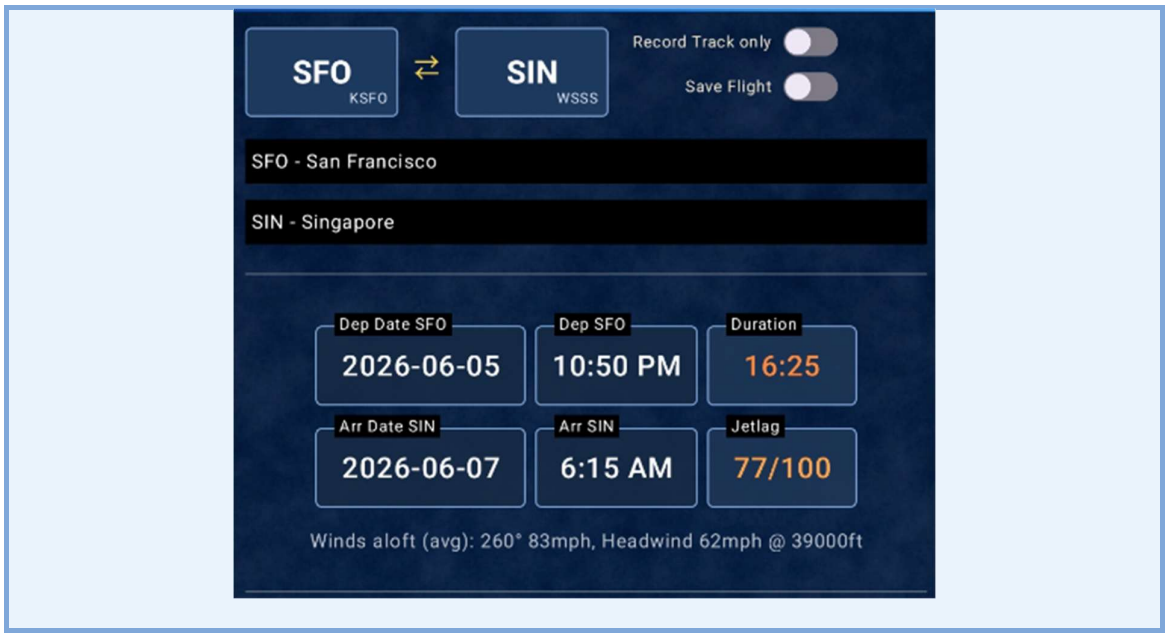
FlightMaven User Manual v4.0.28

FlightMaven is an experimental aviation tool that visualizes how solar time, civil time, and UTC evolve along a flight path. It lets you simulate or record a flight and see how the position of the sun changes throughout the journey.

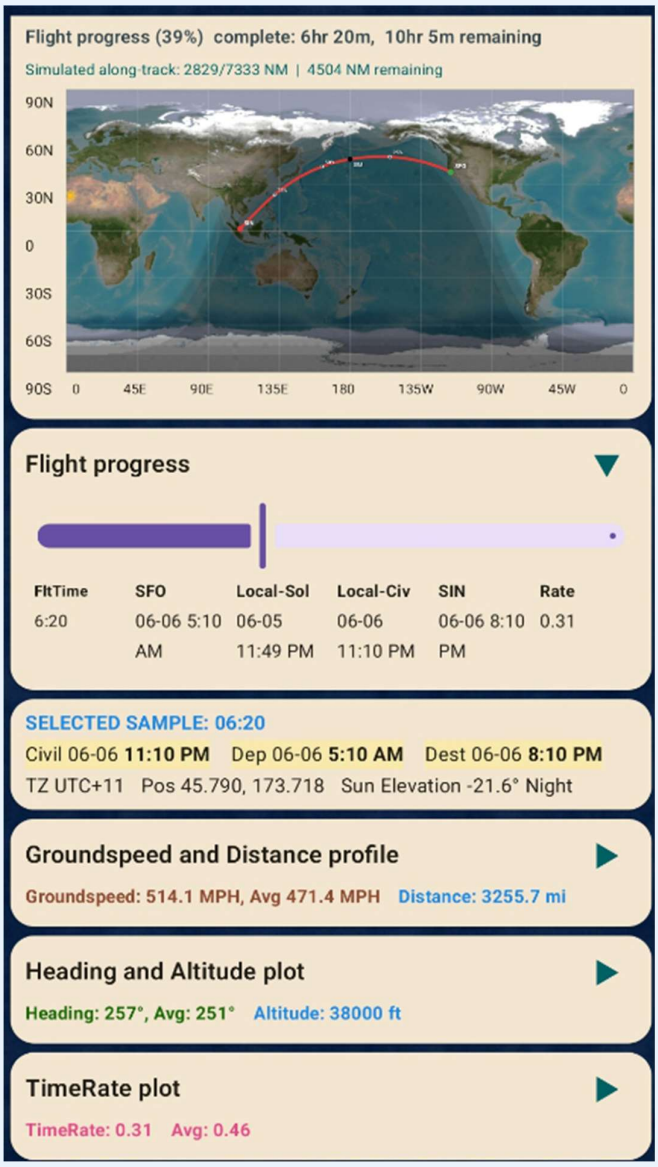
- Main planning screen: departure/destination airport boxes in IATA format and also show ICAO/alternate codes in small text, with full airport names shown below the boxes without truncation.
- The app supports richer airport lookup using IATA, ICAO, and FAA codes where available.
- Record Track only feature - use it when you want GPS track recording without entering airports. In this mode the app records the GPS path only and does not show route-comparison tools such as cross-track error.
- Save Flight stores the last planned route/date/time inputs so they can be restored on the next launch.
- Winds aloft can be displayed while a planned flight is in progress and is hidden after the planned destination arrival time has passed. Wind information is used for flight duration computation where available.
- Altimeter handling is improved: planned/record modes can switch to destination altimeter near arrival; Record Track only can use the closest available altimeter setting when online.
- The duration field gently flashes green while a planned flight or GPS recording is in progress, to make active status easier to notice. Very short GA-style flights are supported without forcing a 30-minute minimum duration.
- Clock plots now use route-aware day/dusk/night shading to better match the map day-night boundary. Time fields default to AM/PM display, with a 24-hour option available in Settings.



