



METAR LOOKUP

Version 2.1.2

USER MANUAL

Real-time Aviation Weather for Windows

Farrand Tech Services

<https://www.farrandtech.com>



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Data: aviationweather.gov (NOAA/NWS) • aeronav.faa.gov (FAA)

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1. Introduction

METAR Lookup is a free Windows desktop application that gives pilots, student pilots, dispatchers, and aviation enthusiasts instant access to real-time aviation weather data. It consolidates METAR observations, TAF forecasts, SIGMETs/AIRMETs, FAA airport charts, an interactive map, and built-in flight calculators into a single, clean interface.

All data is retrieved live from official sources — primarily the NOAA/NWS Aviation Weather Center (aviationweather.gov) and the FAA AeroNav portal — and is presented using standard aviation conventions (ICAO codes, Zulu time, knots, feet MSL, inHg).

⚠ Safety Notice METAR Lookup is for informational purposes only. It must not be used as the sole source of weather information for any actual flight operation. Always obtain an official preflight weather briefing.

1.1 System Requirements

Field	Description
Operating System	Windows 10 version 1809 (build 17763) or later; Windows 11
Architecture	64-bit (x64) only
Internet	Required — all weather data is fetched live from external APIs
Display	Minimum 1024 × 768; recommended 1280 × 800 or higher
Runtime	.NET 10 Desktop Runtime (bundled in the installer)

2. Getting Started

2.1 First Launch

When the application opens for the first time you will see an empty interface with the search bar at the top. There is no data loaded until you perform your first lookup.

To look up an airport:

1. Click the search box labeled “Airport name, city, or ICAO.”
2. Begin typing — you can search by ICAO code (KSEA), IATA code (SEA), airport name (Seattle-Tacoma), city (Seattle), or city and state (Seattle WA or Seattle, WA). A dropdown of up to 10 matching airports appears after you type 2 or more characters. Each suggestion shows the ICAO code, airport name, and location (city, state, country).
3. Select an airport from the dropdown — all tabs will load immediately. Alternatively, if you have typed a full ICAO code directly, press Enter or click Lookup.
4. All tabs will populate with live data within a few seconds.

i ICAO codes and the airport search METAR Lookup uses ICAO codes internally, but the search bar lets you find any airport without knowing the code. Type a city, state, airport name, or IATA code and select from the dropdown — the ICAO is filled in automatically. If you already know it, type it directly. US airports add a ‘K’ prefix: LAX → KLAX, SEA → KSEA. Canadian airports start with ‘C’: CYYZ = Toronto. International: EGLL = London Heathrow.

3. The Interface

3.1 Top Search Bar

The search bar spans the top of every tab and provides access to the application's main controls.

Field	Description
Search Box	Search by airport name, city, city and state, ICAO code, or IATA code. A dropdown of matching airports appears as you type — select one to load all data immediately, or type a full ICAO code and press Enter
Lookup Button	Executes the current search (same as pressing Enter in the search box)
☆ Save	Pins the currently displayed airport to the Favorites strip (up to 8)
⚡ API Status	Opens a connectivity check dialog for all external data endpoints
🌙 Dark	Toggles between dark and light theme; preference is saved automatically
🐛 Report Bug	Opens the Bug Report dialog; optionally click Send Report to submit a crash or feedback report to the developer

3.2 Favorites Strip

The colored chips between the search box and the control buttons are your pinned favorite airports. Each chip is tinted by the flight category that was active when you saved it.

VFR	Visual Flight Rules — Ceiling \geq 3000 ft AGL and Visibility \geq 5 SM
MVFR	Marginal VFR — Ceiling 1000–3000 ft AGL or Visibility 3–5 SM
IFR	Instrument Flight Rules — Ceiling 500–999 ft AGL or Visibility 1–3 SM
LIFR	Low IFR — Ceiling $<$ 500 ft AGL or Visibility $<$ 1 SM

Actions on the Favorites strip:

- Click a chip → instantly looks up that airport in all tabs
- Click × on a chip → removes it from favorites and saves
- Click ☆ Save while viewing an airport → adds it to the strip
- Maximum 8 favorites. Adding a 9th removes the oldest.

