Introduction to SmartCharts

GARMIN



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Airport Diagrams

Departure Procedures

Arrival Procedures

Approach Charts

Legend

Glossary

Abbreviations & Acronyms

References

Appendix

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This manual serves as a guide for those in the aviation industry using Garmin's SmartCharts application. This manual is intended for reference only, and includes some, but not all, of the commonly used symbology. Some differences in operation may be observed when comparing the information in this manual to earlier or later versions. This manual is intended to supplement training and is not meant to be used for navigation.

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Rev	Date	Description
A	May, 2025	Production Release.
B	November, 2025	Updated to reflect software version 25.11.0. Graphical NOTAMS for Airport Diagrams. Updated document structure, images, and formatting throughout.

AIRPORT DIAGRAMS

Airport Diagram Features....1
- Runway Depiction....1
- Pavement Markings....9
- Construction Areas....10
- Hot Spots....10
- Airport Diagram Graphical NOTAMs....13

Details....19

Runway / Departure....21

Alternate Minimums....25

Quick Access Buttons....26
- Quick Access Select Chart....27

DEPARTURE PROCEDURES

Overview....29
- Aircraft Button....30
- Runway Button....30
- Transition Button....31
- Details Button....32
- Quick Actions/Reference Buttons....35
- Planview....36

ARRIVAL PROCEDURES

'Zoomed Out' Icon Depictions....38

Overview....39
- Aircraft Button....42
- Transition Button....43
- Runway Button....44
- Details....45
- Quick Access/Reference Buttons....48
- Planview....50

APPROACH CHARTS

Overview....51
- Minimums Button....55
- Transition Button....60
- Details....61
- Profile View Button....67
- Procedure Reference Bar....69
- Quick Access/Reference Buttons....70
- Planview....73
- Approach Minima Not Authorized....74
- Localizer Backcourse / DME Arc....76
- Profile View....77

LEGEND

U.S. Terminal Procedures Symbols & Legend....83

GLOSSARY

ABBREVIATIONS & ACRONYMS

REFERENCES

APPENDIX

Example Flight With SmartCharts....156
- Overview....156
- Accessing Your Chart....157
- Airport Information....166
- Departures & Arrivals....170
- Instrument Approaches....183

iPad Guidance....198
- Display Orientation....198
- iPad Glare Reduction....198
- AirPrint Wireless Print Capability....199

Additional Information....200
- Overview & Features....200
- Limitations of The Current System/Data....202
- Data Validation, Sourcing, & Legacy Chart Comparison....202
- Cycle Data & Requirements....202
- Geographic Areas....202
- Georeferenced Aircraft Depiction....202
- How to Download SmartCharts to Garmin Pilot....202
- Night Mode....203
- Expired SmartChart....204
- How to Update SmartCharts In Garmin Pilot....205
- How to Report Issues or Problems....206

General SmartCharts Operating Guidelines....207
- Setting SmartCharts as Primary Provider....208
- Re-Activating SmartCharts....209
- SmartCharts Unavailable....210
- Split Screen....211

More/Tools Menu....213
- Show Navigation Info....214
- Zoom to Max Range....215
- Chart settings....216
- Night Mode....217
- Chart Supplement....218
- Decode NOTAM Text....220
- Instrument Approach Procedures - Profile View....222

Blank Page

AIRPORT DIAGRAMS

Welcome to SmartCharts! Garmin's dynamic, data-driven, charting application for use via Garmin Pilot. SmartCharts helps the User in many ways, primarily focused on the four major charting areas of Airport Diagrams, Departure Procedures, Arrival Procedures, and Approach charts. With traditional charts, the airport diagram, chart supplements, take-off minimums, and alternate minimums are all separate documents. SmartCharts integrates this information into a single Airport Diagram, allowing the User to switch between buttons for all relevant information. The Airport Diagram is drawn to scale and displays labels dynamically based on 'Zoom' level, and, when available, a georeferenced aircraft.

AIRPORT DIAGRAM FEATURES

An overview of the Airport Diagram information commonly displayed is listed below:

Magnetic headings and identifiers (I.D.).	Large tanks, including fueling area.
Runways under construction/repair.	Control towers and height.
Runway dimensions, displaced thresholds, and runway end elevations.	Airport beacon.
Runway surface composition.	Landing direction indicators.
Weight bearing capacity (landing gear configuration or Pavement Classification Number).	Lighting.
Land and Hold Short (LAHSO) lines, ILS hold lines, Localizer/Glide Slope Critical Areas.	Navigational Aids (NAVAIDs).
Engineered Materials Arresting System (EMAS).	Helicopter pads.
Taxiways with identifiers.	Radar reflectors.
Taxiways under construction/repair.	Highest obstruction within diagram boundary.
Hot Spot locations.	Any building that a pilot can taxi to.
Parking areas, run-up pads, 'Non-movement' areas (where pilot is not under air traffic control), ramps, aprons, and hold pads.	Other buildings to include terminal, administration, and base operations, fire stations, NWS, AFSS, FAA, FSDO, ANG, USCG, and FBO.
Turnarounds, blast pads, stopways, overruns, and clearways (dimensions included when known).	Communication frequencies.

Airport Diagram Overview

RUNWAY DEPICTION

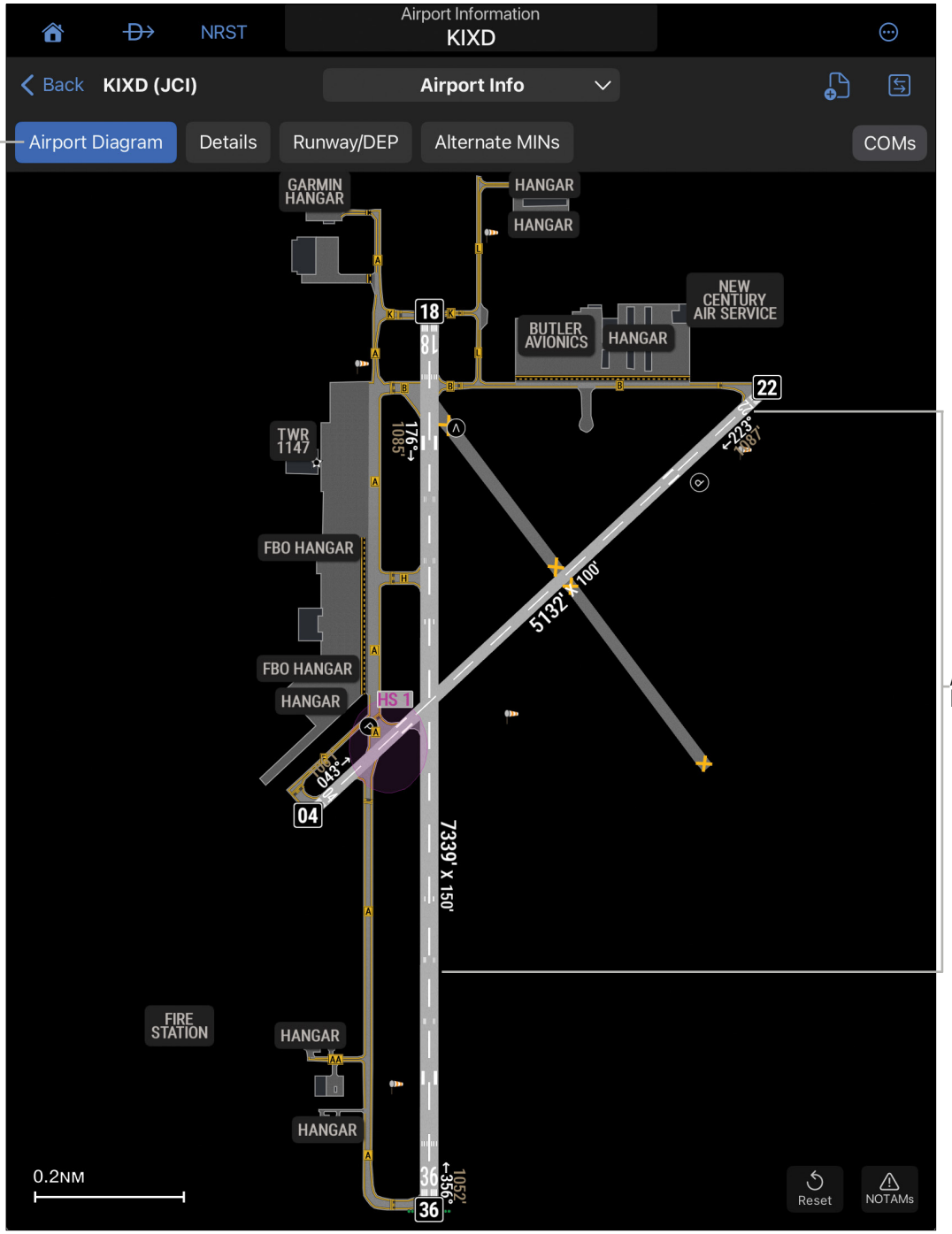
Runways will be displayed as one of the following surface types:

Runway Surface Type	Depiction Info
Asphalt/Concrete/Paved	Black (Day Mode) or Grey (Night Mode) coloring with centerlines.
Gravel	Grey without centerlines.
Grass/Turf	Green without centerlines.
Dirt/Unpaved	Brown without centerlines.
Water	Blue without centerlines.

Runway Depiction Information

ASPHALT/CONCRETE/PAVED RUNWAY - NIGHT MODE

Asphalt/Concrete/Paved runways are depicted in SmartCharts in the color grey in Night Mode.



Airport Info - Airport Diagram - Night Mode - Asphalt/Concrete/Paved Depiction

ASPHALT/CONCRETE/PAVED RUNWAY - DAY MODE

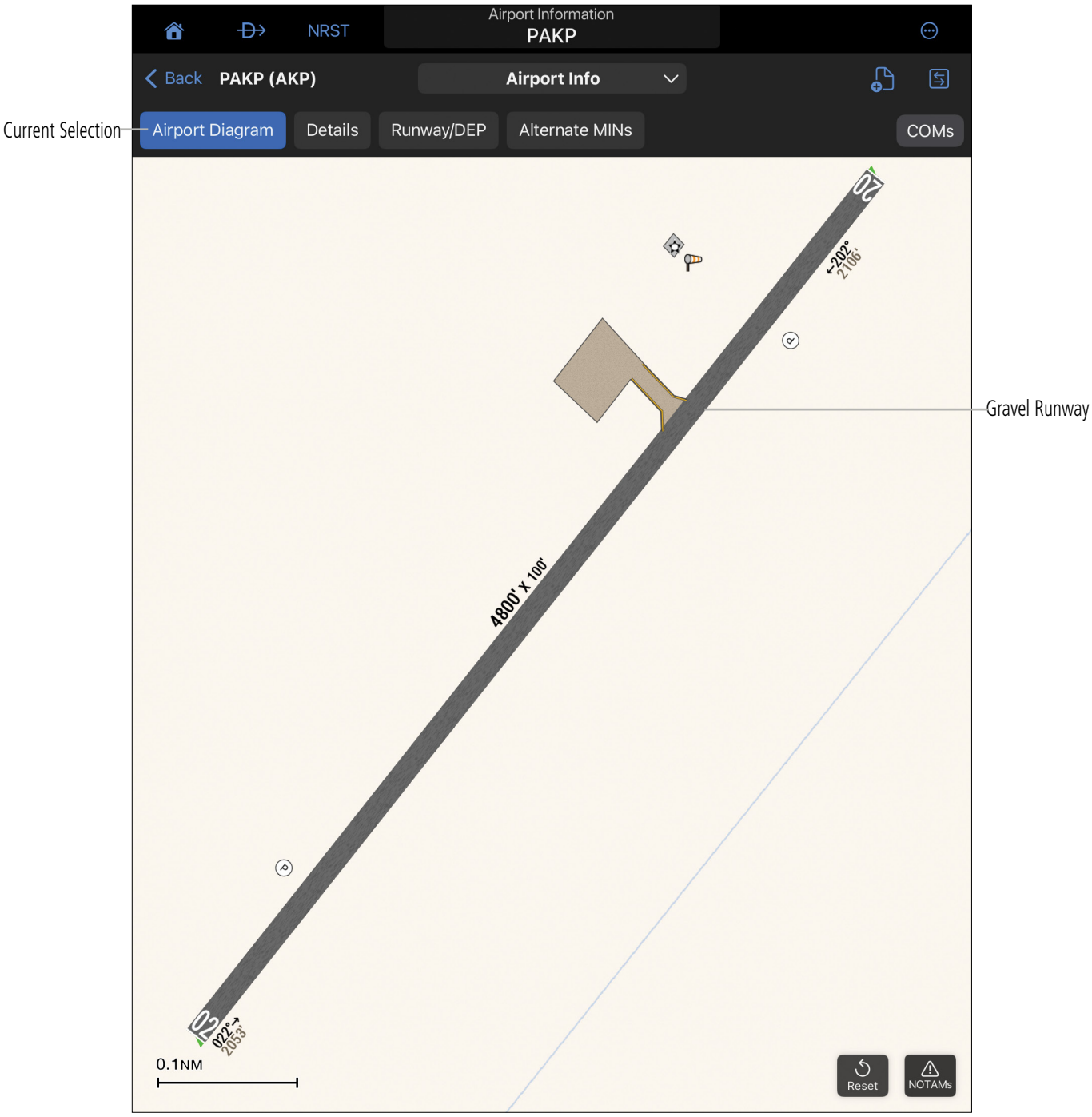
Asphalt/Concrete/Paved runways are depicted in SmartCharts in the color black in Day Mode.



Airport Info - Airport Diagram - Day Mode - Asphalt/Concrete/Paved Depiction

GRAVEL RUNWAY

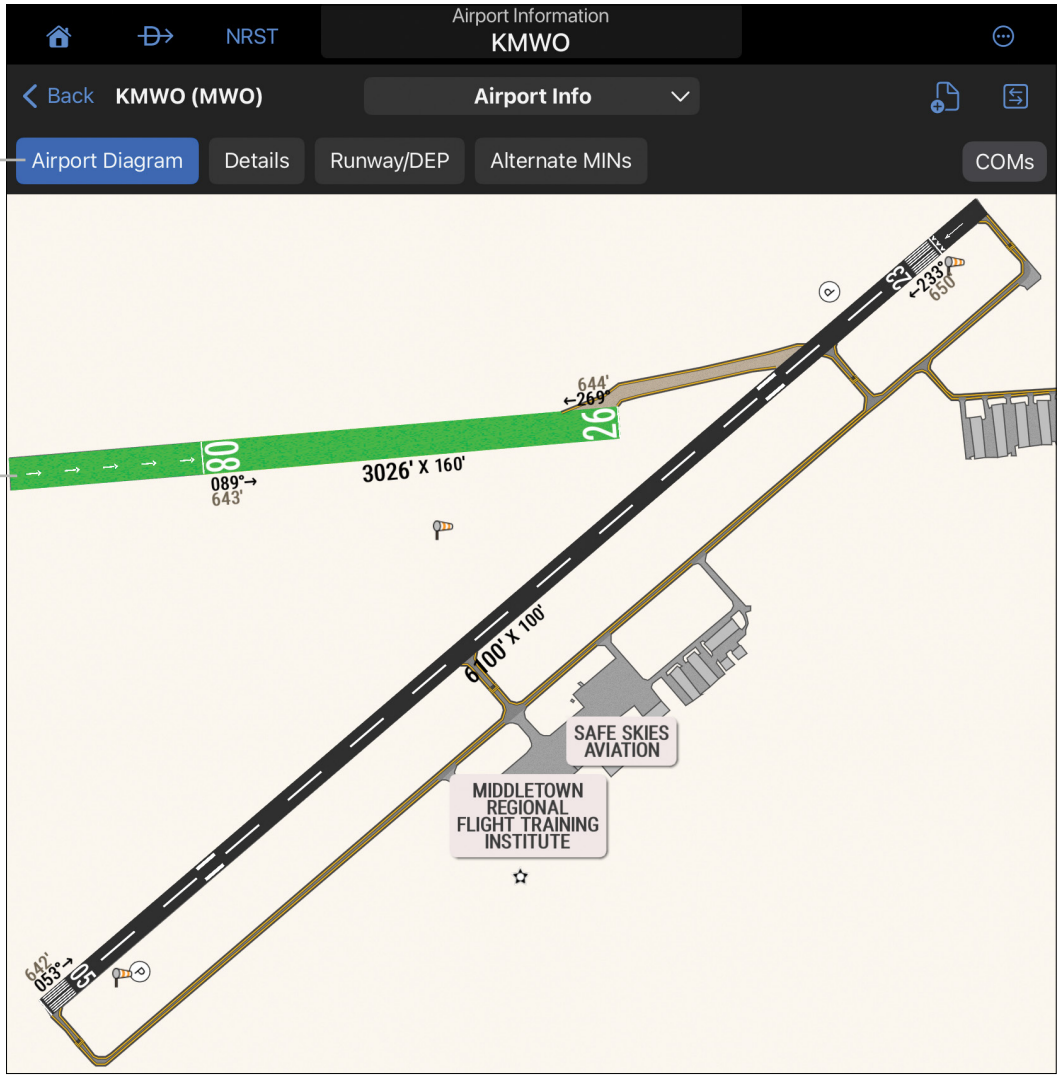
Gravel runways are depicted in SmartCharts in the color dark grey without a centerline.



Airport Info - Airport Diagram - Day Mode - Gravel Runway Depiction

GRASS/TURF RUNWAY

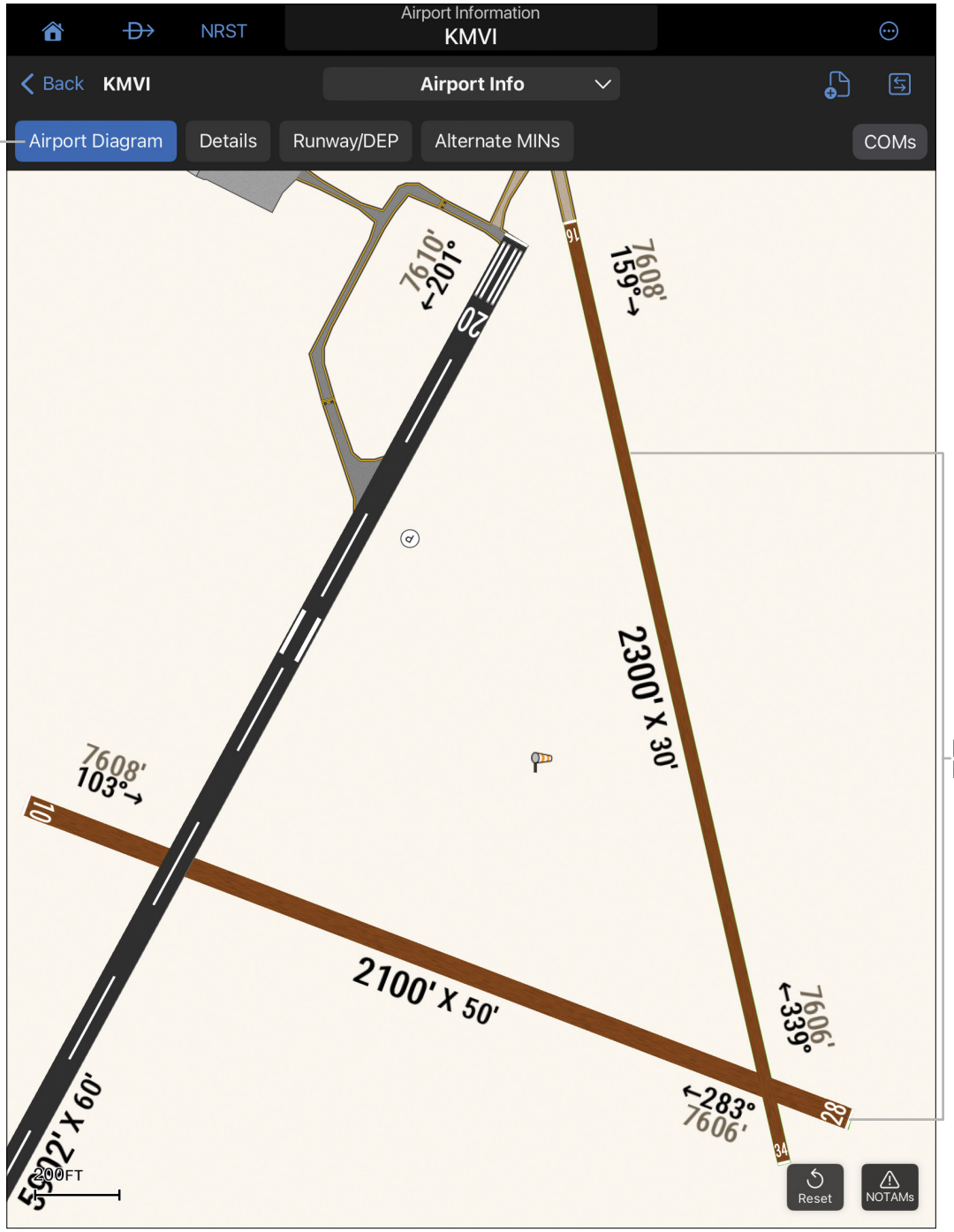
Grass/Turf runways are depicted in SmartCharts in the color green without a centerline.



Airport Info - Airport Diagram - Day Mode - Grass/Turf Runway Depiction

DIRT/UNPAVED RUNWAY

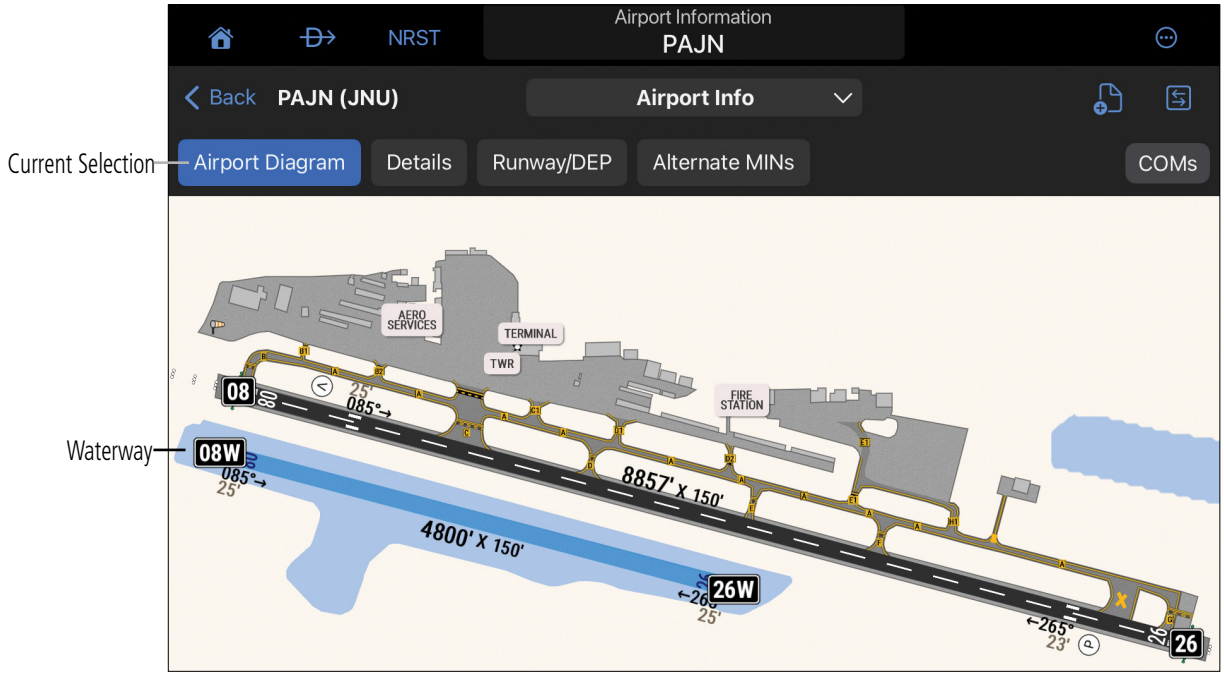
Dirt/Unpaved runways are depicted in SmartCharts in the color brown without a centerline.



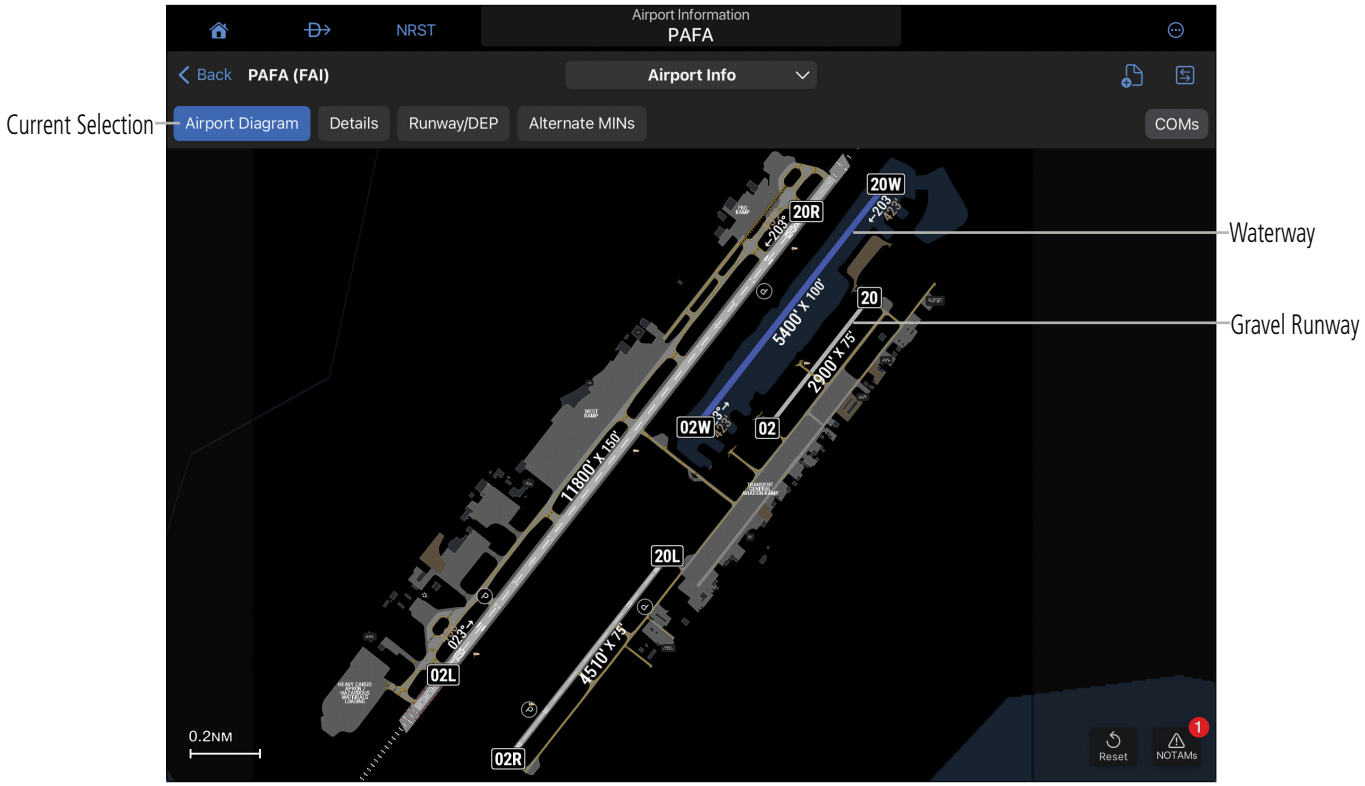
Airport Info - Airport Diagram - Day Mode - Dirt/Unpaved Runway Depiction

WATERWAY

Waterways are depicted in SmartCharts in the color blue with a 'W' alongside the runway I.D., without a centerline.



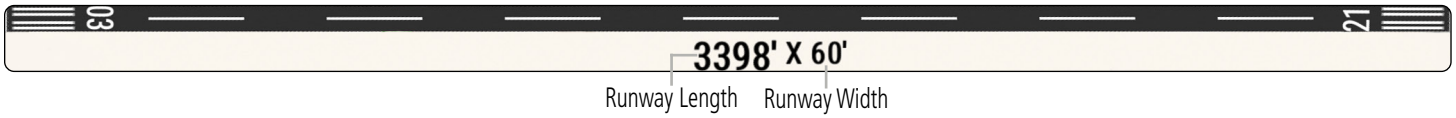
Airport Info - Airport Diagram - Day Mode - Water Runway Depiction



Airport Info - Airport Diagram - Night Mode - Water Runway & Gravel Runway Depiction

RUNWAY LENGTH AND WIDTH

Runway length and width is depicted near the center of each runway.



Paved Runway - Day Mode

RUNWAY BEARING AND ELEVATION

Runway bearing and elevation are depicted at the end of each runway.



Paved Runway - Day Mode - Elevation and Bearing

DISPLACED THRESHOLDS

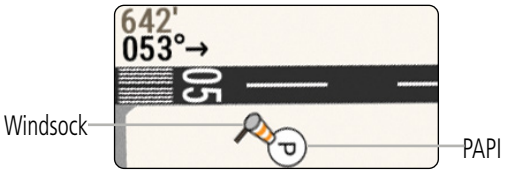
Displaced Thresholds are depicted with arrows regardless of runway surface type.



Displaced Threshold - Turf and Paved

PAPI/VASI AND WINDSOCK

PAPI or VASI and wind indicator icons are depicted along the runway in their general, physical location, and the icon orientation aligns with the applicable runway. Wind indicator locations are depicted with a windsock icon.



Paved Runway - Day Mode - PAPI and Windsock

PAVEMENT MARKINGS

NOTE: *SmartCharts Airport Diagrams depict representative pavement markings for reference only. The User should always rely on actual pavement markings for navigation as exact markings and locations are frequently changed based on airport construction and design modifications.*

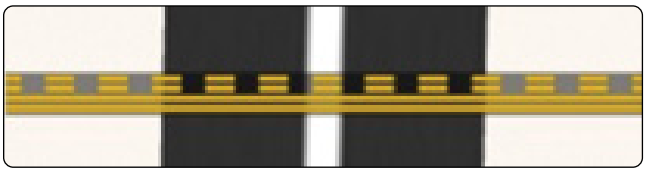
NOTE: *SmartCharts Airport Diagrams depict Runway Threshold Markings, Touchdown Zone Markings, and Aiming Point Markings to runways based on FAA guidelines, and may not match the placement on the actual runway.*

HOLD SHORT



Pavement Markings - Hold Short

LAND AND HOLD SHORT OPERATIONS (LAHSO)



Pavement Markings - LAHSO

ILS HOLD/CRITICAL AREA



Pavement Markings - ILS Hold/Critical Area

NON-MOVEMENT AREA



Pavement Markings - Non-Movement Area

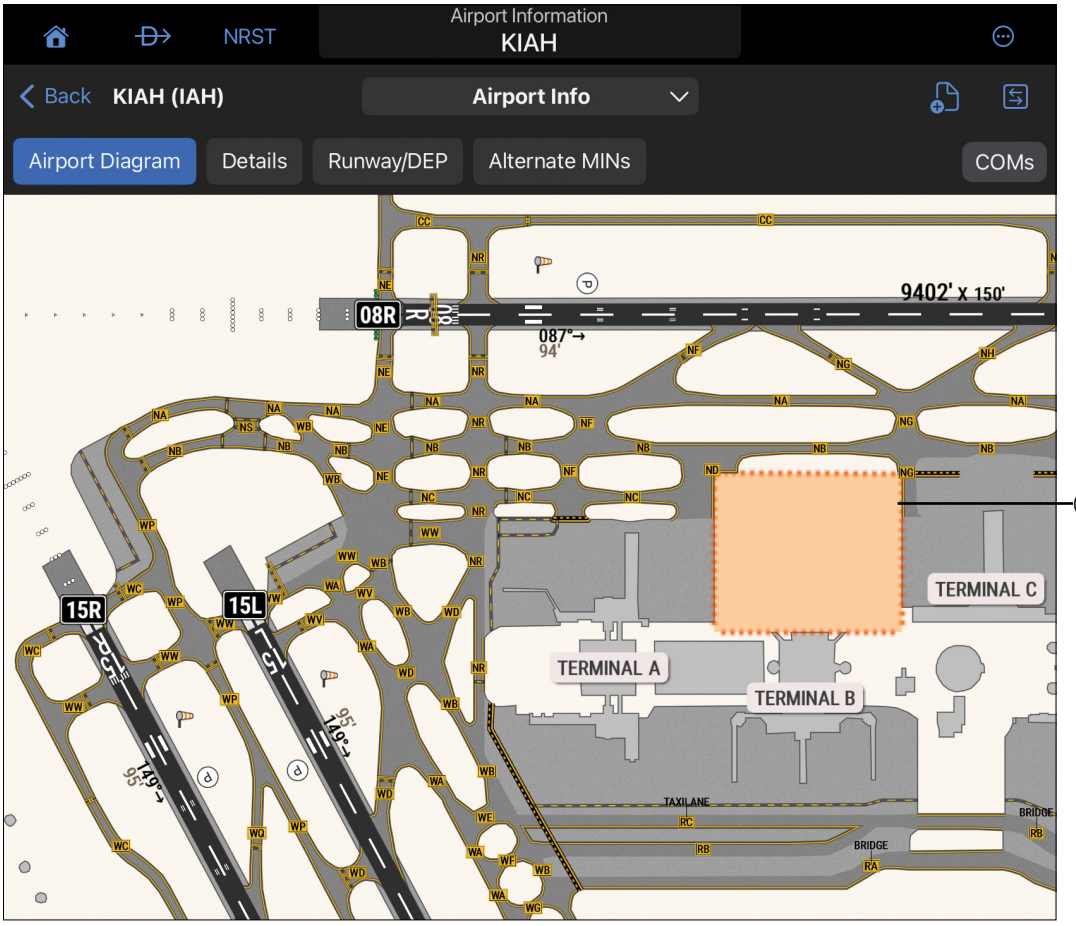
TAXIWAY HOLDING POSITION



Pavement Markings - Taxiway Holding Position

CONSTRUCTION AREAS

Construction areas are depicted as highlighted sections in the color orange.



Airport Info - Airport Diagram - Construction Area Depiction

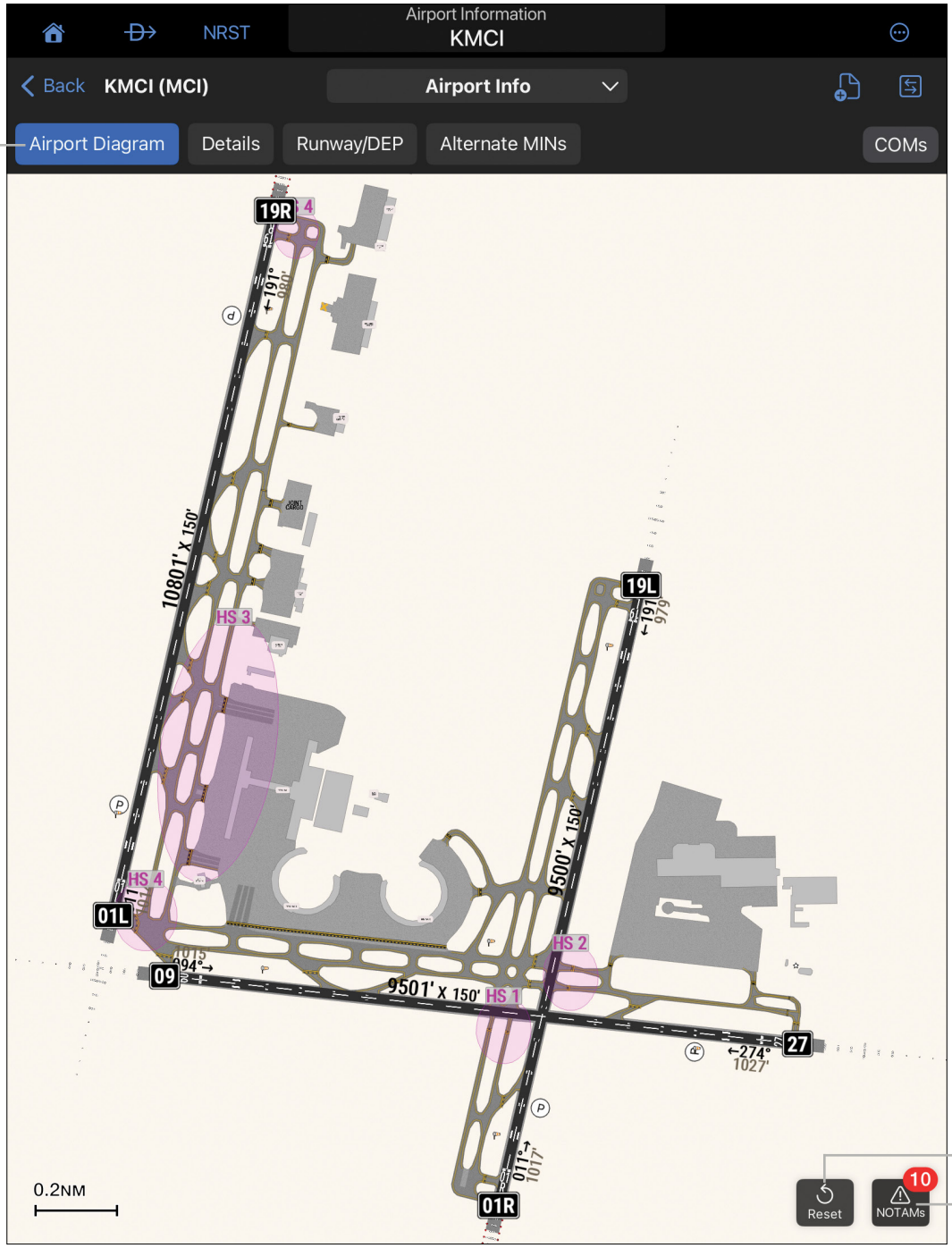
HOT SPOTS

An "Airport surface hot spot" is a location on an aerodrome movement area with a history or potential risk of collision or runway incursion, and where heightened attention by pilots/drivers is necessary.

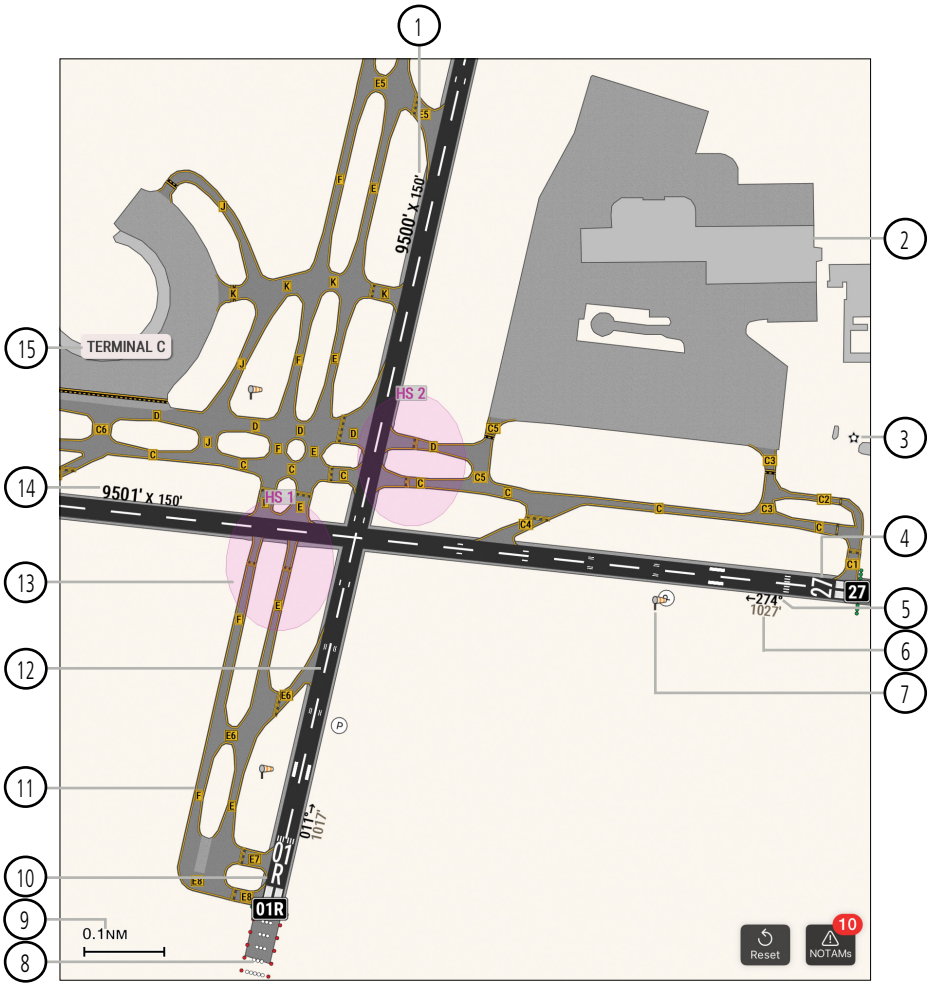
A "hot spot" is a runway safety related problem area on an airport that presents risk during surface operations. Typically, it is a complex or confusing taxiway/taxiway or taxiway/runway intersection. The area of increased risk has either a history of, or potential for, runway incursions or surface incidents, due to a variety of causes, such as, but not limited to: airport layout, traffic flow, airport marking, signage and lighting, situational awareness, and training. Hot spots are depicted on airport diagrams as open circles or polygons designated as "HS 1", "HS 2", etc.,. Hot spots will remain charted on airport diagrams until such time the increased risk has been reduced or eliminated.

Viewing Airport Diagram:

1) Select  >  > **Charts** > **SmartCharts** > **Airport Diagram**.
2) The chart will load at the default scale and centered. Pinch Zoom and/or tap-drag, as desired.
3) Tap **Reset**, if desired, to **Restore All Defaults** or **Zoom to Center**.
4) Tap **Back** to exit and return to previous screen.



Airport Info - Airport Diagram - Day Mode



Airport Info - Airport Diagram - Hot Spots

1. Runway length (9500') and width (150').
2. Buildings on or near the airport are depicted.
3. Location of the airport identification beacon.
4. Runway depiction (27).
5. Runway bearing (274°).
6. Runway end elevation (1,027' MSL).
7. Location on the airport of a wind direction indicator.
8. Approach lighting system depiction.
9. Chart scale.
10. Runway threshold depiction.
11. Taxiway depiction.
12. Runway depiction (01R).
13. Hot Spot (HS1).
14. Runway length (9501') and width (150').
15. Building depiction and name.

AIRPORT DIAGRAM GRAPHICAL NOTAMS

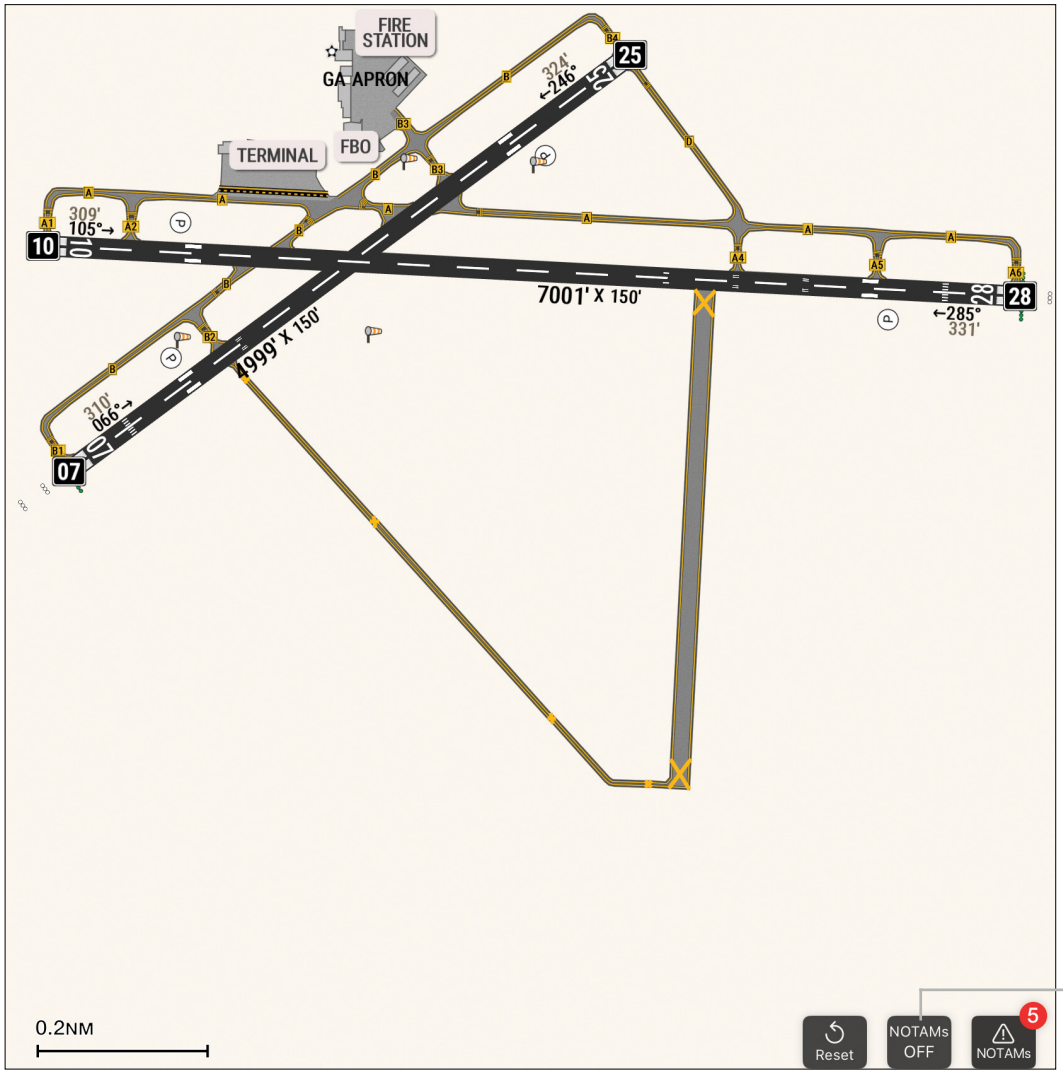
NOTE: *SmartCharts Airport Diagrams display effective Graphical NOTAMs, but do not display upcoming Graphical NOTAMs.*

NOTE: *Time-based NOTAMs that are **Effective** are shown on the Airport Diagram, but may not be **Active** if outside the specified time frame. Verify textural NOTAM details to ensure compliance.*

When viewing the Airport Diagram in SmartCharts, a Graphical NOTAMs overlay can be toggled 'On/Off' by selecting the **NOTAMs** button.

Viewing Graphical NOTAMs:

1) Select  >  > **Charts** > **SmartCharts** > **Airport Diagram**.
2) Tap to toggle the **NOTAMs** button **On**.



Airport Info - Airport Diagram - Day Mode - Graphical NOTAMS Off

When selected 'On', Graphical NOTAMs will depict effective NOTAM conditional closures and closures for runways, taxiways, ramp/aprons, and NOTAM obstacles. In addition, current field condition (FICON) codes will appear on the runway label, allowing pilots to easily see the runway conditions while viewing the airport diagram.

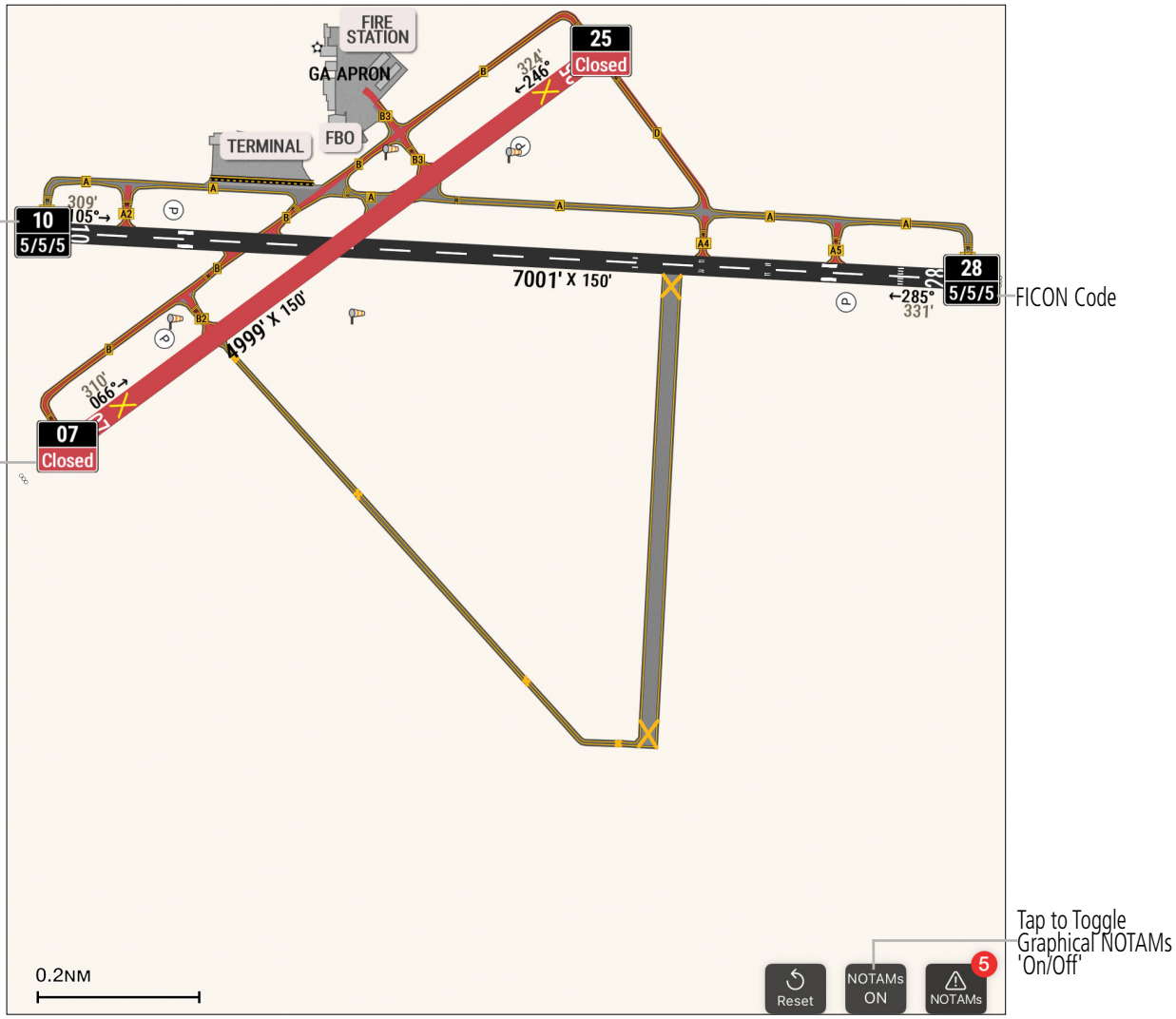
When a runway, taxiway, or ramp/apron is closed via NOTAM, they will be depicted in the color red. Closed runways will also have the traditional amber (yellow) "X" at each end.

Conditionally closed runways and/or taxiways are depicted in the color amber (yellow) and require the pilot to review the NOTAM text to determine the closure details. Conditional closures can be based upon many things, e.g. aircraft size, partial closures, or reoccurring time-based closures. If the runway closure is time-based, a clock symbol is also displayed near the runway label (I.D.) on the SmartCharts Airport Diagram.

To hide the Graphical NOTAMs, simply toggle the **NOTAMs** button 'Off'.

Hiding Graphical NOTAMs:

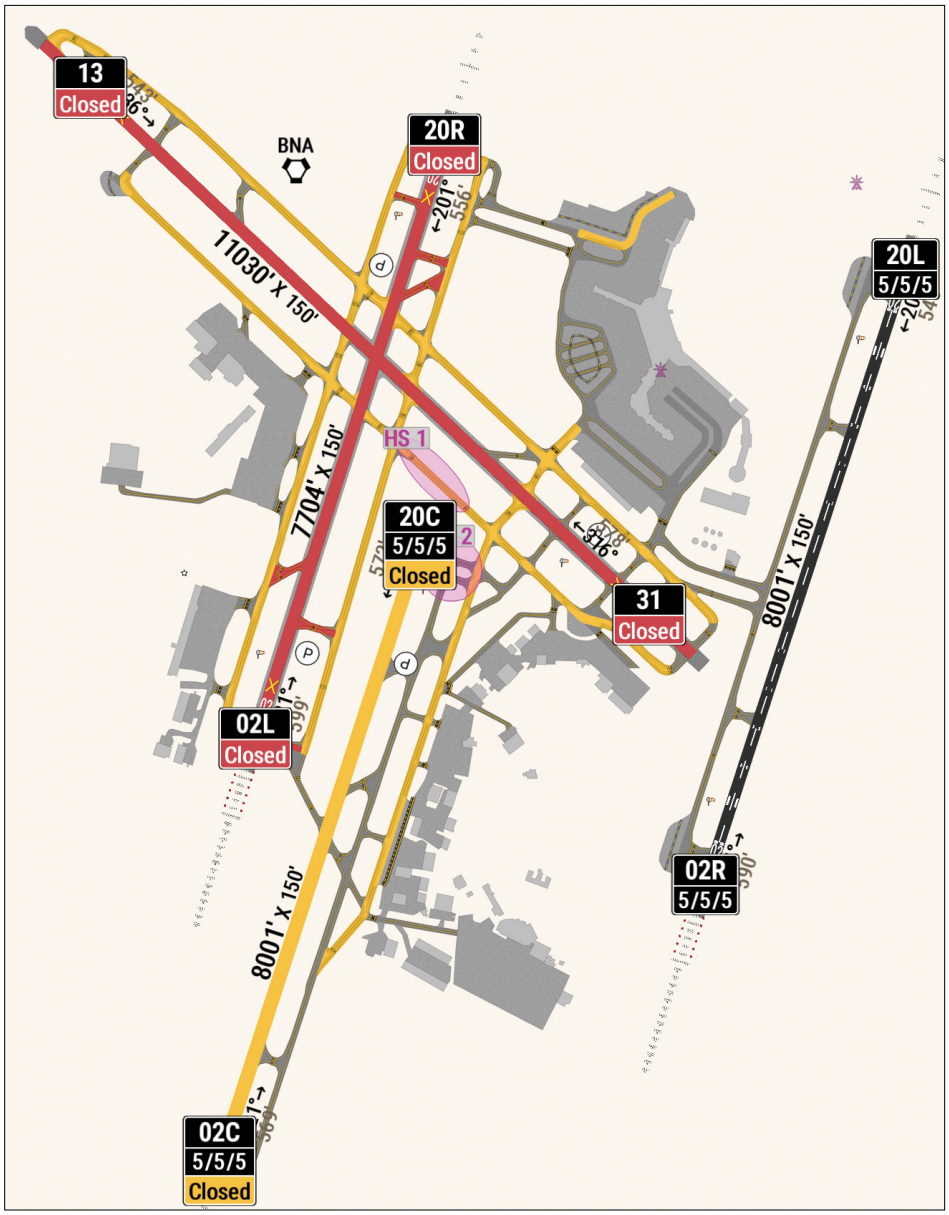
1) Select  >  > **Charts > SmartCharts > Airport Diagram**.
2) Tap to toggle the **NOTAMs** button **Off.**

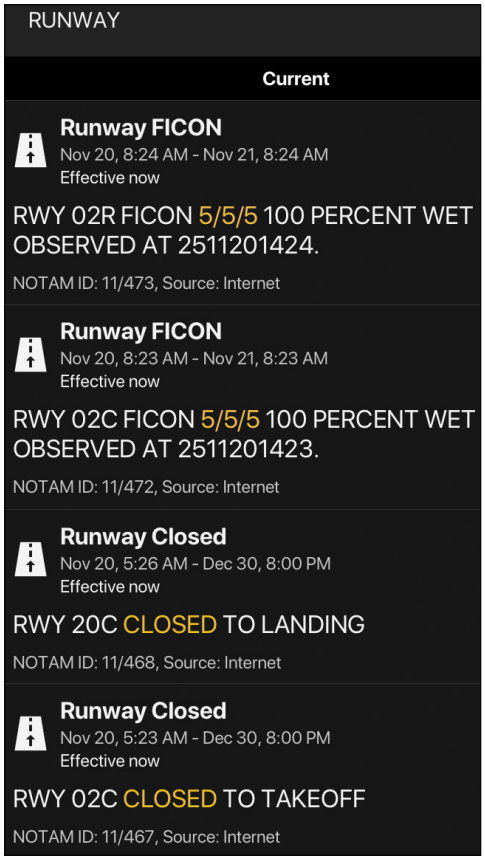


Airport Info - Airport Diagram - Day Mode - NOTAMs On - FICON w/Runway Closed

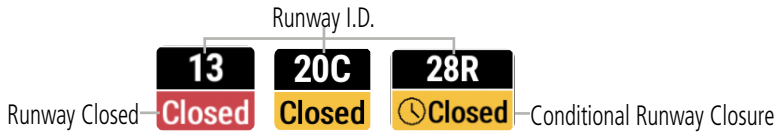
RUNWAY GRAPHICAL NOTAMS

For the vast majority of airports, SmartCharts will display effective graphical Runway NOTAMs. When the NOTAMs button is toggled **On**, the closed runway is displayed in the color red, while the conditional closure runway is displayed in the color amber (yellow).





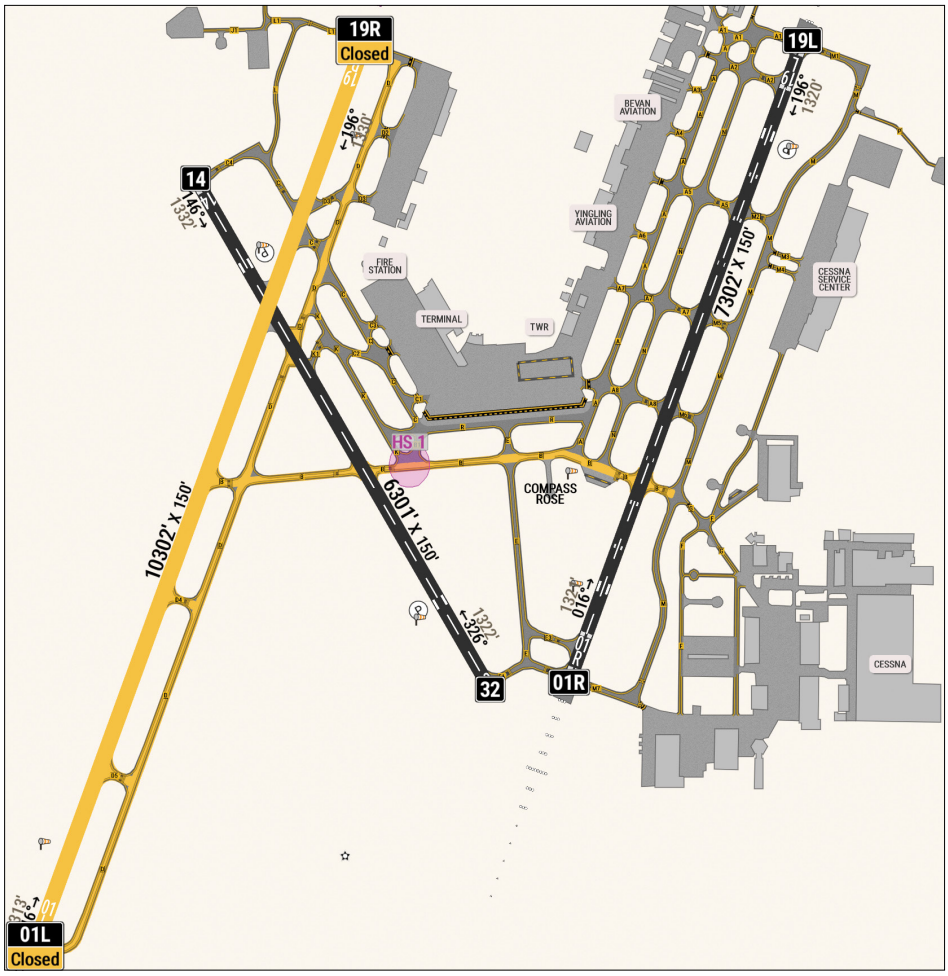
Airport Info - Airport Diagram - NOTAMs On - Active and Conditional & FICON



Airport Info - Airport Diagram - Runway Closed & Conditional Closure

TAXIWAY GRAPHICAL NOTAMS

For the vast majority of airports, SmartCharts will display effective graphical Taxiway NOTAMs. When the NOTAMs button is toggled **On**, the closed Taxiway is displayed in the color red, while the conditional closure area is displayed in the color amber (yellow).



TAXIWAY

Current

Taxiway Closed
Nov 16, 1:54 PM - Nov 20, 5:00 PM
Effective now

TWY D6 BETWEEN APPROACH END RWY 01L AND TWY D CLOSED

NOTAM ID: 11/196, Source: Internet

Taxiway Closed
Nov 16, 1:54 PM - Nov 20, 5:00 PM
Effective now

TWY D BETWEEN RWY 14/32 AND TWY D6 CLOSED

NOTAM ID: 11/195, Source: Internet

Taxiway Closed
Nov 16, 1:53 PM - Nov 20, 5:00 PM
Effective now

TWY B BETWEEN RWY 14/32 AND RWY 01L/19R CLOSED

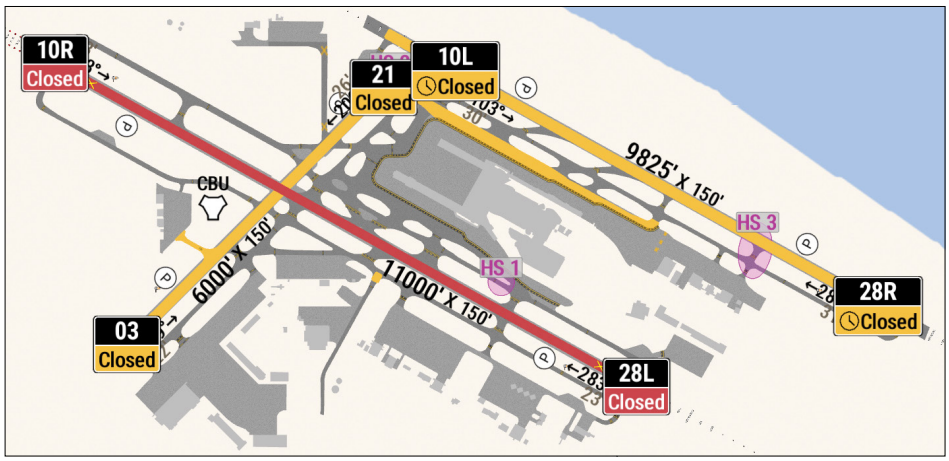
NOTAM ID: 11/193, Source: Internet

Taxiway Closed
Nov 16, 1:53 PM - Nov 20, 5:00 PM
Effective now

TWY D5 BETWEEN RWY 01L/19R AND TWY D CLOSED

NOTAM ID: 11/194, Source: Internet

Airport Info - Airport Diagram - NOTAMs On - Taxiway & Runway Conditionally Closed



RUNWAY

Current

Runway Closed
Nov 12, 1:30 PM - Dec 31, 2:30 PM
Effective now

RWY 10R/28L CLOSED EXCEPT CROSSING WEDNESDAY 1930-2030

NOTAM ID: 11/022, Source: Internet

Runway Closed
Nov 12, 10:00 AM - Dec 31, 11:00 AM
Effective now

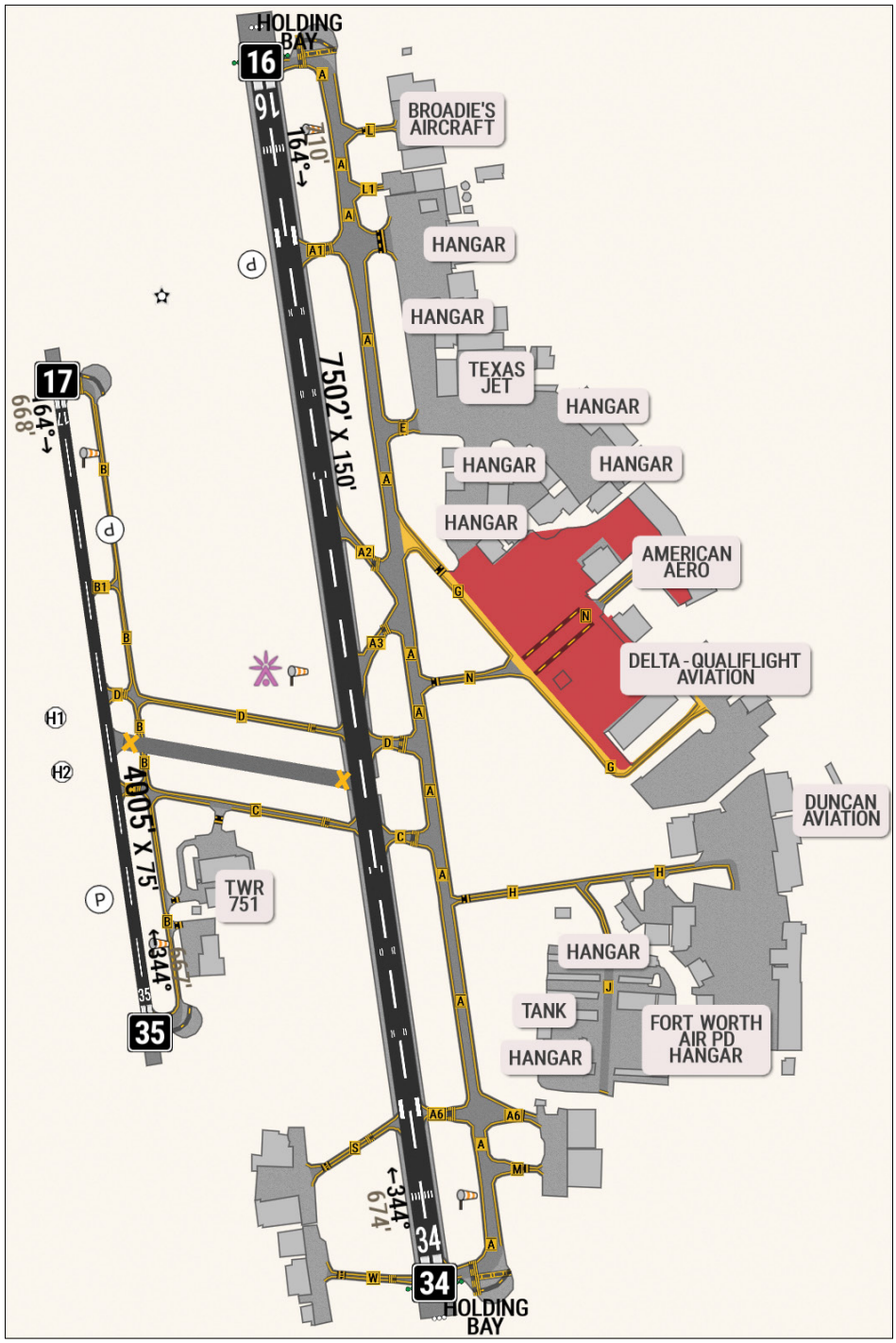
RWY 10L/28R CLOSED WEDNESDAY 1600-1700

NOTAM ID: 11/021, Source: Internet

Airport Info - Airport Diagram - NOTAMs On - Closed and Conditional w/Time Constraint

RAMP/APRON GRAPHICAL NOTAMS

For the vast majority of airports, SmartCharts will display effective graphical Ramp/Apron NOTAMs. When the NOTAMs button is toggled **On**, the closed ramp is displayed in the color red, while the conditional closure area is displayed in the color amber (yellow).



TAXIWAY

Current

Taxiway Closed
Effective Until Nov 30, 11:59 PM
Effective now

TWY G CLOSED TO AIRCRAFT WINGSPAN MORE THAN 49FT

NOTAM ID: 10/179, Source: Internet

Taxiway Closed
Effective Until Nov 30, 11:59 PM
Effective now

TWY G CLOSED TO AIR CARRIERS

NOTAM ID: 10/180, Source: Internet

APRON

Current

Apron Closed
Oct 30, 8:25 AM - Dec 16, 4:00 PM
Effective now

APRON BRAVO RAMP CLOSED LIGHTED AND BARRICADED

NOTAM ID: 10/788, Source: Internet

Apron Closed
Effective Until Nov 30, 11:59 PM
Effective now

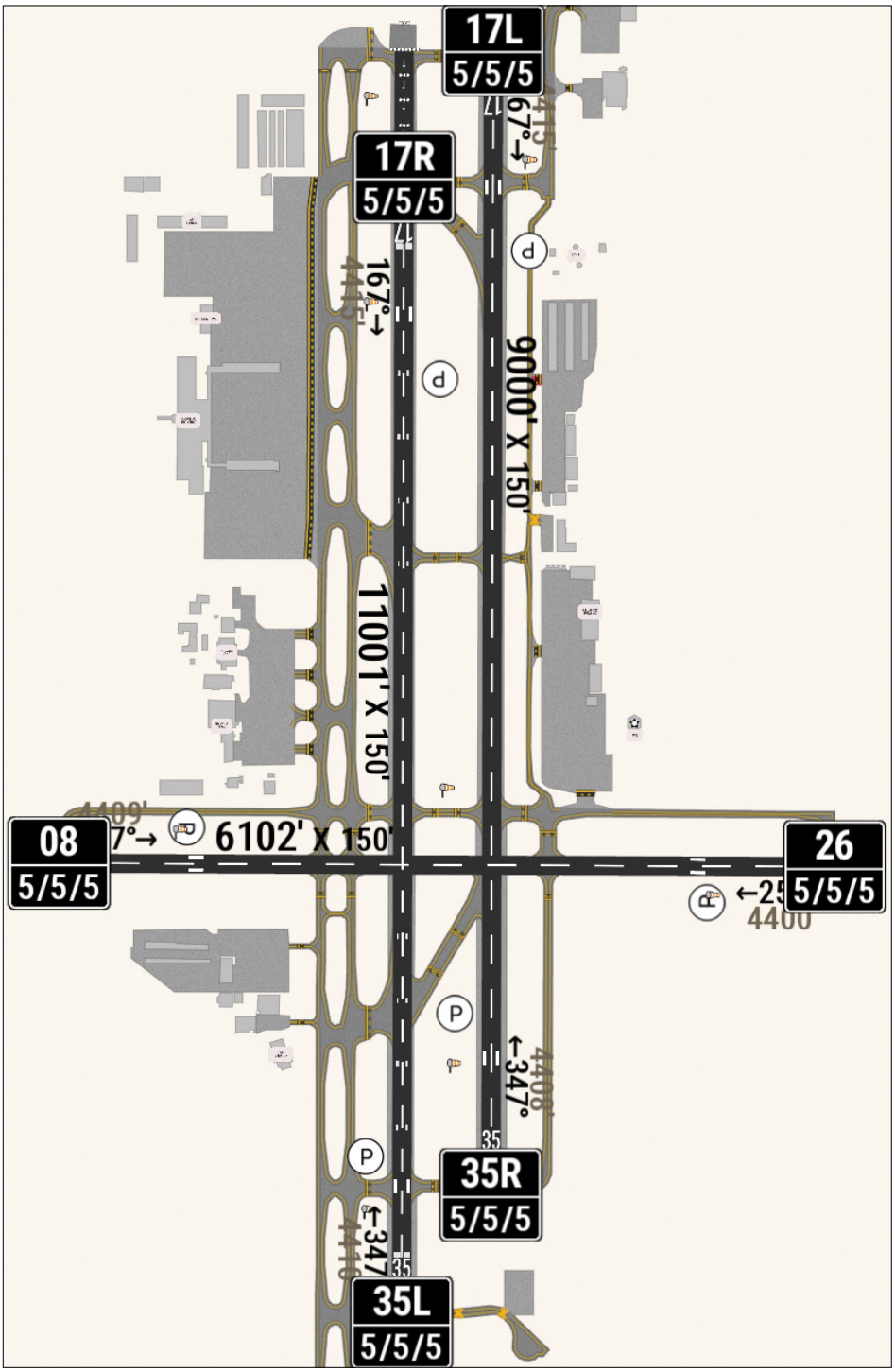
APRON TAXILANE G BETWEEN TAXILANE N AND BRAVO RAMP CLOSED

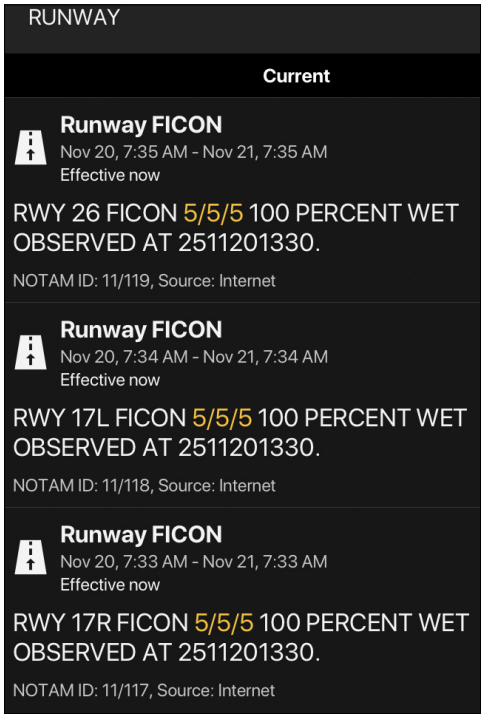
NOTAM ID: 10/176, Source: Internet

Airport Info - Airport Diagram - NOTAMs On - Apron Closed

FIELD CONDITION (FICON) GRAPHICAL NOTAMS

When available, Graphical Field Condition (FICON) NOTAMs are displayed on the Airport Diagram to assist in situational awareness. The NOTAMs are displayed using a badge at the end of the runway with the numeric value of the surface condition and braking action for each third of the runway (touchdown, midpoint, and rollout). The FICON code is colorized based upon the lowest number according to the FAA's Runway Condition Assessment Matrix.





Airport Info - Airport Diagram NOTAMs On - FICON Codes



Airport Info - Airport Diagram - Runway FICON Codes

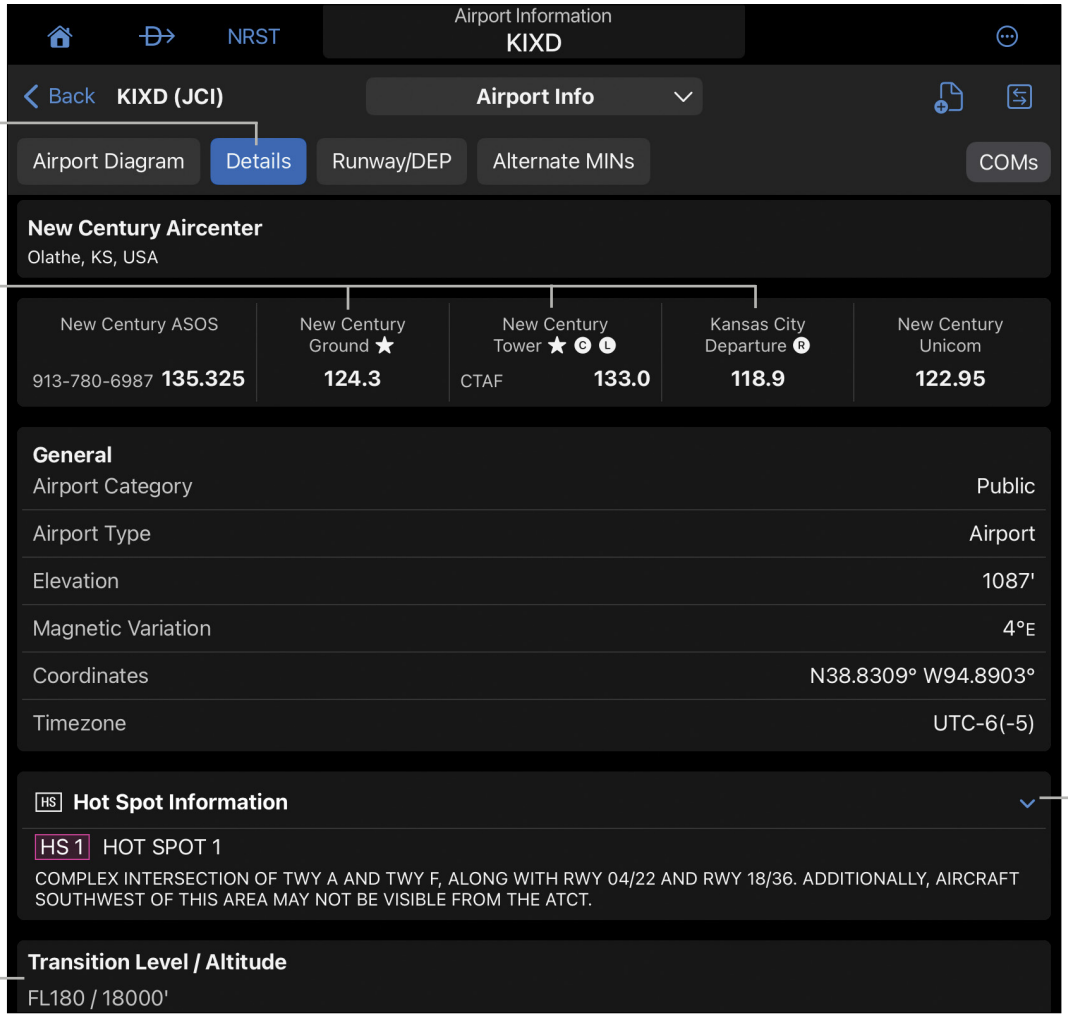
DETAILS

The Details tab contains textural information found on airport charts and the airport facility directory section of the Chart Supplement. When viewing the Airport Chart, selecting the **Details** tab will display additional information specific to the airport, which may include some, or all, of the following items:

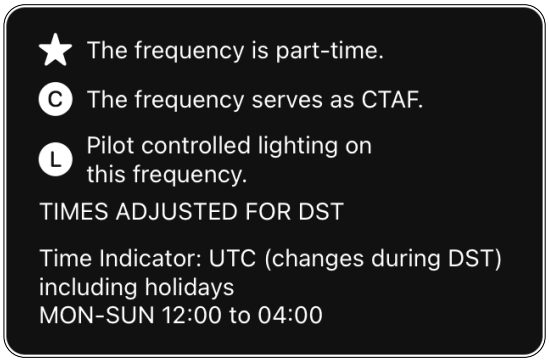
- Airport name, City, State, Country.
- Type of weather reporting equipment and frequency.
- Clearance frequency(s) and hours of operation.
- Ground control frequency(s) and hours of operation.
- Tower control frequency(s) with hours of operation, and/or the frequency serves as CTAF, and/or the pilot controlled lighting is assigned to this frequency.
- Departure control frequency(s) and if the facility has radar services.
- Unicom frequency.
- General Information.
- Hot Spot(s) Information.
- Transition Level / Altitude.
- Operational Notes.
- Aircraft Communications Addressing and Reporting System (ACARS) capabilities.
- Controller Pilot Data Link Communications (CPDLC) capabilities.
- Ramp name and frequency(s).