Planning and route review updates

- The map view shows a local OSM-style map or global map depending on map display settings.
- The flight path view includes a day-night boundary depiction. The clock graph uses matching dusk and night shading so the selected sample, map, and clock plots tell the same story.
- Groundspeed/Distance, Heading/Altitude, TimeRate, Flight Path, and Circadian cards now use collapsible sections. Important one-line readouts remain visible when cards are collapsed.
- Averaged groundspeed, heading, timerate, and cross-track error traces are shown with dashed lines where applicable.
- Winds aloft text now uses compact degree formatting and shows average wind/headwind information for the cruise altitude when available.
- Cross-track error and Path Efficiency graph added for planned GPS recording/playback review. The cross-track average is dashed; path efficiency uses a 0 to 1 scale and approaches 1 when the flown path matches the planned great-circle route.
- Flight table includes cross-track error after the speed column when a planned route is available.
- Circadian Recommendations card now uses a cleaner timeline with a red current-time marker and current-time label when it can be displayed without collision. Basic/free and Pro cards share the same collapsible header behaviour; Pro exposes the full recommendation detail.
- Playback speed options are 10X, 20X, 50X, 100X, 200X, 400X, and infinite. Infinite immediately fills all points instead of replaying them.
- Large Android font settings are handled more tightly in dense panels such as the app-status tiles and flight table.
- Single-finger page scrolling works over the map while two-finger pinch zoom remains available.

CHARTS (PARTIALLY EXPANDED)



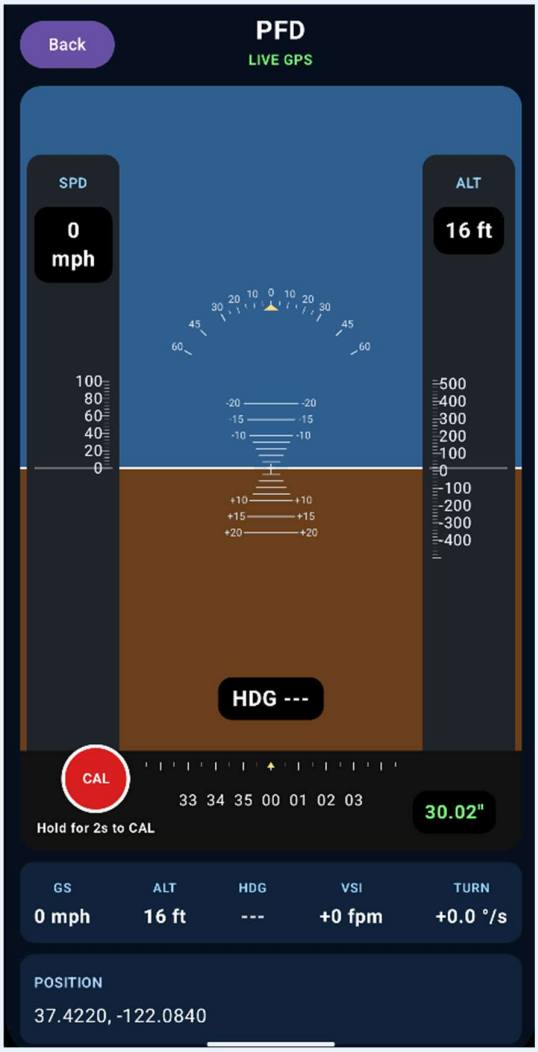
GPS recording, playback, and Glass Cockpit

- GPS recording supports Arm, Start, Stop, Save Track, Share Track, Playback, and Glass Cockpit controls.
- Playback mode can load saved tracks, replay them at selectable speeds, instantly fill the full track with the infinite speed option, regenerate summaries, share files, and delete saved files.
- Glass Cockpit provides a live primary-flight-display style screen using GPS, barometer, and device attitude sensors when available.
- Free users have a short Glass Cockpit session limit; Pro unlocks unlimited Glass Cockpit use.

- Custom GPS update intervals are available as a Pro feature, from 5 seconds to 1 hour.
- Long-track saving and export/share are Pro-gated features. Free mode allows unlimited saved recordings up to 2 hours and a limited number of longer saved recordings.