3.3 Status Indicators

Field	Description
Loading bar	A spinning progress ring with a status message appears while data is being fetched
Error banner	A red bar below the header shows an error message (invalid code, network failure, etc.)
Status bar	The bottom bar shows the last successful lookup time (e.g. "KSEA — updated 14:32 Z")

4. Tabs Reference

4.1 METAR Tab

Displays the most recent surface weather observation (METAR) for the selected airport. METARs are typically issued once per hour and updated as special observations when significant changes occur.

Header Section

Field	Description
Flight Category	Color-coded badge (VFR / MVFR / IFR / LIFR) at top-left
Airport Name	Full name and city/state (e.g. "Seattle–Tacoma International — Seattle, WA")
Observation Time	UTC time of the observation in HH:mm:ss Z format
Observation Date	Calendar date of the observation in YYYY-MM-DD format
Raw METAR	The unprocessed METAR string exactly as broadcast, in monospaced font

Data Tiles

The grid of tiles shows decoded values from the METAR. Tiles are greyed out when the observation does not include that element.

Field	Description
Temperature	Outside air temperature in °C
Dewpoint	Dewpoint temperature in °C; higher dewpoint relative to temperature = higher humidity/fog risk
Visibility	Prevailing visibility in Statute Miles (SM)
Wind Direction	True bearing from which the wind is blowing (e.g. 290°). Displays "VRB" for variable winds
Wind Speed / Gust	Sustained wind speed in knots. If gusting, the gust value is shown in orange (e.g. 12 kt G25kt)
Altimeter	Altimeter setting in both inHg (US) and hPa (metric/international)
Elevation	Airport field elevation in feet MSL and meters
Sky Conditions	Cloud layers listed from lowest to highest (e.g. FEW 2500 ft AGL, BKN 5000 ft AGL, OVC). SKC or CLR = clear

ATIS Sections

If Automatic Terminal Information Service (ATIS) data is available, arrival and departure broadcasts are shown below the tile grid. These are long-form voice broadcast transcripts that include runway-in-use, approach types, and additional NOTAMs.

4.2 TAF Tab

A Terminal Aerodrome Forecast (TAF) is an official weather forecast covering a 24- or 30-hour period for the airspace within 5 nautical miles of an airport. TAFs are issued every 6 hours.

Header

Field	Description
Raw TAF	Full unprocessed TAF text in monospaced font
Issued	The date and time the TAF was issued (UTC)
Valid Period	The window during which the forecast applies

Forecast Period Cards

Each card represents one forecast period within the TAF. Cards are stacked in chronological order.

Field	Description
Time Range	UTC window for this period (HH:mm – HH:mm Z)
Change Indicator	FM (from), BECMG (becoming), TEMPO (temporary), PROB (probability)
Wind	Forecast wind direction and speed with optional gust
Visibility	Forecast visibility in Statute Miles
Sky Conditions	Forecast cloud layers
Category Badge	Color-coded VFR/MVFR/IFR/LIFR badge for the forecast period (top-right of each card)

i No TAF available Smaller or non-towered airports often do not have TAF service. If the tab shows “No TAF available for this station” that is expected behavior, not an error.

4.3 Map Tab

An interactive Leaflet.js map shows the searched airport and surrounding METAR stations color-coded by their current flight category.

Map Elements

Field	Description
Primary Marker	Orange glowing pin at the searched airport with its ICAO label
Nearby Stations	Colored dots within approximately 60 nautical miles; color matches flight category (green=VFR, blue=MVFR, red=IFR, purple=LIFR)
Station Labels	ICAO codes displayed above each marker with a contrasting text shadow for readability
Radar Overlay	Semi-transparent precipitation/radar layer from RainViewer (shown when available)
Tile Layer	CartoDB Voyager in light mode; CartoDB Dark Matter in dark mode. Switches instantly with the theme toggle.

Interacting with the Map

- Pan: click and drag
- Zoom: scroll wheel, or use + / – controls
- Hover over a nearby station marker to see its ICAO code and category
- Click a nearby station marker to open a popup with a “Look Up” link
- Click “Look Up” in the popup to run a full lookup for that station in all tabs

i Lazy loading The map only loads when you first click the Map tab. Switching tabs afterward reuses the loaded map without a network request. The radar overlay is fetched separately and may take a moment.