Viewing Details:

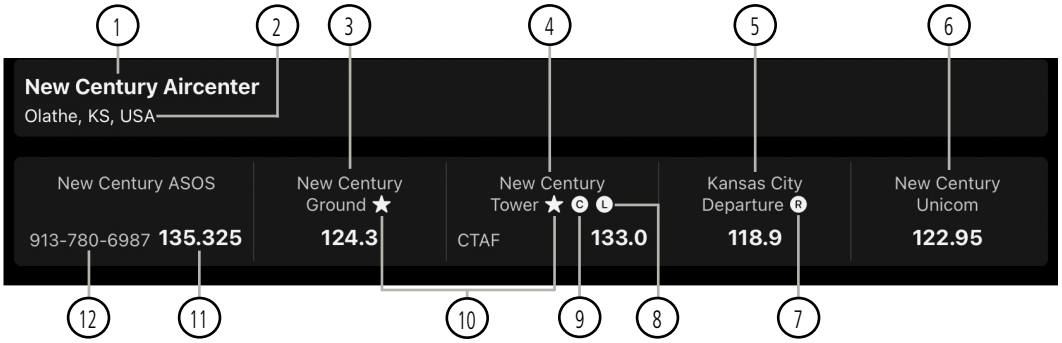
1) Select  >  > **Charts > SmartCharts > Airport Diagram**.
2) Tap the **Details** button to view additional information.



Garmin Pilot iOS - SmartCharts - Airport Info - Details



Garmin Pilot iOS - SmartCharts - Airport Info - Details - Service Indicator Legend



Garmin Pilot iOS - SmartCharts - Airport Info - Details - Communications & Location

1. Airport name.
2. City, State, Country.
3. Ground control name and frequency.
4. Tower control name and frequency.
5. Departure control name and frequency.
6. Unicom name and frequency.
7. Facility has radar services.
8. Pilot-controlled lighting available on this frequency.
9. Frequency serves as CTAF when Tower is unavailable.
10. This frequency is part-time.
11. Airport name, weather reporting equipment (ASOS), and frequency.
12. Phone number for weather reporting equipment (ASOS).

RUNWAY / DEPARTURE

NOTE: *SmartCharts does not depict Cardinal Direction Runways in the Runway/DEP tab, but they will be depicted on the Airport Diagram if their location is known.*

NOTE: *SmartCharts uses runway endpoint elevation values to calculate runway slope, and may differ slightly from the FAA published values.*

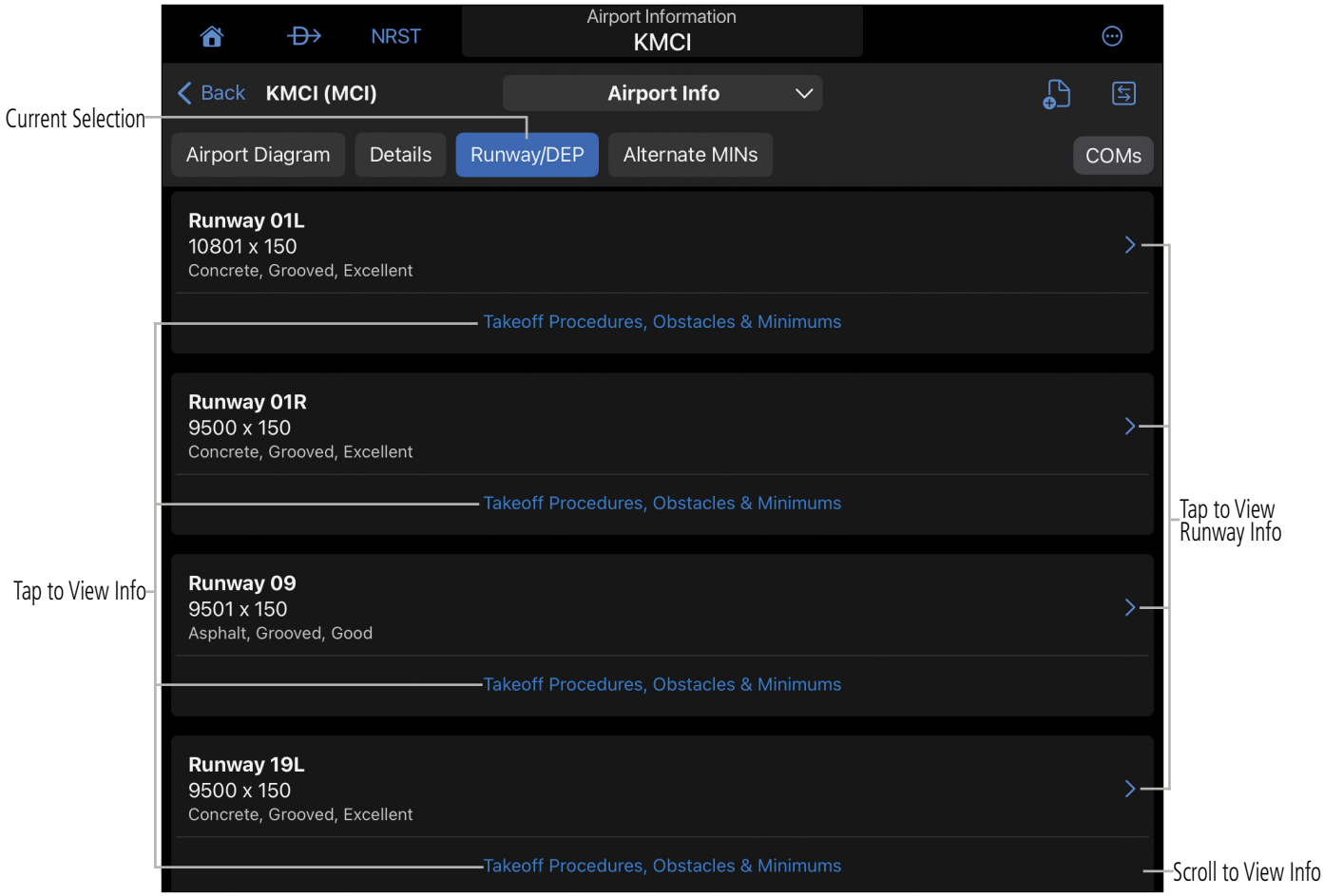
NOTE: *SmartCharts uses the abbreviation APAPI (Abbreviated PAPI) to indicate a 2-box PAPI glideslope indicator. FAA documentation often refers to these systems as "PAPI(2)", but both reference the same system.*

The Runway/DEP tab contains a list of runways with access to Details, Takeoff Procedures, Obstacles, and Minimums for each runway. When viewing the Airport Chart, selecting the **Runway/DEP** tab will provide additional information which may include some, or all, of the following items:

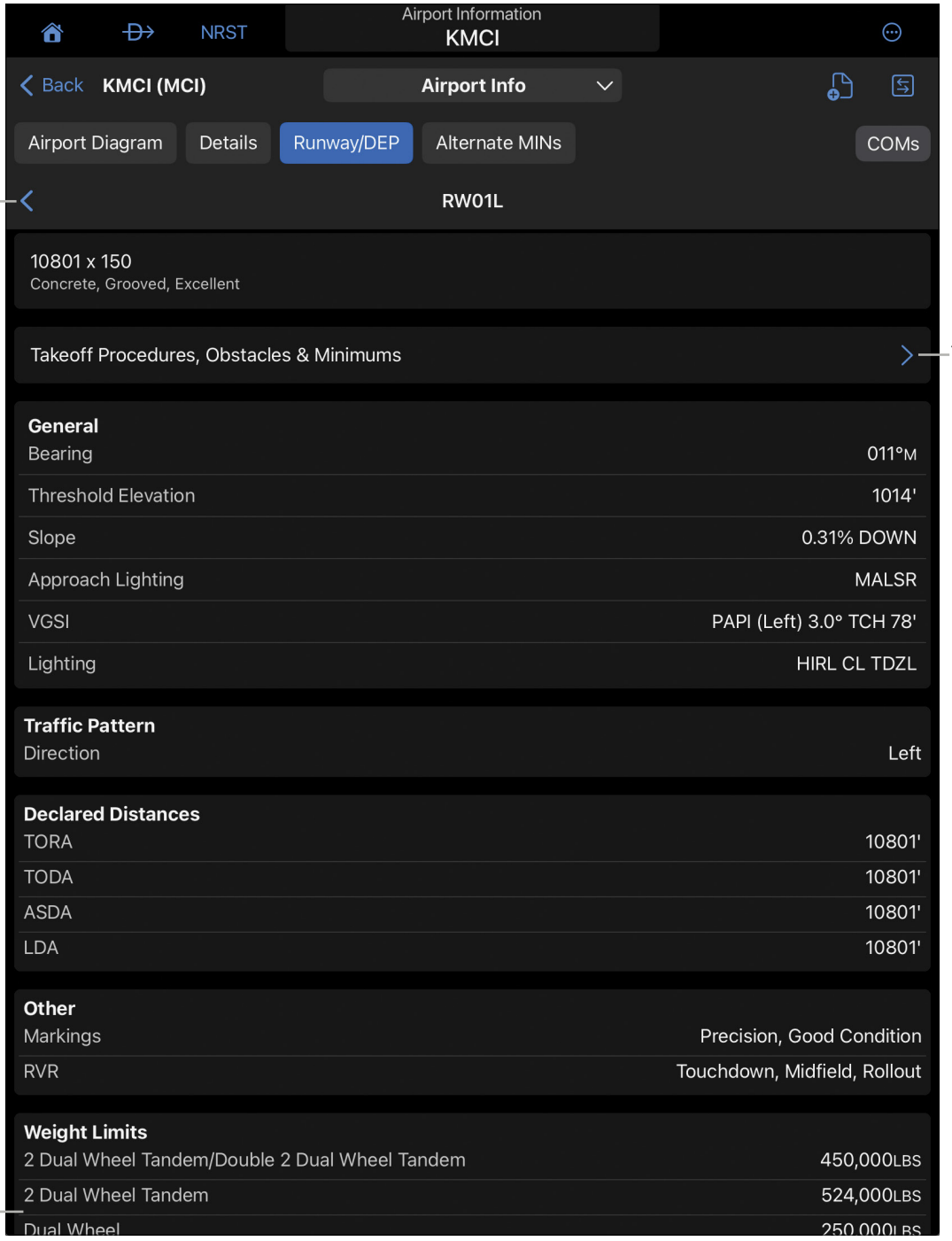
- Runway ID, length and width.
- Type of construction materials (e.g. asphalt).
- Runway surface treatment (if any) and condition.
- Bearing.
- Threshold Elevation.
- Slope.
- Approach Lighting.
- Visual Glide Slope Indicators (VGSI).
- Runway/Airport Lighting.
- Traffic Pattern Direction.
- Declared Distances (TORA, TODA, ASDA, LDA, etc.).
- Markings.
- RVR Capabilities.
- Weight Limits for Aircraft (e.g. dual wheel, single wheel).
- Climb Gradient Table.
- Obstacle Notes.

Viewing Runway / Departure Information:

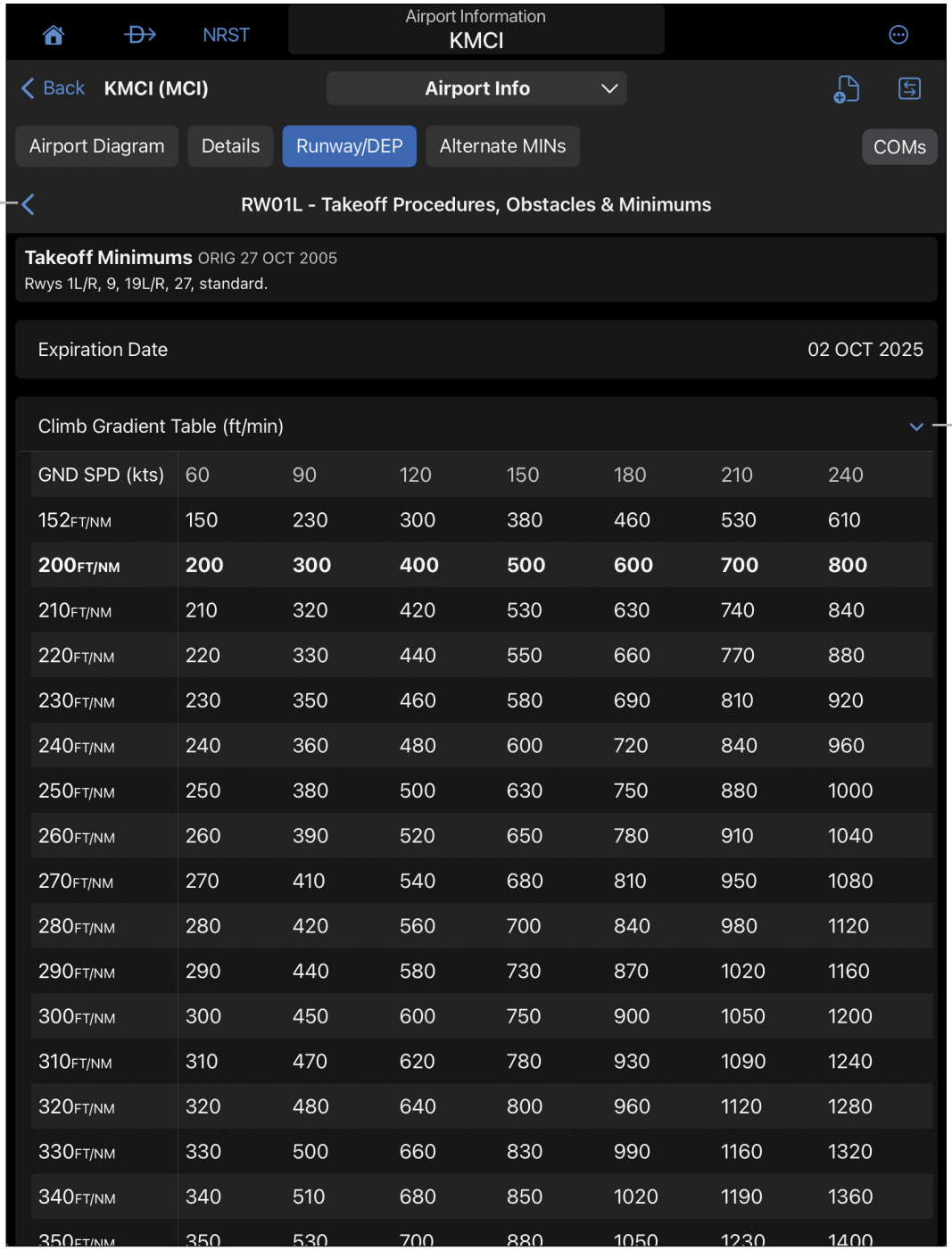
1) Select > > **Charts > SmartCharts > Airport Diagram**.
2) Tap the **Runway/DEP** button.
3) Tap the desired runway to view additional information.
4) Tap **Takeoff Procedures & Minimums**, if desired.
5) Tap **Climb Gradient Table**, if desired.
6) Tap **Back** to return to the Airport Information page.



Garmin Pilot iOS - SmartCharts - Airport Info - Runway/DEP



Garmin Pilot iOS - SmartCharts - Airport Info - Runway/DEP - Runway Info



GND SPD (kts)	60	90	120	150	180	210	240
152FT/NM	150	230	300	380	460	530	610
200FT/NM	**200**	**300**	**400**	**500**	**600**	**700**	**800**
210FT/NM	210	320	420	530	630	740	840
220FT/NM	220	330	440	550	660	770	880
230FT/NM	230	350	460	580	690	810	920
240FT/NM	240	360	480	600	720	840	960
250FT/NM	250	380	500	630	750	880	1000
260FT/NM	260	390	520	650	780	910	1040
270FT/NM	270	410	540	680	810	950	1080
280FT/NM	280	420	560	700	840	980	1120
290FT/NM	290	440	580	730	870	1020	1160
300FT/NM	300	450	600	750	900	1050	1200
310FT/NM	310	470	620	780	930	1090	1240
320FT/NM	320	480	640	800	960	1120	1280
330FT/NM	330	500	660	830	990	1160	1320
340FT/NM	340	510	680	850	1020	1190	1360
350FT/NM	350	530	700	880	1050	1230	1400

Garmin Pilot iOS - SmartCharts - Airport Info - Runway/DEP - Takeoff Minimums - Climb Gradient Table

ALTERNATE MINIMUMS

NOTE: *Runways with no applicable alternate minimums are not listed.*

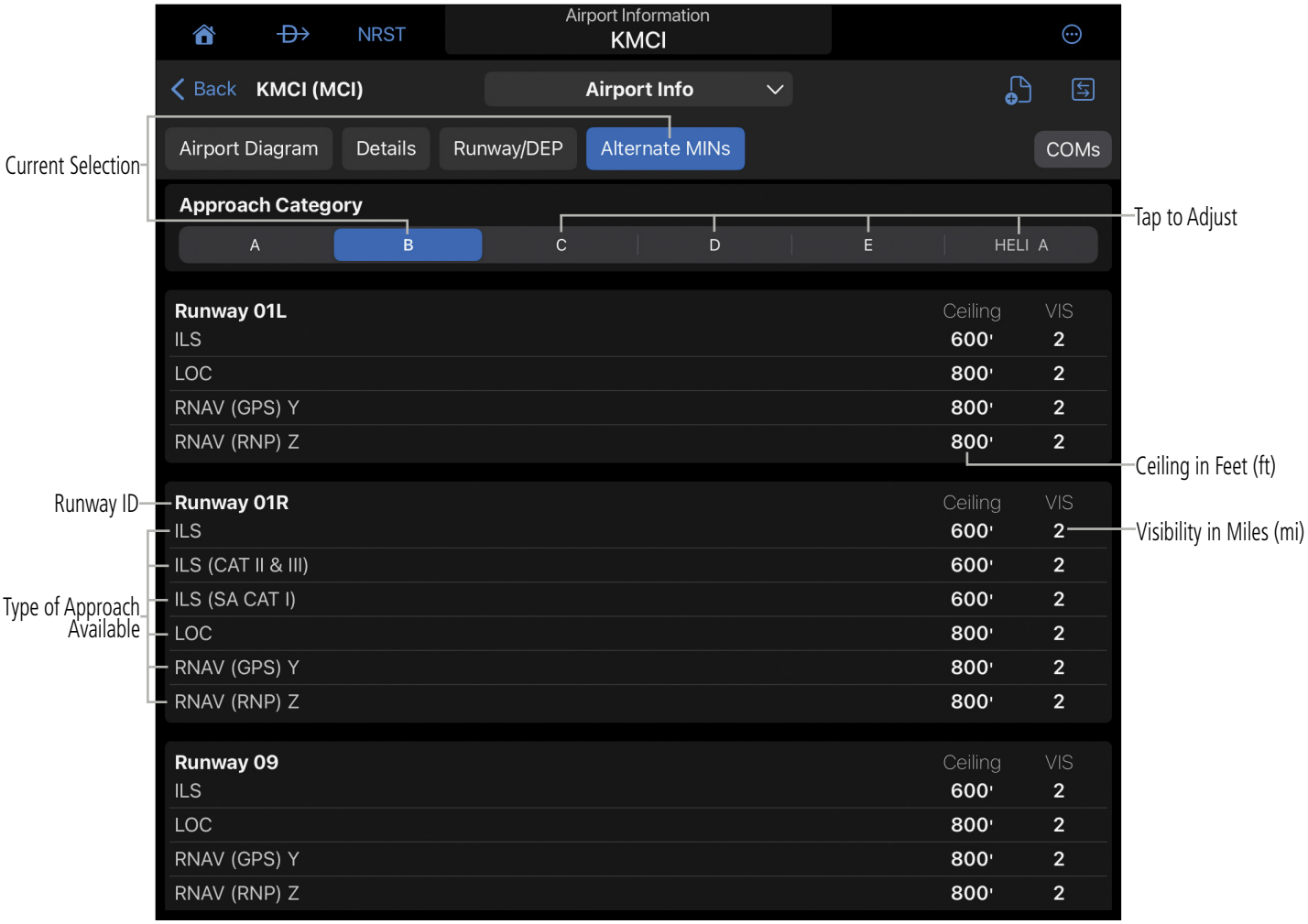
NOTE: *Alternate airport minimums are derived by SmartCharts in accordance with FAA Order 8260.3D, Section 3-4-1.*

The Alternate MINS tab allows the User to select aircraft category and additional adjustments, which are then dynamically rendered. When viewing the Airport Chart, selecting the **Alternate MINs** tab will provide additional information about approach categories, runways, and weather minimums to file as an alternate airport, which may include some, or all, of the following items:

- Approach Categories (A, B, C, D, E, & Heli A).
- Runway ID & Type of Approach.
- Ceiling minimums.
- Visibility minimums.

Viewing Alternate MINs:

1) Select  >  > **Charts** > **SmartCharts** > **Airport Diagram**.
2) Tap the **Alternate MINs** button.
3) Tap the desired Approach Category.
4) Tap **Back** to return to the Airport Information page.



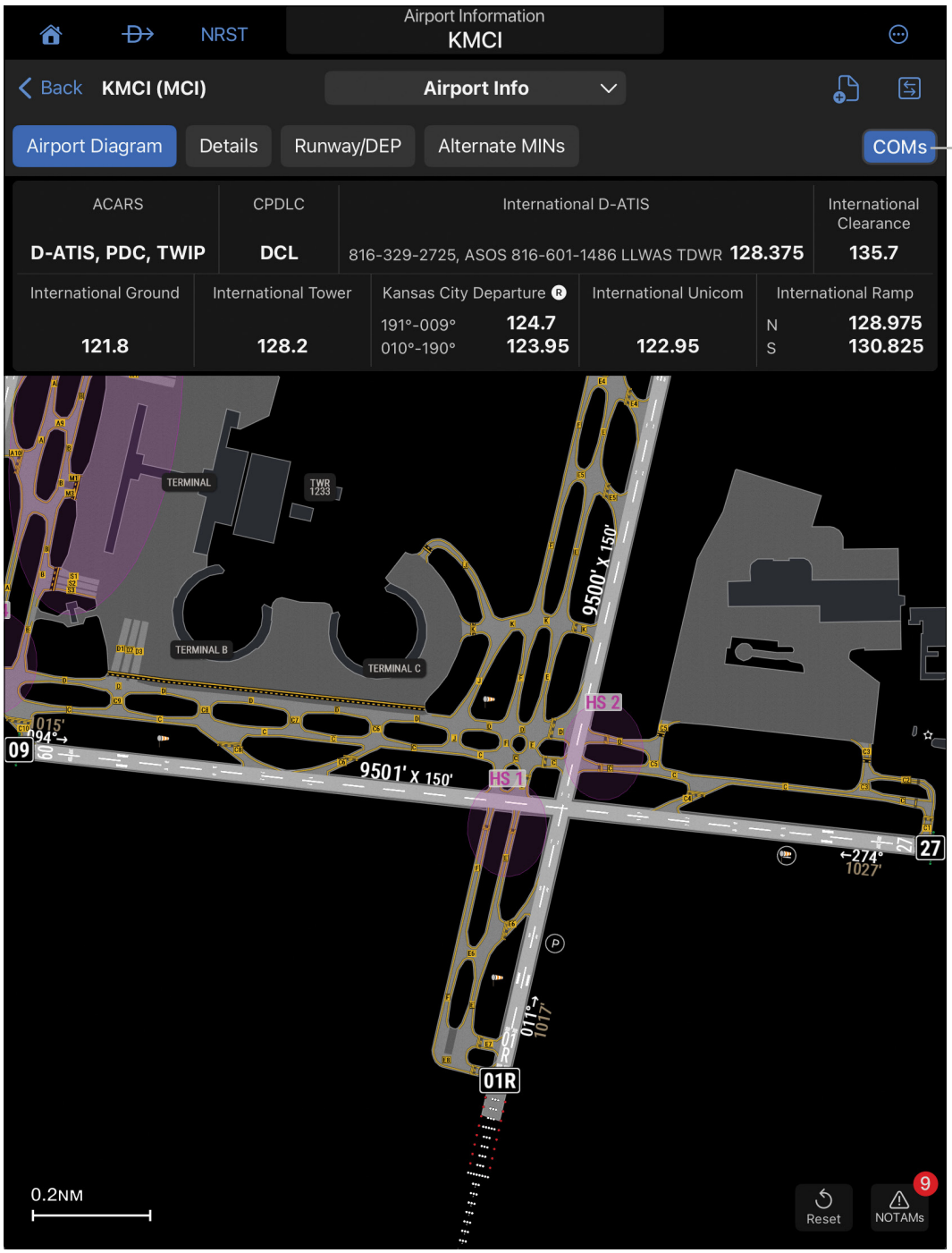
Garmin Pilot iOS - SmartCharts - Airport Info - Alternate MINs - Category B

QUICK ACCESS BUTTONS

For Airport Diagrams, the Quick Access Button(s) is COMs, which allows the User to recall pertinent information without having to scroll through the entire Details window, once the chart is properly configured. When viewing the Airport Chart, selecting the **COMs** button will automatically load the Airport Diagram and display communications frequencies above the Airport Diagram, as a 'header'.

Viewing Communications Header:

1) Select  >  > **Charts > SmartCharts > Airport Diagram.**
2) Tap the **COMs** button to display additional information above the airport diagram.



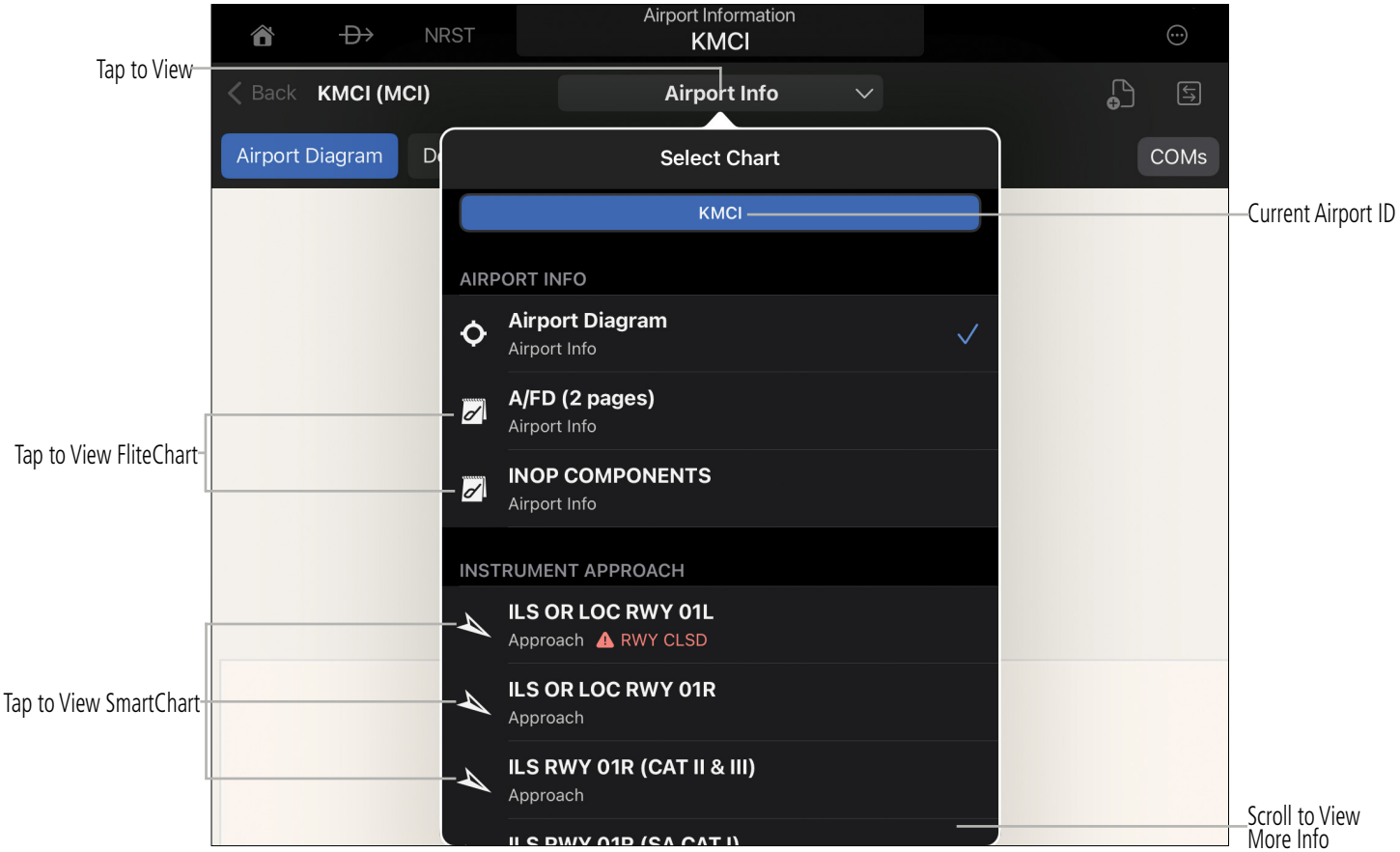
Garmin Pilot iOS - SmartCharts - Night Mode - Airport Info - COMs

QUICK ACCESS SELECT CHART

SmartCharts allows the User to quickly view and select available charts for all phases of the trip via the Select Chart drop-down menu. All available charts (Airport Info, Instrument Approaches, Arrival Procedures, & Departure Procedures) for the selected airport are available for the User to select and view.

Viewing Chart via Quick Access Select Chart Menu:

1) Select  >  > **Charts > SmartCharts > Airport Diagram**.
2) Towards the top of the screen, underneath the airport ID, tap **Airport Info** to display a drop-down menu.
3) Scroll to view additional charts (if available), then tap on the desired chart.

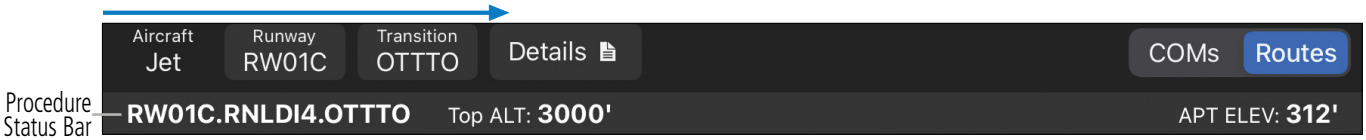


Garmin Pilot iOS - SmartCharts - Select Chart

Blank Page

DEPARTURE PROCEDURES

SmartChart Departure Procedures allow the User to declutter unnecessary information, allowing access to applicable information quickly. The top of the chart contains buttons for making decluttering selections and showing additional information. To ensure users are making the correct inputs to customize the chart, Garmin recommends following a consistent flow, working from left to right, across the top bar buttons. On Departure Procedures, the Procedure Status Bar will show the computer code, if applicable, the Top Altitude, and the Airport Elevation. The remainder of the screen is used for the Planview of the procedure.



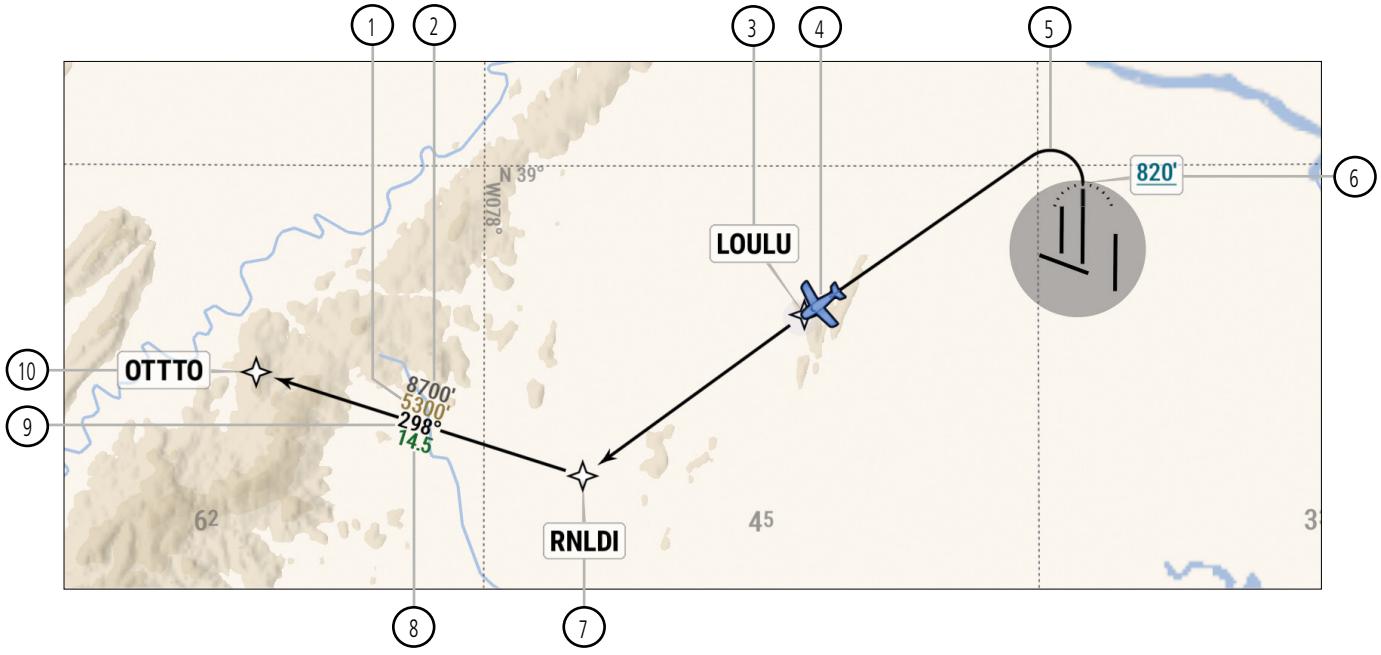
Garmin Pilot iOS - SmartCharts - Departure Procedure - Suggested Flow

SmartCharts are shown to scale allowing the departure procedure to be geo-referenced when connected to a compatible position information source.

OVERVIEW

Selecting a Departure Procedure:

1) Select > > **Charts > SmartCharts.**
2) Scroll down to view a Departure Procedure, if available, then select the desired Departure (e.g. RNLDI 4 DEP (RNAV) from KIAD).



Garmin Pilot iOS - SmartCharts - Departure Procedure - Overview

1. Minimum Obstruction Clearance Altitude - MOCA (5,300' MSL).
2. Minimum Enroute Altitude - MEA (8,700' MSL).
3. Name of Waypoint (LOULU).
4. Georeferenced aircraft.
5. Departure procedure depiction (left-hand turn).
6. Departure procedure initial altitude (820' MSL).
7. Name of Waypoint (RNLDI).
8. Mileage between Radio Aids, Reporting Points, Route Breaks (14.5 nm).
9. Departure route course (298°).
10. Name of Waypoint (OTTTO).

AIRCRAFT BUTTON

The Aircraft button allows the User to filter out any unwanted or unapplicable information. For procedures that do not change based on aircraft type, an aircraft type is displayed, but the button is unselectable by the User.



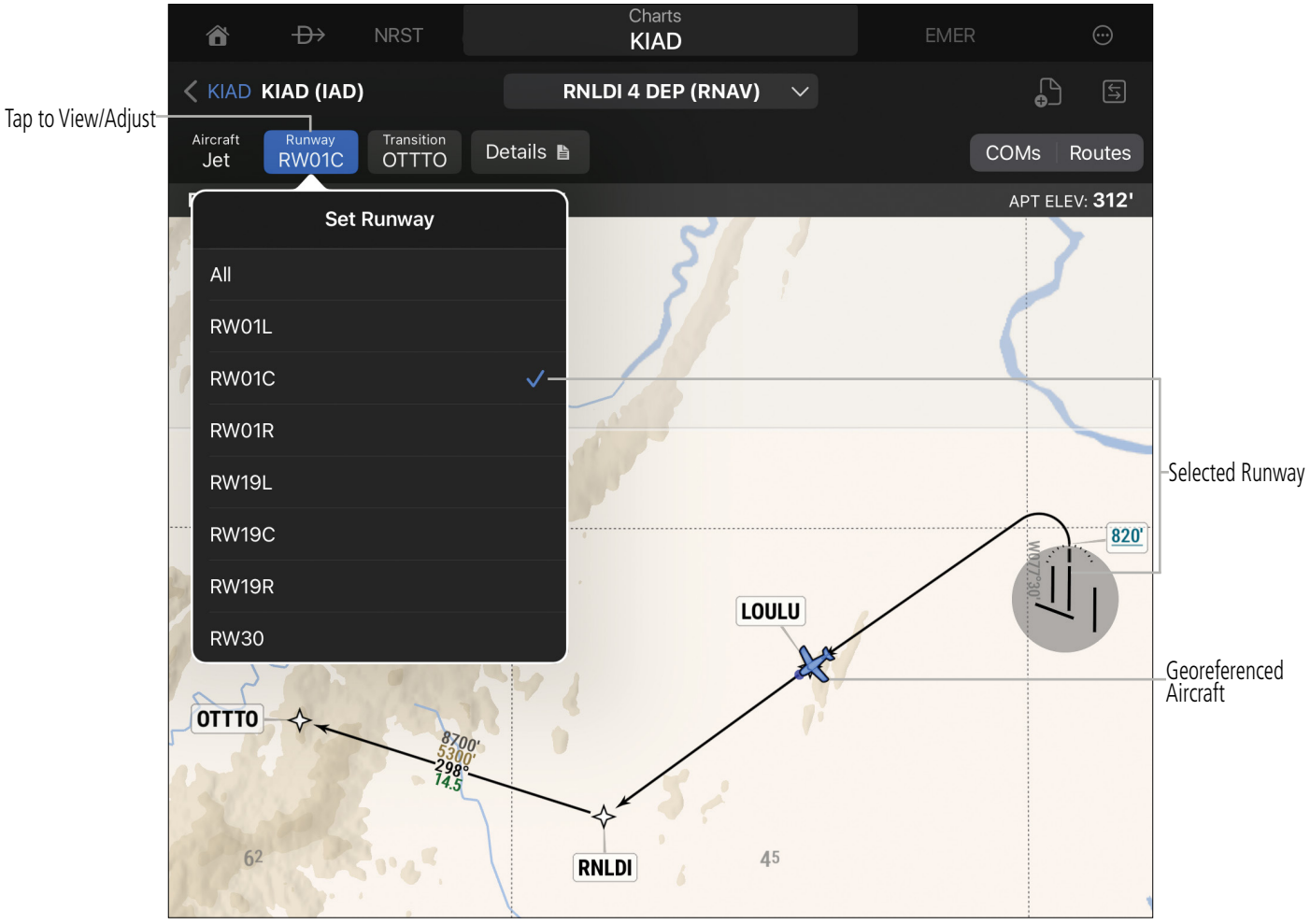
Garmin Pilot iOS - SmartCharts - Departure Procedure - Aircraft Selection - Not Selectable

RUNWAY BUTTON

The Planview is updated based upon User inputs. When "All" is selected for the Runway, the airport locator is centered on the airport, but when a specific runway is selected by the User, minor realignments/adjustments to the Planview may occur, depending on the current scale and/or 'Zoom' level.

Selecting a Departure Procedure Runway:

1) Select > > **Charts > SmartCharts.**
2) Scroll down to view Departure Procedures, if available, then select the desired Departure (e.g. RNLDI 4 DEP (RNAV) from KIAD).
3) Tap the **Runway** button to display the Set Runway menu. Select the desired runway (e.g. RW01C).



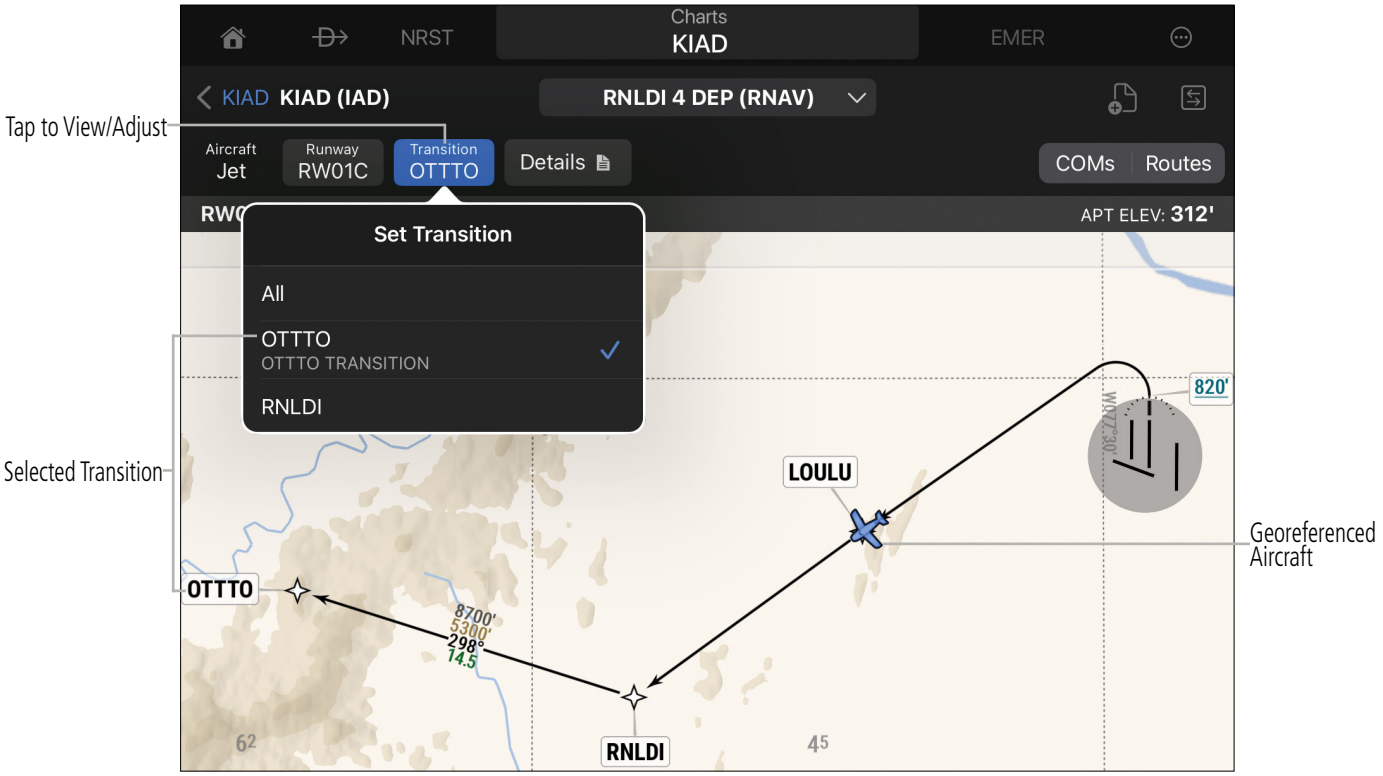
Garmin Pilot iOS - SmartCharts - Departure Procedure - Runway Selection - 01 Center

TRANSITION BUTTON

Selecting a transition removes segments for other transitions from the Planview and hides Routes in the Details section that are not applicable. For procedures that do not have multiple transitions, the route transition is displayed, but the button is unselectable by the user.

Selecting a Departure Procedure Transition:

1) Select > > **Charts > SmartCharts.**
2) Scroll down to view Departure Procedures, if available, then select the desired Departure (e.g. RNLDI 4 DEP (RNAV) from KIAD).
3) Tap the **Runway** button to display the Set Runway menu. Select the desired runway (e.g. RW01C).
4) Tap the **Transitions** button to display the Set Transition menu. Select the desired transition (e.g. OTTTO).



Garmin Pilot iOS - SmartCharts - Departure Procedure - Transition Selection - OTTTO

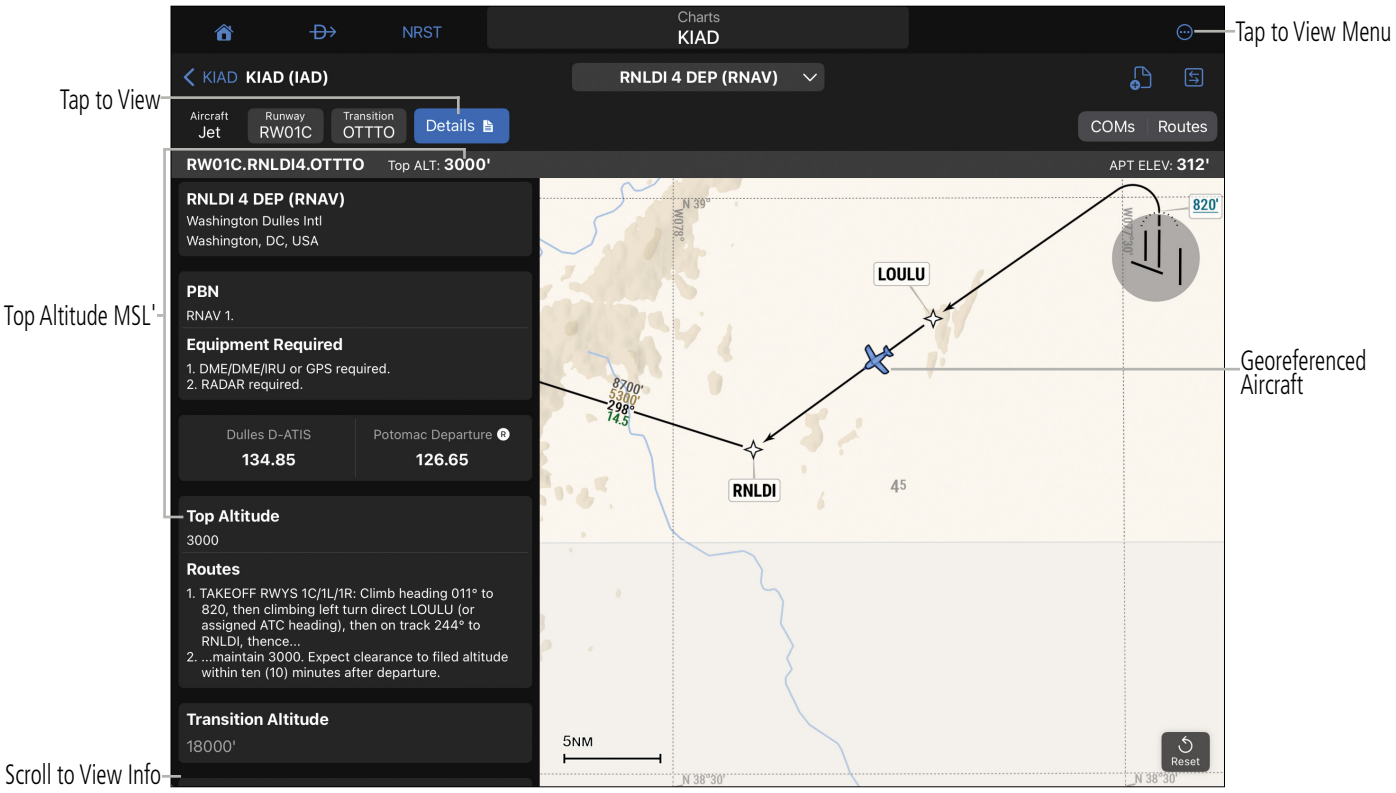
DETAILS BUTTON

The Details section provides information needed for pilots to conduct their departure briefing, which may include some, or all, of the information listed below:

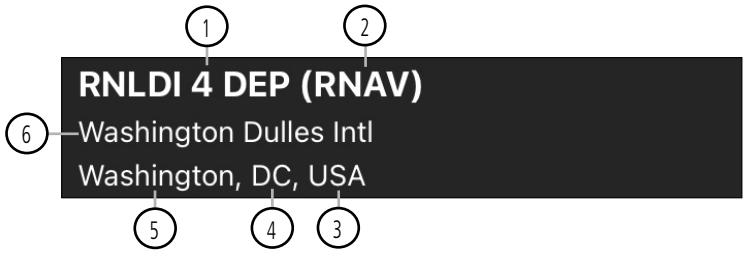
- Name of Departure Procedure.
- Airport Name, City, State, Country.
- Performance Based Navigation (PBN) requirements.
- Equipment required.
- Name of weather reporting station and frequency.
- Name of departure control frequency and if the facility has radar services.
- Top Altitude.
- Route Information.
- Transition Altitude.
- General Notes.
- Takeoff Minimums.
- Chart design criteria & effectivity.
- Climb Gradient Table.

Viewing Departure Procedure Details:

1) Select > > **Charts > SmartCharts.**
2) Scroll down to view Departure Procedures, if available, then select the desired Departure (e.g. RNLDI 4 DEP (RNAV) from KIAD).
3) Tap the **Runway** button to display the Set Runway menu. Select the desired runway (e.g. RW01C).
4) Tap the **Transition** button to display the Set Transition menu. Select the desired transition (e.g. OTTTO).
5) Tap the **Details** button to display additional information alongside the Departure Procedure.

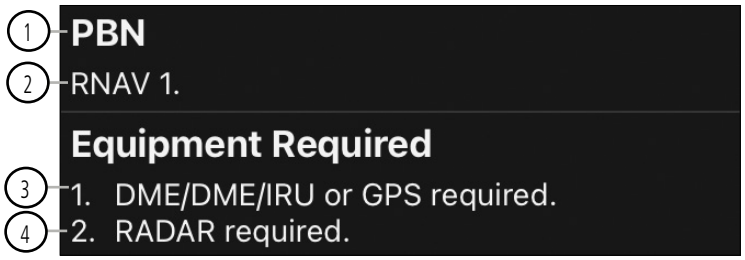


Garmin Pilot iOS - SmartCharts - Departure Procedure - Details Overview



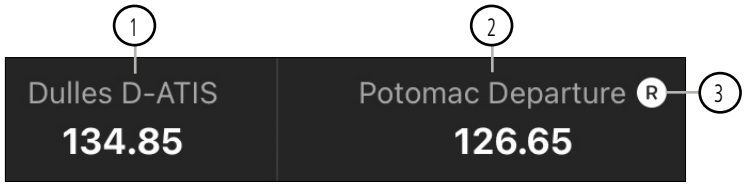
Garmin Pilot iOS - SmartCharts - Departure Procedure - Details - Name & Location

1. Name of Departure Procedure (RNLDI 4).
2. Type of equipment needed for procedure.
3. Country (United States of America).
4. State/Province/District (District of Columbia).
5. City/Town (Washington).
6. Airport Name (Washington Dulles International).



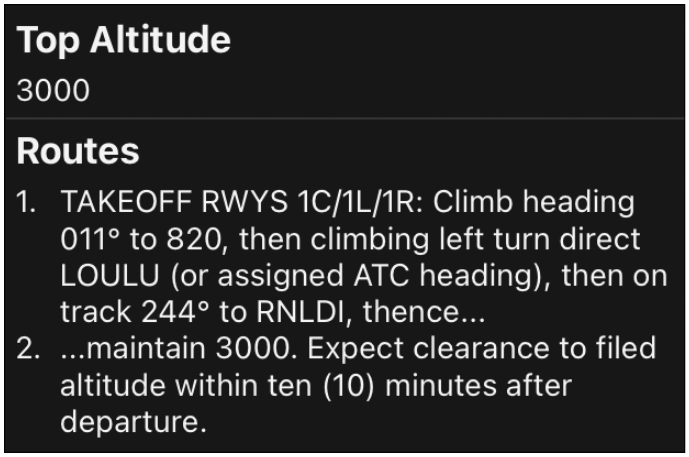
Garmin Pilot iOS - SmartCharts - Departure Procedure - Details - Equipment Required

1. Performance-Based Navigation.
2. Departure requires the accuracy of RNAV 1 equipment.
3. Departure requires the aircraft to have DME, DME/IRU, or GPS equipment.
4. Departure requires the use of an Air Traffic Controller for navigation following take-off to published departure route.

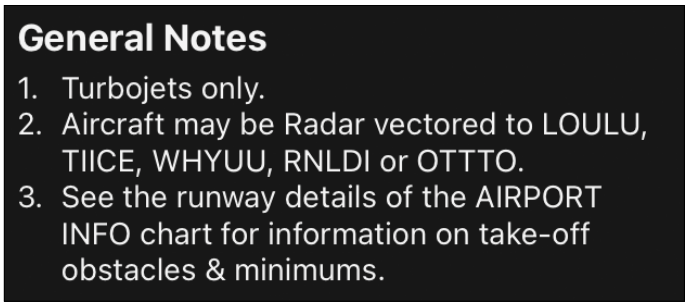


Garmin Pilot iOS - SmartCharts - Departure Procedure - Details - COMs

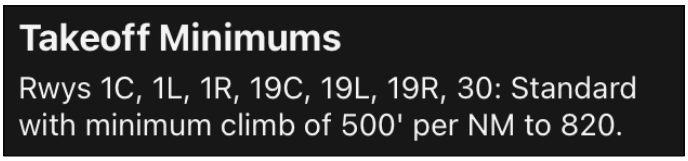
1. Digital Automated Terminal Information Service - D-ATIS frequency (134.85).
2. Name of Departure Control (Potomac) and frequency (126.65).
3. Frequency has radar services.



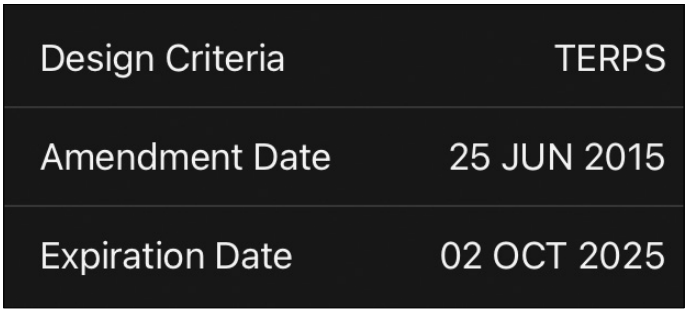
Garmin Pilot iOS - SmartCharts - Departure Procedure - Details - Top Altitude & Routes



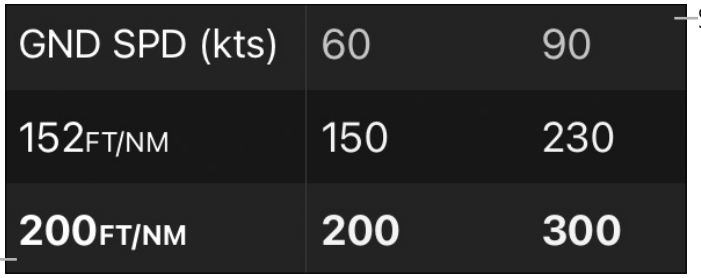
Garmin Pilot iOS - SmartCharts - Departure Procedure - Details - General Notes



Garmin Pilot iOS - SmartCharts - Departure Procedure - Details - Takeoff Minimums



Garmin Pilot iOS - SmartCharts - Departure Procedure - Details - Chart Design Criteria & Effectivity



Garmin Pilot iOS - SmartCharts - Departure Procedure - Details - Climb Performance

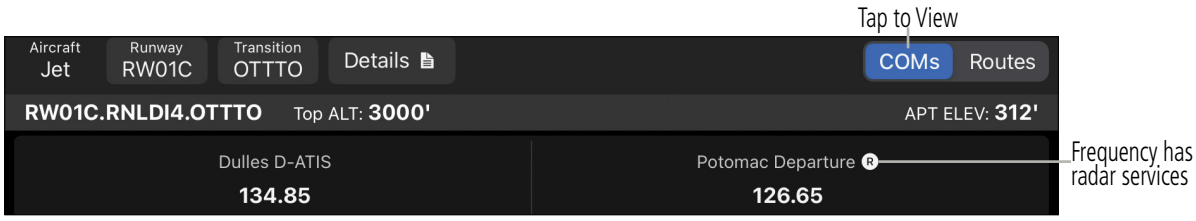
QUICK ACTIONS/REFERENCE BUTTONS

COMS

When viewing the Departure Procedure, selecting the **COMs** tab will display communications frequencies above the Departure, as a 'header'.

Viewing Departure Procedure Communications Info:

1) Select  >  > **Charts > SmartCharts.**
2) Scroll down to view Departure Procedures, if available, then select the desired Departure (e.g. RNLDI 4 DEP (RNAV) from KIAD).
3) Tap the **COMs** button to view communications information.



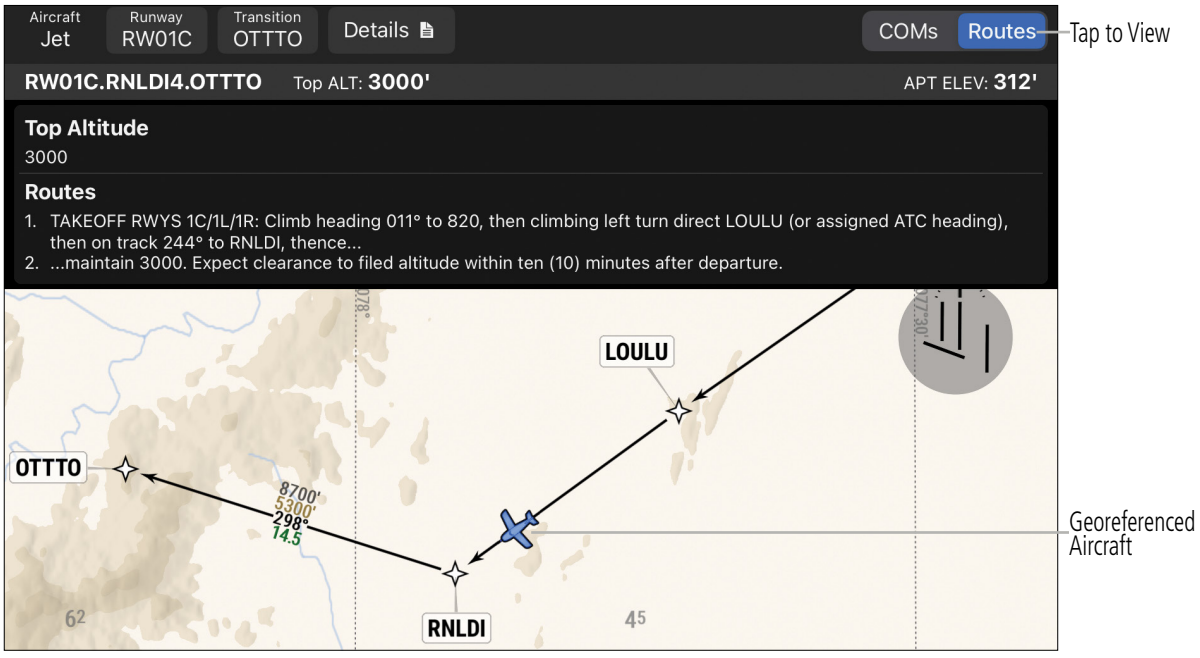
Garmin Pilot iOS - SmartCharts - Departure Procedure - COMs

ROUTES

When viewing the Departure Procedure, selecting the **Routes** tab will display textural guidance above the Departure, as a 'header'.

Viewing Departure Procedure Routes Info:

1) Select  >  > **Charts > SmartCharts.**
2) Scroll down to view Departure Procedures, if available, then select the desired Departure (e.g. RNLDI 4 DEP (RNAV) from KIAD).
3) Tap the **Routes** button to view route information.



Garmin Pilot iOS - SmartCharts - Departure Procedure - Routes

Planview

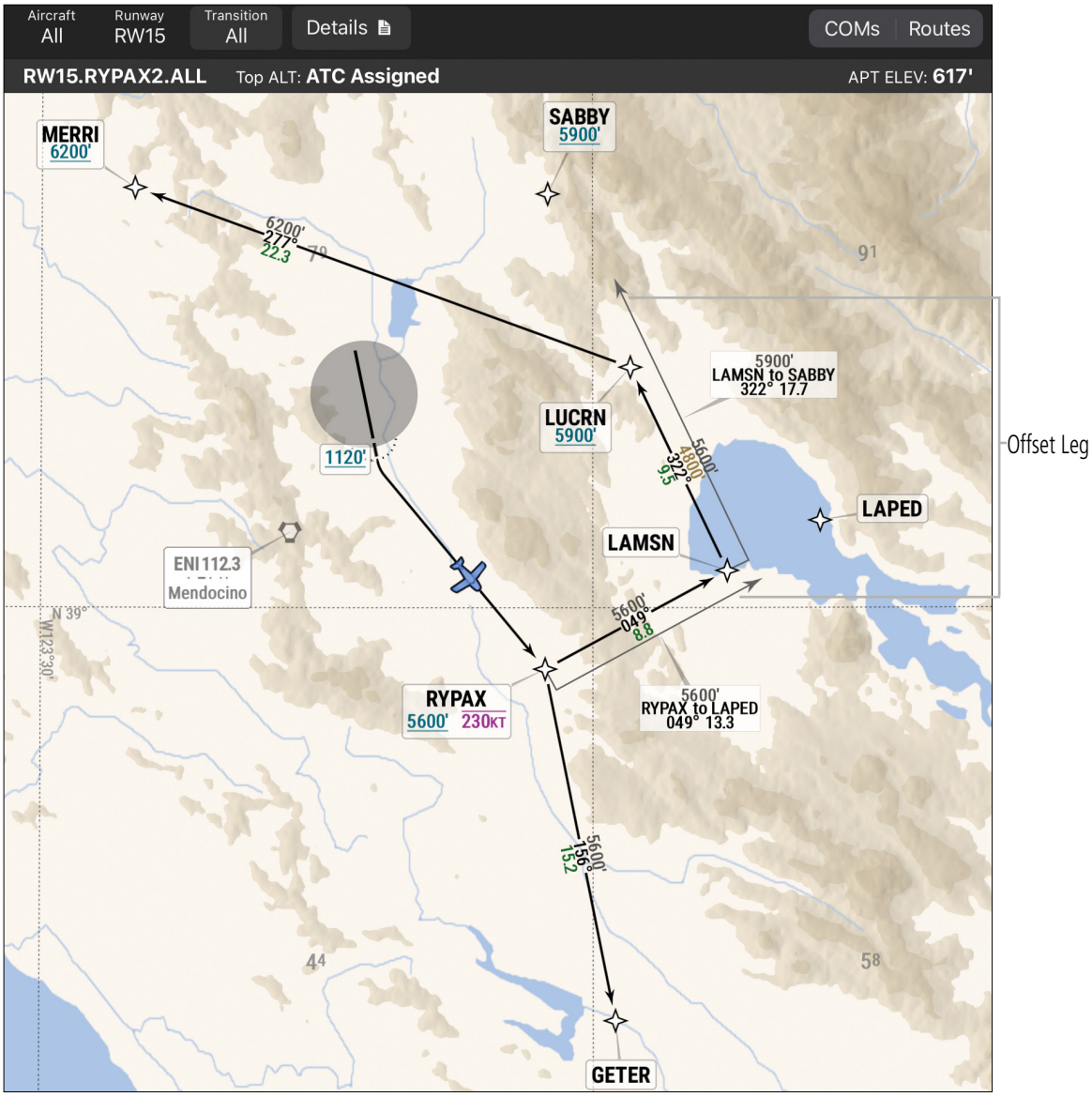
The Planview area is drawn to scale, which allows the departure procedure to be georeferenced when connected to a compatible position information source. Airport locators show an enhanced view of the airport runway layout, but are not to scale when zoomed out on the procedure.

Minimum enroute altitude, minimum obstacle clearance altitude, magnetic course, and distance for applicable segments are shown, along with speed and altitude constraints for all applicable waypoints.

If the Planview is zoomed out to a scale such that the speed or altitude constraint label is removed from Planview, the waypoint symbol or Airport Locator is highlighted to prompt the pilot to 'Zoom-In' and view the constraint.

Holding patterns will be marked with an "h" symbol on the waypoint indicating to the User to 'Zoom-in' to view details.

Offset Legs will be shown and labeled when segments overlap. They will be re-drawn without the offset if filtering selections made by the User remove the overlap.



Garmin Pilot iOS - SmartCharts - Departure Procedure - Planview - Offset Leg(s)

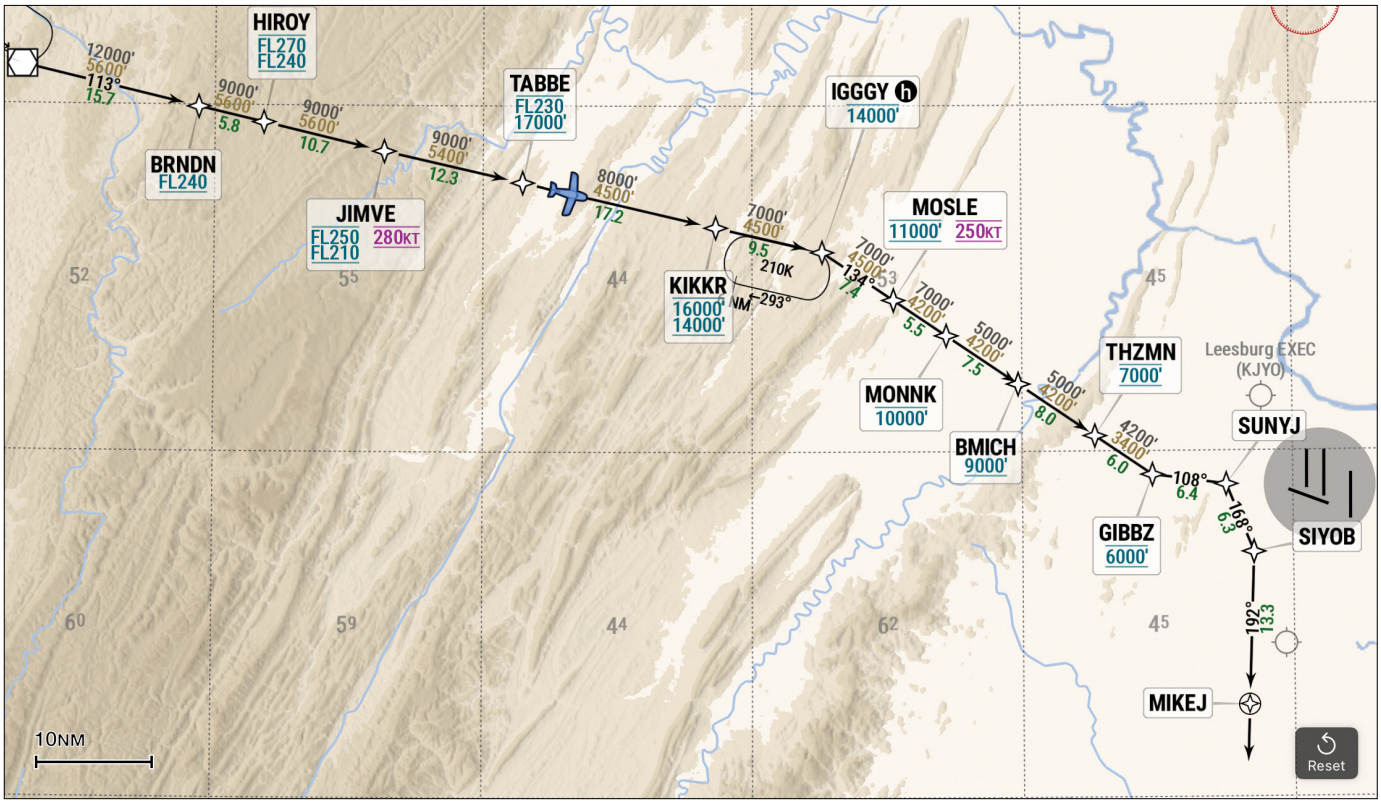
ARRIVAL PROCEDURES

SmartChart Arrival Procedures allow users to easily declutter unnecessary information quickly. The top of the chart contains the buttons for making decluttering selections and showing additional information. To ensure users are making the correct inputs to customize the chart, Garmin recommends following a consistent flow working from left to right across the top bar buttons. On Arrival Procedures, the Procedure Status Bar will show the computer code if applicable and the Airport Elevation. The remainder of the screen is used for the Planview of the procedure.



Garmin Pilot iOS - SmartCharts - Arrival Procedure - Suggested Flow

SmartCharts are shown to scale allowing the arrival procedure to be georeferenced when connected to a compatible position information source.



Garmin Pilot iOS - SmartCharts - Arrival Procedure - RNAV - Overview

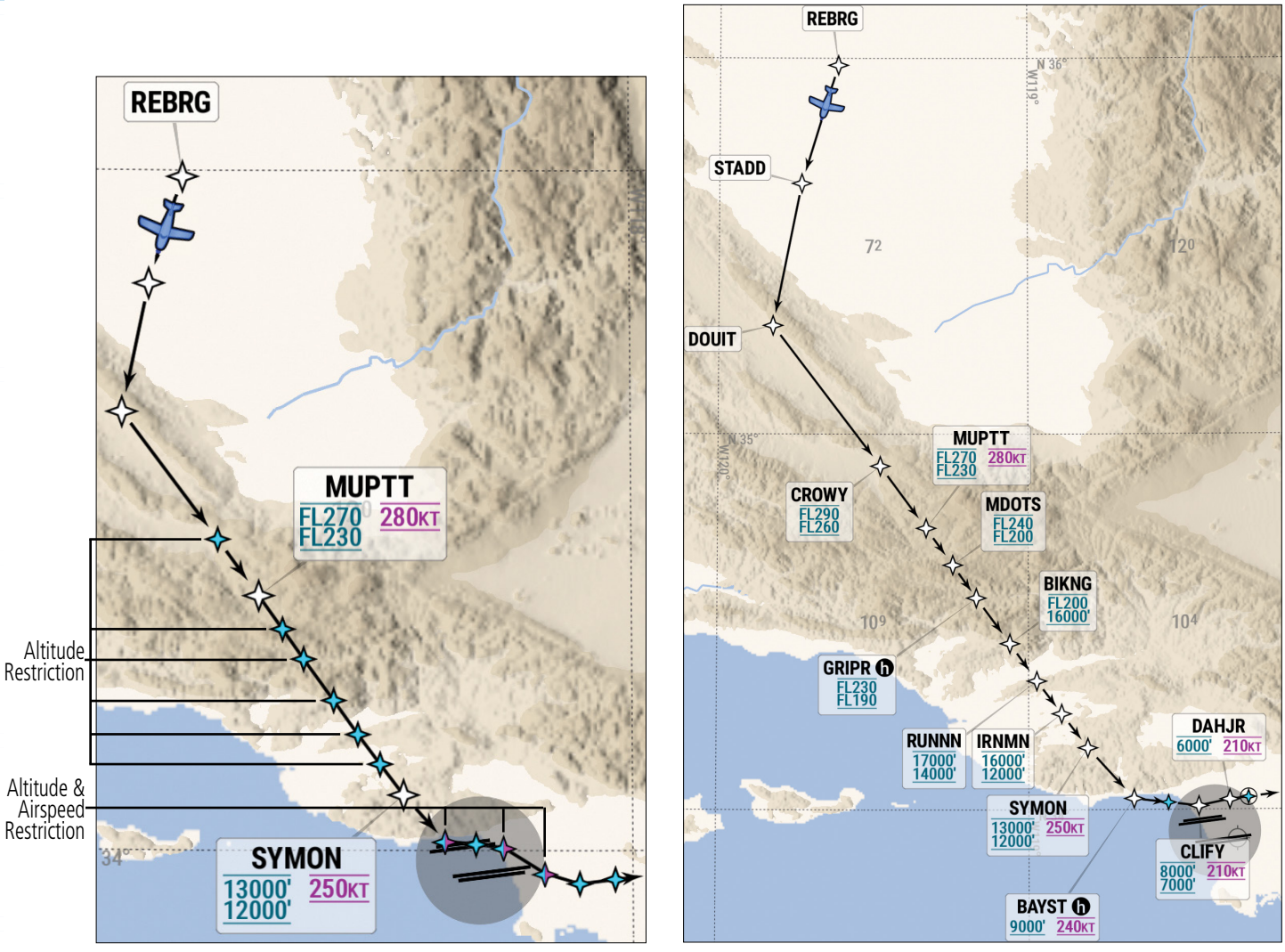
GARMIN

'ZOOMED OUT' ICON DEPICTIONS

When 'Zoomed Out', the Arrival Procedure will display color-coded intersection(s), waypoint(s), VOR(s), VOR/DME(s), and/or VORTAC(s), indicating an airspeed restriction, altitude restriction, or both.

