared on course, proceed on the last routing.*

Open **AMEND** → **HOLD**, then **LEAVE · VIA LAST ROUTING**, **ENTER**. Or use **HDG** ▾ → LEAVE HOLD while the hold is active.

APPCH

APPCH (IFR edition) copies approach clearances at the destination: the procedure, how you join it, circle / side-step, visual, glideslope unusable, low approach, and cancel.

- **APPROACH**: procedures for the landing runway first, then the rest.
- **JOIN**: STRAIGHT-IN or a published transition.
- **VISUAL**: visual approach to the landing runway.
- **MODIFIERS**: GS UNUSABLE, LOW APPROACH.
- **CIRCLE** / side-step runway and turn / leg when offered.
- **CANCEL APPROACH** when an approach is already cleared.



APPCH page: approaches for the landing runway, JOIN and modifiers.

Example 1 — Cleared RNAV straight-in

Clearance: *Cleared RNAV runway 29 approach, straight-in.*

1. **AMEND**, **APPCH**, pick the RNAV RWY 29 procedure.
2. **STRAIGHT-IN**. **ENTER**.

Example 2 — Circle to land

Clearance: *Cleared ILS runway 11, circle to runway 29, left traffic.*

1. **AMEND**, **APPCH**, pick the ILS RWY 11.
2. **CIRCLE 29**, **LEFT**. **ENTER**.

Example 3 — Visual approach

Clearance: *Cleared visual approach runway 29.*

1. **AMEND**, **APPCH**, **VISUAL RWY 29**. **ENTER**.

Example 4 — Glideslope unusable

Clearance: *Glideslope unusable, cleared ILS runway 29.*

1. **AMEND**, **APPCH**, pick the ILS, **GS UNUSABLE**. **ENTER**.

PATTERN

PATTERN copies VFR (and tower) pattern instructions: enter or join, traffic side, leg, how you arrive, runway, report / contact tower, cleared to land / number, extend, short approach, and 360 / 270 delay turns. A report shows as an ATC sign in HITS when you reach that point.



PATTERN page: ENTER / JOIN, side, leg, how, runway, then landing rows.

Example 1 — Enter 45 to left downwind

Clearance: *Enter left downwind runway 29 on the 45.*

1. **AMEND**, **PATTERN**, **ENTER**, **← LEFT**.
2. **DOWNWIND**, **45**, **RWY 29**. **ENTER**.

Example 2 — Report midfield and cleared to land

Clearance: *Report midfield downwind, cleared to land runway 29.*

1. **AMEND**, **PATTERN**, **REPORT MIDFIELD**.
2. **CLEARED TO LAND**, **RWY 29** if needed. **ENTER**.

Example 3 — Extend downwind, number 2

Clearance: *Extend downwind, you are number 2, follow the Cessna on base.*

1. **AMEND**, **PATTERN**, **EXTEND DOWNWIND**.
2. **NUMBER 2**. **ENTER**.

Example 4 — Short approach / 360

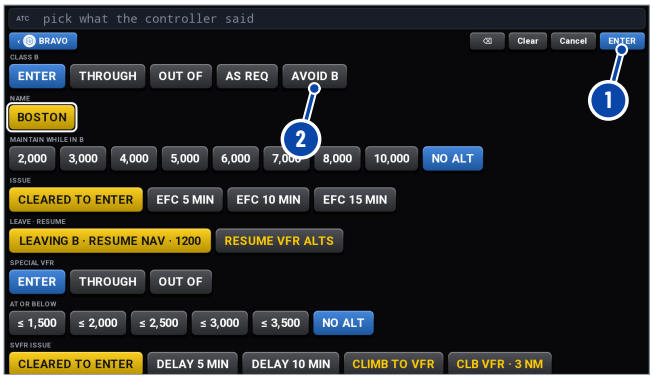
Clearance: *Make short approach* or *make a left 360 for spacing.*

1. **AMEND**, **PATTERN**, **SHORT APPROACH** — or **← 360** / **270**. **ENTER**.

BRAVO

BRAVO copies Class B and Special VFR clearances. **AVOID B** (remain outside) skirts the Class B geometrically on the map — decision support only, not a certified stay-out path.

- Class B: ENTER / THROUGH / OUT OF / AS REQ / AVOID B, name, maintain while in B, EFC, LEAVING B · RESUME NAV · 1200, RESUME VFR ALTS.
- SVFR: ENTER / THROUGH / OUT OF, at or below, DELAY, CLIMB TO VFR.



BRAVO page: Class B kinds, name, maintain altitude, SVFR rows.

Example 1 — Cleared into Class B

Clearance: *Cleared into Boston Class B, maintain 3,000.*

1. **AMEND**, **BRAVO**, **ENTER**, pick the Class B name.
2. **3,000** under MAINTAIN WHILE IN B, then the ISSUE pill. **ENTER**.

Example 2 — Remain outside / avoid Bravo

Clearance: *Remain outside Class B airspace.*

1. **AMEND**, **BRAVO**, **AVOID B**, name if offered, ISSUE **REMAIN OUTSIDE**. **ENTER**.

Example 3 — Leaving Bravo, squawk VFR

Clearance: *Leaving Boston Class B, resume own navigation, squawk VFR.*

1. **AMEND**, **BRAVO**, **LEAVING B · RESUME NAV · 1200**. **ENTER**.

Example 4 — Special VFR

Clearance: *Cleared into the Worcester surface area Special VFR, at or below 2,000.*

1. **AMEND**, **BRAVO**, SPECIAL VFR **ENTER**, **≤ 2,000**, SVFR ISSUE. **ENTER**.

MORE

MORE (IFR edition) covers departure release, hold-for-release, void time, EDCT, VFR departure authorized for IFR pickup, and **DIVERT** to a new airport (filed alternates, nearest, or clear of weather). Dual fuel rings on the map mark green / reserve / outside; OUTSIDE reads UNABLE unless you force reserve.



MORE page: RELEASE, VOID, EDCT, VFR departure, DIVERT.

Example 1 — Released for departure

Clearance: *Released for departure.* (Often while still holding short.)

1. **AMEND**, **MORE**, **RELEASED** (or a +n · zulu time). **ENTER**.

Example 2 — Clearance void if not off

Clearance: *Clearance void if not off by 1530.*

1. **AMEND**, **MORE**, pick a VOID +n · zulu (or TYPE VOID). **ENTER**.

Example 3 — Divert to a filed alternate

Clearance: *Cleared to divert to your alternate, KBAF.*



DIVERT · ALTERNATES: airports inside the fuel rings.

1. **AMEND**, **MORE**, **DIVERT**, **ALTERNATES**.
2. Pick **KBAF** (green). **ENTER**.

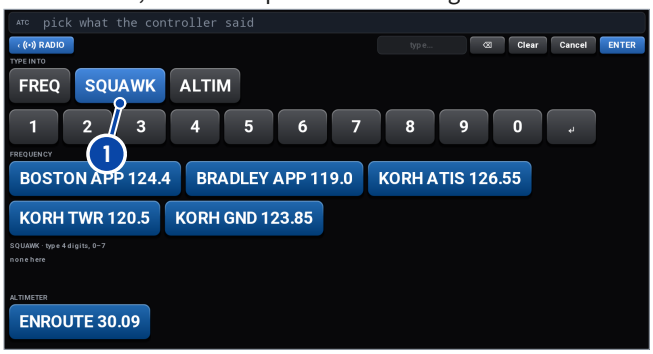
Example 4 — Hold for release

Clearance: *Hold for release, expect 10 minute delay.*

1. **AMEND**, **MORE**, **HFR 10 MIN**. **ENTER**.

RADIO

RADIO copies frequency, squawk and altimeter. They do not change the route, but they go into the readback and the ATC row, and they apply anywhere in the air — even where flown items cannot. Squawks 7500 / 7600 / 7700 ask for confirmation; 7600 also opens lost-comms guidance.



RADIO with SQUAWK chosen.

Example 1 — Squawk

Clearance: *Squawk 4512.*

1. **AMEND**, **RADIO**, **SQUAWK**, type **4512**. **ENTER**.

Example 2 — Contact on frequency

Clearance: *Contact Boston Approach on 124.4.*

1. **AMEND**, **RADIO**, **FREQ**, type **1244** (or tap a listed frequency). **ENTER**.

Example 3 — Altimeter

Clearance: *Altimeter 29.92.*

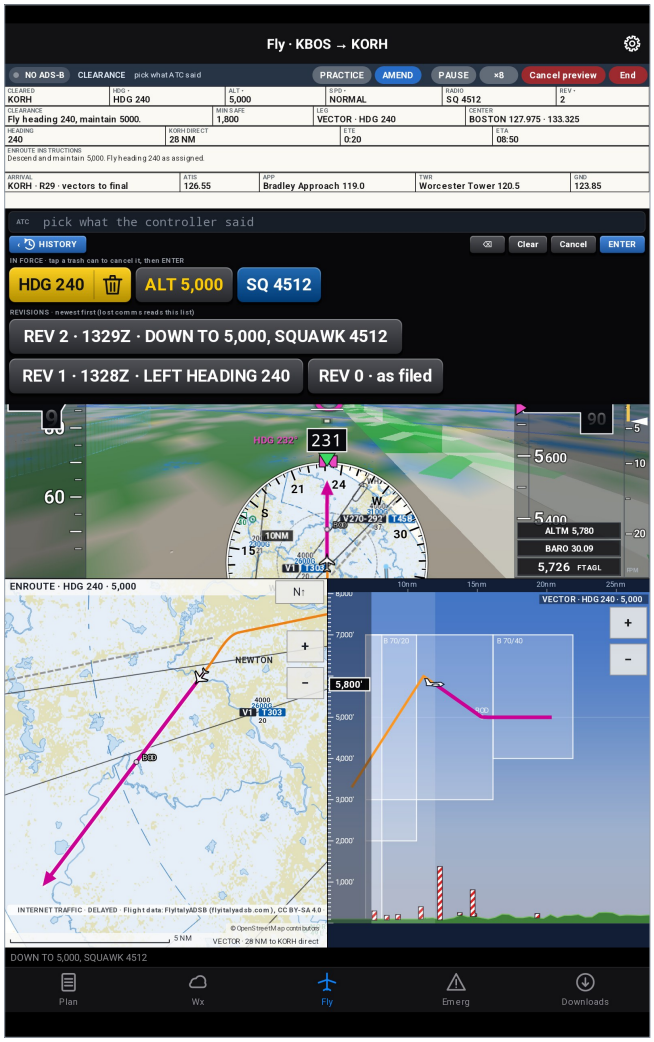
1. **AMEND**, **RADIO**, **ALTIM**, type **2992**. **ENTER**.

The setting also goes onto the Wx tab's Enroute card (*From ATC*) and into the BARO box in HITS; tapping BARO is the quicker way to change it on its own.

The setting also goes onto the Wx tab's Enroute card (*From ATC*) and into the BARO box in HITS; tapping BARO is the quicker way to change it on its own.

HISTORY

HISTORY shows the clearance in force and how it got there. Use it to cancel a single restriction or to review every revision for lost communications.



IN FORCE with trash cans, and the revision list.

- **IN FORCE**: heading or route, limit, altitude, UNTIL / crossings, radio. Trash can cancels a vector (RESUME NAV), hold / limit (LEAVE), crossing / UNTIL, deviation, or ATC speed (RESUME NORMAL).
- **REVISIONS**: every revision newest first, down to *REV 0 · as filed*.

Example 1 — Cancel a crossing

Clearance: *Cancel altitude restriction at ZUMBY.*

1. **AMEND**, **HISTORY**, trash can on the ZUMBY crossing. **ENTER**.

Example 2 — Cancel a vector

Clearance: *Resume own navigation* (from HISTORY).

1. **AMEND**, **HISTORY**, trash can on the vector. **ENTER**.

Example 3 — Review revisions / lost comms

Open **REV ▾** on the strip (or HISTORY) for the list. Choose **LOST COMMS · 91.185** for route / altitude / time guidance from the clearance and filed plan. Squawking 7600 surfaces the same chip on HITS.

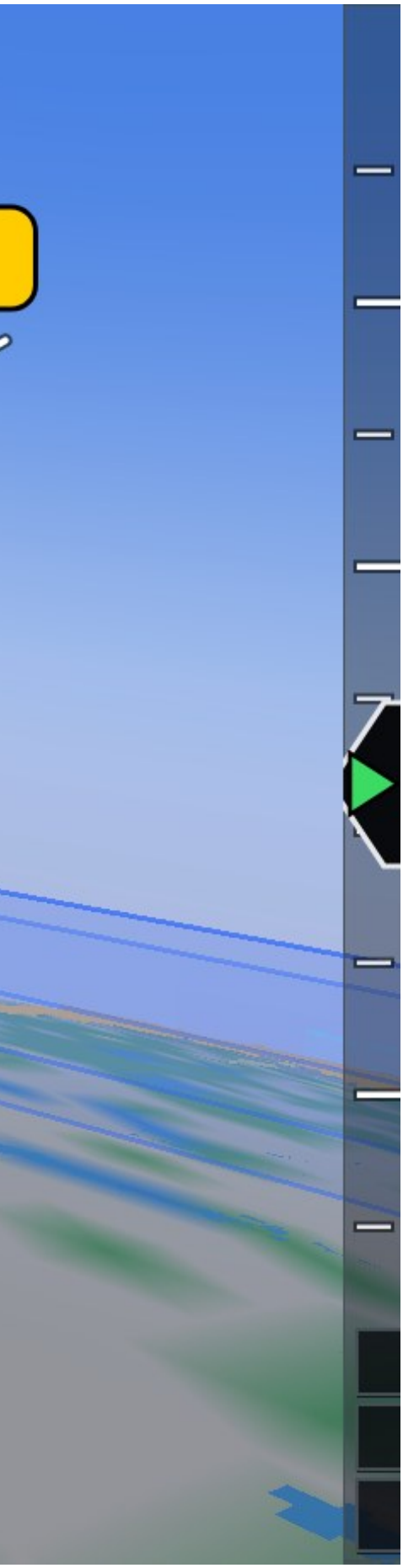
1. Tap **REV ▾** on the ATC row.
2. Pick a revision to review, or **LOST COMMS · 91.185**.



ALTITUDE IS TIME.

PRACTICE ATC





PRACTICE BEFORE THE FREQUENCY GETS BUSY. Practice ATC is a game on the Fly page that issues controller-style clearances so you can drill the AMEND keyboard: timed calls, a score and streak, and a letter grade when you finish a Round.

Set it up under Settings → Practice ATC, or start a Round from the Fly strip. The Virtual Pilot can fly the airplane while you type, so you can focus on the keyboard.

PRACTICE ATC

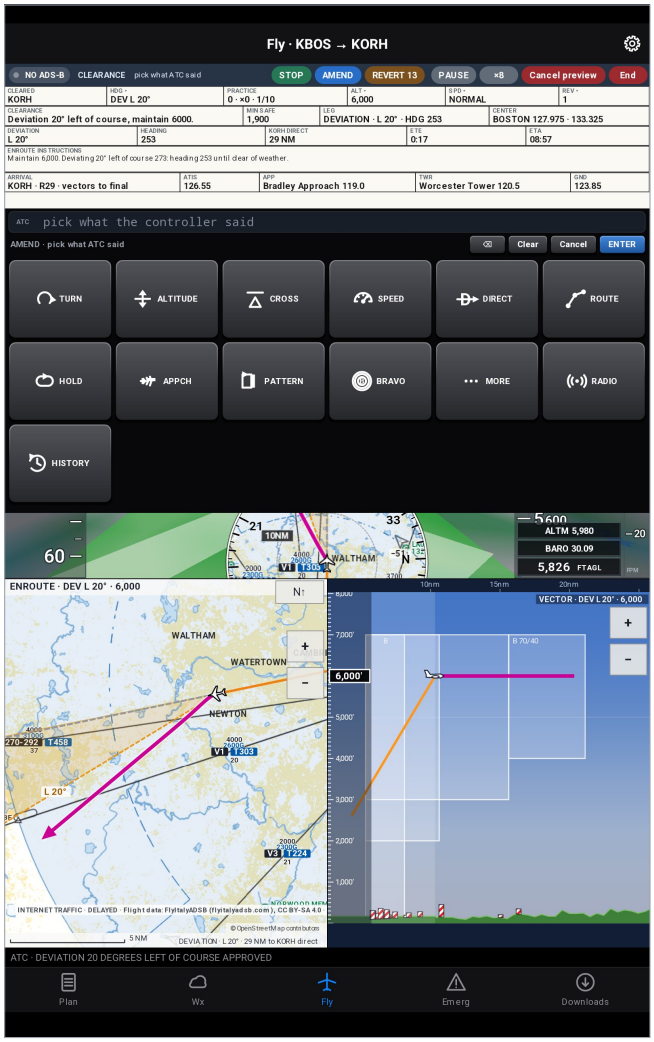
Each call appears as a yellow ATC banner on HITS (spoken too when Speak readbacks is on). Copy it on AMEND and tap ENTER before the timer runs out for a hit — faster answers earn a time bonus. Miss or timeout: the issued clearance still applies so the flight continues, and the streak resets. Hits and misses are logged on the route recorder.



Practice running: yellow call on HITS, PRACTICE cell with score · streak · countdown, AMEND open.

MODES

- **Off** — no practice calls (default).
- **Always-on** — while airborne, phase-fitting calls on a cadence; the PRACTICE cell shows score · streak · countdown for the current call.
- **Round** — tap **PRACTICE** on the Fly strip, pick difficulty and VFR or IFR amendments, then play 10 timed calls. **STOP** cancels. At the end you get a scorecard with letter grade A–F.



Starting a Round: difficulty (Easy / Medium / Hard) and VFR or IFR amendments.

SETTINGS

- **Mode**: Off / Always-on / Round.
- **WILCO only**: apply the call without opening the keyboard (no score change) — useful when you want the airplane to take the clearance but are not drilling taps.
- **Virtual Pilot flies during Practice**: on a simulator link, Perfect Pilot follows the route while you copy amendments.
- **Default difficulty** and **VFR / IFR amendments** for Always-on and as Round defaults (VFR edition forces VFR amendments).

HOW TO PLAY A ROUND

1. Load a plan and start flying (Preview or a simulator). Practice needs an airborne phase.
2. Set Settings → Practice ATC → Mode to **Round** (or leave Always-on if you prefer continuous).

3. On the Fly strip tap **PRACTICE**. Choose Easy / Medium / Hard and VFR or IFR. Optionally leave Virtual Pilot on so the airplane flies itself.
4. When the yellow call appears, open **AMEND**, copy the clearance on the matching pages, **ENTER** before the countdown ends.
5. Watch score and streak on the PRACTICE cell. After 10 calls, read the scorecard grade.

Example Round call — left heading and descend

Banner: *N12345, turn left heading 270, descend and maintain 4,000.*

1. **AMEND**, **TURN**, **← LEFT**, **←270**.
2. **ALTITUDE**, **▼ DESCEND**, **4,000**.
3. **ENTER** before the timer hits zero — chained in one revision.

Example — reduce speed

Banner: *Reduce speed to 150.*

1. **AMEND**, **SPEED**, **▼ REDUCE**, **▼150**, **ENTER**.