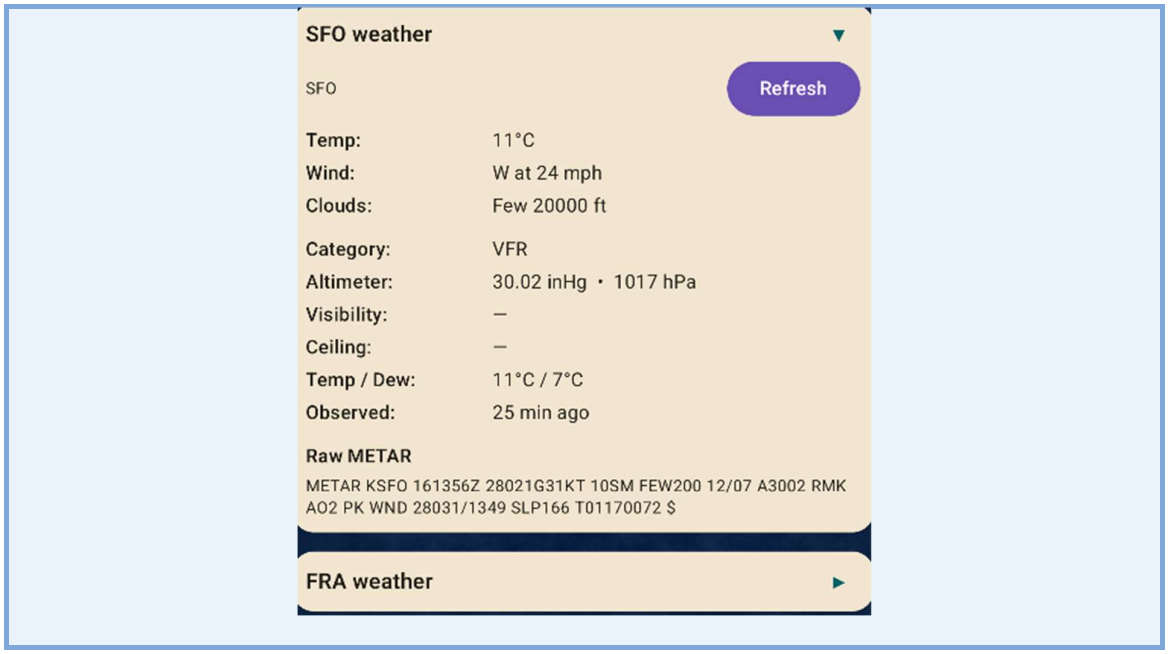
TRACK RECORD AND PLAYBACK MENUS

"GLASS COCKPIT"

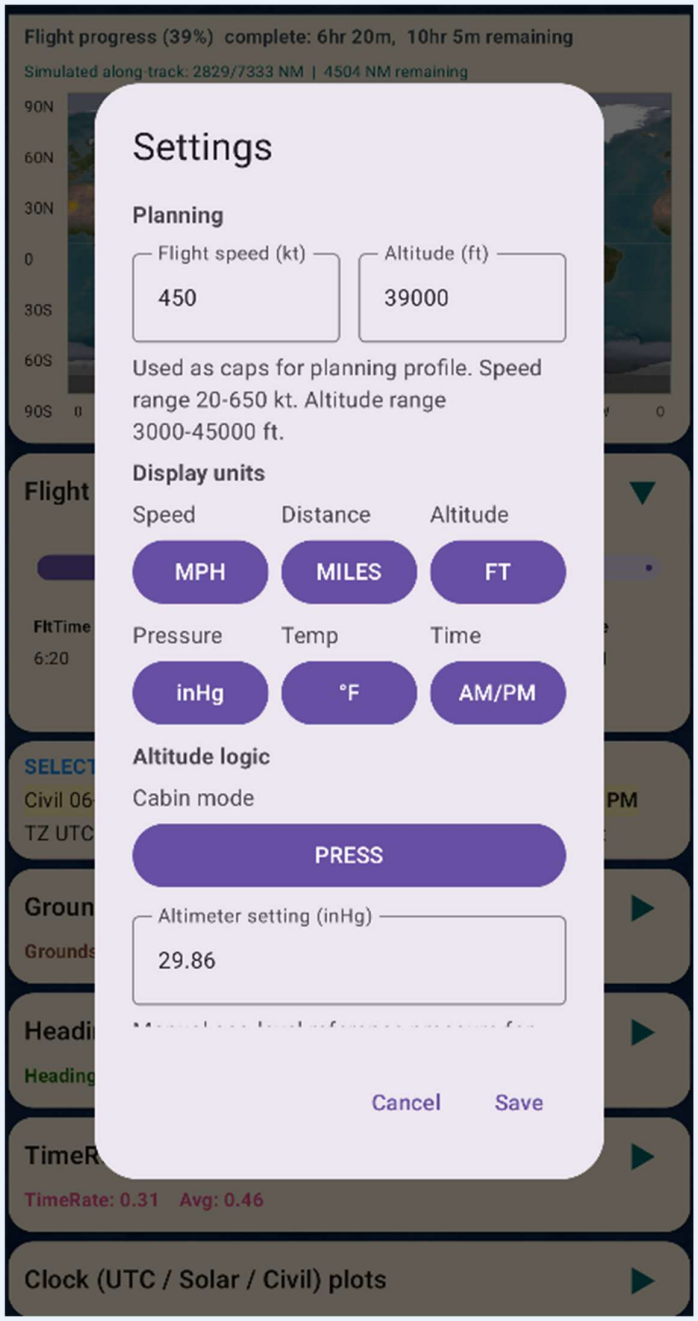


Weather, altimeter, and advisory cautions

- Departure and destination weather cards can import METAR-derived values such as temperature, wind, clouds, and altimeter setting when internet is available.
- Altimeter setting may be entered manually or taken from weather data. This is advisory and depends on data availability and recency.
- Cabin/altitude display settings allow barometric or GPS altitude behaviour, including pressurized/unpressurized cabin assumptions.
- Oxygen and altitude messages are advisory only and must not replace pilot judgment, regulation, or approved aircraft instrumentation. They follow FAA guidelines for oxygen requirements.



SETTINGS MENU (PARTIAL)



Pro version

- FlightMaven Pro unlocks advanced charts, unlimited long-track saving, full circadian features, export/share, Glass Cockpit, custom groundspeed & altitude (planning), custom GPS update intervals, and future advanced tools.