	Airspeed Restriction	Altitude Restriction	Airspeed & Altitude Restriction
VOR			
VOR/DME			
VORTAC			
Intersection			
Waypoint			

Arrival Procedure - Zoomed Out Icon Depictions



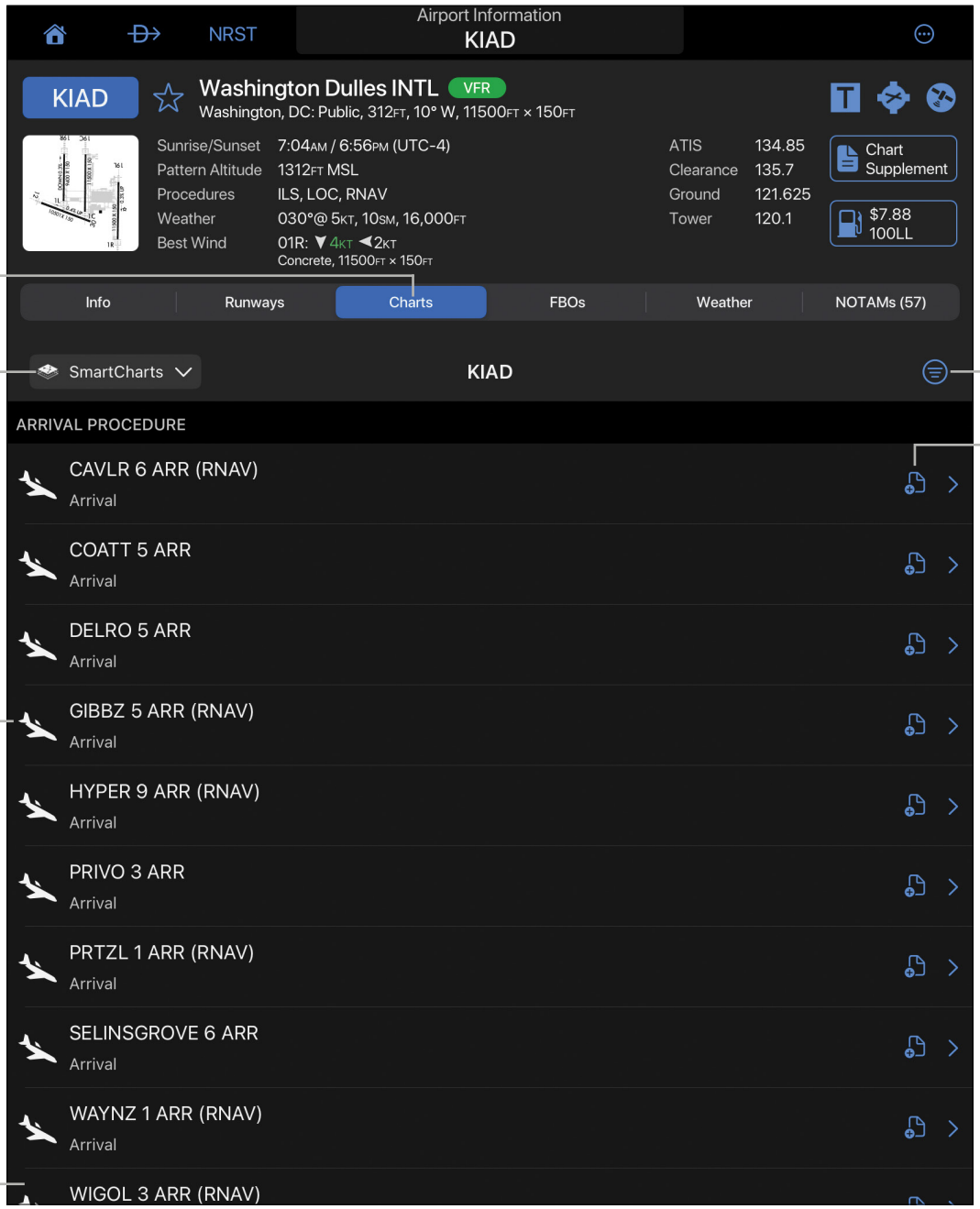
Garmin Pilot iOS - SmartCharts - Arrival Procedure - Overview - Zoomed In & Zoomed Out

OVERVIEW

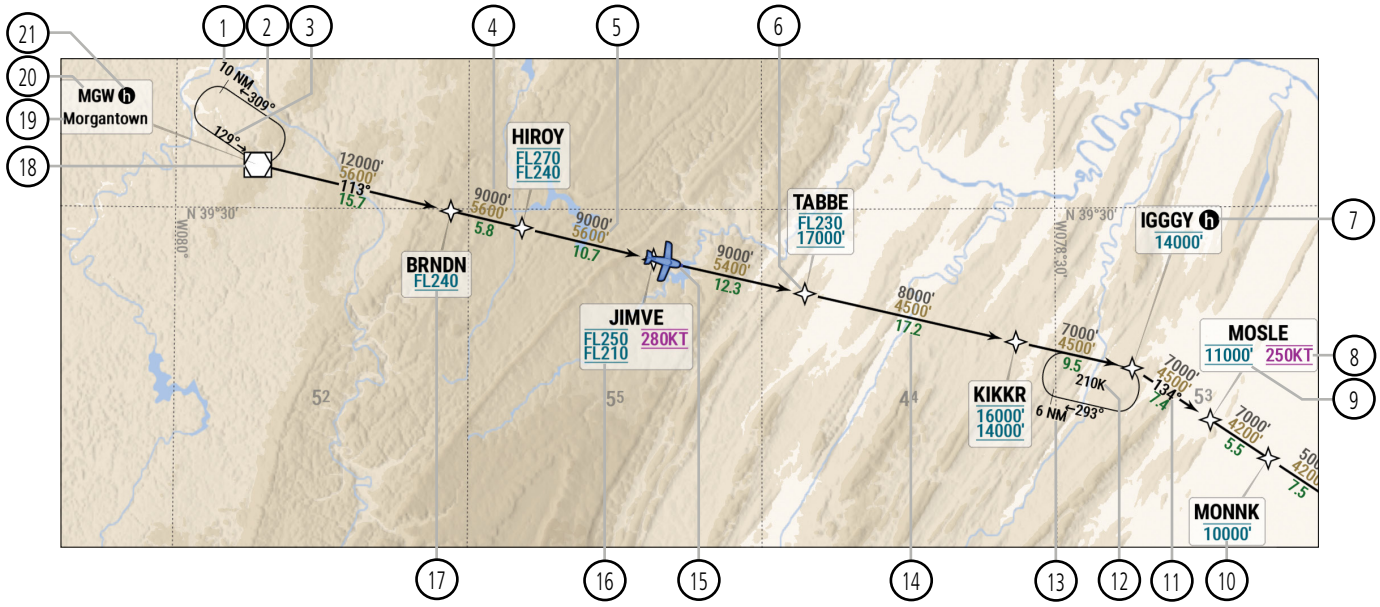
When available, SmartCharts allows the User to view Arrival Procedures, to scale, while also displaying other pertinent information.

Selecting a Arrival Procedure:

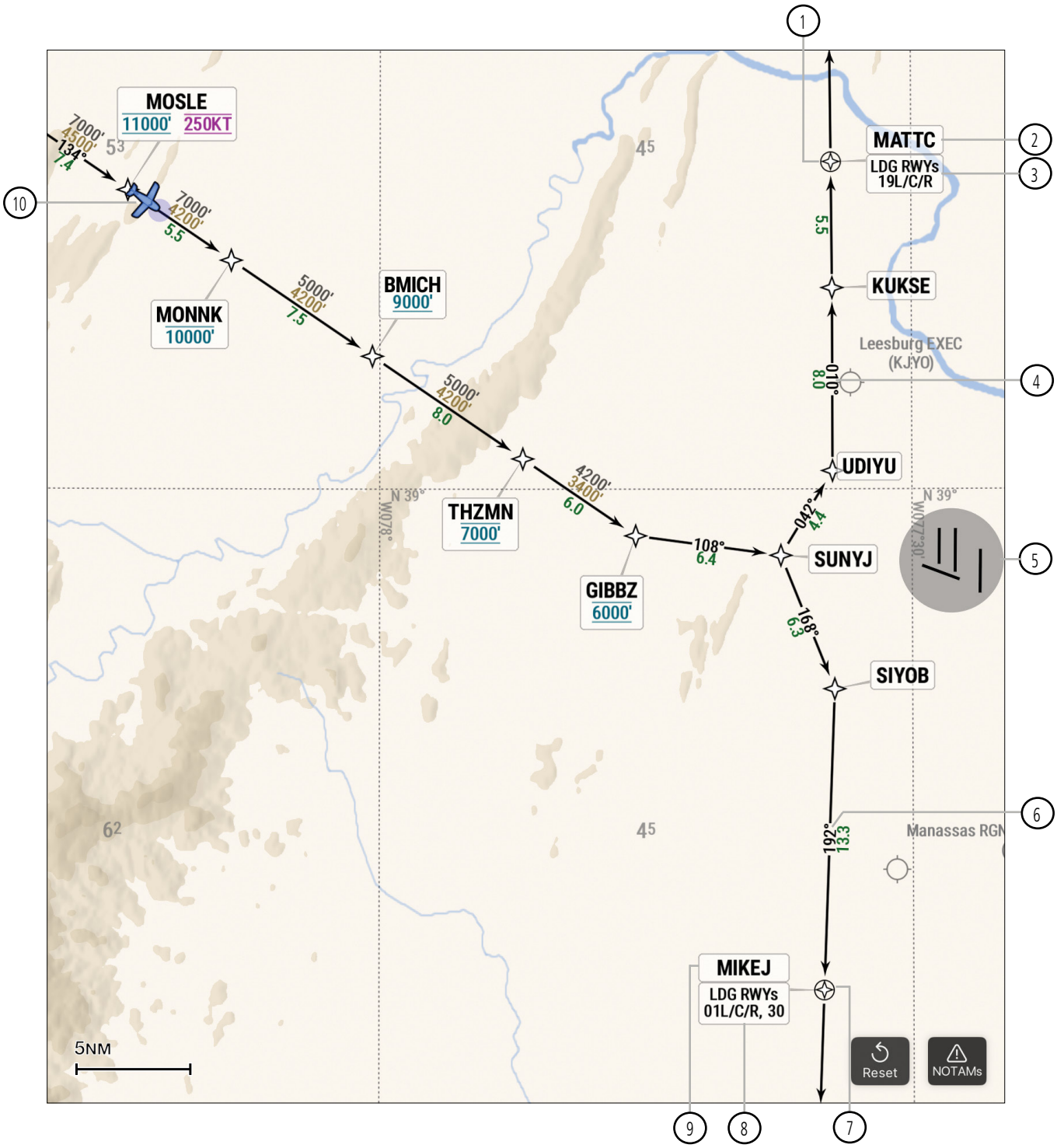
1) Select  >  > **Charts** > **SmartCharts.**
2) Scroll down to view Arrival Procedures, if available, then select the desired Arrival Procedure (e.g. GIBBZ 5 ARR (RNAV) to KIAD).



Garmin Pilot iOS - SmartCharts - Arrival Procedure - KIAD - GIBBZ 5 (RNAV)



1. Length of holding pattern leg (10nm).
2. Outbound holding pattern course (309°).
3. Inbound holding pattern course (129°).
4. Minimum Enroute Altitude - MEA (9,000' MSL).
5. Minimum Obstruction Clearance Altitude - MOCA (5,600' MSL).
6. Non-Compulsory Waypoint (TABBE).
7. Published Holding Pattern available at waypoint.
8. Mandatory airspeed (250 kts).
9. Mandatory altitude - cross at (11,000' MSL).
10. Maximum altitude - cross at or below (10,000' MSL).
11. Arrival route course (134°).
12. Holding pattern airspeed (210 kts).
13. Length of holding pattern leg (6nm).
14. Mileage between Radio Aids, Reporting Points, and Route Breaks (17.2nm).
15. Georeferenced aircraft.
16. Block altitude (FL250-FL210).
17. Minimum altitude - cross at or above (FL240).
18. VOR/DME.
19. Name of NAVAID (Morgantown).
20. NAVAID Identifier (MGW).
21. Published Holding Pattern available at waypoint.



Garmin Pilot iOS - SmartCharts - Arrival Procedure - Overview - Landing North or South

1. Flyover point (landing South).
2. Name of Waypoint (MATTC).
3. Use route and associated waypoint(s) when landing runways 19L, 19C, 19R.
4. Arrival route course (landing South).
5. Airport Locator.
6. Arrival route course (landing North).
7. Flyover point (landing North).
8. Use route and associated waypoint(s) when landing runways 01L, 01C, 01R, 30.
9. Name of Waypoint (MIKEJ).
10. Georeferenced aircraft.

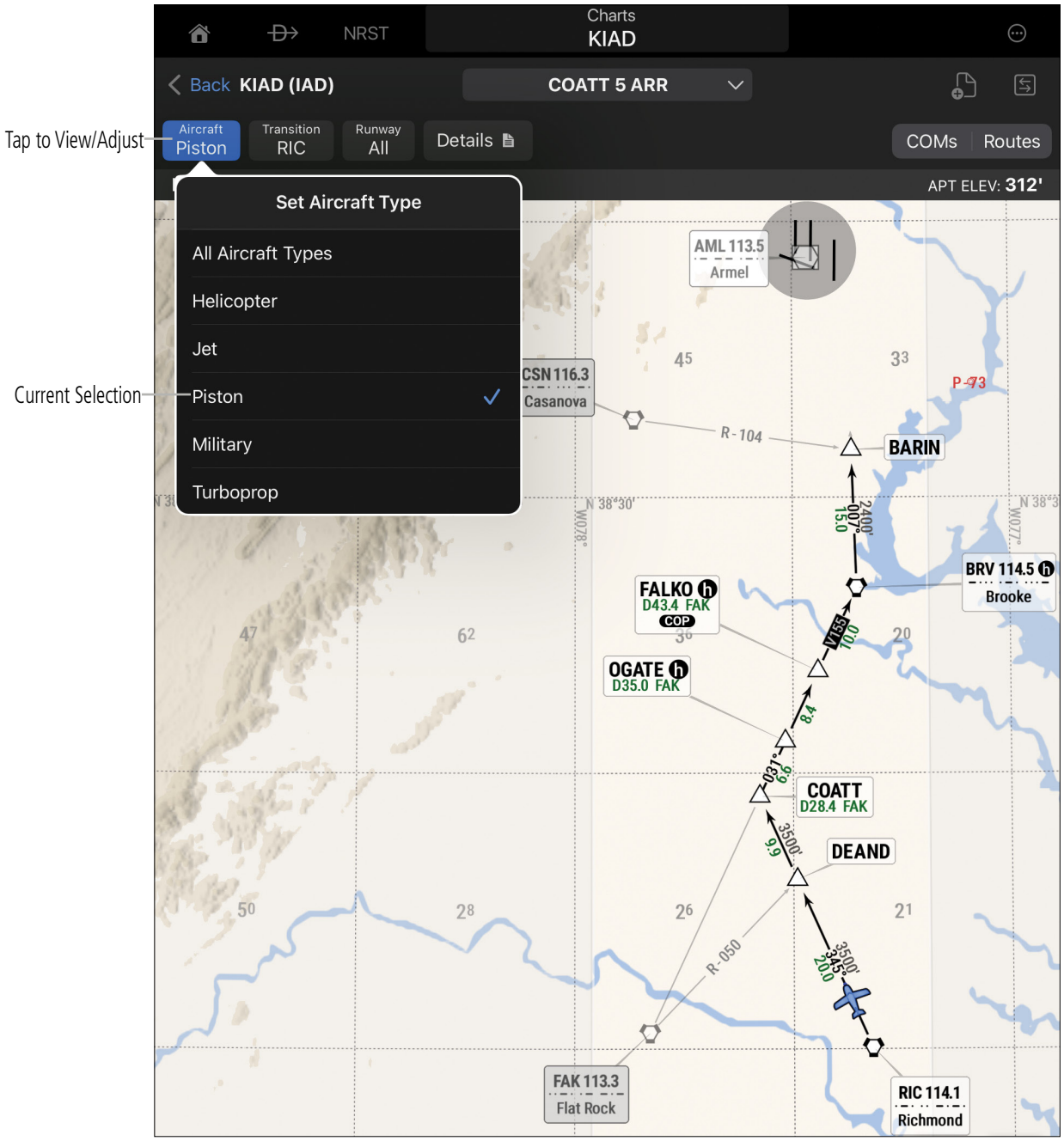
AIRCRAFT BUTTON

The aircraft button allows User to filter out any unwanted or unapplicable information. For procedures that do not change based on aircraft type, an aircraft type is displayed, but the button is unselectable by the User. When applicable, SmartCharts will allow the User to select the aircraft type from the following:

- Helicopter
- Piston
- Turboprop
- Jet
- Military

Selecting Aircraft Type for Arrival Procedure:

1) Select > > **Charts > SmartCharts.**
2) Scroll down to view Arrival Procedures, if available, then select the desired Arrival Procedure (e.g. COATT 5 to KIAD).
3) Tap the **Aircraft** button to display the Set Aircraft Type menu. Select the desired aircraft type (e.g. Piston), if available.



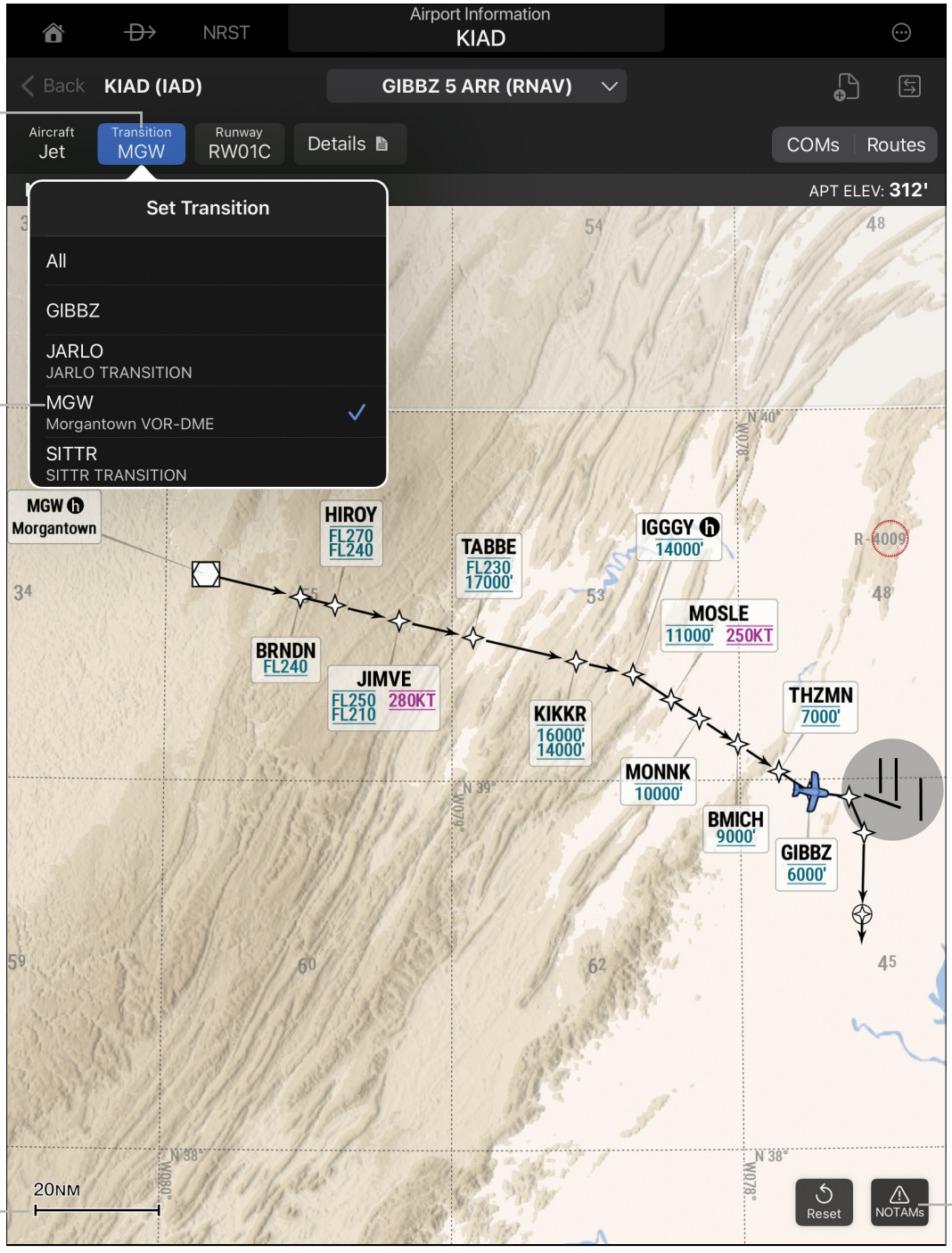
Garmin Pilot iOS - SmartCharts - Arrival Procedure - KIAD - Aircraft Selection - Piston - COATT 5 ARR

TRANSITION BUTTON

Selecting a transition removes segments for other transitions from the Planview and hides Routes in the Details section that are not applicable to the selected transition. For procedures that do not have multiple transitions, the route transition is displayed and the button is unselectable by the User.

Selecting an Arrival Procedure Transition:

1) Select  >  > **Charts > SmartCharts.**
2) Scroll down to view Arrival Procedures, if available, then select the desired Arrival Procedure (e.g. GIBBZ 5 ARR (RNAV) to KIAD).
3) Tap the **Transition** button to display the Set Transition menu. Select the desired transition (e.g. MGW).



Garmin Pilot iOS - SmartCharts - Arrival Procedure - KIAD - Transition Selection - MGW

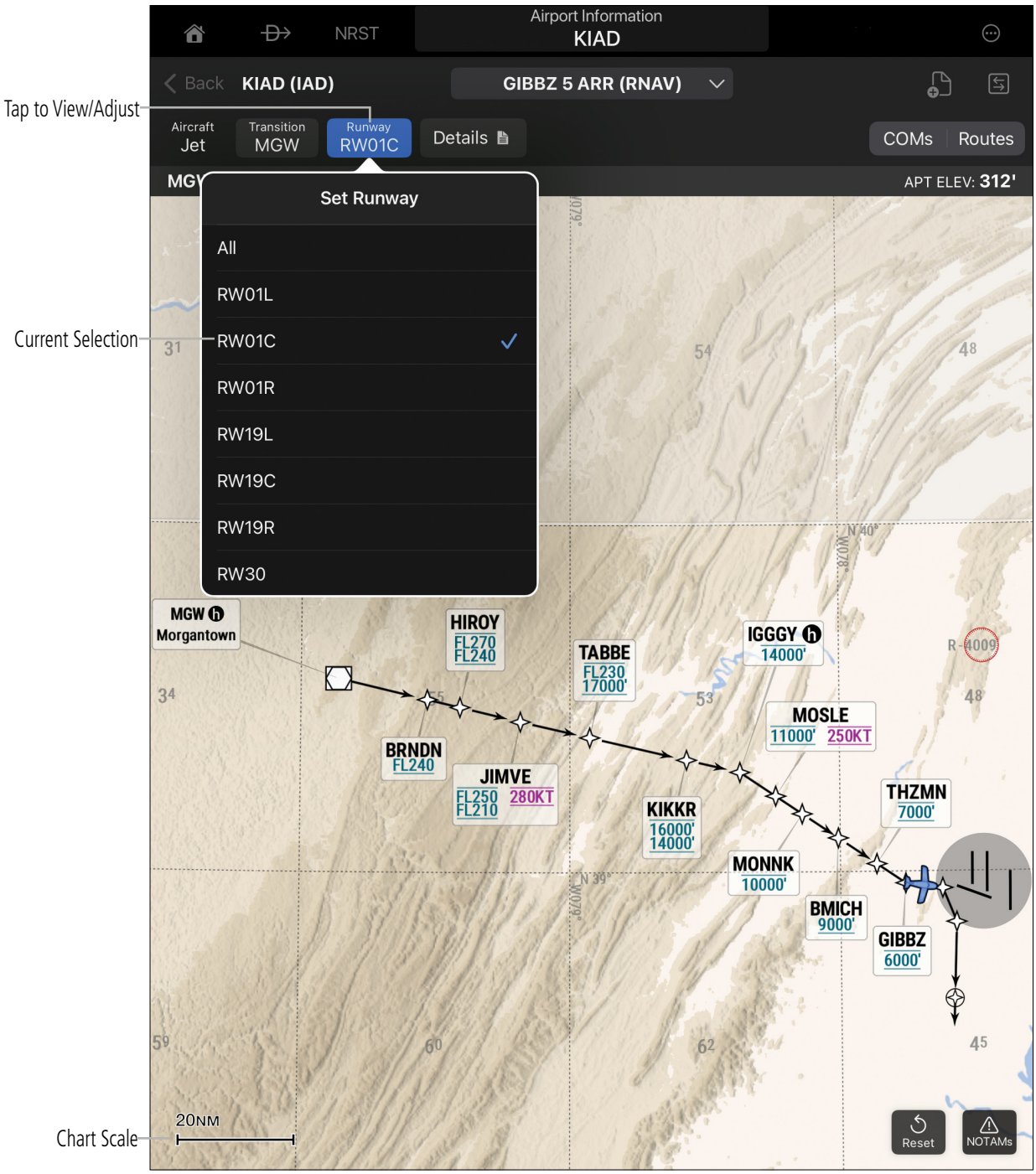
GARMIN

RUNWAY BUTTON

The Planview is updated based upon User inputs. When "All" is selected for the Runway, the airport locator is centered on the airport, but when a specific runway is selected by the User, minor realignments/adjustments to the Planview may occur, depending on the current scale and/or 'Zoom' level.

Selecting a Arrival Procedure Runway:

1) Select > > **Charts > SmartCharts.**
2) Scroll down to view Arrival Procedures, if available, then select the desired Arrival Procedure (e.g. GIBBZ 5 ARR (RNAV) to KIAD).
3) Tap the **Transition** button to display the Set Transition menu. Select the desired transition (e.g. MGW).
4) Tap the **Runway** button to display the Set Runway menu. Select the desired runway (e.g. RW01C).



Garmin Pilot iOS - SmartCharts - Arrival Procedure - KIAD - Runway Selection - 01C

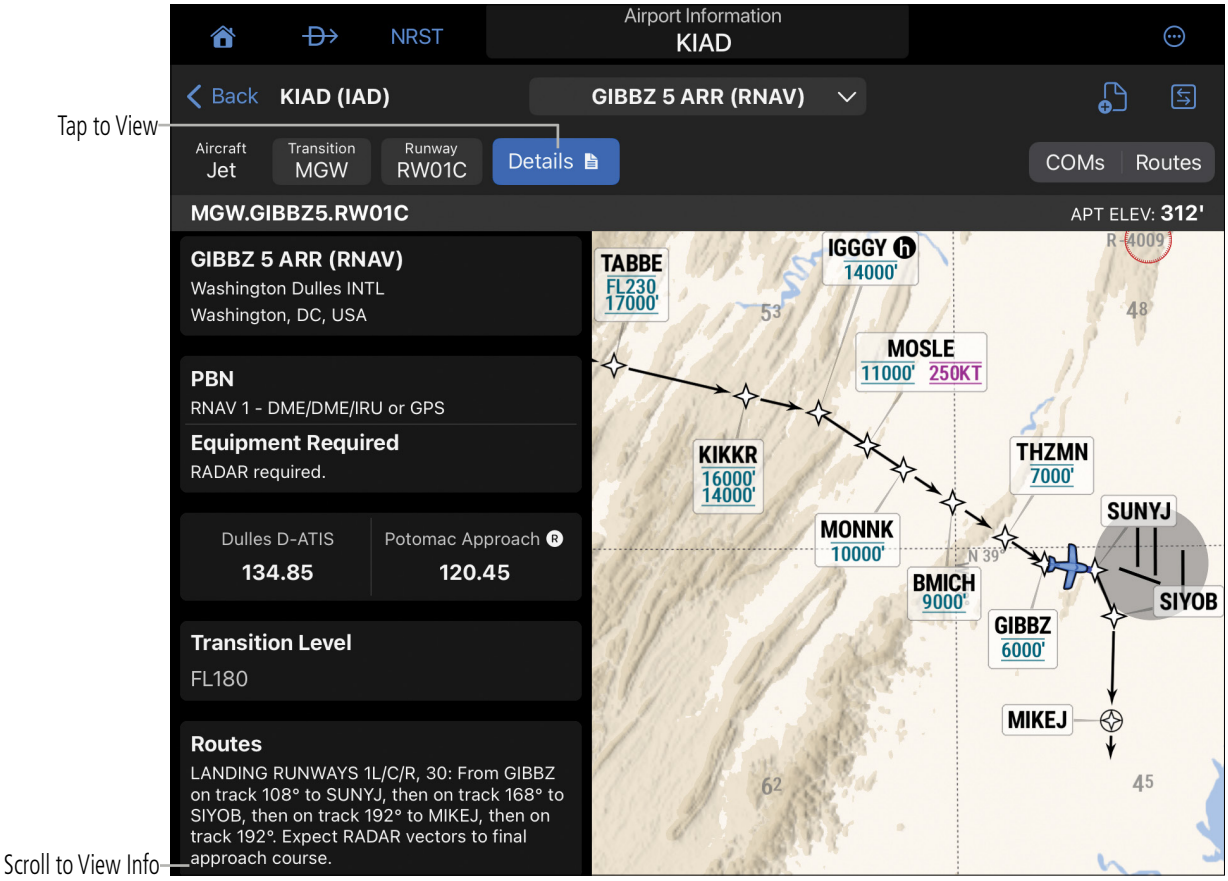
DETAILS

The Details tab aides the User when conducting their briefing. When viewing an Arrival Procedure, selecting the Details tab will display additional information specific to the airport and arrival procedure, which may include some, or all, of the following items:

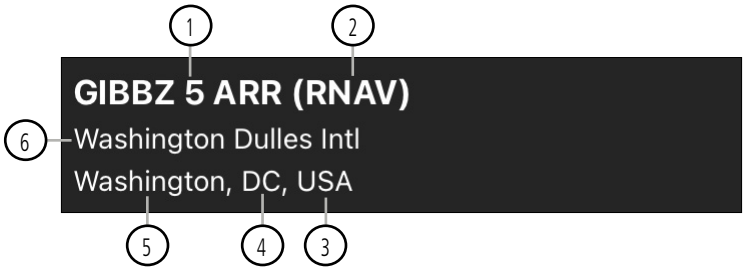
- Name of Arrival Procedure.
- Airport name, City, State, Country.
- Performance Based Navigation (PBN) requirements.
- Equipment required.
- Name of weather reporting station and frequency.
- Name of approach control frequency and if the facility has radar services.
- Transition Level / Altitude.
- Route information.
- General Notes.
- Operational Notes.
- Chart effectivity and expiration date.

Viewing Details:

1) Select  >  > **Charts > SmartCharts.**
2) Scroll down to view Arrival Procedures, if available, then select the desired Arrival Procedure (e.g. GIBBZ 5 ARR (RNAV) to KIAD).
3) Tap the **Transition** button to display the Set Transition menu. Select the desired transition (e.g. MGW).
4) Tap the **Runway** button to display the Set Runway menu. Select the desired runway (e.g. RW01C).
5) Tap the **Details** button to display additional information alongside the Arrival Procedure.

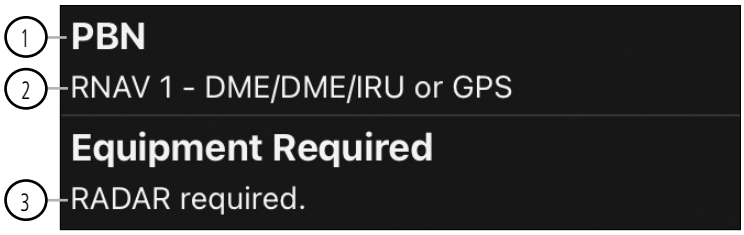


Garmin Pilot iOS - SmartCharts - Arrival Procedure - Details Overview



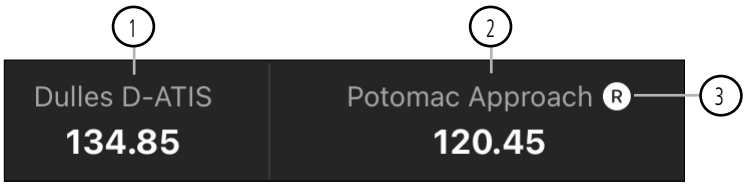
Garmin Pilot iOS - SmartCharts - Arrival Procedure - Details - Name and Location

1. Name of Arrival (GIBBZ 5).
2. Type of Arrival (Area Navigation - RNAV).
3. Country (United States of America).
4. State/Province/District (District of Columbia).
5. City/Town (Washington).
6. Airport Name (Washington Dulles International).



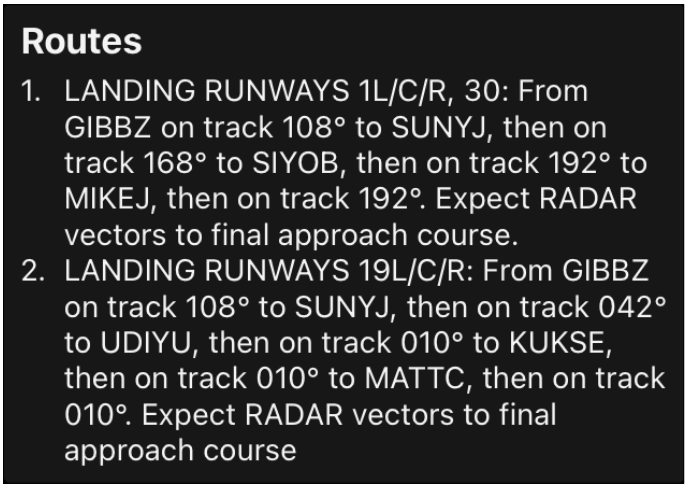
Garmin Pilot iOS - SmartCharts - Arrival Procedure - Details - Equipment Required

1. Performance-Based Navigation.
2. Arrival requires the accuracy of RNAV 1, DME, DME/IRU, or GPS equipment.
3. Arrival requires the use of an Air Traffic Controller for navigation.

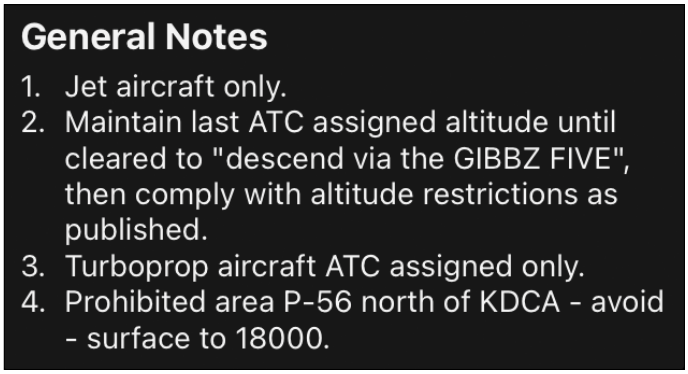


Garmin Pilot iOS - SmartCharts - Arrival Procedure - Frequencies

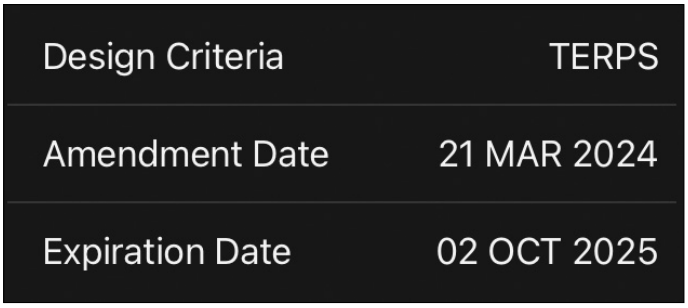
1. Digital Automated Terminal Information Service - D-ATIS frequency (134.85).
2. Name of Approach Control (Potomac) and frequency (120.45).
3. Frequency has radar services.



Garmin Pilot iOS - SmartCharts - Arrival Procedure - Details - Routes



Garmin Pilot iOS - SmartCharts - Arrival Procedure - Details - General Notes



Garmin Pilot iOS - SmartCharts - Arrival Procedure - Details - Chart Design Criteria and Effectivity

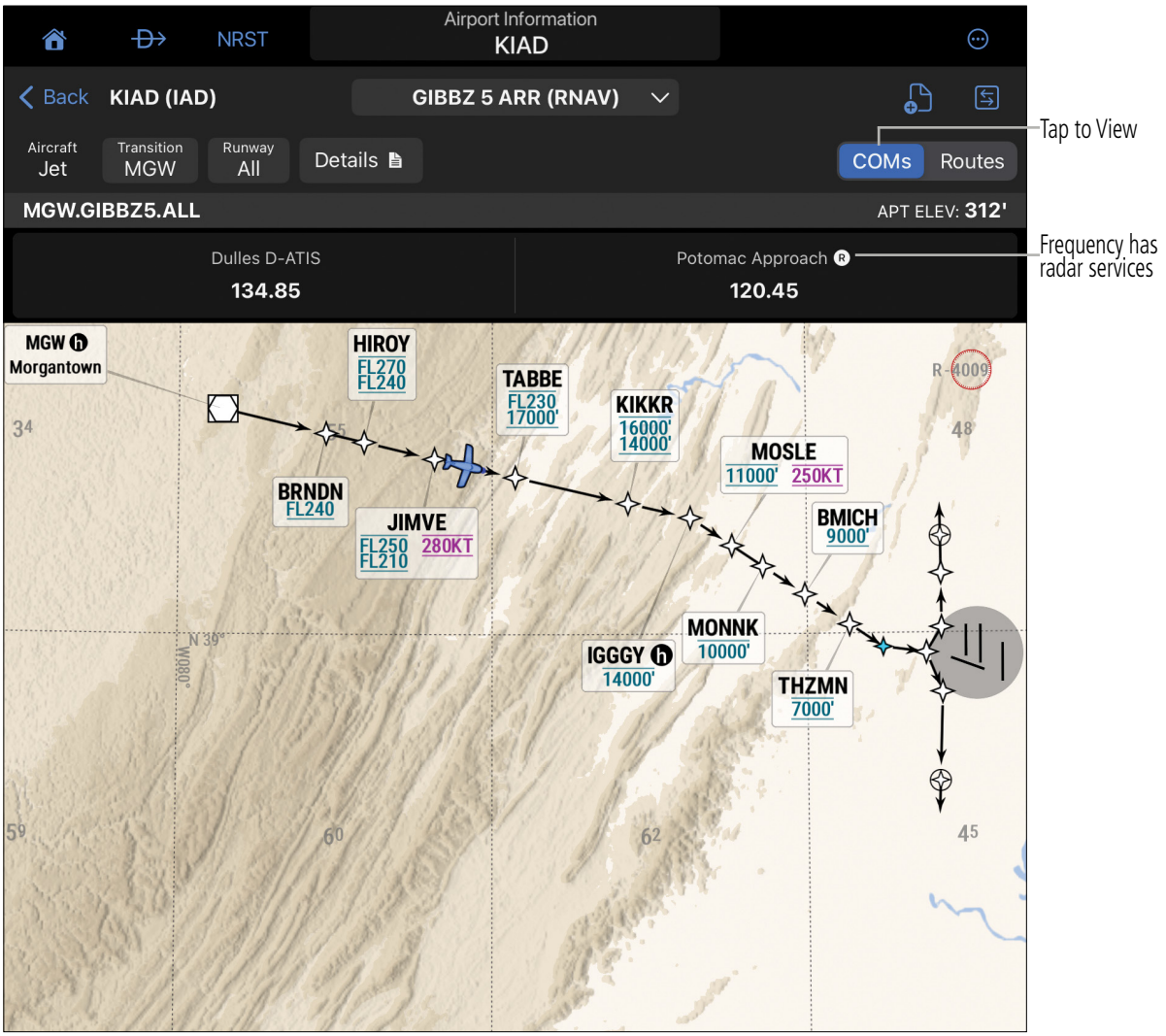
QUICK ACCESS/REFERENCE BUTTONS

COMS

When viewing the Arrival Procedure, selecting the **COMs** button will display communications frequencies above the Arrival Procedure, as a 'header''.

Viewing Communications Header:

1) Select > > **Charts > SmartCharts.**
2) Scroll down to view Arrival Procedures, if available, then select the desired Arrival Procedure (e.g. GIBBZ 5 (RNAV) to KIAD).
3) Tap the **COMs** button to display additional information above the Arrival Procedure.



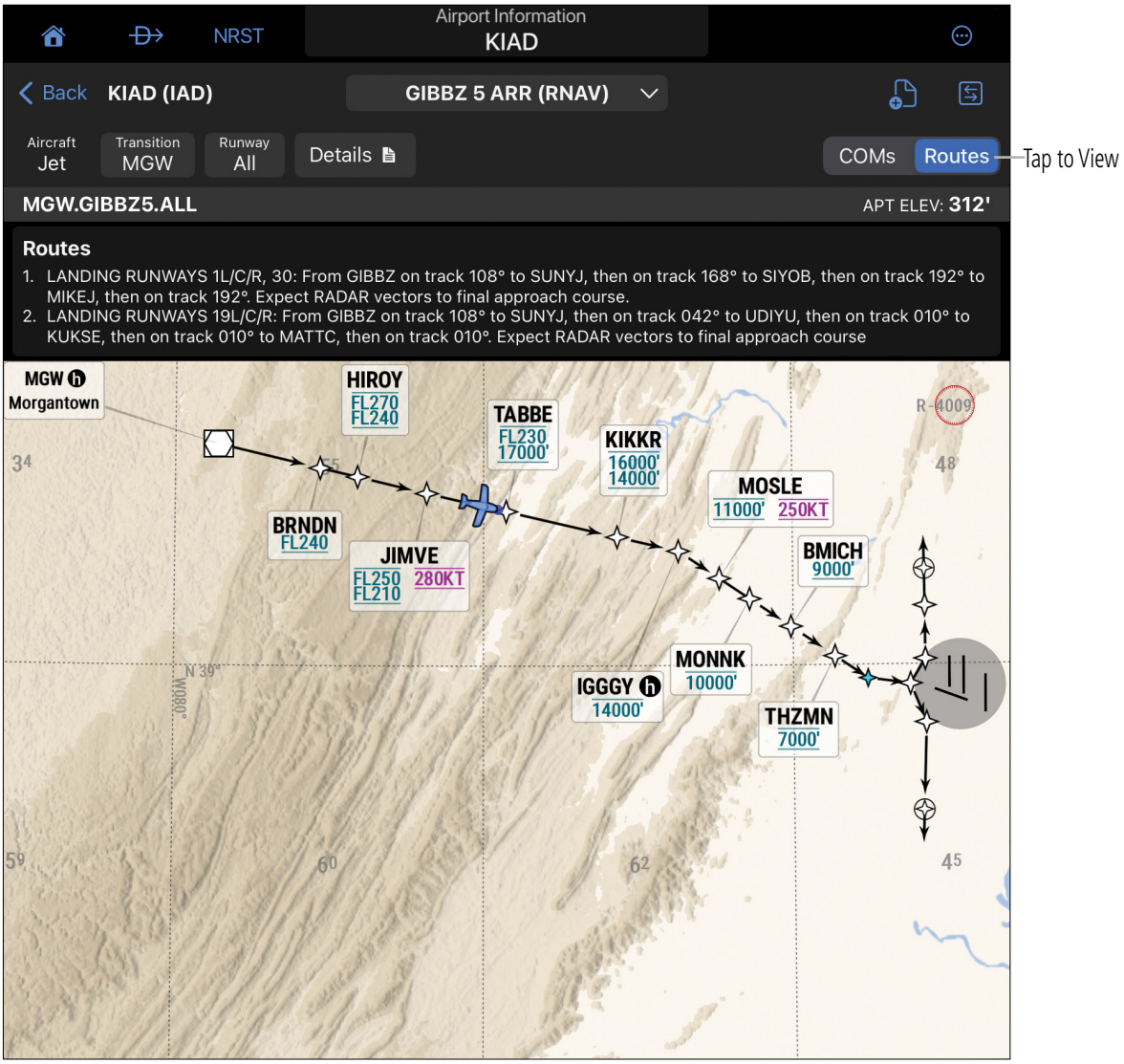
Garmin Pilot iOS - SmartCharts - Arrival Procedure - Communications Header

ROUTES

When viewing the Arrival Procedure, selecting the **Routes** button will display a textural description of advisory information above the Arrival Procedure, as a 'header'.

Viewing Routes Header:

1) Select  >  > **Charts > SmartCharts.**
2) Scroll down to view Arrival Procedures, if available, then select the desired Arrival Procedure (e.g. GIBBZ 5 (RNAV) to KIAD).
3) Tap the **Routes** button to display additional information above the Arrival Procedure.

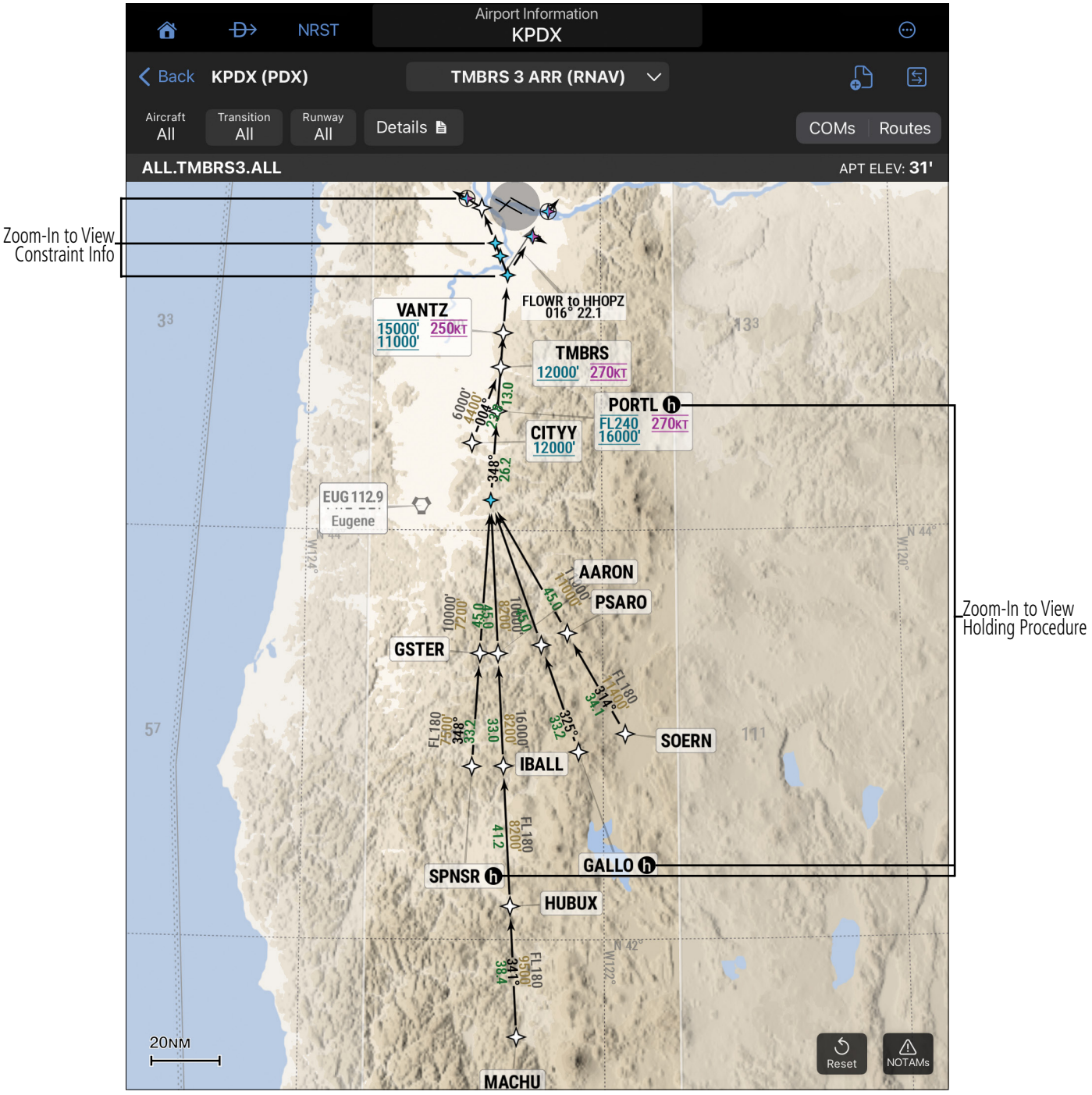


Garmin Pilot iOS - SmartCharts - Arrival Procedure - Routes

PLANVIEW

The Planview area is drawn to scale, which allows the departure procedure to be georeferenced when connected to a compatible position information source. Airport locators show an enhanced view of the airport runway layout, and are not to scale when zoomed out on the procedure. Minimum enroute altitude, minimum obstacle clearance altitude, magnetic course, and distance for applicable segments are shown. Speed and altitude constraints for all applicable waypoints will be shown. If the Planview is zoomed out to a scale such that the speed or altitude constraint label is removed from Planview, the waypoint symbol or Airport Locator is highlighted to prompt the pilot to 'Zoom-In' and view the constraint. Holding patterns will be marked with an "h" symbol on the waypoint indicating to the User to 'Zoom-in' to view details.

Offset Legs will be shown and labeled when segments overlap. They will be re-drawn without the offset if filtering selections made by the User remove the overlap.



Garmin Pilot iOS - SmartCharts - Arrival Procedure - Holding Procedure(s) & Constraints

APPROACH CHARTS

OVERVIEW

SmartChart Approach Procedures allow the User to select and/or adjust minimums, declutter unnecessary information, and access applicable information quickly. The top of the chart contains buttons for making selections to set up the chart for your flight. To ensure users are making the correct inputs to customize and declutter the information, Garmin recommends following a consistent flow working from left to right across the top bar buttons.

On Approach Procedures, the Procedure Status Bar will show the aircraft category, Altitude and Visibility information, Circling Not Authorized notes, and the Airport Elevation. The remainder of the screen is used for the Planview and Profile view of the procedure. SmartCharts are shown to scale allowing the arrival procedure to be geo-referenced when connected to a compatible GPS position source.

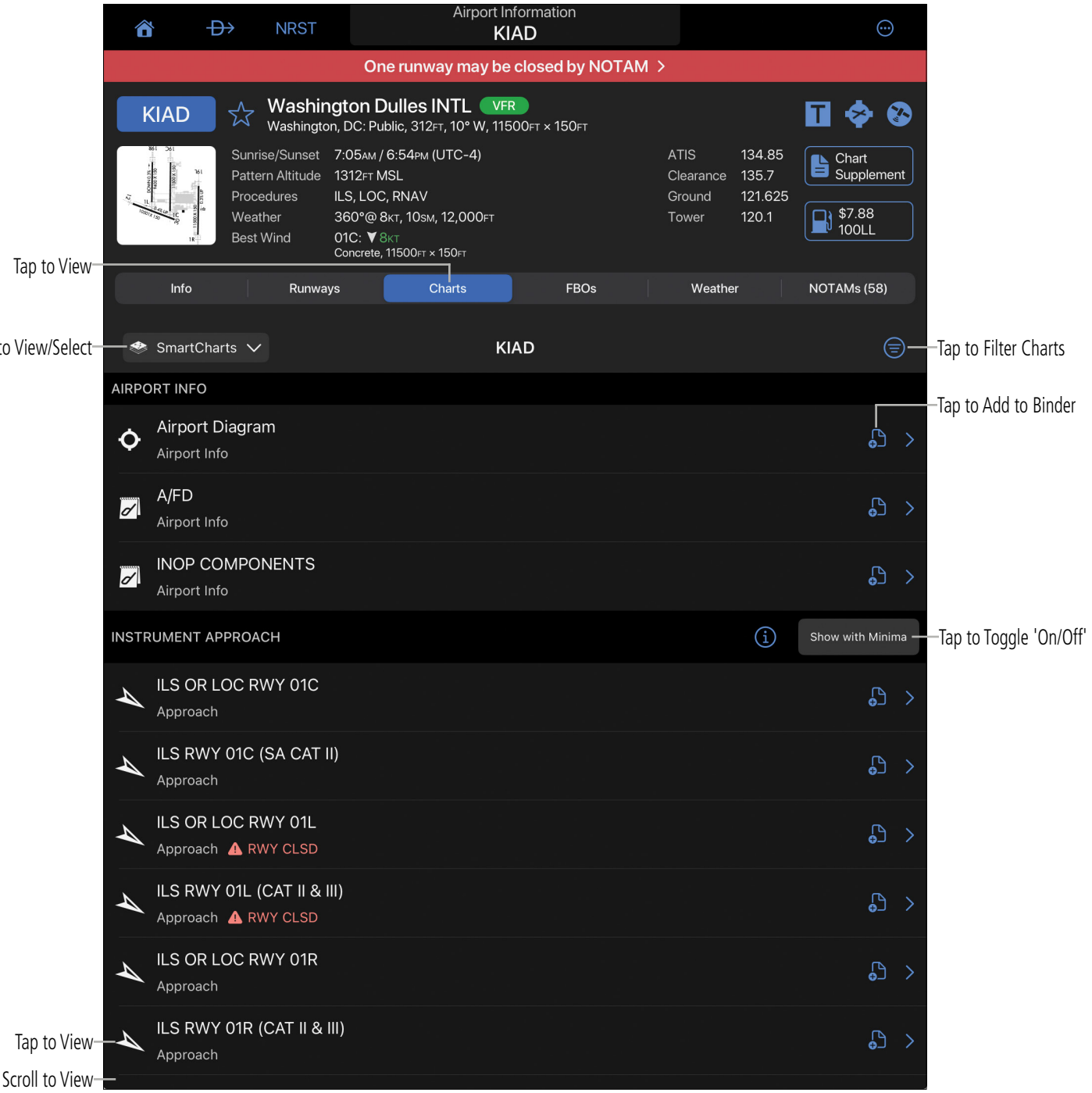


Garmin Pilot iOS - SmartCharts - Approach - Overview - KBFI - RNAV Y RWY 32L

When available, SmartCharts allows the User to view Approach Charts, while also displaying other pertinent information for aircraft type, approach category, and weather minima.

Selecting an Approach Chart:

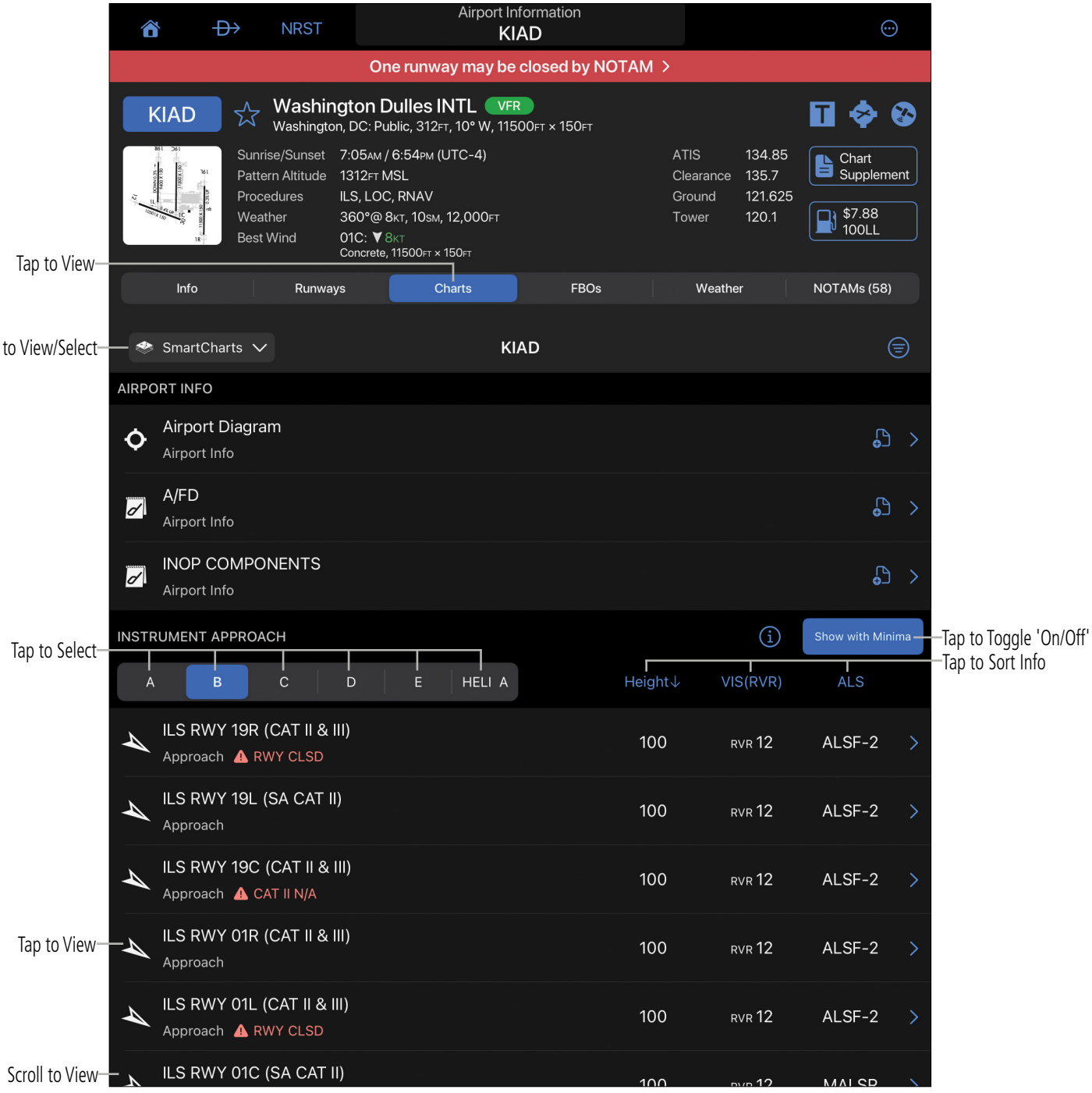
1) Select > > **Charts > SmartCharts.**
2) Scroll down to view an Instrument Approach, if available, then select the desired Instrument Approach Procedure (e.g. ILS RWY 01R (CAT II & III) to KIAD).



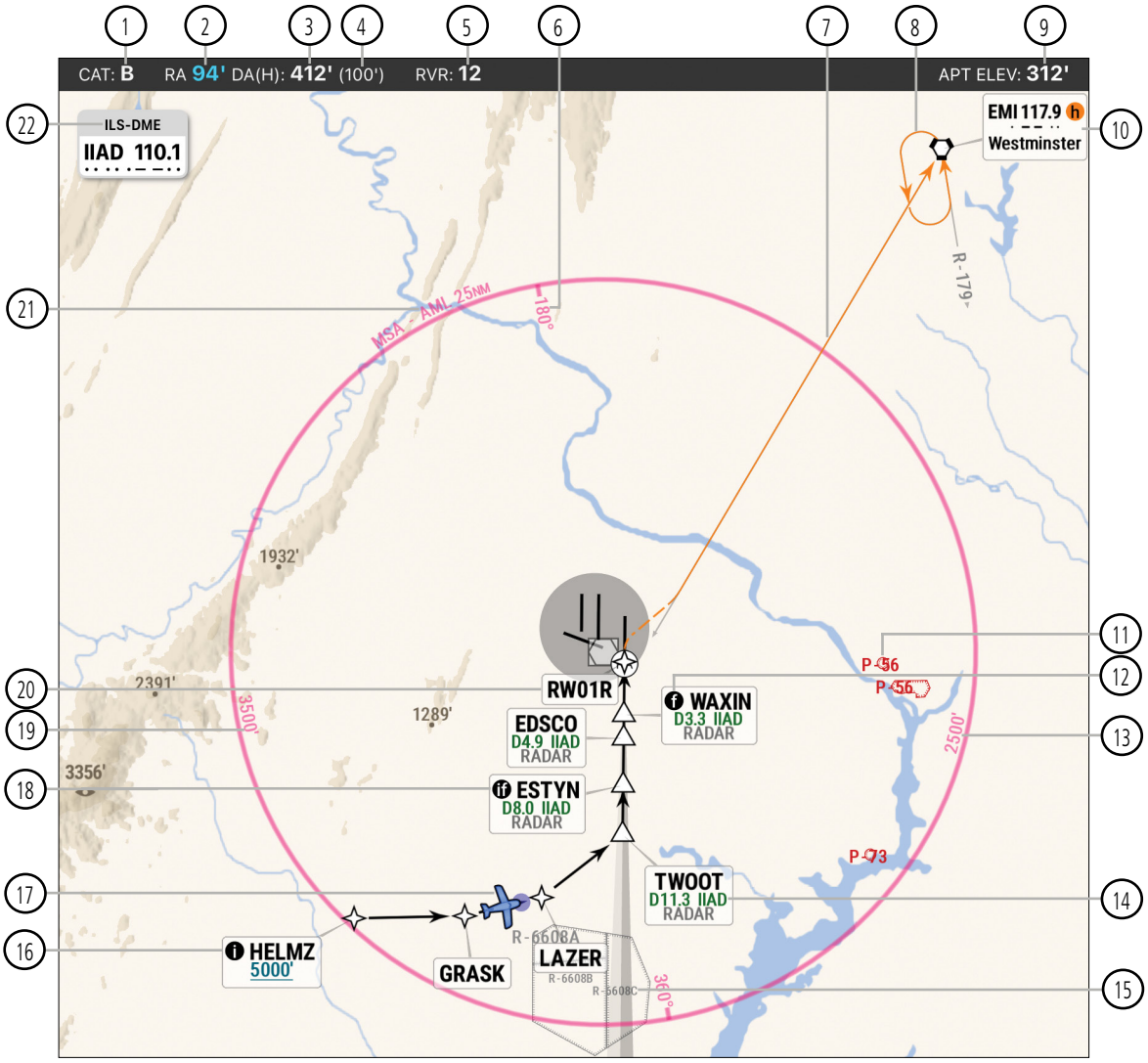
Garmin Pilot iOS - SmartCharts - Approach - KIAD - Select Approach

Or:

3) Tap the **Show with Minima** button, if desired, to adjust the display.
4) Select the desired aircraft category.
5) Tap the blue column titles (e.g. VIS (RVR)) to sort the data, as desired.
6) Select the desired approach. The aircraft category minima will now be applied to all approaches.



Garmin Pilot iOS - SmartCharts - Approach - KIAD - Select Approach - Minima Displayed



Garmin Pilot iOS - SmartCharts - Approach - Overview - ILS CAT II

1. Aircraft Approach Category.
2. Radar Altimeter Minimums (AGL').
3. Decision Altitude (MSL').
4. Height Above Touchdown (ft).
5. Runway Visual Range Minimums (100's of ft).
6. Compass Rose for NAVAID co-located at airport.
7. Missed Approach.
8. Missed Approach Holding Pattern.
9. Airport Elevation (MSL').
10. VORTAC Identifier (EMI), Frequency (117.9), Morse Code ID, Name (Westminster) & Channel (126).
11. Prohibited Airspace (P-56).
12. Final Approach Fix.
13. Minimum Safe Altitude (MSL').
14. Distance From Fix (nautical miles).
15. Restricted Airspace R-6608C.
16. Initial Approach Fix w/Altitude Restriction (At or Above 5000' MSL).
17. Georeferenced Aircraft.
18. Intermediate Fix.
19. Minimum Safe Altitude (MSL').
20. Runway ID (01R).
21. Minimum Safe Altitude Range Ring Center Point (AML) & Radius (25nm).
22. NAVAID Info (ILS), Equipment (DME), ILS DME Identifier (IIAD), Frequency (110.1), & Morse Code ID.

MINIMUMS BUTTON

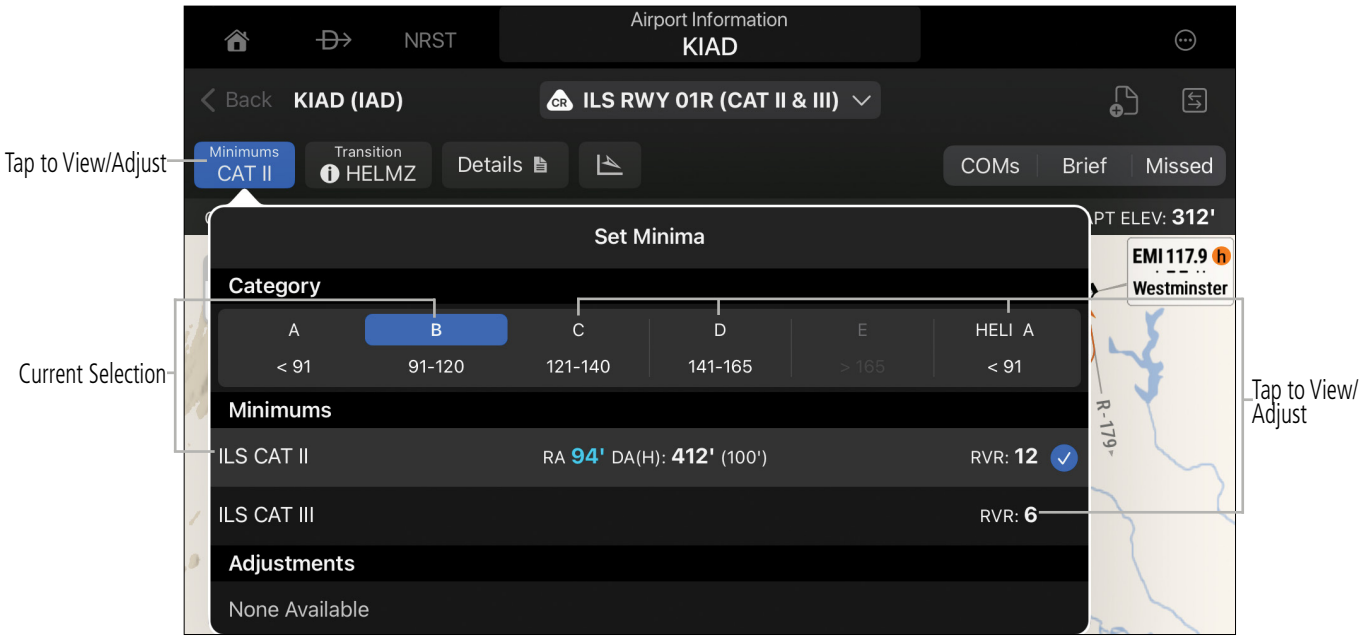
NOTE: *Some approaches will advise the use of a remote altimeter when local altimeter is not available. Depending on the procedure, this may, or may not, incur an adjustment to minima values. In the case no adjustment is required, the selector will not appear in the minima adjustment conditions.*

NOTE: *SmartCharts only accounts for current published minimums. NOTAMs are not automatically applied. When a NOTAM requires other adjustments to minima, manual calculation by the User may be necessary. Making all minima and adjustment selections within the 'Minimums' button, then opening the Minima Adjustment Details window to view the summarized changes and manually apply the NOTAMs where necessary, is suggested.*

The Minimums button allows the User to select the appropriate aircraft category (shown with applicable airspeeds), the line of minima, and any necessary adjustments. When adjusting/toggling info, SmartCharts will calculate the minimums automatically and display them dynamically on the Planview and Profile View depictions.

Selecting an ILS CAT II Approach Chart:

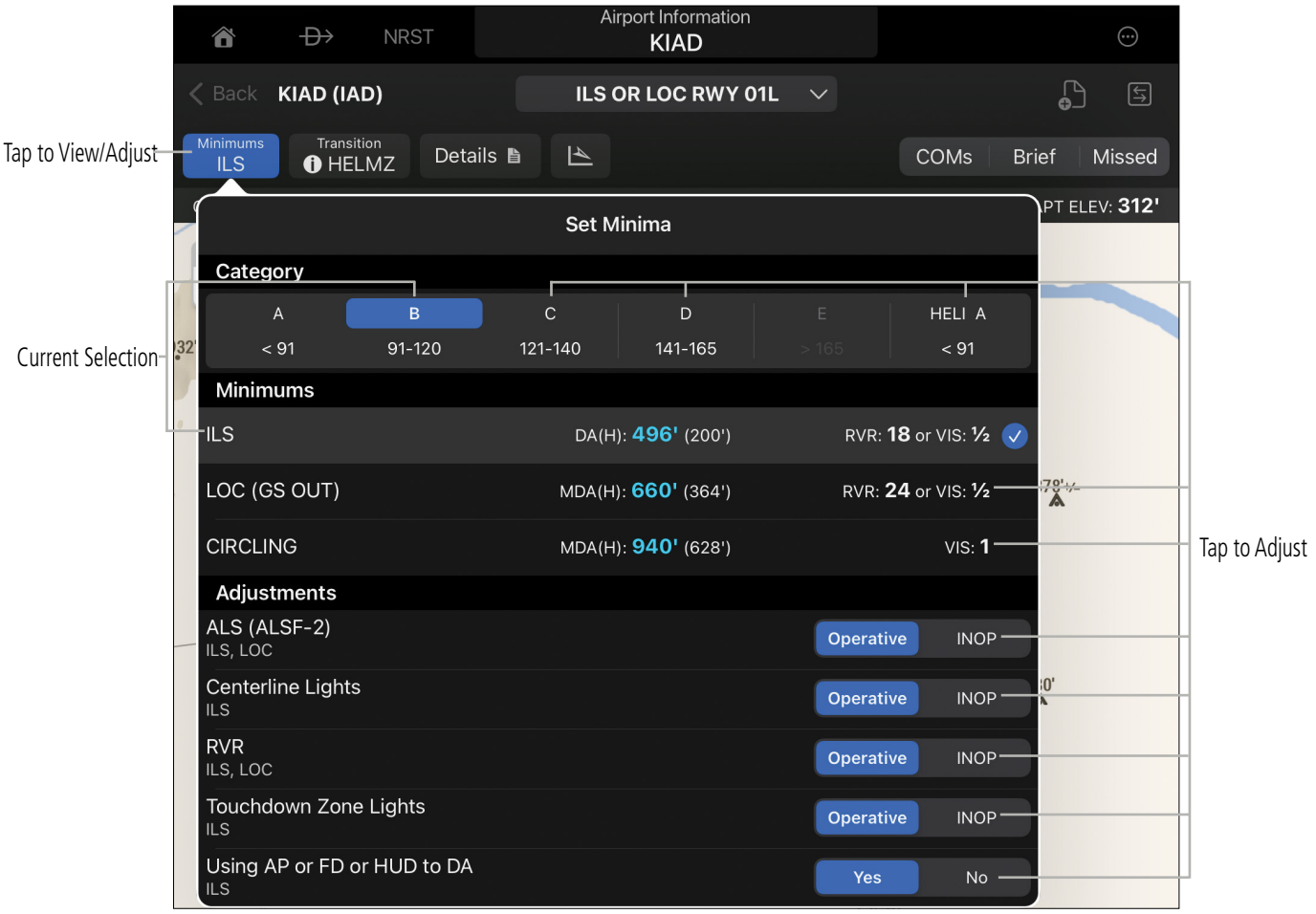
1) Select > > **Charts > SmartCharts**.
2) Scroll down to view an Instrument Approach, if available, then select the desired Instrument Approach Procedure (e.g. ILS RWY 01R (CAT II & III) to KIAD).
3) Tap the **Minimums** button to display the Set Minima menu, then select the Aircraft Category, weather minimums, and, if available, the desired runway.



Garmin Pilot iOS - SmartCharts - Approach - Set Minima - CAT II - Category B

Selecting an ILS or LOC Approach Chart:

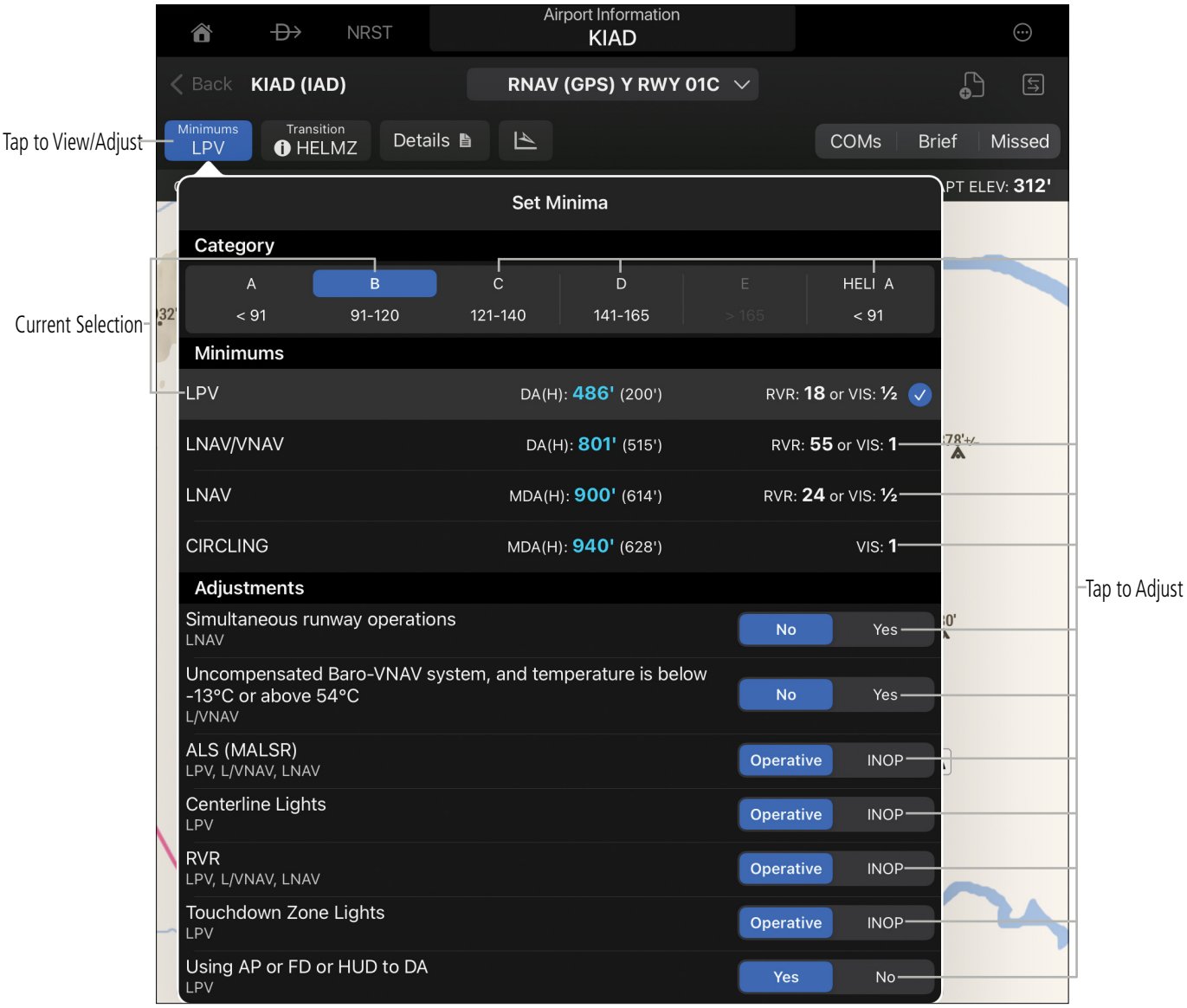
1) Select > > **Charts > SmartCharts**.
2) Scroll down to view an Instrument Approach, if available, then select the desired Instrument Approach Procedure (e.g. ILS or LOC RWY 01L to KIAD).
3) Tap the **Minimums** button to display the Set Minima menu, then select the Aircraft Category, weather minimums, **ILS**, **LOC (GS OUT)**, or **Circling**, and the desired Adjustments (e.g. ALS operative or INOP, Centerline Lights operative or INOP, Using AP or FD or HUD to DA yes or No, etc.).



Garmin Pilot iOS - SmartCharts - Approach - Set Minima - ILS or LOC - Category B

Selecting a RNAV (GPS) Approach Chart:

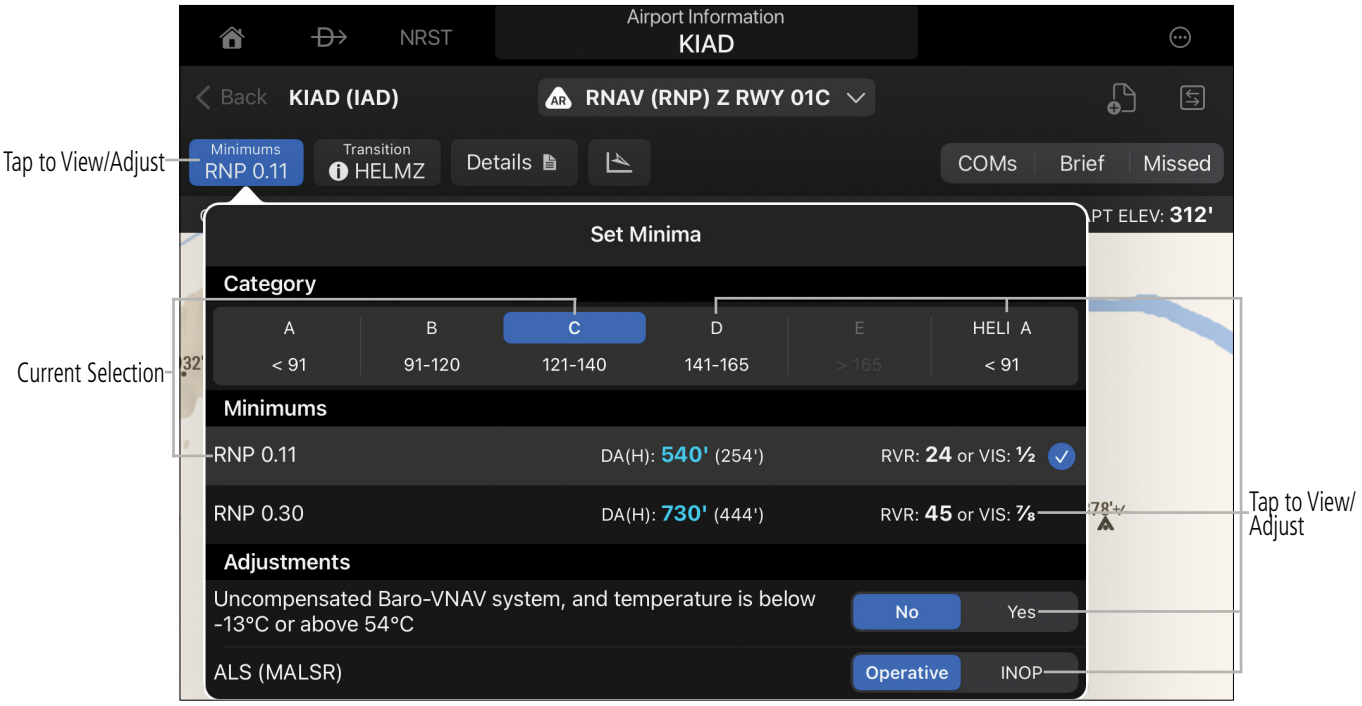
1) Select  >  > **Charts > SmartCharts**.
2) Scroll down to view an Instrument Approach, if available, then select the desired Instrument Approach Procedure (e.g. RNAV (GPS) Y RWY 01C to KIAD).
3) Tap the **Minimums** button to display the Set Minima menu, then select the Aircraft Category, weather minimums, **LPV, LNAV/VNAV, LNAV,** or **Circling**.
4) Select the desired Adjustments (e.g. Simultaneous runway operations, yes or no, RVR, operative or INOP, etc.).