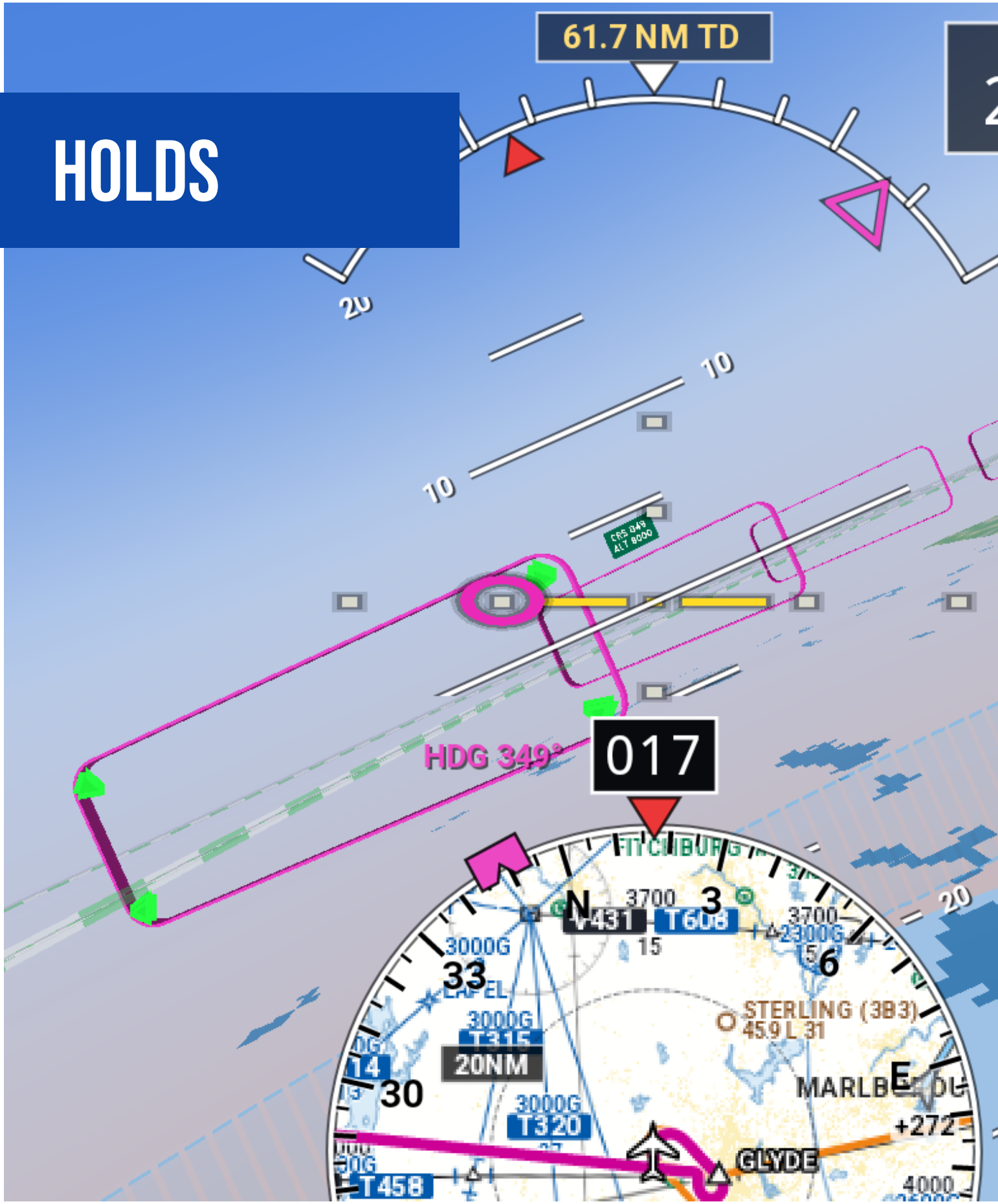
Example — direct to a fix

Banner: *Proceed direct GLYDE.*

1. **AMEND**, **DIRECT**, **GLYDE**, **ENTER**.

NOTE: Practice ATC grades what you ENTER against the issued call. Close is not enough: wrong direction, wrong altitude or an extra pending item counts as a miss. REVERT after a scored ENTER does not change the score.

HOLDS


61.7 NM TD
20
10
10
CRS 049
ALT 8000
HDG 349°
017
FITCHBURG
N
3700
3
V431
T608
3700
2300G
15
5
6
3000G
33
LAP EL
3000G
T315
20NM
14
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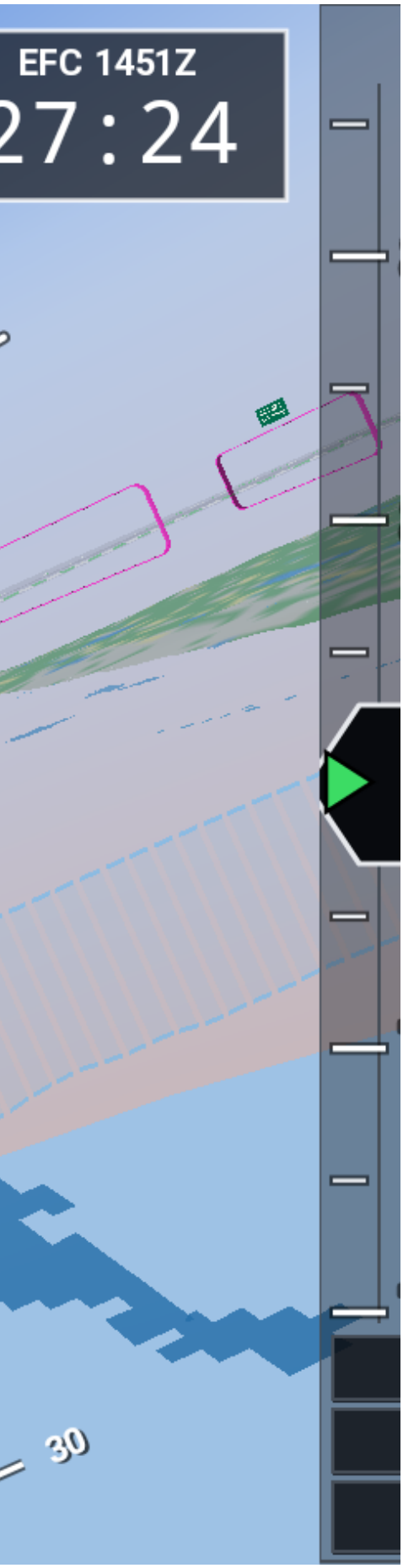
STERLING (3B3)
45.9 L 31
E
MARLB
3000G
T320
+272
GLYDE
T458
4000
20



A HOLD IS A RACETRACK in the sky: a fix, a course into it, a turn at each end and legs about a minute long, flown lap after lap until the controller lets you go on. SkyHeading flies the entry and the laps, and as the fix comes near it swaps the Map for the Hold Advisor: the hold in an approach plate's black and white, with what to fly now and what comes next.

Holds come from ATC (copied on the AMEND keyboard's HOLD page, see *HOLD*), from reaching your clearance limit with no further clearance, and from the missed approach. All three bring up the Hold Advisor.

FLYING A HOLD

THE PARTS OF A HOLD

The **fix** anchors the hold. The **inbound course** leads to it, and the **outbound leg** runs back the other way beside it, on the **holding side**. Standard holds turn right; ATC says *left turns* when they do not. Legs are timed, 1 minute at or below 14,000 ft and 1½ minutes above, unless ATC gives minutes or miles. The time is for the inbound leg: into a headwind the outbound leg is flown shorter, with a tailwind longer.

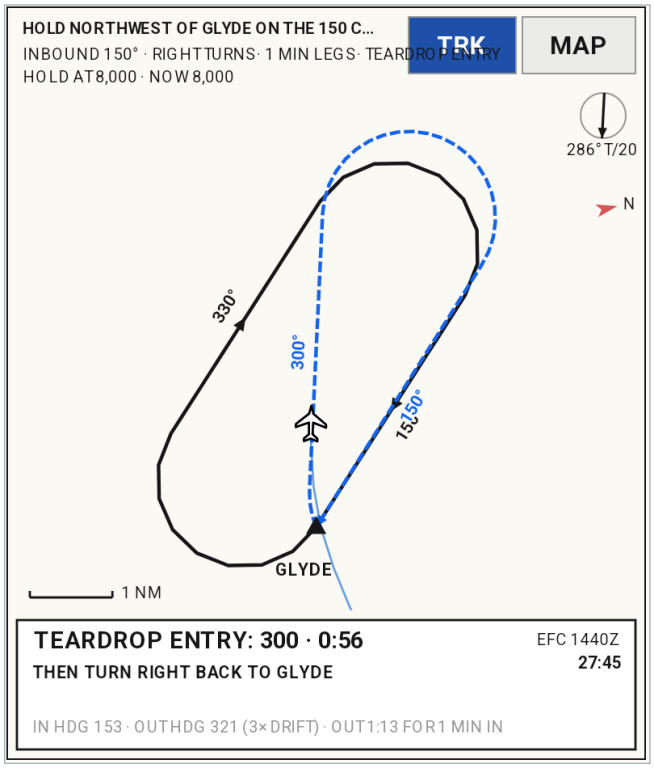
SkyHeading builds the hold as it was cleared (the fix, the direction or the course, the turns, the legs, and the altitude in force), with standard-rate turns at your true airspeed and never more than 25° of bank.

ENTRIES

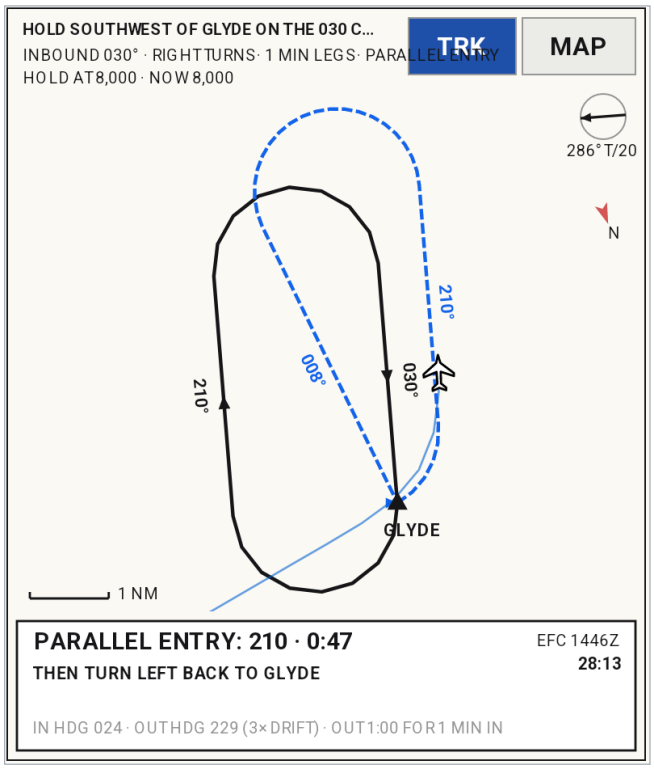
How you join the hold depends on the way you arrive at the fix, measured against the inbound course. SkyHeading picks one of the three entries in the AIM:

- **Direct**: arriving from the holding side or ahead of it. Cross the fix, turn in the hold's direction to the outbound heading, and fly the hold.
- **Teardrop**: arriving from behind the hold on the holding side. Cross the fix, fly 30° off the outbound course into the holding side for one leg, then turn in the hold's direction back to the fix.
- **Parallel**: arriving from the non-holding side. Cross the fix, turn to the outbound course on the non-holding side for one leg, then turn the other way, through more than 180°, back to the fix.

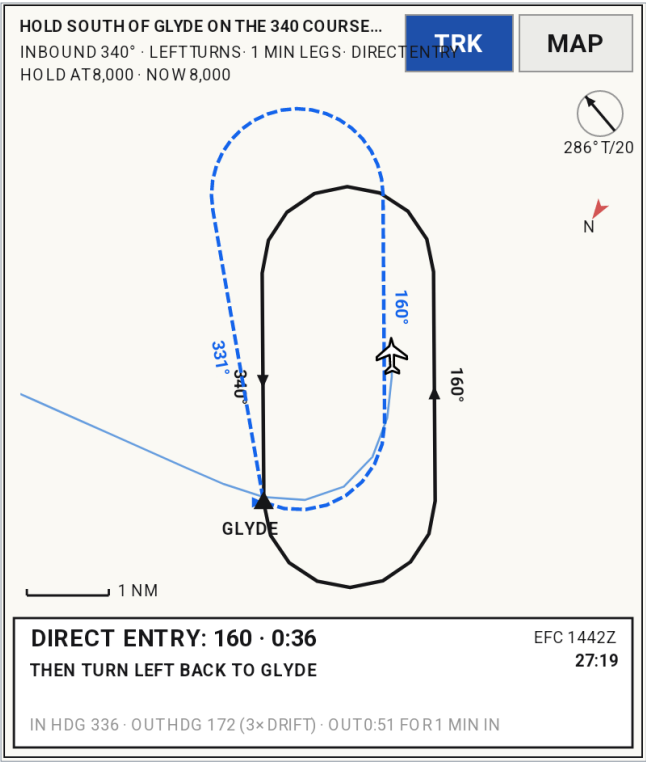
Arriving within 20° of the inbound course there is no entry: cross the fix and turn outbound. Every entry ends over the fix, where the first lap begins. The Hold Advisor names the entry before you get there (*AT GLYDE: TEARDROP ENTRY, TURN RIGHT 300*) and draws it blue dashed, as the approach plan view does for a missed approach's hold.



Teardrop entry: 300 for a minute, then right back to GLYDE. The entry is blue dashed with its headings; the track you have flown is the thin blue line.



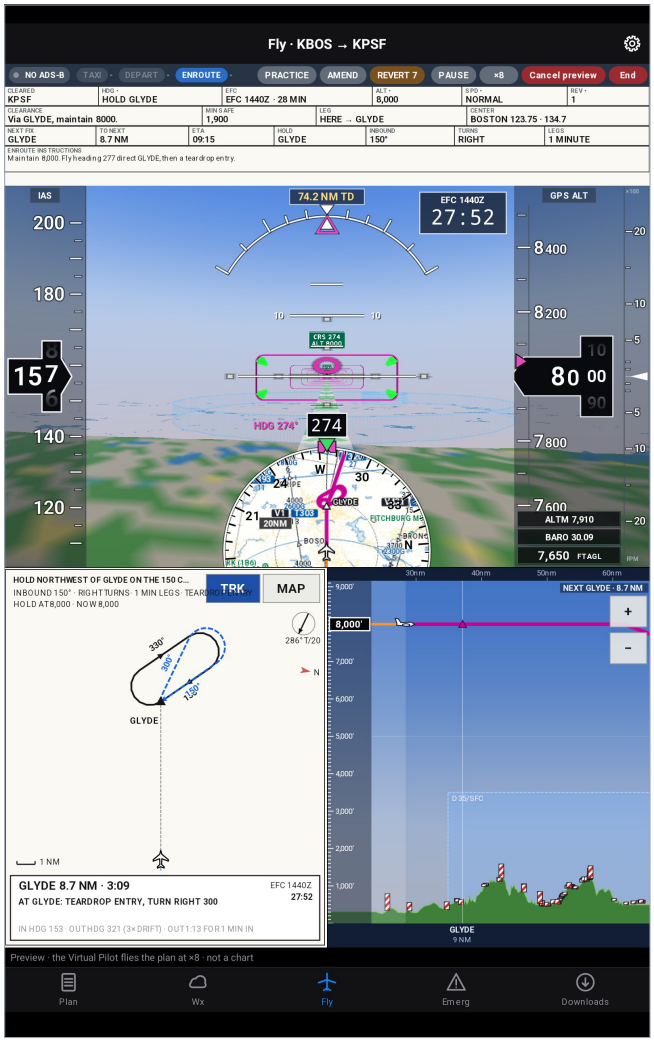
Parallel entry: out on the non-holding side, then the long turn back to the fix against the hold's direction.



Direct entry into a left-hand hold: the turn outbound, the outbound leg, then left back to the fix.

THE HOLD ADVISOR

From 10 NM or 3 minutes out from the fix, whichever comes first, the Hold Advisor takes the Map's place on the Fly page and stays until you leave the hold. **MAP** at its top right gives you the Map back, with the racetrack in magenta and the entry dashed blue; the Map's **HOLD** button brings the advisor back. A new hold always starts on the advisor.



On the way to GLYDE: the Hold Advisor in the Map's place, the EFC counting down in HITS.

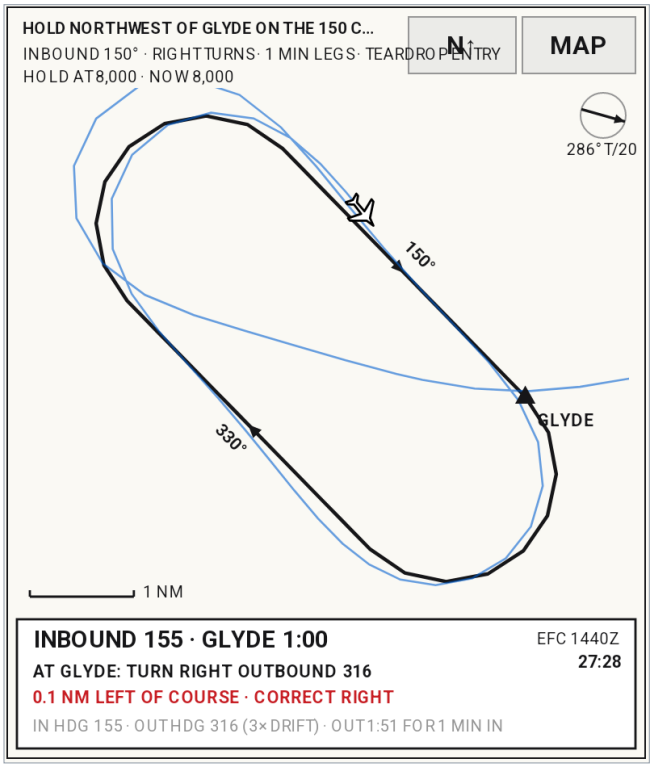
WHAT IT SHOWS

- **Across the top**: the clearance as you copied it, then the pattern (inbound course, turns, legs and entry), and the hold altitude beside your altitude now.
- **The picture**: the racetrack in black with arrows on its legs and their courses beside them, the entry blue dashed with its headings (gone once you are on the first lap), the way to the fix dashed grey, the track you have flown in blue, the fix as a black triangle, and your aircraft. A 1 NM bar gives the scale. The picture pans and zooms by itself to keep the hold, the entry and the aircraft in view.
- **The wind**: an arrow the way it blows, with where it comes from (true) and its speed.
- **The cue box**: what to fly now in large type, what comes next under it, and on the inbound leg how far you are off course. The EFC counts down on the right.

- **The numbers** along the bottom: the inbound and outbound headings with the wind correction in them, and how long to fly outbound.

TRACK UP OR NORTH UP

The **TRK** / **N↑** button beside MAP turns the picture. **Track up** (blue, the default) keeps the way you are going at the top, so the hold looks as it does through the windshield, and a small red arrow shows where north is. It follows your track over the ground, wind drift included, and turns smoothly with you through the hold's turns. **North up** holds the picture still, like the chart. SkyHeading remembers your choice.



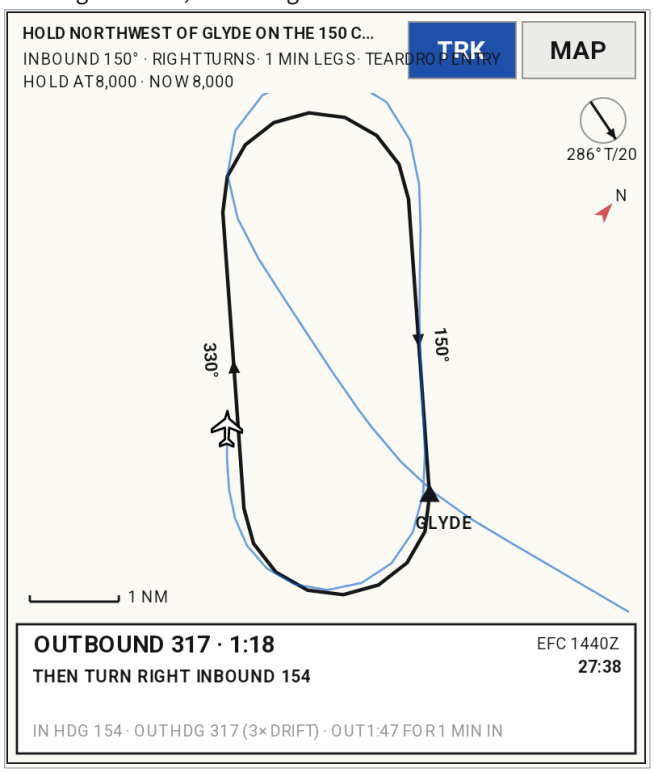
The same moment north up: the hold as it is on the chart.

THE CUES

The cue box follows you around the hold:

Where you are	Now / next (examples)
On the way	*GLYDE 10.6 NM · 3:12 / AT GLYDE: TEARDROP ENTRY, TURN RIGHT 300*
The entry	*TEARDROP ENTRY: 300 · 0:42 / THEN TURN RIGHT BACK TO GLYDE*
Turning outbound	*TURN RIGHT OUTBOUND 326 / ABEAM GLYDE: START 1:12*
Outbound	*OUTBOUND 326 · 0:42 / THEN TURN RIGHT INBOUND 151*
Turning inbound	*TURN RIGHT INBOUND 151 / INTERCEPT 150 TO GLYDE*
Inbound	*INBOUND 151 · GLYDE 0:45 / AT GLYDE: TURN RIGHT OUTBOUND 326*

With legs in miles, the cues give distances instead of times.