- Free version can save an unlimited number of flights under 2 hours. Above 2 hours, 10 saved recordings are allowed. The update interval is restricted from 1 min to 30 min. Glass Cockpit functions for 5 min per app session and has limited circadian recommendations.
- Multi-leg planning is not yet part of the single-flight main workflow; it is a future development direction.
- FlightMaven is for planning, visualization, experimentation, and post-flight review. It is not approved for navigation, flight safety decisions, weather avoidance, aircraft control, or regulatory compliance.

Key Features

Flight Simulation

- Select departure and destination airports with pull down list (IATA)
- Enter departure and arrival local dates and times
- The app automatically calculates flight duration
- Generates a full flight profile along the route
- Accounts for daylight savings times as needed

Time Systems Visualization

FlightMaven shows how three time systems evolve during the flight:

- UTC
- Local Civil Time
- Local Solar Time
- These are displayed both numerically and in graphical plots.

Jetlag Estimator

Looks at several variables to come up with a jetlag severity rating

- Duration of flight
- Time zones
- Arrival & Departure times, etc.

Solar Time Rate / Time Change

A key feature of FlightMaven is that it calculates the rate at which local solar time changes during the journey.

- On some routes, solar time can appear to slow down
- On others, it can effectively speed up
- This makes it easier to understand how eastbound and westbound travel affect the perception of time and daylight

- At every point in the flight, you know the solar time and civil time at the location. No more guessing.

Sun Position Analysis

- Calculates solar altitude continuously along the flight
- Shows day vs night segments
- Detects sunrise and sunset during the flight
- Displays when they occur relative to departure time

Interactive Flight Timeline

- A slider lets you scrub through the entire flight
- Displays the aircraft position, solar altitude, and various other information
- Shows local time at both departure and destination simultaneously
- Shows the instantaneous solar time rate at the selected point
- If GPS input is available, it will show this overlaid on computed great-circle track with deviation (at the moment only great-circle routes are possible without an aviation database for navigation fixes).

Arrival information, Weather information and Circadian Recommendations

- An arrival card gives lot of information about the flight with various parameters (see section below)
- Weather for departure and destination (briefly temperature, cloud cover and wind). You can get more details with the pull-down arrow to set altimeter setting if you like.
- Circadian recommendations (experimental) attempts to advise you when to sleep, eat etc. to reduce jetlag. Your “mileage” may vary!

Graphical Plots (Plan mode and Recording mode)

- Groundspeed (instantaneous and average) and altitude – when GPS is available
- Heading, instantaneous and average – when GPS is available
- Solar altitude vs flight progress
- UTC / Solar / Civil time comparison
- Night periods automatically shaded
- “Rate of time change” – indicates if time is moving slower or faster. Varies, depending on longitudinal meridian crossing

GPS based Flight Tracking

- GPS based tracking to record flights
- When armed and running shows status of GPS
- Adjustable sampling rates from 1m to 30m
- Tabulates samples which can be saved

CSV Import / Export

- Load flight tracks from CSV files

- Export simulated or recorded tracks
- Share tracks easily

Detailed Flight Table

Each time step shows:

- Aircraft position
- Civil / Solar / UTC time
- Sun altitude w.r.t horizon
- Day/Night state
- Ground speed
- Aircraft altitude
- Distance travelled
- Solar time rate

Interesting things to try

- Simulate long-haul flights
- Compare eastbound vs westbound flights
- Try flights that cross sunrise or sunset
- Observe where local solar time appears to speed up or slow down
- Record short GPS tracks
- Import CSV tracks if available
- Evaluate jetlag severity warnings

STATUS

v4.0.25 to v4.0.28 revision summary

v4.0.25: added Cross-track error and Path Efficiency chart, added XTK to the flight table, fixed GA short-flight duration/profile handling, and matched Basic Circadian collapsible behaviour to Pro.

v4.0.26: fixed XTK/Efficiency after loading saved tracks, improved larger-font layout handling, added faster playback choices including infinite fill, and fixed single-finger scrolling over maps.

v4.0.27: first production release baseline.

v4.0.28: added AM/PM time display as default with 24-hour option, and polished Circadian timeline labels/current-time marker.

Version 4.0.28 consolidates the first production-era FlightMaven feature set: airport planning, Record Track only mode, GPS recording, playback, weather/winds aloft support, Glass Cockpit, AM/PM time display, updated collapsible chart cards, cross-track/path-efficiency review, circadian timeline polish, and Pro feature gating. The app remains experimental and advisory only; it is not a certified navigation, weather, or aircraft instrument system.

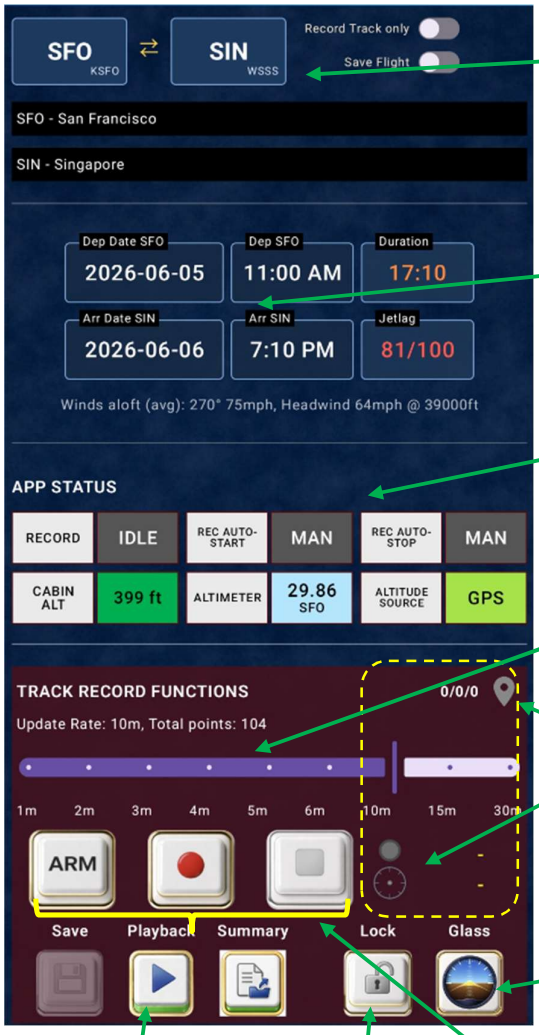
- Future enhancement: multi-leg journeys
- Future enhancement: 3D visualisation
- Future enhancement: broader GA airport/support database and routing data
- Future enhancement: navaid/fix-based routing beyond great-circle planning