Garmin Pilot iOS - SmartCharts - Approach - Set Minima - RNAV (GPS) - Category B

Selecting a RNAV (RNP) Approach Chart:

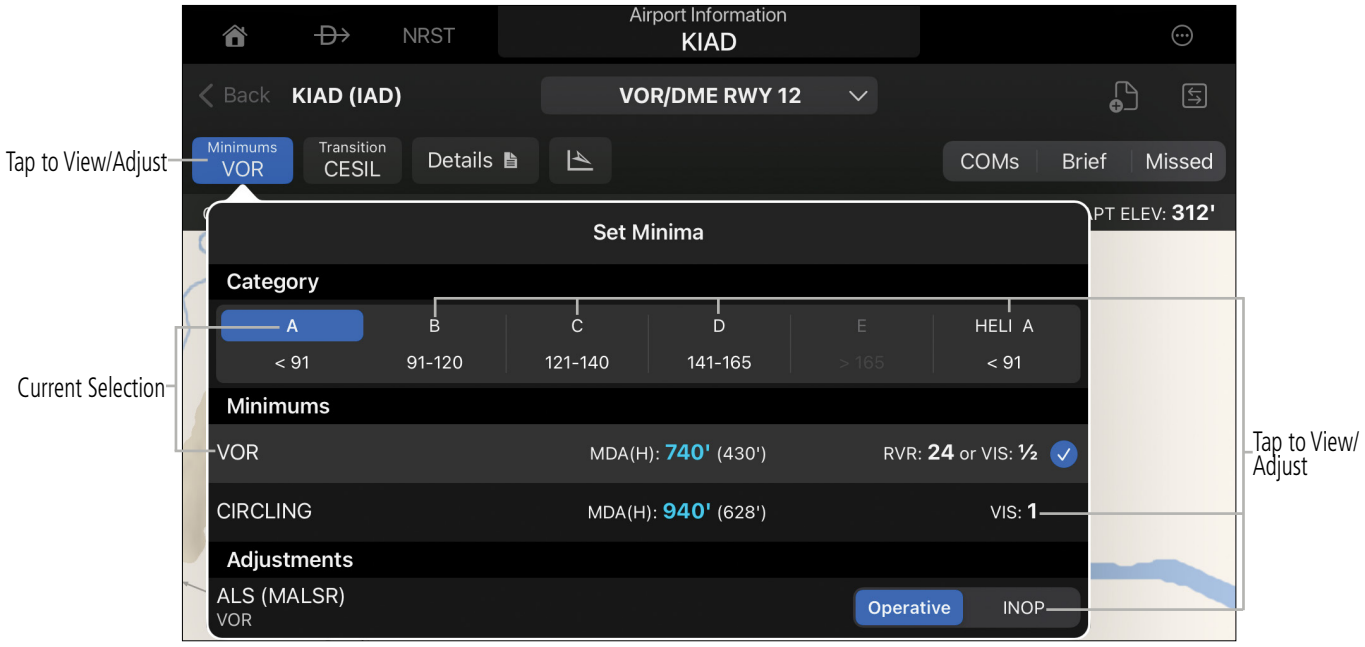
1) Select  >  > **Charts > SmartCharts**.
2) Scroll down to view an Instrument Approach, if available, then select the desired Instrument Approach Procedure (e.g. RNAV (RNP) Z RWY 01C to KIAD).
3) Tap the **Minimums** button to display the Set Minima menu, then select the Aircraft Category, weather minimums, **RNP 0.11** or **RNP 0.30**.
4) Select the desired Adjustments (e.g. Simultaneous runway operations, yes or no, RVR, operative or INOP, etc.).



Garmin Pilot iOS - SmartCharts - Approach - Set Minima - RNAV (RNP) - Category C

Selecting a VOR/DME Approach Chart:

1) Select  >  > **Charts > SmartCharts**.
2) Scroll down to view an Instrument Approach, if available, then select the desired Instrument Approach Procedure (e.g. VOR/DME RWY 12 to KIAD).
3) Tap the **Minimums** button to display the Set Minima menu, then select the Aircraft Category, weather minimums, **VOR,** or **Circling**.
4) Select the desired Adjustments (e.g. ALS operative or INOP, etc.).



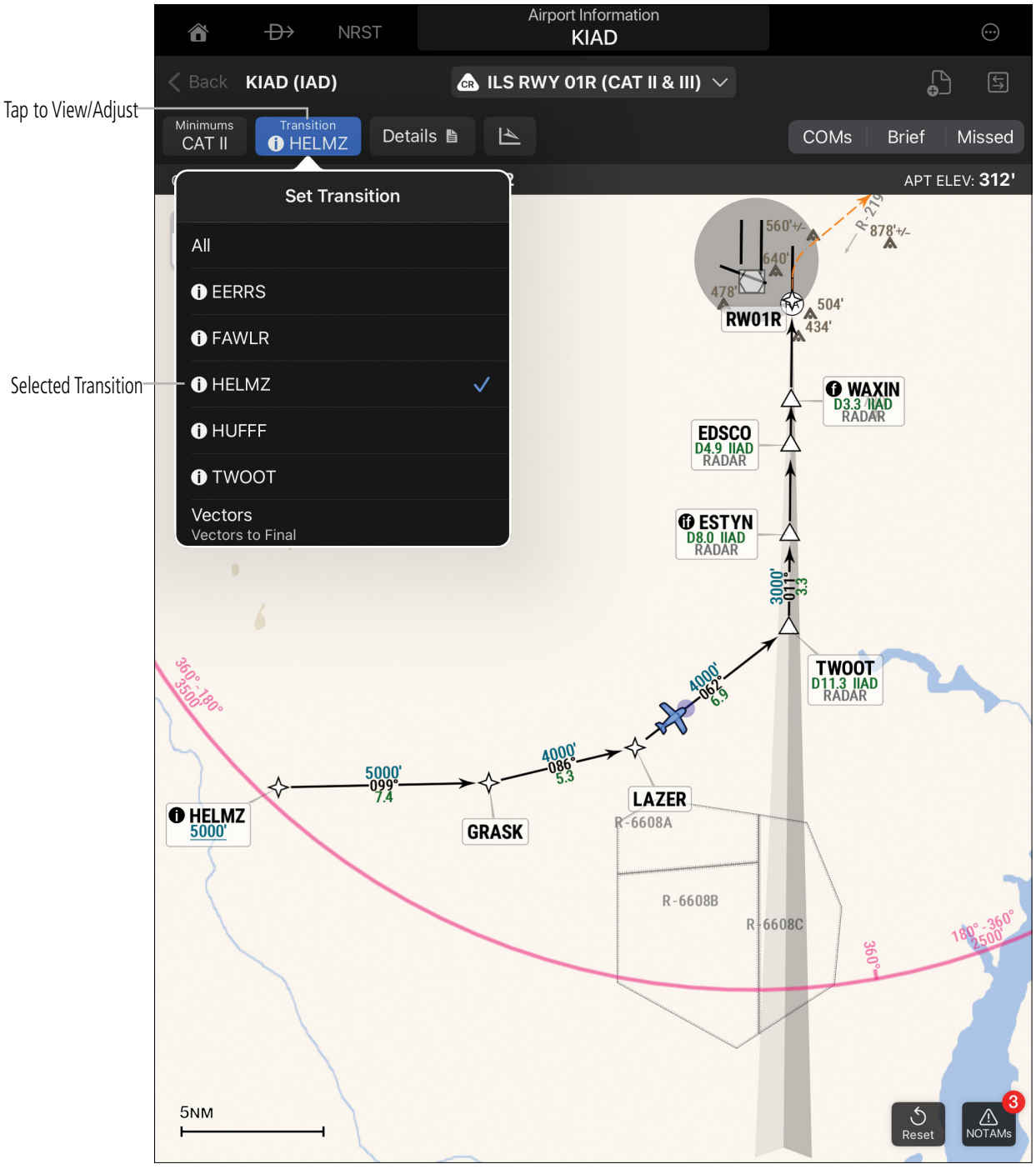
Garmin Pilot iOS - SmartCharts - Approach - Set Minima - VOR/DME - Category A

TRANSITION BUTTON

The Transition button allows the User to select the initial approach fix or feeder fix, to begin the approach while filtering out unapplicable information/ segments. Most approaches will offer a 'Vectors to Final' option, where only waypoints along the final approach course will be shown. For procedures that do not have multiple transitions, the route transition is displayed, but the button is unselectable by the User.

Selecting an Approach Transition:

1) Select > > **Charts > SmartCharts.**
2) Scroll down to view an Instrument Approach, if available, then select the desired Approach Procedure (e.g. ILS RWY 01R (CAT II & CAT III) to KIAD).
3) Tap the **Transition** button to display the Set Transition menu. Select the desired transition (e.g. GNATZ).



Garmin Pilot iOS - SmartCharts - Approach - Transition - ILS CAT II

DETAILS

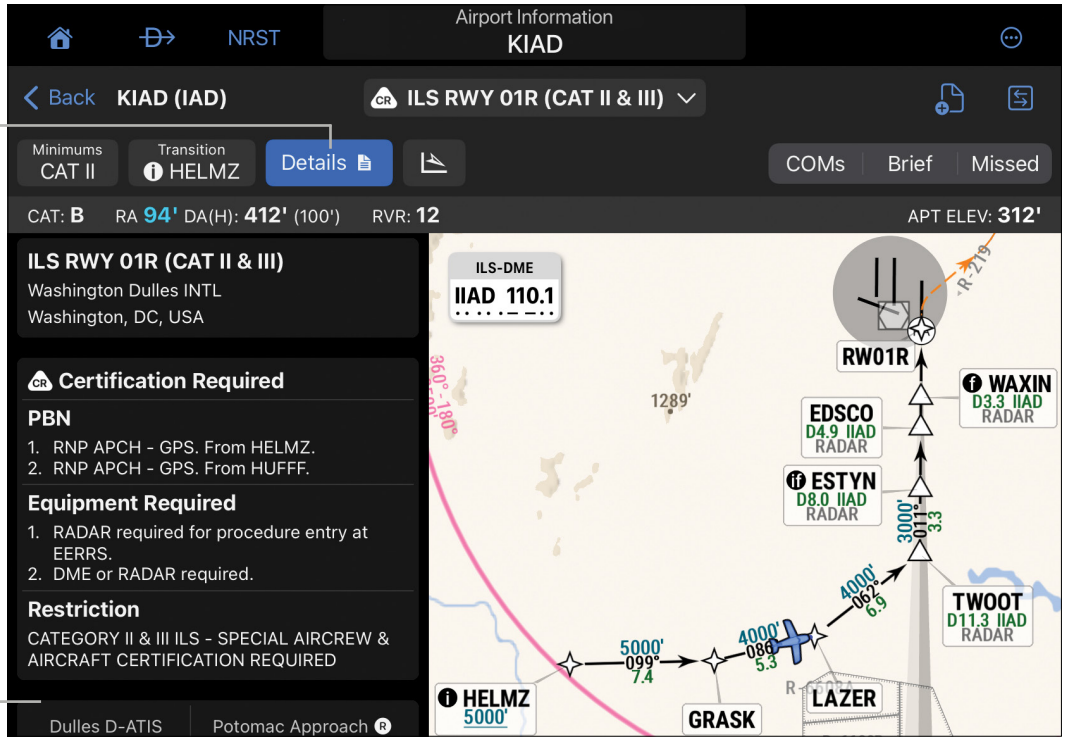
The Details button displays additional information to aide the User in their briefing. Relevant COM frequencies are provided, which, if applicable, allow the User to tap and view a legend of the relevant symbols. A briefing section contains six information boxes that summarize key approach parameters. A missed approach section provides icons and textural descriptions for the primary missed approach procedure, along with textural descriptions for any alternate missed approach procedures. Transition altitude, general notes, and MSA or TAA information are also available along with amended version, effective, and expiration dates.

The Details button will display most, if not all, of the information displayed below:

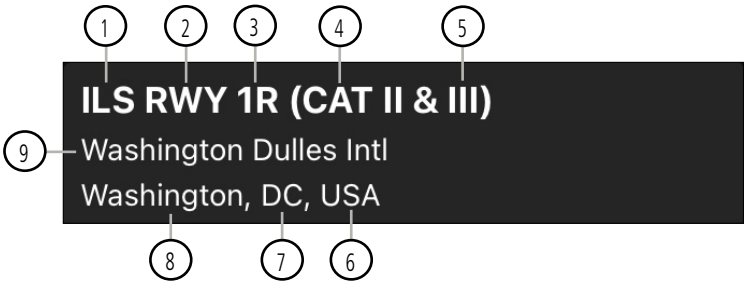
- Name of Approach.
- Airport name, City, State, Country.
- Performance Based Navigation (PBN) requirements.
- Equipment required.
- Restriction(s).
- Name of weather reporting station and frequency.
- Name of approach control frequency(s) and if the facility has radar services.
- Name of tower control frequency(s).
- Name of ground control frequency(s).
- Instrument Landing System (ILS) ID and frequency.
- Final Approach Course.
- Radar Altimeter (RA) & Runway Visual Range (RVR) minimums.
- Type of approach lighting system.
- Length of available runway & Touchdown zone when using the Glide Slope.
- Missed Approach Procedure (MAP).
- Transition Level / Altitude.
- General Notes.
- Minimum Safe Altitude.
- Descent Rate Table.
- Chart design criteria, effectivity, and expiration date.

Viewing Details:

1) Select  >  > **Charts > SmartCharts.**
2) Scroll down to view an Instrument Approach, if available, then select the desired Approach Procedure (e.g. ILS RWY 01R (CAT II & CAT III) to KIAD).
3) Tap the **Details** button to view additional information alongside the Approach.

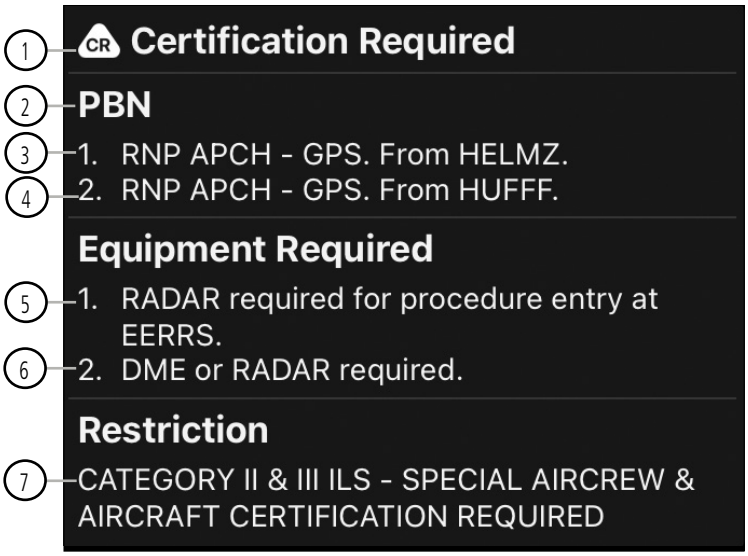


Garmin Pilot iOS - SmartCharts - Approach - Details - ILS CAT II



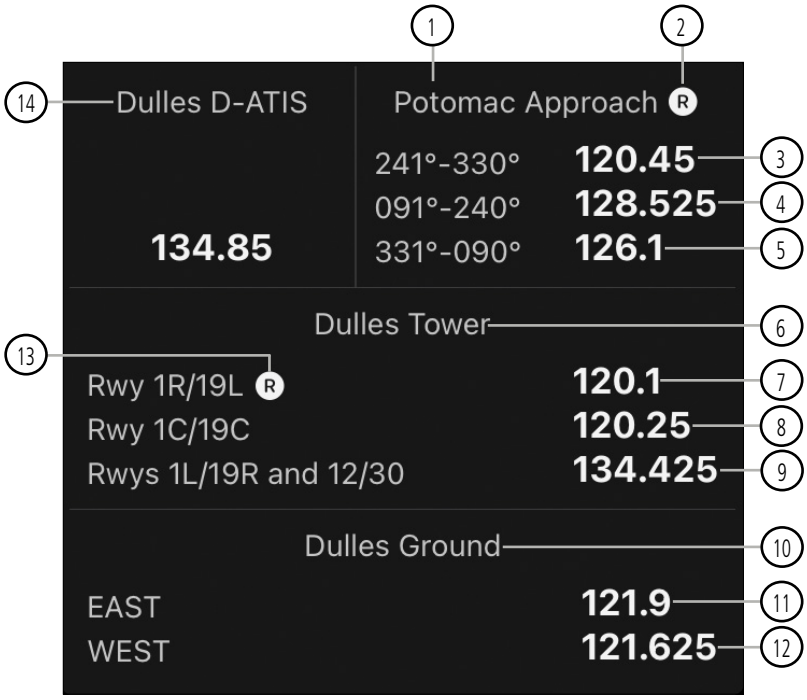
Garmin Pilot iOS - SmartCharts - Approach - Details - ILS CAT II - Location

1. Type of Approach (Instrument Landing System).
2. Runway.
3. Runway identifier (01 Right).
4. Approach minimums available (CAT II).
5. Approach minimums available (CAT III).
6. Country (United States of America).
7. State/Province/District (District of Columbia).
8. City/Town (Washington).
9. Airport Name (Washington Dulles International).



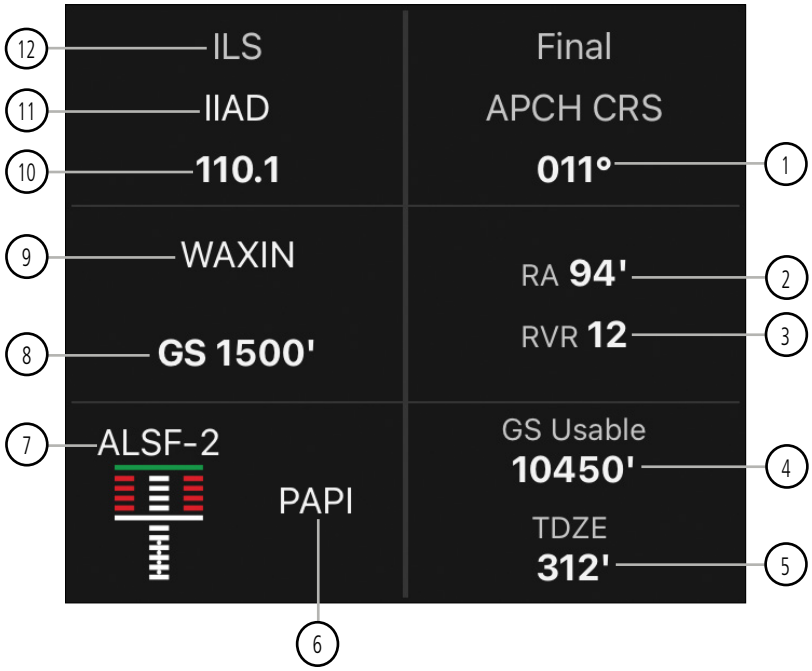
Garmin Pilot iOS - SmartCharts - Approach - Details - ILS CAT II - Requirements

1. Approach requires additional equipment and/or crew training/ experience.
2. Performance-Based Navigation.
3. Required Navigation Performance (RNP) for the approach (APCH) must be GPS from the HELMZ fix.
4. Required Navigation Performance (RNP) for the approach (APCH) must be GPS from the HUFFF fix.
5. If entering/beginning the approach at EERRS, the aircraft must have assistance from an ATC facility with RADAR equipment.
6. Approach requires the aircraft to have DME or assistance from an ATC facility with RADAR equipment.
7. Additional aircrew and aircraft certification required along with approach restrictions for CAT II & CAT III ILS.



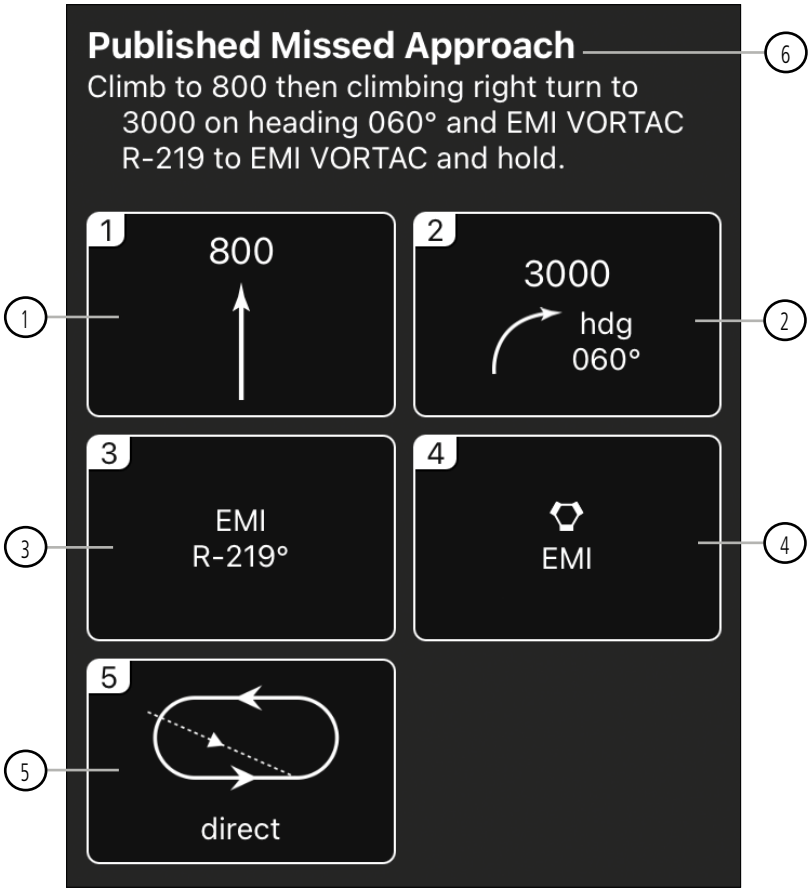
Garmin Pilot iOS - SmartCharts - Approach - Details - ILS CAT II - Communications

1. Approach control name (Potomac).
2. The frequency has radar services.
3. When approaching the airport from the cardinal heading range of 241°-330° use the frequency 120.45.
4. When approaching the airport from the cardinal heading range of 091°-240° use the frequency 128.525.
5. When approaching the airport from the cardinal heading range of 331°-090° use the frequency 126.1.
6. Control tower name (Dulles Tower).
7. When landing on runway 01 right or runway 19 left, use the control tower frequency 120.1.
8. When landing on runway 01 center or runway 19 center, use the control tower frequency 120.25.
9. When landing on runway 01 left, runway 19 right, runway 12 or runway 30, use the control tower frequency 134.425.
10. Ground control name (Dulles Ground).
11. When taxiing on the East side of the airport, use the ground frequency 121.9.
12. When taxiing on the West side of the airport, use the ground frequency 121.625.
13. The frequency has radar services.
14. The Digital ATIS (D-ATIS) frequency is 134.85.



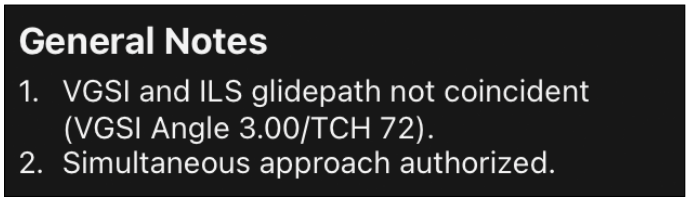
Garmin Pilot iOS - SmartCharts - Approach - Details - ILS CAT II - Course & Fix

1. Final approach course (APCH CRS) heading 011°.
2. Radio Altimeter (RA) height for the selected aircraft category, approach, and runway. 94' is the minimum height for the approach.
3. Runway Visual Range (RVR) for the selected aircraft category, approach, and runway. 1200 feet RVR is the minimum visibility for the approach.
4. Length of usable runway (10,450').
5. Touchdown Zone Elevation (TDZE) for the selected runway (312' MSL).
6. Type of Visual Glide Slope Indicator (VGSI), if available. Precision Approach Path Indicators (PAPI) are available for the selected runway, and depicted on the Left or Right side of the info box, representing their physical location next to the runway.
7. Type of Approach Lighting System (ALS) if available. ALSF-2 is available for the selected runway.
8. Glide Slope (GS) intercept altitude (1500'MSL) at final approach fix.
9. Name of final approach fix (WAXIN).
10. Instrument Landing System frequency for the approach and runway.
11. Instrument Landing System identifier (IIAD).
12. Type of approach - ILS (Instrument Landing System).

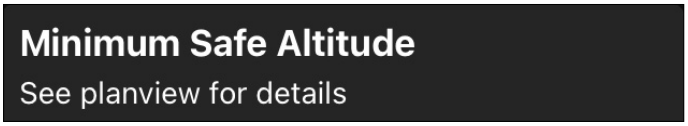


Garmin Pilot iOS - SmartCharts - Approach - Details - ILS CAT II - Missed Approach

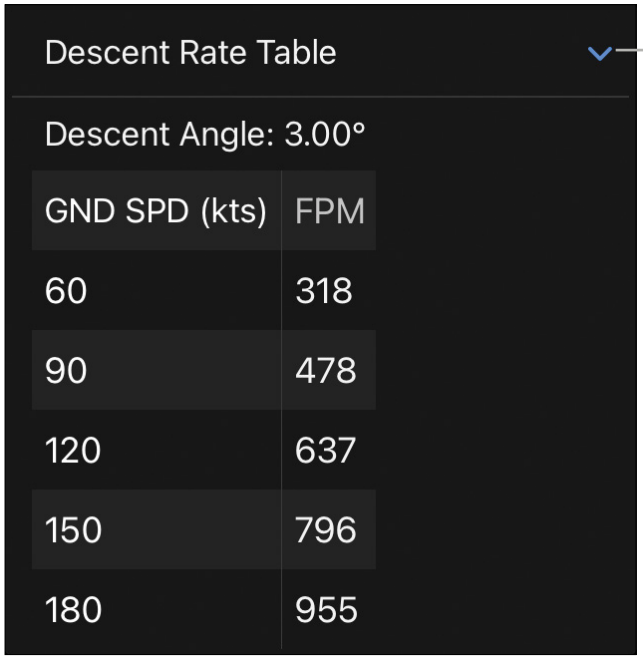
1. Initial climb (800' MSL).
2. Altitude (3000' MSL) direction of initial turn (right) and heading (060°).
3. Name of NAVAID (EMI) and radial (219°).
4. Name of NAVAID (EMI VORTAC).
5. Hold entry (direct) and pattern (left-hand turns).
6. Published Missed Approach textual briefing.



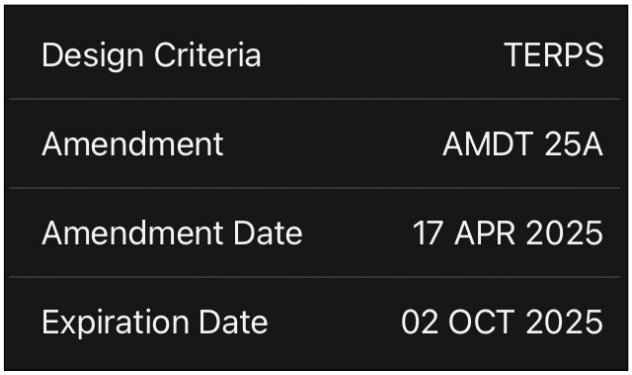
Garmin Pilot iOS - SmartCharts - Approach - Details - General Notes



Garmin Pilot iOS - SmartCharts - Approach - Details - Minimum Safe Altitude Text Box



Garmin Pilot iOS - SmartCharts - Approach - Details - Descent Rate Table



Garmin Pilot iOS - SmartCharts - Approach - Details - Chart Design Criteria and Effectivity

PROFILE VIEW BUTTON

NOTE: *In Portrait screen orientation, toggling*  *allows the User to display both Planview and Profile View.*

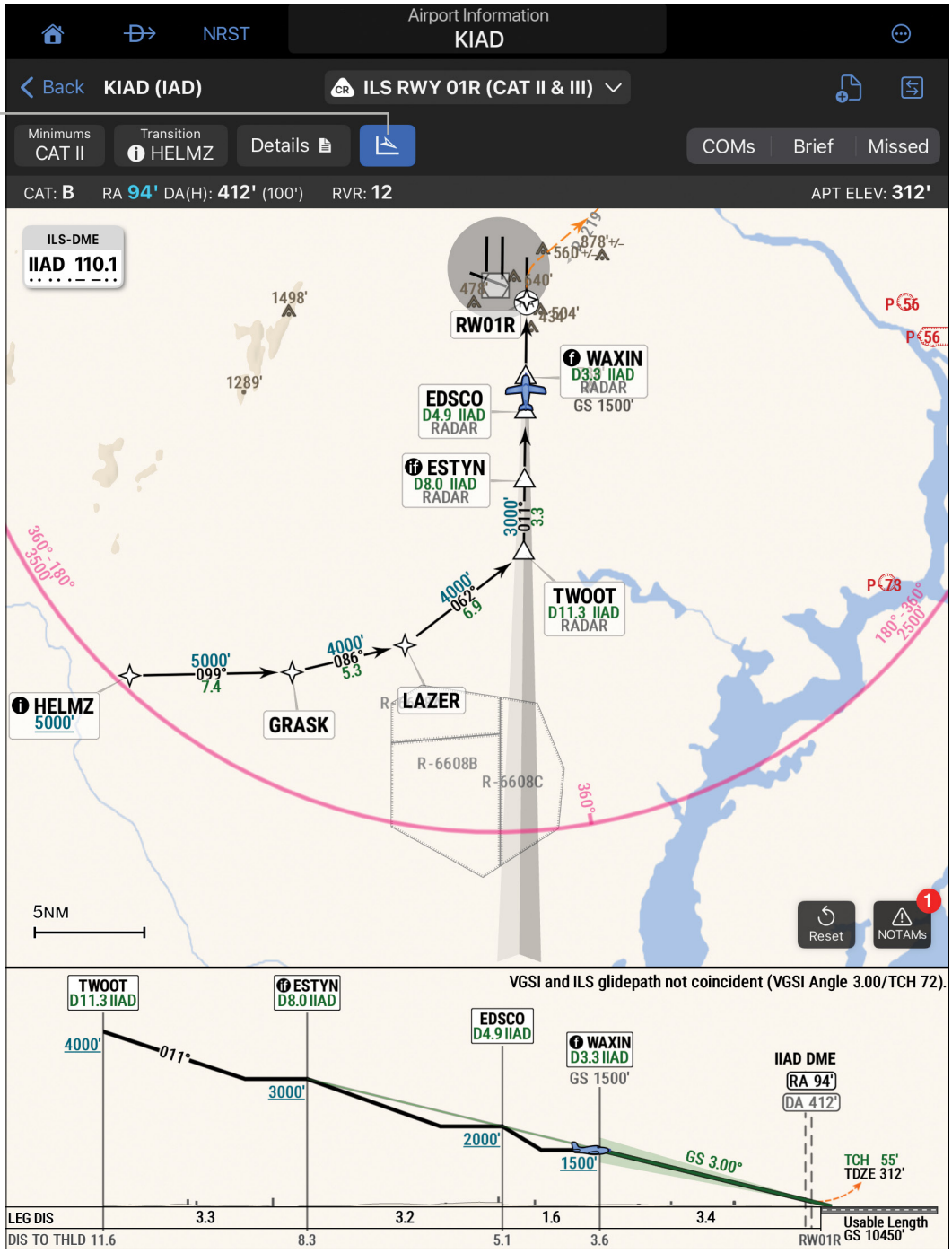
NOTE: *In Landscape screen orientation, toggling*  *allows the User to swap the screen display between Planview and Profile View.*

When viewing an Approach Chart, selecting  will display additional information specific to the approach procedure in a profile view, beneath the plan view, which may include some, or all, of the following items:

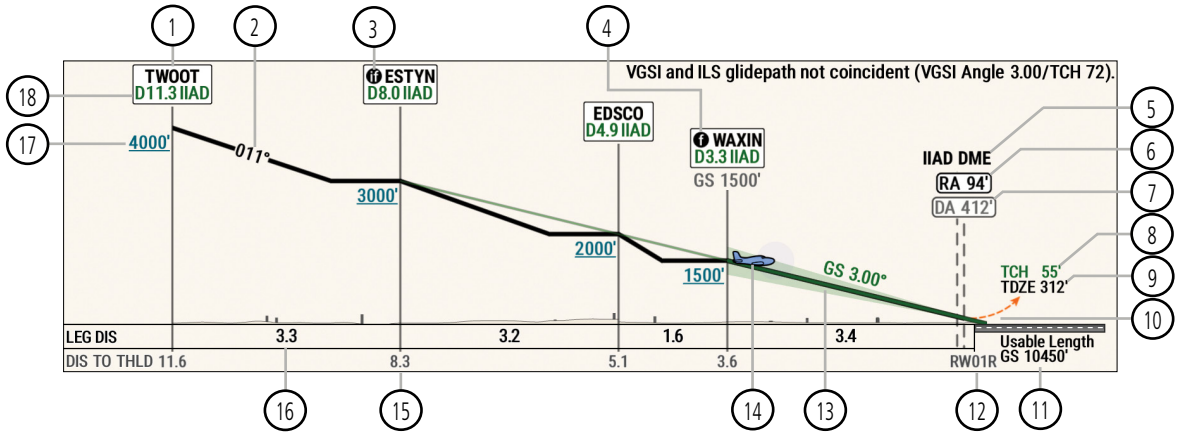
- Name of Fixes/Waypoints.
- Distance to Runway Threshold.
- Procedure Turn(s).
- Outbound Course.
- Inbound Course.
- Runway Depiction.
- Runway ID.
- Touchdown Zone Elevation.
- Threshold Crossing Height.
- Missed Approach Track.
- Georeferenced aircraft depiction.
- Altitude Constraints.
- Glideslope/Glidepath depiction.
- Degree of Glideslope/Glidepath.
- Decision Altitude.
- Radar Altimeter Altitude.
- Usable Runway Length.
- Pertinent Notes.
- Leg Distance.
- Initial Approach Fix.
- Final Approach Fix.

Displaying Profile View:

1) Select  >  > **Charts > SmartCharts.**
2) Scroll down to view an Instrument Approach, if available, then select the desired Approach Procedure (e.g. ILS RWY 01R (CAT II & CAT III) to KIAD).
3) Tap  to toggle Profile View 'On/Off'.



Garmin Pilot iOS - SmartCharts - Approach - Profile View - ILS CAT II & CAT III



Garmin Pilot iOS - SmartCharts - Approach - Profile View - ILS CAT II - Info

1. Name of fix (TWOOT).
2. Final approach course (APCH CRS) heading 011°.
3. Name of intermediate fix (ESTYN).
4. Final Approach Fix (WAXIN).
5. ILS DME Identifier (IIAD).
6. Radar Altimeter (RA) Minimums AGL' (94').
7. Decision Altitude (DA) Minimums MSL' (412').
8. Threshold Crossing Height (TCH) AGL' (55').
9. Touchdown Zone Elevation (TDZE) MSL' (312').
10. Missed Approach track.
11. Usable runway length (10,450') when on Glide Slope (GS).
12. Runway ID (01R).
13. Glide Slope (GS) descent angle (3°).
14. Georeferenced aircraft.
15. Distance to runway threshold (8.3 nm).
16. Leg distance (3.3 nm).
17. Altitude requirement for fix MSL' (at or above 4,000').
18. Distance from ILS DME station (11.3 nm).

PROCEDURE REFERENCE BAR

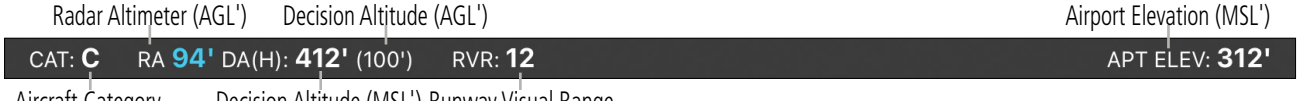
When used for an Approach, the Procedure Reference Bar displays aircraft approach type, Minimum Descent Altitude (MDA), Runway Visual Range (RVR), Visibility, and airport elevation.



Garmin Pilot iOS - SmartCharts - Approach - Procedure Reference Bar - Aircraft Category A



Garmin Pilot iOS - SmartCharts - Approach - Procedure Reference Bar - HELI A



Garmin Pilot iOS - SmartCharts - Approach - Procedure Reference Bar - Aircraft Category C - CAT II



Garmin Pilot iOS - SmartCharts - Approach - Procedure Reference Bar - Aircraft Category C - CAT III

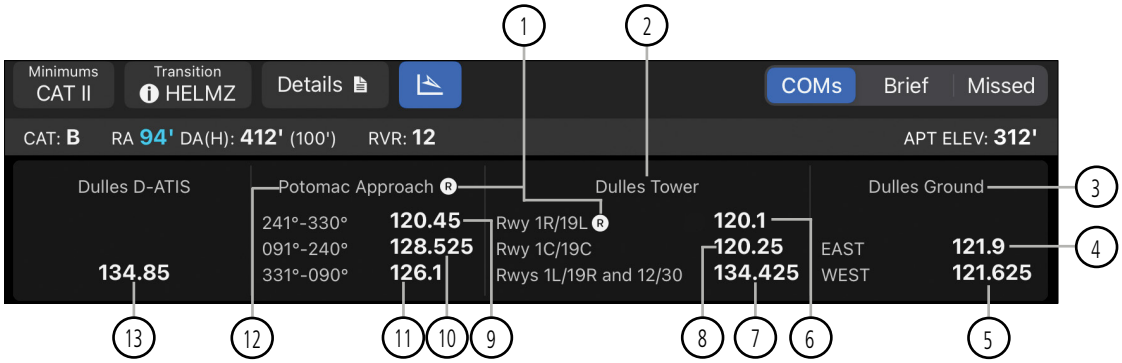
QUICK ACCESS/REFERENCE BUTTONS

COMS

For Approach Procedures, the Quick Access/Reference buttons are COMs, Brief, and Missed. These sections are taken directly from the details window, allow the User to quickly recall pertinent information without having to scroll through the Details window after the chart is set-up correctly. When viewing the Approach, selecting the **COMs** tab will display communications frequencies above the Approach, as a 'header'.

Viewing Communications (COMs) Header:

1) Select > > **Charts > SmartCharts.**
2) Scroll down to view an Instrument Approach, if available, then select the desired Approach Procedure (e.g. ILS RWY 01R (CAT II & CAT III) to KIAD).
3) Tap the **COMs** button to display communication information above the Approach.



Garmin Pilot iOS - SmartCharts - Approach - ILS CAT II - Communications Header

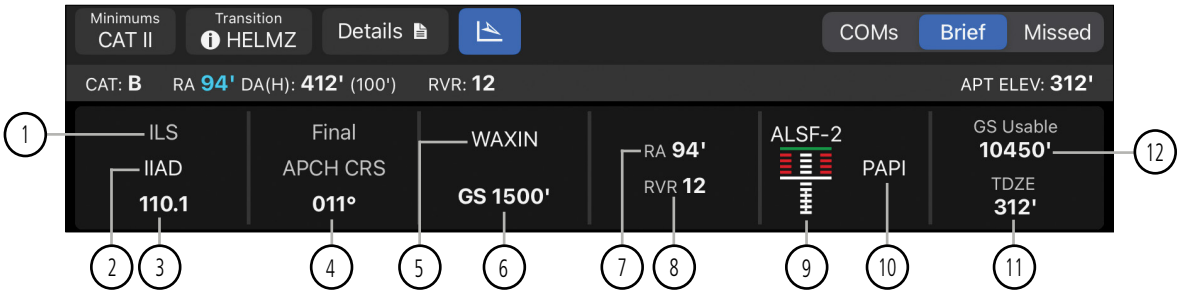
1. Frequency has radar services.
2. Tower name (Dulles).
3. Ground control name (Dulles).
4. When taxiing on the East side of the airport, use the ground frequency 121.9.
5. When taxiing on the West side of the airport, use the ground frequency 121.625.
6. When landing on runway 01 right or runway 19 left, use the frequency 120.1.
7. When landing on runway 01 left, runway 19 right, runway 12, or runway 30, use the frequency 134.425.
8. When landing on runway 01 center or runway 19 center, use the frequency 120.25.
9. When approaching the airport from the cardinal heading range of 241°-330° use the frequency 120.45.
10. When approaching the airport from the cardinal heading range of 91°-240° use the frequency 128.525.
11. When approaching the airport from the cardinal heading range of 331°-90° use the frequency 126.1.
12. Approach name (Potomac).
13. Digital ATIS (D-ATIS) frequency is 134.85.

BRIEF

When viewing the Approach, selecting the **Brief** button will display pertinent information above the Approach, as a 'header'.

Viewing Brief Header:

1) Select  >  > **Charts > SmartCharts.**
2) Scroll down to view an Instrument Approach, if available, then select the desired Approach Procedure (e.g. ILS RWY 01R (CAT II & CAT III) to KIAD).
3) Tap the **Brief** button to display approach information above the Approach.



Garmin Pilot iOS - SmartCharts - Approach - ILS CAT II - Brief Header

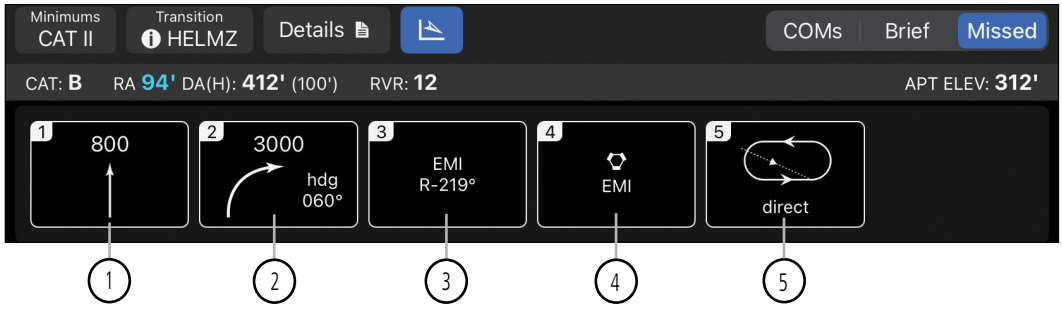
1. Type of approach - ILS (Instrument Landing System).
2. Instrument Landing System identifier (IIAD).
3. Instrument Landing System frequency for the approach.
4. Final approach course (APCH CRS) heading 011°.
5. Name of final approach fix (WAXIN).
6. Glide Slope (GS) intercept altitude (1500' MSL) at final approach fix.
7. Radar Altimeter (RA) height for the selected aircraft category, approach and runway. 94' AGL is the minimum height for the approach.
8. Runway Visual Range (RVR) for the selected aircraft category, approach and runway.
9. Type of Approach Lighting System (ALS) if available. ALSF-2 is available for the selected runway.
10. Type of Visual Glide Slope Indicator (VGSI) if available. Precision Approach Path Indicators (PAPI) are available for the selected runway, and depicted on the Left or Right side of the info box, representing their physical location next to the runway.
11. Touchdown Zone Elevation (TDZE) for the selected runway (312' MSL).
12. Length of usable runway (10,450').

MISSED

When viewing the Approach, selecting the **Missed** button will display the Missed Approach Procedure above the Approach, as a 'header'.

Viewing Missed Header:

1) Select  >  > **Charts > SmartCharts.**
2) Scroll down to view an Instrument Approach, if available, then select the desired Approach Procedure (e.g. ILS RWY 01R (CAT II & CAT III) to KIAD).
3) Tap the **Missed** button to display the missed approach procedure information above the Approach.



Garmin Pilot iOS - SmartCharts - Approach - ILS - CAT II - Missed Header

1. Initial climb (800' MSL).
2. Altitude (3000' MSL) direction of initial turn (right) and heading (060°).
3. Name of NAVAID (EMI) and radial (219°).
4. Name of NAVAID (EMI VORTAC).
5. Hold entry (direct) and pattern (left-hand turns).

Planview

NOTE: *When Circling is selected, the Airport Locator will be replaced by a circling radius when precise runway endpoint locations are known. If that information is unavailable, the circling area will not be depicted and the Airport Locator will remain.*

The Planview area is drawn to scale, which allows a georeferenced aircraft to be displayed, when connected to a compatible position information source. Airport locators show an enhanced view of the airport runway layout, but is not to scale when 'Zoomed-out' on the procedure. Speed and altitude constraints for all applicable waypoints will be displayed.

If the Planview is ''Zoomed-out' to a scale such the speed and/or altitude constraint label is removed, the waypoint symbol or Airport Locator is highlighted to prompt the User to 'Zoom-In' to view the constraint(s).

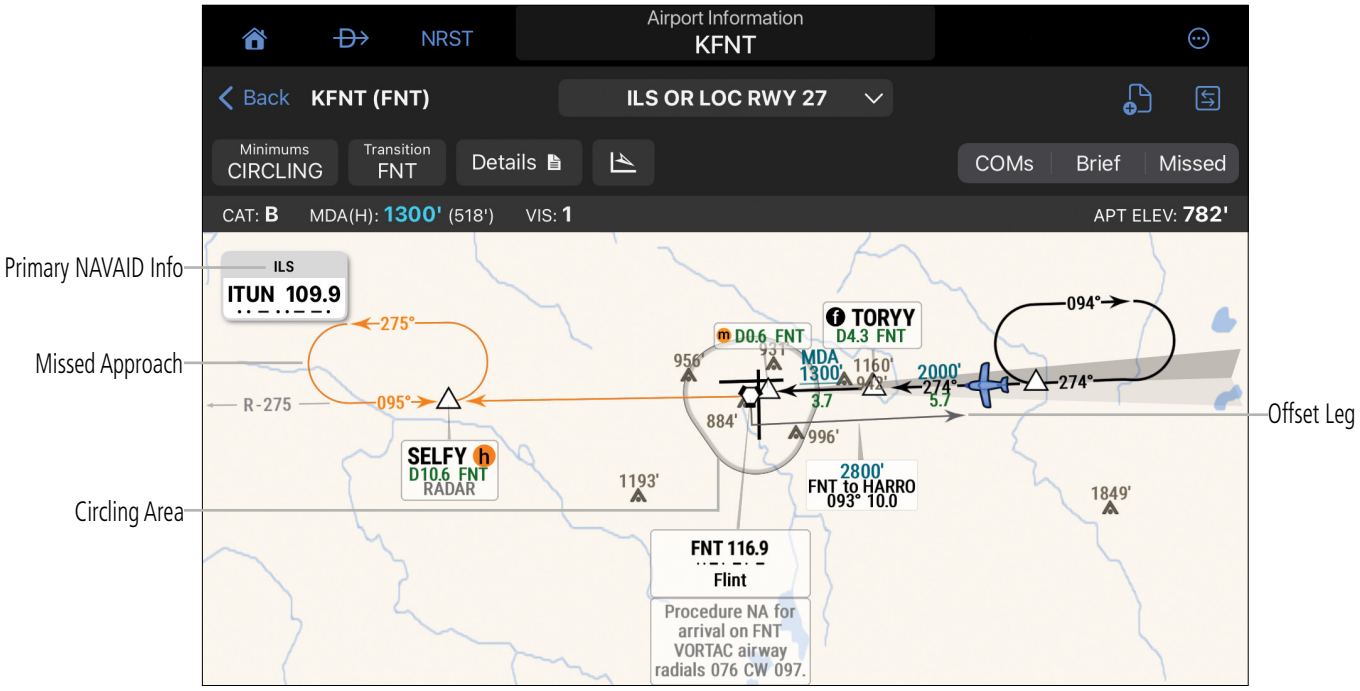
MSA and TAA is shown to scale and their referenced waypoints will match the color of the MSA or TAA.

Holding patterns will be marked with an 'h' symbol on the waypoint, indicating the User will need to 'Zoom-In' to view information.

Offset Legs will be shown and labeled when segments overlap, but will be removed should the User adjust the filters to avoid an overlap.

Missed Approach routes are depicted in the color orange.

ILS and LOC procedures will constantly show the primary NAVAID information in the upper left corner of the Planview.

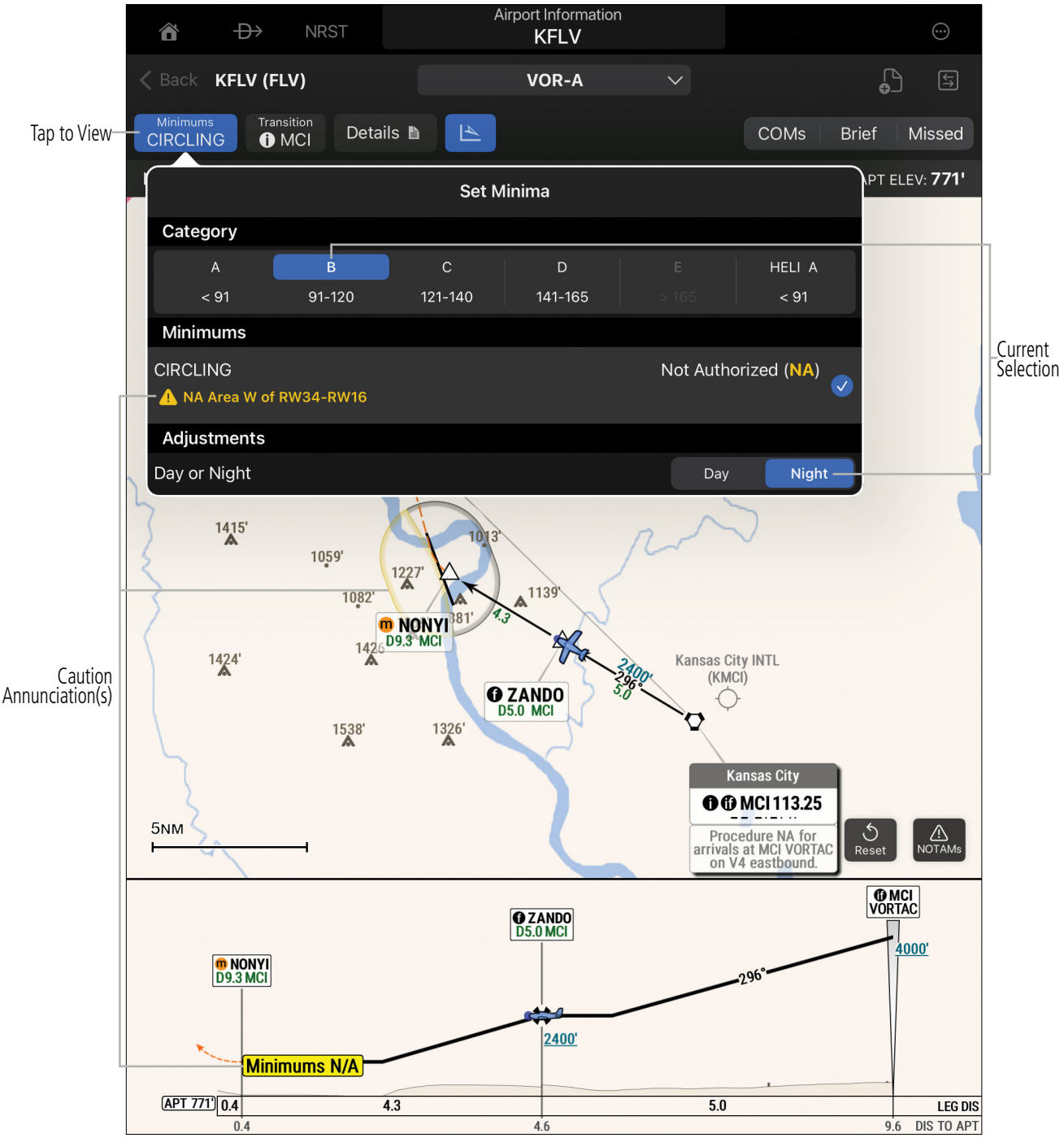


Garmin Pilot iOS - SmartCharts - Approach - ILS - Circling and Offset Legs

APPROACH MINIMA NOT AUTHORIZED

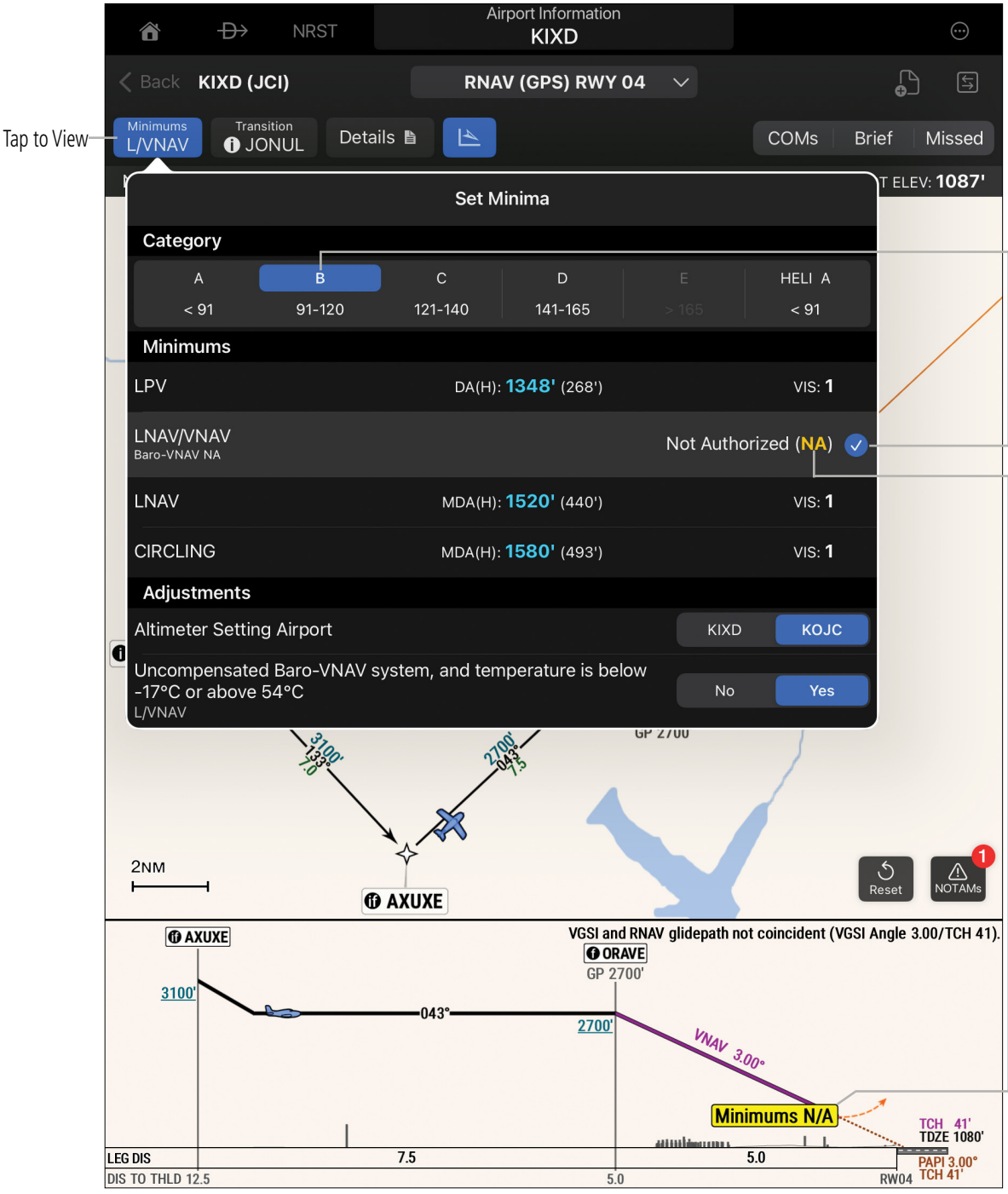
When adjusting/setting the approach minima in SmartCharts, the User will be notified if any criteria is exceeded. For example, when flying the VOR-A approach into KFLV, the User sets the Minimums as **Category B aircraft > Circling > Night.** In the "Set Minima" window on Garmin Pilot, an amber "NA" will be visible under the "Circling" setting.

On the Planview, an amber annunciation is visible stating "Circling NA Area" in the Set Minima window, and in the Procedure Reference Bar, along with an amber shaded area depiction. On the Profile View, an amber annunciation is displayed near the missed approach point stating "Minimums N/A".



Approach - VOR-A - Circling Not Authorized

In the planview, when the procedure minima is not authorized, there will be an amber annunciator "NA" (Not Authorized) in the minimums section and the procedure reference bar. On the Profile View, an amber annunciation is displayed near the missed approach point stating "Minimums N/A".



Approach - RNAV - LNAV/VNAV - Not Authorized

LOCALIZER BACKCOURSE / DME ARC

When used in conjunction with the VOR system, Distance Measuring Equipment (DME) makes it possible for pilots to determine an accurate geographic position of the aircraft, including the bearing and distance TO and FROM the station. When flying a DME arc with wind, it is important to keep a continuous mental picture of the aircraft's position relative to the facility. High airspeeds require more pilot attention because of the higher rate of deviation and correction. Maintaining the arc is simplified by keeping slightly inside the curve, thus, the arc is turning toward the aircraft and interception may be accomplished by holding a straight course.

A Lead Radial is the radial at which the turn from the arc to the inbound course is initiated. When intercepting a radial from a DME arc, the lead varies with arc radius and groundspeed.



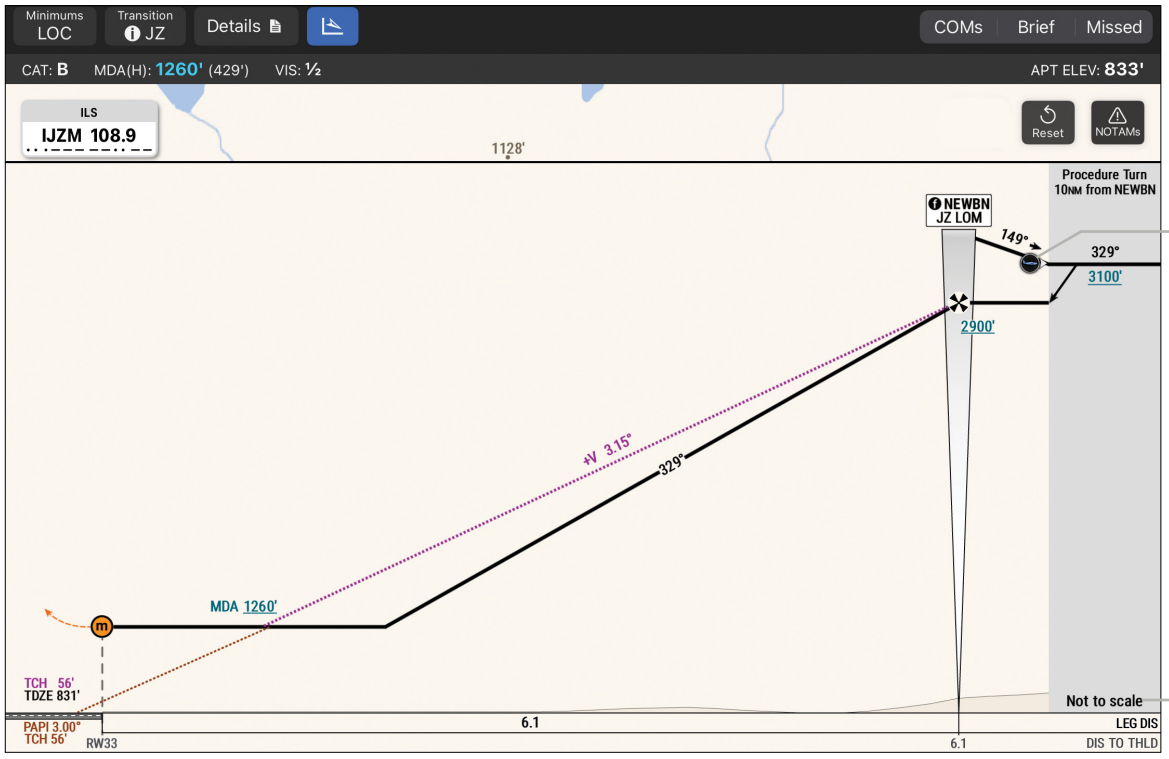
Garmin Pilot iOS - SmartCharts - Approach - Planview - Localizer Back Course & DME Arc - Overview

1	Aircraft Category.	11	Georeferenced aircraft.	21	Inbound Course (degrees).
2	Minimum Descent Altitude (MSL').	12	NAVAID Name and Arc Distance (nautical miles).	22	Intermediate Fix.
3	Height Above Touchdown (ft).	13	Minimum Altitude (MSL') for Arc.	23	Final Approach Fix.
4	Missed Approach has Holding Pattern.	14	Lead Radial from VORTAC (TOP).	24	Minimum Descent Altitude (MSL').
5	Minimum Flight Visibility (statute miles).	15	Minimum Altitude (MSL').	25	Missed Approach Point.
6	Missed Approach Holding Pattern.	16	Minimum Safe Altitude (3,100' MSL) for area and heading (240°-040°).	26	Airport Depiction.
7	Radial From VORTAC (TOP).	17	Minimum Safe Altitude (MSA) depiction.	27	Missed Approach Track.
8	Initial Approach Fix.	18	Back Course depiction.	28	Secondary NAVAID.
9	Airport Elevation (MSL').	19	Initial Approach Fix.	29	Primary NAVAID ID, Frequency, and Name.
10	Distance (nautical miles) From NAVAID.	20	Leg Distance (nautical miles).	30	Localizer ID, Frequency, and Morse Code ID.

Profile View

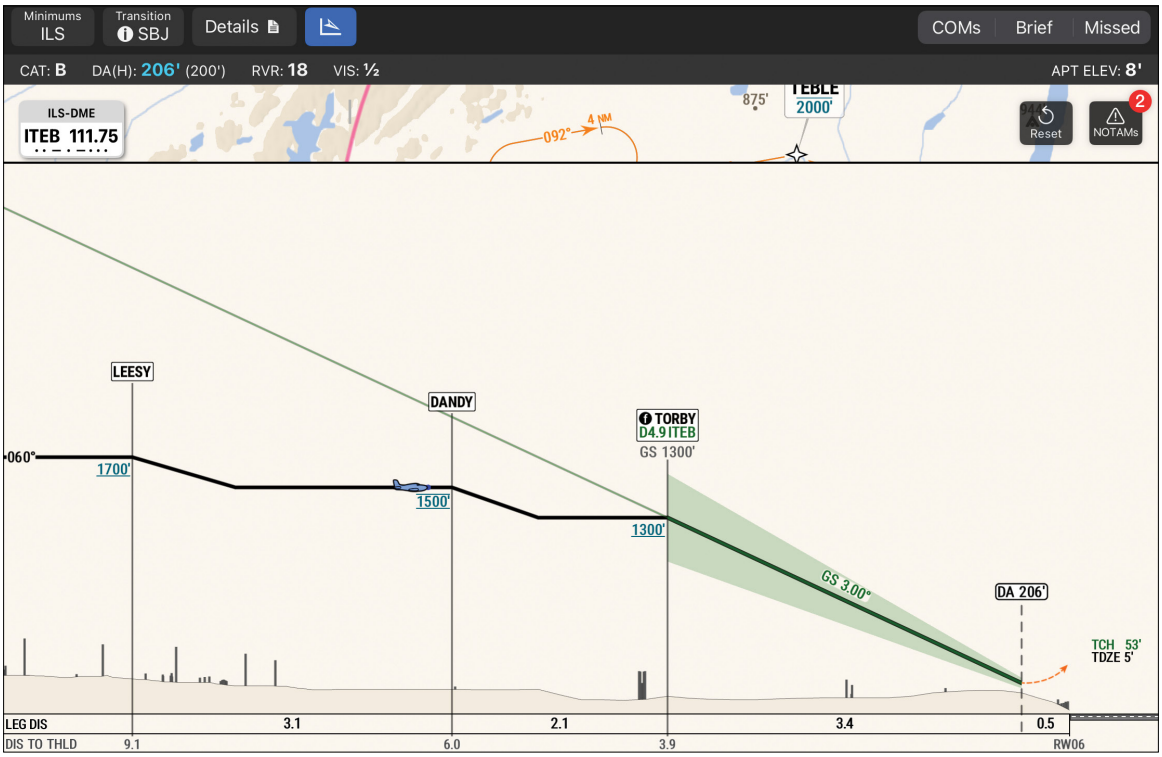
NOTE: *Profile View georeferenced aircraft is depicted via GPS, not barometric altitude, even when Garmin Pilot is connected to the avionics via Connext. This depiction is for reference only and should not be used for navigation purposes.*

The Profile View is drawn to scale, with a few exceptions. With certain features, such as course reversals, the Profile View shows a small, grey area on the far left or right, which is not to scale and will not depict the georeferenced aircraft, instead,  will be displayed indicating the direction of flight with a white arrow, next to an encircled aircraft.



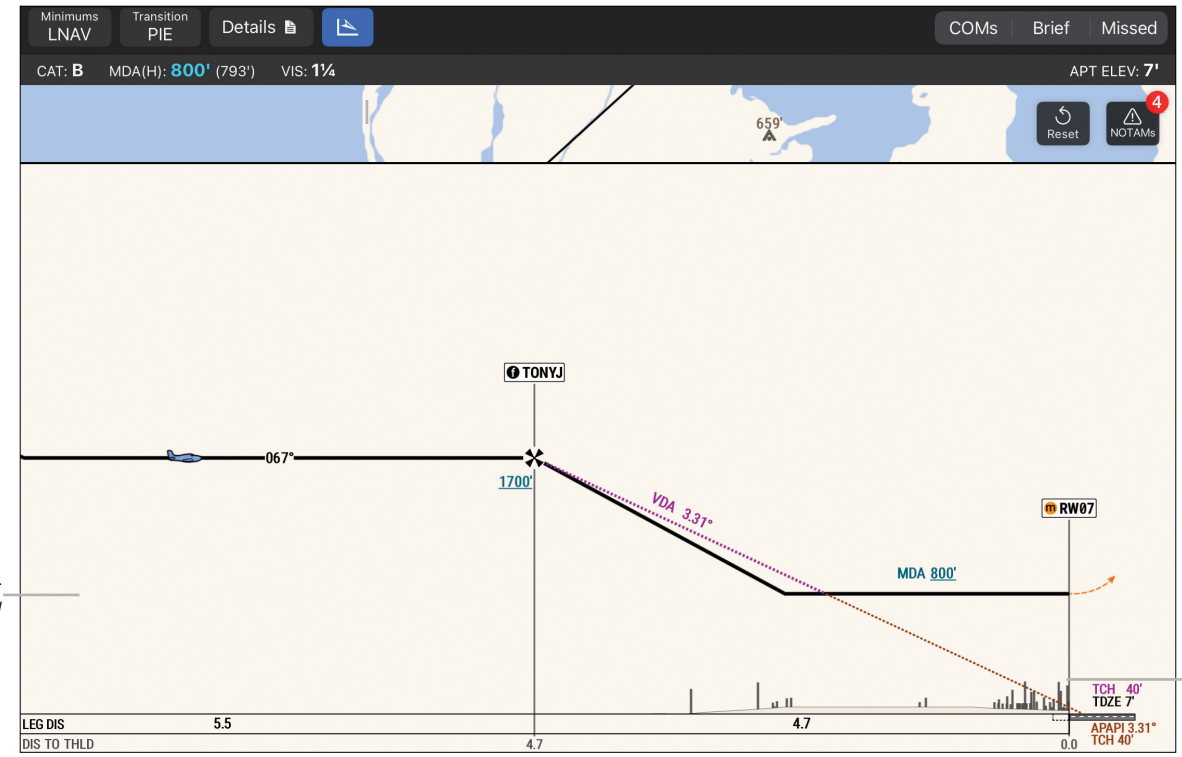
Garmin Pilot iOS - SmartCharts - KLWC - Approach - ILS - Profile View - Landscape Orientation - Not to Scale Aircraft Location

The to scale depiction can also allow pilots to visualize the descent profile, allowing for increased situational awareness, e.g, when landing at KTEB on the ILS Z or LOC Z RWY 06, the pilot will miss the mandatory altitude at DANDY if they intercept the glideslope too early.



Garmin Pilot iOS - SmartCharts - KTEB - Approach - ILS Z or LOC Z - RWY06 - Profile View - Landscape Orientation

Occasionally, the entire Profile View may not fit on the screen. In that case, scroll left or right by swiping on the Profile View.

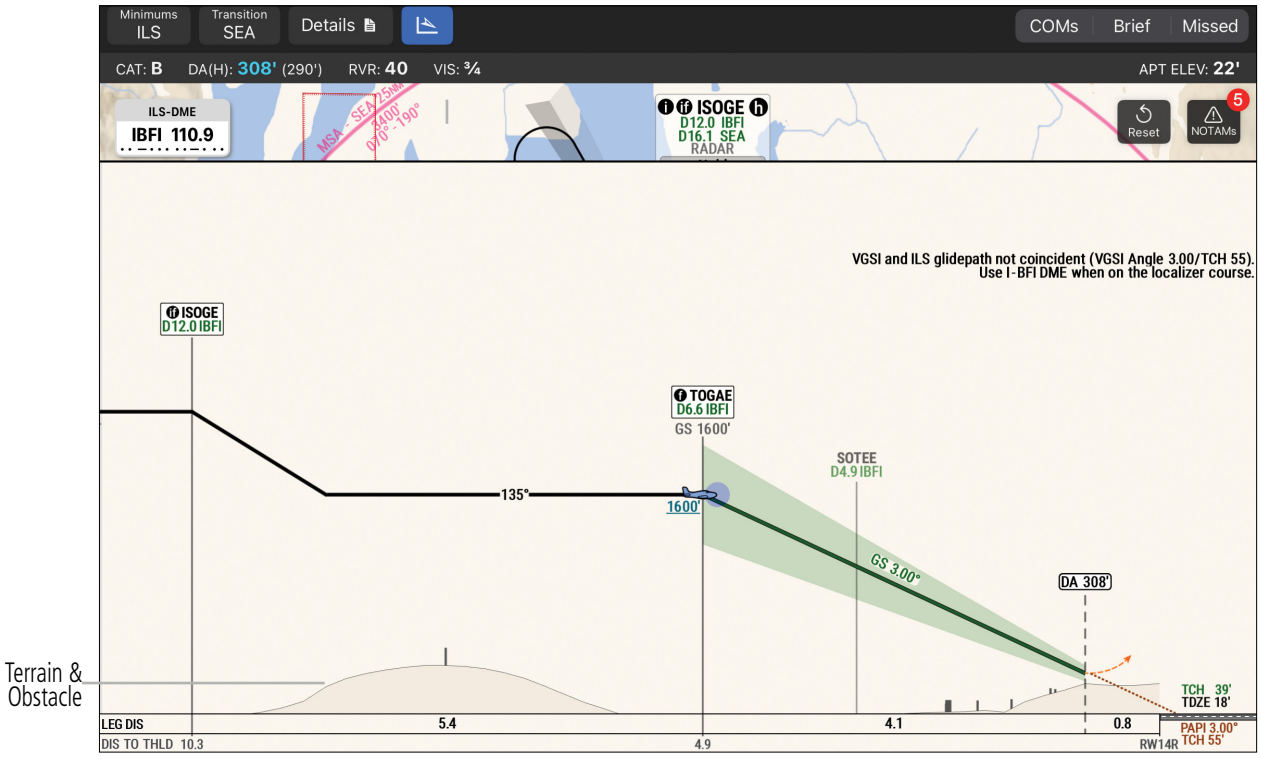


Scroll Left-Right to View

Obstacles

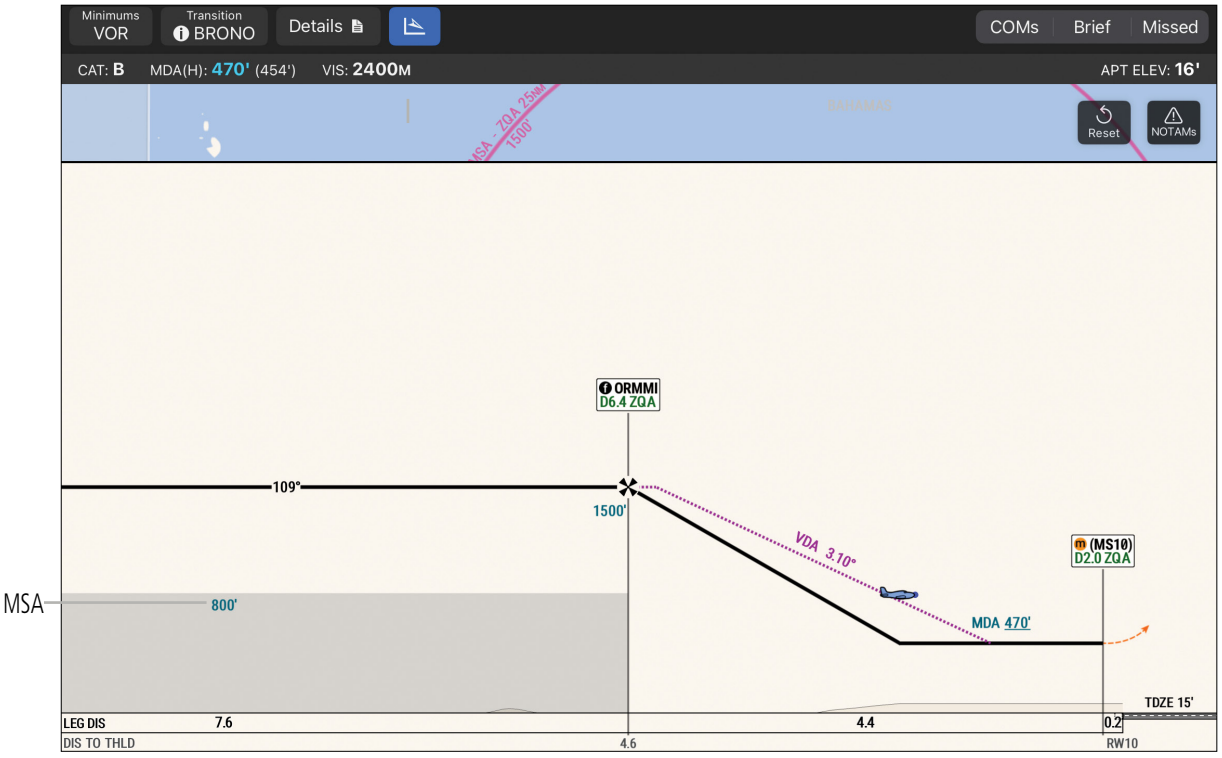
Garmin Pilot iOS - SmartCharts - KSPG - Approach - RNAV - RWY07 - Profile View - Landscape Orientation

Terrain and Obstacles are shown on the Profile View based on a decreasing swath width as you approach the runway. Due to this swath width, some procedures may have Obstacles or Terrain shown in the path, this is expected and designed for increased situational awareness.



Garmin Pilot iOS - SmartCharts - KBFI - Approach - ILS or LOC - RWY14R - Profile View - Landscape Orientation

In some regions, the Profile View depicts Segment MSA altitudes as a shaded area over the top of terrain and obstacles.



Garmin Pilot iOS - SmartCharts - MYNN - Approach - VOR Y - RWY10 - Profile View - Landscape Orientation

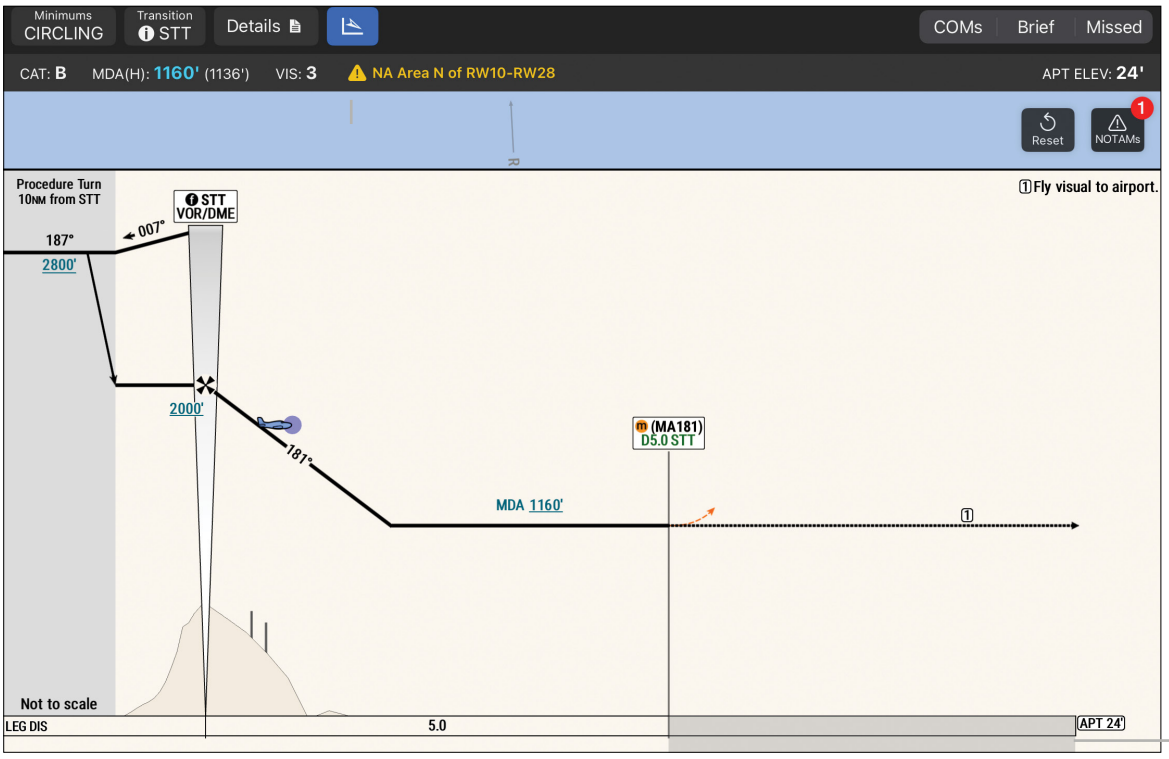
When a Decision Altitude (DA) is changed via Minima Adjustments, the distance between the DA and runway will change according to the glideslope. This distance is calculated dynamically by SmartCharts and will be depicted on the Profile View.

The Final Approach Fix is identified on SmartCharts in the Profile View as such, (f ORMMI) with the 'f' next to the applicable fix name. This differs from other charting providers' depictions (e.g. FAA uses a lightning bolt arrow).