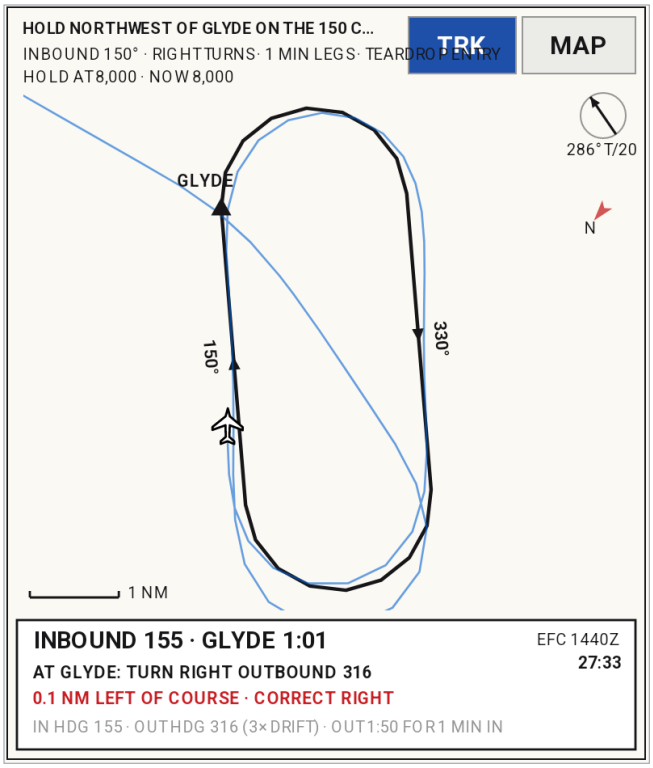


Outbound: 326 for 42 more seconds, then the turn inbound.

STAYING ESTABLISHED

The headings already carry the wind. Inbound, the **IN HDG** is the course plus the wind correction. Outbound, the **OUT HDG** corrects three times as much (up to 30°), the Instrument Flying Handbook's technique for coming back onto the inbound course. **OUT** is the time to fly outbound so that the inbound leg comes out at its length: longer than a minute into a headwind outbound, shorter with a tailwind. Start it abeam the fix, or wings level if that comes later.

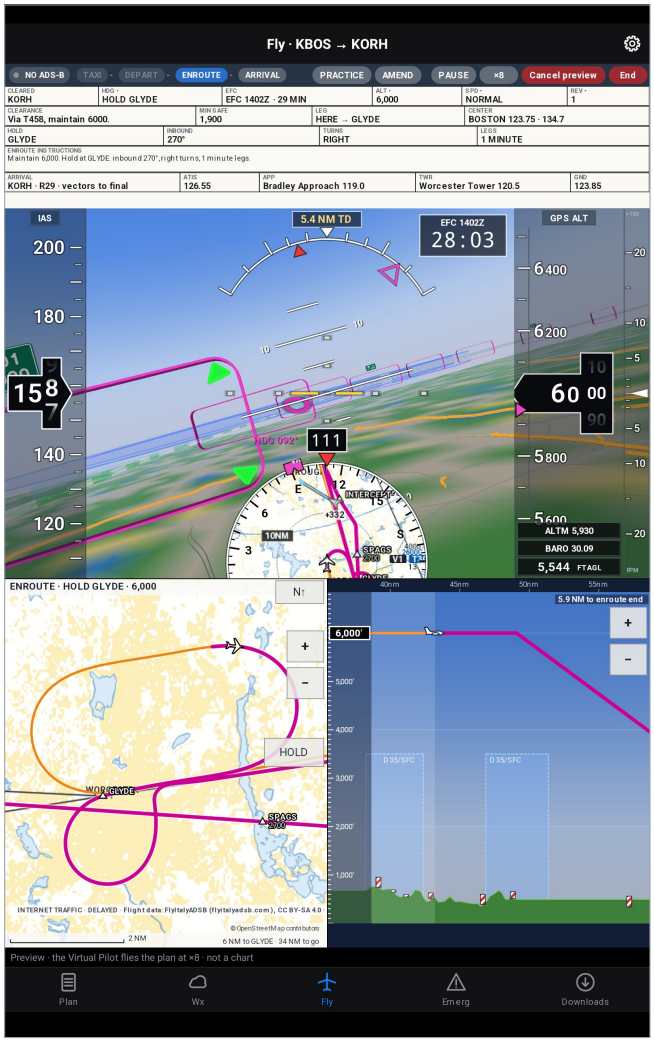
On the inbound leg the course line reads *ON COURSE*, or in red how far off you are and which way to correct (*0.3 NM LEFT OF COURSE · CORRECT RIGHT*).



Inbound to GLYDE: the heading with the wind in it and the time to the fix.

THE EFC AND LEAVING

The EFC counts down in the cue box and in HITS. If it passes with no word from ATC, HITS says so in amber: time to ask. Copy the clearance out on the AMEND keyboard (**LEAVE · VIA LAST ROUTING**, a heading or a DIRECT); the hold ends, the Map comes back, and the route is rebuilt from where you are.



MAP gives the Map back while you hold: the racetrack in magenta, the HOLD button to bring the advisor back, and the EFC countdown in HITS.

AT THE CLEARANCE LIMIT

Reach your clearance limit short of the destination with no further clearance and SkyHeading holds there, as ATC expects: at the hold charted at the fix, or a standard hold on the course you arrived on. The strip reads *HOLDING AT GLYDE · CLEARANCE LIMIT*, and the Hold Advisor's title starts *CLEARANCE LIMIT*.

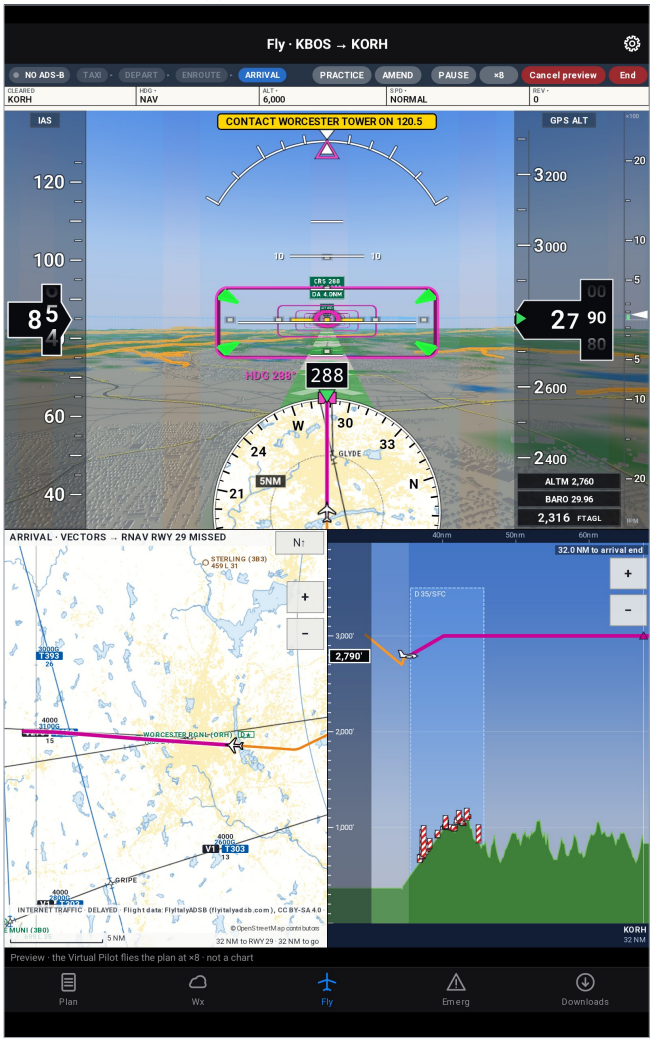
HOLDS ON THE MISSED APPROACH

Most missed approaches end in a hold: *climb to 3,000 direct RILOC and hold*. Tap **GO MISSED**, or let the Virtual Pilot go missed at minimums, and SkyHeading flies the published missed approach: the climb, the way to the hold's fix, the entry the way you arrive, and then the charted hold, lap after lap.

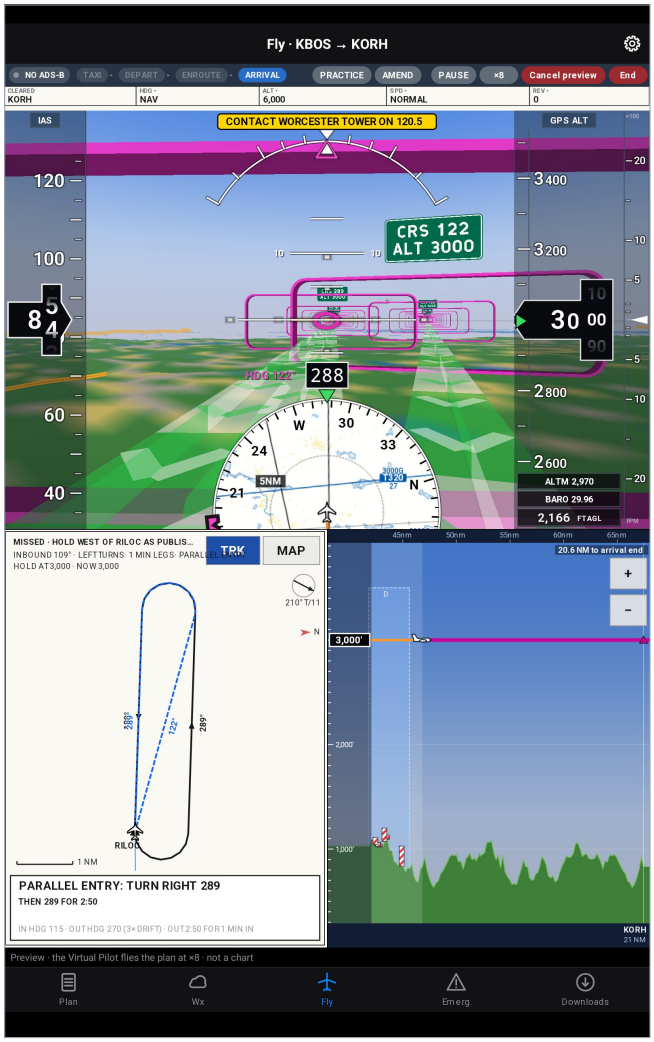
Once you go missed, the approach's plan view and profile give way to the Map and Profile, which fly the missed approach from where you started it: the climb to the missed approach altitude and the way to the hold. As the hold's fix comes near,

the Hold Advisor takes the Map's place, as for any other hold. Its title starts *MISSED* and the hold is the charted one (*HOLD WEST OF RILOC AS PUBLISHED*). HITS shows the hold's hoops a piece at a time: the way to the fix, the entry, then the racetrack. The Virtual Pilot levels at the missed approach altitude and slows to holding speed.

On the missed approach you are flying a published procedure: anything on the AMEND keyboard that would change the path reads back UNABLE, while frequency, squawk and altimeter still apply.



Forty seconds into the missed approach on the RNAV 29 at Worcester: the Map and Profile show the climb to 3,000 and the way to RILOC.



Nearing RILOC: the Hold Advisor with the missed approach's charted hold and the parallel entry, blue dashed.



PICK A FIELD. FLY TO IT.

HITS

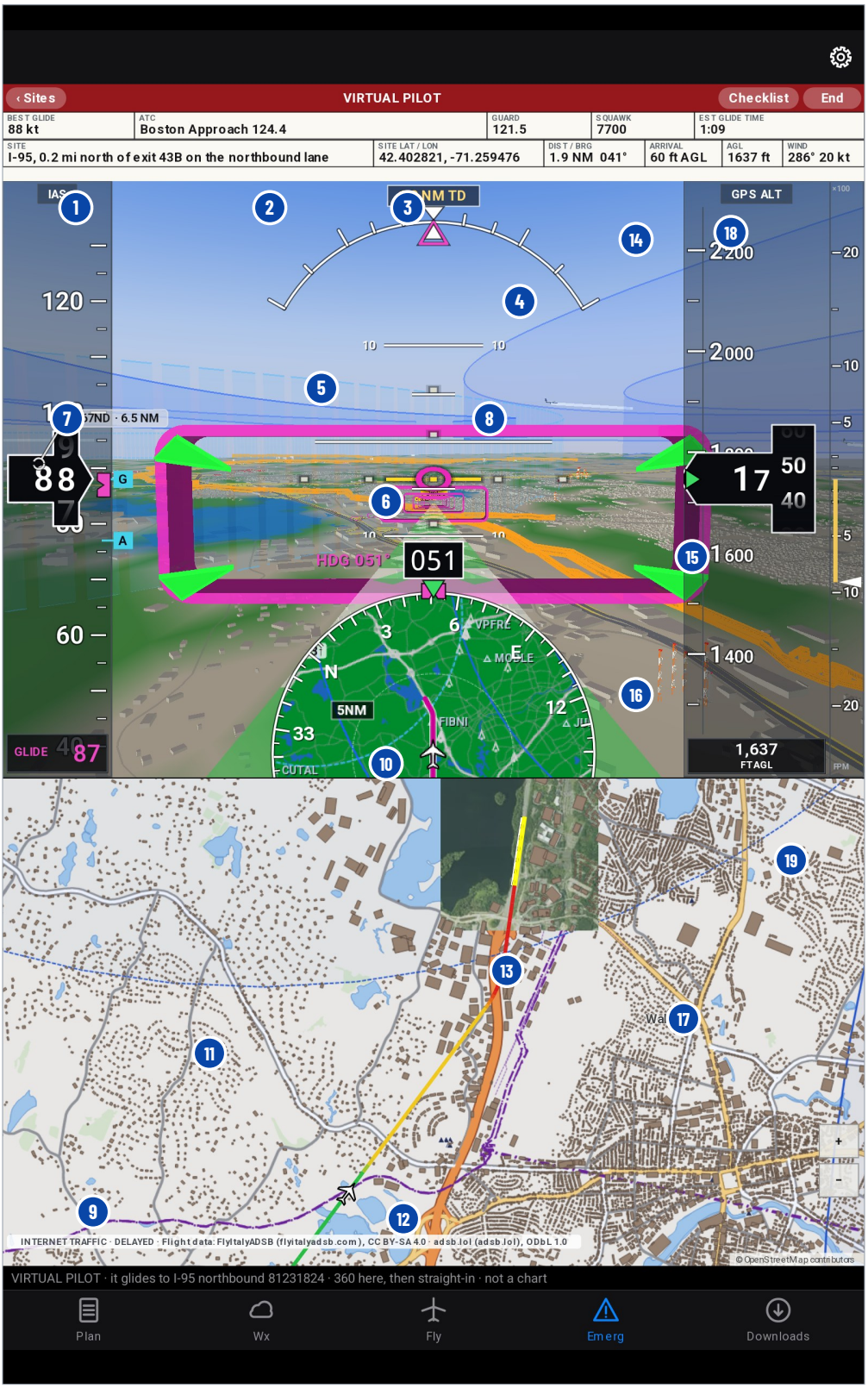

CONTACT WORCESTER TOWER ON 120.5
10
10
CRS 288
ALT 1860
DA 2.1NM
HDG 288°
288
W
30
33
24
21
N
5NM
GLYDE



HITS STANDS FOR HIGHWAY IN The Sky: a three-dimensional view of the world ahead with a path of hoops to fly through. Keep the airplane inside the hoops and you are on the plan, whether that plan is an ILS to minimums or a glide to a field.

HITS draws the terrain, buildings and roads around you, the runways and their markings, airspace, TFRs and restricted areas as red volumes, hot special-use airspace hatched magenta, and the instruments you need along its edges. The same view is used on the Fly page and on the Emergency screen; the picture below is from an emergency glide, which adds the glide brief across the top.

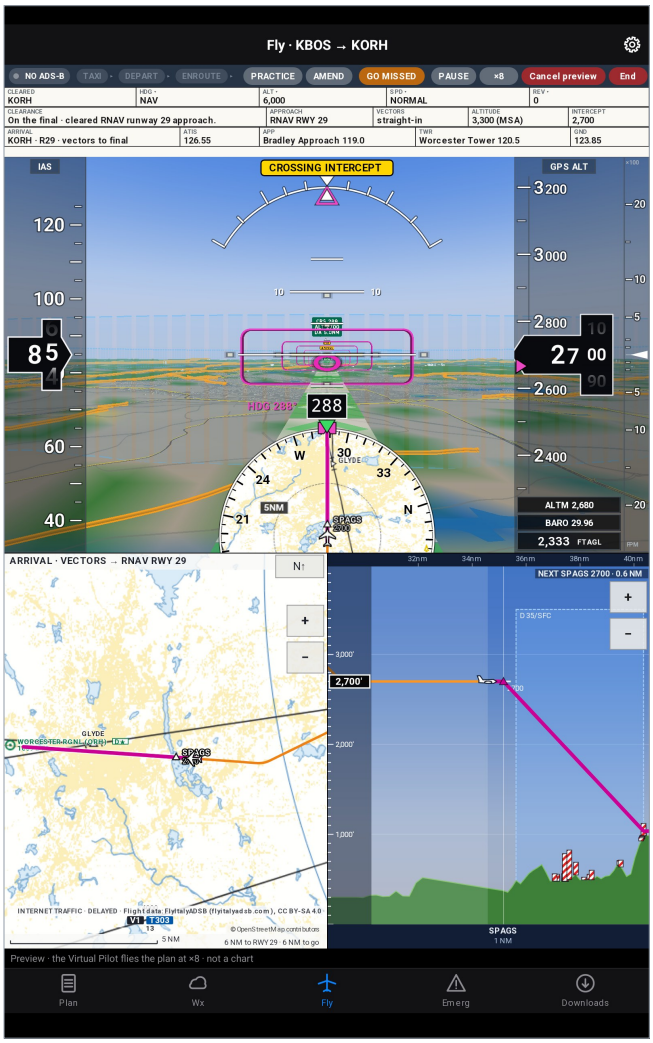
HITS AT A GLANCE



HITS on an emergency glide to a field 0.8 NM ahead, with the glide brief above and the map beside it, numbered by part (listed below).

1. ‹ **Sites**: rank the sites again from here; the flight carries on.
2. The session: **EMERGENCY**, or **VIRTUAL PILOT** when it flies the glide.
3. **Checklist** and **End**.
4. The glide brief (see *The Emergency Screen*).
5. Distance to touchdown.
6. Roll scale, with the sky pointer.
7. Speed tape: IAS from an airspeed source, or GPS GS (ground speed).
8. Altitude tape (GPS ALT), with the altitude to be at.
9. Speed to fly (GLIDE, FINAL) and the flap setting above it.
10. The hoops: fly through them.
11. Compass rose with the moving map inside, and the heading box.
12. Height above the ground.
13. Vertical speed, in feet per minute.
14. Wind (CALM when there is none).
15. The glide path on the map.
16. The site you are flying to, outlined in yellow.
17. Site card: landing direction, photo with its age, ground, size and address.
18. **NORTH UP** / **TRACK UP** and the Settings gear.
19. Your aircraft.

FLYING HITS



On the approach: the hoops lead down to the runway, with the course, altitude and distance sign ahead and GO MISSED below.

THE HOOPS

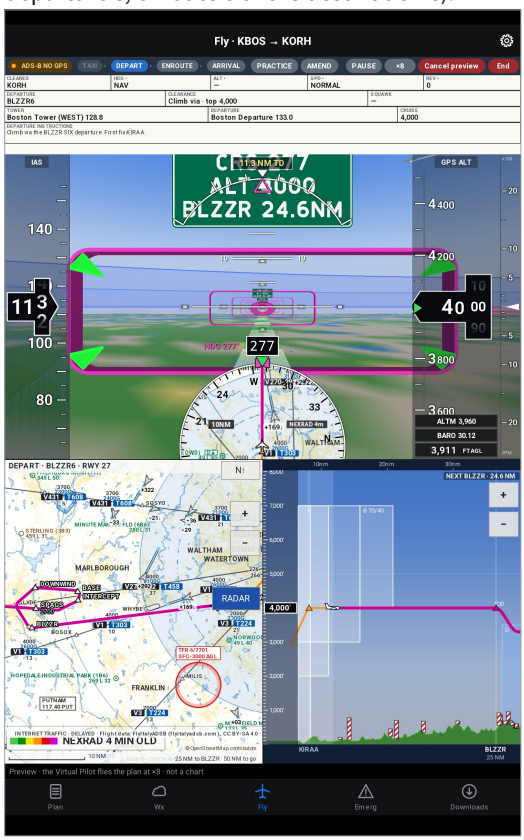
The magenta hoops mark the path in the air, spaced along it and set at the height you should be as you pass. Fly through each one. On the Fly page they run from the runway to the next phase and on to the destination; on a glide they include every turn needed to line up with the runway or field, and end at the threshold.

Above the roll scale, the distance to touchdown (*5.7 NM TD*) counts down. When an amendment or a new plan changes the path, the hoops are rebuilt ahead of you.

SPEED AND ALTITUDE TAPES

The speed tape on the left is tagged at its top with what it shows: **IAS** when SkyHeading has an airspeed (from a receiver's pitot-static port or a simulator), **EST IAS** when it works one out from GPS ground speed and the wind, **GS** when it only has ground speed. A magenta bug marks the speed to fly; with an ATC speed, the bug is that speed and the box at the foot of the tape reads *ATC 140* (see *SPEED*). The altitude tape on the right shows your altitude with the altitude to be at as a triangle on its left edge, and vertical speed beside it. Your height above the ground is in the box at the foot, on one line (*3,905 FT AGL*).