4.4 Airport Charts Tab

Provides one-click access to official FAA Terminal Procedures Publication (d-TPP) charts including instrument approach plates, departure procedures, arrival routes, and airport diagrams.

Chart List (Left Panel)

- Charts are grouped by category (Instrument Approaches, Standard Instrument Departures, STARs, Airport Diagram, etc.)
- Click a category header to expand or collapse its list
- Click any chart name to load it in the right panel

PDF Viewer (Right Panel)

- The selected chart renders as a full PDF in the embedded browser
- Zoom and pan within the PDF using standard browser controls
- A placeholder message is shown until a chart is selected

i International airports FAA d-TPP charts cover US airports only. International airports will show “No FAA charts found.” Use the appropriate ANSP or Jeppesen service for non-US charts.

i Lazy loading Charts are only downloaded when you first click the Charts tab for a given airport. The chart index is then cached so subsequent visits are instantaneous.

4.5 SIGMETs / AIRMETs Tab

Shows all currently active Significant Meteorological Information (SIGMETs) and Airmen’s Meteorological Information (AIRMETs) for the United States. These advisories are fetched with every airport lookup, regardless of which airport was searched.

Tab Badge

A red count badge appears on the tab header (e.g. “3”) when active advisories exist. The badge is hidden when there are none.

Advisory Cards

Field	Description
Type Badge	Red label: SIGMET or AIRMET
Hazard	Type of hazard and severity (e.g. “TURBULENCE — Severe”, “ICING — Moderate”, “IFR — Mountain Obscuration”)
Raw Text	Monospaced reproduction of the original advisory text
Validity	From and To times in HH:mmZ format
Altitude Block	Vertical extent: lower and upper altitude limits in feet MSL

⚠ SIGMETs vs AIRMETs SIGMETs (Significant Meteorological Information) are issued for hazards significant to all aircraft: severe turbulence, severe icing, volcanic ash, tropical cyclones. AIRMETs are for conditions that may affect lighter aircraft or those not equipped for IFR operations.

4.6 Calculators Tab

Three standard aviation performance calculators that auto-populate from the current METAR when a new airport is loaded.

Density Altitude Calculator

Density altitude is pressure altitude corrected for temperature deviation from standard. High density altitude reduces aircraft performance.

Field	Description
Pressure Altitude	Input in feet (–2000 to 60000 ft); auto-filled from METAR
OAT	Outside Air Temperature in °C (–80 to +60°C); auto-filled from METAR
Density Altitude	Calculated result in feet; updates in real time as inputs change

Formula: $DA = \text{Pressure Altitude} + 118.8 \times (\text{OAT} - \text{ISA Temperature})$

where ISA Temperature = $15^{\circ}\text{C} - (\text{Pressure Altitude} / 1000 \times 2^{\circ}\text{C})$

Pressure Altitude Calculator

Pressure altitude is the altitude indicated when the altimeter is set to 29.92 inHg (standard day). Used as the basis for density altitude and performance charts.

Field	Description
Field Elevation	Airport elevation in feet MSL; auto-filled from METAR
Altimeter Setting	Current altimeter setting in inHg; auto-filled from METAR (default 29.92)
Pressure Altitude	Calculated result in feet; updates in real time

Formula: $PA = \text{Field Elevation} + (29.92 - \text{Altimeter Setting}) \times 1000 \text{ ft}$

Crosswind / Headwind Component Calculator

Calculates the headwind and crosswind components based on current wind conditions and the active runway.

Field	Description
Wind Direction	True wind direction in degrees (0–360); auto-filled from METAR
Wind Speed	Wind speed in knots (0–200 kt); auto-filled from METAR
Runway Heading	The magnetic heading of the runway in use (e.g. 160 for runway 16L)
Headwind	Headwind component in knots (positive = headwind, negative = tailwind)
Crosswind	Crosswind component in knots (always positive; direction not shown)


Formulas:

Headwind = *Wind Speed* × *cos(Wind Direction – Runway Heading)*

Crosswind = |*Wind Speed* × *sin(Wind Direction – Runway Heading)*|

i Auto-population When a new METAR loads, all calculator inputs are automatically filled from the live observation data. You only need to enter the runway heading to get a crosswind component.

5. Dark / Light Theme

The  Dark / Light toggle button in the top-right corner of the toolbar switches the entire application between a dark and a light visual theme.