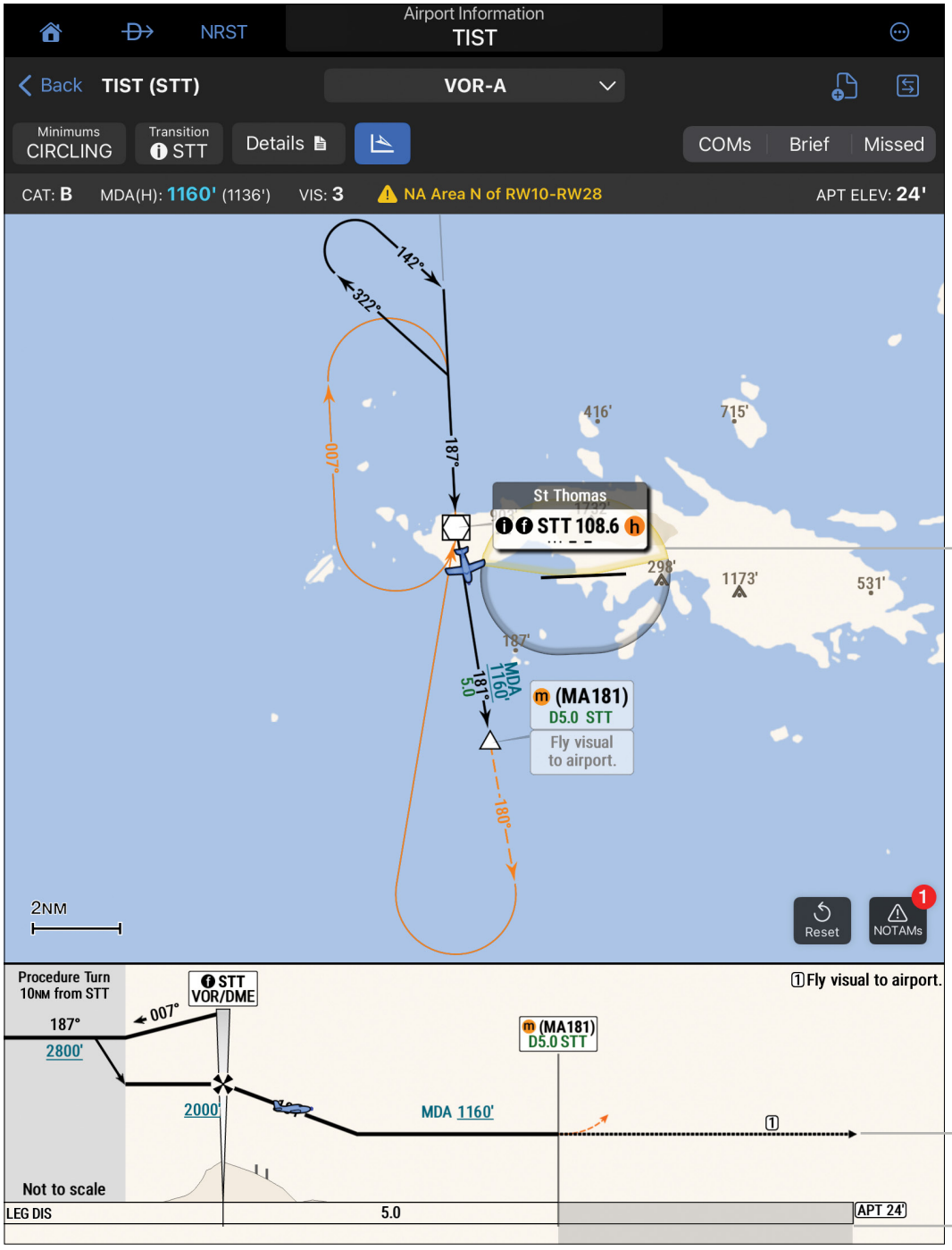
When the glideslope crossing altitude and glideslope intercept altitude are the same, the altitude will only be shown once on the Profile View as the glideslope intercept altitude (the crossing altitude will be omitted).

When a circling approach is selected, the Profile View will depict a distance between the missed approach point (MAP) and the airport. This distance is calculated from the MAP to the airport reference point (ARP), which may or may not, be located near the end of the landing runway.

For procedures containing fly visual segments, the distance scale segment is greyed out as an indication that no obstacles or terrain is shown on the fly visual segment and the leg distance is removed. The bottom distance scale, distance to airport, or distance to threshold, is removed.



Garmin Pilot iOS - SmartCharts - TIST - Approach - VOR-A - Profile View - Landscape Orientation



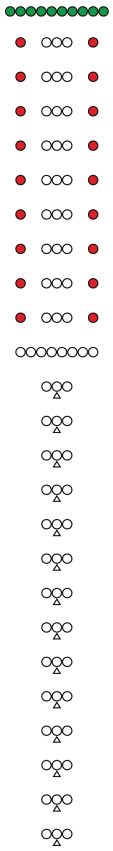
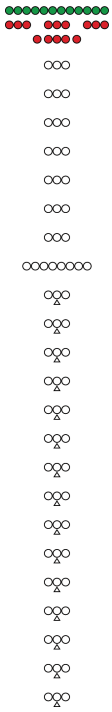
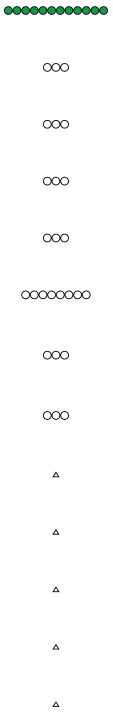
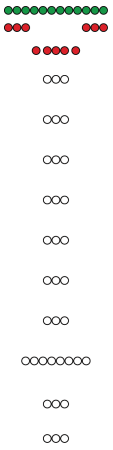
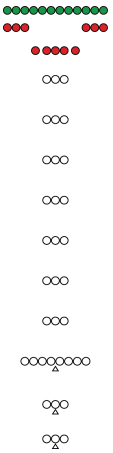
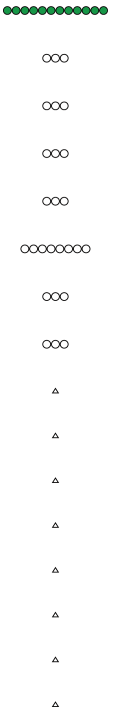
Garmin Pilot iOS - SmartCharts - TIST Approach - VOR-A - Visual Segment - Circling Not Authorized

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LEGEND

U.S. TERMINAL PROCEDURES SYMBOLS & LEGEND

Symbols shown are for the Terminal Procedures Publication (TPP), which includes Standard Terminal Arrival (Arrival Procedures) Charts, Departure Procedures (DPs), Instrument Approach Procedures (IAP), and Airport Diagrams.

Approach Lighting Systems								
ALSF-2	ALSF-1	MALS SSALS	MALSF SSALF	MALSR	SALS	SALSF	SSALR	ODALS
								

Approach Lighting Systems

GARMIN

Charting Symbols					
	Civil Airport	if	Intermediate Fix		Fly-Over Intersection w/Airspeed Restriction
	Airport Closed	i if	Initial Approach Fix & Intermediate Approach Fix		Fly-Over Intersection w/Airspeed & Altitude Restriction
	Generic Airport	m	Missed Approach Point		Fly-Over Intersection w/Altitude Restriction
H	Heliport	DA DA	Decision Altitude (Day/Night)		Fly-By DME Compulsory Reporting Point
	Joint Use Airport	P P	Precision Approach Path Indicator - PAPI (Day/Night)		Fly-By DME Non-compulsory Reporting Point
	Military Airport	RA RA	Radar Altimeter (Day/Night)		Fly-By DME Non-compulsory w/Airspeed Restriction
COP COP	Change Over Point (Day/Night)	V V	Visual Approach Slope Indicator - VASI (Day/Night)		Fly-By DME Non-compulsory w/Airspeed & Altitude Restriction
h	Hold Procedure		Fly-By Intersection Compulsory Reporting Point		Fly-By DME Non-compulsory w/Altitude Restriction
h	Hold is Not Part of Procedure		Fly-By Intersection Non-compulsory Reporting Point		Fly-Over DME Compulsory Reporting Point
h	Missed Approach Hold		Fly-By Intersection w/Airspeed Restriction		Fly-Over DME Non-compulsory Reporting Point
f	Final Approach Fix		Fly-By Intersection w/Airspeed & Altitude Restriction		Fly-Over DME Non-compulsory w/Airspeed Restriction
i	Initial Approach Fix		Fly-By Intersection w/Altitude Restriction		Fly-Over DME Non-compulsory w/Airspeed & Altitude Restriction
i f	Initial Approach Fix & Final Approach Fix		Fly-Over Intersection Compulsory Reporting Point		Fly-Over DME Non-compulsory w/Altitude Restriction
i m	Initial Approach Fix & Missed Approach Point		Fly-Over Intersection Non-compulsory Reporting Point		NAVAID

Charting Symbols

Charting Symbols					
	Fly-By Locator Outer Marker (LOM) Non-compulsory Reporting Point		Fly-By NDB/DME Non-compulsory Reporting Point w/Airspeed Restriction		Fly-Over TACAN Non-compulsory Reporting Point
	Fly-By Marker Non-compulsory Reporting Point		Fly-By NDB/DME Non-compulsory Reporting Point w/Airspeed & Altitude Restriction		Fly-Over TACAN Non-compulsory Reporting Point w/Airspeed Restriction
	Fly-By Non-Directional Beacon (NDB) Compulsory Reporting Point		Fly-By NDB/DME Non-compulsory Reporting Point w/Altitude Restriction		Fly-Over TACAN Non-compulsory Reporting Point w/Airspeed & Altitude Restriction
	Fly-By NDB Non-compulsory Reporting Point		Fly-Over NDB/DME Compulsory Reporting Point		Fly-Over TACAN Non-compulsory Reporting Point w/Altitude Restriction
	Fly-By NDB Non-compulsory Reporting Point w/Airspeed Restriction		Fly-Over NDB/DME Non-compulsory Reporting Point		Fly-By VOR Compulsory Reporting Point
	Fly-By NDB Non-compulsory Reporting Point w/Airspeed & Altitude Restriction		Fly-Over NDB/DME Non-compulsory Reporting Point w/Airspeed Restriction		Fly-By VOR Non-compulsory Reporting Point
	Fly-By NDB Non-compulsory Reporting Point w/Altitude Restriction		Fly-Over NDB Non-compulsory Reporting Point w/Airspeed & Altitude Restriction		Fly-By VOR Non-compulsory Reporting Point w/Airspeed Restriction
	Fly-Over NDB Compulsory Reporting Point		Fly-Over NDB Non-compulsory Reporting Point w/Altitude Restriction		Fly-By VOR Non-compulsory Reporting Point w/Airspeed & Altitude Restriction
	Fly-Over NDB Non-compulsory Reporting Point		Fly-By TACAN Compulsory Reporting Point		Fly-By VOR Non-compulsory Reporting Point w/Altitude Restriction
	Fly-Over NDB Non-compulsory Reporting Point w/Airspeed Restriction		Fly-By TACAN Non-compulsory Reporting Point		Fly-Over VOR Compulsory Reporting Point
	Fly-Over NDB Non-compulsory Reporting Point w/Airspeed & Altitude Restriction		Fly-By TACAN Non-compulsory Reporting Point w/Airspeed Restriction		Fly-Over VOR Non-compulsory Reporting Point
	Fly-Over NDB Non-compulsory Reporting Point w/Altitude Restriction		Fly-By TACAN Non-compulsory Reporting Point w/Airspeed & Altitude Restriction		Fly-Over VOR Non-compulsory Reporting Point w/Airspeed Restriction
	Fly-By NDB/DME Compulsory Reporting Point		Fly-By TACAN Non-compulsory Reporting Point w/Altitude Restriction		Fly-Over VOR Non-compulsory Reporting Point w/Airspeed & Altitude Restriction
	Fly-By NDB/DME Non-compulsory Reporting Point		Fly-Over TACAN Compulsory Reporting Point		Fly-Over VOR Non-compulsory Reporting Point w/Altitude Restriction

Charting Symbols

Charting Symbols					
	Fly-By VOR/DME Compulsory Reporting Point		Fly-By VORTAC Non-compulsory Reporting Point w/Airspeed Restriction		Fly-By RNAV Non-compulsory Reporting Point w/Altitude Restriction
	Fly-By VOR/DME Non-compulsory Reporting Point		Fly-By VORTAC Non-compulsory Reporting Point w/Airspeed & Altitude Restriction		Fly-Over RNAV Compulsory Reporting Point
	Fly-By VOR/DME Non-compulsory Reporting Point w/Airspeed Restriction		Fly-By VORTAC Non-compulsory Reporting Point w/Altitude Restriction		Fly-Over RNAV Non-compulsory Reporting Point
	Fly-By VOR/DME Non-compulsory Reporting Point w/Airspeed & Altitude Restriction		Fly-Over VORTAC Compulsory Reporting Point		Fly-Over RNAV Non-compulsory Reporting Point w/Airspeed Restriction
	Fly-By VOR/DME Non-compulsory Reporting Point w/Altitude Restriction		Fly-Over VORTAC Non-compulsory Reporting Point		Fly-Over RNAV Non-compulsory Reporting Point w/Airspeed & Altitude Restriction
	Fly-Over VOR/DME Compulsory Reporting Point		Fly-Over VORTAC Non-compulsory Reporting Point w/Airspeed Restriction		Fly-Over RNAV Non-compulsory Reporting Point w/Altitude Restriction
	Fly-Over VOR/DME Non-compulsory Reporting Point		Fly-Over VORTAC Non-compulsory Reporting Point w/Airspeed & Altitude Restriction		Fly-Over Runway
	Fly-Over VOR/DME Non-compulsory Reporting Point w/Airspeed Restriction		Fly-Over VORTAC Non-compulsory Reporting Point w/Altitude Restriction		Fly-By Runway
	Fly-Over VOR/DME Non-compulsory Reporting Point w/Airspeed & Altitude Restriction		Fly-By RNAV Compulsory Reporting Point		Airport Beacon (Day/Night)
	Fly-Over VOR/DME Non-compulsory Reporting Point w/Altitude Restriction		Fly-By RNAV Non-compulsory Reporting Point		Windsock
	Fly-By VORTAC Compulsory Reporting Point		Fly-By RNAV Non-compulsory Reporting Point w/Airspeed Restriction		Non-Precision Approach Final Approach Fix
	Fly-By VORTAC Non-compulsory Reporting Point		Fly-By RNAV Non-compulsory Reporting Point w/Airspeed & Altitude Restriction		Visual Descent Point

Charting Symbols

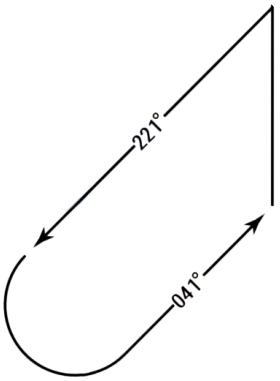
ROUTES

Procedure Track

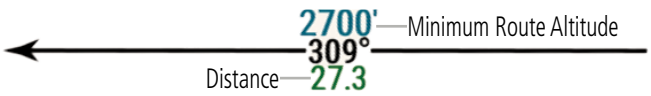
Feeder Route

Missed Approach

Heading Legs



Procedure Turn



ALTITUDES

10000' Mandatory Altitude

11000' Minimum Altitude

7000' Maximum Altitude

17000' / 13000' Mandatory Block Altitude

3600' Recommended Altitude

INDICATED AIRSPEED

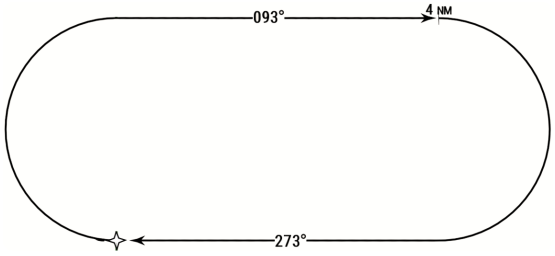
280KT Mandatory Airspeed

230KT Maximum Airspeed

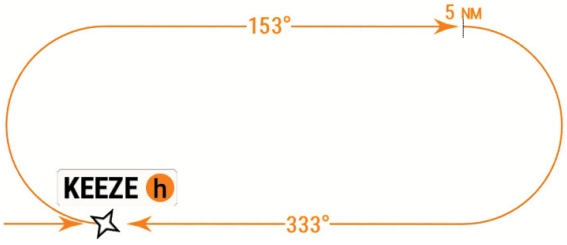
210KT Minimum Airspeed

250KT Recommended Airspeed

HOLDING PATTERNS



Hold-in-lieu



Missed Approach Holding Pattern



ILS - Vectors - Planview



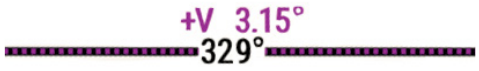
Glidepath - GNSS to DA - Profile View



Conventional Glideslope to DA - Profile View



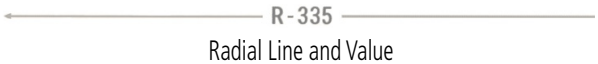
Vertical Navigation to MDA - Profile View



Vertical Guidance to MDA - Profile View



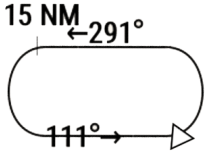
Visual Descent Angle to MDA - Profile View



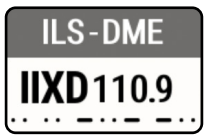
Radial Line and Value



VOR/VORTAC ID & Lead Radial



Arrival Holding Pattern



Primary NAVAID



Secondary NAVAID



TACAN or DME NAVAID



Runway ID



EMAS



Hot Spot



Displaced Threshold



Grass/Turf Runway



Waterway

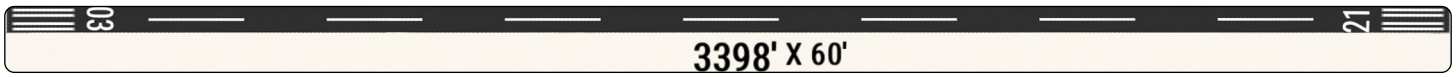


Gravel Runway

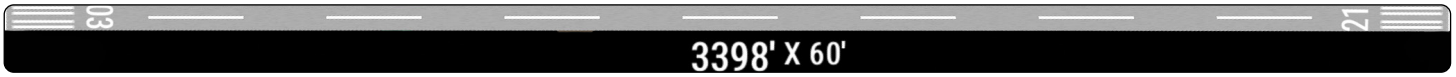
SmartCharts - Planview Symbols - Legend - Instrument Approach Procedures



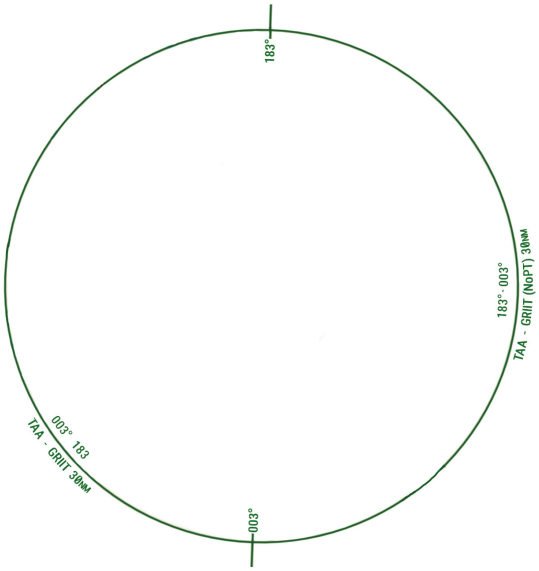
Dirt/Unpaved Runway



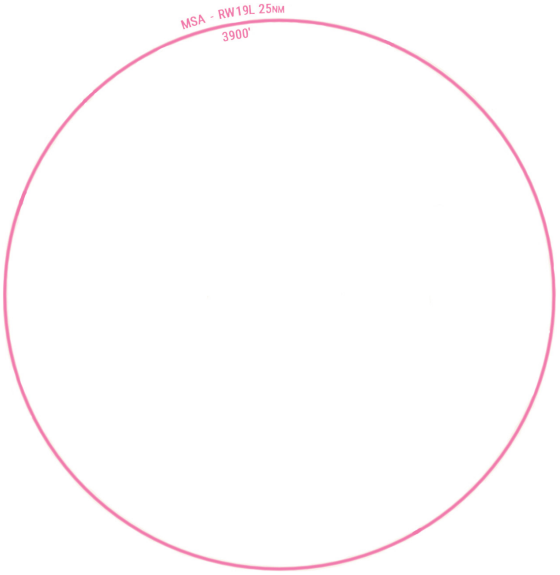
Paved Runway - Day Mode



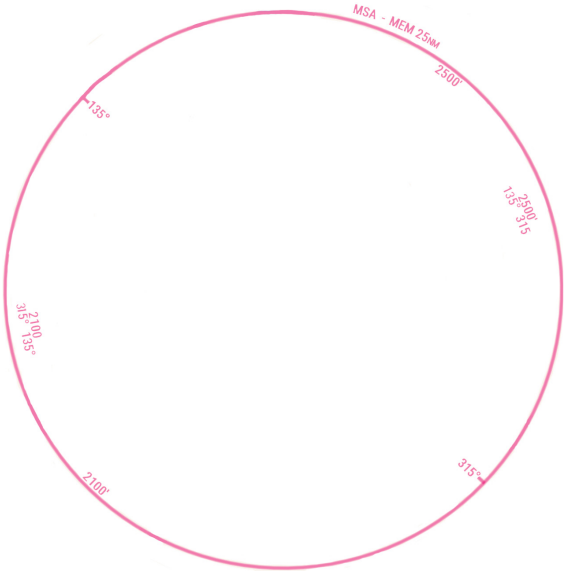
Paved Runway - Night Mode



Terminal Arrival Area - TAA



Minimum Safe Altitude - MSA - Runway ID



Minimum Safe Altitude - MSA - Airport ID

MISCELLANEOUS



International Boundary (Day)

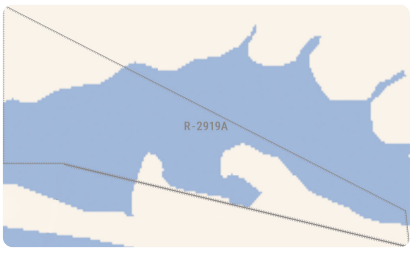


International Boundary (Night)

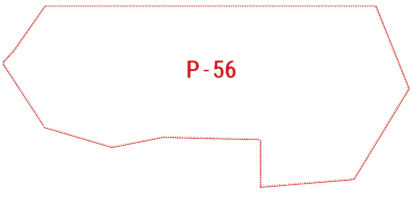
OBSTACLES



SPECIAL USE AIRSPACE



Restricted Airspace



Prohibited Airspace

SmartCharts - Profile View Symbols - Legend - Instrument Approach Procedures Cont'd

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GLOSSARY

NOTE: *This glossary provides definitions commonly used in the aviation industry, along with some unique to Garmin publications. While many items were included, not all the terms of basic aeronautical nomenclature are listed.*

A

14 CFR. See Title 14 of the Code of Federal Regulations.

100-hour inspection. An inspection identical in scope to an annual inspection. Conducted every 100 hours of flight on aircraft of under 12,500 pounds that are used to carry passengers for hire.

Absolute accuracy. The ability to determine present position in space independently, and is most often used by pilots.

Absolute altitude. The actual distance between an aircraft and the terrain over which it is flying.

Absolute pressure. Pressure measured from the reference of zero pressure, or a vacuum.

A.C. Alternating current.

Acceleration. Force involved in overcoming inertia, and which may be defined as a change in velocity per unit of time.

Acceleration error. A magnetic compass error apparent when the aircraft accelerates while flying on an easterly or westerly heading, causing the compass card to rotate toward North.

Accelerate-go distance. The distance required to accelerate to V1 with all engines at takeoff power, experience an engine failure at V1, and continue the takeoff on the remaining engine(s). The runway required includes the distance required to climb to 35 feet by which time V2 speed must be attained.

Accelerate-stop distance. The distance required to accelerate to V1 with all engines at takeoff power, experience an engine failure at V1, and abort the takeoff and bring the airplane to a stop using braking action only (use of thrust reversing is not considered).

Accelerometer. A part of an inertial navigation system (INS) that accurately measures the force of acceleration in one direction.

ADC. See air data computer.

ADF. See automatic direction finder.

ADI. See attitude director indicator.

Adiabatic cooling. A process of cooling the air through expansion. For example, as air moves up slope it expands with the reduction of atmospheric pressure and cools as it expands.

Adiabatic heating. A process of heating dry air through compression. For example, as air moves down a slope it is compressed, which results in an increase in temperature.

Adjustable-pitch propeller. A propeller with blades whose pitch can be adjusted on the ground with the engine not running, but which cannot be adjusted in flight. Also referred to as a ground adjustable propeller. Sometimes also used to refer to constant-speed propellers that are adjustable in flight.

Adjustable stabilizer. A stabilizer that can be adjusted in flight to trim the airplane, thereby allowing the airplane to fly hands-off at any given airspeed.

ADM. See aeronautical decision-making.

ADS-B. See automatic dependent surveillance-broadcast.

Advection fog. Fog resulting from the movement of warm, humid air over a cold surface.

Adverse yaw. A condition of flight in which the nose of an airplane tends to yaw toward the outside of the turn. This is caused by the higher induced drag on the outside wing, which is also producing more lift. Induced drag is a by-product of the lift associated with the outside wing.

Aerodynamics. The science of the action of air on an object, and with the motion of air on other gases. Aerodynamics deals with the production of lift by the aircraft, the relative wind, and the atmosphere.

Aeronautical chart. A map used in air navigation containing all or part of the following: topographic features, hazards and obstructions, navigation aids, navigation routes, designated airspace, and airports.

Aeronautical decision-making (ADM). A systematic approach to the mental process used by pilots to consistently determine the best course of action in response to a given set of circumstances.

Agonic line. An irregular imaginary line across the surface of the Earth along which the magnetic and geographic poles are in alignment, and along which there is no magnetic variation.

Ailerons. Primary flight control surfaces mounted on the trailing edge of an airplane wing, near the tip. Ailerons control roll about the longitudinal axis.

Aircraft. A device that is used, or intended to be used, for flight.

Aircraft altitude. The actual height above sea level at which the aircraft is flying.

Aircraft approach category. A performance grouping of aircraft based on a speed of 1.3 times the stall speed in the landing configuration at maximum gross landing weight.

Air data computer (ADC). An aircraft computer that receives and processes pitot pressure, static pressure, and temperature to calculate very precise altitude, indicated airspeed, true airspeed, and air temperature.

Airfoil. Any surface, such as a wing, propeller, rudder, or even a trim tab, which provides aerodynamic force when it interacts with a moving stream of air.

Air mass. An extensive body of air having fairly uniform properties of temperature and moisture.

AIRMET. In-flight weather advisory issued as an amendment to the area forecast, concerning weather phenomena of operational interest to all aircraft and that is potentially hazardous to aircraft with limited capability due to lack of equipment, instrumentation, or pilot qualifications.

Airplane. An engine-driven, fixed-wing aircraft heavier than air that is supported in flight by the dynamic reaction of air against its wings.

Airplane Flight Manual (AFM). A document developed by the airplane manufacturer and approved by the Federal Aviation Administration (FAA). It is specific to a particular make and model airplane by serial number and it contains operating procedures and limitations.

Airplane Owner/Information Manual. A document developed by the airplane manufacturer containing general information about the make and model of an airplane. The airplane owner's manual is not FAA approved and is not specific to a particular serial numbered airplane. This manual is not kept current, and therefore cannot be substituted for the AFM/POH.

Airport diagram. The section of an instrument approach procedure chart that shows a detailed diagram of the airport. This diagram includes surface features and airport configuration information.

Airport/Facility Directory (A/FD). See Chart Supplement U.S.

Airport surface detection equipment (ASDE). Radar equipment specifically designed to detect all principal features and traffic on the surface of an airport, presenting the entire image on the control tower console; used to augment visual observation by tower personnel of aircraft and/or vehicular movements on runways and taxiways.

Airport surveillance radar (ASR). Approach control radar used to detect and display an aircraft's position in the terminal area.

Airport surveillance radar approach. An instrument approach in which ATC issues instructions for pilot compliance based on aircraft position in relation to the final approach course and the distance from the end of the runway as displayed on the controller's radar scope.

Air route surveillance radar (ARSR). Air route traffic control center (ARTCC) radar used primarily to detect and display an aircraft's position while en route between terminal areas.

Air route traffic control center (ARTCC). Provides ATC service to aircraft operating on IFR flight plans within controlled airspace and principally during the en route phase of flight.

Airspeed. Rate of the aircraft's progress through the air.

Airspeed indicator. A differential pressure gauge that measures the dynamic pressure of the air through which the aircraft is flying. Displays the craft's airspeed, typically in knots, to the pilot.

Air traffic control radar beacon system (ATCRBS). Sometimes called secondary surveillance radar (SSR), which utilizes a transponder in the aircraft. The ground equipment is an interrogating unit, in which the beacon antenna is mounted so it rotates with the surveillance antenna. The interrogating unit transmits a coded pulse sequence that actuates the aircraft transponder. The transponder answers the coded sequence by transmitting a preselected coded sequence back to the ground equipment, providing a strong return signal and positive aircraft identification, as well as other special data.

Airway. An airway is based on a centerline that extends from one navigation aid or intersection to another navigation aid (or through several navigation aids or intersections); used to establish a known route for en route procedures between terminal areas.

Airworthiness Certificate. A certificate issued by the FAA to all aircraft that have been proven to meet the minimum standards set down by the Code of Federal Regulations.

Airworthiness Directive. A regulatory notice sent out by the FAA to the registered owner of an aircraft informing the owner of a condition that prevents the aircraft from continuing to meet its conditions for airworthiness. Airworthiness Directives (AD notes) are to be complied with within the required time limit, and the fact of compliance, the date of compliance, and the method of compliance are recorded in the aircraft's maintenance records.

Alert area. An area in which there is a high volume of pilot training or an unusual type of aeronautical activity.

Almanac data. Information the global positioning system (GPS) receiver can obtain from one satellite which describes the approximate orbital positioning of all satellites in the constellation. This information is necessary for the GPS receiver to know what satellites to look for in the sky at a given time.

ALS. See approach lighting system.

Alt. maximum landing weight (MLDW). Maximum landing weight aircraft is allowed at the alternate airport.

Alt. planned landing weight (PLDW). Estimated landing weight upon reaching the alternate airport.

Alt. maximum runway landing weight (MRLW). Maximum performance limit for the applicable runway based on planned conditions and aircraft configuration for landing at the alternate airport.

Alternate airport. An airport designated in an IFR flight plan, providing a suitable destination if a landing at the intended airport becomes inadvisable.

Alternate static source valve. A valve in the instrument static air system that supplies reference air pressure to the altimeter, airspeed indicator, and vertical speed indicator if the normal static pickup should become clogged or iced over.

Altimeter. A flight instrument that indicates altitude by sensing pressure changes.

Altimeter setting. Station pressure (the barometric pressure at the location the reading is taken) which has been corrected for the height of the station above sea level.

Altitude engine. A reciprocating aircraft engine having a rated takeoff power that is producible from sea level to an established higher altitude.

Ambient pressure. The pressure in the area immediately surrounding the aircraft.

Ambient temperature. The temperature in the area immediately surrounding the aircraft.

AME. See aviation medical examiner.

Amendment status. The circulation date and revision number of an instrument approach procedure, printed above the procedure identification.

Ammeter. An instrument installed in series with an electrical load used to measure the amount of current flowing through the load.

Aneroid. The sensitive component in an altimeter or barometer that measures the absolute pressure of the air. It is a sealed, flat capsule made of thin disks of corrugated metal soldered together and evacuated by pumping all of the air out of it.

Aneroid barometer. An instrument that measures the absolute pressure of the atmosphere by balancing the weight of the air above it against the spring action of the aneroid.

Angle of attack. The angle of attack is the angle at which relative wind meets an airfoil. It is the angle that is formed by the chord of the airfoil and the direction of the relative wind or between the chord line and the flight path. The angle of attack changes during a flight as the pilot changes the direction of the aircraft and is related to the amount of lift being produced.

Angle of incidence. The acute angle formed between the chord line of an airfoil and the longitudinal axis of the aircraft on which it is mounted.

Anhedral. A downward slant from root to tip of an aircraft's wing or horizontal tail surface.

Annual inspection. A complete inspection of an aircraft and engine, required by the Code of Federal Regulations, to be accomplished every 12 calendar months on all certificated aircraft. Only an A&P technician holding an Inspection Authorization can conduct an annual inspection.

Anti-ice. Preventing the accumulation of ice on an aircraft structure via a system designed for that purpose.

Antiservo tab. An adjustable tab attached to the trailing edge of a stabilator that moves in the same direction as the primary control. It is used to make the stabilator less sensitive.

Approach lighting system (ALS). Provides lights that will penetrate the atmosphere far enough from Touchdown to give directional, distance, and glidepath information for safe transition from instrument to visual flight.

Area chart. Part of the low-altitude en route chart series, this chart furnishes terminal data at a larger scale for congested areas.

Area forecast (FA). A report that gives a picture of clouds, general weather conditions, and visual meteorological conditions (VMC) expected over a large area encompassing several states.

Area navigation (RNAV). Allows a pilot to fly a selected course to a predetermined point without the need to overfly ground-based navigation facilities, by using waypoints.

Arm. See moment arm.

ARSR. See air route surveillance radar. ARTCC. See air route traffic control center. ASDE. See airport surface detection equipment.

ASOS. See Automated Surface Observing System. Aspect ratio. Span of a wing divided by its average chord. ASR. See airport surveillance radar.

Asymmetric thrust. Also known as P-factor. A tendency for an aircraft to yaw to the left due to the descending propeller blade on the right producing more thrust than the ascending blade on the left. This occurs when the aircraft's longitudinal axis is in a climbing attitude in relation to the relative wind. The P-factor would be to the right if the aircraft had a counterclockwise rotating propeller.

ATC. Air Traffic Control.

ATCRBS. See air traffic control radar beacon system.

ATIS. See automatic terminal information service.

Atmospheric propagation delay. A bending of the electromagnetic (EM) wave from the satellite that creates an error in the GPS system.

Attitude. A personal motivational predisposition to respond to persons, situations, or events in a given manner that can, nevertheless, be changed or modified through training as sort of a mental shortcut to decision-making.

Attitude and heading reference system (AHRS). A system composed of three-axis sensors that provide heading, attitude, and yaw information for aircraft. AHRS are designed to replace traditional mechanical gyroscopic flight instruments and provide superior reliability and accuracy.

Attitude director indicator (ADI). An aircraft attitude indicator that incorporates flight command bars to provide pitch and roll commands.

Attitude indicator. The foundation for all instrument flight, this instrument reflects the airplane's attitude in relation to the horizon.

Attitude instrument flying. Controlling the aircraft by reference to the instruments rather than by outside visual cues.

Attitude management. The ability to recognize hazardous attitudes in oneself and the willingness to modify them as necessary through the application of an appropriate antidote thought.

Autokinesis. Nighttime visual illusion that a stationary light is moving, which becomes apparent after several seconds of staring at the light.

Automated Surface Observing System (ASOS). Weather reporting system which provides surface observations every minute via digitized voice broadcasts and printed reports.

Automated Weather Observing System (AWOS). Automated weather reporting system consisting of various sensors, a processor, a computer-generated voice subsystem, and a transmitter to broadcast weather data.

Automatic dependent surveillance—broadcast (ADS–B). A function on an aircraft or vehicle that periodically broadcasts its state vector (i.e., horizontal and vertical position, horizontal and vertical velocity) and other information.

Automatic direction finder (ADF). Electronic navigation equipment that operates in the low- and medium-frequency bands. Used in conjunction with the ground-based nondirectional beacon (NDB), the instrument displays the number of degrees clockwise from the nose of the aircraft to the station being received.

Automatic terminal information service (ATIS). The continuous broadcast of recorded non-control information in selected terminal areas. Its purpose is to improve controller effectiveness and relieve frequency congestion by automating repetitive transmission of essential but routine information.

Autopilot. An automatic flight control system which keeps an aircraft in level flight or on a set course. Automatic pilots can be directed by the pilot, or they may be coupled to a radio navigation signal.

Aviation medical examiner (AME). A physician with training in aviation medicine designated by the Civil Aerospace Medical Institute (CAMI).

Aviation Routine Weather Report (METAR). Observation of current surface weather reported in a standard international format.

AWOS. See Automated Weather Observing System.

Axes of an aircraft. Three imaginary lines that pass through an aircraft's center of gravity. The axes can be considered as imaginary axles around which the aircraft rotates. The three axes pass through the center of gravity at 90° angles to each other. The axis from nose to tail is the longitudinal axis (pitch), the axis that passes from wingtip to wingtip is the lateral axis (roll), and the axis that passes vertically through the center of gravity is the vertical axis (yaw).

Axial flow compressor. A type of compressor used in a turbine engine in which the airflow through the compressor is essentially linear. An axial-flow compressor is made up of several stages of alternate rotors and stators. The compressor ratio is determined by the decrease in area of the succeeding stages.

Azimuth card. A card that may be set, gyroscopically controlled, or driven by a remote compass.

B

Back course (BC). The reciprocal of the localizer course for an ILS. When flying a back-course approach, an aircraft approaches the instrument runway from the end at which the localizer antennas are installed.

Balance tab. An auxiliary control mounted on a primary control surface, which automatically moves in the direction opposite the primary control to provide an aerodynamic assist in the movement of the control.

Baro-aiding. A method of augmenting the GPS integrity solution by using a nonsatellite input source. To ensure that baro-aiding is available, the current altimeter setting must be entered as described in the operating manual.

Barometric scale. A scale on the dial of an altimeter to which the pilot sets the barometric pressure level from which the altitude shown by the pointers is measured.

Basic empty weight (GAMA). Basic empty weight includes the standard empty weight plus optional and special equipment that has been installed.

BC. See back course.

Bernoulli's Principle. A principle that explains how the pressure of a moving fluid varies with its speed of motion. An increase in the speed of movement causes a decrease in the fluid's pressure.

Biplanes. Airplanes with two sets of wings.

Block altitude. A block of altitudes assigned by ATC to allow altitude deviations; for example, "Maintain block altitude 9 to 11 thousand."

Bypass ratio. The ratio of the mass airflow in pounds per second through the fan section of a turbofan engine to the mass airflow that passes through the gas generator portion of the engine.

C

Cabin altitude. Cabin pressure in terms of equivalent altitude above sea level.

Cage. The black markings on the ball instrument indicating its neutral position.

Calibrated. The instrument indication compared with a standard value to determine the accuracy of the instrument.

Calibrated orifice. A hole of specific diameter used to delay the pressure change in the case of a vertical speed indicator.

Calibrated airspeed. The speed at which the aircraft is moving through the air, found by correcting IAS for instrument and position errors.

Camber. The camber of an airfoil is the characteristic curve of its upper and lower surfaces. The upper camber is more pronounced, while the lower camber is comparatively flat. This causes the velocity of the airflow immediately above the wing to be much higher than that below the wing.

Canard. A horizontal surface mounted ahead of the main wing to provide longitudinal stability and control. It may be a fixed, movable, or variable geometry surface, with or without control surfaces.

Canard configuration. A configuration in which the span of the forward wings is substantially less than that of the main wing.

Cantilever. A wing designed to carry loads without external struts.

CAS. Calibrated airspeed.

CDI. Course deviation indicator.

Ceiling. The height above the earth's surface of the lowest layer of clouds, which is reported as broken or overcast, or the vertical visibility into an obscuration.

Center of gravity (CG). The point at which an airplane would balance if it were possible to suspend it at that point. It is the mass center of the airplane, or the theoretical point at which the entire weight of the airplane is assumed to be concentrated. It may be expressed in inches from the reference datum, or in percentage of mean aerodynamic chord (MAC). The location depends on the distribution of weight in the airplane.

Center of gravity limits. The specified forward and aft points within which the CG must be located during flight. These limits are indicated on pertinent airplane specifications.

Center of gravity range. The distance between the forward and aft CG limits indicated on pertinent airplane specifications.

Center of pressure. A point along the wing chord line where lift is considered to be concentrated. For this reason, the center of pressure is commonly referred to as the center of lift.

Centrifugal flow compressor. An impeller-shaped device that receives air at its center and slings the air outward at high velocity into a diffUser for increased pressure. Also referred to as a radial outflow compressor.

Centrifugal force. An outward force that opposes centripetal force, resulting from the effect of inertia during a turn.

Centripetal force. A center-seeking force directed inward toward the center of rotation created by the horizontal component of lift in turning flight.

CG. See center of gravity.

Changeover point (COP). A point along the route or airway segment between two adjacent navigation facilities or waypoints where changeover in navigation guidance should occur.

Chart Supplement U.S. (formerly Airport/Facility Directory). An FAA publication containing information on all airports, communications, and NAVAIDs.

Checklist. A tool that is used as a human factors aid in aviation safety. It is a systematic and sequential list of all operations that must be performed to properly accomplish a task.

Chord line. An imaginary straight line drawn through an airfoil from the leading edge to the trailing edge.

Circling approach. A maneuver initiated by the pilot to align the aircraft with a runway for landing when a straight- in landing from an instrument approach is not possible or is not desirable.

Class A airspace. Airspace from 18,000 feet MSL up to and including FL 600, including the airspace overlying the waters within 12 NM of the coast of the 48 contiguous states and Alaska; and designated international airspace beyond 12 NM of the coast of the 48 contiguous states and Alaska within areas of domestic radio navigational signal or ATC radar coverage, and within which domestic procedures are applied.

Class B airspace. Airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports in terms of IFR operations or passenger numbers. The configuration of each Class B airspace is individually tailored and consists of a surface area and two or more layers, and is designed to contain all published instrument procedures once an aircraft enters the airspace. For all aircraft, an ATC clearance is required to operate in the area, and aircraft so cleared receive separation services within the airspace.

Class C airspace. Airspace from the surface to 4,000 feet above the airport elevation (charted in MSL) surrounding those airports having an operational control tower, serviced by radar approach control, and having a certain number of IFR operations or passenger numbers. Although the configuration of each Class C airspace area is individually tailored, the airspace usually consists of a 5 NM radius core surface area that extends from the surface up to 4,000 feet above the airport elevation, and a 10 NM radius shelf area that extends from 1,200 feet to 4,000 feet above the airport elevation.

Class D airspace. Airspace from the surface to 2,500 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower. The configuration of each Class D airspace area is individually tailored, and when instrument procedures are published, the airspace is normally designed to contain the procedures.

Class E airspace. Airspace that is not Class A, Class B, Class C, or Class D, and is controlled airspace.

Class G airspace. Airspace that is uncontrolled, except when associated with a temporary control tower, and has not been designated as Class A, Class B, Class C, Class D, or Class E airspace.

Clean configuration. A configuration in which all flight control surfaces have been placed to create minimum drag. In most aircraft this means flaps and gear retracted.

Clearance. ATC permission for an aircraft to proceed under specified traffic conditions within controlled airspace, for the purpose of providing separation between known aircraft.

Clearance delivery. Control tower position responsible for transmitting departure clearances to IFR flights.

Clearance limit. The fix, point, or location to which an aircraft is cleared when issued an air traffic clearance.

Clearance on request. An IFR clearance not yet received after filing a flight plan.

Clearance void time. Used by ATC, the time at which the departure clearance is automatically canceled if takeoff has not been made. The pilot must obtain a new clearance or cancel the IFR flight plan if not off by the specified time.

Clear ice. Glossy, clear, or translucent ice formed by the relatively slow freezing of large, supercooled water droplets.

Coefficient of lift (CL). The ratio between lift pressure and dynamic pressure.

Cold front. The boundary between two air masses where cold air is replacing warm air.

Compass course. A true course corrected for variation and deviation errors.

Compass locator. A low-power, low- or medium-frequency (L/MF) radio beacon installed at the site of the outer or middle marker of an ILS.

Compass rose. A small circle graduated in 360° increments, to show direction expressed in degrees.

Complex aircraft. An aircraft with retractable landing gear, flaps, and a controllable-pitch propeller.

Compressor pressure ratio. The ratio of compressor discharge pressure to compressor inlet pressure.

Compressor stall. In gas turbine engines, a condition in an axial-flow compressor in which one or more stages of rotor blades fail to pass air smoothly to the succeeding stages. A stall condition is caused by a pressure ratio that is incompatible with the engine rpm. Compressor stall will be indicated by a rise in exhaust temperature or rpm fluctuation, and if allowed to continue, may result in flameout and physical damage to the engine.

Computer navigation fix. A point used to define a navigation track for an airborne computer system such as GPS or FMS.

Concentric rings. Dashed-line circles depicted in the plan view of IAP charts, outside of the reference circle, that show en route and feeder facilities.

Condensation. A change of state of water from a gas (water vapor) to a liquid.

Condensation nuclei. Small particles of solid matter in the air on which water vapor condenses.

Cone of confusion. A cone-shaped volume of airspace directly above a VOR station where no signal is received, causing the CDI to fluctuate.

Configuration. This is a general term, which normally refers to the position of the landing gear and flaps.

Constant-speed propeller. A controllable-pitch propeller whose pitch is automatically varied in flight by a governor to maintain a constant rpm in spite of varying air loads.

Continuous flow oxygen system. System that supplies a constant supply of pure oxygen to a rebreather bag that dilutes the pure oxygen with exhaled gases and thus supplies a healthy mix of oxygen and ambient air to the mask. Primarily used in passenger cabins of commercial airliners.

Control and performance. A method of attitude instrument flying in which one instrument is used for making attitude changes, and the other instruments are used to monitor the progress of the change.

Control display unit. A display interfaced with the master computer, providing the pilot with a single control point for all navigations systems, thereby reducing the number of required flight deck panels.

Controllability. A measure of the response of an aircraft relative to the pilot's flight control inputs.

Controllable-pitch propeller (CPP). A type of propeller with blades that can be rotated around their long axis to change their pitch. If the pitch can be set to negative values, the reversible propeller can also create reverse thrust for braking or reversing without the need of changing the direction of shaft revolutions.

Controlled airspace. An airspace of defined dimensions within which ATC service is provided to IFR and VFR flights in accordance with the airspace classification. It includes Class A, Class B, Class C, Class D, and Class E airspace.

Control pressures. The amount of physical exertion on the control column necessary to achieve the desired attitude.

Convective weather. Unstable, rising air found in cumuliform clouds.

Convective SIGMET. Weather advisory concerning convective weather significant to the safety of all aircraft, including thunderstorms, hail, and tornadoes.

Conventional landing gear. Landing gear employing a third rear-mounted wheel. These airplanes are also sometimes referred to as tailwheel airplanes.

Coordinated flight. Flight with a minimum disturbance of the forces maintaining equilibrium, established via effective control use.

COP. See changeover point.

Coriolis illusion. The illusion of rotation or movement in an entirely different axis, caused by an abrupt head movement, while in a prolonged constant-rate turn that has ceased to stimulate the brain's motion sensing system.

Coupled ailerons and rudder. Rudder and ailerons are connected with interconnected springs in order to counteract adverse yaw. Can be overridden if it becomes necessary to slip the aircraft.

Course. The intended direction of flight in the horizontal plane measured in degrees from north.

Cowl flaps. Shutter-like devices arranged around certain air-cooled engine cowlings, which may be opened or closed to regulate the flow of air around the engine.

Crew resource management (CRM). The application of team management concepts in the flight deck environment. It was initially known as cockpit resource management, but as CRM programs evolved to include cabin crews, maintenance personnel, and others, the phrase "crew resource management" was adopted. This includes single pilots, as in most general aviation aircraft. Pilots of small aircraft, as well as crews of larger aircraft, must make effective use of all available resources; human resources, hardware, and information. A current definition includes all groups routinely working with the flight crew who are involved in decisions required to operate a flight safely. These groups include, but are not limited to pilots, dispatchers, cabin crew members, maintenance personnel, and air traffic controllers. CRM is one way of addressing the challenge of optimizing the human/machine interface and accompanying interpersonal activities.

Critical altitude. The maximum altitude under standard atmospheric conditions at which a turbocharged engine can produce its rated horsepower.

Critical angle of attack. The angle of attack at which a wing stalls regardless of airspeed, flight attitude, or weight.

Critical areas. Areas where disturbances to the ILS localizer and glideslope courses may occur when surface vehicles or aircraft operate near the localizer or glideslope antennas.

CRM. See crew resource management.

Cross-check. The first fundamental skill of instrument flight, also known as "scan," the continuous and logical observation of instruments for attitude and performance information.

Cruise clearance. An ATC clearance issued to allow a pilot to conduct flight at any altitude from the minimum IFR altitude up to and including the altitude specified in the clearance. Also authorizes a pilot to proceed to and make an approach at the destination airport.

Current induction. An electrical current being induced into, or generated in, any conductor that is crossed by lines of flux from any magnet.

D

DA. See decision altitude.

Datum (Reference Datum). An imaginary vertical plane or line from which all measurements of arm are taken. The datum is established by the manufacturer. Once the datum has been selected, all moment arms and the location of CG range are measured from this point.

D.C. Direct current.

Dark adaptation. Physical and chemical adjustments of the eye that make vision possible in relative darkness.

Dead reckoning. Navigation of an airplane solely by means of computations based on airspeed, course, heading, wind direction and speed, groundspeed, and elapsed time.

Deceleration error. A magnetic compass error that occurs when the aircraft decelerates while flying on an easterly or westerly heading, causing the compass card to rotate toward South.

Decision altitude (DA). A specified altitude in the precision approach, charted in feet MSL, at which a missed approach must be initiated if the required visual reference to continue the approach has not been established.

Decision height (DH). A specified altitude in the precision approach, charted in height above threshold elevation, at which a decision must be made either to continue the approach or to execute a missed approach.

Deice. The act of removing ice accumulation from an aircraft structure.

Delta. A Greek letter expressed by the symbol Δ to indicate a change of values. As an example, ΔCG indicates a change (or movement) of the CG.

Density altitude. Pressure altitude corrected for nonstandard temperature. Density altitude is used in computing the performance of an aircraft and its engines.

Departure procedure (DP). Preplanned IFR ATC departure, published for pilot use, in textual and graphic format.

Deposition. The direct transformation of a gas to a solid state, in which the liquid state is bypassed. Some sources use sublimation to describe this process instead of deposition.

Dest. planned landing weight (PLDW). Estimated landing weight upon reaching primary airport.

Dest. maximum landing weight (MLDW). Maximum landing weight aircraft is allowed at the destination.

Dest. runway maximum landing weight (MRLW). Maximum performance limit for the applicable runway based on planned conditions and aircraft configuration for landing.

Detonation. The sudden release of heat energy from fuel in an aircraft engine caused by the fuel-air mixture reaching its critical pressure and temperature. Detonation occurs as a violent explosion rather than a smooth burning process.

Deviation. A magnetic compass error caused by local magnetic fields within the aircraft. Deviation error is different on each heading.

Dew. Moisture that has condensed from water vapor. Usually found on cooler objects near the ground, such as grass, as the near-surface layer of air cools faster than the layers of air above it.

Dewpoint. The temperature at which air reaches a state where it can hold no more water.

DGPS. Differential global positioning system.

DH. See decision height.

Differential ailerons. Control surface rigged such that the aileron moving up moves a greater distance than the aileron moving down. The up aileron produces extra parasite drag to compensate for the additional induced drag caused by the down aileron. This balancing of the drag forces helps minimize adverse yaw.

Differential Global Positioning System (DGPS). A system that improves the accuracy of Global Navigation Satellite Systems (GNSS) by measuring changes in variables to provide satellite positioning corrections.

Differential pressure. A difference between two pressures. The measurement of airspeed is an example of the use of differential pressure.

Dihedral. The positive acute angle between the lateral axis of an airplane and a line through the center of a wing or horizontal stabilizer. Dihedral contributes to the lateral stability of an airplane.

Diluter-demand oxygen system. An oxygen system that delivers oxygen mixed or diluted with air in order to maintain a constant oxygen partial pressure as the altitude changes.

Direct indication. The true and instantaneous reflection of aircraft pitch-and-bank attitude by the miniature aircraft, relative to the horizon bar of the attitude indicator.

Direct User Access Terminal System (DUATS). A system that provides current FAA weather and flight plan filing services to certified civil pilots, via personal computer, modem, or telephone access to the system. Pilots can request specific types of weather briefings and other pertinent data for planned flights.

Directional stability. Stability about the vertical axis of an aircraft, whereby an aircraft tends to return, on its own, to flight aligned with the relative wind when disturbed from that equilibrium state. The vertical tail is the primary contributor to directional stability, causing an airplane in flight to align with the relative wind.

Distance circle. See reference circle.

Distance measuring equipment (DME). A pulse-type electronic navigation system that shows the pilot, by an instrument-panel indication, the number of nautical miles between the aircraft and a ground station or waypoint.

DME. See distance measuring equipment.

DME arc. A flight track that is a constant distance from the station or waypoint.

DOD. Department of Defense.

Doghouse. A turn-and-slip indicator dial mark in the shape of a doghouse.

Domestic Reduced Vertical Separation Minimum (DRVSM). Additional flight levels between FL 290 and FL 410 to provide operational, traffic, and airspace efficiency.

Double gimbal. A type of mount used for the gyro in an attitude instrument. The axes of the two gimbals are at right angles to the spin axis of the gyro, allowing free motion in two planes around the gyro.

DP. See departure procedure.

Drag. The net aerodynamic force parallel to the relative wind, usually the sum of two components: induced drag and parasite drag.

Drag curve. The curve created when plotting induced drag and parasite drag.

Drift angle. Angle between heading and track.

DRVSM. See Domestic Reduced Vertical Separation Minimum.

DUATS. See direct User access terminal system.

Duplex. Transmitting on one frequency and receiving on a separate frequency.

Dutch roll. A combination of rolling and yawing oscillations that normally occurs when the dihedral effects of an aircraft are more powerful than the directional stability. Usually dynamically stable but objectionable in an airplane because of the oscillatory nature.

Dynamic hydroplaning. A condition that exists when landing on a surface with standing water deeper than the tread depth of the tires. When the brakes are applied, there is a possibility that the brake will lock up and the tire will ride on the surface of the water, much like a water ski. When the tires are hydroplaning, directional control and braking action are virtually impossible. An effective anti-skid system can minimize the effects of hydroplaning.

Dynamic stability. The property of an aircraft that causes it, when disturbed from straight-and-level flight, to develop forces or moments that restore the original condition of straight and level.

E

Eddy currents. Current induced in a metal cup or disc when it is crossed by lines of flux from a moving magnet.

Eddy current damping. The decreased amplitude of oscillations by the interaction of magnetic fields. In the case of a vertical card magnetic compass, flux from the oscillating permanent magnet produces eddy currents in a damping disk or cup. The magnetic flux produced by the eddy currents opposes the flux from the permanent magnet and decreases the oscillations.

EFC. See expect-further-clearance. EFD. See electronic flight display. EGT. See exhaust gas temperature.

Electronic flight display (EFD). For the purpose of standardization, any flight instrument display that uses LCD or other image-producing system (cathode ray tube (CRT), etc.)

Elevator. The horizontal, movable primary control surface in the tail section, or empennage, of an airplane. The elevator is hinged to the trailing edge of the fixed horizontal stabilizer.

Elevator illusion. The sensation of being in a climb or descent, caused by the kind of abrupt vertical accelerations that result from up- or downdrafts.

Emergency. A distress or urgent condition.

Empennage. The section of the airplane that consists of the vertical stabilizer, the horizontal stabilizer, and the associated control surfaces.

Emphasis error. The result of giving too much attention to a particular instrument during the cross-check, instead of relying on a combination of instruments necessary for attitude and performance information.

Empty-field myopia. Induced nearsightedness that is associated with flying at night, in instrument meteorological conditions and/or reduced visibility. With nothing to focus on, the eyes automatically focus on a point just slightly ahead of the airplane.

EM wave. Electromagnetic wave.

Encoding altimeter. A special type of pressure altimeter used to send a signal to the air traffic controller on the ground, showing the pressure altitude the aircraft is flying.

Engine pressure ratio (EPR). The ratio of turbine discharge pressure divided by compressor inlet pressure, which is used as an indication of the amount of thrust being developed by a turbine engine.

En route facilities ring. Depicted in the plan view of IAP charts, a circle which designates NAVAIDs, fixes, and intersections that are part of the en route low altitude airway structure.

En route high-altitude charts. Aeronautical charts for en route instrument navigation at or above 18,000 feet MSL.

En route low-altitude charts. Aeronautical charts for en route IFR navigation below 18,000 feet MSL.

EPR. See engine pressure ratio.

Equilibrium. A condition that exists within a body when the sum of the moments of all of the forces acting on the body is equal to zero. In aerodynamics, equilibrium is when all opposing forces acting on an aircraft are balanced (steady, unaccelerated flight conditions).

Equivalent airspeed. Airspeed equivalent to CAS in standard atmosphere at sea level. As the airspeed and pressure altitude increase, the CAS becomes higher than it should be, and a correction for compression must be subtracted from the CAS.

Evaporation. The transformation of a liquid to a gaseous state, such as the change of water to water vapor.

Exhaust gas temperature (EGT). The temperature of the exhaust gases as they leave the cylinders of a reciprocating engine or the turbine section of a turbine engine.

Expect-further-clearance (EFC). The time a pilot can expect to receive clearance beyond a clearance limit.

Explosive decompression. A change in cabin pressure faster than the lungs can decompress. Lung damage is possible.

F

FA. See area forecast.

FAA. Federal Aviation Administration.

FAF. See final approach fix.

False horizon. Inaccurate visual information for aligning the aircraft, caused by various natural and geometric formations that disorient the pilot from the actual horizon.

FDI. See flight director indicator.

Federal airways. Class E airspace areas that extend upward from 1,200 feet to, but not including, 18,000 feet MSL, unless otherwise specified.

Feeder facilities. Used by ATC to direct aircraft to intervening fixes between the en route structure and the initial approach fix.

Final approach. Part of an instrument approach procedure in which alignment and descent for landing are accomplished.

Final Approach Fix. The fix from which the IFR final approach to an airport is executed, and which identifies the beginning of the final approach segment. An FAF is designated on government charts by a Maltese cross symbol for nonprecision approaches, and a lightning bolt symbol for precision approaches.

Fixating. Staring at a single instrument, thereby interrupting the cross-check process.

Fixed-pitch propellers. Propellers with fixed blade angles. Fixed-pitch propellers are designed as climb propellers, cruise propellers, or standard propellers.

Fixed slot. A fixed, nozzle shaped opening near the leading edge of a wing that ducts air onto the top surface of the wing. Its purpose is to increase lift at higher angles of attack.

FL. See flight level.

Flameout. A condition in the operation of a gas turbine engine in which the fire in the engine goes out due to either too much or too little fuel sprayed into the combustors.

Flaps. Hinged portion of the trailing edge between the ailerons and fuselage. In some aircraft ailerons and flaps are interconnected to produce full-span "flaperons." In either case, flaps change the lift and drag on the wing.

Floor load limit. The maximum weight the floor can sustain per square inch/foot as provided by the manufacturer.

Flight configurations. Adjusting the aircraft control surfaces (including flaps and landing gear) in a manner that will achieve a specified attitude.

Flight director indicator (FDI). One of the major components of a flight director system, it provides steering commands that the pilot (or the autopilot, if coupled) follows.

Flight level (FL). A measure of altitude (in hundreds of feet) used by aircraft flying above 18,000 feet with the altimeter set at 29.92 "Hg.

Flight management system (FMS). Provides pilot and crew with highly accurate and automatic long-range navigation capability, blending available inputs from long- and short- range sensors.

Flight path. The line, course, or track along which an aircraft is flying or is intended to be flown.

Flight patterns. Basic maneuvers, flown by reference to the instruments rather than outside visual cues, for the purpose of practicing basic attitude flying. The patterns simulate maneuvers encountered on instrument flights such as holding patterns, procedure turns, and approaches.

Flight strips. Paper strips containing instrument flight information, used by ATC when processing flight plans.

FMS. See flight management system.

FOD. See foreign object damage.

Fog. Cloud consisting of numerous minute water droplets and based at the surface; droplets are small enough to be suspended in the earth's atmosphere indefinitely. (Unlike drizzle, it does not fall to the surface. Fog differs from a cloud only in that a cloud is not based at the surface, and is distinguished from haze by its wetness and gray color.)

Force (F). The energy applied to an object that attempts to cause the object to change its direction, speed, or motion. In aerodynamics, it is expressed as F, T (thrust), L (lift), W (weight), or D (drag), usually in pounds.

Foreign object damage (FOD). Damage to a gas turbine engine caused by some object being sucked into the engine while it is running. Debris from runways or taxiways can cause foreign object damage during ground operations, and the ingestion of ice and birds can cause FOD in flight.

Form drag. The drag created because of the shape of a component or the aircraft.

Frise-type aileron. Aileron having the nose portion projecting ahead of the hinge line. When the trailing edge of the aileron moves up, the nose projects below the wing's lower surface and produces some parasite drag, decreasing the amount of adverse yaw.

Front. The boundary between two different air masses.

Frost. Ice crystal deposits formed by sublimation when temperature and dewpoint are below freezing.

Fuel load. The expendable part of the load of the airplane. It includes only usable fuel, not fuel required to fill the lines or that which remains trapped in the tank sumps.

Fundamental skills. Pilot skills of instrument cross-check, instrument interpretation, and aircraft control.

Fuselage. The section of the airplane that consists of the cabin and/or cockpit, containing seats for the occupants and the controls for the airplane.

G

GAMA. General Aviation Manufacturers Association.

Gimbal ring. A type of support that allows an object, such as a gyroscope, to remain in an upright condition when its base is tilted.

Glideslope (GS). Part of the ILS that projects a radio beam upward at an angle of approximately 3° from the approach end of an instrument runway. The glideslope provides vertical guidance to aircraft on the final approach course for the aircraft to follow when making an ILS approach along the localizer path.

Glideslope intercept altitude. The minimum altitude of an intermediate approach segment prescribed for a precision approach that ensures obstacle clearance.

Global landing system (GLS). An instrument approach with lateral and vertical guidance with integrity limits (similar to barometric vertical navigation (BARO VNAV).

Global navigation satellite system (GNSS). Satellite navigation system that provides autonomous geospatial positioning with global coverage. It allows small electronic receivers to determine their location (longitude, latitude, and altitude) to within a few meters using time signals transmitted along a line of sight by radio from satellites.

Global positioning system (GPS). Navigation system that uses satellite rather than ground-based transmitters for location information.

GLS. See global landing system.

GNSS. See global navigation satellite system.

Goniometer. As used in radio frequency (RF) antenna systems, a direction-sensing device consisting of two fixed loops of wire oriented 90° from each other, which separately sense received signal strength and send those signals to two rotors (also oriented 90°) in the sealed direction-indicating instrument. The rotors are attached to the direction-indicating needle of the instrument and rotated by a small motor until minimum magnetic field is sensed near the rotors.

GPS. See global positioning system.

GPS Approach Overlay Program. An authorization for pilots to use GPS avionics under IFR for flying designated existing nonprecision instrument approach procedures, with the exception of LOC, LDA, and SDF procedures.

GPWS. See ground proximity warning system.

Graveyard spiral. The illusion of the cessation of a turn while still in a prolonged, coordinated, constant rate turn, which can lead a disoriented pilot to a loss of control of the aircraft.

Great circle route. The shortest distance across the surface of a sphere (the Earth) between two points on the surface.

Ground adjustable trim tab. Non-movable metal trim tab on a control surface. Bent in one direction or another while on the ground to apply trim forces to the control surface.

Ground effect. The condition of slightly increased air pressure below an airplane wing or helicopter rotor system that increases the amount of lift produced. It exists within approximately one wing span or one rotor diameter from the ground. It results from a reduction in upwash, downwash, and wingtip vortices, and provides a corresponding decrease in induced drag.

Ground proximity warning system (GPWS). A system designed to determine an aircraft's clearance above the Earth and provides limited predictability about aircraft position relative to rising terrain.

Groundspeed. Speed over the ground, either closing speed to the station or waypoint, or speed over the ground in whatever direction the aircraft is going at the moment, depending upon the navigation system used.

GS. See glideslope.

GWPS. See ground proximity warning system.

Gyroscopic precession. An inherent quality of rotating bodies, which causes an applied force to be manifested 90° in the direction of rotation from the point where the force is applied.

H

HAA. See height above airport.

HAL. See height above landing.

HAT. See height above Touchdown elevation.

Hazardous attitudes. Five aeronautical decision-making attitudes that may contribute to poor pilot judgment: anti- authority, impulsivity, invulnerability, machismo, and resignation.

Hazardous In-flight Weather Advisory Service (HIWAS). An en route FSS service providing continuously updated automated of hazardous weather within 150 nautical miles of selected VORs, available only in the conterminous 48 states.

Head-up display (HUD). A special type of flight viewing screen that allows the pilot to watch the flight instruments and other data while looking through the windshield of the aircraft for other traffic, the approach lights, or the runway.

Heading. The direction in which the nose of the aircraft is pointing during flight.

Heading indicator. An instrument which senses airplane movement and displays heading based on a 360° azimuth, with the final zero omitted. The heading indicator, also called a directional gyro (DG), is fundamentally a mechanical instrument designed to facilitate the use of the magnetic compass. The heading indicator is not affected by the forces that make the magnetic compass difficult to interpret.

Headwork. Required to accomplish a conscious, rational thought process when making decisions. Good decision- making involves risk identification and assessment, information processing, and problem solving.

Height above airport (HAA). The height of the MDA above the published airport elevation.

Height above landing (HAL). The height above a designated helicopter landing area used for helicopter instrument approach procedures.

Height above Touchdown elevation (HAT). The DA/DH or MDA above the highest runway elevation in the Touchdown zone (first 3,000 feet of the runway).

HF. High frequency.

Hg. Abbreviation for mercury, from the Latin hydrargyrum.

High performance aircraft. An aircraft with an engine of more than 200 horsepower.

Histotoxic hypoxia. The inability of cells to effectively use oxygen. Plenty of oxygen is being transported to the cells that need it, but they are unable to use it.

HIWAS. See Hazardous Inflight Weather Advisory Service.

Holding. A predetermined maneuver that keeps aircraft within a specified airspace while awaiting further clearance from ATC.

Holding pattern. A racetrack pattern, involving two turns and two legs, used to keep an aircraft within a prescribed airspace with respect to a geographic fix. A standard pattern uses right turns; nonstandard patterns use left turns.

Homing. Flying the aircraft on any heading required to keep the needle pointing to the 0° relative bearing position.

Horizontal situation indicator (HSI). A flight navigation instrument that combines the heading indicator with a CDI, in order to provide the pilot with better situational awareness of location with respect to the courseline.

Horsepower. The term, originated by inventor James Watt, means the amount of work a horse could do in one second. One horsepower equals 550 foot-pounds per second, or 33,000 foot-pounds per minute.

Hot Start. In gas turbine engines, a start which occurs with normal engine rotation, but exhaust temperature exceeds prescribed limits. This is usually caused by an excessively rich mixture in the combustor. The fuel to the engine must be terminated immediately to prevent engine damage.

HSI. See horizontal situation indicator.

HUD. See head-up display.

Human factors. A multidisciplinary field encompassing the behavioral and social sciences, engineering, and physiology, to consider the variables that influence individual and crew performance for the purpose of optimizing human performance and reducing errors.

Hung start. In gas turbine engines, a condition of normal light off but with rpm remaining at some low value rather than increasing to the normal idle rpm. This is often the result of insufficient power to the engine from the starter. In the event of a hung start, the engine should be shut down.

Hydroplaning. A condition that exists when landing on a surface with standing water deeper than the tread depth of the tires. When the brakes are applied, there is a possibility that the brake will lock up and the tire will ride on the surface of the water, much like a water ski. When the tires are hydroplaning, directional control and braking action are virtually impossible. An effective anti-skid system can minimize the effects of hydroplaning.

Hypemic hypoxia. A type of hypoxia that is a result of oxygen deficiency in the blood, rather than a lack of inhaled oxygen. It can be caused by a variety of factors. Hypemic means "not enough blood."

Hyperventilation. Occurs when an individual is experiencing emotional stress, fright, or pain, and the breathing rate and depth increase, although the carbon dioxide level in the blood is already at a reduced level. The result is an excessive loss of carbon dioxide from the body, which can lead to unconsciousness due to the respiratory system's overriding mechanism to regain control of breathing.

Hypoxia. A state of oxygen deficiency in the body sufficient to impair functions of the brain and other organs.

Hypoxic hypoxia. This type of hypoxia is a result of insufficient oxygen available to the lungs. A decrease of oxygen molecules at sufficient pressure can lead to hypoxic hypoxia.

I

IAF. See initial approach fix.

IAP. See instrument approach procedures.

IAS. See indicated airspeed.

ICAO. See International Civil Aviation Organization.

Ident. Air Traffic Control request for a pilot to push the button on the transponder to identify return on the controller's scope.

IFR. See instrument flight rules.

ILS. See instrument landing system.

ILS categories. Categories of instrument approach procedures allowed at airports equipped with the following types of instrument landing systems:

ILS Category I: Provides for approach to a height above Touchdown of not less than 200 feet, and with runway visual range of not less than 1,800 feet.

ILS Category II: Provides for approach to a height above Touchdown of not less than 100 feet and with runway visual range of not less than 1,200 feet.

ILS Category III A: Provides for approach without a decision height minimum and with runway visual range of not less than 700 feet.

ILS Category III B: Provides for approach without a decision height minimum and with runway visual range of not less than 150 feet.

ILS Category III C: Provides for approach without a decision height minimum and without runway visual range minimum.

IMC. See instrument meteorological conditions.

Inclinometer. An instrument consisting of a curved glass tube, housing a glass ball, and damped with a fluid similar to kerosene. It may be used to indicate inclination, as a level, or, as used in the turn indicators, to show the relationship between gravity and centrifugal force in a turn.

Indicated airspeed (IAS). Shown on the dial of the instrument airspeed indicator on an aircraft. Indicated airspeed (IAS) is the airspeed indicator reading uncorrected for instrument, position, and other errors. Indicated airspeed means the speed of an aircraft as shown on its pitot static airspeed indicator calibrated to reflect standard atmosphere adiabatic compressible flow at sea level uncorrected for airspeed system errors. Calibrated airspeed (CAS) is IAS corrected for instrument errors, position error (due to incorrect pressure at the static port) and installation errors.

Indicated altitude. The altitude read directly from the altimeter (uncorrected) when it is set to the current altimeter setting.

Indirect indication. A reflection of aircraft pitch-and-bank attitude by instruments other than the attitude indicator.

Induced drag. Drag caused by the same factors that produce lift; its amount varies inversely with airspeed. As airspeed decreases, the angle of attack must increase, in turn increasing induced drag.

Induction icing. A type of ice in the induction system that reduces the amount of air available for combustion. The most commonly found induction icing is carburetor icing.

Inertial navigation system (INS). A computer-based navigation system that tracks the movement of an aircraft via signals produced by onboard accelerometers. The initial location of the aircraft is entered into the computer, and all subsequent movement of the aircraft is sensed and used to keep the position updated. An INS does not require any inputs from outside signals.

Initial approach fix (IAF). The fix depicted on IAP charts where the instrument approach procedure (IAP) begins unless otherwise authorized by ATC.

Inoperative components. Higher minimums are prescribed when the specified visual aids are not functioning; this information is listed in the Inoperative Components Table found in the United States Terminal Procedures Publications.

INS. See inertial navigation system.

Instantaneous vertical speed indicator (IVSI). Assists in interpretation by instantaneously indicating the rate of climb or descent at a given moment with little or no lag as displayed in a vertical speed indicator (VSI).

Instrument approach procedures (IAP). A series of predetermined maneuvers for the orderly transfer of an aircraft under IFR from the beginning of the initial approach to a landing or to a point from which a landing may be made visually.

Instrument flight rules (IFR). Rules and regulations established by the Federal Aviation Administration to govern flight under conditions in which flight by outside visual reference is not safe. IFR flight depends upon flying by reference to instruments in the flight deck, and navigation is accomplished by reference to electronic signals.

Instrument landing system (ILS). An electronic system that provides both horizontal and vertical guidance to a specific runway, used to execute a precision instrument approach procedure.

Instrument meteorological conditions (IMC). Meteorological conditions expressed in terms of visibility, distance from clouds, and ceiling less than the minimums specified for visual meteorological conditions, requiring operations to be conducted under IFR.

Instrument takeoff. Using the instruments rather than outside visual cues to maintain runway heading and execute a safe takeoff.

Intercooler. A device used to reduce the temperatures of the compressed air before it enters the fuel metering device. The resulting cooler air has a higher density, which permits the engine to be operated with a higher power setting.

Interference drag. Drag generated by the collision of airstreams creating eddy currents, turbulence, or restrictions to smooth flow.

International Civil Aviation Organization (ICAO). The United Nations agency for developing the principles and techniques of international air navigation, and fostering planning and development of international civil air transport.

International standard atmosphere (IAS). A model of standard variation of pressure and temperature.

Interpolation. The estimation of an intermediate value of a quantity that falls between marked values in a series. Example: In a measurement of length, with a rule that is marked in eighths of an inch, the value falls between 3/8 inch and 1/2 inch. The estimated (interpolated) value might then be said to be 7/16 inch.

Inversion. An increase in temperature with altitude.

Inversion illusion. The feeling that the aircraft is tumbling backwards, caused by an abrupt change from climb to straight- and-level flight while in situations lacking visual reference.

Inverter. A solid-state electronic device that converts D.C. into A.C. current of the proper voltage and frequency to operate A.C. gyro instruments.

Isobars. Lines which connect points of equal barometric pressure.

Isogonic lines. Lines drawn across aeronautical charts to connect points having the same magnetic variation.

I**VSI.** See instantaneous vertical speed indicator.

J

Jet route. A route designated to serve flight operations from 18,000 feet MSL up to and including FL 450.

Jet stream. A high-velocity narrow stream of winds, usually found near the upper limit of the troposphere, which flows generally from west to east.

Judgment. The mental process of recognizing and analyzing all pertinent information in a particular situation, a rational evaluation of alternative actions in response to it, and a timely decision on which action to take.

K

KIAS. Knots indicated airspeed.

Knot. The knot is a unit of speed equal to one nautical mile (1.852 km) per hour, approximately 1.151 mph.

Kollsman window. A barometric scale window of a sensitive altimeter used to adjust the altitude for the altimeter setting.

L

LAAS. See local area augmentation system.

Lag. The delay that occurs before an instrument needle attains a stable indication.

Land breeze. A coastal breeze flowing from land to sea caused by temperature differences when the sea surface is warmer than the adjacent land. The land breeze usually occurs at night and alternates with the sea breeze that blows in the opposite direction by day.

Land as soon as possible. Land without delay at the nearest suitable area, such as an open field, at which a safe approach and landing is assured.

Land as soon as practical. The landing site and duration of flight are at the discretion of the pilot. Extended flight beyond the nearest approved landing area is not recommended.

Land immediately. The urgency of the landing is paramount. The primary consideration is to ensure the survival of the occupants. Landing in trees, water, or other unsafe areas should be considered only as a last resort.

Lateral axis. An imaginary line passing through the center of gravity of an airplane and extending across the airplane from wingtip to wingtip.

Lateral stability (rolling). The stability about the longitudinal axis of an aircraft. Rolling stability or the ability of an airplane to return to level flight due to a disturbance that causes one of the wings to drop.

Latitude. Measurement north or south of the equator in degrees, minutes, and seconds. Lines of latitude are also referred to as parallels.

LDA. See localizer-type directional aid.

Lead radial. The radial at which the turn from the DME arc to the inbound course is started.

Leading edge. The part of an airfoil that meets the airflow first.

Leading edge devices. High lift devices which are found on the leading edge of the airfoil. The most common types are fixed slots, movable slats, and leading edge flaps.

Leading-edge flap. A portion of the leading edge of an airplane wing that folds downward to increase the camber, lift, and drag of the wing. The leading-edge flaps are extended for takeoffs and landings to increase the amount of aerodynamic lift that is produced at any given airspeed.

Leans, the. A physical sensation caused by an abrupt correction of a banked attitude entered too slowly to stimulate the motion sensing system in the inner ear. The abrupt correction can create the illusion of banking in the opposite direction.

Licensed empty weight. The empty weight that consists of the airframe, engine(s), unusable fuel, and undrainable oil plus standard and optional equipment as specified in the equipment list. Some manufacturers used this term prior to GAMA standardization.

Lift. A component of the total aerodynamic force on an airfoil and acts perpendicular to the relative wind.

Limit load factor. Amount of stress, or load factor, that an aircraft can withstand before structural damage or failure occurs.

Lines of flux. Invisible lines of magnetic force passing between the poles of a magnet.

L/MF. See low or medium frequency.

LMM. See locator middle marker.

Load factor. The ratio of a specified load to the total weight of the aircraft. The specified load is expressed in terms of any of the following: aerodynamic forces, inertial forces, or ground or water reactions.

Loadmeter. A type of ammeter installed between the generator output and the main bus in an aircraft electrical system.

LOC. See localizer.