With an altimeter setting and a temperature on the Wx tab, two boxes sit above it. **ALTM** is what your panel's altimeter should read now, set to that setting and corrected for the temperature: a quick cross-check of the two. **BARO** is the setting in use. Tap BARO to type a new one, as ATC or the ATIS gives it; it goes into the Wx card of the leg you are on (the departure's, enroute's or the destination's).



Climbing out of Boston on Preview at ×8: ALTM 3,960, BARO 30.12 and 3,905 FT AGL under the altitude tape.

SIGNS AND THE EFC TIMER

Signs follow one color code, all in capital letters. On the path: green boards with white letters and a white border stand above the route where it names a place, an altitude or a course; yellow boards with black letters and a black border stand on the route at fixes, top of climb, top and bottom of descent, and where flaps or a slip go in.

A floating sign with rounded corners crosses the top of the scene. Yellow with black letters, it is ATC: an amendment readback, the ATC speed sign, UPDATED ROUTE, an EFC passed and radio calls such as *CONTACT BOSTON DEPARTURE ON 133.0*; a long readback runs onto more lines. Red with white letters, it is a warning: FLAP OVERSPEED, TOO FAST FOR FLAPS when a flap key is refused, and FAST TOUCHDOWN. While taxiing, instructions such as *TURN LEFT ON KILO* float near the top in the style of airport signs. With **Progressive taxi** on (Settings › Alert voices, under Taxi), a voice also talks you along the cleared route, out and in, like turn-by-turn directions in a car: *Proceed ahead on taxiway Bravo* as you move off, *Ahead, turn right on taxiway Alpha* about ten seconds before each turn and *Turn right on taxiway Alpha* at it, taxiway letters said in full (*BB* is *Bravo Bravo*). After a wrong turn it says *Off route* once and waits until you are back on the route: it does not re-route you, because the route is ATC's clearance. Runway crossings and hold-shorts keep their own calls. Follow ATC, the signs and the markings.

In a hold with an expect-further-clearance time, a box at the top right, beside the altitude tape, counts down to the EFC; it turns amber and counts up once the time has passed.

The last spoken alert shows in a box at the top of HITS for 15 seconds, with its figures (*RWY 15R-33L*, *124.4*): red with white letters for a warning, yellow with black letters for the others. A newer alert replaces it; a tap clears it.

THE COMPASS MAP

The compass rose along the bottom of HITS holds a heading-up moving map, with the aircraft at its center just above the bottom edge, so it shows what is ahead. The digital heading sits in a box above the lubber line, with the magenta HDG readout to its left and the cyan FINAL course to its right. A dashed ring marks half the range, which is shown up and left of the aircraft.

The range follows your height above the ground:

Height above ground	Map range
On the ground or below 30 ft	0.5 NM
Below 500 ft	1 NM
Below 1,500 ft	2.5 NM
Below 3,000 ft	5 NM
Below 6,000 ft	10 NM
Above 6,000 ft	20 NM

Terrain is colored against your altitude. Coloring is off on the ground and below 400 ft, where everything near the field would be red.

	Terrain
	Within 100 ft of your altitude, or above it.
	Within 1,000 ft below you.
	Within 2,000 ft below you.
	More than 2,000 ft below you.

On top of the terrain: water; roads (only highways beyond 5 NM); Class B in blue, C and D in lighter blue with D dashed; prohibited and restricted areas in blue and MOAs in magenta; TFRs in red; runways, and airport rings beyond 5 NM; the taxiways near the field; your route in magenta with the next fix; the taxi route on the ground; RNAV fixes out to 10 NM, navaids, and obstacles (all of them out to 5 NM, beyond that only those colored red or yellow against you).



The compass map on a VFR flight: heading up, the route in magenta, RNAV fixes and water, and terrain far below the aircraft drawn light green.

On an IFR plan in the air, the rose holds the Fly page Map's enroute chart instead, heading up at the same range: **IFR LOW** below FL180 and **IFR HIGH** above, with the airways and their MEAs, fixes, navaids and airports. The flight is drawn on it as on the Map: orange where you have been, magenta to the next fix, blue beyond, and the route's fixes with their altitudes. It takes a few seconds to draw after the flight starts. On the ground, and on VFR flights, it is the terrain map above.



On an IFR flight: the IFR LOW chart in the rose, the route along V270-V292-T458 and the top of descent ahead.

TRAFFIC IN HITS

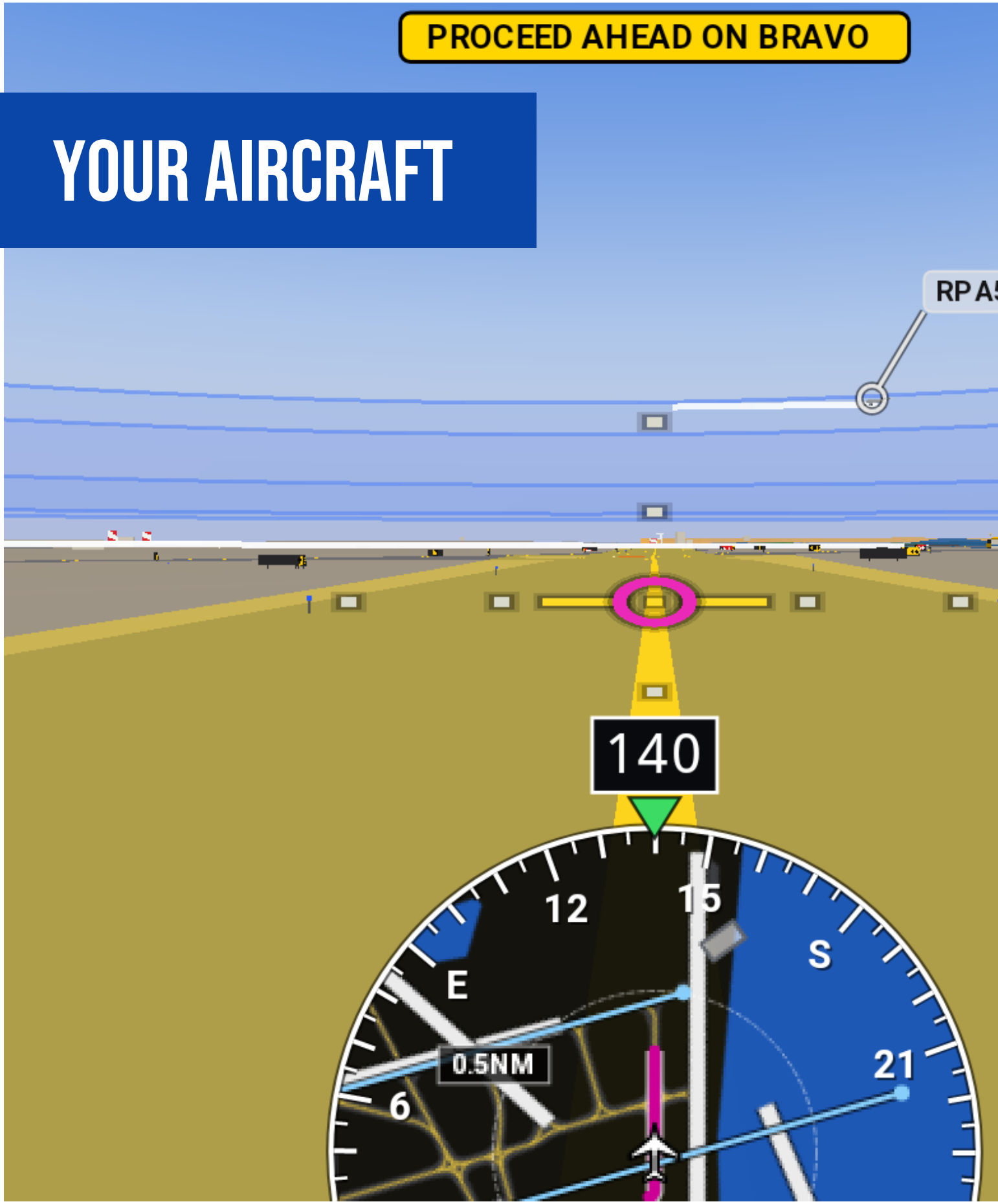
Traffic is drawn in HITS as the aircraft it is: its own type where SkyHeading knows it (an A220, a 737 MAX 9, a King Air), else one of its kind, in its airline's colors with the airline's name along the fuselage and an emblem on the tail when it is close. Far off, each is drawn a little larger than life so you can still see it, with a callout: its flight and distance, and its heading, height and speed when it is close. On the ground the callout is just its callsign or tail number, for *follow the JetBlue*. Callouts are hidden behind anything nearer than the aircraft, the way the aircraft is: a hoop, a sign, a hangar, other traffic.

Tap an aircraft in HITS for its card, at the lower left beside the speed tape. Settings › Traffic turns the 3D traffic, its callouts, the airline names and emblems, and the trend lines on or off.



EVERY LANDING BEGINS WITH A PLAN.

YOUR AIRCRAFT





SKYHEADING FLIES YOUR AIRPLANE, not a generic one. Every climb, takeoff, landing and glide check uses the numbers for your make and model, and you can make them match your POH.

Numbers belong to the make and model, not the N-number: every tail of a type, every plan and the Emergency screen fly the same figures.

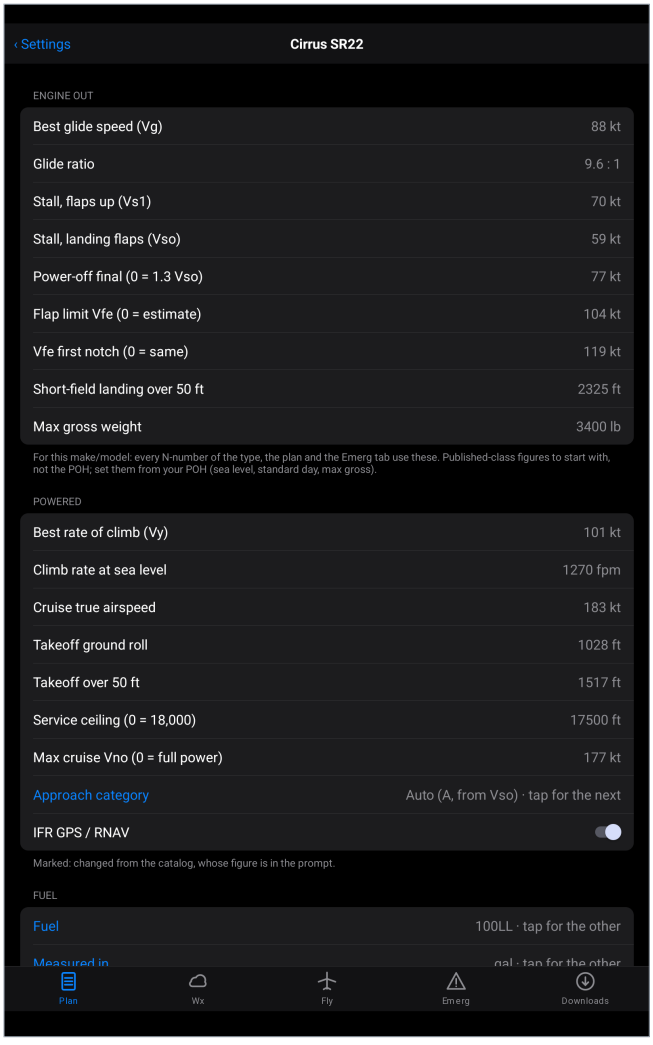
YOUR AIRCRAFT

MY AIRCRAFT

Add your aircraft by N-number with its make and model and its IFR navigator (none, IFR GPS, or IFR GPS with WAAS), then pick it in a plan as *N12345 · Cessna 172S Skyhawk*. Flying a plan switches the Emergency screen to the plan's aircraft.

THE NUMBERS

Each make and model starts with the catalog's figures, which are typical published values for the class and not your POH. Open **Numbers for this type** from Settings, from the plan's aircraft menu, or when adding an aircraft, to edit them. Changed figures show in amber with the catalog's beside them; only your changes are kept, so the rest follow catalog updates, and **Reset to catalog** clears them.



Settings › Numbers for this type, for the Cirrus SR22: the engine-out and powered figures as rows. ‹ Settings keeps the changes.

Group	Figures
Engine out	Best glide speed, glide ratio, stall speeds Vs1 and Vso, power-off final speed, flap limit speed, short-field landing distance, maximum gross weight.
Powered	Vy and the sea-level climb rate, cruise true airspeed, takeoff ground roll and distance over 50 ft, approach category (from 1.3 Vso unless set), ceiling.
Fuel	Fuel burn in cruise (gal/hr or lb/hr), the climb and descent burns (1.3 and 0.7 times the cruise burn unless set), start and taxi fuel (8 minutes at the cruise burn unless set), usable fuel, fuel type (100LL 6.0 lb/gal, Jet A 6.7). The NLog uses them all.
Navigator	Kept with the N-number: none, IFR GPS, or IFR GPS with WAAS. Without GPS, RNAV SIDs, STARs, T and Q routes and GPS approaches are listed but grayed *needs GPS*; without WAAS, RNAV approaches fly to LNAV minimums and the plan says so. With GPS, a new IFR plan starts with a SID.

WEIGHT

The figures are for maximum gross. Enter your weight in Settings and best glide and the stall speeds slow down to suit: about 5% for each 10% under gross, or the POH's glide speeds by weight where the type has them.

WHAT THE NUMBERS DRIVE

- Departure climb gradient and speed, liftoff point, and the runway-length check.
- Cruise pace for the enroute hoops, the approach category, and UNABLE checks on amendments.
- The NLog's times and fuel, the fuel check on the Plan page, and FUEL and ENDUR on the Fly strip.
- The Emergency screen's reach, path checks and hoops.
- The minimum field length: one and a half ground rolls, about 43% of the short-field landing over 50 ft.

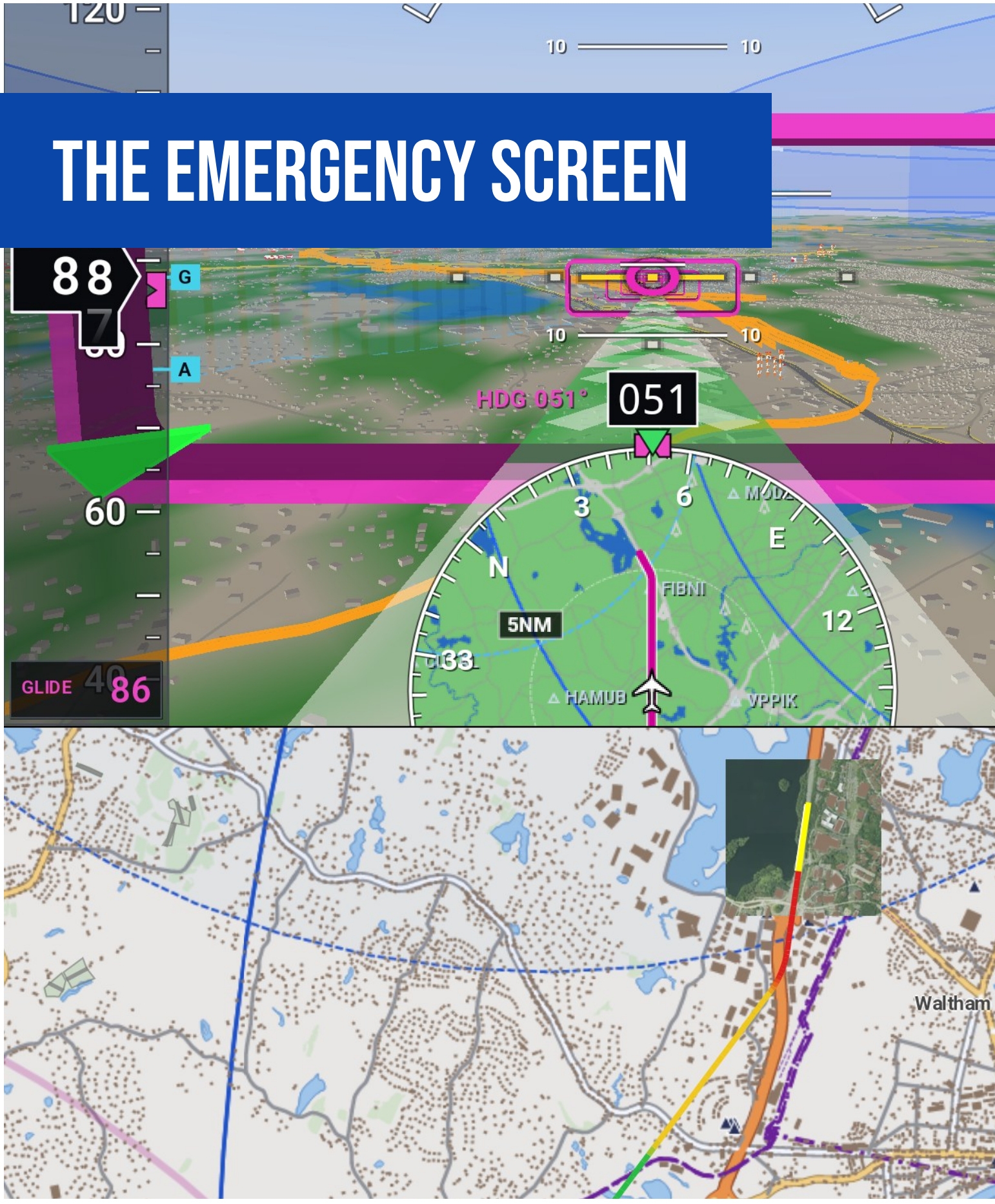
LANDING ORDER

Landing order in Settings sets the kinds of site you prefer for an emergency landing, in order, for each aircraft type. The defaults:

Aircraft	Default order
Most aircraft	Airports, Fields, Roads, Water
Turboprops and jets	Airports, Roads, Fields, Water
Seaplanes	Water, Airports, Fields, Roads

Tap a kind for **Move up**, **Move down** or **Move to top**; **Type default** puts the type's own back.

THE EMERGENCY SCREEN





WHEN THE ENGINE QUITS, the Emerg tab is one tap away from anywhere in the app. It ranks every place you could put the airplane down from where you are right now, and then flies you to the one you choose.

This section walks through the Emergency screen in the order you will meet it in an emergency: who flies the glide, the list of landing sites, the glide brief and the map, what happens when the plan changes, and the landing.

The hoops, tapes and compass map are the same HITS described earlier in this guide.

THE EMERGENCY SCREEN

THE LONGEST MINUTE

Every pilot has rehearsed it. The engine coughs, the nose comes down to best glide, and a calm voice in your head starts the flow: airspeed, best field, checklist. In the practice area, with an instructor's hand near the mixture, the best field is the one you picked out before the throttle came back. Over strange country, in haze, or above a quilt of trees and rooftops, the best field is the one you cannot see.

SkyHeading was built for that minute too. It carries thousands of places to put an airplane down: public and private airports, and off-airport fields, pastures and long straight roads. None of the off-airport sites was taken on trust from a map. Each one was found in national land-cover and crop data, measured, checked against the terrain for slope, against obstacles such as buildings, power lines and towers, and against aerial photographs, and then looked at by a person before it was allowed into the app.

When you tap the Emerg tab, SkyHeading works out which of those sites you can still reach from where you are, at your height, in today's wind, with your aircraft's own glide numbers. It does not stop at a straight line: lining up with a runway or a field costs height, so the app plans the turns too, and only calls a site reachable when the whole path works with height to spare. The list that comes back is ordered the way you would choose: reachable sites first, in your preferred order of airports, fields, roads and water, each card showing the height you will arrive with.

Pick one and tap **Activate Glide**. HITS draws a path of magenta hoops all the way to the threshold. Above it, a brief gives you the frequency to call, Guard, the 7700 squawk, the time left in the glide, and the address and coordinates of where you are going, ready to read to a controller or a dispatcher. If you fall short of the plan, SkyHeading looks for a shorter way in or a better site, and offers it.

WHO FLIES THE GLIDE

SkyHeading asks no question first: the Emerg tab goes straight to the landing sites. When your aircraft is flying with a live position (the tablet's GPS, an ADS-B receiver or a flight simulator, in the air, with its altitude), the glide follows your aircraft and the brief reads **EMERGENCY**. Otherwise (on the ground, from a test position, or from a Preview flight) the Virtual Pilot flies the glide from where the aircraft is, and the brief reads **VIRTUAL PILOT**: the way to practice at home.

Either way the whole session is recorded on the device.