FLIGHTMAVEN v4.0.28 - QUICK USER GUIDE

FlightMaven is a tool for exploring how solar time, civil time, and daylight changes during a flight. You can simulate flights between airports, import track files, or record your own GPS track.

1. BASIC FLIGHT SIMULATION

This feature is for computing a pre-determined flight between airports to see the great-circle route, evaluate day/night features, jetlag effects, compute civil/solar time at any point in the journey.



Departure and Destination airport (3 letter IATA code). Also switchable for return flight

Main input fields for the flight (partially auto populated and overwritable). Duration and Jetlag scores are calculated

App status information (recording status, auto-start/stop speeds, altimeter settings and cabin altitude and source of altitude data

Slider to adjust recording interval (auto, but under user control).

GPS status (# satellites/total satellites/lock condition)

LED Recording status – armed (flashing yellow), recording (green). Compass gives visual direction and altitude is either GPS or barometer based (if available). Groundspeed in user selected units

Glass cockpit PFD screen

Track record control functions

- ARM – arms GPS (if auto-record is enabled).
- RECORD (manual start)
- STOP (manual stop)

Lock Screen

Track file functions
Track Save, Track Share and Track Load

Step 1 – Select Airports

Enter 3 letter IATA code for:

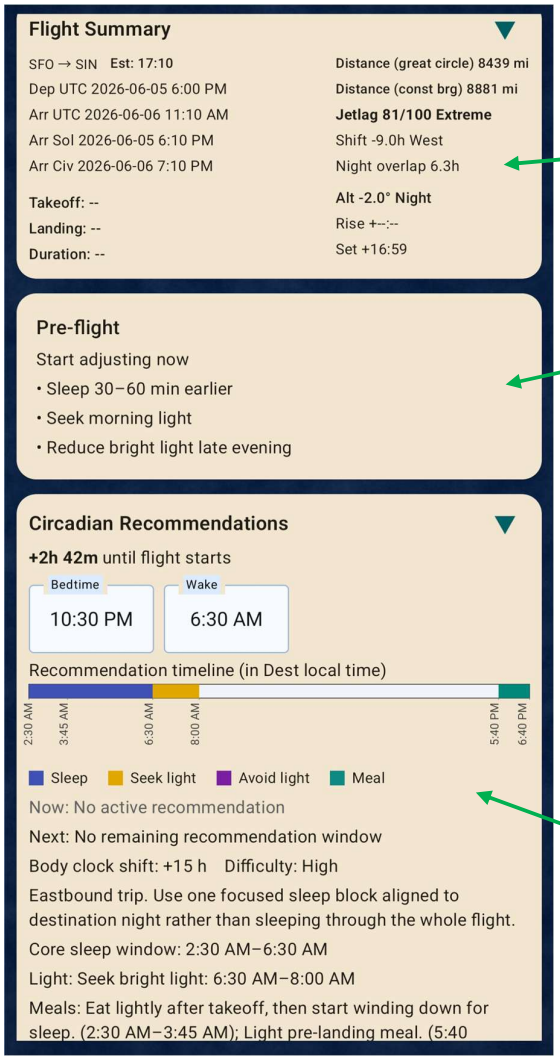
- Departure airport
- Destination airport

Step 2 – Set Date and Times

Tap the fields to open pickers:

- Dates
    - App sets today's date for departure, user can override. Arr date calculated based on flight duration and time zone
- Times
    - App sets the time closest to current time (10 min resolution) and calculates arrival time. Times display in AM/PM by default for US users; Settings can switch the app to 24-hour time. User can override.
- Dur
    - App calculates duration based on typical commercial aircraft groundspeed. User can override based on actual flight arrival time

Step 3 – Review Arrival card and Circadian Recommendations (Advisory only!)



Arrival summary card gives you information about flight distance, time zone shift, jetlag scores, night time overlap, sunrise/sunset (if present) and arrival time in various TZ.

Pre-flight preparation (if any, depends on

This card goes into more details on what can be done to reduce jetlag. The timeline tape (Pro version) suggests when to eat, sleep, seek light and avoid light. This is shown in the other graphs (see below) as well. You can program your Bedtime and Wake time from the default values set.