Local area augmentation system (LAAS). A differential global positioning system (DGPS) that improves the accuracy of the system by determining position error from the GPS satellites, then transmitting the error, or corrective factors, to the airborne GPS receiver.

Localizer (LOC). The portion of an ILS that gives left/right guidance information down the centerline of the instrument runway for final approach.

Localizer-type directional aid (LDA). A NAVAID used for nonprecision instrument approaches with utility and accuracy comparable to a localizer but which is not a part of a complete ILS and is not aligned with the runway. Some LDAs are equipped with a glideslope.

Locator middle marker (LMM). Nondirectional radio beacon (NDB) compass locator, collocated with a middle marker (MM).

Locator outer marker (LOM). NDB compass locator, collocated with an outer marker (OM).

LOM. See locator outer marker.

Longitude. Measurement east or west of the Prime Meridian in degrees, minutes, and seconds. The Prime Meridian is 0° longitude and runs through Greenwich, England. Lines of longitude are also referred to as meridians.

Longitudinal axis. An imaginary line through an aircraft from nose to tail, passing through its center of gravity. The longitudinal axis is also called the roll axis of the aircraft. Movement of the ailerons rotates an airplane about its longitudinal axis.

Longitudinal stability (pitching). Stability about the lateral axis. A desirable characteristic of an airplane whereby it tends to return to its trimmed angle of attack after displacement.

Low or medium frequency. A frequency range between 190 and 535 kHz with the medium frequency above 300 kHz. Generally associated with nondirectional beacons transmitting a continuous carrier with either a 400 or 1,020 Hz modulation.

Lubber line. The reference line used in a magnetic compass or heading indicator.

M

MAA. See maximum authorized altitude.

MAC. See mean aerodynamic chord.

Mach number. The ratio of the true airspeed of the aircraft to the speed of sound in the same atmospheric conditions, named in honor of Ernst Mach, late 19th century physicist.

Mach meter. The instrument that displays the ratio of the speed of sound to the true airspeed an aircraft is flying.

Magnetic bearing (MB). The direction to or from a radio transmitting station measured relative to magnetic north.

Magnetic compass. A device for determining direction measured from magnetic north.

Magnetic dip. A vertical attraction between a compass needle and the magnetic poles. The closer the aircraft is to a pole, the more severe the effect.

Magnetic heading (MH). The direction an aircraft is pointed with respect to magnetic north.

Magneto. A self-contained, engine-driven unit that supplies electrical current to the spark plugs; completely independent of the airplane's electrical system. Normally there are two magnetos per engine.

Magnus effect. Lifting force produced when a rotating cylinder produces a pressure differential. This is the same effect that makes a baseball curve or a golf ball slice.

Mandatory altitude. An altitude depicted on an instrument approach chart with the altitude value both underscored and overscored. Aircraft are required to maintain altitude at the depicted value.

Mandatory block altitude. An altitude depicted on an instrument approach chart with two underscored and overscored altitude values between which aircraft are required to maintain altitude.

Maneuverability. Ability of an aircraft to change directions along a flight path and withstand the stresses imposed upon it.

Maneuvering speed (VA). The design maneuvering speed. Operating at or below design maneuvering speed does not provide structural protection against multiple full control inputs in one axis or full control inputs in more than one axis at the same time.

Manifold absolute pressure. The absolute pressure of the fuel/air mixture within the intake manifold, usually indicated in inches of mercury.

MAP. See missed approach point.

Margin identification. The top and bottom areas on an instrument approach chart that depict information about the procedure, including airport location and procedure identification.

Marker beacon. A low-powered transmitter that directs its signal upward in a small, fan-shaped pattern. Used along the flight path when approaching an airport for landing, marker beacons indicate both aurally and visually when the aircraft is directly over the facility.

Mass. The amount of matter in a body.

Maximum altitude. An altitude depicted on an instrument approach chart with overscored altitude value at which or below aircraft are required to maintain altitude.

Maximum authorized altitude (MAA). A published altitude representing the maximum usable altitude or flight level for an airspace structure or route segment.

Maximum landing weight. The greatest weight that an airplane normally is allowed to have at landing.

Maximum ramp weight. The total weight of a loaded aircraft, including all fuel. It is greater than the takeoff weight due to the fuel that will be burned during the taxi and runup operations. Ramp weight may also be referred to as taxi weight.

Maximum runway takeoff weight (MRTW). Maximum performance limit for the applicable runway based on planned conditions and aircraft configuration for takeoff.

Maximum takeoff weight. The maximum allowable weight for takeoff.

Maximum weight. The maximum authorized weight of the aircraft and all of its equipment as specified in the Type Certificate Data Sheets (TCDS) for the aircraft.

Maximum zero fuel weight (GAMA). The maximum weight, exclusive of usable fuel.

MB. See magnetic bearing.

MCA. See minimum crossing altitude. MDA. See minimum descent altitude. MEA. See minimum en route altitude.

Mean aerodynamic chord (MAC). The average distance from the leading edge to the trailing edge of the wing.

Mean sea level. The average height of the surface of the sea at a particular location for all stages of the tide over a 19-year period.

MEL. See minimum equipment list.

Meridians. Lines of longitude.

Mesophere. A layer of the atmosphere directly above the stratosphere.

METAR. See Aviation Routine Weather Report.

MFD. See multi-function display.

MH. See magnetic heading.

MHz. Megahertz.

Microburts. A strong downdraft which normally occurs over horizontal distances of 1 NM or less and vertical distances of less than 1,000 feet. In spite of its small horizontal scale, an intense microburst could induce wind speeds greater than 100 knots and downdrafts as strong as 6,000 feet per minute.

Microwave landing system (MLS). A precision instrument approach system operating in the microwave spectrum which normally consists of an azimuth station, elevation station, and precision distance measuring equipment.

Mileage breakdown. A fix indicating a course change that appears on the chart as an "x" at a break between two segments of a federal airway.

Military operations area (MOA). Airspace established for the purpose of separating certain military training activities from IFR traffic.

Military training route (MTR). Airspace of defined vertical and lateral dimensions established for the conduct of military training at airspeeds in excess of 250 knots indicated airspeed (KIAS).

Minimum altitude. An altitude depicted on an instrument approach chart with the altitude value underscored. Aircraft are required to maintain altitude at or above the depicted value.

Minimum crossing altitude (MCA). The lowest allowed altitude at certain fixes an aircraft must cross when proceeding in the direction of a higher minimum en route altitude (MEA).

Minimum descent altitude (MDA). The lowest altitude (in feet MSL) to which descent is authorized on final approach, or during circle-to-land maneuvering in execution of a nonprecision approach.

Minimum drag. The point on the total drag curve where the lift-to-drag ratio is the greatest. At this speed, total drag is minimized.

Minimum en route altitude (MEA). The lowest published altitude between radio fixes that ensures acceptable navigational signal coverage and meets obstacle clearance requirements between those fixes.

Minimum equipment list (MEL). A list developed for larger aircraft that outlines equipment that can be inoperative for various types of flight including IFR and icing conditions. This list is based on the master minimum equipment list (MMEL) developed by the FAA and must be approved by the FAA for use. It is specific to an individual aircraft make and model.

Minimum obstruction clearance altitude (MOCA). The lowest published altitude in effect between radio fixes on VOR airways, off-airway routes, or route segments, which meets obstacle clearance requirements for the entire route segment and which ensures acceptable navigational signal coverage only within 25 statute (22 nautical) miles of a VOR.

Minimum reception altitude (MRA). The lowest altitude at which an airway intersection can be determined.

Minimum safe altitude (MSA). The minimum altitude depicted on approach charts which provides at least 1,000 feet of obstacle clearance for emergency use within a specified distance from the listed navigation facility.

Minimum vectoring altitude (MVA). An IFR altitude lower than the minimum en route altitude (MEA) that provides terrain and obstacle clearance.

Minimums section. The area on an IAP chart that displays the lowest altitude and visibility requirements for the approach.

Missed approach. A maneuver conducted by a pilot when an instrument approach cannot be completed to a landing.

Missed approach point (MAP). A point prescribed in each instrument approach at which a missed approach procedure shall be executed if the required visual reference has not been established.

Mixed ice. A mixture of clear ice and rime ice.

MLS. See microwave landing system.

MM. Middle marker.

MOA. See military operations area.

MOCA. See minimum obstruction clearance altitude.

Mode C. Altitude reporting transponder mode.

Moment. The product of the weight of an item multiplied by its arm. Moments are expressed in pound-inches (lb-in). Total moment is the weight of the airplane multiplied by the distance between the datum and the CG.

Moment arm. The distance from a datum to the applied force.

Moment index (or index). A moment divided by a constant such as 100, 1,000, or 10,000. The purpose of using a moment index is to simplify weight and balance computations of airplanes where heavy items and long arms result in large, unmanageable numbers.

Monocoque. A shell-like fuselage design in which the stressed outer skin is used to support the majority of imposed stresses. Monocoque fuselage design may include bulkheads but not stringers.

Monoplanes. Airplanes with a single set of wings.

Movable slat. A movable auxiliary airfoil on the leading edge of a wing. It is closed in normal flight but extends at high angles of attack. This allows air to continue flowing over the top of the wing and delays airflow separation.

MRA. See minimum reception altitude.

MSA. See minimum safe altitude.

MSL. See mean sea level.

MTOW. See Maximum Take-off Weight.

MTR. See military training route.

Multi-function display (MFD). Small screen (CRT or LCD) in an aircraft that can be used to display information to the pilot in numerous configurable ways. Often an MFD will be used in concert with a primary flight display.

MVA. See minimum vectoring altitude.

N

N1. Rotational speed of the low pressure compressor in a turbine engine.

N2. Rotational speed of the high pressure compressor in a turbine engine.

Nacelle. A streamlined enclosure on an aircraft in which an engine is mounted. On multiengine propeller-driven airplanes, the nacelle is normally mounted on the leading edge of the wing.

NACG. See National Aeronautical Charting Group.

NAS. See National Airspace System.

National Airspace System (NAS). The common network of United States airspace—air navigation facilities, equipment and services, airports or landing areas; aeronautical charts, information and services; rules, regulations and procedures, technical information; and manpower and material.

National Aeronautical Charting Group (NACG). A Federal agency operating under the FAA, responsible for publishing charts such as the terminal procedures and en route charts.

National Route Program (NRP). A set of rules and procedures designed to increase the flexibility of User flight planning within published guidelines.

National Security Area (NSA). Areas consisting of airspace of defined vertical and lateral dimensions established at locations where there is a requirement for increased security and safety of ground facilities. Pilots are requested to voluntarily avoid flying through the depicted NSA. When it is necessary to provide a greater level of security and safety, flight in NSAs may be temporarily prohibited. Regulatory prohibitions are disseminated via NOTAMs.

National Transportation Safety Board (NTSB). A United States Government independent organization responsible for investigations of accidents involving aviation, highways, waterways, pipelines, and railroads in the United States. NTSB is charged by congress to investigate every civil aviation accident in the United States.

NAVAID. Navigational aid.

NAV/COM. Navigation and communication radio.

NDB. See nondirectional radio beacon.

Negative static stability. The initial tendency of an aircraft to continue away from the original state of equilibrium after being disturbed.

Neutral static stability. The initial tendency of an aircraft to remain in a new condition after its equilibrium has been disturbed.

NM. Nautical mile.

NOAA. National Oceanic and Atmospheric Administration.

No-gyro approach. A radar approach that may be used in case of a malfunctioning gyro-compass or directional gyro. Instead of providing the pilot with headings to be flown, the controller observes the radar track and issues control instructions "turn right/left" or "stop turn," as appropriate.

Non-directional radio beacon (NDB). A ground-based radio transmitter that transmits radio energy in all directions.

Non-precision approach. A standard instrument approach procedure in which only horizontal guidance is provided.

No procedure turn (NoPT). Term used with the appropriate course and altitude to denote that the procedure turn is not required.

NoPT. See no procedure turn.

NOTAM. See Notice to Airmen.

Notice to Airmen (NOTAM). A notice filed with an aviation authority to alert aircraft pilots of any hazards en route or at a specific location. The authority in turn provides means of disseminating relevant NOTAMs to pilots.

NRP. See National Route Program.

NSA. See National Security Area.

NTSB. See National Transportation Safety Board.

NWS. National Weather Service.

O

Obstacle departure procedures (ODP). A preplanned instrument flight rule (IFR) departure procedure printed for pilot use in textual or graphic form to provide obstruction clearance via the least onerous route from the terminal area to the appropriate en route structure. ODPs are recommended for obstruction clearance and may be flown without ATC clearance unless an alternate departure procedure (SID or radar vector) has been specifically assigned by ATC.

Obstruction lights. Lights that can be found both on and off an airport to identify obstructions.

Occluded front. A frontal occlusion occurs when a fast- moving cold front catches up with a slow moving warm front. The difference in temperature within each frontal system is a major factor in determining whether a cold or warm front occlusion occurs.

ODP. See obstacle departure procedures.

OEW. See Operational Empty Weight.

OM. Outer marker.

Omission error. The failure to anticipate significant instrument indications following attitude changes; for example, concentrating on pitch control while forgetting about heading or roll information, resulting in erratic control of heading and bank.

Operational Empty Weight. Basic empty weight or fleet empty weight plus operational items.

Optical illusion. A misleading visual image. For the purpose of this handbook, the term refers to the brain's misinterpretation of features on the ground associated with landing, which causes a pilot to misread the spatial relationships between the aircraft and the runway.

Orientation. Awareness of the position of the aircraft and of oneself in relation to a specific reference point.

Otolith organ. An inner ear organ that detects linear acceleration and gravity orientation.

Outer marker. A marker beacon at or near the glideslope intercept altitude of an ILS approach. It is normally located four to seven miles from the runway threshold on the extended centerline of the runway.

Outside air temperature (OAT). The measured or indicated air temperature (IAT) corrected for compression and friction heating. Also referred to as true air temperature.

Overcontrolling. Using more movement in the control column than is necessary to achieve the desired pitch-and- bank condition.

Overboost. A condition in which a reciprocating engine has exceeded the maximum manifold pressure allowed by the manufacturer. Can cause damage to engine components.

Overpower. To use more power than required for the purpose of achieving a faster rate of airspeed change.

P

P-static. See precipitation static.

PAPI. See precision approach path indicator.

PAR. See precision approach radar.

Parallels. Lines of latitude.

Parasite drag. Drag caused by the friction of air moving over the aircraft structure; its amount varies directly with the airspeed.

Payload (GAMA). The weight of occupants, cargo, and baggage.

Personality. The embodiment of personal traits and characteristics of an individual that are set at a very early age and extremely resistant to change.

P-factor. A tendency for an aircraft to yaw to the left due to the descending propeller blade on the right producing more thrust than the ascending blade on the left. This occurs when the aircraft's longitudinal axis is in a climbing attitude in relation to the relative wind. The P-factor would be to the right if the aircraft had a counterclockwise rotating propeller.

PFD. See primary flight display.

PFOB. See Planned Fuel on Board.

Phugoid oscillations. Long-period oscillations of an aircraft around its lateral axis. It is a slow change in pitch accompanied by equally slow changes in airspeed. Angle of attack remains constant, and the pilot often corrects for phugoid oscillations without even being aware of them.

PIC. See pilot in command.

Pilotage. Navigation by visual reference to landmarks.

Pilot in command (PIC). The pilot responsible for the operation and safety of an aircraft.

Pilot report (PIREP). Report of meteorological phenomena encountered by aircraft.

Pilot's Operating Handbook/Airplane Flight Manual (POH/AFM). FAA-approved documents published by the airframe manufacturer that list the operating conditions for a particular model of aircraft.

PIREP. See pilot report.

Pitot pressure. Ram air pressure used to measure airspeed.

Pitot-static head. A combination pickup used to sample pitot pressure and static air pressure.

Plan view. The overhead view of an approach procedure on an instrument approach chart. The plan view depicts the routes that guide the pilot from the en route segments to the IAF.

Planform. The shape or form of a wing as viewed from above. It may be long and tapered, short and rectangular, or various other shapes.

Planned Fuel on Board. Estimated amount of fuel entered into flight plan.

Planned Take-off Weight. Estimated take-off weight.

Pneumatic. Operation by the use of compressed air.

POH/AFM. See Pilot's Operating Handbook/Airplane Flight Manual.

Point-in-space approach. A type of helicopter instrument approach procedure to a missed approach point more than 2,600 feet from an associated helicopter landing area.

Poor judgment chain. A series of mistakes that may lead to an accident or incident. Two basic principles generally associated with the creation of a poor judgment chain are:

(1) one bad decision often leads to another;

(2) as a string of bad decisions grows, it reduces the number of subsequent alternatives for continued safe flight. ADM is intended to break the poor judgment chain before it can cause an accident or incident.

Position error. Error in the indication of the altimeter, ASI, and VSI caused by the air at the static system entrance not being absolutely still.

Position report. A report over a known location as transmitted by an aircraft to ATC.

Positive static stability. The initial tendency to return to a state of equilibrium when disturbed from that state.

Power. Implies work rate or units of work per unit of time, and as such, it is a function of the speed at which the force is developed. The term "power required" is generally associated with reciprocating engines.

Powerplant. A complete engine and propeller combination with accessories.

Precession. The characteristic of a gyroscope that causes an applied force to be felt, not at the point of application, but 90° from that point in the direction of rotation.

Precipitation. Any or all forms of water particles (rain, sleet, hail, or snow) that fall from the atmosphere and reach the surface.

Precipitation static (P-static). A form of radio interference caused by rain, snow, or dust particles hitting the antenna and inducing a small radio-frequency voltage into it.

Precision approach. A standard instrument approach procedure in which both vertical and horizontal guidance is provided.

Precision approach path indicator (PAPI). A system of lights similar to the VASI, but consisting of one row of lights in two- or four-light systems. A pilot on the correct glideslope will see two white lights and two red lights. See VASI.

Precision approach radar (PAR). A type of radar used at an airport to guide an aircraft through the final stages of landing, providing horizontal and vertical guidance. The radar operator directs the pilot to change heading or adjust the descent rate to keep the aircraft on a path that allows it to Tap down at the correct spot on the runway.

Precision runway monitor (PRM). System allows simultaneous, independent instrument flight rules (IFR) approaches at airports with closely spaced parallel runways.

Preferred IFR routes. Routes established in the major terminal and en route environments to increase system efficiency and capacity. IFR clearances are issued based on these routes, listed in the Chart Supplement U.S. except when severe weather avoidance procedures or other factors dictate otherwise.

Preignition. Ignition occurring in the cylinder before the time of normal ignition. Preignition is often caused by a local hot spot in the combustion chamber igniting the fuel-air mixture.

Pressure altitude. Altitude above the standard 29.92 "Hg plane.

Pressure demand oxygen system. A demand oxygen system that supplies 100 percent oxygen at sufficient pressure above the altitude where normal breathing is adequate. Also referred to as a pressure breathing system.

Prevailing visibility. The greatest horizontal visibility equaled or exceeded throughout at least half the horizon circle (which is not necessarily continuous).

Preventive maintenance. Simple or minor preservative operations and the replacement of small standard parts not involving complex assembly operation as listed in 14 CFR part 43, appendix A. Certificated pilots may perform preventive maintenance on any aircraft that is owned or operated by them provided that the aircraft is not used in air carrier service.

Primary and supporting. A method of attitude instrument flying using the instrument that provides the most direct indication of attitude and performance.

Primary flight display (PFD). A display that provides increased situational awareness to the pilot by replacing the traditional six instruments used for instrument flight with an easy-to-scan display that provides the horizon, airspeed, altitude, vertical speed, trend, trim, and rate of turn among other key relevant indications.

PRM. See precision runway monitor.

Procedure turn. A maneuver prescribed when it is necessary to reverse direction to establish an aircraft on the intermediate approach segment or final approach course.

Profile view. Side view of an IAP chart illustrating the vertical approach path altitudes, headings, distances, and fixes.

Prohibited area. Designated airspace within which flight of aircraft is prohibited.

Propeller. A device for propelling an aircraft that, when rotated, produces by its action on the air, a thrust approximately perpendicular to its plane of rotation. It includes the control components normally supplied by its manufacturer.

Propeller/rotor modulation error. Certain propeller rpm settings or helicopter rotor speeds can cause the VOR course deviation indicator (CDI) to fluctuate as much as +/- 6°. Slight changes to the rpm setting will normally smooth out this roughness.

PTOW. See Planned Take-off Weight.

R

Rabbit, the. High-intensity flasher system installed at many large airports. The flashers consist of a series of brilliant blue-white bursts of light flashing in sequence along the approach lights, giving the effect of a ball of light traveling toward the runway.

Radar. A system that uses electromagnetic waves to identify the range, altitude, direction, or speed of both moving and fixed objects such as aircraft, weather formations, and terrain. The term RADAR was coined in 1941 as an acronym for Radio Detection and Ranging. The term has since entered the English language as a standard word, radar, losing the capitalization in the process.

Radar approach. The controller provides vectors while monitoring the progress of the flight with radar, guiding the pilot through the descent to the airport/heliport or to a specific runway.

Radar services. Radar is a method whereby radio waves are transmitted into the air and are then received when they have been reflected by an object in the path of the beam. Range is determined by measuring the time it takes (at the speed of light) for the radio wave to go out to the object and then return to the receiving antenna. The direction of a detected object from a radar site is determined by the position of the rotating antenna when the reflected portion of the radio wave is received.

Radar summary chart. A weather product derived from the national radar network that graphically displays a summary of radar weather reports.

Radar weather report (SD). A report issued by radar stations at 35 minutes after the hour, and special reports as needed. Provides information on the type, intensity, and location of the echo tops of the precipitation.

Radials. The courses oriented from a station.

Radio or radar altimeter. An electronic altimeter that determines the height of an aircraft above the terrain by measuring the time needed for a pulse of radio-frequency energy to travel from the aircraft to the ground and return.

Radio frequency (RF). A term that refers to alternating current (AC) having characteristics such that, if the current is input to antenna, an electromagnetic (EM) field is generated suitable for wireless broadcasting and/or communications.

Radio magnetic indicator (RMI). An electronic navigation instrument that combines a magnetic compass with an ADF or VOR. The card of the RMI acts as a gyro-stabilized magnetic compass, and shows the magnetic heading the aircraft is flying.

Radiosonde. A weather instrument that observes and reports meteorological conditions from the upper atmosphere. This instrument is typically carried into the atmosphere by some form of weather balloon.

Radio wave. An electromagnetic (EM) wave with frequency characteristics useful for radio transmission.

RAIM. See receiver autonomous integrity monitoring.

RAM recovery. The increase in thrust as a result of ram air pressures and density on the front of the engine caused by air velocity.

Random RNAV routes. Direct routes, based on area navigation capability, between waypoints defined in terms of latitude/longitude coordinates, degree-distance fixes, or offsets from established routes/airways at a specified distance and direction.

Ranging signals. Transmitted from the GPS satellite, signals allowing the aircraft's receiver to determine range (distance) from each satellite.

Rapid decompression. The almost instantaneous loss of cabin pressure in aircraft with a pressurized cockpit or cabin.

RB. See relative bearing.

RBI. See relative bearing indicator.

RCO. See remote communications outlet.

Receiver autonomous integrity monitoring (RAIM). A system used to verify the usability of the received GPS signals and warns the pilot of any malfunction in the navigation system. This system is required for IFR-certified GPS units.

Recommended altitude. An altitude depicted on an instrument approach chart with the altitude value neither underscored nor overscored. The depicted value is an advisory value.

Receiver-transmitter (RT). A system that receives and transmits a signal and an indicator.

Reduced vertical separation minimum (RVSM). Reduces the vertical separation between flight levels (FL) 290 and 410 from 2,000 feet to 1,000 feet, and makes six additional FLs available for operation. Also see DRVSM.

Reference circle (also, distance circle). The circle depicted in the plan view of an IAP chart that typically has a 10 NM radius, within which chart the elements are drawn to scale.

Regions of command. The "regions of normal and reversed command" refers to the relationship between speed and the power required to maintain or change that speed in flight.

Region of reverse command. Flight regime in which flight at a higher airspeed requires a lower power setting and a lower airspeed requires a higher power setting in order to maintain altitude.

REIL. See runway end identifier lights.

Relative bearing (RB). The angular difference between the aircraft heading and the direction to the station, measured clockwise from the nose of the aircraft.

Relative bearing indicator (RBI). Also known as the fixed- card ADF, zero is always indicated at the top of the instrument and the needle indicates the relative bearing to the station.

Relative humidity. The ratio of the existing amount of water vapor in the air at a given temperature to the maximum amount that could exist at that temperature; usually expressed in percent.

Relative wind. Direction of the airflow produced by an object moving through the air. The relative wind for an airplane in flight flows in a direction parallel with and opposite to the direction of flight; therefore, the actual flight path of the airplane determines the direction of the relative wind.

Remote communications outlet (RCO). An unmanned communications facility that is remotely controlled by air traffic personnel.

Required navigation performance (RNP). A specified level of accuracy defined by a lateral area of confined airspace in which an RNP-certified aircraft operates.

Restricted area. Airspace designated under 14 CFR part 73 within which the flight of aircraft, while not wholly prohibited, is subject to restriction.

Reverse sensing. The VOR needle appearing to indicate the reverse of normal operation.

RF. Radio frequency.

Rhodopsin. The photosensitive pigments that initiate the visual response in the rods of the eye.

Rigging. The final adjustment and alignment of an aircraft and its flight control system that provides the proper aerodynamic characteristics.

Rigidity. The characteristic of a gyroscope that prevents its axis of rotation tilting as the Earth rotates.

Rigidity in space. The principle that a wheel with a heavily weighted rim spinning rapidly will remain in a fixed position in the plane in which it is spinning.

Rime ice. Rough, milky, opaque ice formed by the instantaneous freezing of small supercooled water droplets.

Risk. The future impact of a hazard that is not eliminated or controlled.

Risk elements. There are four fundamental risk elements in aviation: the pilot, the aircraft, the environment, and the type of operation that comprise any given aviation situation.

Risk management. The part of the decision-making process which relies on situational awareness, problem recognition, and good judgment to reduce risks associated with each flight.

RMI. See radio magnetic indicator.

RNAV. See area navigation.

RNP. See required navigation performance.

RT. See receiver-transmitter.

Rudder. The movable primary control surface mounted on the trailing edge of the vertical fin of an airplane. Movement of the rudder rotates the airplane about its vertical axis.

Ruddervator. A pair of control surfaces on the tail of an aircraft arranged in the form of a V. These surfaces, when moved together by the control wheel, serve as elevators, and when moved differentially by the rudder pedals, serve as a rudder.

Runway centerline lights. Runway lighting which consists of flush centerline lights spaced at 50-foot intervals beginning 75 feet from the landing threshold.

Runway edge lights. A component of the runway lighting system that is used to outline the edges of runways at night or during low visibility conditions. These lights are classified according to the intensity they are capable of producing.

Runway end identifier lights (REIL). A pair of synchronized flashing lights, located laterally on each side of the runway threshold, providing rapid and positive identification of the approach end of a runway.

Runway visibility value (RVV). The visibility determined for a particular runway by a transmissometer.

Runway visual range (RVR). The instrumentally derived horizontal distance a pilot should be able to see down the runway from the approach end, based on either the sighting of high-intensity runway lights, or the visual contrast of other objects.

RVR. See runway visual range.

RVV. See runway visibility value.

S

SA. See selective availability.

St. Elmo's Fire. A corona discharge which lights up the aircraft surface areas where maximum static discharge occurs.

Satellite ephemeris data. Data broadcast by the GPS satellite containing very accurate orbital data for that satellite, atmospheric propagation data, and satellite clock error data.

Sea breeze. A coastal breeze blowing from sea to land caused by the temperature difference when the land surface is warmer than the sea surface. The sea breeze usually occurs during the day and alternates with the land breeze that blows in the opposite direction at night.

Sea level engine. A reciprocating aircraft engine having a rated takeoff power that is producible only at sea level.

Scan. The first fundamental skill of instrument flight, also known as "cross-check;" the continuous and logical observation of instruments for attitude and performance information.

Sectional aeronautical charts. Designed for visual navigation of slow- or medium-speed aircraft. Topographic information on these charts features the portrayal of relief, and a judicious selection of visual check points for VFR flight. Aeronautical information includes visual and radio aids to navigation, airports, controlled airspace, restricted areas, obstructions and related data.

SDF. See simplified directional facility.

Selective availability (SA). A satellite technology permitting the Department of Defense (DOD) to create, in the interest of national security, a significant clock and ephemeris error in the satellites, resulting in a navigation error.

Semicircular canal. An inner ear organ that detects angular acceleration of the body.

Semimonocoque. A fuselage design that includes a substructure of bulkheads and/or formers, along with stringers, to support flight loads and stresses imposed on the fuselage.

Sensitive altimeter. A form of multipointer pneumatic altimeter with an adjustable barometric scale that allows the reference pressure to be set to any desired level.

Service ceiling. The maximum density altitude where the best rate-of-climb airspeed will produce a 100-feet-per-minute climb at maximum weight while in a clean configuration with maximum continuous power.

Servo. A motor or other form of actuator which receives a small signal from the control device and exerts a large force to accomplish the desired work.

Servo tab. An auxiliary control mounted on a primary control surface, which automatically moves in the direction opposite the primary control to provide an aerodynamic assist in the movement of the control.

SIDS. See standard instrument departure procedures.

SIGMET. The acronym for Significant Meteorological information. A weather advisory in abbreviated plain language concerning the occurrence or expected occurrence of potentially hazardous en route weather phenomena that may affect the safety of aircraft operations. SIGMET is warning information, hence it is of highest priority among other types of meteorological information provided to the aviation Users.

Signal-to-noise ratio. An indication of signal strength received compared to background noise, which is a measure of the adequacy of the received signal.

Significant weather prognostic. Presents four panels showing forecast significant weather.

Simplex. Transmission and reception on the same frequency.

Simplified directional facility (SDF). A NAVAID used for nonprecision instrument approaches. The final approach course is similar to that of an ILS localizer; however, the SDF course may be offset from the runway, generally not more than 3°, and the course may be wider than the localizer, resulting in a lower degree of accuracy.

Single-pilot resource management (SRM). The ability for a pilot to manage all resources effectively to ensure the outcome of the flight is successful.

Situational awareness. Pilot knowledge of where the aircraft is in regard to location, air traffic control, weather, regulations, aircraft status, and other factors that may affect flight.

Skidding turn. An uncoordinated turn in which the rate of turn is too great for the angle of bank, pulling the aircraft to the outside of the turn.

Skills and procedures. The procedural, psychomotor, and perceptual skills used to control a specific aircraft or its systems. They are the airmanship abilities that are gained through conventional training, are perfected, and become almost automatic through experience.

Skin friction drag. Drag generated between air molecules and the solid surface of the aircraft.

Slant range. The horizontal distance from the aircraft antenna to the ground station, due to line-of-sight transmission of the DME signal.

Slaved compass. A system whereby the heading gyro is "slaved to," or continuously corrected to bring its direction readings into agreement with a remotely located magnetic direction sensing device (usually a flux valve or flux gate compass).

Slipping turn. An uncoordinated turn in which the aircraft is banked too much for the rate of turn, so the horizontal lift component is greater than the centrifugal force, pulling the aircraft toward the inside of the turn.

Small airplane. An airplane of 12,500 pounds or less maximum certificated takeoff weight.

Somatogravic illusion. The misperception of being in a nose-up or nose-down attitude, caused by a rapid acceleration or deceleration while in flight situations that lack visual reference.

Spatial disorientation. The state of confusion due to misleading information being sent to the brain from various sensory organs, resulting in a lack of awareness of the aircraft position in relation to a specific reference point.

Special flight permit. A flight permit issued to an aircraft that does not meet airworthiness requirements but is capable of safe flight. A special flight permit can be issued to move an aircraft for the purposes of maintenance or repair, buyer delivery, manufacturer flight tests, evacuation from danger, or customer demonstration. Also referred to as a ferry permit.

Special use airspace. Airspace in which flight activities are subject to restrictions that can create limitations on the mixed use of airspace. Consists of prohibited, restricted, warning, military operations, and alert areas.

Special fuel consumption. The amount of fuel in pounds per hour consumed or required by an engine per brake horsepower or per pound of thrust.

Speed. The distance traveled in a given time.

Spin. An aggravated stall that results in an airplane descending in a helical, or corkscrew path.

Spiral instability. A condition that exists when the static directional stability of the airplane is very strong as compared to the effect of its dihedral in maintaining lateral equilibrium.

Spiraling slipstream. The slipstream of a propeller-driven airplane rotates around the airplane. This slipstream strikes the left side of the vertical fin, causing the aircraft to yaw slightly. Rudder offset is sometimes used by aircraft designers to counteract this tendency.

Spoilers. High-drag devices that can be raised into the air flowing over an airfoil, reducing lift and increasing drag. Spoilers are used for roll control on some aircraft. Deploying spoilers on both wings at the same time allows the aircraft to descend without gaining speed. Spoilers are also used to shorten the ground roll after landing.

SRM. See single-pilot resource management.

SSR. See secondary surveillance radar.

SSV. See standard service volume.

Stabilator. A single-piece horizontal tail surface on an airplane that pivots around a central hinge point. A stabilator serves the purposes of both the horizontal stabilizer and the elevators.

Stability. The inherent quality of an airplane to correct for conditions that may disturb its equilibrium, and to return or to continue on the original flight path. It is primarily an airplane design characteristic.

Stagnant hypoxia. A type of hypoxia that results when the oxygen-rich blood in the lungs is not moving to the tissues that need it.

Stall. A rapid decrease in lift caused by the separation of airflow from the wing's surface, brought on by exceeding the critical angle of attack. A stall can occur at any pitch attitude or airspeed.

Standard atmosphere. At sea level, the standard atmosphere consists of a barometric pressure of 29.92 inches of mercury ("Hg) or 1013.2 millibars, and a temperature of 15 °C (59°F). Pressure and temperature normally decrease as altitude increases. The standard lapse rate in the lower atmosphere for each 1,000 feet of altitude is approximately 1 "Hg and 2 °C (3.5 °F). For example, the standard pressure and temperature at 3,000 feet mean sea level (MSL) are 26.92 "Hg (29.92 "Hg – 3 "Hg) and 9 °C (15 °C – 6 °C).

Standard empty weight (GAMA). This weight consists of the airframe, engines, and all items of operating equipment that have fixed locations and are permanently installed in the airplane including fixed ballast, hydraulic fluid, unusable fuel, and full engine oil.

Standard holding pattern. A holding pattern in which all turns are made to the right.

Standard instrument departure procedures (SIDS). Published procedures to expedite clearance delivery and to facilitate transition between takeoff and en route operations.

Standard rate turn. A turn in which an aircraft changes its direction at a rate of 3° per second (360° in 2 minutes) for low- or medium-speed aircraft. For high-speed aircraft, the standard rate turn is 1½° per second (360° in 4 minutes).

Standard service volume (SSV). Defines the limits of the volume of airspace which the VOR serves.

Standard terminal arrival route (STAR). A preplanned IFR ATC STAR published for pilot use in graphic and/or textual form.

Standard weights. Weights established for numerous items involved in weight and balance computations. These weights should not be used if actual weights are available.

STAR. See standard terminal arrival route.

Static longitudinal stability. The aerodynamic pitching moments required to return the aircraft to the equilibrium angle of attack.

Static pressure. Pressure of air that is still or not moving, measured perpendicular to the surface of the aircraft.

Static stability. The initial tendency an aircraft displays when disturbed from a state of equilibrium.

Station. A location in the airplane that is identified by a number designating its distance in inches from the datum. The datum is, therefore, identified as station zero. An item located at station +50 would have an arm of 50 inches.

Stationary front. A front that is moving at a speed of less than 5 knots.

Steep turns. In instrument flight, any turn greater than standard rate; in visual flight, anything greater than a 45° bank.

Stepdown fix. The point after which additional descent is permitted within a segment of an IAP.

Strapdown system. An INS in which the accelerometers and gyros are permanently "strapped down" or aligned with the three axes of the aircraft.

Stratosphere. A layer of the atmosphere above the tropopause extending to a height of approximately 160,000 feet.

Stress. The body's response to demands placed upon it.

Stress management. The personal analysis of the kinds of stress experienced while flying, the application of appropriate stress assessment tools, and other coping mechanisms.

Structural icing. The accumulation of ice on the exterior of the aircraft.

Sublimation. Process by which a solid is changed to a gas without going through the liquid state.

Suction relief valve. A relief valve in an instrument vacuum system required to maintain the correct low pressure inside the instrument case for the proper operation of the gyros.

Supercharger. An engine- or exhaust-driven air compressor used to provide additional pressure to the induction air so the engine can produce additional power.

Supercooled water droplets. Water droplets that have been cooled below the freezing point, but are still in a liquid state.

Surface analysis chart. A report that depicts an analysis of the current surface weather. Shows the areas of high and low pressure, fronts, temperatures, dewpoints, wind directions and speeds, local weather, and visual obstructions.

Synchro. A device used to transmit indications of angular movement or position from one location to another.

Synthetic vision. A realistic display depiction of the aircraft in relation to terrain and flight path.

T

TAA. See terminal arrival area.

TACAN. See tactical air navigation.

Tactical air navigation (TACAN). An electronic navigation system used by military aircraft, providing both distance and direction information.

Takeoff decision speed (V1). Per 14 CFR section 23.51: "the calibrated airspeed on the ground at which, as a result of engine failure or other reasons, the pilot assumed to have made a decision to continue or discontinue the takeoff."

Takeoff distance. The distance required to complete an all-engines operative takeoff to the 35-foot height. It must be at least 15 percent less than the distance required for a one-engine inoperative engine takeoff. This distance is not normally a limiting factor as it is usually less than the one- engine inoperative takeoff distance.

Takeoff safety speed (V2). Per 14 CFR part 1: "A referenced airspeed obtained after lift-off at which the required one- engine-inoperative climb performance can be achieved."

TAWS. See terrain awareness and warning system.

Taxiway lights. Omnidirectional lights that outline the edges of the taxiway and are blue in color.

Taxiway turnoff lights. Lights that are flush with the runway which emit a steady green color.

TCAS. See traffic alert collision avoidance system.

TCH. See threshold crossing height.

TDZE. See Touchdown zone elevation.

TEC. See Tower En Route Control.

Technique. The manner in which procedures are executed.

Telephone information briefing service (TIBS). An FSS service providing continuously updated automated telephone recordings of area and/or route weather, airspace procedures, and special aviation-oriented announcements.

Temporary flight restriction (TFR). Restriction to flight imposed in order to:

- » Protect persons and property in the air or on the surface from an existing or imminent flight associated hazard;
- » Provide a safe environment for the operation of disaster relief aircraft;
- » Prevent an unsafe congestion of sightseeing aircraft above an incident;
- » Protect the President, Vice President, or other public figures; and,
- » Provide a safe environment for space agency operations.

Pilots are expected to check appropriate NOTAMs during flight planning when conducting flight in an area where a temporary flight restriction is in effect.

Tension. Maintaining an excessively strong grip on the control column, usually resulting in an overcontrolled situation.

Terminal aerodrome forecast (TAF). A report established for the 5 statute mile radius around an airport. Utilizes the same descriptors and abbreviations as the METAR report.

Terminal arrival area (TAA). A procedure to provide a new transition method for arriving aircraft equipped with FMS and/or GPS navigational equipment. The TAA contains a "T" structure that normally provides a NoPT for aircraft using the approach.

Terminal instrument approach procedure (TERP). Prescribes standardized methods for use in designing instrument flight procedures.

TERP. See terminal instrument approach procedure.

Terminal radar service areas (TRSA). Areas where participating pilots can receive additional radar services. The purpose of the service is to provide separation between all IFR operations and participating VFR aircraft.

Terrain awareness and warning system (TAWS). A timed-based system that provides information concerning potential hazards with fixed objects by using GPS positioning and a database of terrain and obstructions to provide true predictability of the upcoming terrain and obstacles.

TFR. See temporary flight restriction.

Thermosphere. The last layer of the atmosphere that begins above the mesosphere and gradually fades away into space.

Threshold crossing height (TCH). The theoretical height above the runway threshold at which the aircraft's glideslope antenna would be if the aircraft maintained the trajectory established by the mean ILS glideslope or MLS glidepath.

Thrust. The force which imparts a change in the velocity of a mass. This force is measured in pounds but has no element of time or rate. The term "thrust required" is generally associated with jet engines. A forward force which propels the airplane through the air.

Thrust (aerodynamic force). The forward aerodynamic force produced by a propeller, fan, or turbojet engine as it forces a mass of air to the rear, behind the aircraft.

Thrust line. An imaginary line passing through the center of the propeller hub, perpendicular to the plane of the propeller rotation.

Time and speed table. A table depicted on an instrument approach procedure chart that identifies the distance from the FAF to the MAP, and provides the time required to transit that distance based on various groundspeeds.

Timed turn. A turn in which the clock and the turn coordinator are used to change heading a definite number of degrees in a given time.

TIS. See traffic information service.

Title 14 of the Code of Federal Regulations (14 CFR). Includes the federal aviation regulations governing the operation of aircraft, airways, and airmen.

Torque.

- A resistance to turning or twisting.
- Forces that produce a twisting or rotating motion.
- In an airplane, the tendency of the aircraft to turn (roll) in the opposite direction of rotation of the engine and propeller.
- In helicopters with a single, main rotor system, the tendency of the helicopter to turn in the opposite direction of the main rotor rotation.

Torquemeter. An instrument used with some of the larger reciprocating engines and turboprop or turboshaft engines to measure the reaction between the propeller reduction gears and the engine case.

Total drag. The sum of the parasite drag and induced drag.

Touchdown zone elevation (TDZE). The highest elevation in the first 3,000 feet of the landing surface, TDZE is indicated on the instrument approach procedure chart when straight-in landing minimums are authorized.

Touchdown zone lights. Two rows of transverse light bars disposed symmetrically about the runway centerline in the runway Touchdown zone.

Tower En Route Control (TEC). The control of IFR en route traffic within delegated airspace between two or more adjacent approach control facilities, designed to expedite traffic and reduce control and pilot communication requirements.

TPP. See United States Terminal Procedures Publication.

Track. The actual path made over the ground in flight.

Tracking. Flying a heading that will maintain the desired track to or from the station regardless of crosswind conditions.

Traffic Alert Collision Avoidance System (TCAS). An airborne system developed by the FAA that operates independently from the ground-based Air Traffic Control system. Designed to increase flight deck awareness of proximate aircraft and to serve as a "last line of defense" for the prevention of midair collisions.

Traffic information service (TIS). A ground-based service providing information to the flight deck via data link using the S-mode transponder and altitude encoder to improve the safety and efficiency of "see and avoid" flight through an automatic display that informs the pilot of nearby traffic.

Trailing edge. The portion of the airfoil where the airflow over the upper surface rejoins the lower surface airflow.

Transcribed Weather Broadcast (TWEB). An FSS service, available in Alaska only, providing continuously updated automated broadcast of meteorological and aeronautical data over selected L/MF and VOR NAVAIDs.

Transponder. The airborne portion of the ATC radar beacon system.

Transponder code. One of 4,096 four-digit discrete codes ATC assigns to distinguish between aircraft.

Trend. Immediate indication of the direction of aircraft movement, as shown on instruments.

Tricycle gear. Landing gear employing a third wheel located on the nose of the aircraft.

Trim. To adjust the aerodynamic forces on the control surfaces so that the aircraft maintains the set attitude without any control input.

Trim tab. A small auxiliary hinged portion of a movable control surface that can be adjusted during flight to a position resulting in a balance of control forces.

Tropopause. The boundary layer between the troposphere and the stratosphere which acts as a lid to confine most of the water vapor, and the associated weather, to the troposphere.

Troposphere. The layer of the atmosphere extending from the surface to a height of 20,000 to 60,000 feet, depending on latitude.

True airspeed. Actual airspeed, determined by applying a correction for pressure altitude and temperature to the CAS.

True altitude. The vertical distance of the airplane above sea level—the actual altitude. It is often expressed as feet above mean sea level (MSL). Airport, terrain, and obstacle elevations on aeronautical charts are true altitudes.

Truss. A fuselage design made up of supporting structural members that resist deformation by applied loads. The truss- type fuselage is constructed of steel or aluminum tubing. Strength and rigidity is achieved by welding the tubing together into a series of triangular shapes, called trusses.

T-tail. An aircraft with the horizontal stabilizer mounted on the top of the vertical stabilizer, forming a T.

Turbine discharge pressure. The total pressure at the discharge of the low-pressure turbine in a dual-turbine axial- flow engine.

Turbine engine. An aircraft engine which consists of an air compressor, a combustion section, and a turbine. Thrust is produced by increasing the velocity of the air flowing through the engine.

Turbocharger. An air compressor driven by exhaust gases, which increases the pressure of the air going into the engine through the carburetor or fuel injection system.

Turbofan engine. A fanlike turbojet engine designed to create additional thrust by diverting a secondary airflow around the combustion chamber.

Turbojet engine. A turbine engine which produces its thrust entirely by accelerating the air through the engine.

Turboprop engine. A turbine engine which drives a propeller through a reduction gearing arrangement. Most of the energy in the exhaust gases is converted into torque, rather than using its acceleration to drive the aircraft.

Turboshaft engine. A gas turbine engine that delivers power through a shaft to operate something other than a propeller.

Turn-and-slip indicator. A flight instrument consisting of a rate gyro to indicate the rate of yaw and a curved glass inclinometer to indicate the relationship between gravity and centrifugal force. The turn-and-slip indicator indicates the relationship between angle of bank and rate of yaw. Also called a turn-and-bank indicator.

Turn coordinator. A rate gyro that senses both roll and yaw due to the gimbal being canted. Has largely replaced the turn-and-slip indicator in modern aircraft.

TWEB. See Transcribed Weather Broadcast.

U

UHF. See ultra-high frequency.

Ultra-high frequency (UHF). The range of electromagnetic frequencies between 300 MHz and 3,000 MHz.

Ultimate load factor. In stress analysis, the load that causes physical breakdown in an aircraft or aircraft component during a strength test, or the load that according to computations, should cause such a breakdown.

Uncaging. Unlocking the gimbals of a gyroscopic instrument, making it susceptible to damage by abrupt flight maneuvers or rough handling.

Uncontrolled airspace. Class G airspace that has not been designated as Class A, B, C, D, or E. It is airspace in which air traffic control has no authority or responsibility to control air traffic; however, pilots should remember there are VFR minimums which apply to this airspace.

Underpower. Using less power than required for the purpose of achieving a faster rate of airspeed change.

United States Terminal Procedures Publication (TPP). Booklets published in regional format by FAA Aeronautical Navigation Products (AeroNav Products) that include DPs, STARs, IAPs, and other information pertinent to IFR flight.

Unusual attitude. An unintentional, unanticipated, or extreme aircraft attitude.

Useful load. The weight of the pilot, copilot, passengers, baggage, usable fuel, and drainable oil. It is the basic empty weight subtracted from the maximum allowable gross weight. This term applies to general aviation aircraft only.

User-defined waypoints. Waypoint location and other data which may be input by the User, this is the only GPS database information that may be altered (edited) by the User.

V

V1. See takeoff decision speed. V2. See takeoff safety speed. VA. See maneuvering speed.

Vapor lock. A problem that mostly affects gasoline-fuelled internal combustion engines. It occurs when the liquid fuel changes state from liquid to gas while still in the fuel delivery system. This disrupts the operation of the fuel pump, causing loss of feed pressure to the carburetor or fuel injection system, resulting in transient loss of power or complete stalling. Restarting the engine from this state may be difficult. The fuel can vaporize due to being heated by the engine, by the local climate or due to a lower boiling point at high altitude.

Variation. Compass error caused by the difference in the physical locations of the magnetic north pole and the geographic north pole.

VASI. See visual approach slope indicator.

VDP. See visual descent point.

Vector. A force vector is a graphic representation of a force and shows both the magnitude and direction of the force.

Vectoring. Navigational guidance by assigning headings.

VEF. Calibrated airspeed at which the critical engine of a multi-engine aircraft is assumed to fail.

Velocity. The speed or rate of movement in a certain direction.

Venturi tube. A specially shaped tube attached to the outside of an aircraft to produce suction to allow proper operation of gyro instruments.

Vertical axis. An imaginary line passing vertically through the center of gravity of an aircraft. The vertical axis is called the z-axis or the yaw axis.

Vertical card compass. A magnetic compass that consists of an azimuth on a vertical card, resembling a heading indicator with a fixed miniature airplane to accurately present the heading of the aircraft. The design uses eddy current damping to minimize lead and lag during turns.

Vertical speed indicator (VSI). A rate-of-pressure change instrument that gives an indication of any deviation from a constant pressure level.

Vertical stability. Stability about an aircraft's vertical axis. Also called yawing or directional stability.

Very-high frequency (VHF). A band of radio frequencies falling between 30 and 300 MHz.

Very-high frequency omnidirectional range (VOR). Electronic navigation equipment in which the flight deck instrument identifies the radial or line from the VOR station, measured in degrees clockwise from magnetic north, along which the aircraft is located.

Vestibule. The central cavity of the bony labyrinth of the ear, or the parts of the membranous labyrinth that it contains.

VFE. The maximum speed with the flaps extended. The upper limit of the white arc.

VFR. See visual flight rules.

VFR on top. ATC authorization for an IFR aircraft to operate in VFR conditions at any appropriate VFR altitude.

VFR over the top. A VFR operation in which an aircraft operates in VFR conditions on top of an undercast.

VFR terminal area chart. At a scale of 1:250,000, a chart that depicts Class B airspace, which provides for the control or segregation of all the aircraft within the Class B airspace. The chart depicts topographic information and aeronautical information including visual and radio aids to navigation, airports, controlled airspace, restricted areas, obstructions, and related data.

V-G diagram. A chart that relates velocity to load factor. It is valid only for a specific weight, configuration and altitude and shows the maximum amount of positive or negative lift the airplane is capable of generating at a given speed. Also shows the safe load factor limits and the load factor that the aircraft can sustain at various speeds.

Victor airways. Airways based on a centerline that extends from one VOR or VORTAC navigation aid or intersection, to another navigation aid (or through several navigation aids or intersections); used to establish a known route for en route procedures between terminal areas.

Visual approach slope indicator (VASI). A visual aid of lights arranged to provide descent guidance information during the approach to the runway. A pilot on the correct glideslope will see red lights over white lights.

Visual descent point (VDP). A defined point on the final approach course of a nonprecision straight-in approach procedure from which normal descent from the MDA to the runway Touchdown point may be commenced, provided the runway environment is clearly visible to the pilot.

Visual flight rules (VFR). Flight rules adopted by the FAA governing aircraft flight using visual references. VFR operations specify the amount of ceiling and the visibility the pilot must have in order to operate according to these rules. When the weather conditions are such that the pilot cannot operate according to VFR, he or she must use instrument flight rules (IFR).

Visual meteorological conditions (VMC). Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling meeting or exceeding the minimums specified for VFR.

VLE. Landing gear extended speed. The maximum speed at which an airplane can be safely flown with the landing gear extended.

VLO. Landing gear operating speed. The maximum speed for extending or retracting the landing gear if using an airplane equipped with retractable landing gear.

VMC. Minimum control airspeed. This is the minimum flight speed at which a light, twin-engine airplane can be satisfactorily controlled when an engine suddenly becomes inoperative and the remaining engine is at takeoff power.

VMC. See visual meteorological conditions.

VNE. The never-exceed speed. Operating above this speed is prohibited since it may result in damage or structural failure. The red line on the airspeed indicator.

VNO. The maximum structural cruising speed. Do not exceed this speed except in smooth air. The upper limit of the green arc.

VOR. See very-high frequency omnidirectional range.

VORTAC. A facility consisting of two components, VOR and TACAN, which provides three individual services: VOR azimuth, TACAN azimuth, and TACAN distance (DME) at one site.

VOR test facility (VOT). A ground facility which emits a test signal to check VOR receiver accuracy. Some VOTs are available to the User while airborne, while others are limited to ground use only.

VOT. See VOR test facility.

VSI. See vertical speed indicator.

VS0. The stalling speed or the minimum steady flight speed in the landing configuration. In small airplanes, this is the power-off stall speed at the maximum landing weight in the landing configuration (gear and flaps down). The lower limit of the white arc.

VS1. The stalling speed or the minimum steady flight speed obtained in a specified configuration. For most airplanes, this is the power-off stall speed at the maximum takeoff weight in the clean configuration (gear up, if retractable, and flaps up). The lower limit of the green arc.

V-tail. A design which utilizes two slanted tail surfaces to perform the same functions as the surfaces of a conventional elevator and rudder configuration. The fixed surfaces act as both horizontal and vertical stabilizers.

VX. Best angle-of-climb speed. The airspeed at which an airplane gains the greatest amount of altitude in a given distance. It is used during a short-field takeoff to clear an obstacle.

VY. Best rate-of-climb speed. This airspeed provides the most altitude gain in a given period of time.

VYSE. Best rate-of-climb speed with one engine inoperative. This airspeed provides the most altitude gain in a given period of time in a light, twin-engine airplane following an engine failure.

W

WAAS. See wide area augmentation system.

Wake turbulence. Wingtip vortices that are created when an airplane generates lift. When an airplane generates lift, air spills over the wingtips from the high pressure areas below the wings to the low pressure areas above them. This flow causes rapidly rotating whirlpools of air called wingtip vortices or wake turbulence.

Warm front. The boundary area formed when a warm air mass contacts and flows over a colder air mass. Warm fronts cause low ceilings and rain.

Warning area. An area containing hazards to any aircraft not participating in the activities being conducted in the area. Warning areas may contain intensive military training, gunnery exercises, or special weapons testing.

WARP. See weather and radar processing.

Waste gate. A controllable valve in the tailpipe of an aircraft reciprocating engine equipped with a turbocharger. The valve is controlled to vary the amount of exhaust gases forced through the turbocharger turbine.

Waypoint. A designated geographical location used for route definition or progress-reporting purposes and is defined in terms of latitude/longitude coordinates.

WCA. See wind correction angle.

Weather and radar processor (WARP). A device that provides real-time, accurate, predictive, and strategic weather information presented in an integrated manner in the National Airspace System (NAS).

Weather depiction chart. Details surface conditions as derived from METAR and other surface observations.

Weight. The force exerted by an aircraft from the pull of gravity.

Wide area augmentation system (WAAS). A differential global positioning system (DGPS) that improves the accuracy of the system by determining position error from the GPS satellites, then transmitting the error, or corrective factors, to the airborne GPS receiver.

Wind correction angle (WCA). The angle between the desired track and the heading of the aircraft necessary to keep the aircraft tracking over the desired track.

Wind direction indicators. Indicators that include a wind sock, wind tee, or tetrahedron. Visual reference will determine wind direction and runway in use.

Wind shear. A sudden, drastic shift in windspeed, direction, or both that may occur in the horizontal or vertical plane.

Winds and temperature aloft forecast (FB). A twice daily forecast that provides wind and temperature forecasts for specific locations in the contiguous United States.

Wing area. The total surface of the wing (in square feet), which includes control surfaces and may include wing area covered by the fuselage (main body of the airplane), and engine nacelles.

Wings. Airfoils attached to each side of the fuselage and are the main lifting surfaces that support the airplane in flight.

Wing root. The wing root is the part of the wing on a fixed- wing aircraft that is closest to the fuselage. Wing roots usually bear the highest bending forces in flight and during landing, and they often have fairings to reduce interference drag between the wing and the fuselage. The opposite end of a wing from the wing root is the wing tip.

Wing span. The maximum distance from wingtip to wingtip.

Wingtip vortices. The rapidly rotating air that spills over an airplane's wings during flight. The intensity of the turbulence depends on the airplane's weight, speed, and configuration. Also referred to as wake turbulence. Vortices from heavy aircraft may be extremely hazardous to small aircraft.

Wing twist. A design feature incorporated into some wings to improve aileron control effectiveness at high angles of attack during an approach to a stall.

Work. A measurement of force used to produce movement.

World aeronautical charts (WAC). A standard series of aeronautical charts covering land areas of the world at a size and scale convenient for navigation (1:1,000,000) by moderate speed aircraft. Topographic information includes cities and towns, principal roads, railroads, distinctive landmarks, drainage, and relief. Aeronautical information includes visual and radio aids to navigation, airports, airways, restricted areas, obstructions and other pertinent data.

Z

Zero fuel weight (ZFW). Maximum weight of an aircraft when loaded with passengers and cargo, but without usable fuel or oil onboard.

Zone of confusion. Volume of space above the station where a lack of adequate navigation signal directly above the VOR station causes the needle to deviate.

Zulu time. A term used in aviation for coordinated universal time (UTC) which places the entire world on one time standard.

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ABBREVIATIONS & ACRONYMS

A	
/	and
A/C	approach control
AAM	Advanced Air Mobility
AAS	airport advisory service
ICAO:	AAP - approach control; AC - altocumulus
ACFT	aircraft
ACR	air carrier
ADF	automatic direction finder
AER	approach end runway
AFIS	Automatic Flight Information Service
AFT	after
AGL	above ground level
AHRS	Attitude Heading Reference System
AIM	Aeronautical Information Manual
ALS	approach light system
ALSF-1	standard 2400' high-intensity approach lighting system with sequenced flashers (Category I configuration)
ALSF-2	standard 2400' high-intensity approach lighting system with sequenced flashers (Category II configuration)
ALSTG	altimeter setting
ALT	altitude
ALTM	altimeter
ALTN	alternate
AMDT	amendment
ICAO:	AMD - amendment
APCH	approach
APCHG	approaching
APRX	approximate
APV	approve or approved or approval
ARAC	Army Radar Approach Control facility (US Army)
ARPT	airport
ATO	Air Traffic Organization
ICAO:	AD - aerodrome
ARSR	air route surveillance radar
ARTCC	air route traffic control center
ASDE	airport surface detection equipment
ASPH	asphalt
ASSC	Airport Surface Surveillance Capability
ATCT	air traffic control tower
ATD	along-track distance
ASR	airport surveillance radar
ATIS	automatic terminal information service

AVBL	available
AWY	airway
B	
BC	back course
BCN	beacon
BCST	broadcast
BLDG	building
BRG	bearing
BTN	between
BYD	beyond
C	
CAT	category
ICAO:	CAT - clear air turbulence
CBO	Community-Based Organization
CFR	Code of Federal Regulations
CFR	crash fire rescue
CLNC	clearance
ICAO:	CLR - clear/cleared to/clearance
CLSD	close or closed or closing
CMSND	commissioned
CNTR	center
CNTRLN	centerline
ICAO:	CL - centerline
COA	Certificate of Waiver or Authorization
COMLO	compass locator
CONST	construction
CPTY	capacity
CTC	contact
ICAO:	CTR - control zone
D	
ICAO:	D - danger area
ICAO:	D - downward (tendency in RVR during previous 10 minutes)
DALGT	daylight
DCMSND	decommissioned
DDT	runway weight bearing capacity for aircraft with double dual-tandem type landing gear
DEGS	degrees
ICAO:	C - degrees Celsius (Centigrade) F - degrees Fahrenheit
DEP	depart; departure
ICAO:	DEP - depart/departure/departure message
DF	direction finder
ICAO:	DF - I am connecting you to the station you request
DH	decision height
DME	UHF standard (TACAN compatible distance measuring equipment)
ICAO:	DME - distance meaning equipment

DSPLCD	displaced	**FL**	flight level
ICAO:	DIST - distance	**FM**	fan marker
DT	runway weight bearing capacity for aircraft with dual-tandem type landing gear	**FM**	from
DURG	during	**ICAO:**	FM - from; FM - from (followed by time weather change is forecast to begin)
ICAO:	DRG - during	**FREQ**	frequency
DVFR	defense visual flight rule	**FRIA**	FAA-Recognized Identification Area
DW	runway weight bearing capacity for aircraft with dual-wheel type landing gear	**FRQ**	frequent
E		**FSS**	Flight Service Station
E	east	**FT**	feet
ICAO:	E - east/east longitude	**G**	
EQUIP	equipment	**GOVT**	government
ICAO:	EQPT - equipment	**GP**	glide path
ETA	estimated time of arrival	**ICAO:**	GP - glide path
ETE	estimated time en route	**GS**	Glide Slope
EXCP	except	**ICAO:**	GS - ground speed; GS - small hail and/or snow pellets
ICAO:	EXC-except	**H**	
EXTD	extend or extended	**HAA**	height above airport
F		**HAT**	height above Touchdown
FAF	final approach fix	**HAZMAT**	Hazardous Material
FDC	flight data center	**ICAO:**	HGT - height/height above
FI/P	flight information (permanent)	**HIRL**	High intensity runway lights
FI/T	flight information (temporary)		

HOL	holiday
HWY	highway
I	
IAF	initial approach fix
IAP	instrument approach procedure
ICAO:	INA - initial approach
IDENT	identifi cation
ICAO:	ID - identifi er/identifi cation/identify
IF	intermediate fix
ICAO:	IF - intermediate approach fix
IFR	instrument flight rules
IFSS	international flight service station
INFO	information
INOP	inoperative
INS	Inertial Navigation System
INT	intersection
INTL	international
INTST	intensity
IRU	Inertial Reference Unit
J	
J-bar	jet runway barrier
K	
KHZ	kilohertz
L	
L	left (used only to designate rwys; e.g., rwy 12L)
ICAO:	L - left/runway identification/locator
LAANC	Low Altitude Authorization and Notification Capability
LAT	latitude
LB	pounds (weight)
LCTD	located
ICAO:	LDA - landing distance available LLZ - localizer
LGTD	lighted
LMM	compass locator at ILS middle marker
LNDG	landing
ICAO:	LDG - landing
LOC	localizer
ICAO:	LOC-localizer or locally or location or located
LOM	compass locator at ILS outer marker
LONG	longitude
LRCO	limited remote communications outlet
M	
MAA	maximum authorized altitude
MAG	magnetic

MAINT	maintain, maintenance	**NATL**	national
ICAO:	MNTN - maintain; MAINT - maintenance	**NDB**	nondirectional radio beacon
MALS	medium intensity approach light system	**NM**	nautical mile(s)
MALSR	medium intensity approach light system with runway alignment indicator lights	**NOPT**	no procedure turn required
MAP	missed approach point	**NR**	number
MAX	maximum	**O**	
MCA	minimum crossing altitude	**OBSTN**	obstruction
MDA	minimum descent altitude	**OCA**	Oceanic Control Area
MEA	minimum en route IFR altitude	**ODALS**	omnidirectional approach lighting system
MGOW	Maximum Gross Operating Weight	**OM**	outer marker ILS
MHZ	megahertz	**OOP**	Operations Over People
MIN	minimum or minute	**OPER**	operate
MIRL	medium intensity runway edge lights	**OPN**	operation
MM	middle marker ILS	**ICAO:**	OPR - operator/operate/operative/ operating/ operational
MOCA	minimum obstruction clearance altitude	**ORIG**	original
MRA	minimum reception altitude	**OTS**	out of service
MSA	minimum safe altitude	**OVRN**	overrun
MSL	mean sea level	**P**	
MUNI	municipal	**PAO**	Public Aircraft Operation
N		**PAT**	pattern
N	north	**PBCS**	Performance-Based Communication and Surveillance
NA	not authorized	**PCN**	pavement classification number

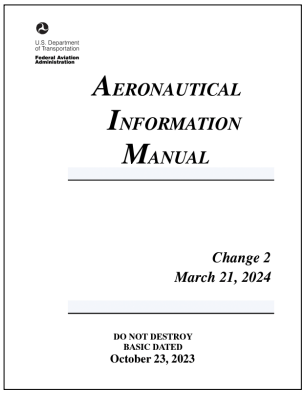
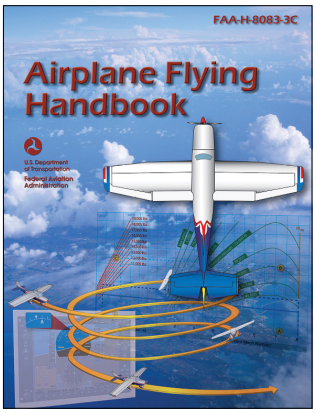
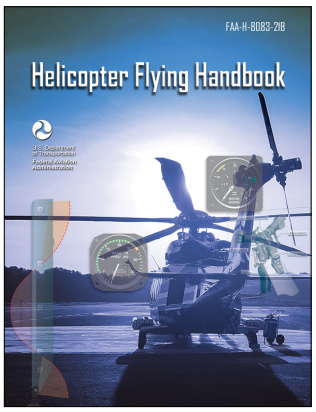
PERMLY	permanently
PIC	Pilot-in-Command
POB	persons on board
PPR	prior permission required
PROC	procedure
Q	
QUAD	quadrant
R	
R	right (used only to designate rwys; e.g., rwy 19R)
ICAO:	R - received (acknowledgement of receipt)/red/ restricted area (followed by identification)/right (runway identification)
RADAR	radio detection and ranging
RAPCON	Radar Approach Control facility (USAF, USN and USMC)
RATCF	Radar Air Traffic Control Facility (USN and USMC)
RC	Radio-Controlled
RCAG	remote communications air/ground
ICAO:	RCL - runway centerline
RCO	remote communications outlet
RCV	receive
RCVG	receiving
REIL	runway end identifier lights
REQ	request
RID	Remote Identification
RNAV	area navigation
RPIC	Remote Pilot-in-Command
RRP	runway reference point
REL	runway entrance lights
RLLS	Runway Lead-in Light System
RSTRD	restricted
RTS	returned to service
RVR	runway visual range
RVRM	runway visual range midpoint
RVRR	runway visual range rollout
RVRT	runway visual range Touchdown
RWY	runway
ICAO:	RWY-runway
S	
S	runway weight bearing capacity for aircraft with single-wheel type landing gear
S	south
ICAO:	S - south/south latitude
SAA	Sense and Avoid
SDF	simplified directional facility
SEC	second
SFC	surface

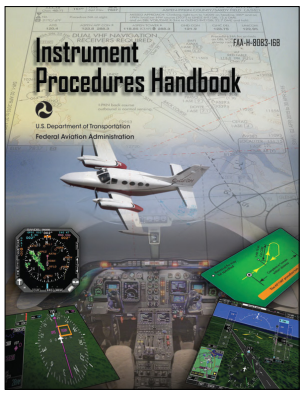
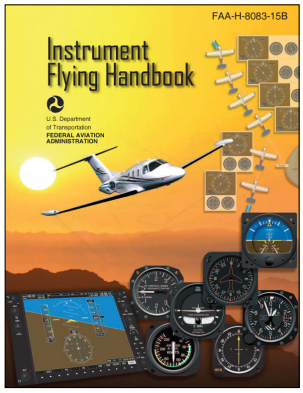
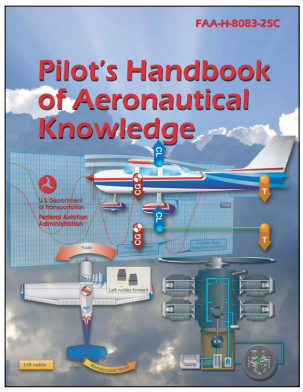
SFL	sequenced flashing lights	**TCH**	threshold crossing height
SGI	Special Government Interest	**ICAO:**	TEMPO - Temporary/temporarily
SI	straight-in approach	**TFC**	traffic
ICAO:	STA - straight-in approach	**THL**	takeoff hold lights
SM	statute mile(s)	**THRU**	through
SR	sunrise	**ICAO:**	THRU - through/I am connecting you to another switchboard
SS	sunset	**TKOF**	take-off
ICAO:	SS - sandstorm	**TEMPRLY**	temporarily
SSALR	simplified short approach lighting system with runway alignment indicator lights	**ICAO:**	TMA - TERMINAL CONTROL AREA
SSALS	simplified short approach lighting system	**TMPRY**	temporary/temporarily
STOL	short take-off and landing runway	**TPA**	traffic pattern altitude
ICAO:	STOL - short takeoff and landing	**TRACON**	terminal radar approach control
sUAS	Small UAS	**TRML**	terminal
SVC	service	**TRSA**	terminal radar service area
ICAO:	SVC - service message	**TRUST**	The Recreational UAS Safety Test
T		**TSNT**	transient
T	true (after a bearing)	**TWR**	tower
ICAO:	T - temperature	**TWY**	taxiway
TAC	terminal area chart	**U**	
TACAN	UHF navigational facility - omnidirectioal course and distance information	**ICAO:**	U/S - unserviceable
ICAO:	TACAN - VHF tactical navigational aid	**UAM**	Urban Air Mobility
TAS	true air speed	**UAS**	Unmanned Aircraft System

UAVBL	unavailable
UHF	ultra high frequency
UNLGTD	unlighted
UNMON	unmonitored
UNSKED	unscheduled
UNUSBL	unusable
UTM	UAS Traffic Management
V	
VASI	visual approach slope indicator
VCNTY	vicinity
VDP	visual descent point
VFR	visual flight rules
VHF	very high frequency
VOR	VHF omni-directional radio range
VLOS	Visual Line of Sight
VO	Visual Observer
VORTAC	Combined VOR and TACAN system (collocated)
VOT	a VOR Receiver testing facility
ICAO:	VIS - visibility
W	
W	west
WEA	weather
ICAO:	WX - weather
WKDAY	weekday
WKEND	weekend
WPT	waypoint
WS	Weather Service
WT	weight
Z	
Z	Coordinated Universal Time
ICAO:	UTC - Coordinated Universal Time

REFERENCES

Many of the items discussed throughout this document are referenced from various Federal Aviation Administration (FAA) publications. For additional information about charts and other aviation related topics, please follow the links provided.

Publication	Title and/or ID
	Aeronautical Information Manual (AIM)
Federal Aviation Administration	Aeronautical Information Publication (AIP)
	Airplane Flying Handbook FAA-H-8083-3C
	Helicopter Flying Handbook FAA-H-8083-21B

Publication	Title and/or ID
	Instrument Procedures Handbook FAA-H-8083-16B
	Instrument Flying Handbook FAA-H-8083-15B
	Pilot's Handbook of Aeronautical Knowledge FAA-H-8083-25C

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APPENDIX

EXAMPLE FLIGHT WITH SMARTCHARTS

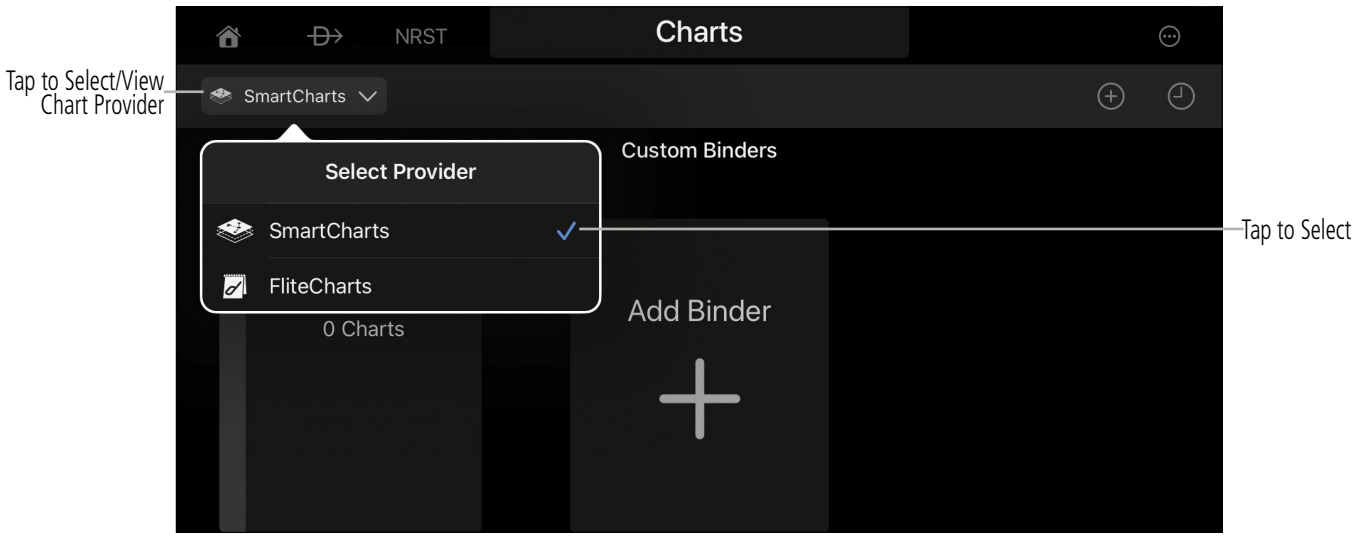
NOTE: *Not all charts are available in SmartCharts. When another chart provider is used, i.e. FliteCharts, the chart(s) will be used and displayed accordingly.*

NOTE: *When updated and/or downloaded successfully, SmartCharts will be indicated by the following icons next to the appropriate chart: Instrument Approach =* , *Arrival Procedure =* , *Departure Procedure =* .

NOTE: *When updated and/or downloaded successfully, FliteCharts will be indicated by* *next to the chart.*

NOTE: *When updated and/or downloaded successfully, Jeppesen charts will be indicated by* *next to the chart.*

NOTE: *When in the Charts or Airport Info chapters, please ensure SmartCharts is selected as the primary chart provider from the dropdown menu in the upper left-hand corner.*



Garmin Pilot iOS - SmartCharts - Charts - Select Provider

Overview

For this example flight scenario, click to view a Garmin training video via YouTube that follows along with this printed scenario.

The text in this 'Example Flight With SmartCharts' section is transcribed from the Garmin Training video.

For this example flight scenario, we will walk you through the Airport Information, Departure, Arrival, and Approach charts on SmartCharts for an IFR flight from Ontario, CA (KONT) to Phoenix-Mesa Gateway, Arizona (KIWA), in a Category B turboprop aircraft.

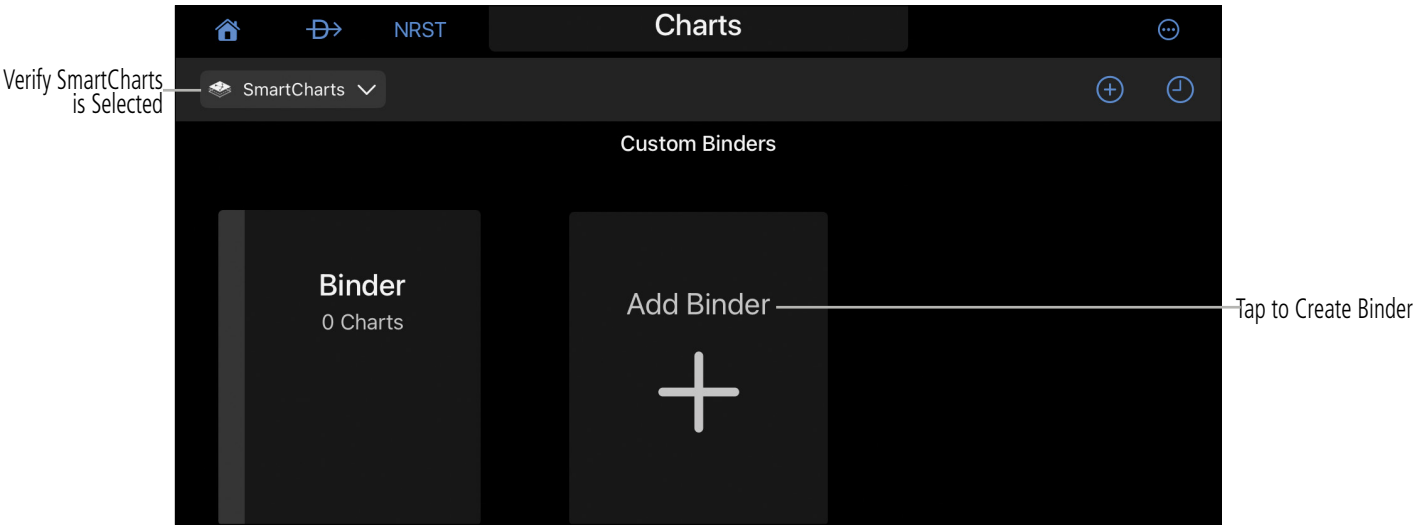
Accessing Your Chart

There are two primary methods to accessing your chart, either Charts or Airport Info.

For this example flight, we will display procedures for both methods, then for the rest of the document, we will focus on Airport Info as the primary method to reduce redundancy.