DURING A FLIGHT

Flying a plan, tap the **Emerg** tab: the landing sites are ranked from that flight's aircraft (its position, height, heading and speed), and a Preview holds where it is. Pick a site and tap **Activate Glide**.

While the emergency lasts, the Fly strip shows **CANCEL EMERG** at its left end. Tap it (or **End** on the glide brief) and the session ends and is saved, and SkyHeading flies your plan again from where you are: the clearance in force, back onto the route or the arrival, as after an amendment. After a landing in a field, the flight ends instead.

LANDING SITES

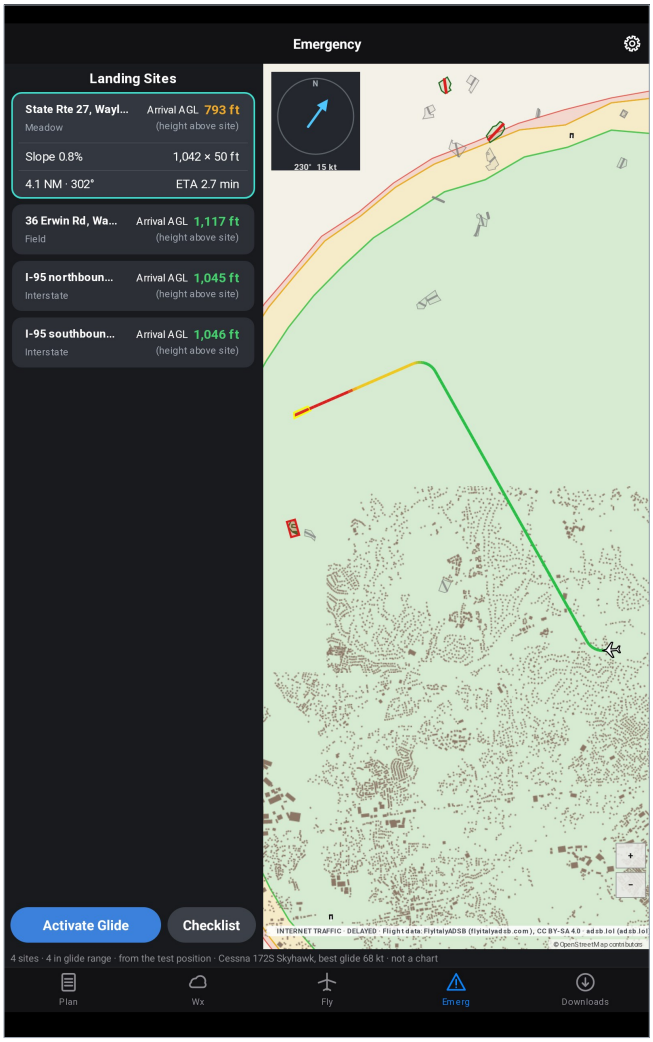
The landing sites are listed as cards, best first (on the left, or in the right-hand column from the Fly screen). Each card shows:

- The site's **name** and the kind of ground (runway, grassland, crops, road…).
- The **height you will arrive with** over the threshold: **green** at 1,000 ft or more, **amber** from 300 ft, **red** below 300 ft.
- **Slope** and **size**: the strip's length and width in feet.
- **Distance** in nautical miles, the **bearing** to fly, and the **ETA** in minutes.
- **Out of glide** or **No route** in place of the height when you cannot make it.
- Warnings such as *Downwind landing, 8 kt tailwind* or *Gear-up landing only*.

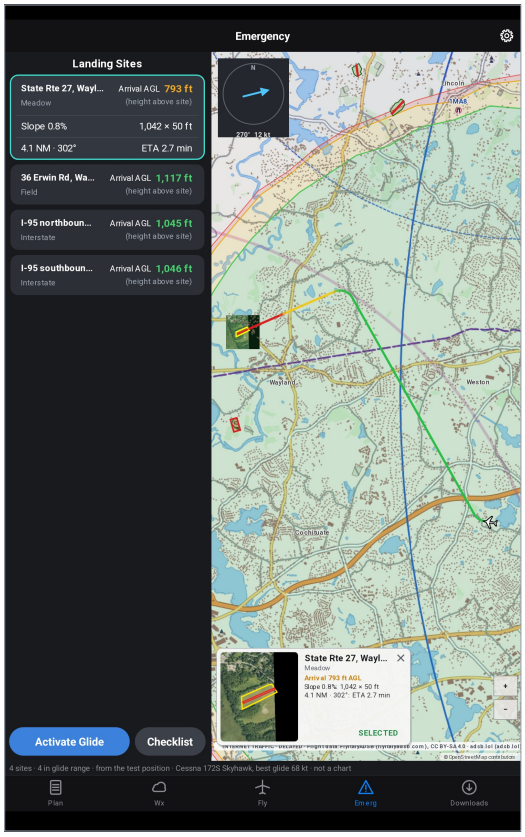
Tap a card to select it: it opens to its details, is outlined, and shows on the map with its photo.

On the map, pinch or use **+** and **−** to zoom and drag with one finger to look around; **FIT**, or a double tap, frames the aircraft and the chosen site again. Tap a site on the map for its card: its aerial photo (airports have none) with the field's extent outlined in yellow and the landing strip in red, what it is, the height you would arrive with and its details. **SELECT** on the card makes it the chosen site and draws the route to it; on the chosen site the card says *SELECTED*. Traffic is drawn on the map as on the Fly page, and tapping an aircraft opens its card.

During a glide the map zooms the same way and keeps following you. Every ranked site on it can be tapped: **SELECT** on another site plans a new glide there from where you are now, at your height, heading and speed, and the glide screen switches to it (a Virtual Pilot glide carries on from where it is). HITS and the compass map show the traffic too.



The Emergency screen opened from the flight plan: ranked site cards on the left, the map on the right.



A site's card on the map: its aerial photo with the field outlined in yellow and the landing strip in red, what it is, the height you would arrive with, and SELECT.

How sites are ranked

Sites you can reach come first, in your **landing order** (Airports, Fields, Roads, Water unless you change it), longest fields first within their kind. After that, each site's **confidence** decides: FAA runways count fully, and off-airport sites by their size against your aircraft's needs, their slope, and the age of the photos they were checked against. Sites out of reach follow, unless **Hide sites out of reach** is on; when none can be reached, all are listed anyway.

Reachable means more than in range. For the best sites SkyHeading plans the actual path, including the turns to line up, with your glide numbers, the wind and a reserve, and calls a site reachable only when that path works. A site that is within glide in a straight line but cannot be lined up shows **No route**.

Divided highways are offered only in the direction of traffic, never against it. Helicopters prefer heliports and open fields; seaplanes are offered seaplane bases.

Where the sites come from

A field that looks fine from 3,000 ft can hide a ditch, a fence or a crop taller than your wheels. That is why SkyHeading does not simply mark every patch of green on a map. Each off-airport site goes through the same steps before it reaches you:

- **Found** in the USGS National Land Cover Database (cultivated crops, pasture and hay, grassland), the USDA Cropland Data Layer (which crop it is: corn, hay, soybeans, cranberries…), and OpenStreetMap for long straight roads.
- **Measured** for a usable strip: at least about 500 ft by 40 ft for farmland, and about 1,500 ft for roads, which are held to a stricter standard than fields.
- **Checked** against elevation data for slope, and against obstacles: the FAA's obstacle file and mapped buildings, power lines, bridges and tunnels.
- **Photographed**: an aerial image of the strip from the USDA's NAIP program is stored with it, with its date.
- **Reviewed** by a person, who verifies it or rejects it for a ditch, trees, a fence, a building, wet ground or anything else that would spoil a landing.

Only verified sites and FAA airports go into the app. Among them, SkyHeading prefers farm fields to roads, and tells you how old the photo is, because crops grow and fences go up.

ACTIVATE GLIDE AND CHECKLIST

Two pills sit at the foot of the list. **Activate Glide** flies the selected site; it is dimmed until a reachable site is selected. **Checklist** opens your aircraft's emergency checklists above the list (see *Checklists* below).

THE GLIDE SCREEN

Activate Glide replaces the list with the glide brief across the top, HITS beneath it and the map on the right. Along the top of the brief are ‹ **Sites**, the session's label (EMERGENCY, or VIRTUAL PILOT when it flies the glide), **Checklist** and **End**, and the Settings gear in the corner.

‹ **Sites** opens the sites list again over the map, ranked from where you are now, at your height and speed, while you keep flying the hoops; the site you are flying to is highlighted when it is still in the list. **Activate Glide** on another site switches the glide to it; **Close** puts the map back. **End** finishes the session and saves the recording; when the emergency came from a flight, End (like CANCEL EMERG) flies your plan again from where the glide left you.

A line along the foot of the screen says what is going on: on the sites list how many sites there are, how many are in glide range, where they are ranked from and your glide numbers; during the glide who flies it (*EMERGENCY · squawk 7700 · 121.5*, or *VIRTUAL PILOT · it glides to …*) and notes such as a new plan accepted.

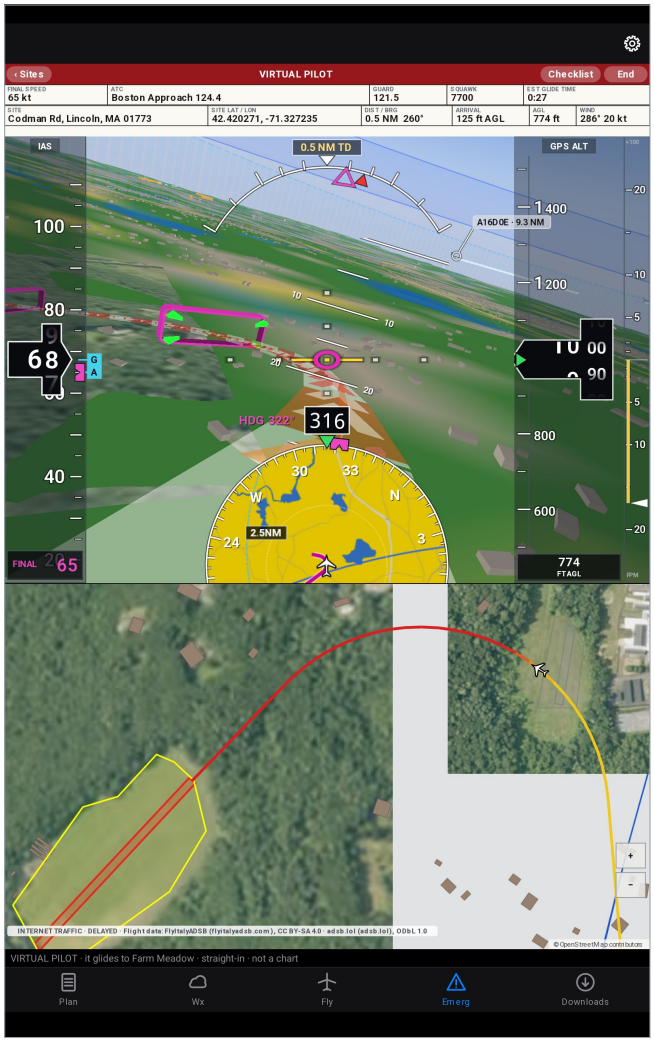
The first thing HITS shows is the speed to fly: **PITCH FOR 68 KTS** (your aircraft's best glide at its weight) floats over the scene until the airspeed has held within 5 kt of it for 3 seconds, or for 20 seconds at most.



‹ Sites 40 seconds into a glide: the sites ranked again from where the aircraft is, the one being flown highlighted, HITS still flying the hoops beside the list.



Two seconds into the glide: PITCH FOR 68 KTS over HITS while the airspeed is still 119 kt. The magenta GLIDE 68 at the bottom left is the same speed.



The glide screen 0.7 NM from touchdown: the brief across the top, the FULL FLAPS board over the path ahead in HITS, the glide path on the photo map, and the site card with the landing direction (LAND ↑ 237°).

The glide brief

Cell	What it tells you
BEST GLIDE	Your aircraft's best glide speed at its weight, in knots.
ATC	Who to call: the landing airport's tower while it is open (its approach control when it is closed), otherwise the approach control nearby, otherwise center, with the frequency.
GUARD	121.5, the emergency frequency.
SQUAWK	7700, the emergency code.
EST GLIDE TIME	Time left to the threshold at your present ground speed.
SITE	The runway, or the field and its street address for a dispatcher.
SITE LAT / LON	The site's coordinates, for off-airport sites.
DIST / BRG	Distance and magnetic bearing to the aim point.
ARRIVAL	The height you will arrive with over the threshold, worked out with a glide a little worse than the book. *on plan* when that sits a few feet under the numbers but you can still make it; MARGIN and *cannot make it* in red when you cannot.
AGL	Your height above the ground now.
WIND	The wind SkyHeading is planning with.

THE MAP

The map shows the sites as outlines, the one you are flying to in yellow, with a red line down each landing strip. Your glide path is drawn from the aircraft to the threshold. A box at the top left shows the wind (CALM when there is none). When **Show glide range** is on, the map draws how far you can glide.

At the bottom left, the **site card** shows which way to land (*LAND ↑ 057°*), an aerial photo of the site with its date and age (*NAIP Jul 2023 · 3 yr old*), the kind of ground and its size, and the address. The map is drawn from the data on your device, so it works without the internet.

Your aircraft stays in the middle of the map, zoomed so the rest of the glide and the touchdown zone fit around it. The button at the top right switches between **NORTH UP** and **TRACK UP** (the map turns with your ground track, and N in the wind box turns with it); the aircraft stays in the middle either way, and while the checklist is open and the map is smaller.

WHEN THE PLAN CHANGES

Gliders do not always glide by the book. SkyHeading watches how you are doing against the plan and helps when it goes wrong:

- **Below the hoops.** When you are 100 ft or more below them, the hoops ahead are lowered to what you can still reach from here, so you fly from where the airplane is. They go back up only if you climb back to within 30 ft of the plan, for instance in lift.
- **Short of the site.** After three seconds short of the plan, SkyHeading looks for a shorter path to the same site, then for another reachable site, and offers what it finds in the brief: *Shorter to Runway 23: … arrive 340 ft* or *Divert to ….* Tap the offer to fly it from where you are.
- **Far too high.** Arriving 600 ft or more above the threshold with room for a pattern, SkyHeading offers a new plan to the same site.
- **Nothing better.** When no better plan exists, the brief says so: *Low to … about 120 ft under the numbers at the design glide; nothing better in reach. Hold best glide.*
- **Too low.** Below 50 ft it stops looking: *Too low for a new plan, land straight ahead.*

A new path to the runway you are already flying to is flown at once when **Auto-accept same runway** is on (it is by default), and **UPDATED ROUTE** shows across HITS for a few seconds. A divert to a different site always waits for your tap.

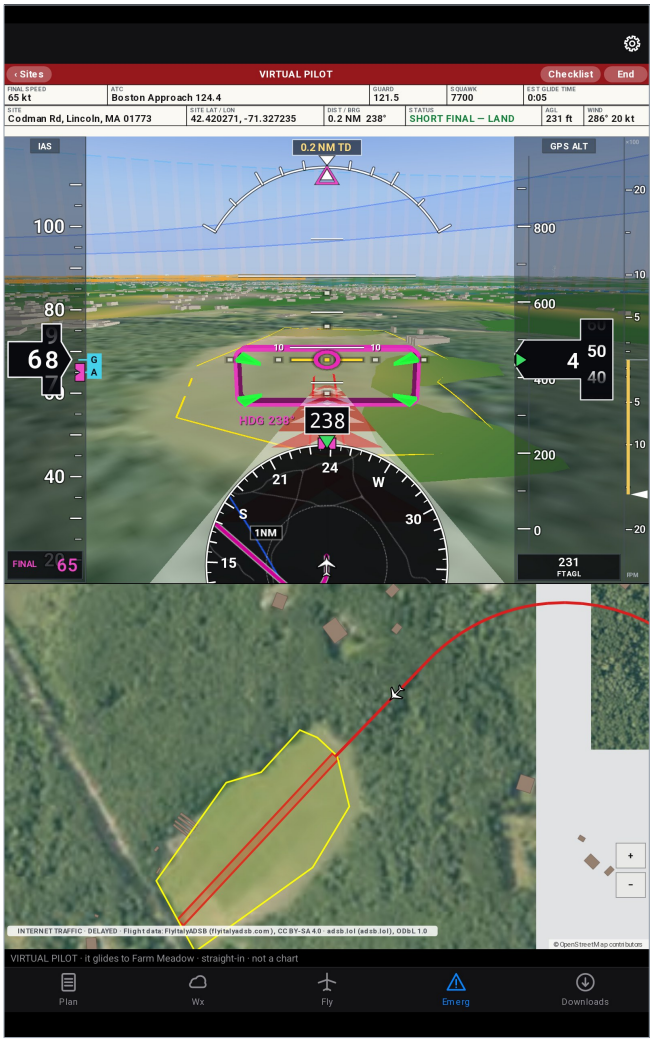
YOUR REAL GLIDE

With an ADS-B receiver that sends airspeed from its AHRS, SkyHeading measures how your aircraft is really gliding, clean and wings level, and when it is doing worse than the book it plans with the measured glide: the list, the path check and any new plan. It only ever plans with a *worse* glide than the book, never a better one.

FLAPS, SLIP AND THE LANDING

Yellow boards stand over the path where each step of the landing configuration goes in: **FLAPS 10**, **FULL FLAPS · 0.5 NM TO LANDING**, **BEGIN SLIP**. When SkyHeading can see your flaps, for example flying a simulator, HITS also shows a red **FLAP OVERSPEED** with the speed and the limit if you are too fast for the flaps you have. The speed tape shows the flap setting at its foot. At airports, only the runway distance-remaining signs for your landing direction are shown.

At touchdown the recording carries on through the rollout until the aircraft stops (or for 90 seconds), and then the session ends. HITS stays up until you tap ‹ **Sites** or **End**.



Short final to a field, 0.1 NM to touchdown: SHORT FINAL — LAND in the brief, final speed on the speed tape, and the strip outlined on the photo map.



Checklist during a glide from the Fly screen: the Engine failure in flight list at the top of the right-hand column, the map smaller beneath it, and HITS and the brief unchanged. The tabs switch lists; Done closes it.

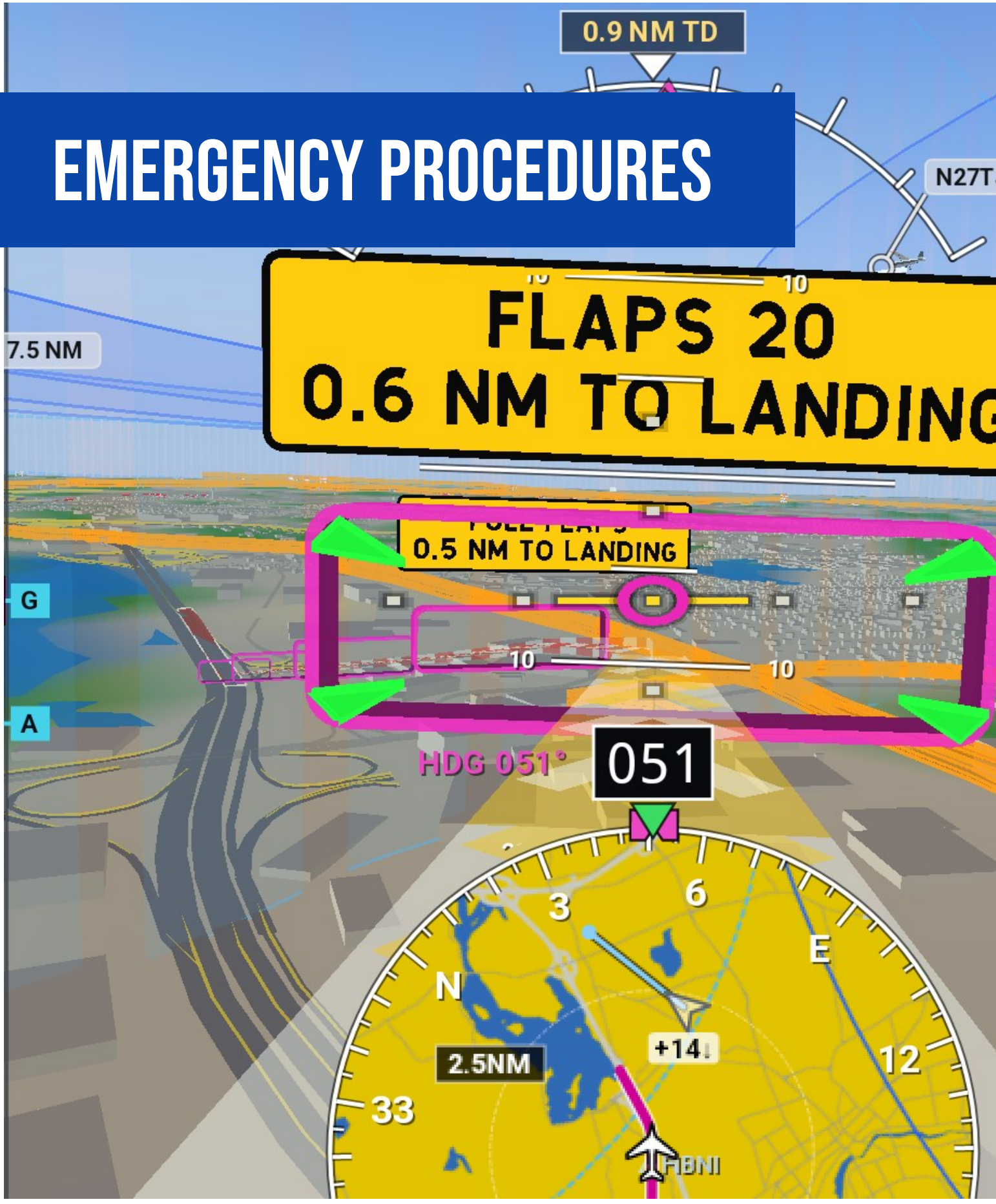
CHECKLISTS

Checklist opens typical engine-failure and forced-landing checklists for your aircraft's family: carbureted and injected Cessnas, low-wing Pipers, the Super Cub, Cirrus (with CAPS), Diamonds, retractables, helicopters, and seaplanes (with a water landing list). Your best glide speed is filled in from your numbers. Tap items as you complete them, then **Done**.