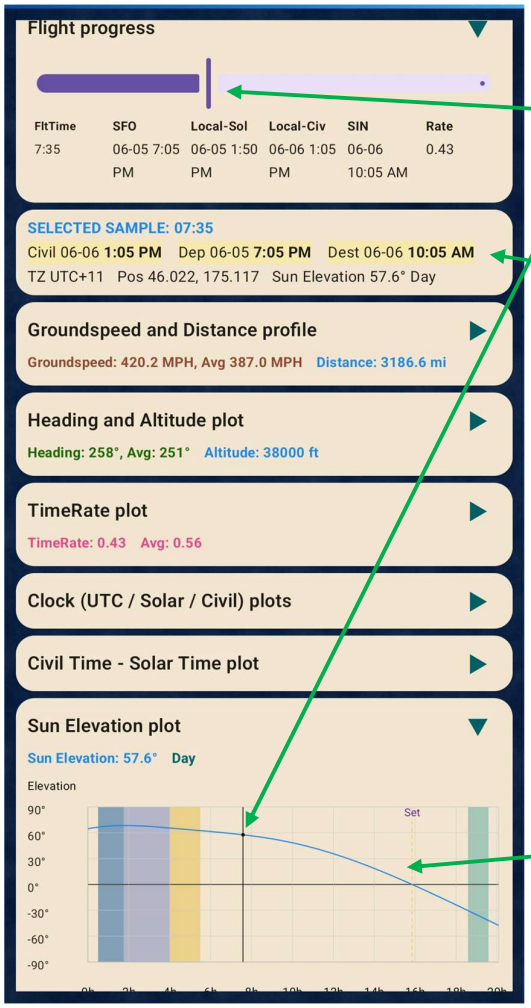
Flight Computation Results

When any of above fields change in Step 2, the app generates a simulated flight path between the airports and calculates:

- Solar position
- Solar time
- Civil time
- UTC time
- Sunrise / sunset events
- Jetlag severity estimator

Once on the flight and GPS is available, the app can auto-start recording the points for the actual flight, overlay them with the ideal computed great-circle path, and display cross-track error and path

efficiency. Cross-track error is zero when the actual path follows the planned great-circle path; path efficiency is near 1.0 when the flown path is close to the planned path.



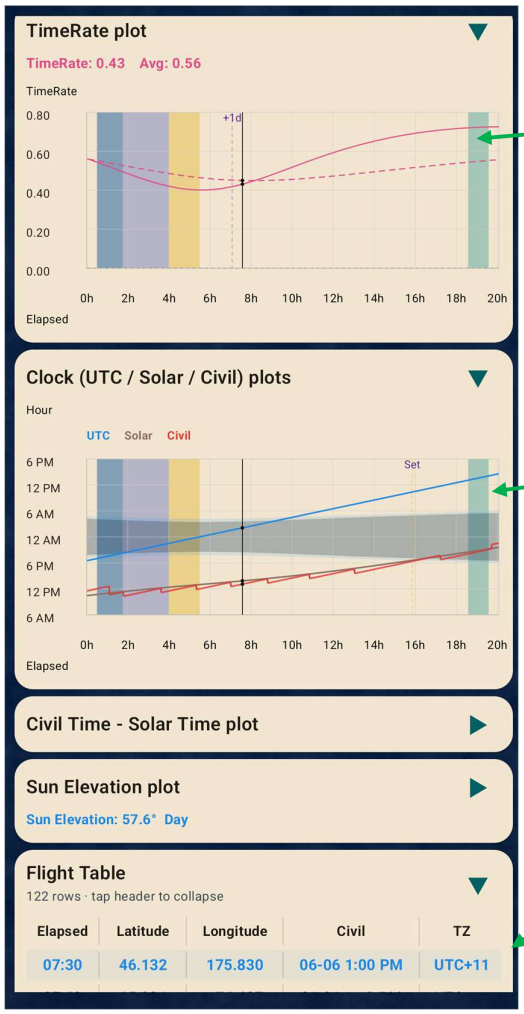
Aircraft position updates on the world map (black dot) as well on all the graphs

Flight progress slider – will show location on the route as one updates its position (if GPS recording is turned on)

Selected sample in the flight (vertical black line indicates position on all the graphs).

Position of the sun throughout the flight. Colour coded shaded areas (see Circadian Recommendation). Shaded grey is when sun is below the horizon (local night)

Weather at departure and destination airport. Use pull down arrows to get more details (raw METAR etc.)



TimeRate plot. Depiction of how solar time slows up or speeds up. Strongly dependent of direction of travel. TR=1.0 indicates normal rate of time change (N-S flights)

Civil, Solar and UTC time along with day/night (dark shade) portion of the flight which is latitude dependent

Table shows numerical values of all computed fields at the update rate. Scroll right/up/down to see all the points. In recording mode, this table updates in real time. Selected sample highlights using vertical black line

In above pictures, the aircraft is 7:30 hrs into the journey. It is daytime on the plane, with sun elevation 57.6 deg and (in the clock plots) in a daylight shaded region. Local solar time in the aircraft is 1:50 PM and time at departure and destination is 7:05 PM and 10:05 AM respectively. Expected sunset is almost at 16hrs into the flight as the plane lands (19:10 at the destination). Also, the rate of "change of time" is displayed in the TimeRate plot. In this case, time is "slowing down". If this value is 1, it means your clock is running at the same rate as solar time. Significant speed up and slowdown will be seen in east-west, circumpolar flights.

Flight Progress Slider

Use the slider to move along the flight timeline. The display shows:

- Local time at departure airport
- Local time at destination airport
- Solar time rate
- Elapsed flight time

Selected Sample

Shows detailed values at the selected point:

- UTC time
- Solar time
- Civil time
- Position
- Solar altitude
- Day /night state

Arrival Summary

Displays key information including:

- Departure time
- Arrival time in UTC/Solar/Civil
- Solar altitude at arrival
- Night overlap and TZ shift
- Sunrise/sunset relative to departure

Example: Rise +02:15 Set +07:40 [Meaning sunrise occurs 2hrs 15m after departure, sunset 7hrs 40m after departure]

Graphs

Graphs are displayed as collapsible cards. Several cards keep the selected or average values visible even while collapsed:

- Groundspeed and Distance profile
    - Sun's elevation changes during the flight. Night periods are shaded.
- Heading and Altitude plot
    - Shows heading and altitude versus elapsed flight time, including selected and average readouts.
- TimeRate, Clock, Civil-Solar, Flight Path, and Circadian plots
    - Show solar/civil/UTC time behaviour, flight path progress, and circadian recommendation timing. The Cross-track error and Path Efficiency plot is available for planned GPS recording and post-flight review, but not for Record Track only mode because there is no planned route to compare against.