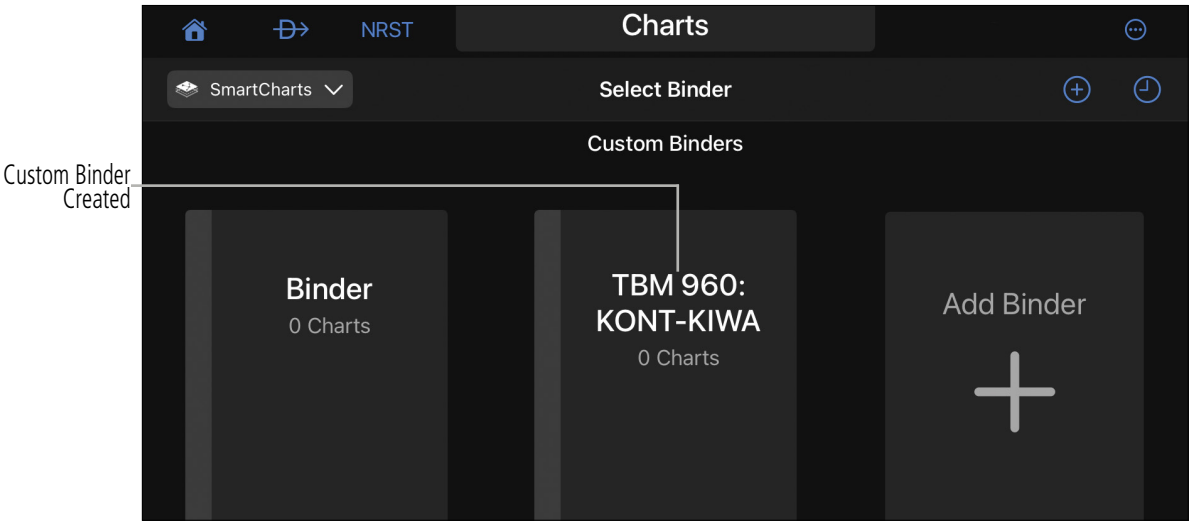
Accessing SmartChart via Charts Page:

1) Tap > Charts > **Add Binder.**



Garmin Pilot iOS - SmartCharts - Charts - Add Binder

2) Enter a Chart Binder title, e.g. 'TBM 960: KONT-KIWA', then tap on the binder.



Garmin Pilot iOS - SmartCharts - Charts - Add Binder - Custom Binder Created

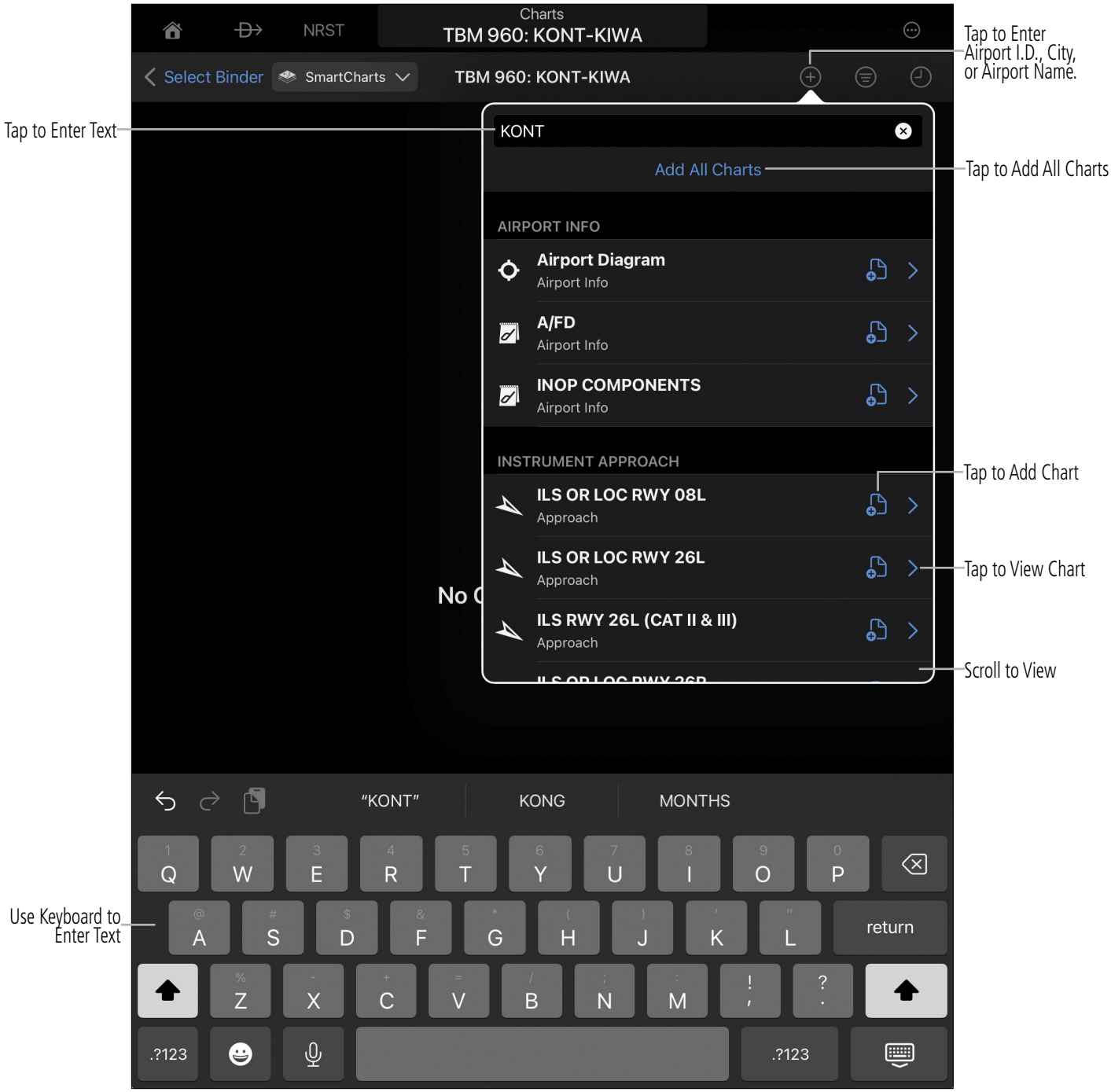
3) Since this is a new trip, no charts are displayed. To add charts, select + in the upper right-hand corner.

4) Enter the airport I.D. (e.g. KONT), city name (Ontario, CA), or airport name (Ontario International Airport) to display the available chart(s) Menu.

5) Scroll down (if applicable) to view additional charts, then select **Add All Charts.**

Or:

6) Individually add charts by selecting next to the desired chart(s).



Garmin Pilot iOS - SmartCharts - Charts - Add Binder - Custom Binder Created - Add Charts

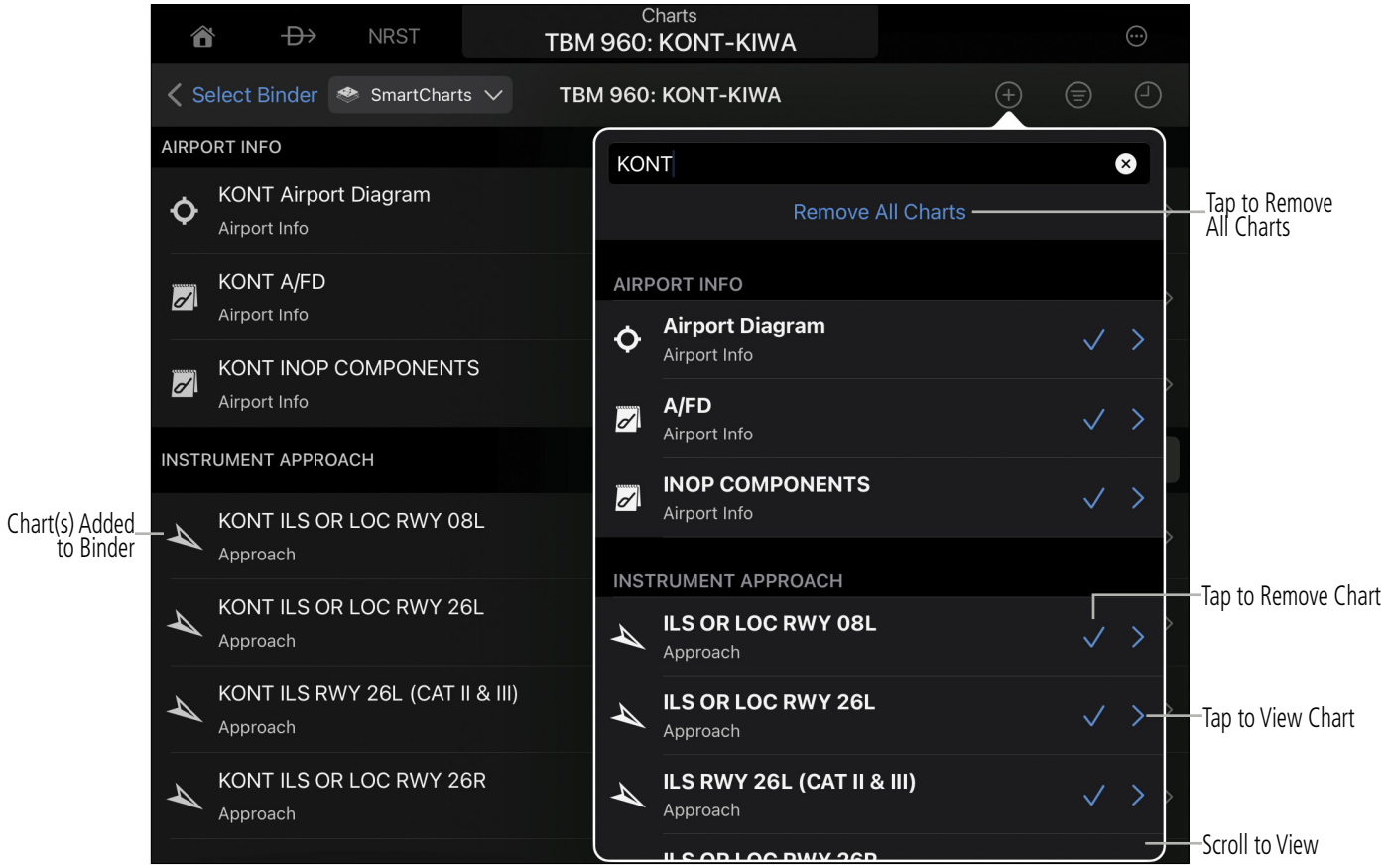
7) If desired, tap next to the desired chart to view.

8) Once the chart(s) are added, will be displayed next to the chart in the Menu. Behind the Menu, the Binder will autopopulate as charts are added/removed.

9) If desired, tap **Remove All Charts** to empty the Binder

Or:

10) Tap ✓ next to the desired chart to remove from the Binder.



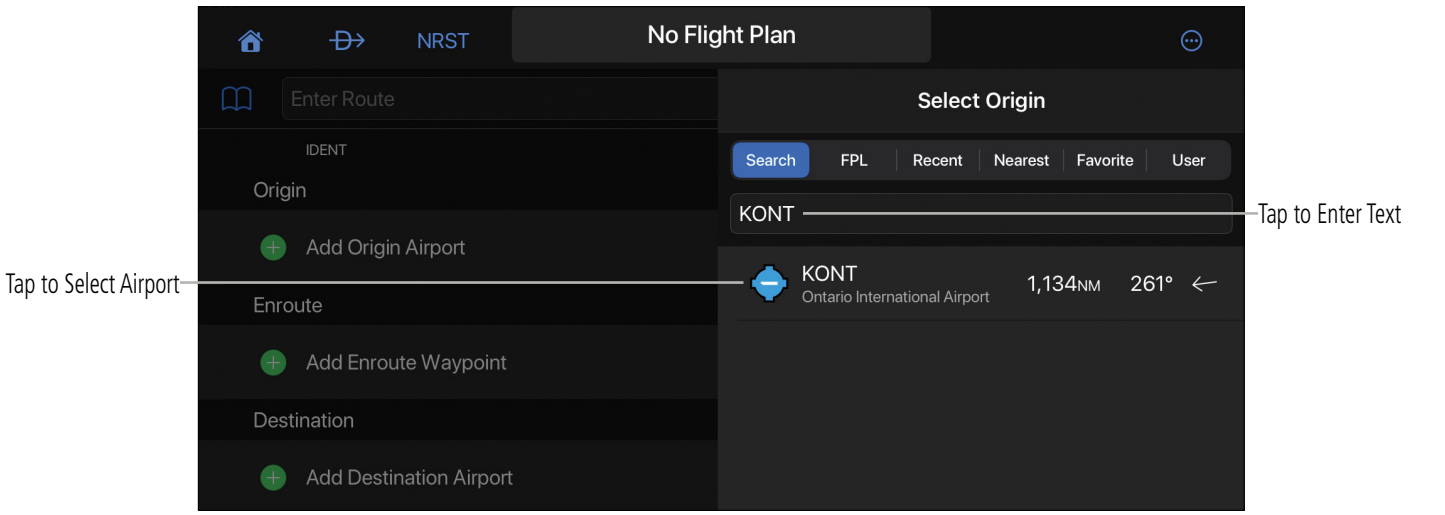
Garmin Pilot iOS - SmartCharts - Charts - Add Binder - Custom Binder Created - All Charts Added

Next, we will create a flight plan, which will autogenerate Binders for the Origin Airport and Destination Airport.

Creating Flight Plan:

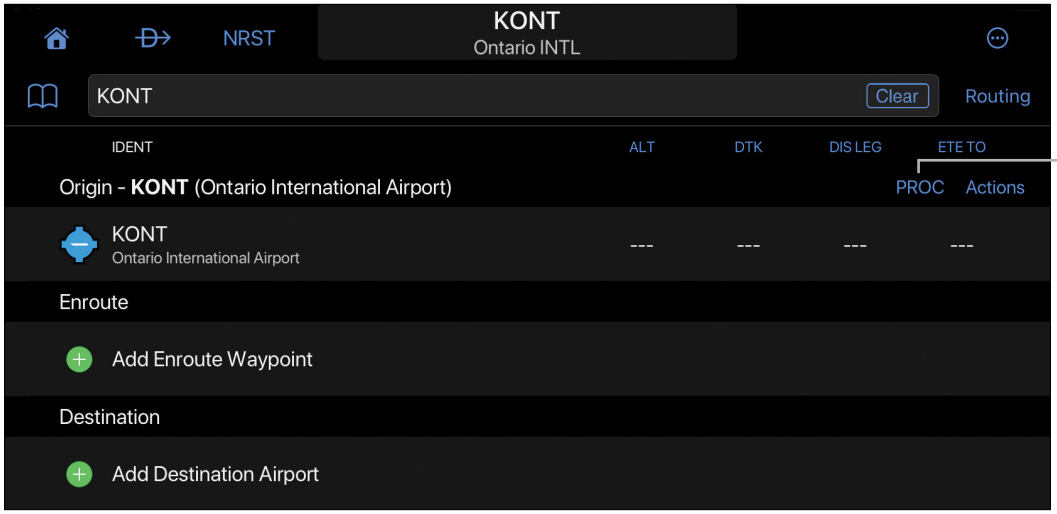
1) Tap 🏠 > ✈ Flight Plan > **Add Origin Airport.**

2) In the Search text bar, type **KONT**, then tap on the airport icon. KONT will now be displayed as the 'Origin' for your flight plan.

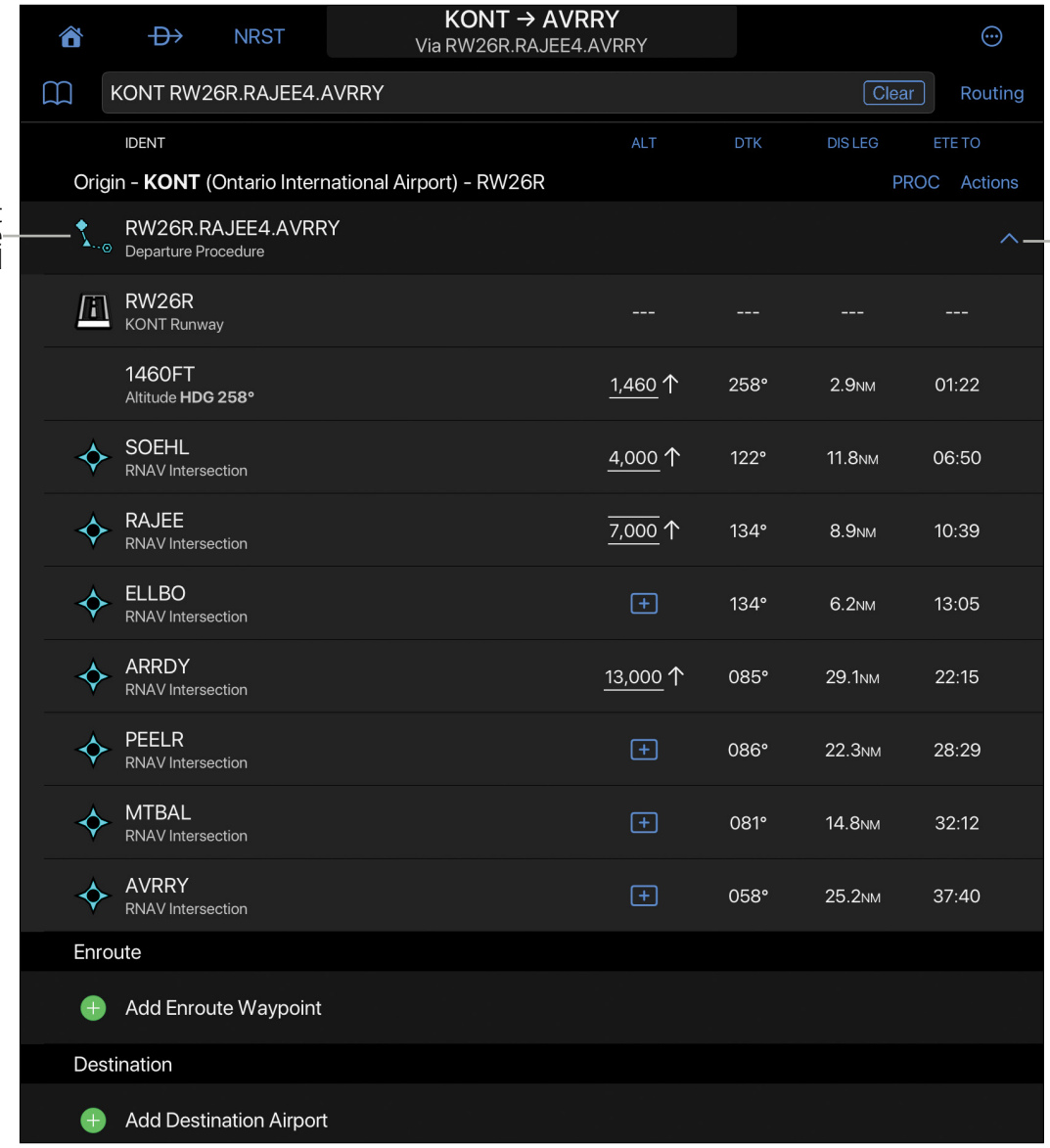


Garmin Pilot iOS - SmartCharts - Flight Plan - Add Origin Airport - KONT

3) Add the Departure Procedure by selecting **PROC** > **Select Procedure > RAJEE4 > RW26R > AVRRY.** If desired, tap ⌄ to expand/collapse info.

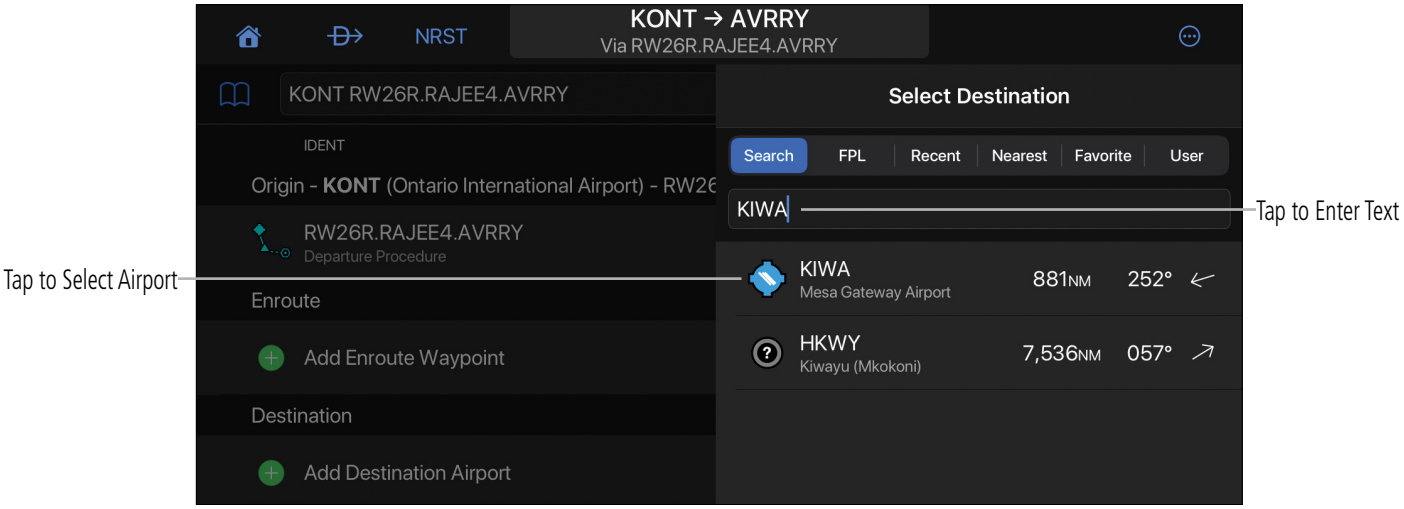


Garmin Pilot iOS - SmartCharts - Flight Plan - Origin Airport Entered



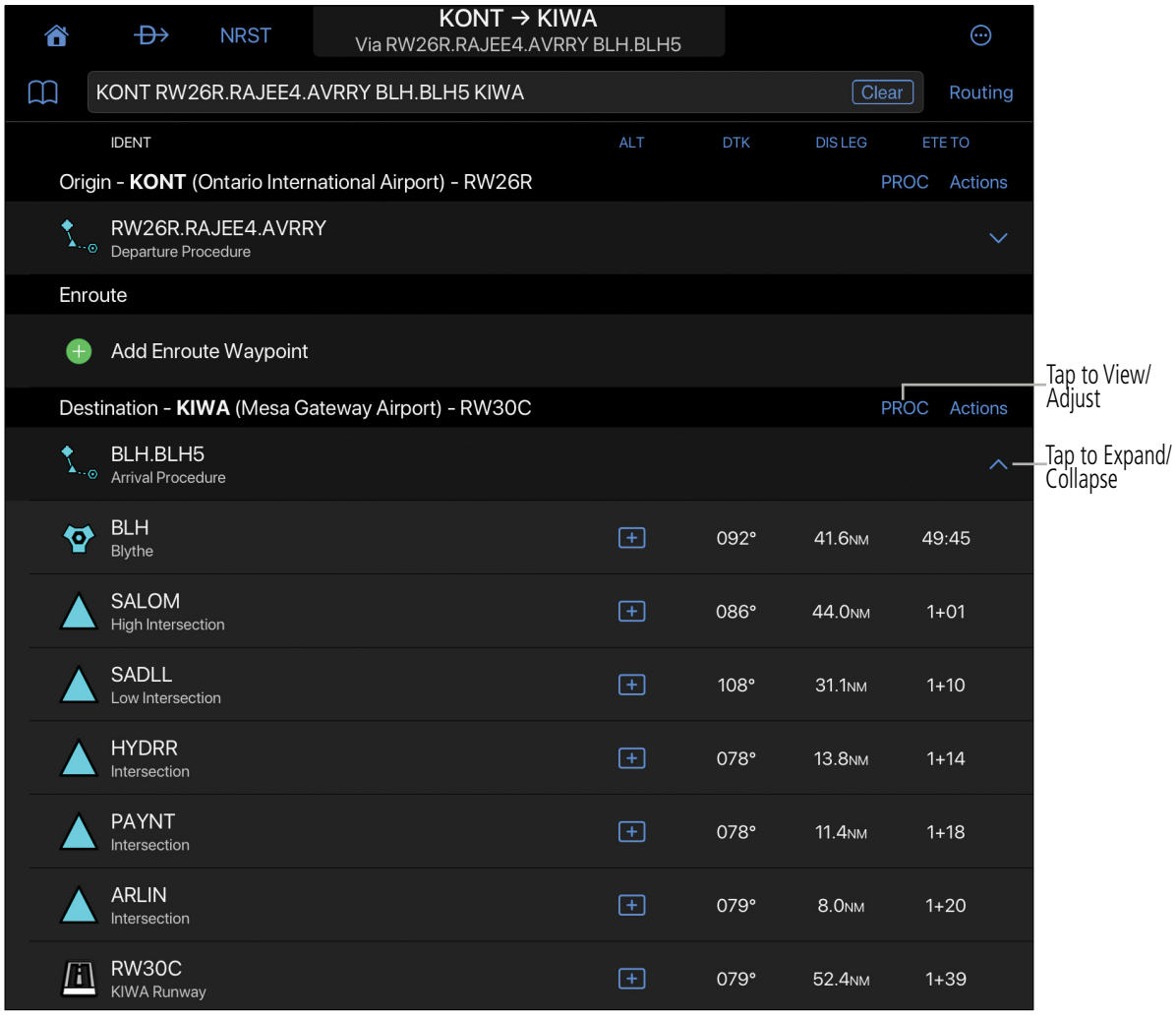
Garmin Pilot iOS - SmartCharts - Flight Plan - Origin Airport with Departure Procedure

4) Tap **Add Destination Airport,** and enter **KIWA** in the search text bar, then tap on the airport icon. KIWA will now be displayed as the 'Destination' for your flight plan.



Garmin Pilot iOS - SmartCharts - Flight Plan - Add Destination Airport - KIWA

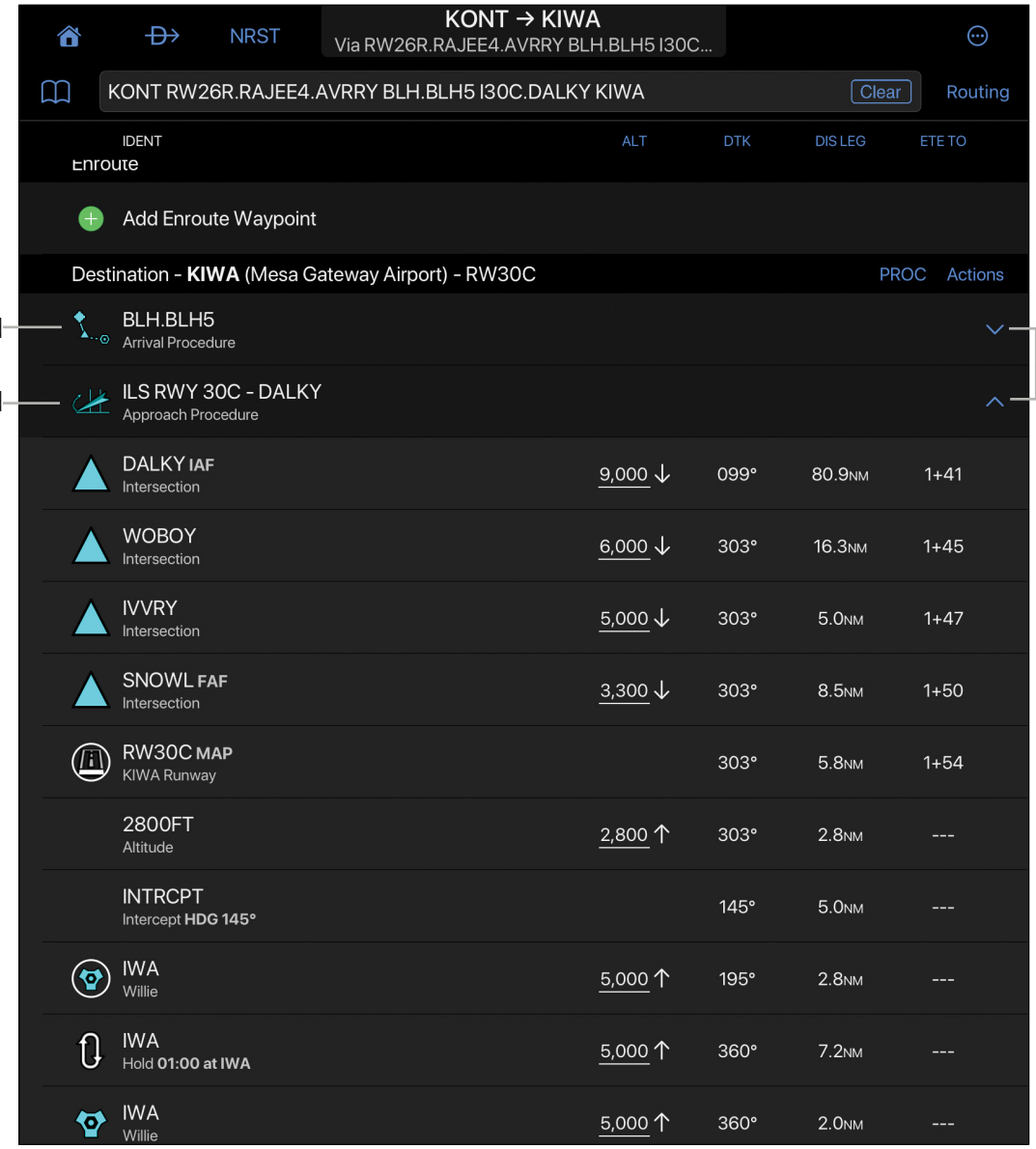
5) Add the Arrival Procedure by selecting **PROC > Select Arrival > BLH5 > BLH > RW30C.** If desired, tap to expand/collapse info.



Garmin Pilot iOS - SmartCharts - Flight Plan - Destination Airport and Arrival Procedure Entered

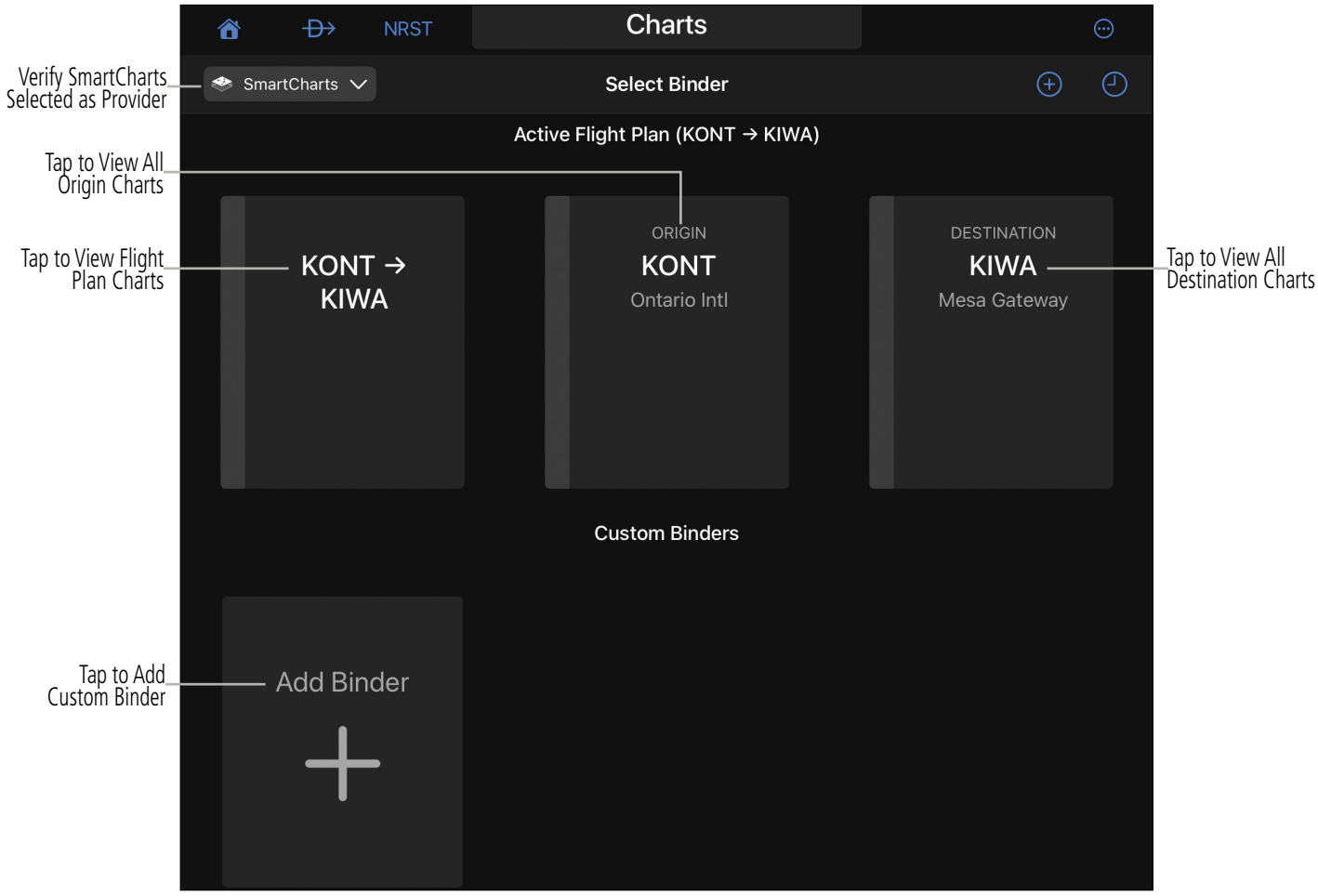
NOTE: *An Instrument Approach cannot be activated when in the Planning Mode.*

6) Add an Instrument Approach by selecting **PROC > Select Approach > ILS RWY 30C > DALKY > Load Approach**. If desired, tap ⌄ to expand/collapse info.



Garmin Pilot iOS - SmartCharts - Flight Plan - Destination Airport with Arrival Procedure & Instrument Approach

7) Once the procedures are loaded for the flight plan, tap > .



Garmin Pilot iOS - SmartCharts - Flight Plan - Autogenerated Charts

8) Customized chart binders can also be constructed and organized. Tap > > **Add Binder.**

9) Enter a binder name, then select the binder.

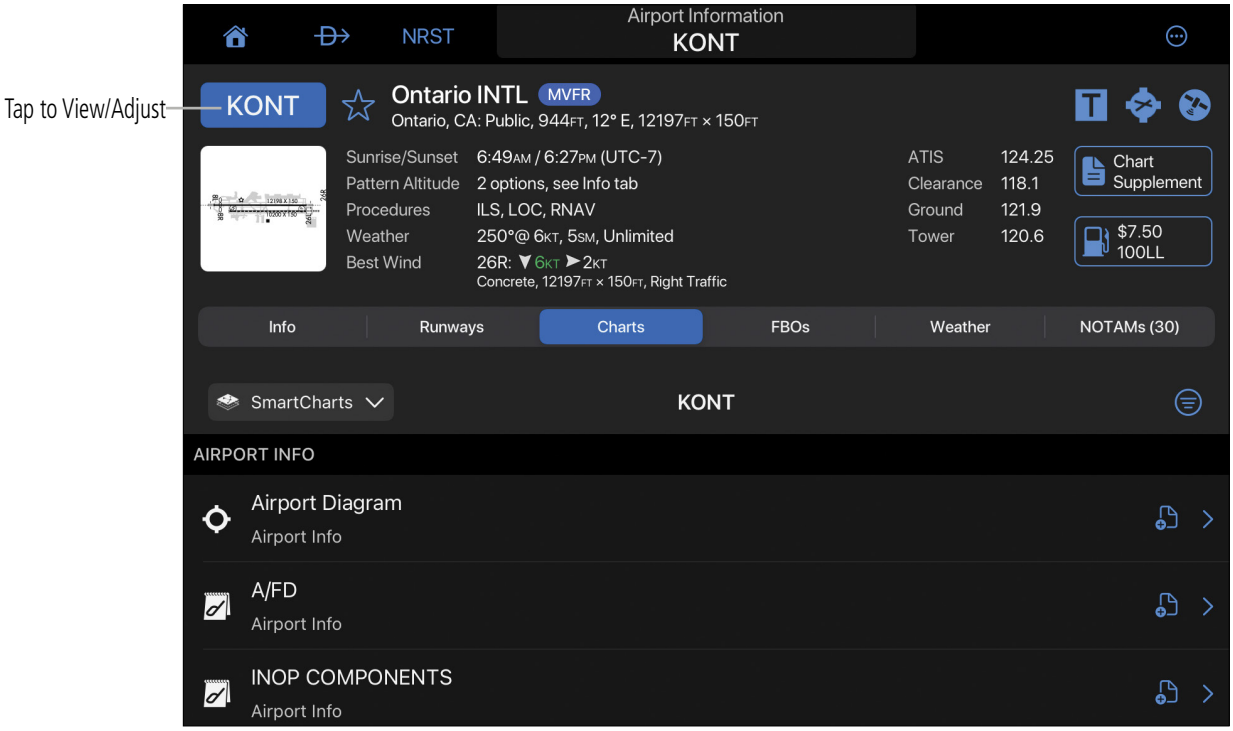
10) To add charts, select in the upper right-hand corner.

11) Enter the airport I.D. (e.g. KONT), city name (Ontario, CA), or airport name (Ontario International Airport) to display the available chart(s) Menu.

12) Scroll down (if applicable) to view additional charts, then select **Add All Charts.**

13) Another method to view charts is via Airport Information. Tap  > 

. The most recent airport will be loaded. The easiest way to view the airports in the active flight plan is to tap the Airport I.D. in the upper left portion of the screen, which displays a menu with the Relevant, Search, or Nearest functions.

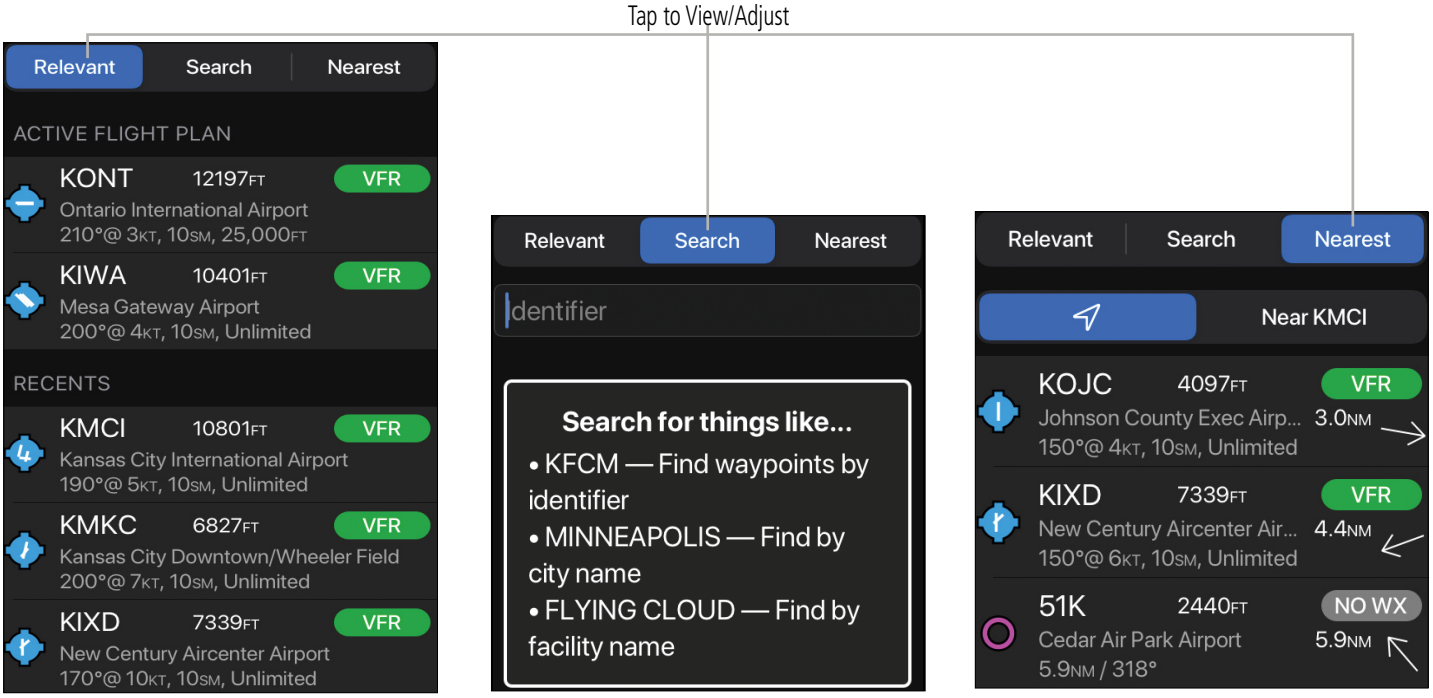


Garmin Pilot iOS - SmartCharts - Airport Info - Charts

14) Tap **Relevant**. The origin and destination airports will be listed at the top of the menu under Active Flight Plan.

15) Tap **Search** to manually enter text for either an airport I.D., airport name, or city.

16) Tap **Nearest** to view airports nearest either your current location, or nearest the selected airport.

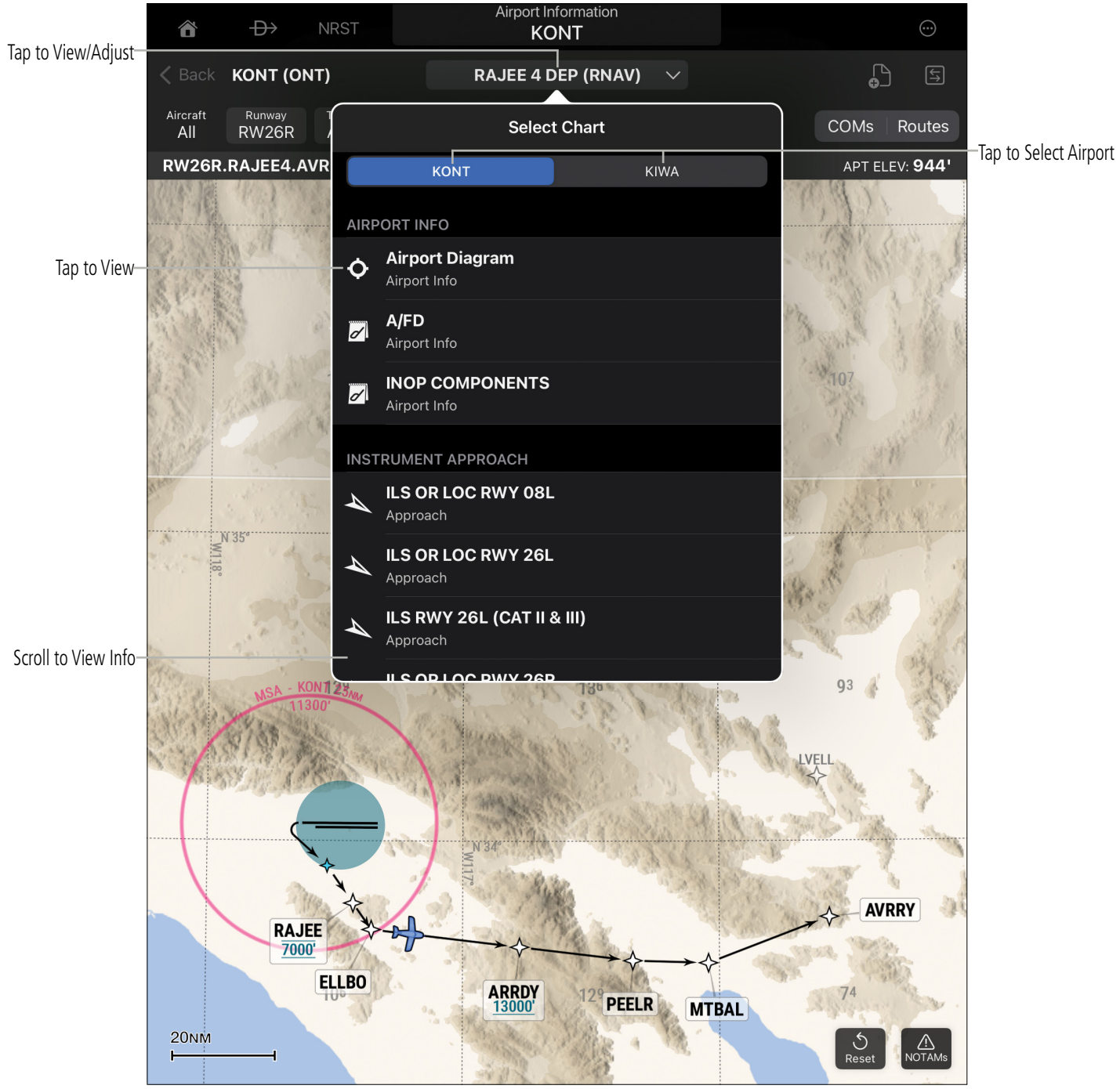


Garmin Pilot iOS - SmartCharts - Airport Info - Charts - Filter Airport Data

17) If desired, from the Airport Information page, the airport can be added as a favorite by tapping .

18) Once a chart has been selected, you can easily switch to another chart by tapping the chart name at the top of the page. A Select Chart dropdown menu will be displayed.

19) Filter the Select Chart menu by tapping the airport I.D., then scroll to view and select the desired chart.



Garmin Pilot iOS - SmartCharts - Airport Info - Chart - Quick Access Select Chart Menu

NOTE: *All the decluttering selections made will be retained by default, to avoid losing chart customization(s) after viewing other features in Garmin Pilot.*

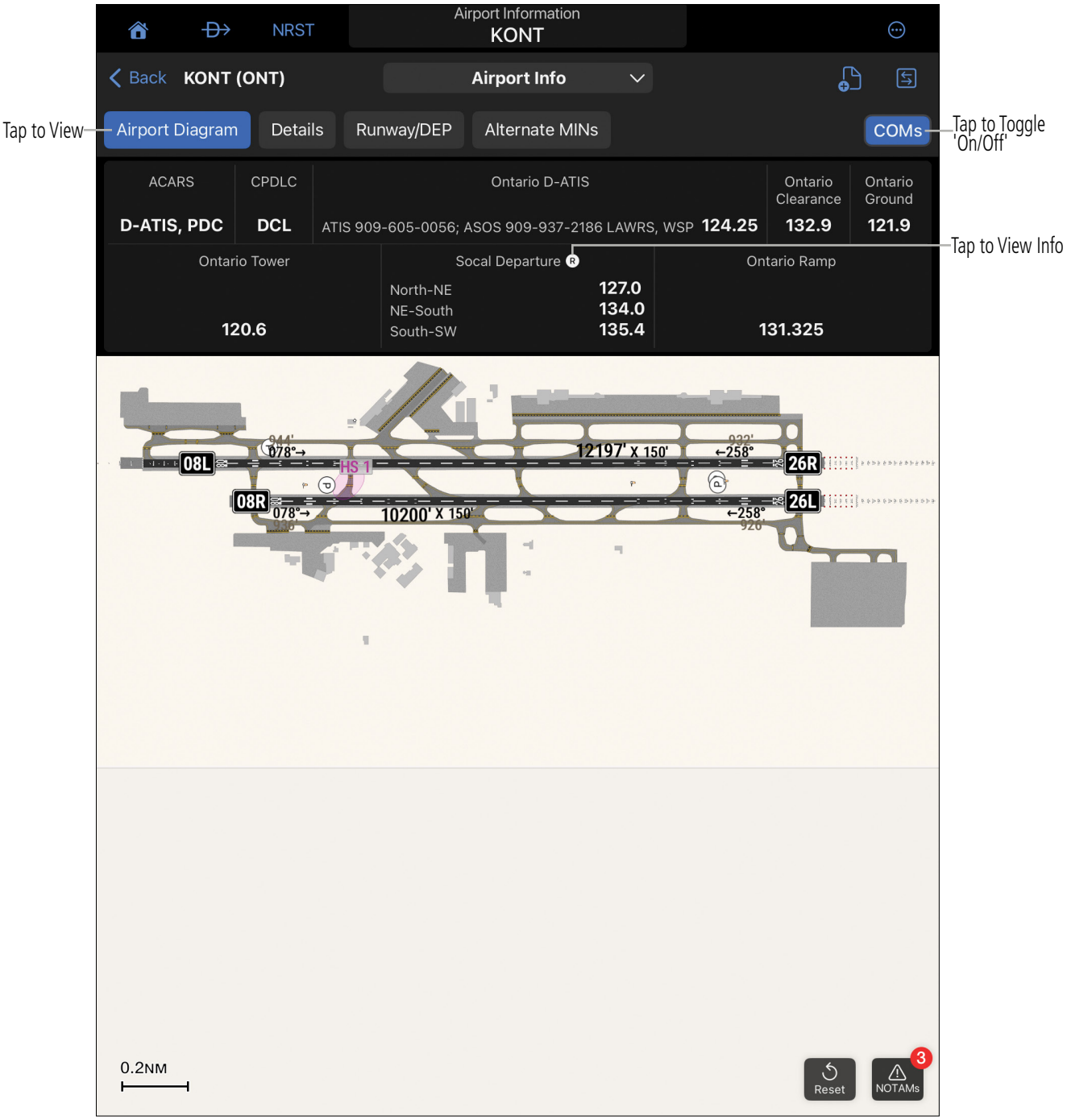
NOTE: *After twelve (12) hours, when SmartCharts are accessed, the User will be prompted to reset all chart selections or continue to retain previous selections.*

Airport Information

Another design element in SmartCharts that reduces clutter for the Airport Diagram is the COM's header. Tap the **COMs** button to toggle the display On/Off, as desired.

When displayed, the frequencies are neatly organized to help the User find the correct information vs. having to strain to find frequencies in the traditional, static, cluttered format.

If the frequency has additional information, a legend is used and can be viewed by tapping on the applicable frequency.



Garmin Pilot iOS - SmartCharts - Airport Info - KONT - Airport Diagram - COMs Header

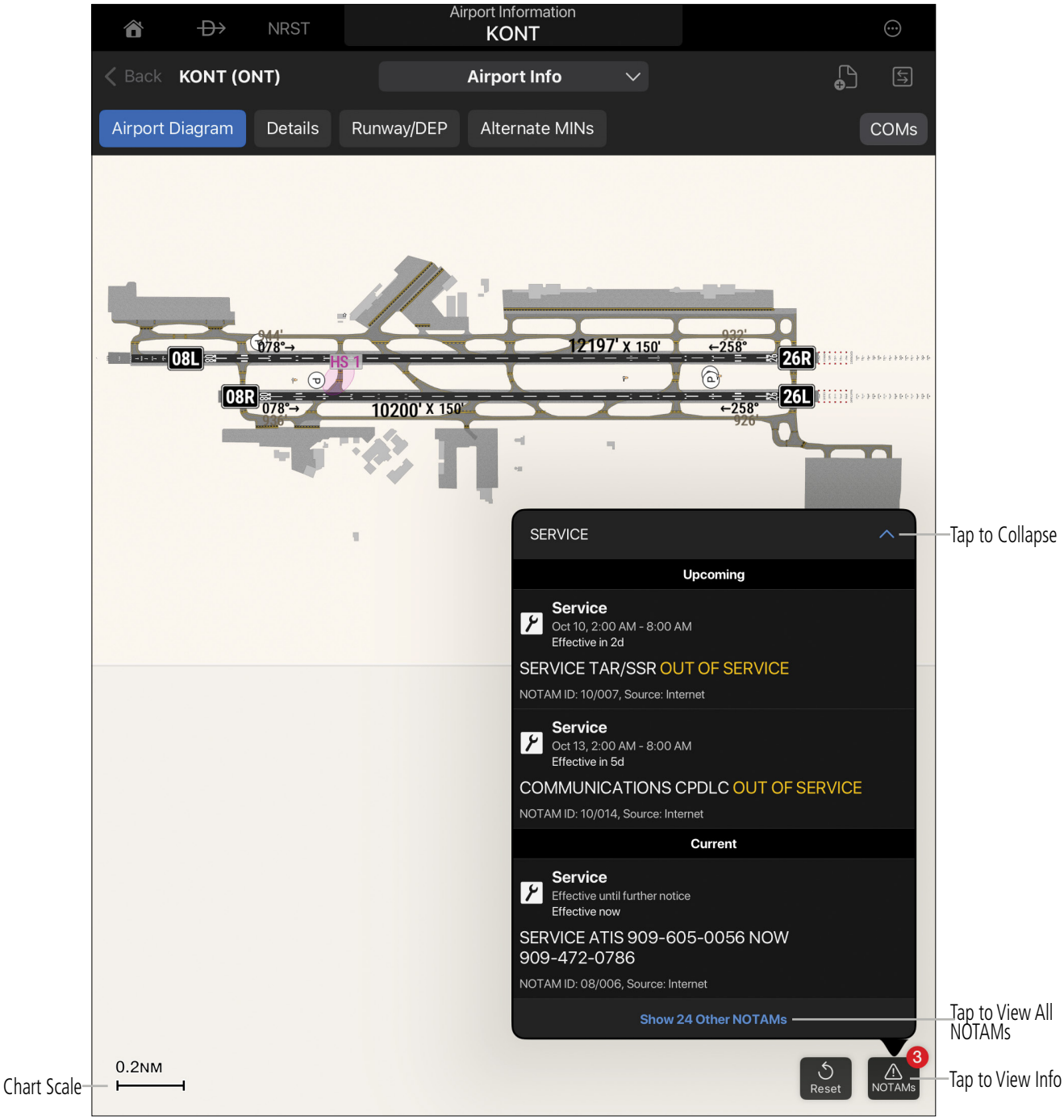
Another way SmartCharts helps reduce pilot workload and improve situational awareness is the integration of information into a single Airport Diagram. With conventional charts, chart supplements, takeoff minimums, and alternate minimums are all separate documents. But with SmartCharts, these are all contained within the Airport Diagram by tapping the **Details**, **Runway/Departure**, and **Alternate MINS** buttons, respectively.

Let's consider our example flight and Arrival Procedures by reviewing our departure airport, KONT. With the Airport Diagram opened in SmartCharts, we can review the airport layout.

After zooming and panning around the diagram, tap **Reset** to return to the center of the chart at the default zoom level.

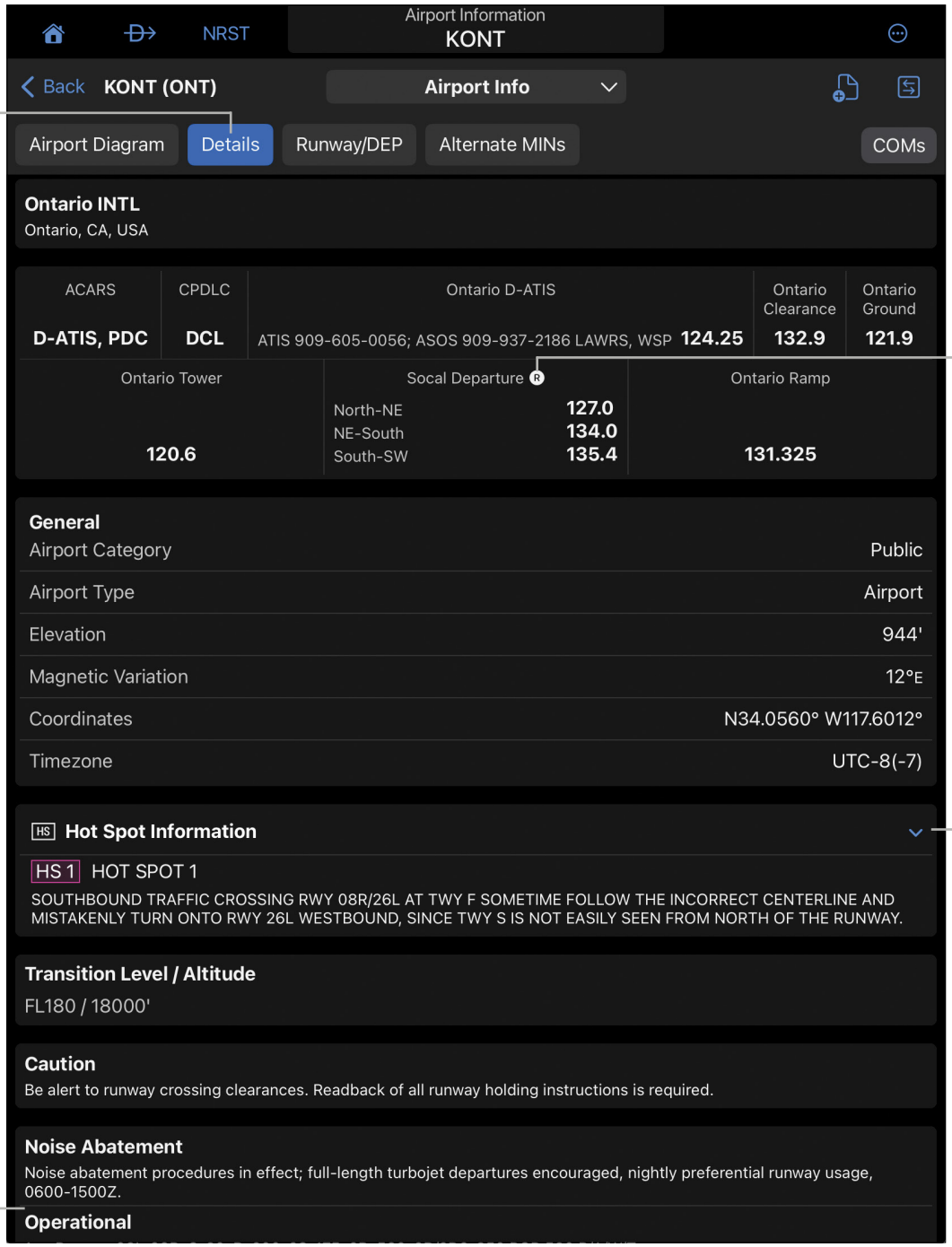
When you tap the **NOTAMs** button, a pop-up window displays NOTAM info for review.

Tap the **NOTAMs** button to exit the pop-up window and return to the chart.



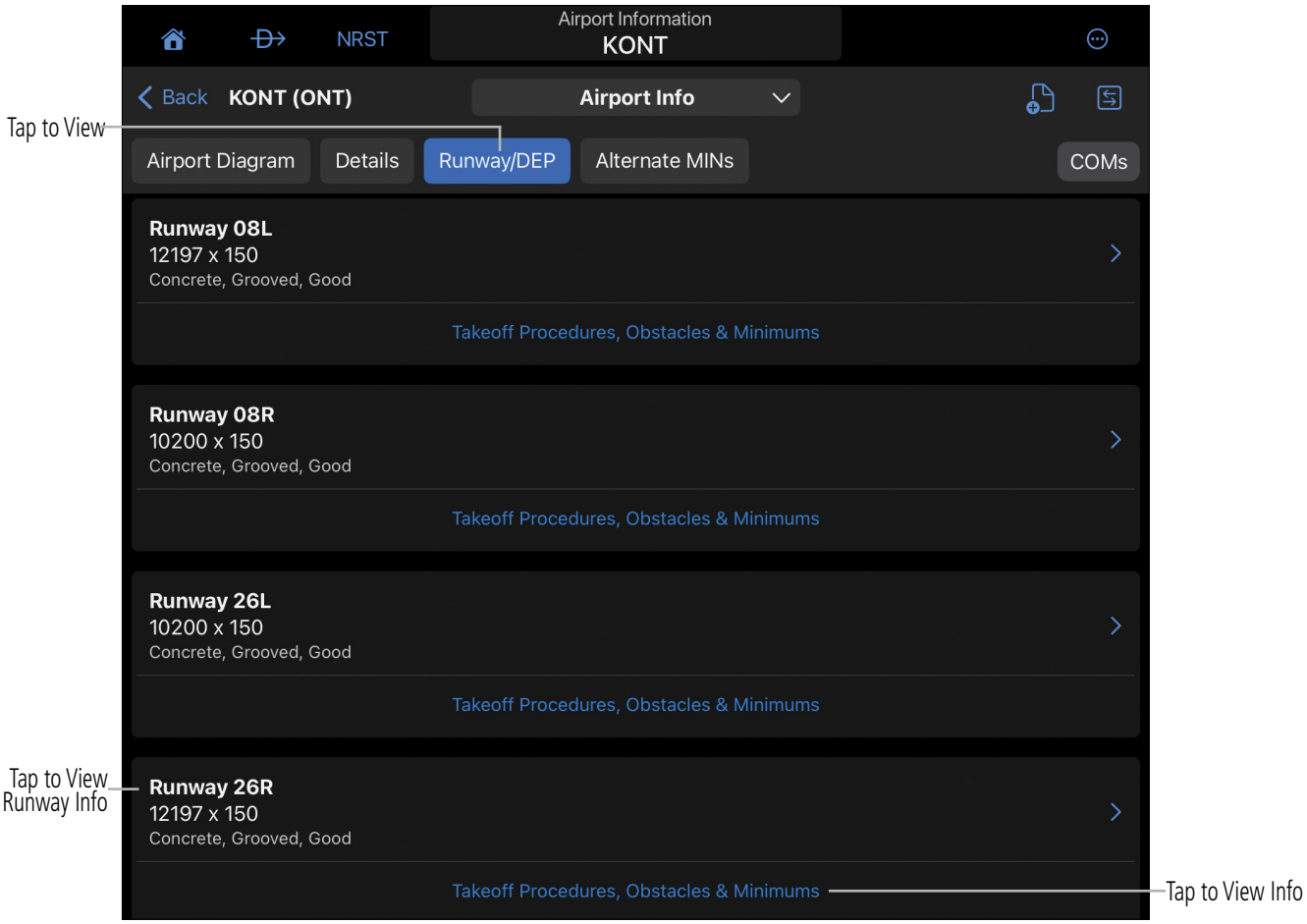
Garmin Pilot iOS - SmartCharts - Airport Info - KONT - Airport Diagram - NOTAMs Window

Next, tap the **Details** tab to view additional information previously found in the Airport Facility Directory section of the Chart Supplement.



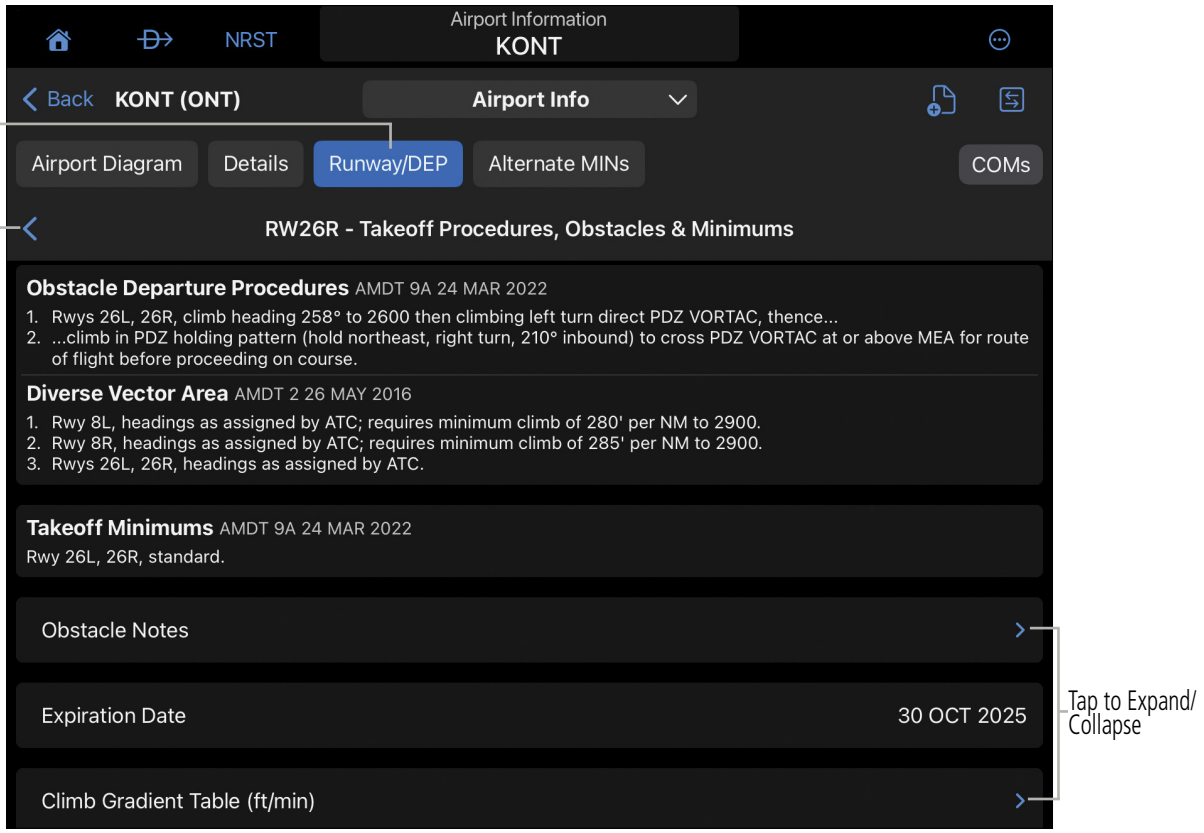
Garmin Pilot iOS - SmartCharts - Airport Info - KONT - Airport Diagram - Details

Now, tap the **Runway/DEP** tab to view the list of available runways. Tap on a runway to view additional information, if desired.



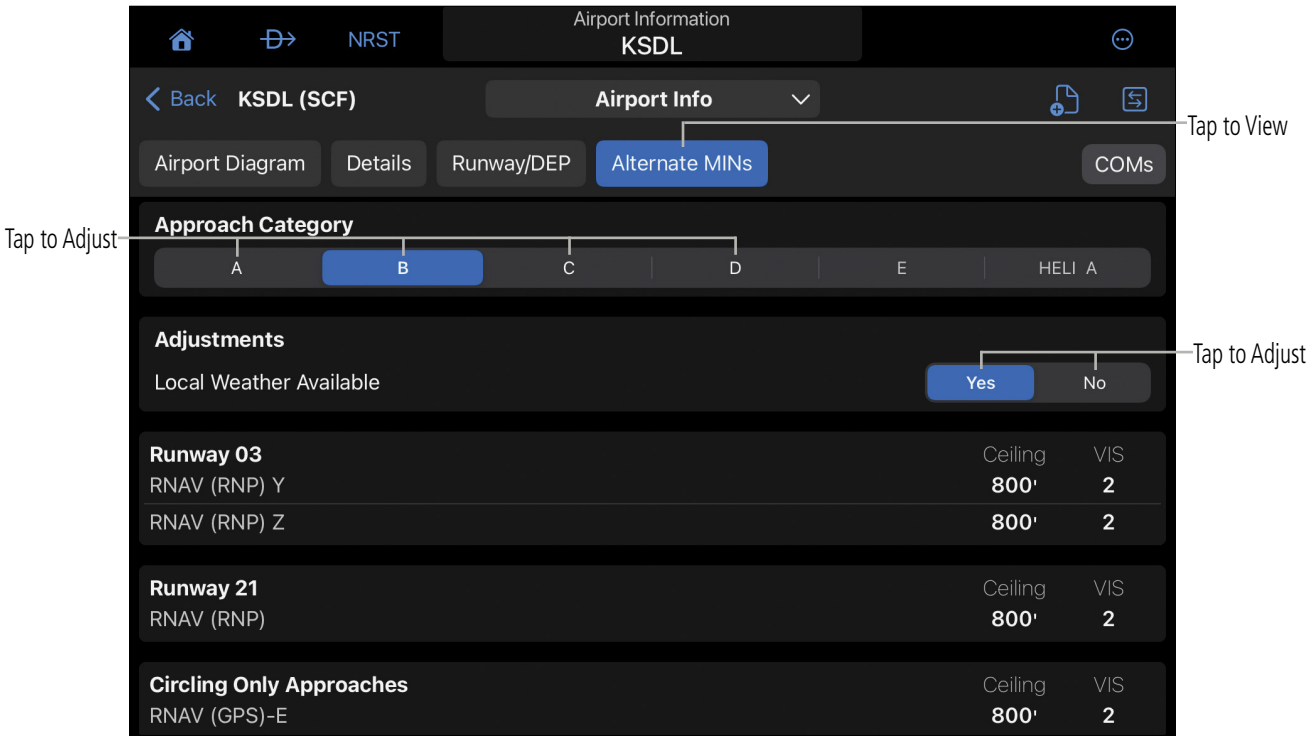
Garmin Pilot iOS - SmartCharts - Airport Info - KONT - Airport Diagram - Runway / Departure

Takeoff procedures and minimums, obstacle departure procedures, and notes for the intended runway, can also be viewed.



Garmin Pilot iOS - SmartCharts - Airport Info - KONT - Runway / Departure - Takeoff & Obstacle Mins

Assume that we are considering the Scottsdale, AZ airport (KSDL) as our alternate destination airport for our primary destination airport in Phoenix, AZ (KIWA). To evaluate if KSDL is a viable choice as an alternate, we need to open the Airport Diagram for KSDL then select the **Alternate MINs** button. Select the Aircraft Approach Category, then tap **YES** for 'Local Weather Available'. The applicable information is displayed to help streamline the process of looking up airport information during preflight preparation.

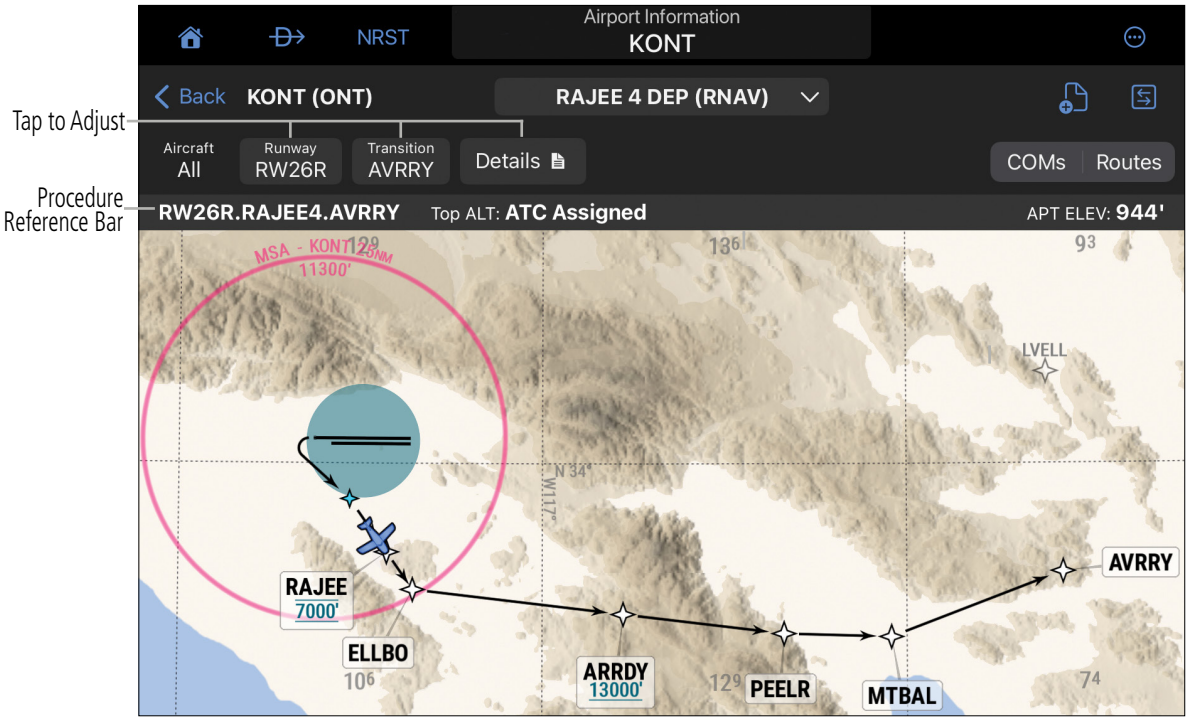


Garmin Pilot iOS - SmartCharts - Airport Info - KSDL - Alternate MINs

Next, let's look at how SmartCharts helps the User simplify departure procedure charts. For our example flight, let's assume that we are flying the RAJEE4 Departure with the AVRRY transition, departing Runway 26R.

With the Departure Procedure chart pulled up, we can see some buttons across the top of the chart that will help declutter and customize the information (Aircraft, Runway, Transition, Details, COMs, and Routes). Below those buttons is the Procedure Reference Bar, which displays the departure runway, departure procedure, transition, top altitude, and airport elevation. The remainder of the screen is used for the planview of the procedure.

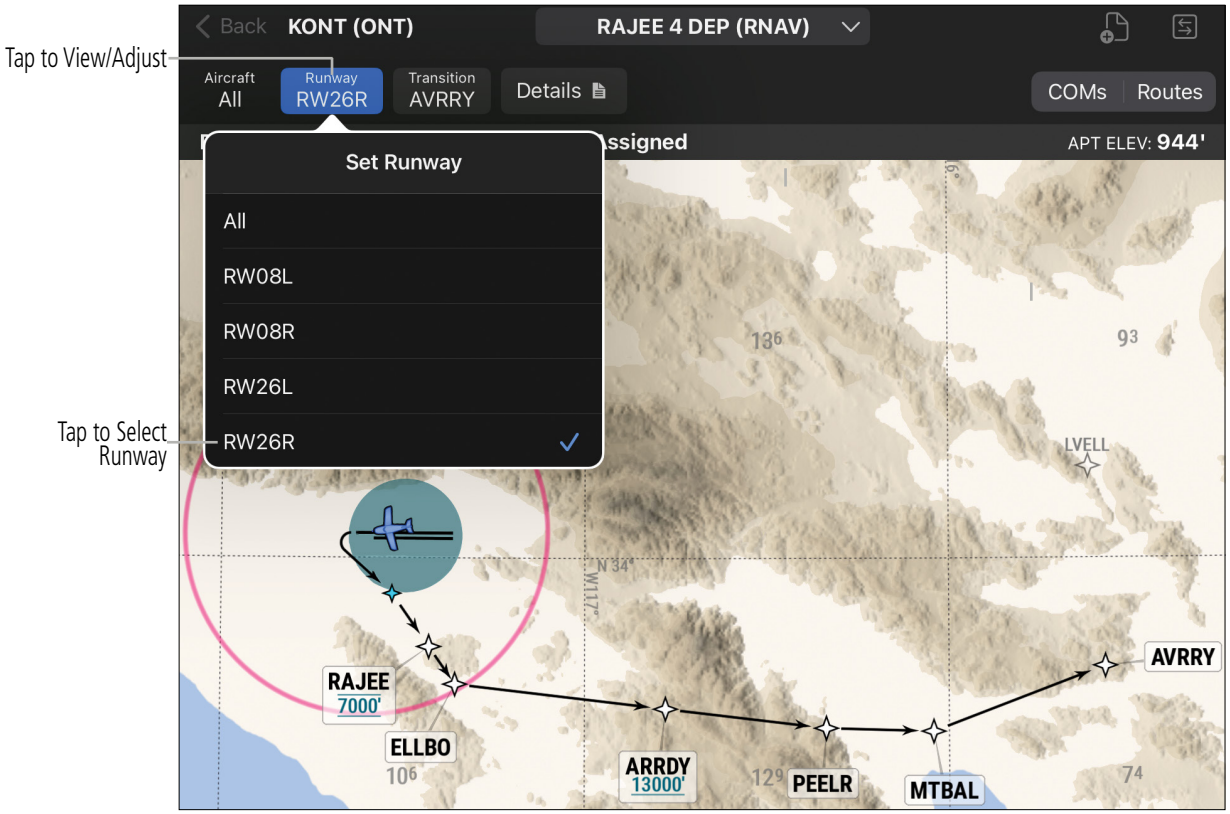
To ensure you are making the correct inputs to customize and declutter the information, we recommend that you follow a consistent flow, working from left to right across the top bar.



Garmin Pilot iOS - SmartCharts - KONT - Departure Procedure

The first button is **Aircraft Type**. For procedures that differ for piston, turboprop, military, helicopter, and jet aircraft, this feature allows information not applicable to your aircraft to be filtered out. For procedures that do not change based on aircraft type, "All" is displayed and not selectable by the User, which is the case for our example.

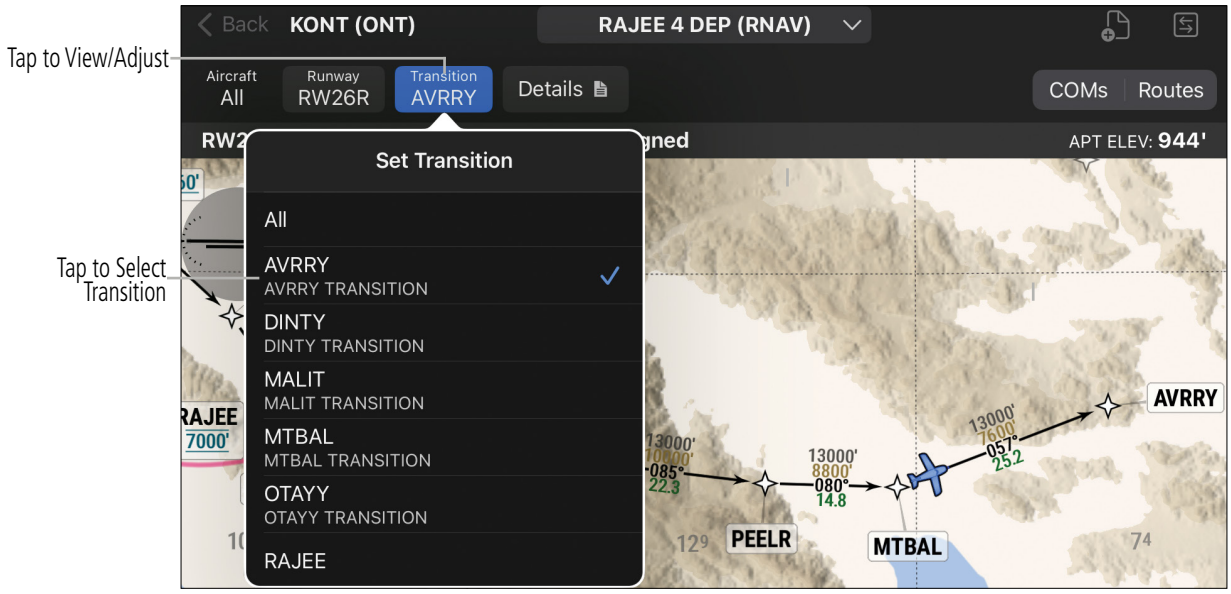
The next button is **Runway**. Select your departure runway to remove route segments not relevant to your flight. If your departure runway changes later, simply tap Runway and select another runway. For our scenario, we will select **RW26R**.