The checklist never covers HITS or the brief. It takes the top of the side column, and the map or the sites list shrinks underneath it until you tap **Done**. When the column is narrow, the list tabs wrap onto a second row.

Every list can be edited in Settings under **Emergency checklists**. They are typical lists: verify them against your POH. Opening a checklist, and each item you check off, goes into the recording.

EMERGENCY PROCEDURES





THIS SECTION SHOWS HOW SKYHEADING fits into the engine-failure flows you already know. The app never comes first: aviate, then navigate, then communicate. SkyHeading helps with the second and the third.

These procedures are suggestions for using the app, not a replacement for your aircraft's POH, your training or your judgment. Practice them with an instructor until they are second nature, and fly the airplane all the way to the ground.

ENGINE FAILURE BELOW 1,000 FT AGL

1. Airspeed: best glide, at once.
2. Do **not** reach for the tablet. There is no time.
3. Land ahead, turning only as needed to avoid obstacles.
4. Fly the airplane all the way to the ground.

ENGINE FAILURE IN FLIGHT

1. Airspeed: best glide (PITCH FOR on HITS and BEST GLIDE on the brief once they are up).
2. Tap the **Emerg** tab.
3. Choose a site: the top card is the best reachable site in your order.
   - **a.** Arrival height: green 1,000 ft or more, amber from 300 ft, red below
   - **b.** Warnings: tailwind, gear-up only
   - **c.** Tap the card to see the photo and the landing direction
4. Tap **Activate Glide** and turn for the first hoop.
5. Checklist: run the engine-failure flow and attempt a restart.
6. Communicate:
   - **a.** Call the ATC frequency on the brief, or 121.5
   - **b.** Squawk 7700
   - **c.** Read out SITE and SITE LAT / LON
7. Fly the hoops. Accept a recovery offer if one appears.
8. Checklist: forced-landing flow before final.

SHORT OF THE SITE

1. Hold best glide. Do not stretch the glide by pulling up.
2. Watch the brief for *Shorter to …* or *Divert to …*, and tap to accept.
3. If the brief says nothing better is in reach, keep flying the plan and pick the best ground short of the site.
4. Below 50 ft: land straight ahead.

TOO HIGH

1. Let SkyHeading offer a new plan to the same site (flown at once with Auto-accept same runway).
2. Use flaps and a forward slip where the yellow signs on the HITS path say.
3. Fly the new hoops to the threshold.

AFTER LANDING

1. Shut down and evacuate per your POH.
2. Call for help: 121.5, ATC or 911, with the SITE address and coordinates from the brief.
3. SkyHeading ends the recording when the aircraft stops. Tap **End**.

IMPORTANT: SkyHeading does not call for help. It is not a substitute for 911, an ELT or a personal locator beacon.

RECEIVERS AND SIMULATORS

ADS-B RECEIVERS

SkyHeading listens for a GDL-90 ADS-B receiver all the time: join the receiver's Wi-Fi network and it is used as soon as it sends (on UDP port 4000, as ForeFlight's receivers do). The line under the Plan page's title says where the position comes from, by the receiver's name, or the tablet's own GPS without one. A receiver's position is used in place of the tablet's GPS.

- **Position** and altitude for everything in the app.
- **Traffic**, drawn on the Map, the airport plan, the Profile, the compass map and in HITS, with the spoken traffic alerts (see *Traffic* and *Alert Voices*). Without a receiver, internet traffic fills in where it can, never alerting.
- **TFRs** from FIS-B, drawn in HITS and on the compass map.
- **Airspeed** from an AHRS, which lets SkyHeading measure your real glide.
- **Wind**: in the air, the receiver's wind fills the Wx tab's Enroute card (Settings › ADS-B receiver › Use receiver wind), and the Fly page flies it.

NOTE: Many receivers' "air data" is worked out from GPS, not measured. SkyHeading learns your glide only from a real airspeed.

A receiver can also join another Wi-Fi network, such as Starlink's, so the device keeps its internet in the air. Then SkyHeading announces itself on that network (UDP port 63093, as ForeFlight does) so the receiver sends to it; if it does not, type the receiver's address in Settings › Internet in flight › **Receiver on Starlink's Wi-Fi**. See *Internet weather in flight*.

RECEIVER DATA

To check the receiver is connected, that it hears traffic and ground stations, and how fresh its data is, open **Receiver data**: tap the position line under the Plan page's title, the **ADS-B** pill at the left of the Fly strip, or **Settings › ADS-B receiver › Receiver data**. The Fly page's pill reads **ADS-B** in green while the receiver sends with a GPS fix, **ADS-B NO GPS** or **ADS-B LOST 14 S** in amber when its fix or its data stops, and **NO ADS-B** in grey when nothing has come.

- **Messages per minute**: a bar for each of the last 20 minutes, stacked by message type in the raw data's colours, so a dropout shows as a gap.
- **Connection**: receiving or not, the receiver's name, how much has come, bad checksums and reconnects since SkyHeading started listening (**Reset counts** starts them again).
- **GPS**: the fix, its accuracy (NACp) and integrity (NIC) from every position report, and the vertical accuracy. GDL-90 does not say whether WAAS is in use or which satellites: a **Stratux** does, from its web page, so with one the page also shows WAAS, the satellites used, tracked and seen, and the **GPS sky view**: each satellite where it is in the sky, filled when the fix uses it, with its signal as a bar. Other receivers' WAAS reads *not reported* (NACp 11, under 3 m, is WAAS-class accuracy).
- **Traffic scope**: the aircraft the receiver hears round you, north up, on range rings: each as the maps draw it, with its call sign and type, its height above or below you, altitude and speed, and under the scope a list with bearing and distance, altitude, speed and track (in the air first). The range fits the traffic; pinch to zoom in or out, double-tap to fit it again. Tap an aircraft on the scope or its row in the list for its card, as on the Fly page's views (picture, altitude, distance and bearing, speed and heading); tap it again, or the card's ×, to close it.
- **Receiver**, **Traffic** and **Weather (FIS-B)**: each kind of message, how many, how many in the last minute and how long ago the last came, green while fresh and amber when late: the heartbeat, this aircraft, the aircraft heard in the last minute, the UAT uplinks and ground stations, and each FIS-B product (METARs, TAFs, winds aloft, NEXRAD, TFRs, and those counted but not drawn yet).
- **Sentry** (a uAvionix Sentry only): its mode. In its ForeFlight mode it sends an encrypted stream SkyHeading cannot read, and the Status, the Fly page's pill (**SENTRY: FOREFLIGHT MODE**) and this row say so. Join the Sentry's Wi-Fi and tap **Switch to standard GDL-90**; tap **Switch back to ForeFlight mode** before flying with ForeFlight. The setting stays in the Sentry when it is turned off and applies to every app; ForeFlight's Sentry page and CO alerts may want its own mode. It is an undocumented Sentry setting, which a later firmware may refuse. In standard GDL-90 SkyHeading reads the Sentry's 1090 ES and UAT (978 MHz) traffic, and its live status: the GPS fix (WAAS when it reports DGPS), the satellites in use and the devices on its Wi-Fi.
- **Raw data**: every message as it comes, scrolling up a black console as a terminal prints it, each kind in its own colour (this aircraft green, traffic cyan, UAT traffic orange, uplinks and their METAR and TAF text yellow, AHRS magenta, the receiver's name blue, bad checksums red). **Pause** holds it to read, **Hex** shows each message's bytes.

NOTE: No ground station in sight is normal on the ground: FIS-B weather needs line of sight to a tower. Situational awareness

only: not an IFR navigator.

PRACTICING WITH A SIMULATOR

Under **Flight simulator** in Settings, SkyHeading can follow an aircraft in X-Plane, Microsoft Flight Simulator 2020, Microsoft Flight Simulator 2024 or FSX. It is the best way to practice, whether a whole flight plan with a controller's amendments or an engine failure: SkyHeading sees the flaps and airspeed, so every prompt works, and the **Virtual Pilot follows route** switch lets SkyHeading fly the hoops for you to watch.

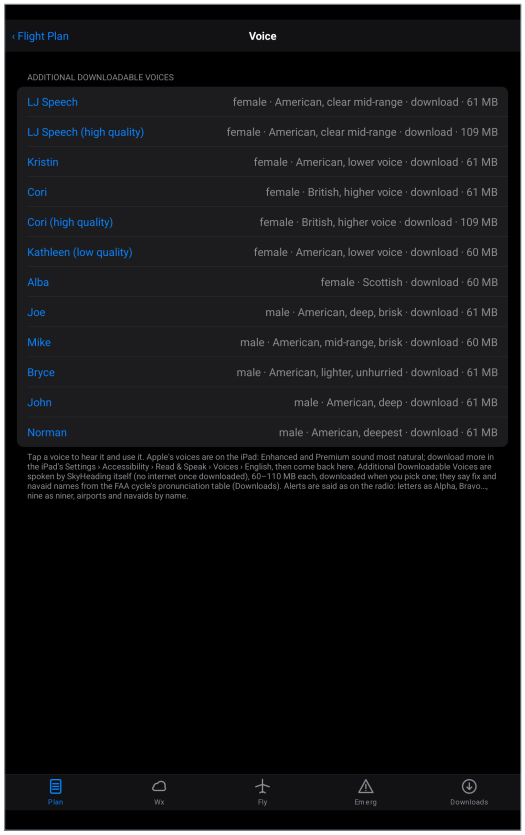
- **X-Plane** talks to SkyHeading straight over the network: choose X-Plane, type the address of the PC X-Plane runs on (port 49000), and turn on **Connect**. Windows Firewall on that PC must let X-Plane's UDP port through.
- **MSFS 2020, MSFS 2024 and FSX** only talk on their own PC, so run the small **SkyHeading SimBridge** app there: pick the simulator, type the address of the tablet running SkyHeading, and tap **Start**. Its window shows the bridge, the simulator and SkyHeading connected, the messages going each way, this PC's addresses, and a log (turn on **Debug logging** for support). Then choose the same simulator in SkyHeading and turn on **Connect**.

ALERT VOICES

SkyHeading can say what matters out loud, so your eyes stay outside. Open **Settings › Alert voices**: **Voice** picks the voice, **Voices by phase** gives a phase of flight a voice of its own, **Test voice** plays a sample, and each alert has its own switch. Tap an alert's name to hear it. **Speak all alerts** turns every one on.

The **Voice** page lists two kinds of voice. The tablet's own English voices come first (Android's text-to-speech; add more in Android's Settings › System › Languages › Text-to-speech output, or from the speech engine's own settings). Then the **Additional Downloadable Voices**: voices SkyHeading speaks itself, with no internet once downloaded. Each shows its gender and how it sounds, for example *male · American, deep, brisk* (Joe) or *female · British, higher voice* (Cori): LJ Speech (the default, close to the tablet's voice; also in high quality), Kristin, Cori (also in high quality), Kathleen and Alba among the women; Joe, Mike, John, Norman and Bryce among the men. For an ATC-like delivery try the brisk ones, Joe and Mike. Each is 60 to 110 MB and downloads from SkyHeading's pack server (Downloads) when you tap it, then plays. Their pronunciation of fix and navaid names comes with each FAA cycle on the Downloads: a voice picked fetches it if the cycle on the device came without it.

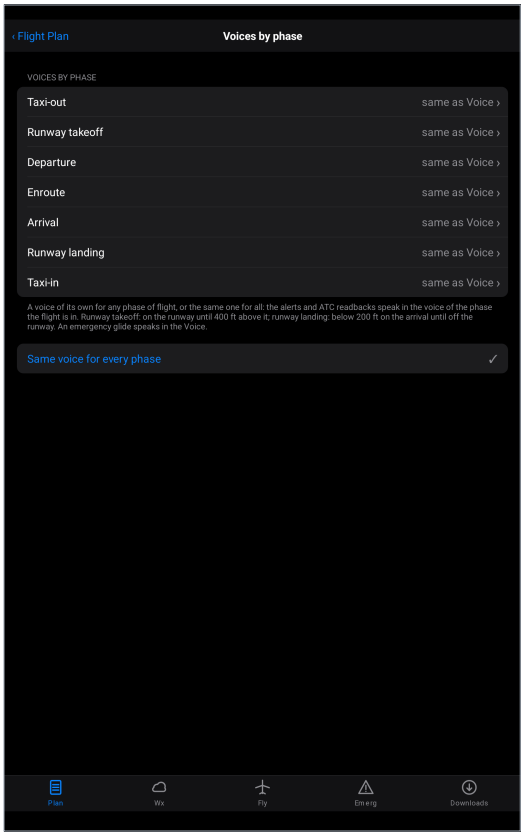
The alerts speak while you fly on the live position (GPS or a receiver), and on a Preview: faster than ×1, Preview pauses while each one plays so the next does not come on top of it. A glide the Virtual Pilot flies is silent.



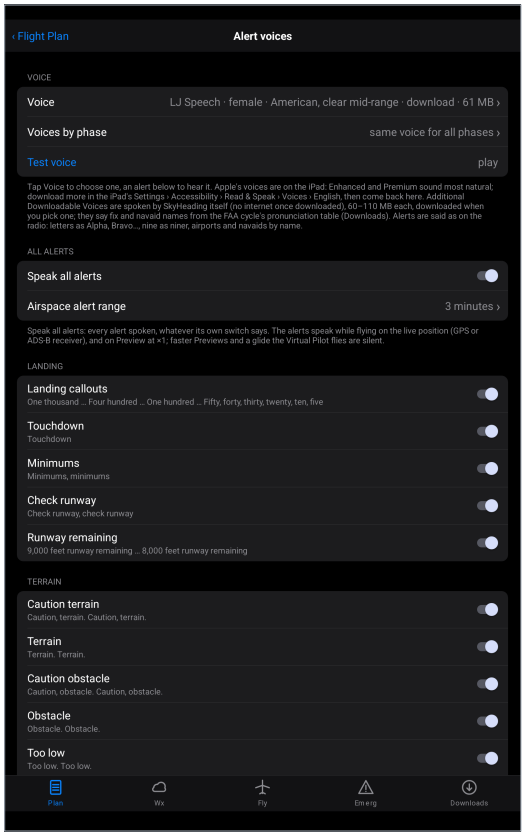
Settings › Alert voices › Voice: the Additional Downloadable Voices, each with its gender, how it sounds and its download size, under the tablet's own voices.

VOICES BY PHASE

Some pilots like one voice throughout; others like to hear at once which part of the flight a call belongs to. **Voices by phase** lists **Taxi-out**, **Runway takeoff**, **Departure**, **Enroute**, **Arrival**, **Runway landing** and **Taxi-in**, each *Same as Voice* until you pick one for it; **Same voice for every phase** puts them all back. The alerts and the ATC readbacks speak in the voice of the phase the flight is in. Runway takeoff is the departure runway only, from entering it until 400 ft above it (crossing another runway on the way out stays the taxi's voice); runway landing is below 200 ft on the arrival until you are off the landing runway, then the taxi-in's. An emergency glide speaks in the Voice.



Voices by phase: each phase of flight Same as Voice until a voice is picked for it, and Same voice for every phase.



Settings › Alert voices: the voice, Speak all alerts, the airspace alert range, and a switch for each alert with what it says.

AS SAID ON THE RADIO

Every voice says things the way pilots and controllers do. Letters are the phonetic alphabet: *taxiway Alpha*, *class Bravo airspace*, *November one two three Alpha Bravo*. Figures are said one by one, nine as *niner*: *runway two niner*, *runway one five right*, *heading zero niner zero*, *squawk seven seven zero zero*, except whole hundreds and thousands: *six thousand five hundred*, *one one thousand*. Frequencies have their *point*, altimeter settings do not. Fixes are said as words, never spelled out, and airports and navaids by the names used on the radio: *Boston* for KBOS, *Worcester* for KORH (*Worcester ATIS*), *Hartford* for the HFD VOR (*Approaching Hartford*), *O'Hare* and *Midway* in Chicago, *Kennedy*, *LaGuardia* and *Newark* round New York. Every navaid in the data has its name; an identifier with no name known is spelled in the phonetic alphabet.

Calls are not repeated: an airspace is called once by its name however many shelves or sectors it has, and the same airspace or radio call is not said again within ten minutes. On an IFR plan, or VFR with flight following (**Talking to departure** on the Departure screen), there is no *Contact … tower* call before a Class B, C or D: ATC hands you off.

Group	Alerts (what you hear)
Landing	Landing callouts (*One thousand … Five hundred … ten, five*), *Touchdown*, minimums (*Minimums, minimums* at the DA or MDA, over the height callouts: a callout under way stops for it, and the one at the DA is not said), *Check runway* when the runway ahead is not the planned one, and runway remaining (each 1,000 ft left on the takeoff roll, and on the rollout from *Touchdown* on, above 30 kt; 500 ft on runways under 5,000 ft).
Terrain	Worded as a TSO-C151c Class C TAWS: *Caution, terrain* then *Terrain. Terrain.* for the ground ahead, the same for obstacles, *Too low* (going down short of the runway), *Sink rate* then *Pull up*, *Don't sink* after takeoff or a go-around, and *Five hundred* away from a landing. Low by the departure and destination runways they stay quiet. On final the look ahead stops at the threshold: the ground beyond the runway is not called, but terrain or an obstacle short of it still is, and so are *Too low* and *Sink rate*.

Group	Alerts (what you hear)
Taxi	Approaching a runway (*Approaching runway 15R-33L, hold for crossing clearance*) and entering one, with the runway remaining. **Progressive taxi** (off until you turn it on): turn-by-turn along the cleared route, out and in (*Proceed ahead on taxiway Bravo*, *Ahead, turn right on taxiway Alpha*, then *Turn right on taxiway Alpha* at the turn; a turn beyond a runway to cross is called once you are across it, and with no turn close, *Continue ahead on taxiway Foxtrot* as soon as you are across), and *Off route* once after a wrong turn (never lining up or on the takeoff roll). **Continue ahead** (with progressive taxi): *Continue ahead on taxiway Alpha* every 30 seconds on a long taxiway. **Taxi hot spot**: *Approaching taxi hot spot, use caution* 500 ft before an FAA hot spot on the route. **Hold for Departure** (a towered field, the tower open): *Hold short on taxiway Alpha 5 for departure clearance on runway two niner. Contact Worcester Tower on one two five point zero for departure clearance.* **Arrived at parking**: *Arrived at North Cargo*.
Airspace	Approaching Class B, C or D, a TFR, a prohibited area or a MOA, within the **Airspace alert range** (minutes at your speed, or a distance) above 1,000 ft.
Flight	*Oxygen required* (91.211), the radio frequencies to contact, *Approaching GLYDE* about 30 seconds before each fix and *Crossing GLYDE* as it goes behind.
Traffic	*Traffic, two o'clock, one mile, same altitude*, traffic on the runway and on short final, and wake turbulence. After a *pew pew*: **Entering a runway that is not clear**, past the hold into the red stretch of the route, says why (*Alert, traffic on short final, runway two niner* or *Alert, traffic on runway two niner*); **Runway incursion**, on the departure runway, an aircraft or vehicle on it (*Alert, runway incursion on runway two niner, one thousand five hundred feet ahead*). These need a receiver that reports your own aircraft (Preview counts internet traffic, as the red route does).