Flight Table

The detailed table shows each computed flight step.

Columns include:

- Elapsed time
- Latitude
- Longitude
- Civil time
- Time zone offset
- Distance travelled (NM)
- Speed (knots)

Cross-track error (when a planned route exists)

- Solar time
- UTC
- Solar
- Altitude
- Day/Night
- Solar time rate

Tap any row to select that point.

Solar Time Rate

FlightMaven calculates how solar time changes relative to clock time during the flight.

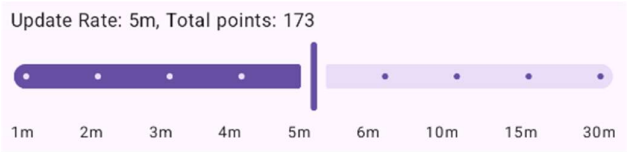
Rate > 1 → solar time advances faster (west to east flights)

Rate < 1 → solar time advances slower (east to west flights)

This occurs because the aircraft is moving across longitudes.

2. GPS BASED RECORDING

GPS tracking is for tracking flights in real time. This works by arming the GPS or manually starting the GPS. When the aircraft reaches the programmable AUTO_START value, it will start capturing data. The user can force recording manually regardless of speed. The GPS will stop capturing data when speed drops below the programmed AUTO_STOP value long enough to auto-stop, or when the user presses Stop GPS. The sampling interval can be changed depending on flight length and resolution needed. Free mode uses the main-page interval slider from 1 min to 30 min; Pro allows custom update intervals down to 5 sec.



Arm the GPS, Press: *GPS Arm*

The phone begins recording your position when aircraft speed exceeds the configured AUTO_START threshold (default 80 kt).

Start Recording, Press: *GPS Start*

The phone begins recording your position regardless of speed (manual start)

Stop Recording, Press: *GPS Stop*

The phone stops recording your position manually. If auto-stop is enabled, GPS auto-stops after sustained speed below the configured AUTO_STOP threshold (default 40 kt).

Save Track Press: *Save Track*

The recorded track is saved as a CSV file. The output contains several columns from the flight computation engine, including recorded position/time values and route comparison values when a planned route exists.

Share Track Press: *Share Track*

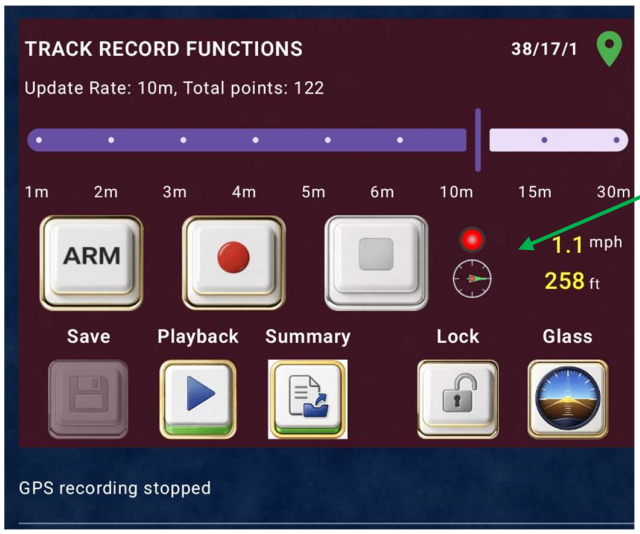
This allows you to send the CSV file via email or messaging when export/share is available. Export/share is a Pro feature.

Table below shows the Recording modes

Record LED	Button (Arm)	Button (Start)	Button (Stop)	GPS Speed	Status
Red	Active	Active	Inactive	-	GPS off
Blinking amber	Inactive	Active	Active	value	GPS armed
Solid green	Inactive	Inactive	Active	value	GPS capturing data

A mini compass displays heading when GPS is active and also the aircraft groundspeed. Altitude is displayed preferentially using phone's internal barometric sensor (can be overridden) or GPS based if barometric sensor is not available.

Record Track only mode lets you record a GPS track without specifying departure or destination airports. This can be useful for generic track recording, testing, or non-airport workflows. Because there is no planned route, cross-track/path-efficiency comparison is not shown. When internet/weather data is available, the app can use the nearest available altimeter setting during this mode.



GPS locked with 38 satellites visible and 17 locked.

LED (red) indicates recording stopped. If accuracy is not good (indoors), there might be a small speed and direction shown as in this case. With good GPS lock (window seat) in actual flight, these will have valid values.

3. LOADING/SAVING/SHARING FLIGHT TRACKS

You can import a flight track from a CSV file.

Press: *Load CSV*

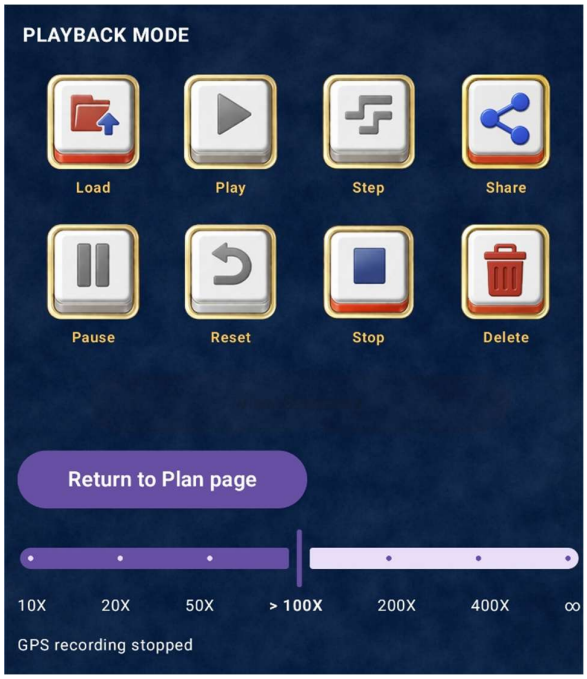
The app will compute solar and time values along the track.
The CSV file must contain the following columns (comma separated):
Example