- The switch is instant — all tiles, backgrounds, and text update immediately
- The map tile layer also switches: CartoDB Voyager (colorful, light) ↔ CartoDB Dark Matter (muted, dark)
- The map tile swap is performed via JavaScript without reloading the page, so there is no blank screen or flicker
- Your preference is saved automatically and restored the next time the application opens

6. Settings & Data Persistence

METAR Lookup stores a small settings file on your local machine. No data is sent to any server.

Field	Description
Favorites	Up to 8 pinned airports stored as ICAO code + last-seen flight category
Theme	Dark or light theme preference (boolean)

7. API Status Window

Clicking the  API Status button opens a diagnostic dialog that tests connectivity to every external endpoint the application uses. This is useful for diagnosing slow lookups or missing data.

- Each endpoint is tested with a lightweight HEAD or GET request
- A green checkmark indicates a successful response; a red X indicates a timeout or error
- This check does not affect the main application state

i Network environments Some corporate networks or strict firewalls may block outbound connections to aviationweather.gov or aeronav.faa.gov. If all APIs show red, check your firewall or proxy settings.

8. Troubleshooting

8.1 Common Error Messages

Field	Description
"Please enter a valid 3–4 character ICAO code"	The search box was empty or contained fewer than 3 characters. Enter a full ICAO identifier.
"Failed to fetch METAR data"	The application could not reach aviationweather.gov. Check your internet connection and try again.
"No METAR found for [ICAO]"	The entered ICAO code is not recognised by the weather service. Verify the code is correct.
"No TAF available for this station"	Expected for non-towered and small airports that do not have TAF service.
"No FAA charts found"	The airport is either international (no FAA d-TPP coverage) or too small to have published instrument procedures.
"No active SIGMETs or AIRMETs"	Normal status. No significant meteorological advisories are currently in force.

8.2 Data Appears Stale

METARs are typically updated every hour. If data appears stale, perform a new lookup by pressing Enter in the search box or clicking Lookup. The application always fetches fresh data on each explicit lookup.

8.3 Map Does Not Load

- The map requires an internet connection to download tile images from CartoDB.
- If tiles appear grey or the map is blank, check your connection.
- The radar overlay is optional and may not appear if RainViewer is unavailable.

8.4 Charts Tab Is Empty or Shows an Error

- Charts are loaded the first time you click the Charts tab.
- If loading fails, switching away from and back to the tab will retry.
- Charts are only available for US airports with published FAA instrument procedures.

9. Data Sources

Field	Description
NOAA/NWS Aviation Weather Center	aviationweather.gov — METAR, TAF, SIGMET, AIRMET, nearby station data
FAA AeroNav	aeronav.faa.gov — Airport charts (d-TTP Terminal Procedures Publication)
airport-data.com	Airport coordinates, elevation, and supplemental metadata
RainViewer	rainviewer.com — Radar and precipitation overlay tiles
CartoDB	cartocdn.com — Map tile layers (Voyager and Dark Matter themes)
Leaflet	leafletjs.com — Open-source interactive map library v1.9.4
D-ATIS Broadcasts	datis.cloudw.io — Digital ATIS broadcast data (arrival and departure information)

All external services are accessed over HTTPS. METAR Lookup does not cache weather data between sessions; every lookup retrieves fresh data from the source.

10. Quick Reference

Keyboard and mouse quick reference

Action	How	Result
Look up an airport	Type name/city/ICAO → select from dropdown, or Enter	All tabs refresh with live data
Quick-access favorite	Click any chip in the header strip	Instant lookup for that airport
Pin an airport	Click ☆ Save	Airport added to Favorites (max 8)
Remove a favorite	Click × on the chip	Removed and saved
Toggle theme	Click 🌙 Dark / ☀️ Light	Entire UI + map tile layer updates instantly
View a chart	Charts tab → click chart name	PDF renders in right panel
Look up a nearby station	Map tab → click marker → Look Up	Full lookup for that station
Retry failed lookup	Press Enter in the search box	New fetch from APIs
Check API connectivity	Click ⚡ API Status	Diagnostic window opens
Report a bug	Click 🐛 Report Bug; optionally click Send Report	Bug report dialog opens; report sent only if you click Send Report

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