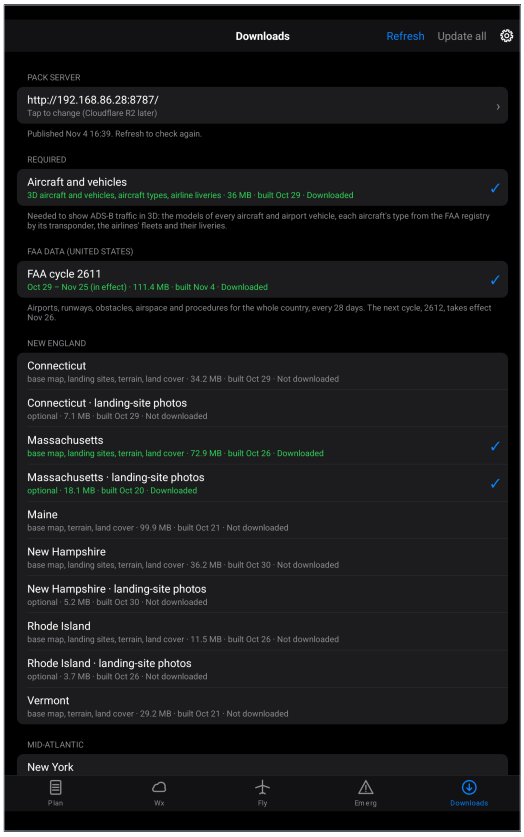
NOTE: The alerts are decision support: SkyHeading is not a TAWS, a TCAS or a certified alerter.

DOWNLOADS

Everything SkyHeading draws and plans with comes from data packs on your tablet, so it works with no signal. **Downloads** (the download icon at the top right, left of the gear) gets them:

- **FAA data (United States)**: airports, runways, obstacles, airspace and procedures for the whole country, a new cycle every 28 days. The tab shows the cycle in effect, its dates, and when the next one takes effect; a plan made on an older cycle is checked again on the new one.
- **States**, by region: each state's base map (roads, water, buildings, taxiways), its emergency landing sites, terrain and land cover.
- **Landing-site photos**, optional, per state: the aerial photo on each site card.
- **Aircraft and vehicles**, required, at the top of the tab: the traffic models, the FAA aircraft registry (which type each U.S. aircraft is), the airlines' fleets, and their colors. Traffic is drawn as arrowheads only until it is installed.

Tap a pack to download, update or delete it. Green with a check is on your tablet and current; orange says an update is available; **Update all** at the top right gets every newer pack. Downloads carry on where they stopped if the connection drops, and each file is checked before it is used.



Downloads: the FAA cycle in effect, then the New England states, Massachusetts with an update available and its photos downloaded.

STORAGE: THE TABLET OR AN SD CARD

On a tablet without a card, SkyHeading keeps its data in the tablet's own storage. A tablet with a **microSD slot** can keep it on the card instead, which frees the tablet's storage: a 128 GB tablet with a large card holds every state you fly (Samsung's Galaxy Tab S10 FE, S11 and S12 models take cards of up to 2 TB).

Settings › Storage appears when a card is in. It shows where the data is (*Data on*), how much SkyHeading holds, and the room left on the tablet and on the card. Everything moves together: plans, settings, the FAA cycle, state packs, landing-site photos, voices and logs.

- **Move to the SD card** (or **Move to the tablet**), on the ground: SkyHeading checks there is room, copies the data with a progress bar, checks every file, deletes the old copy and restarts on the new place. **Stop** clears the half-made copy and leaves the data where it was. A move is not offered while a flight is under way.
- When the other place already holds SkyHeading data from an earlier move, choose **Use its data** as it is, or **Replace it with this data**.
- Downloads go where the data is: with the data on the card, new packs and photos download to the card.
- **Keep the card in.** If SkyHeading starts without it, it says so and runs on the tablet's storage, without the card's packs and plans. Put the card back and restart SkyHeading, or choose **Stay on the tablet** to keep the data on the tablet from then on (the card's copy stays on the card).

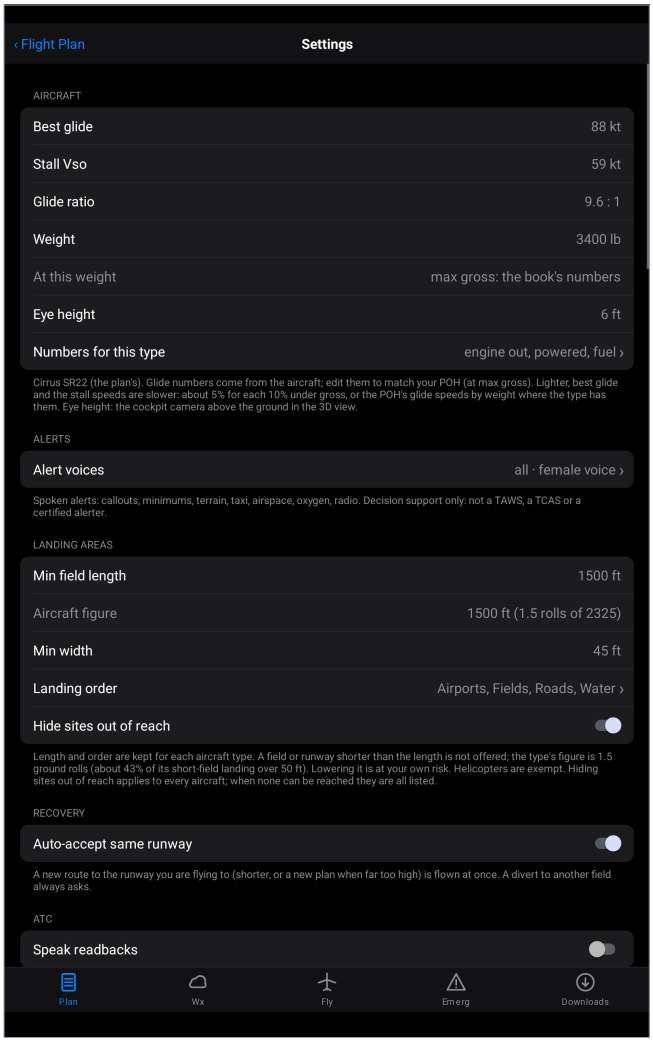


Settings › Storage on an Android tablet with an SD card: the data on the card, the room left on each, and Move to the tablet.

NOTE: Uninstalling SkyHeading deletes its data on the card as well as on the tablet: Android removes an app's own folders with the app.

SETTINGS REFERENCE

Tap the gear at the top right. Settings are grouped as follows.



The top of Settings (the gear): the aircraft and its glide numbers, then the position SkyHeading is using.

Setting	What it does
AIRCRAFT	
Aircraft	The aircraft type the Emergency screen flies.
Numbers for this type	Opens the aircraft numbers editor.
Best glide, Stall Vso	Knots, at maximum gross.
Weight	Pounds; slows the speeds to suit (shown under *At this weight*).
Glide ratio	Distance forward for each unit of height lost (9 : 1 is typical).
Eye height	The pilot's eye above the ground, for the cockpit view in 3D.
ALERTS	
Alert voices	The voice, a voice for each phase of flight (Voices by phase), and a switch for each spoken alert (see *Alert Voices*).
POSITION	
Latitude, Longitude, Altitude, Heading, Airspeed	Where SkyHeading thinks you are; read-only while flying. A test position sets where the Emergency screen starts without GPS.
LANDING AREAS	
Min field length	Shortest field or runway offered; the type's own figure shown beside it, amber when you go lower.
Min width	Narrowest off-airport strip offered.
Landing order	Kinds of site, in the order you prefer them.
Hide sites out of reach	List only sites you can reach (all of them when none can be).
RECOVERY	
Auto-accept same runway	Fly a new path to the runway you are flying to at once; a divert always asks.
ATC	
Speak readbacks	Speak each amendment's readback aloud as well as showing it across HITS.
Edition	Override: VFR or IFR features (subscriptions when the Google Play build ships).
PRACTICE ATC	
Mode	Off, Always-on (calls while airborne) or Round (10 timed calls from the Fly strip).
WILCO only	Apply a practice call without the keyboard; score unchanged.
Virtual Pilot flies during Practice	On a simulator link, Perfect Pilot flies while you type.
Default difficulty	Easy, Medium or Hard for Always-on and Round defaults.
VFR / IFR amendments	Which kinds of practice calls to issue (VFR edition forces VFR).
STORAGE (with an SD card)	
Data on	The tablet or the SD card; the room left on each.
Move to the SD card / tablet	Copies all of SkyHeading's data there, checks it and restarts (see Downloads, Storage).
Stay on the tablet	Shown when the card holding the data is not in: keeps the data on the tablet from now on.
KEYBOARDS	

Setting	What it does
QWERTY letter keys	Letters in QWERTY rows instead of the FMS's A to E rows; the number keys stay on the left.
DISPLAY	
Show glide range	Draw how far you can glide on the map.
Show ADS-B radar	The receiver's NEXRAD on the Fly Map, the compass map, the Route, pattern and taxi maps.
Radar smoothing	On at first: the radar (and the Wx map's icing, turbulence and cloud tops) drawn smooth close in, no reported bin weaker; off shows the bins as received.
Fly Map	Each weather layer on the Fly Map on or off, with how see-through it is, over a made-up preview on the VFR, IFR LOW or IFR HIGH chart (see *Weather on the Map*).
Offline basemap	The states installed on the device (get more in Downloads).
FLY LAYOUT	
On a phone / tablet / large tablet	Which views share the Fly page on each size of device; a tap for the next layout. The Views button on the Fly page picks them too.
Default layouts	Every size back to its default.
3D RADAR	
Width	How far across the cylinder is, 10 to 50 NM (20 at first).
Headroom over the ceiling	How far its top stands over your aircraft's service ceiling.
Heights drawn	How many times taller than distances across heights are drawn (×3 at first).
Breadcrumbs, Breadcrumbs for	Each aircraft's trail, and how many minutes of it.
TrafficTrend	A line to where each aircraft will be.
HSI	
Map inside, ARC	The moving map inside the rose; the 120° ahead instead of the whole rose.
Rose follows the track	The rose turns with your track even when a heading is sent.
Bearing pointer 1, 2	Off, the next fix, the destination, the departure, the nearest airport or the nearest VOR.
Top left, Top right	The corner fields above the rose.

Setting	What it does
Wind on the rose	The wind's arrow and speed on the rim.
TAXI MAPS	
Display Gates	Each gate and numbered spot drawn as its sign on the taxi maps and the airport page's Map.
Display Airport Locations	The airport's places as pins, of the kinds switched on below it: FBOs, terminals, ramps, hangars, fuel. The CLEARED TO keyboard offers every one whatever is shown.
FLIGHT PLAN FILING	
Flight Plan Filing w/ Leidos (Beta)	The Plan tab's Flight plan filing row. Practice only: nothing is sent to Flight Service yet.
FLIGHT SIMULATOR	
Simulator, Connect, Status	Follow X-Plane (the address of its PC) or MSFS 2020, MSFS 2024 or FSX (through the SkyHeading SimBridge app on the simulator's PC).
Virtual Pilot follows route	Let SkyHeading fly the simulator along the hoops.
ADS-B RECEIVER	
Receiver	Listen for a GDL-90 receiver over Wi-Fi (on at first).
Use receiver wind	In the air, the receiver's wind fills the Wx tab's Enroute card.
Status	Receiving (with the receiver's name), listening with nothing yet, or how long since the data stopped.
Receiver data	What the receiver has sent, kind by kind, how fresh, its GPS, raw data and the sky view (see *Receivers and Simulators*).
TRAFFIC	
3D traffic in HITS, Callouts in HITS	Draw the traffic in HITS, and its callouts.
Callouts on the Fly Map	Tag traffic that is close (and any you tap) on the Map.
TrafficTrend on the maps / in HITS, Trend ahead	A line to where each aircraft will be that many seconds ahead.
Show traffic within, Callouts within	Leave out traffic, and callouts, farther than this (threats always show).
Airline names on aircraft, Airline emblems on tails	The airline's name and emblem on traffic close by.

Setting	What it does
Internet traffic, in flight	Traffic from the internet where no receiver feeds any; in the air too with the second switch.
Traffic server	The SkyHeading server the internet traffic, NOTAMs, D-ATIS, METARs and TAFs come through.
INTERNET IN FLIGHT	
Internet weather in flight	On at first: the internet's winds aloft, radar, advisories, PIREPs and satellite keep coming in the air; off for a metered link.
Internet now	How the device reaches the internet now, and whether SkyHeading's server answers.
Receiver on Starlink's Wi-Fi	The receiver's address when it is joined to another Wi-Fi (Starlink's), so it sends to this device there.
EMERGENCY CHECKLISTS	
Edit checklists	Edit the lists for your aircraft. Typical; verify against your POH.
LEGAL	
Open Data Licenses	The data sources and their credits, the full ODbL, GNU GPL v2 and MIT texts, and where to get the data they cover (see *Credits*).
Trademarks	The airlines whose names and emblems the traffic is drawn with (see *Credits*).

RECORDINGS AND YOUR DATA

Routes flown from a plan are recorded one file per leg, with every amendment you read back. Every emergency session, whoever flies the glide, records full telemetry: your position, height, heading, attitude and speed several times a second, which site you chose and when, every re-rank and recovery offer, every checklist item, the touchdown and the rollout.

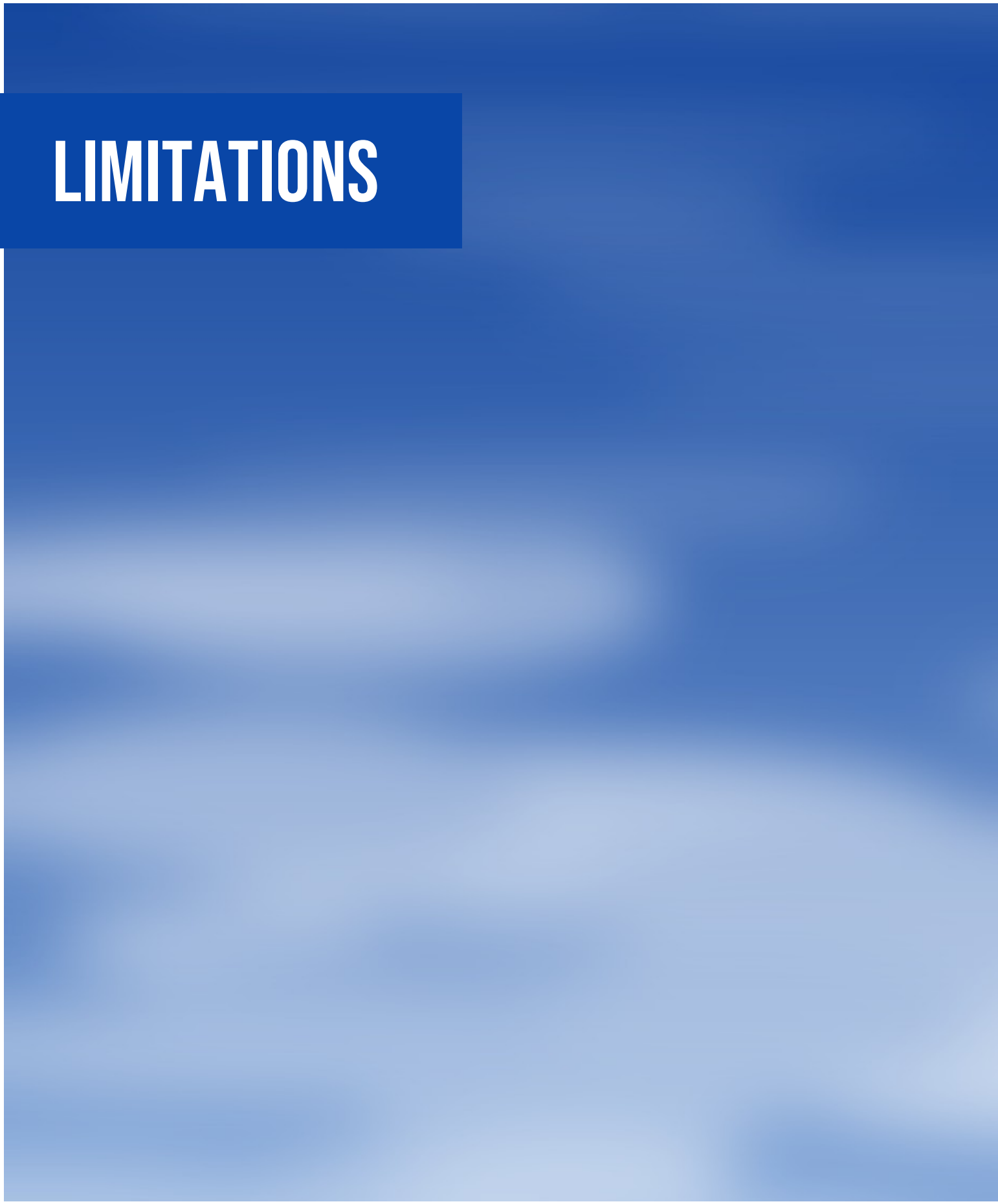
Recordings are kept **on your device**. SkyHeading does not send them anywhere.

Why record at all? An honest record of what happened helps you debrief, helps your instructor see what you saw, and helps SkyHeading's planning get better.



AVIATE. NAVIGATE. COMMUNICATE.

LIMITATIONS





SKYHEADING IS DECISION SUPPORT. It is not certified avionics and it is not approved for navigation. Read these limitations before you rely on it, and keep them in mind every time you do.

If anything SkyHeading shows disagrees with what you see out of the window, believe the window.

LIMITATIONS

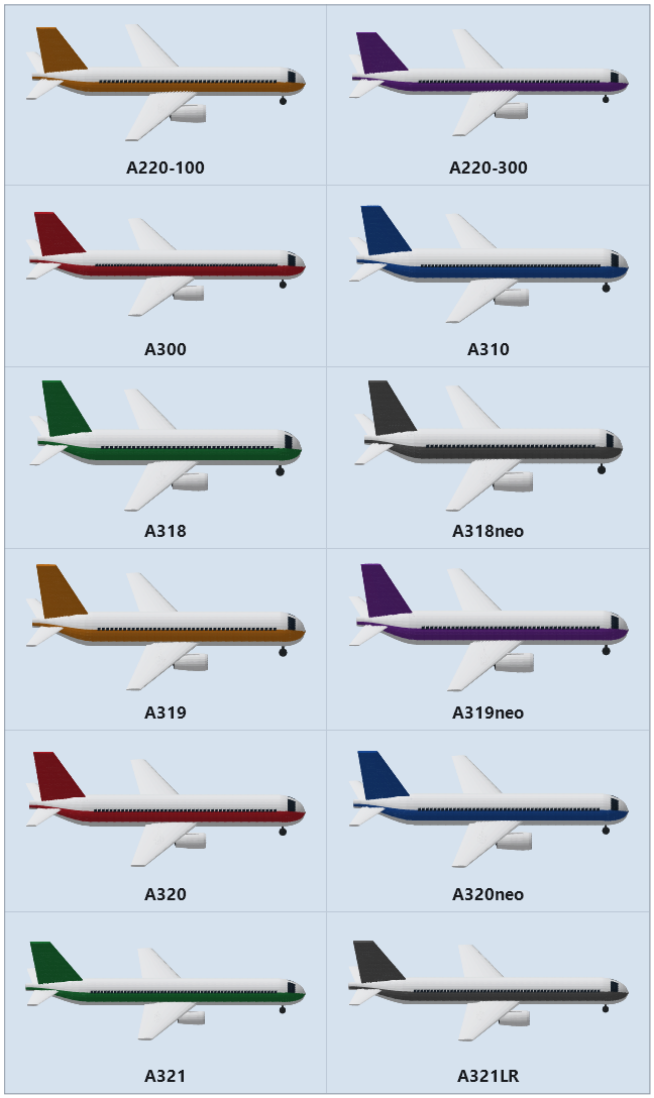
- **Not certified.** SkyHeading is uncertified decision support. It does not replace your training, your POH, ATC or your judgment.
- **The controller's word is the clearance.** The AMEND keyboard records what you copied and flies it as SkyHeading understands it. If the route it draws is not what you were told, fly what you were told and ask.
- **Data goes out of date.** FAA procedures change every 28 days. SkyHeading warns when a plan outlives the data on your device, and checks saved plans against newer data.
- **Numbers are typical.** The aircraft figures are published-class values, not your POH, until you change them. Your aircraft's real climb and glide depend on its weight, condition, configuration and how it is flown.
- **Wind is an estimate.** Wind changes with height and over terrain. Plans include a reserve, but not for every gust.
- **TFRs need a fresh feed.** Without current TFR data, SkyHeading says *TFR data not current*; it never says the sky is clear.
- **Sites can change.** Off-airport sites were checked against aerial photos that may be years old (the age is on every site card). Crops grow, fences go up, fields flood and roads fill with traffic. Look before you land.
- **Weather is not a briefing.** The D-ATIS, METARs and TAFs SkyHeading brings over the internet are unofficial and need a connection; FIS-B weather is minutes old; what you copy is only as current as the last ATIS you heard. Listen to the ATIS on frequency and get an official briefing.
- **NOTAMs are not a briefing.** SkyHeading relays the FAA's NOTAMs and reads them by rule; a NOTAM it cannot read is still listed, but nothing is drawn for it. Get the official briefing (1800wxbrief.com).
- **Not everywhere yet.** Coverage is the United States, state by state: New England first, with landing sites in Massachusetts and Rhode Island so far.
- **Below 1,000 ft** after an engine failure there is no time for an app. Land ahead.
- **Not a lifeline.** SkyHeading does not call for help and is not a substitute for 911, an ELT or a personal locator beacon.