UTC,Latitude,Longitude
2026-03-13T07:00:00,37.618,-122.375
2026-03-13T07:05:00,37.720,-122.100
2026-03-13T07:10:00,37.900,-121.800
2026-03-13T07:15:00,38.120,-121.400

- The first row must contain the **column headers**.
- Longitude in decimal degrees
- Times must be in **ISO-8601 UTC format**:
  YYYY-MM-DDTHH:MM:SS (2026-03-13T07:15:00)

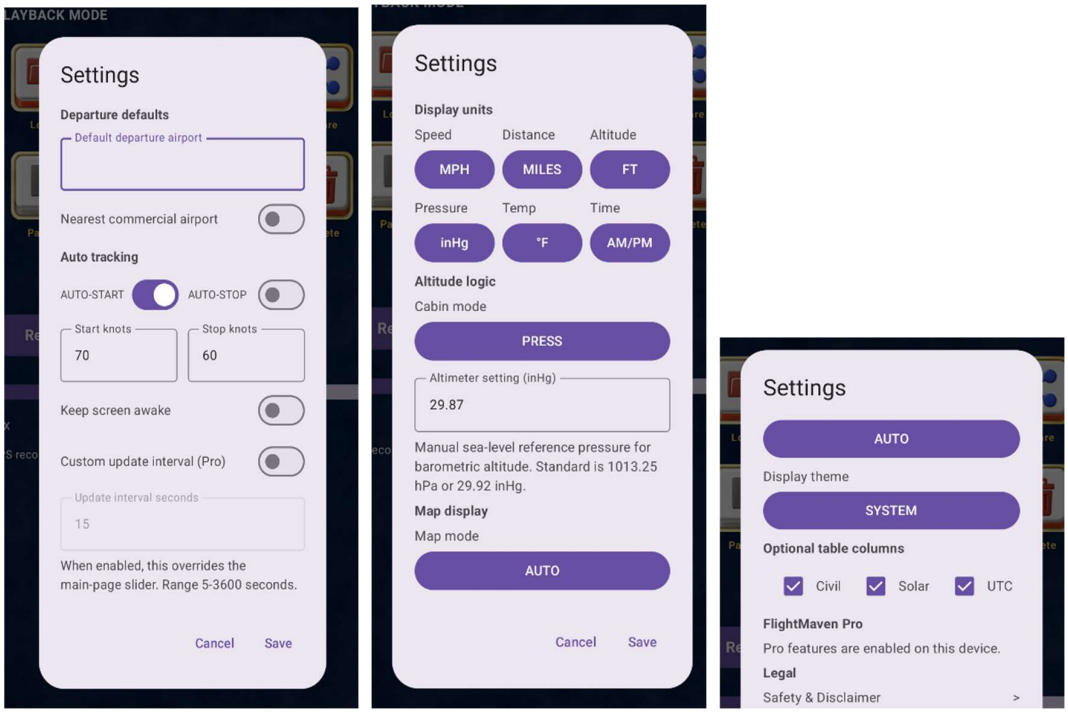
Above is the minimum requirement for loading a track. The track generated by the app has more fields from the computation engine.

Playback mode allows you to load a saved file and play it back at 10X, 20X, 50X, 100X, 200X, or 400X. The infinite option immediately fills all points instead of replaying them over time. Loaded planned-route tracks can regenerate cross-track/path-efficiency review and post-flight summaries.



Flights are saved with different file formats:
Planned flights between airports – DEP_DEST_Plan_DATE_TIME.csv
Recorded flights (using GPS) – DEP_DEST_Track_DATE_TIME.csv
Free flights (using GPS) – FF_DATE_TIME.csv
Summary file (pop-up after recording is over) – DEP_DEST_Summary_DATE_TIME.csv

4. APP SETTINGS



Various parameters can be programmed. Most are self-explanatory. Time display can be set to AM/PM or 24-hour format; AM/PM is the default. Nearest commercial airport, if enabled, will try to find a nearby major airport (not guaranteed); you can force it by setting Default departure airport.

Altimeter setting is available in the weather card, so you can put the value in the altimeter setting (this will give you more accurate altitude information than GPS derived altitude).

Display settings include distance/speed/altitude units and Time display format. AM/PM is the default for the production release; choose 24-hour if preferred.

Legal disclaimers apply. This can be reviewed as well at any time.

FUN THINGS TO TRY

- Compare eastbound vs westbound flights
- Try long-haul routes
- Look for flights where sunrise or sunset occurs mid-flight
- Observe where solar time speeds up or slows down
- Record short GPS tracks
- Import CSV flight tracks
- Evaluate jetlag effects depending on routes, time of arrival etc.

KNOWN ISSUES

- Note: Solar versus civil time graphs and computation are complex because time zone boundaries are complex. FlightMaven uses a simplified database, so some flights, especially circumpolar routes and oceanic routes, may show strange jumps. Use these displays as visualization and review aids only.
- Planning uses rough aircraft groundspeed and altitude values for flight-duration estimation. Pro users can customize planning speed/altitude, including GA-style settings for short and slower flights. Calculations may still differ from true flight-planning software.