APPENDIX: TRAFFIC MODELS

Every aircraft and vehicle SkyHeading can draw as traffic, from the Aircraft and vehicles pack. Each is shown here on its own scale so you can see its shape; in HITS and on the maps they are drawn to scale. Here they wear a plain livery; as traffic they are drawn in their airline's colors with its name and an emblem on the tail (military types in their service's colors).

An aircraft's model comes from its type: the FAA registry for aircraft registered in the U.S., the airline's fleet for airliners from abroad (by the size class it broadcasts), else the kind of aircraft it is. A type that has no model of its own is drawn as the nearest one.

AIRLINERS

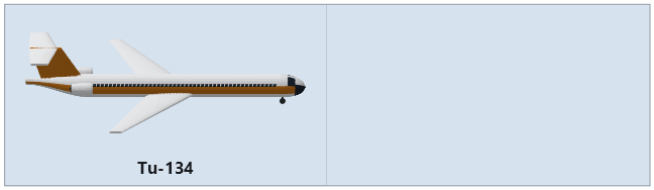



A321XLR
A321neo
A330-200
A330-300
A330-900neo
A340-300
A340-600
A350-1000
A350-900
A380
B717
B727


B737-200
B737-300
B737-600
B737-700
B737-800
B737-8200
B737-900
B737-900ER
B737-MAX10
B737-MAX7
B737-MAX8
B737-MAX9

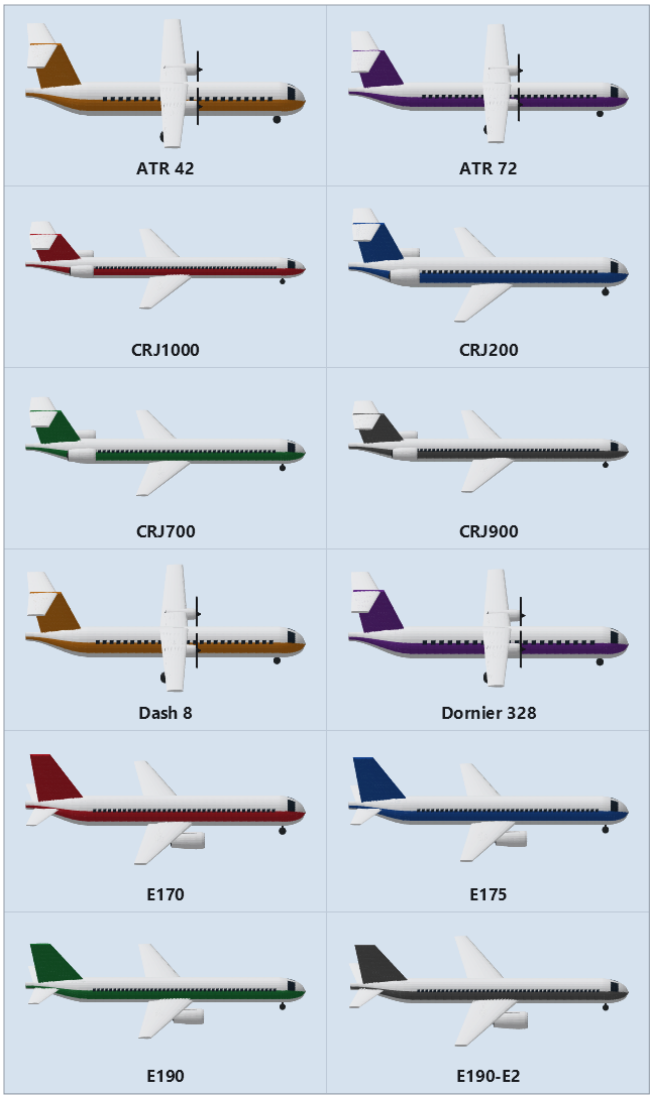






The Airbus, Boeing, McDonnell Douglas, Fokker, Lockheed, Tupolev and Ilyushin airliners.

REGIONAL JETS AND TURBOPROPS





Embraer, Bombardier CRJ, ATR, De Havilland Dash 8 and Q400, Saab, Dornier and the Superjet.

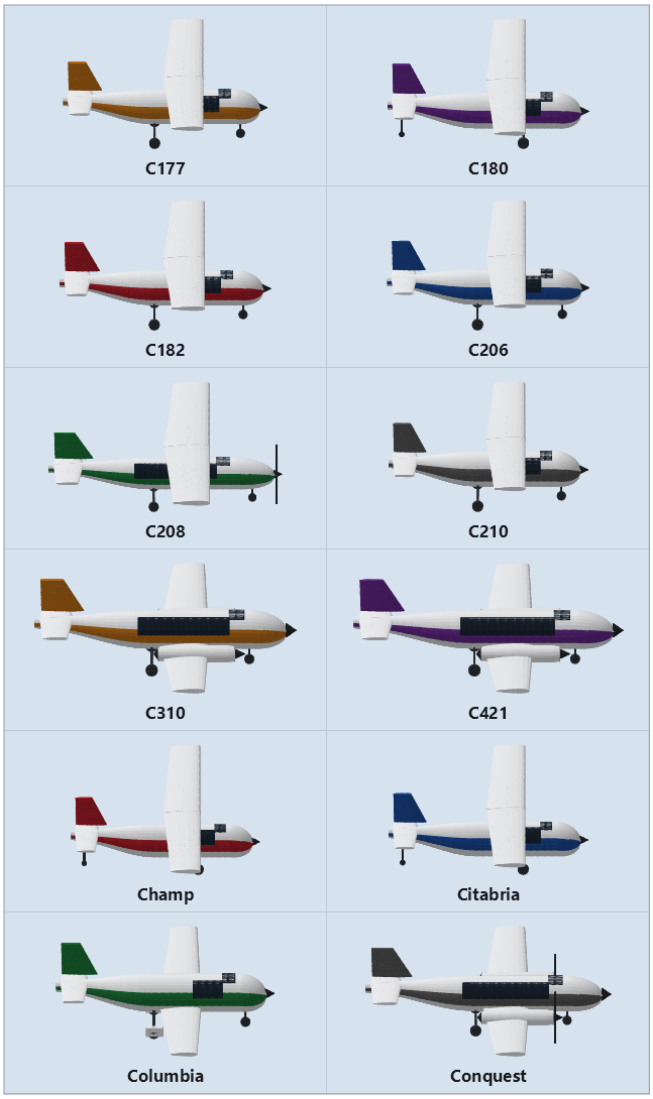
BUSINESS JETS



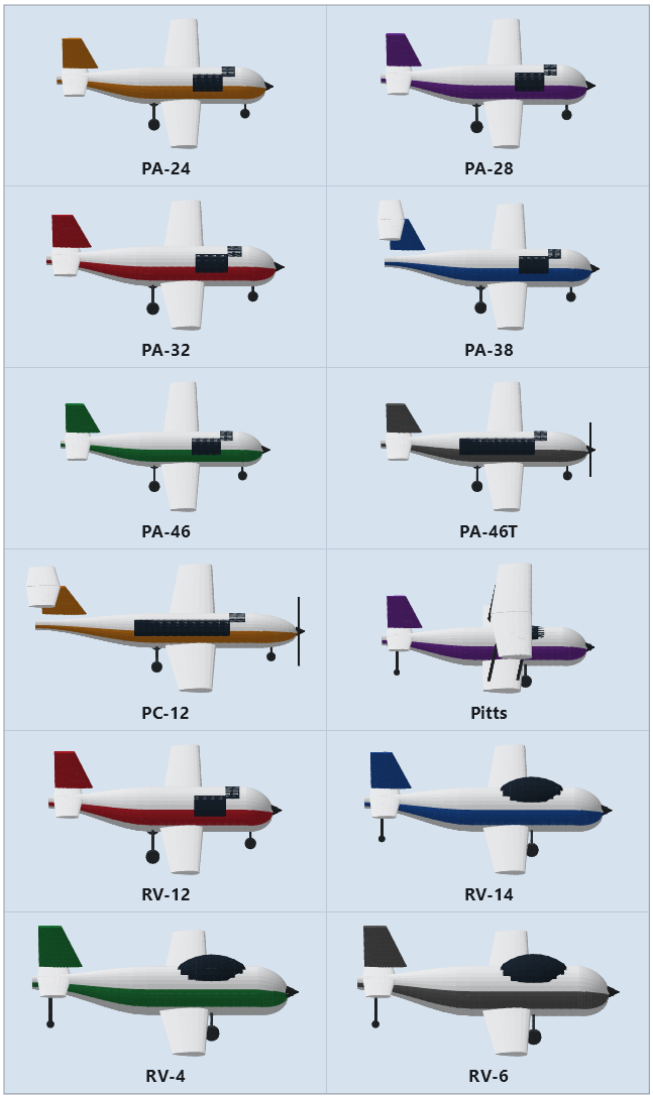


From the HondaJet and Phenom to the Global and Gulfstream.

GENERAL AVIATION


C177
C180
C182
C206
C208
C210
C310
C421
Champ
Citabria
Columbia
Conquest


DA40
Duchess
J3 Cub
King Air 200
King Air 350
King Air 90
Kodiak
Luscombe 8
M20
PA-12
PA-18
PA-22







Singles, twins, turboprops, aerobatic and agricultural aircraft, homebuilts, the glider and the balloon.

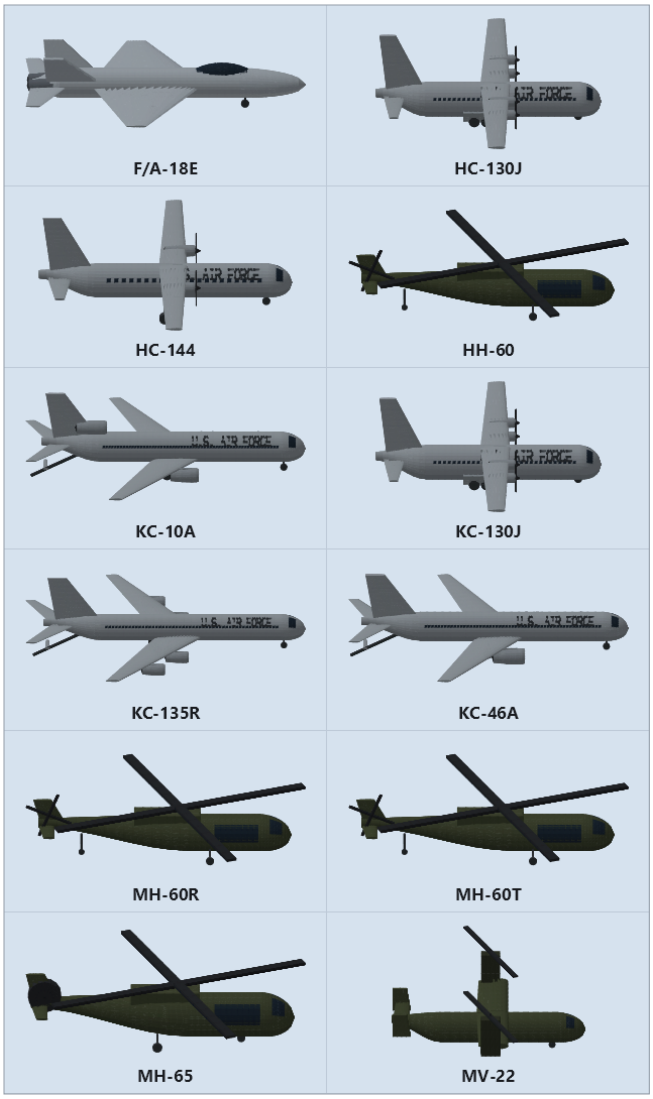
HELICOPTERS



Robinson, Bell, Airbus (AS350, EC135).

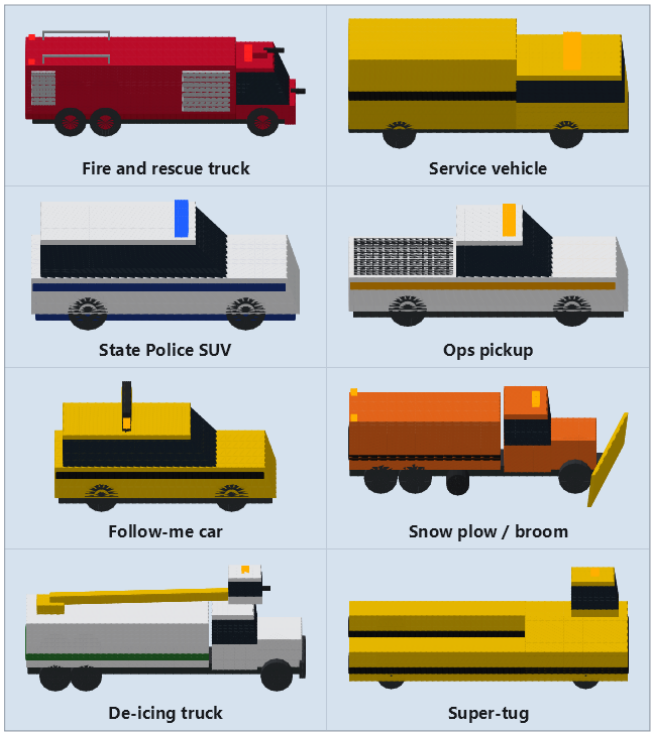
MILITARY





Transports, tankers, patrol aircraft, fighters, helicopters and the MV-22, in their services' colors.

AIRPORT VEHICLES



The vehicles that broadcast ADS-B on the airfield, each in its service's colors and called by its callsign.

GLOSSARY

AGL Above ground level.

AHRS Attitude and heading reference system; some ADS-B receivers include one.

ATA Actual time of arrival: the NLog's time at each fix passed.

ATIS Automatic terminal information service.

Block altitude An assigned band, such as 6,000 through 8,000, to fly anywhere within.

CIFP The FAA's coded instrument flight procedures, the source of SkyHeading's SIDs, STARs, approaches, airways and published holds.

Clearance limit The fix you are cleared to; past it you need a further clearance, so you hold there.

CRAFT Clearance limit, Route, Altitude, Frequency, Transponder: the order of an IFR clearance.

CTAF Common traffic advisory frequency.

D-ATIS Digital ATIS: the ATIS as text, published by about 80 of the busiest US airports.

Density altitude The altitude the air feels like to the airplane, from the field's elevation, the altimeter setting and the temperature; higher means a longer takeoff and a slower climb.

Deviation Leave to fly off course around weather, within the limits ATC gives, until you report clear of weather and ATC gives the way back.

DVA Diverse vector area.

EFC Expect further clearance: the time to expect to leave a hold.

ELT Emergency locator transmitter.

FAF Final approach fix.

FIS-B Flight information service – broadcast: weather and TFRs over ADS-B.

GDL-90 The data format most portable ADS-B receivers use to talk to apps.

GPL GNU General Public License (version 2): the licence of the X-Plane Scenery Gateway's airport data.

Guard 121.5 MHz, the emergency frequency.

HITS Highway In The Sky: SkyHeading's 3D view with a path of hoops.

Hold entry How you join a hold from the way you arrive at the fix: direct, teardrop or parallel.

Holding side The side of the inbound course the racetrack is on: the right for standard (right) turns, the left for left turns.

IAF / IF Initial approach fix / intermediate fix: where an approach begins.

MEA Minimum enroute altitude on an airway.

MSA Minimum safe altitude around an approach's fix.

NAIP The USDA's National Agriculture Imagery Program: the aerial photos on the site cards.

NASR The FAA's National Airspace System Resource data: airports, runways, frequencies, holds, fuel and services.

NLog SkyHeading's navigation log tab: every leg's course, heading, wind, time and fuel, live in flight.

NOTAM Notice to Air Missions: a change to an airport, a navaid, airspace or a procedure, from the FAA.

ODbL Open Database License: OpenStreetMap's licence. Data derived from it stays under it.

ODP Obstacle departure procedure.

PD Pilot's discretion: start the climb or descent when you choose.

PPOS Present position: the NLog's row for where you are now.

POH Pilot's Operating Handbook.

Practice ATC Game mode on the Fly page that issues timed clearances so you can drill the AMEND keyboard (Always-on or a 10-call Round with a letter grade).

Readback Repeating a clearance back to the controller; in SkyHeading, what ENTER shows and applies.

Revision Each change to the clearance in force, numbered from REV 0, as filed.

SID / STAR Standard instrument departure / standard terminal arrival.

SVFR Special VFR: clearance into or through a surface area below basic VFR weather.

SWIM The FAA's System Wide Information Management: its data feeds, the source of the D-ATIS.

TAF Terminal aerodrome forecast: the National Weather Service's forecast for an airport.

TFR Temporary flight restriction.

TOC / TOD Top of climb / top of descent.

REVERT Pill on the Fly strip after ENTER, with a short countdown, that puts the previous revision back.

Vector A heading assigned by ATC, taking you off your route.

WAAS Wide Area Augmentation System: GPS corrections that give LPV and LNAV/VNAV approach minimums.

Vno Maximum structural cruising speed; the top of the ATC speeds your aircraft accepts.

Vg, Vso, Vs1, Vy Best glide; stall in landing configuration; stall clean; best rate of climb.

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- **Federal Aviation Administration**: NASR airports, runways, frequencies, holding patterns, fuel and services; CIFP procedures and airways; d-TPP plate minimums; the Digital Obstacle File; airspace; Airport Mapping taxiway outlines; TFRs; the D-ATIS (SWIM, the SWIM Cloud Distribution Service: not for operational use). NOTAMs

come from the FAA's NOTAM Management Service and are relayed by SkyHeading: not official FAA data and not a briefing.

- **ATIS Relay** (atisrelay.com): the phone-line ATIS transcripts of airports without a D-ATIS, and the D-ATIS when the FAA's feed is down. Data: ATIS Relay. Unofficial. Not for operational use. Confirm on frequency.
- **National Weather Service** (aviationweather.gov): the internet METARs and TAFs.
- **NOAA**: the GFS model's winds aloft for the NLog. **NOAA and NGA**: the World Magnetic Model 2025, the magnetic variation everywhere in the app (public domain).
- **U.S. Geological Survey**: the National Hydrography Dataset and 3DEP elevation.
- **MRLC**: the National Land Cover Database.
- **U.S. Department of Agriculture**: the Cropland Data Layer and NAIP aerial imagery.
- **U.S. Census Bureau**: TIGER/Line towns and address ranges.
- **OurAirports**: runway ends missing from NASR.
- **Natural Earth**: state, province and North American country outlines on the national radar. Made with Natural Earth; free vector and raster map data at naturalearthdata.com.
- **HIFLD** (via Esri Living Atlas): transmission lines. **MassGIS** and **MassDOT**: town names and highway exits in Massachusetts.
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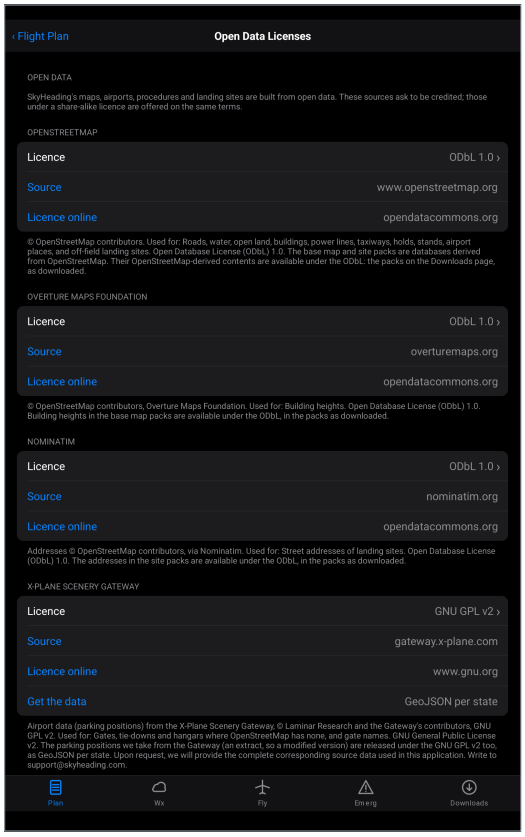

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