Garmin Pilot iOS - SmartCharts - KONT - Departure Procedure - Set Runway

We then move to the Transition button. Tap **Transition** to select the expected routing, and segments for other transitions will be removed. For our example flight, we will be using the **AVRRY** transition.

The Top Altitude reminder in the Procedure Reference Bar will update based upon aircraft type, runway, and transition selected.

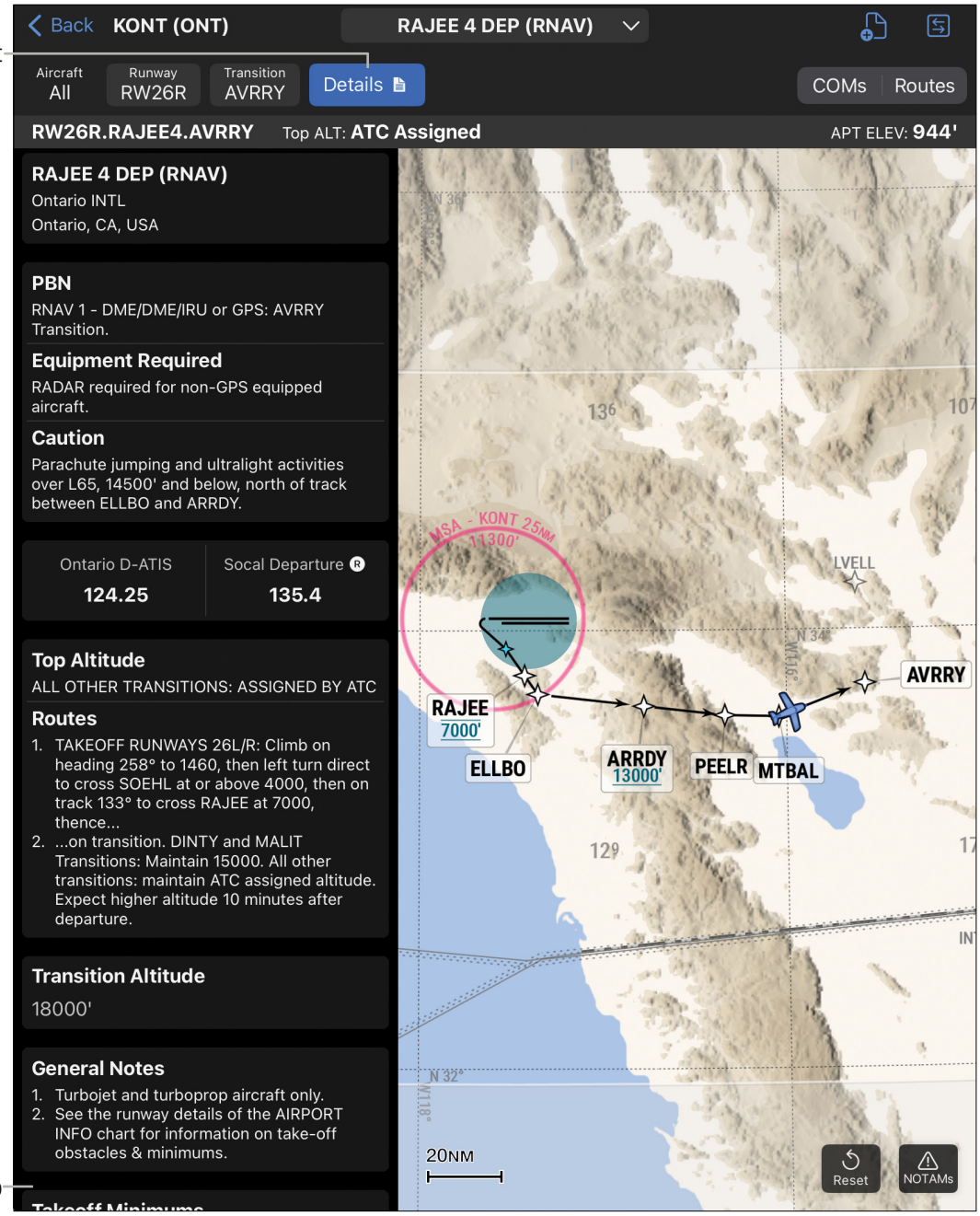


Garmin Pilot iOS - SmartCharts - KONT - Departure Procedure - Set Transition

To the right of the Transition button is the Details button. Tap **Details** to display information needed for the User to conduct their departure briefing, which includes the required equipment and navigation capabilities, relevant COM frequencies, textural description of the route and top altitude, transition altitude, general notes, takeoff minimums, and minimum safe altitude.

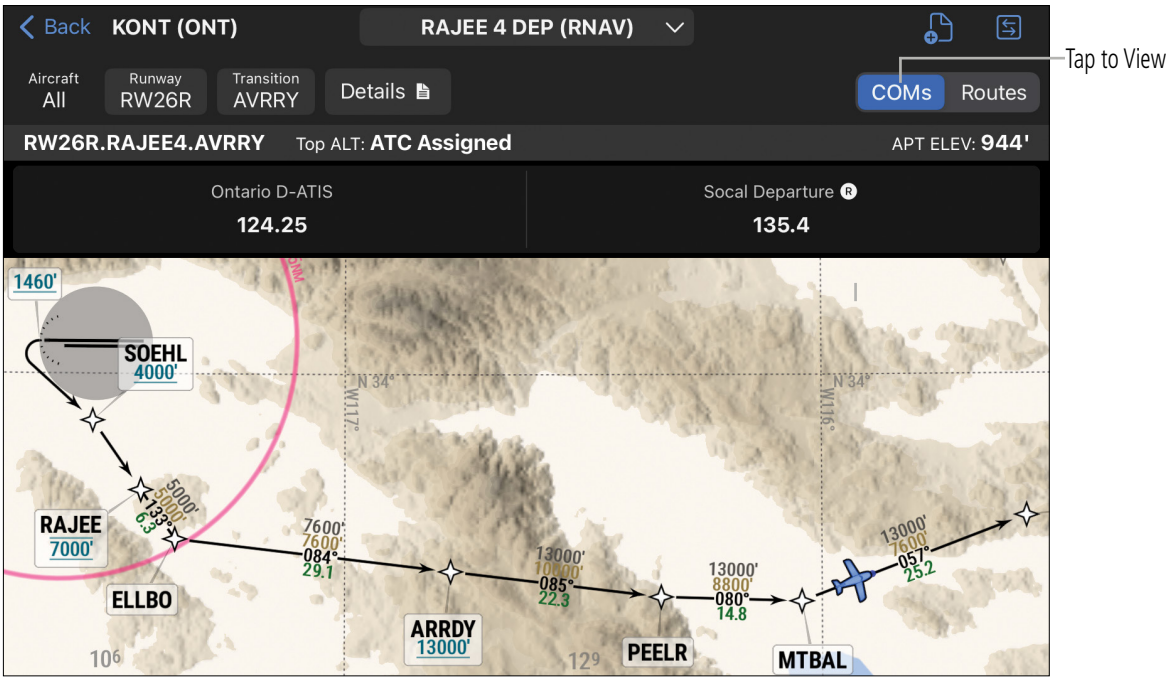
The effective date and expiration date of the chart can also be found at the bottom of the Details window.

If the chart is out of date, a red banner will be shown.



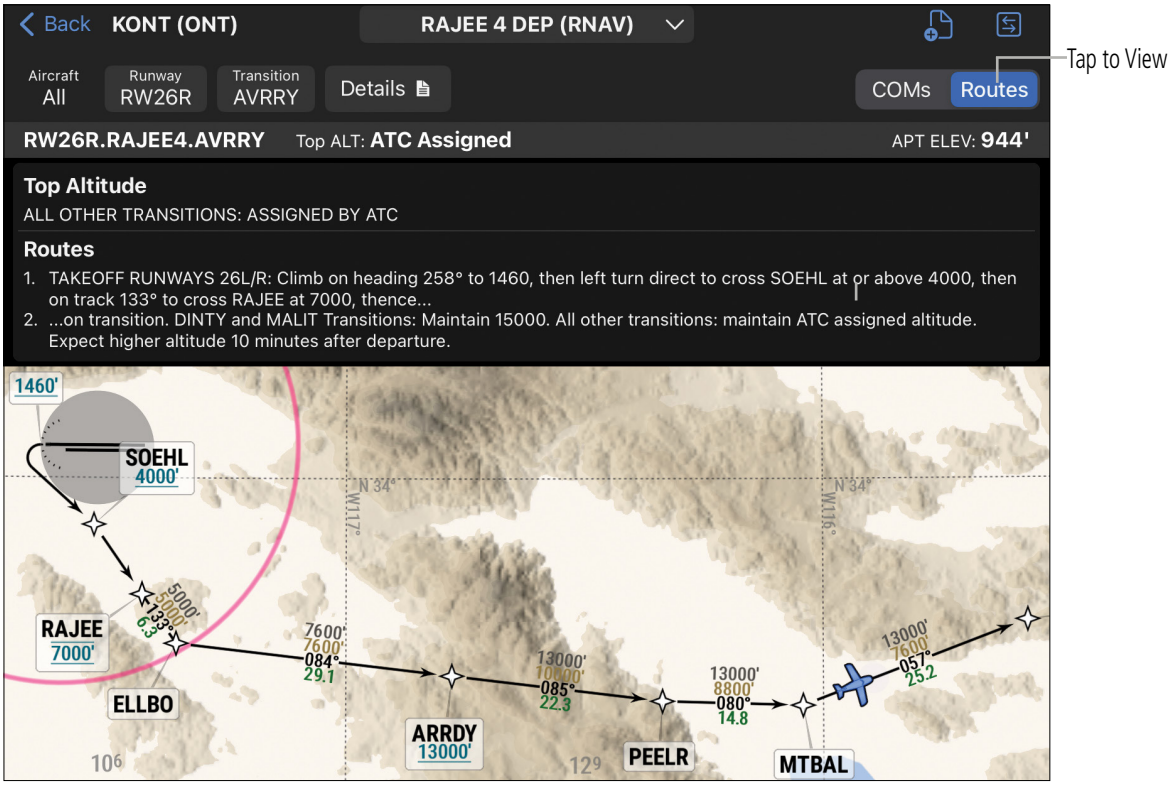
Garmin Pilot iOS - SmartCharts - KONT - Departure Procedure - Details

Use the **COMs** or **Routes** buttons on the right to open the quick reference window with the respective information.



Garmin Pilot iOS - SmartCharts - KONT - Departure Procedure - COMs

These sections are taken directly from the Details window, and allow the User to quickly recall the most pertinent information without having to scroll through the whole details window.

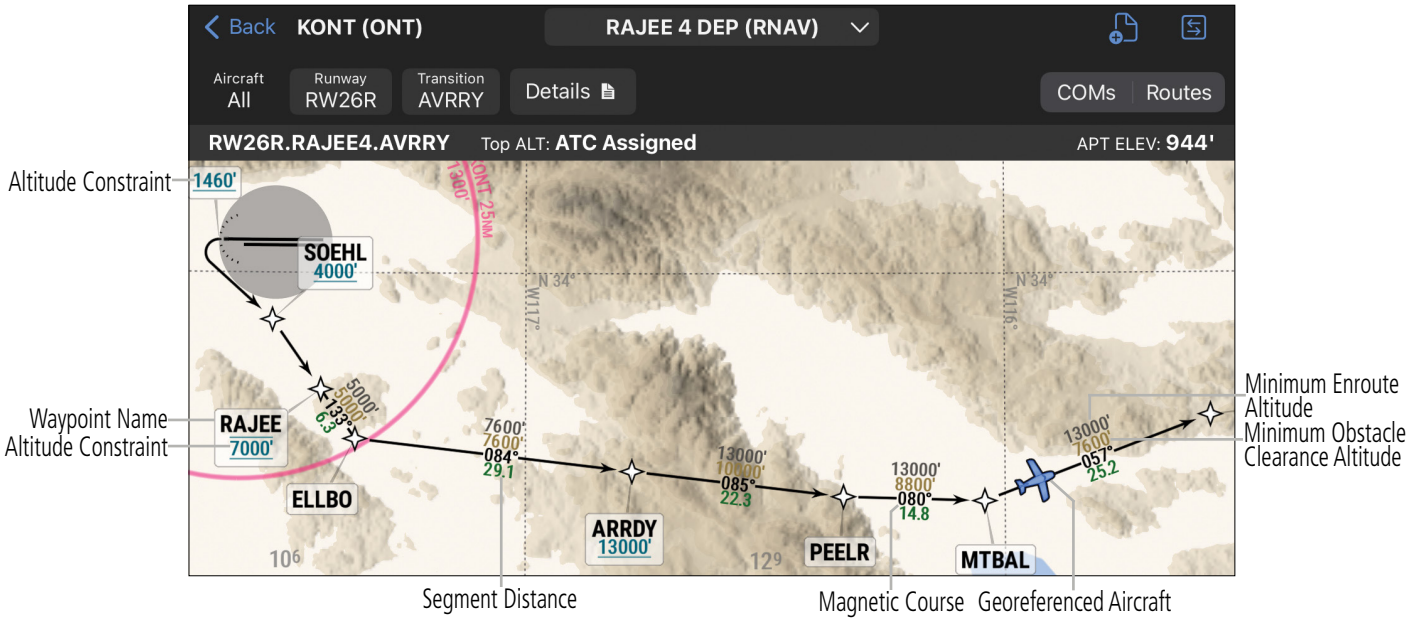


Garmin Pilot iOS - SmartCharts - KONT - Departure Procedure - Routes

After the chart is setup correctly, let's look at the planview. One major advantage of SmartCharts' planview is everything is drawn to scale. This allows the departure procedures to be georeferenced when connected to a compatible positional information source.

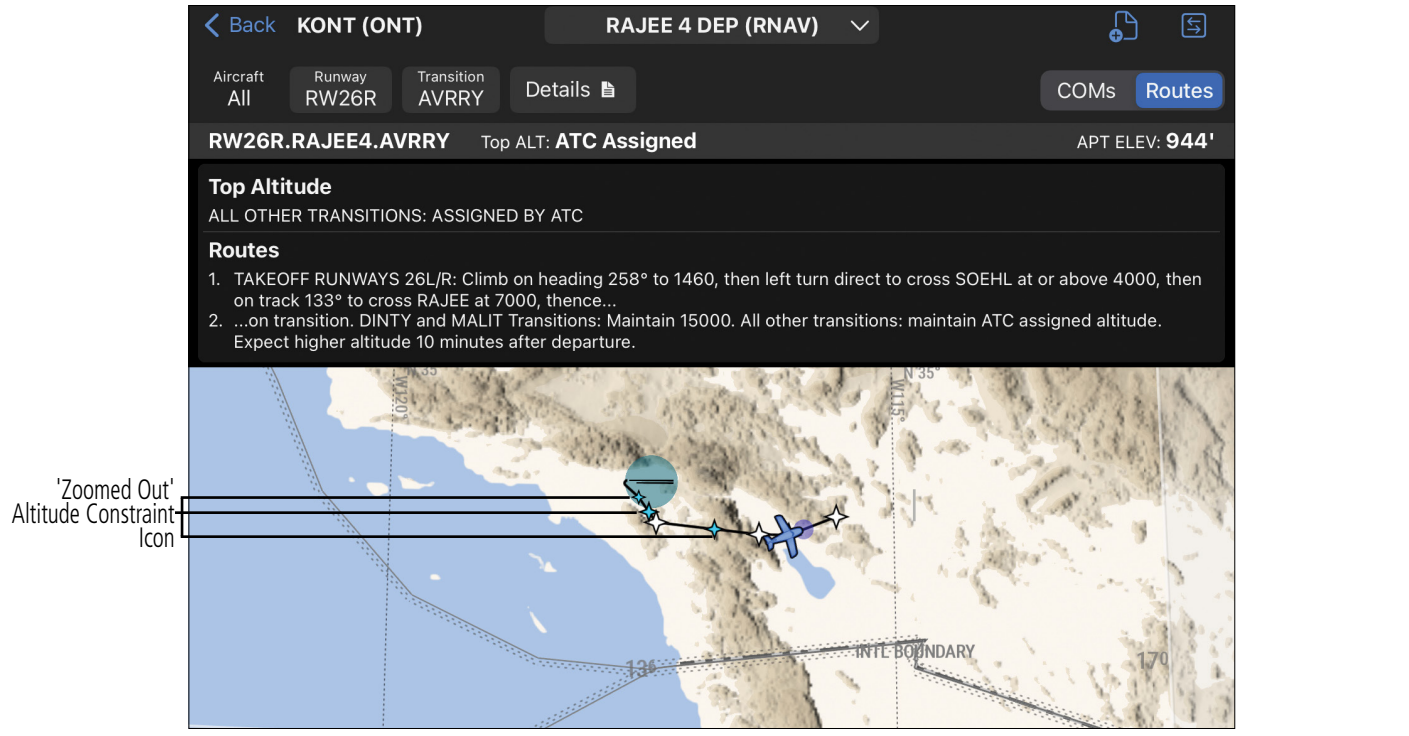
The route segments are displayed in a similar manner to conventional charts, where the Minimum Enroute Altitude (MEA), Minimum Obstacle Clearance Altitude (MOCA), magnetic course, and distance for applicable segments (nautical miles) are shown.

When applicable, speed and altitude constraints for specific waypoints will be displayed.



Garmin Pilot iOS - SmartCharts - KONT - Departure Procedure - Planview Info

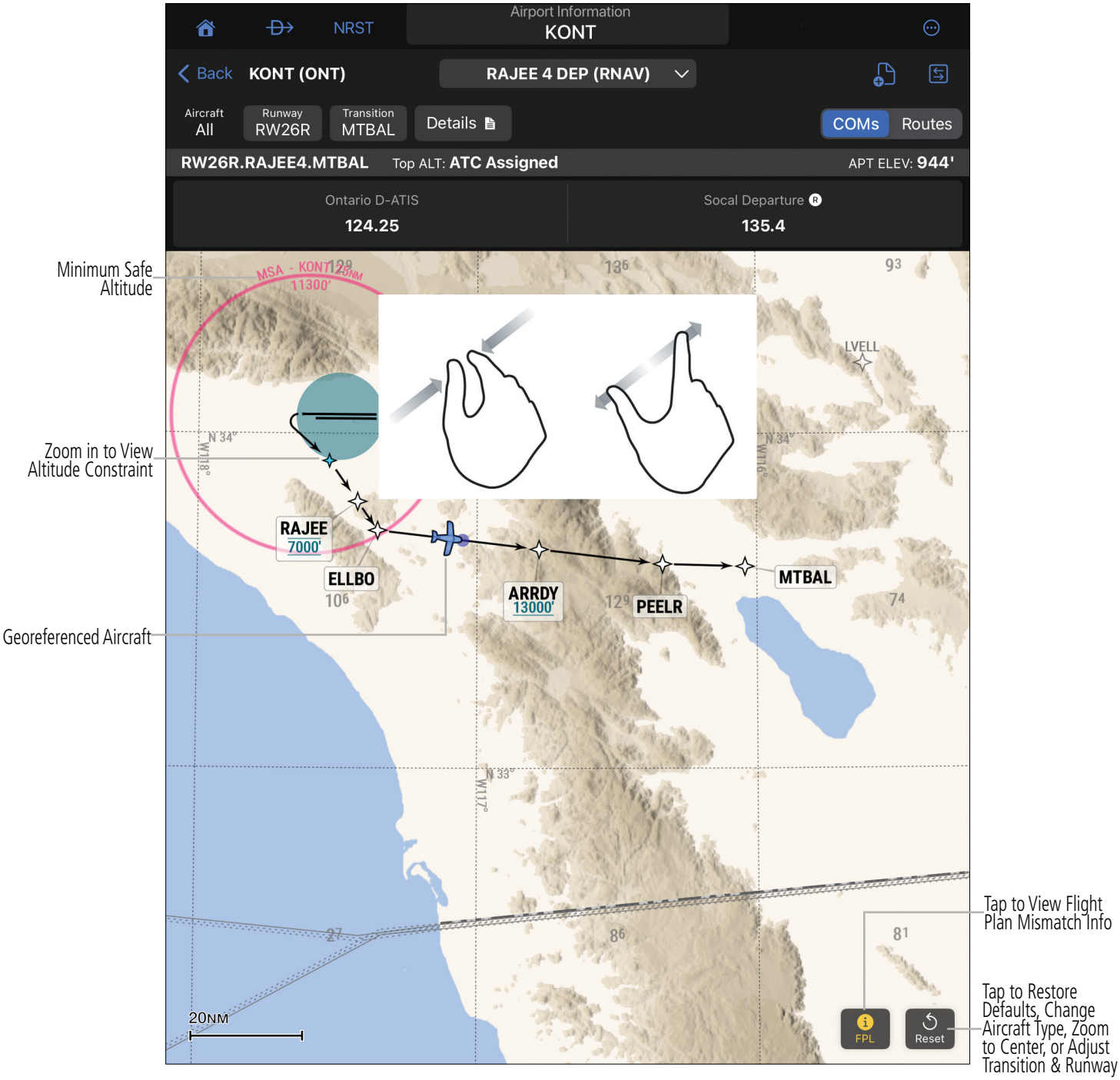
If the planview is zoomed out to a scale such that the speed or altitude constraint label is removed from view, the waypoint symbol is highlighted to prompt the pilot to zoom in and view the constraint details. The magenta highlight is for speed restrictions, and the cyan is for altitude restrictions. When zooming out, you will also find the Minimum Safe Altitude (MSA) depicted to scale.



Garmin Pilot iOS - SmartCharts - KONT - Departure Procedure - Altitude Constraints - Zoomed Out

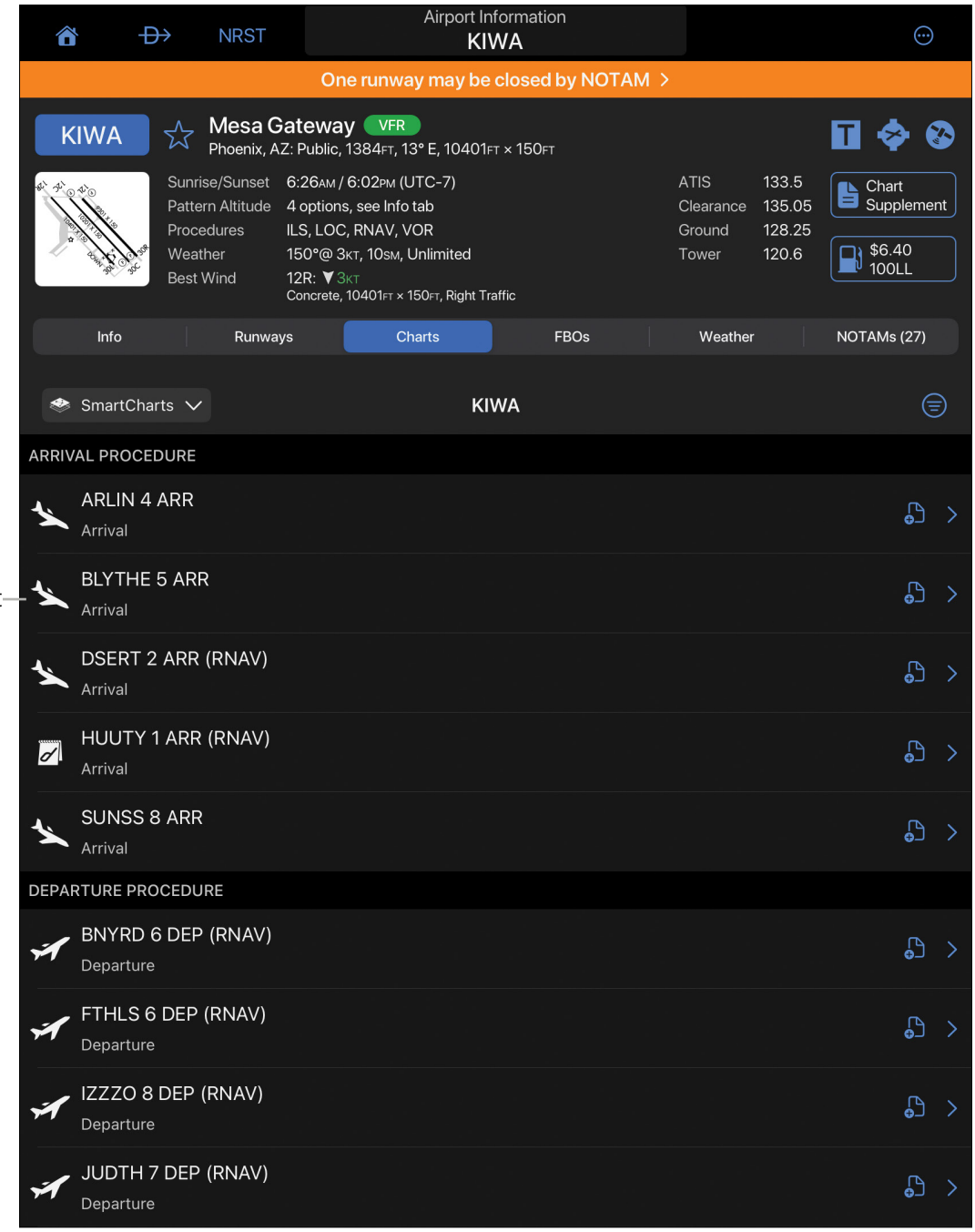
You can use the **Reset** button to return the planview to center and default zoom level, or to remove your aircraft type, runway, and transition selections. This can be a convenient way to modify your decluttering selections for situations such as a runway change or getting ready for a different flight. There are also buttons for you to view relevant **NOTAMs** and to revert to the conventional chart.

Finally, you will see this **Flight Plan Mismatch** caution if the departure you are viewing is not the one specified in your flight plan.



Garmin Pilot iOS - SmartCharts - KONT - Departure Procedure - Planview - Zoom In to View

We will now switch to our arrival procedure. We will be flying the **BLYTHE 5** Arrival for our example flight, expecting **RW30C** at our destination, KIWA.



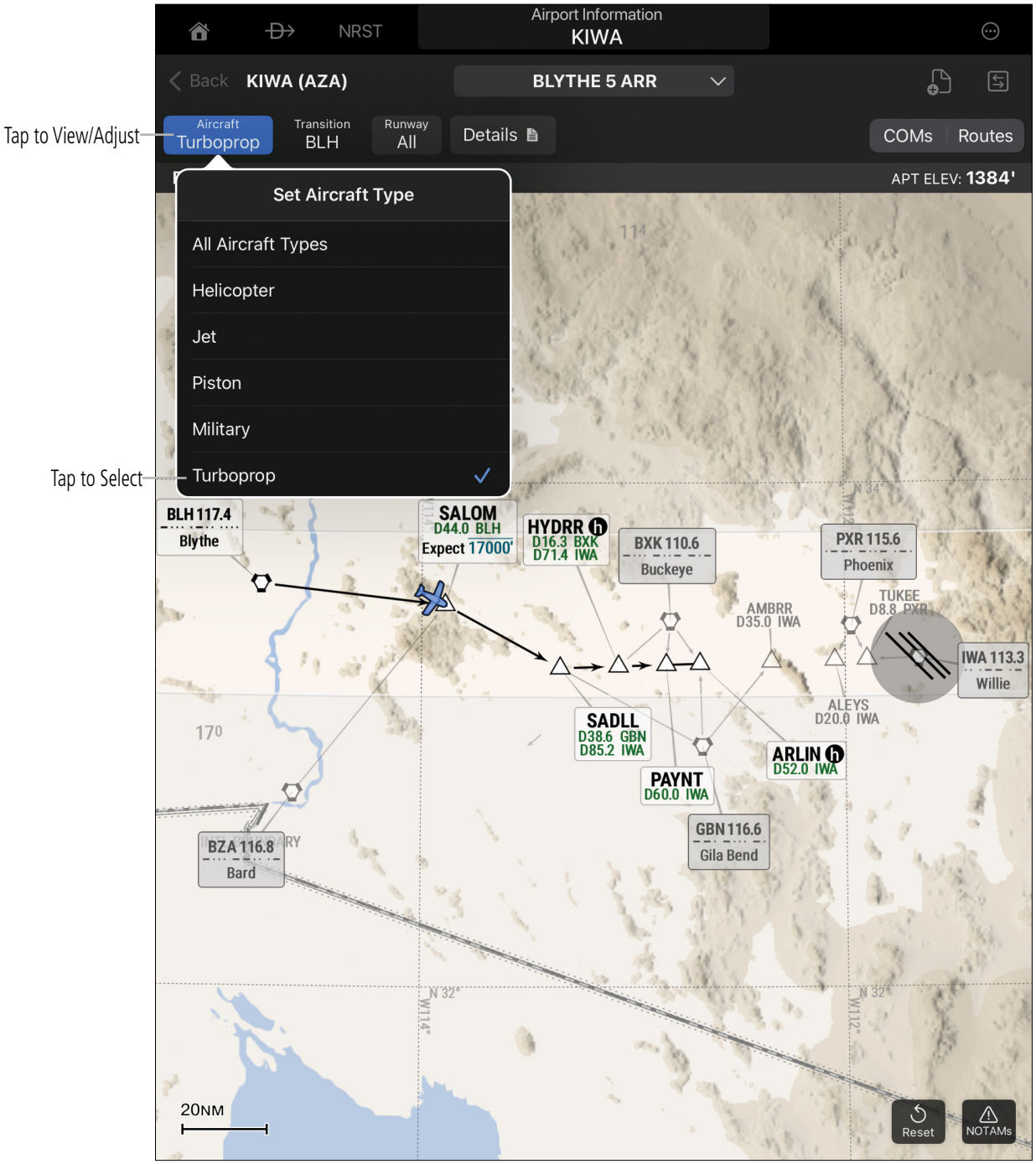
Tap to Select

Garmin Pilot iOS - SmartCharts - KIWA - Airport Info - Charts - Arrival Procedures

You will find the layout of information for an arrival is basically the same as a departure, except information not applicable to arrival procedures, such as MSA, is not shown.

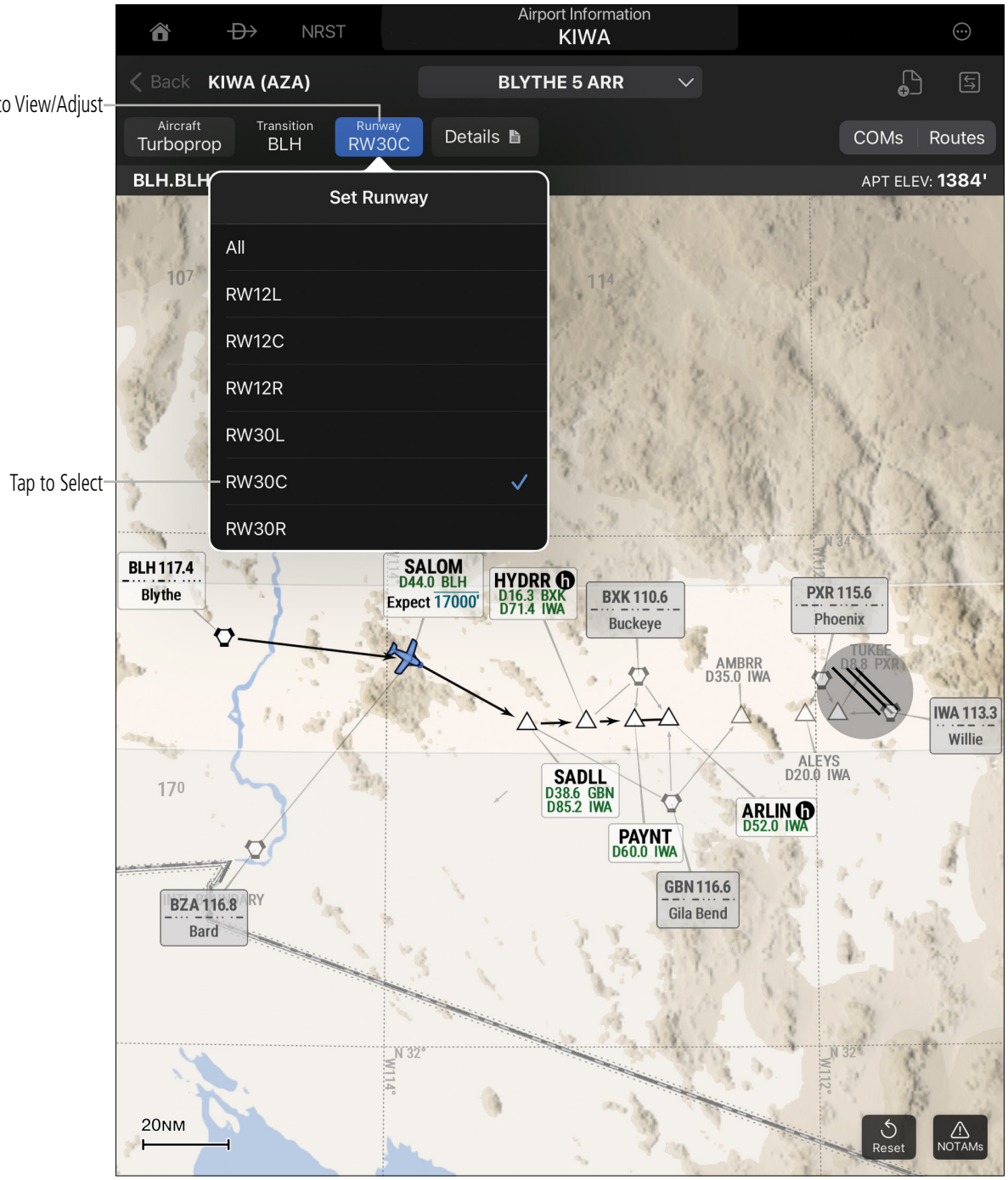
Just like departure procedures, we will customize the chart by following the selections from left to right. Select the aircraft type, **Turboprop** in the case of our scenario. You can see that the expected crossing altitude for jet aircraft at PAYNT has been removed from view.

For this procedure, the Transition button is not selectable since there is only one possible transition.



Garmin Pilot iOS - SmartCharts - KIWA - Airport Info - Charts - Arrival Procedures - Set Aircraft Type

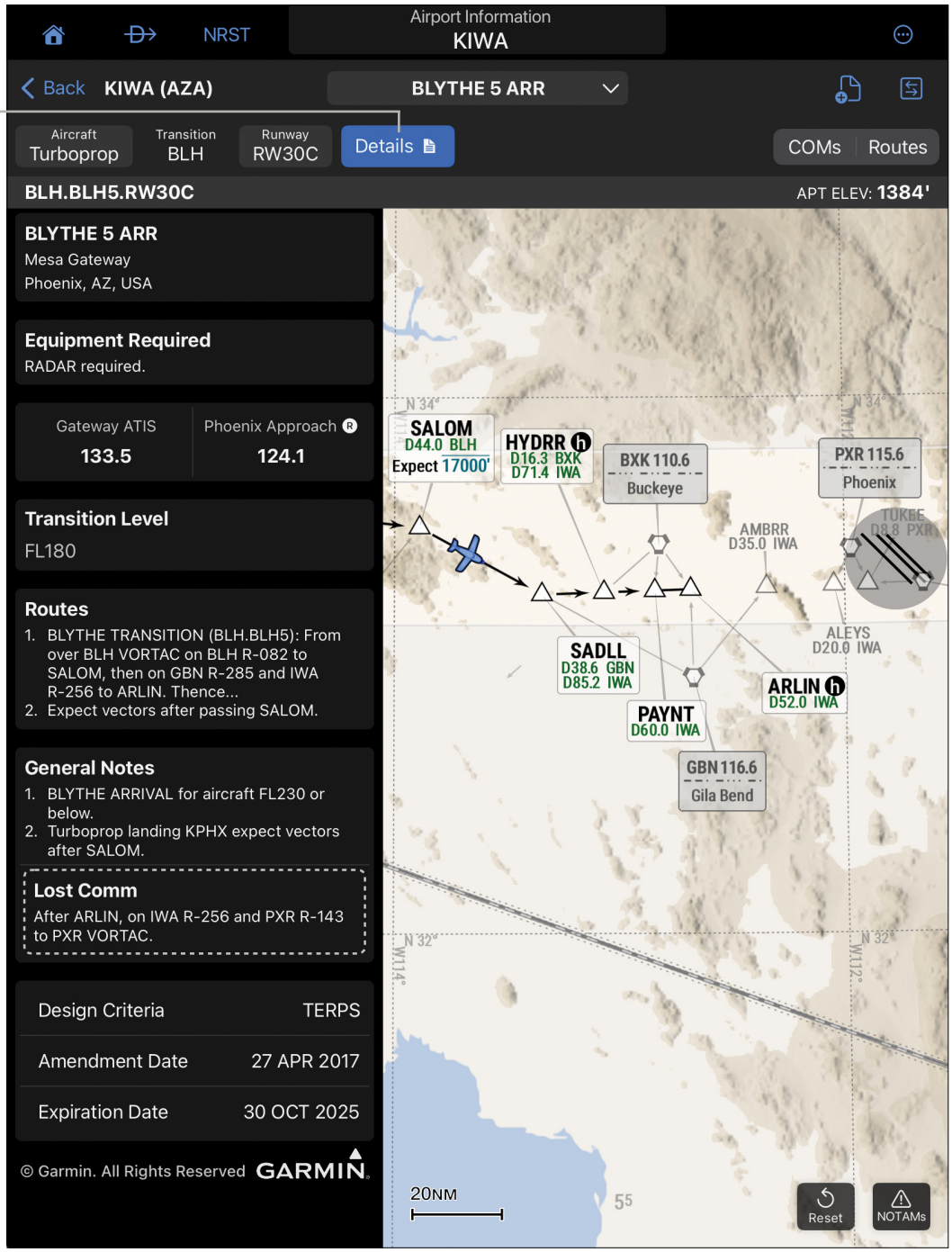
Once you know the expected runway, you can make that selection. In this case, we'll select **RW30C**.



Garmin Pilot iOS - SmartCharts - KIWA - Airport Info - Charts - Arrival Procedures - Set Runway

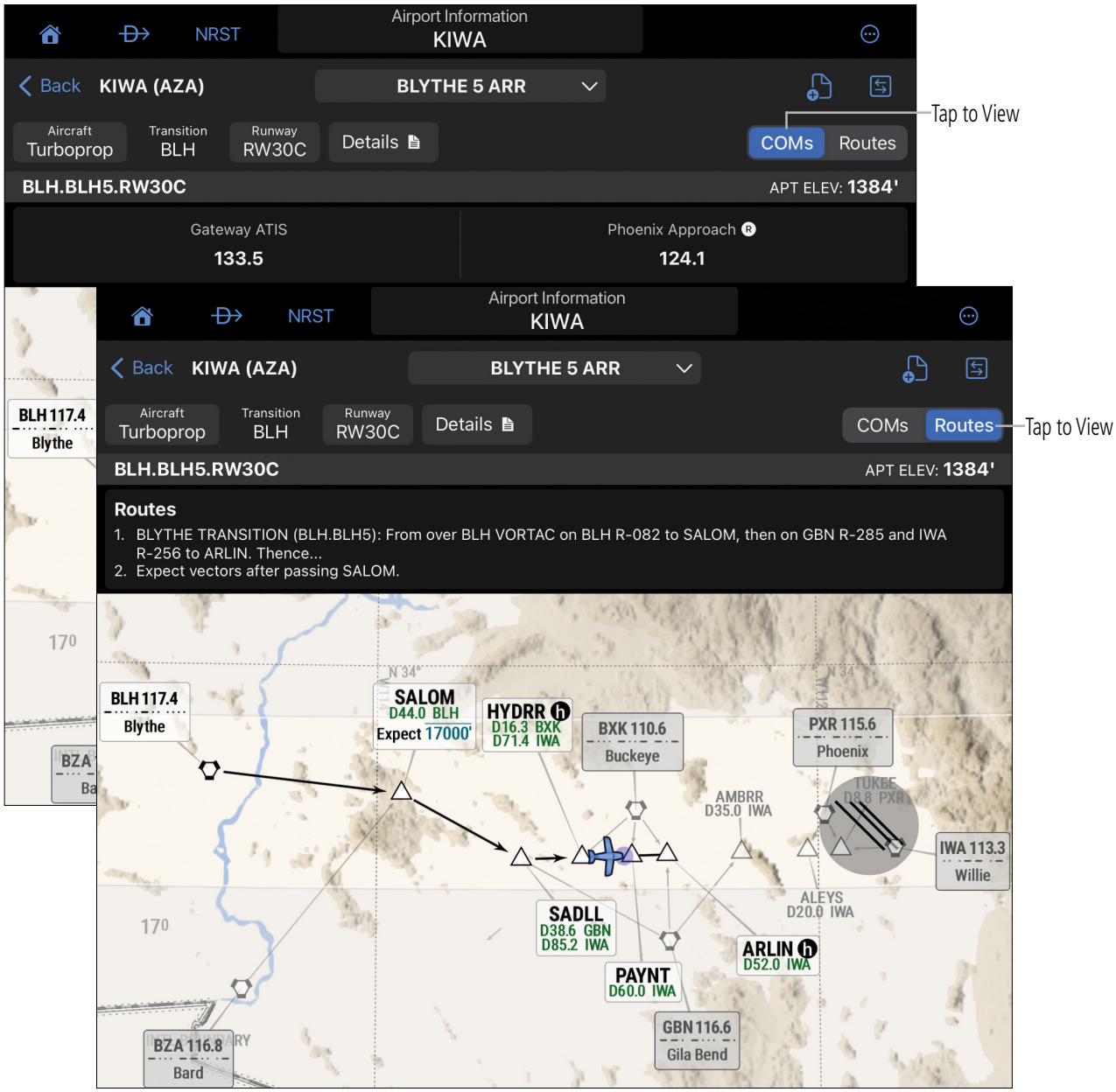
Just like the departure charts, the **Details** button gives you additional information to conduct your briefing.

Tap to View/Adjust



Garmin Pilot iOS - SmartCharts - KIWA - Airport Info - Charts - Arrival Procedures - Details

COMs and **Routes** quick reference buttons are available as well.



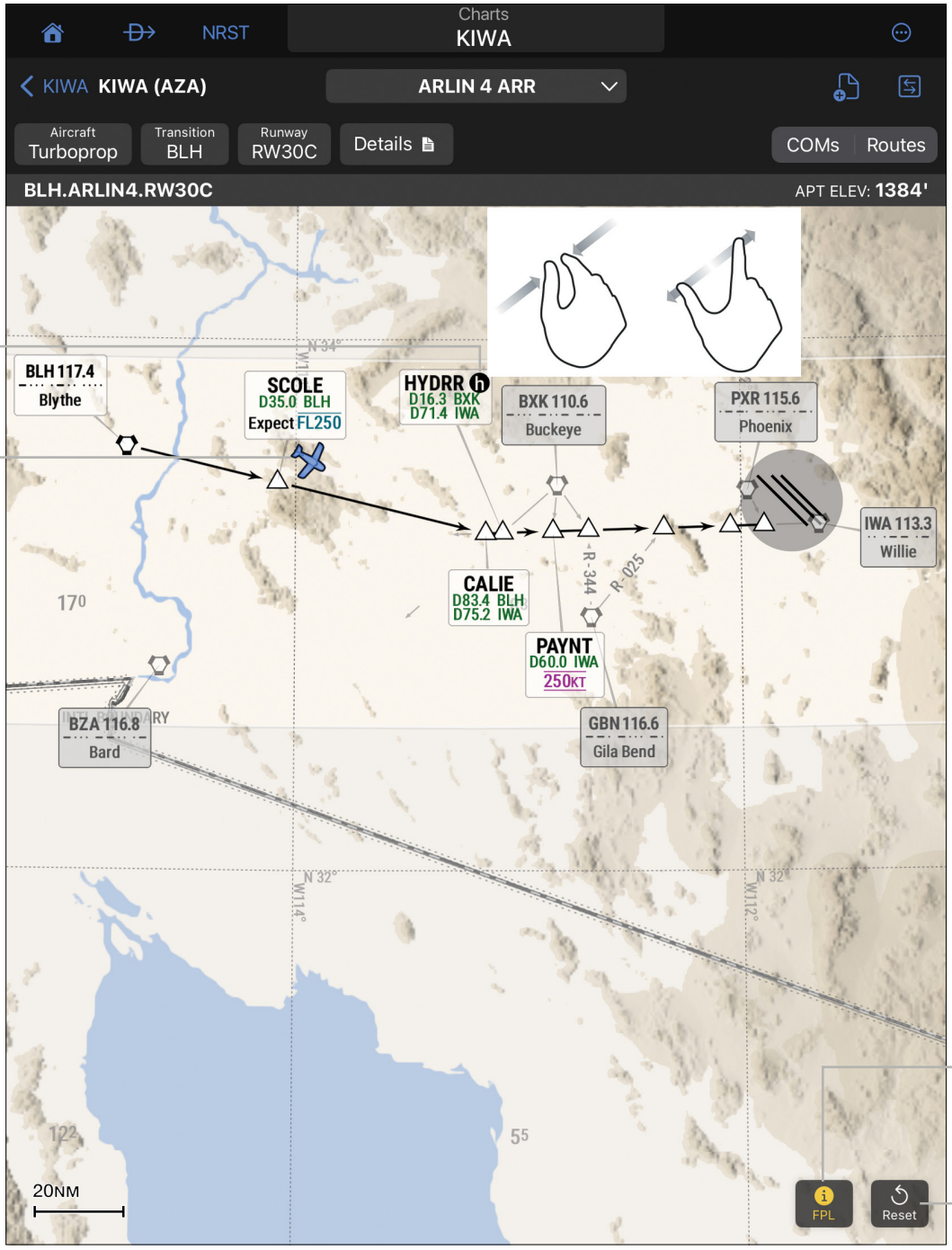
Garmin Pilot iOS - SmartCharts - KIWA - Airport Info - Charts - Arrival Procedures - COMs & Routes

Waypoints with a published holding pattern will be marked with the "h" symbol. Zoom in to view the details of the hold.

Just like departures, use the buttons to reset the chart, to view relevant **NOTAMs**, and to revert to the conventional chart, if necessary.

FPL (Flight Plan Mismatch) will be shown when viewing an arrival different from the one in your flight plan.

We hope you see how SmartCharts can help improve your IFR experience. Just remember to use a consistent workflow to make your chart selections, and you will be able to enjoy decluttered charts, customized for you.

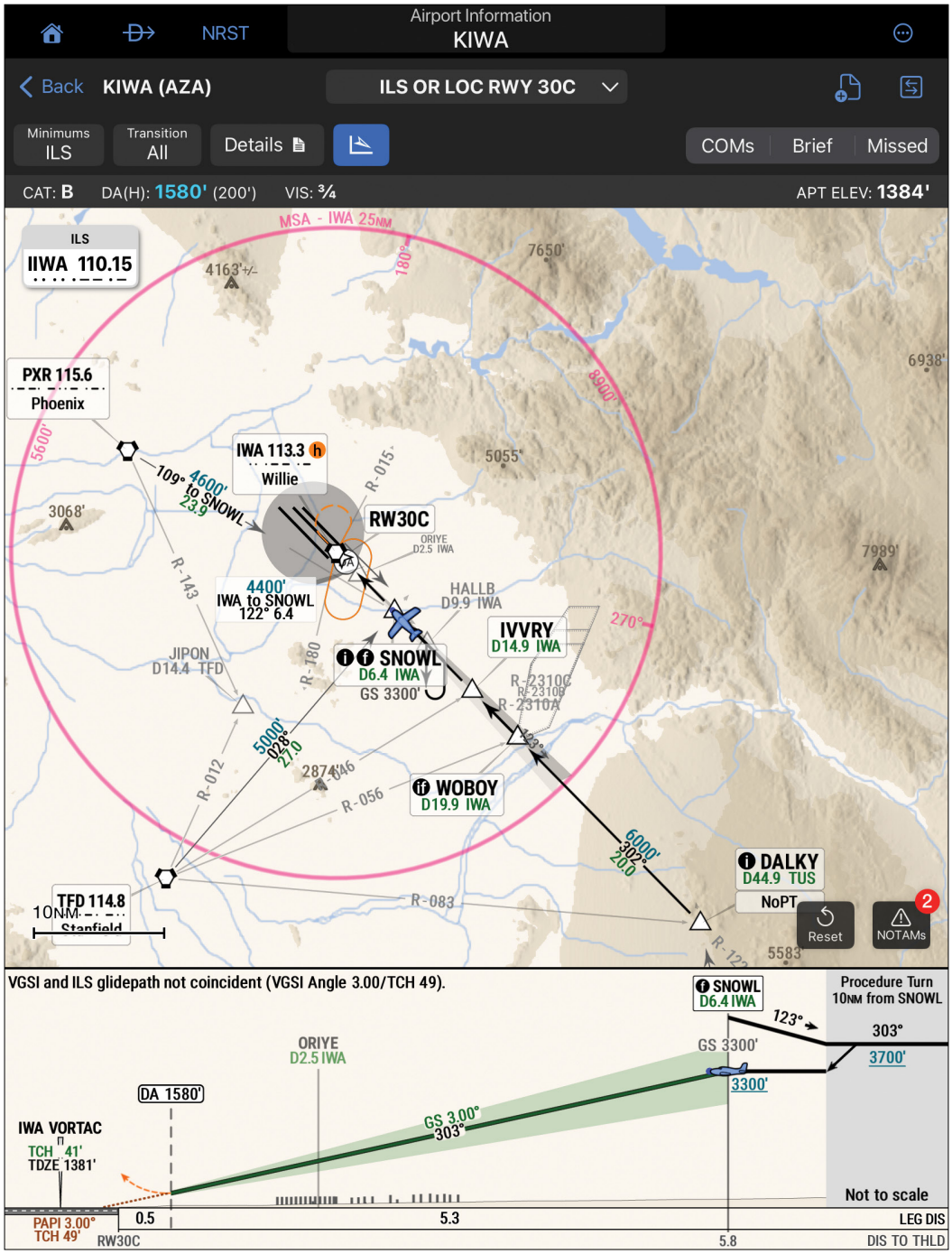


Garmin Pilot iOS - SmartCharts - KIWA - Arrival Procedure - Planview - Zoom In to View & FPL Mismatch

Instrument Approaches

Let's look at how SmartCharts helps you simplify approach charts. For our example flight, we are expecting the **ILS RW30C** into KIWA.

Opening up the chart, you will find the buttons to make selections for customizing the information and to access additional information at the top, just like the departure and arrival charts we looked at. The approach minimums and field elevation are displayed underneath, followed by the planview and profile view of the procedure.



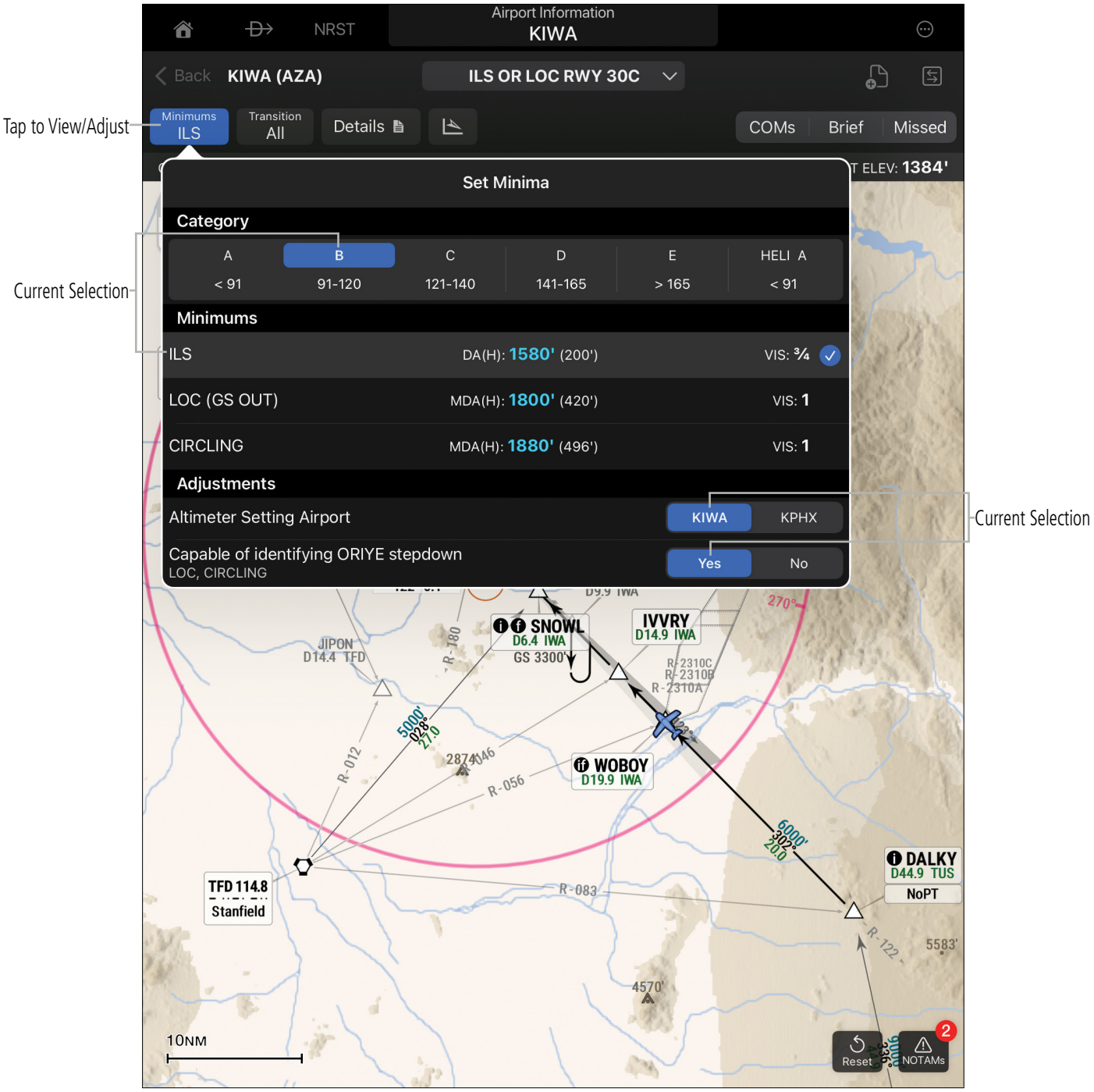
Garmin Pilot iOS - SmartCharts - KIWA - Airport Info - Charts - Approach - ILS RWY 30C - Overview

We recommend working through the selection options left to right for a consistent workflow. Let's proceed with our **Minimums** button. We will then make selections from top to bottom in this window to get the correct approach minimums.

First, select the approach category, **B** for our example flight. The speed, in knots, for each category is provided for your convenience.

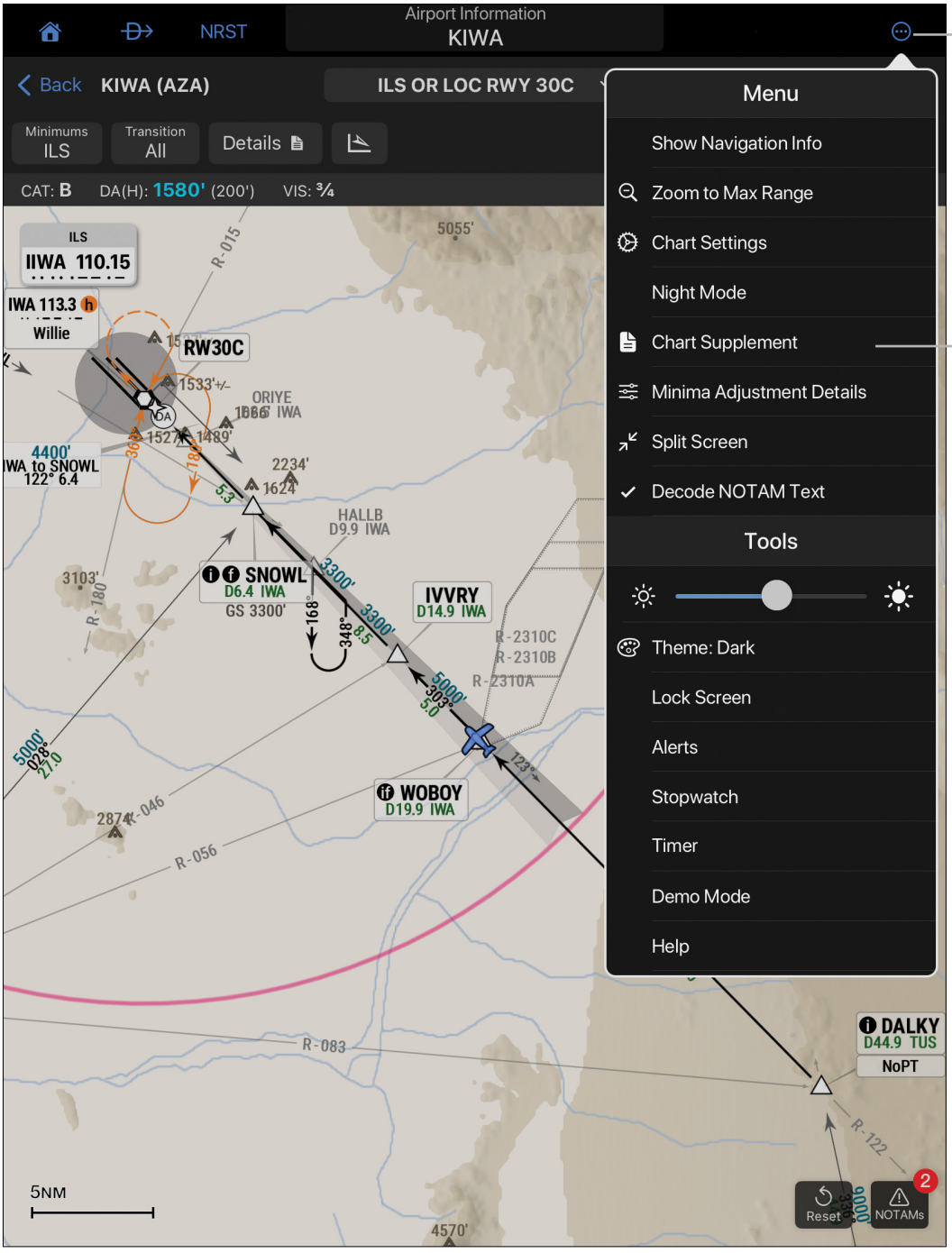
Next, select the type of minimums to be used. For this ILS approach, the options are ILS, Localizer-only, and Circling. Available options vary based on the type of approach. For example, an RNAV approach will provide options such as LPV and LNAV.

We will select the **ILS** option, since this is what we are expecting. Below that, adjustment factors for the minimums of this particular approach are listed. Instead of manually applying adjustments to your minimums using the Inop Table and the notes on conventional approach charts, simply make the applicable selection for each of the listed adjustment factors, and SmartCharts will automatically calculate the minimums for your flight.

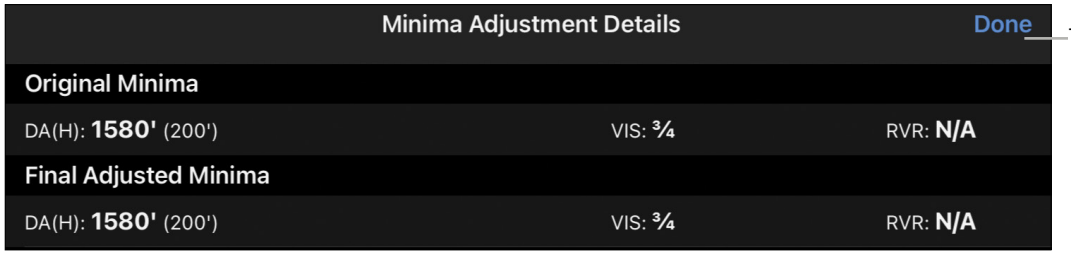


Garmin Pilot iOS - SmartCharts - KIWA - Approach - Set Minima - Category B

For pilots who are curious about how SmartCharts performed these adjustment calculations, you can view them by opening the More/Tools Menu by tapping and selecting **Minima Adjustment Details**. This window shows you the minimums prior to the adjustment, how each individual adjustment selected changes the minimum, and the final value that includes all the adjustments cumulatively.



Garmin Pilot iOS - SmartCharts - KIWA - Airport Info - Charts - Approach - More/Tools Menu



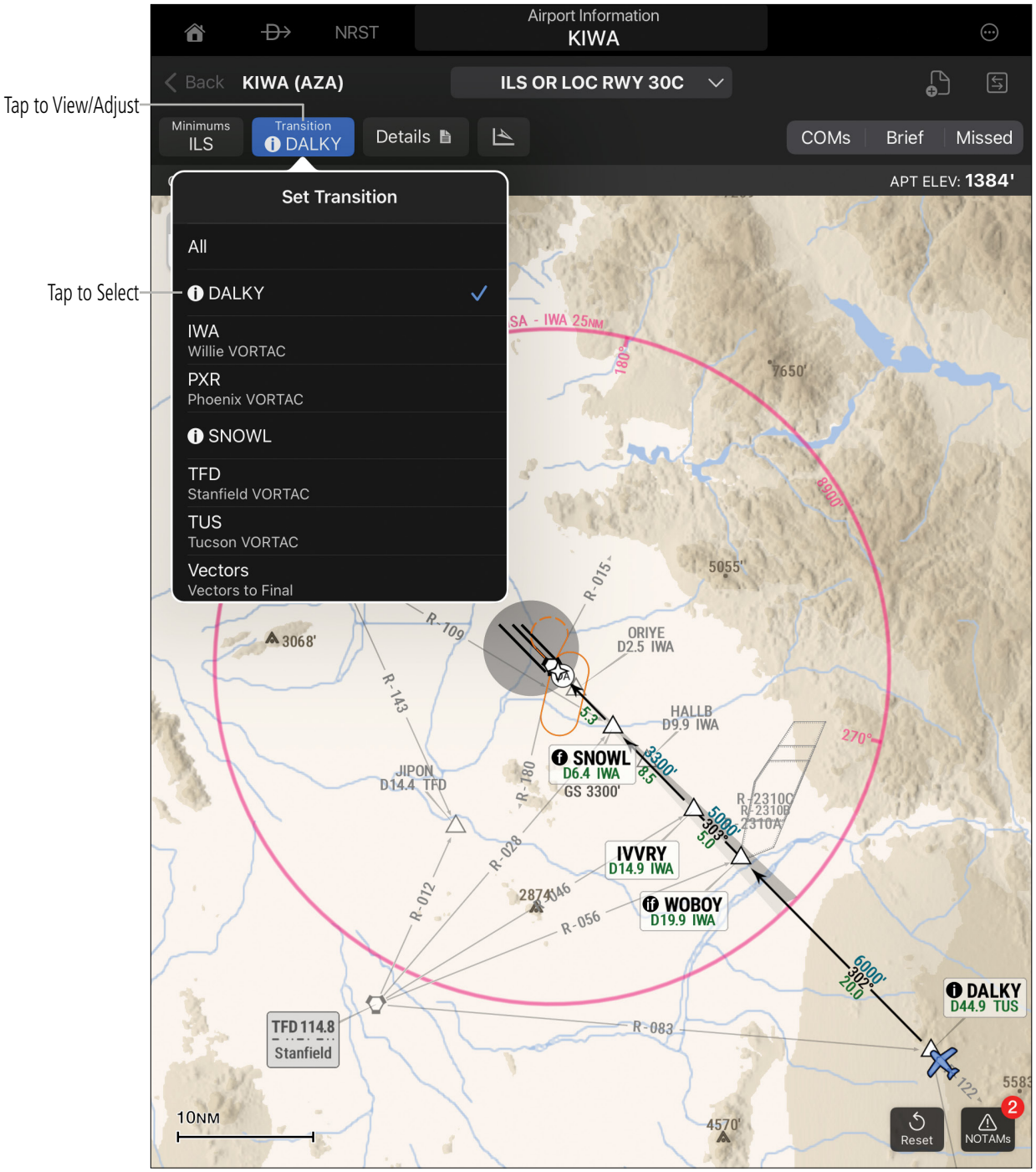
Garmin Pilot iOS - SmartCharts - KIWA - Airport Info - Charts - Approach - More/Tools Menu - Minima Adjustment Details

It is important to note that SmartCharts currently only accounts for published minimums. If the minimums are temporarily altered by a NOTAM, you must select the correct minimums and apply corrections manually. To do this, first open the Minimums window and apply all selections and adjustments as demonstrated. Then, open the Minima Adjustment Details mentioned earlier. Replace the Original Minima shown in the window with the NOTAM'd values, then follow along with the selected adjustments and manually apply them to the NOTAM'd minimums.

Next is the **Transition** button. Use this to select the Initial Approach Fix or feeder fix where you will begin your approach, and route segments not applicable to you will be filtered out.

Most approaches will offer a Vectors to Final option as well, where only waypoints along the final approach course will be shown.

For our example flight, let's select the **DALKY** transition.

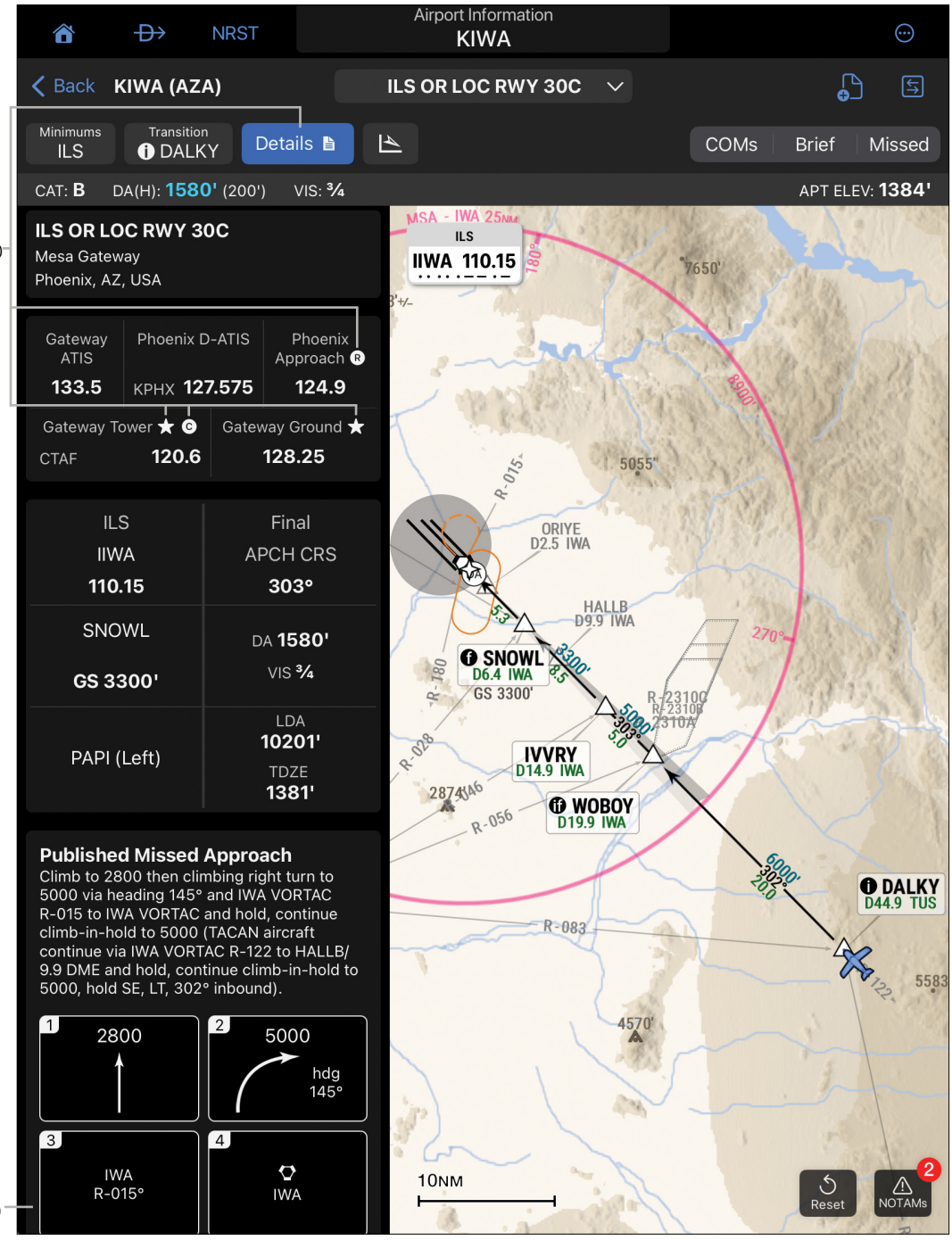


Garmin Pilot iOS - SmartCharts - KIWA - Approach - Set Transition

The **Details** button brings up additional information. Relevant COM frequencies are provided, and you can tap on the frequency to see a legend of the symbols. A Briefing section containing six information boxes summarizing key parameters for the approach is next.

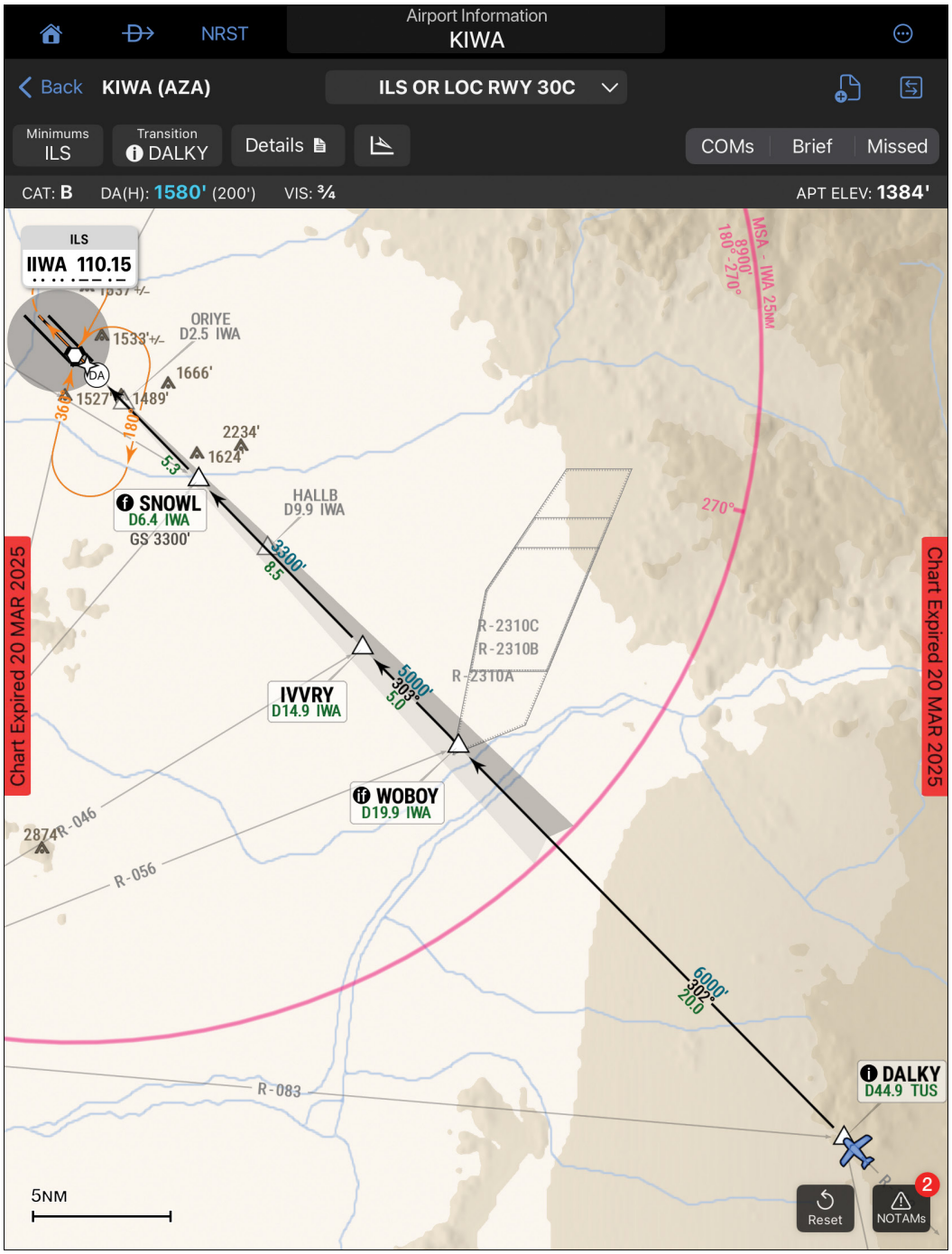
Missed approach icons and the textual descriptions, transition altitude, general notes and MSA or TAA information can also be found.

At the bottom of the Details window you will find the amendment version, effective date, and expiration date of the procedure chart.



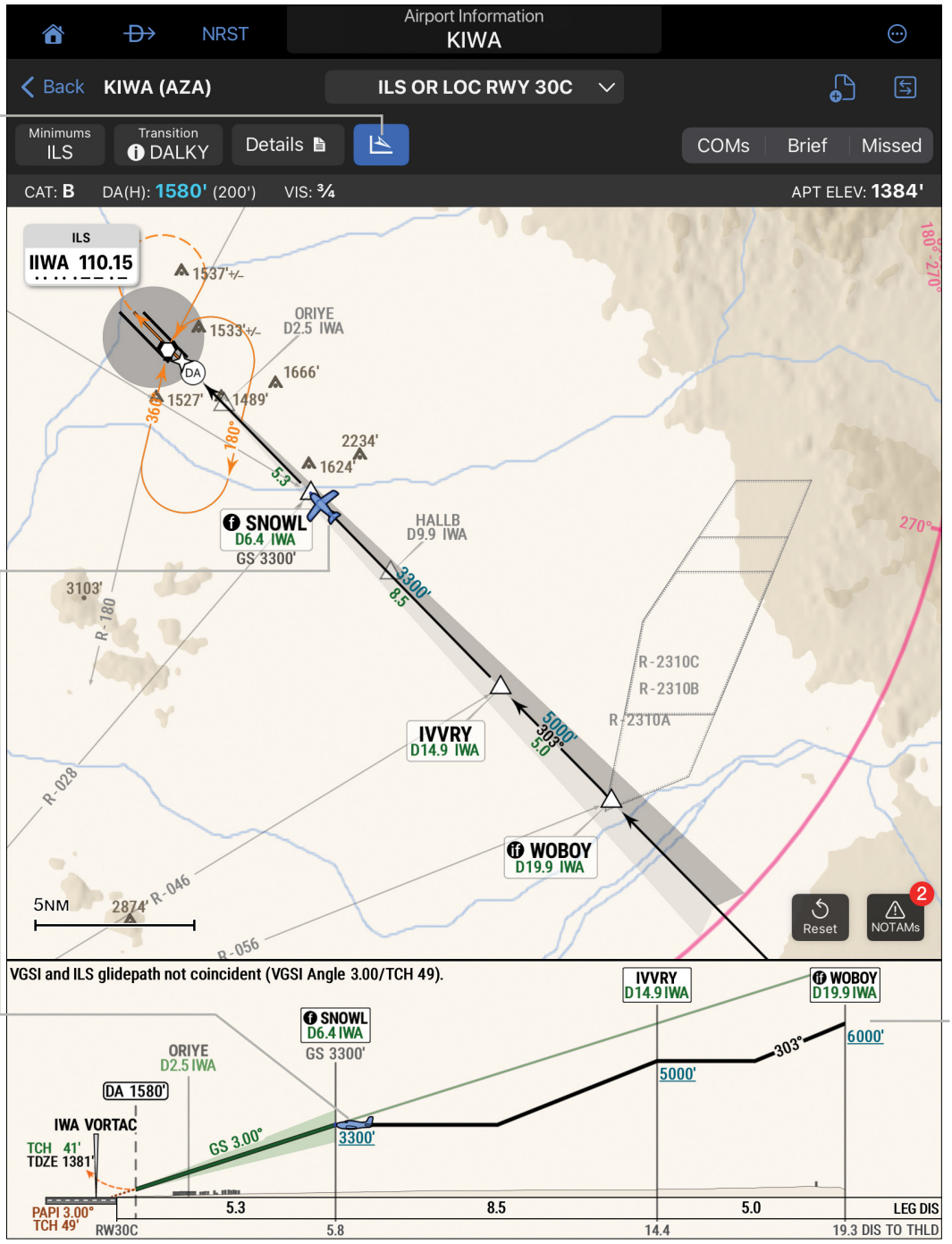
Garmin Pilot iOS - SmartCharts - KIWA - Approach - Details

Just like the departure and arrival procedures, in case the chart is out of date, a red banner will be shown for your awareness without needing to open the Details window.

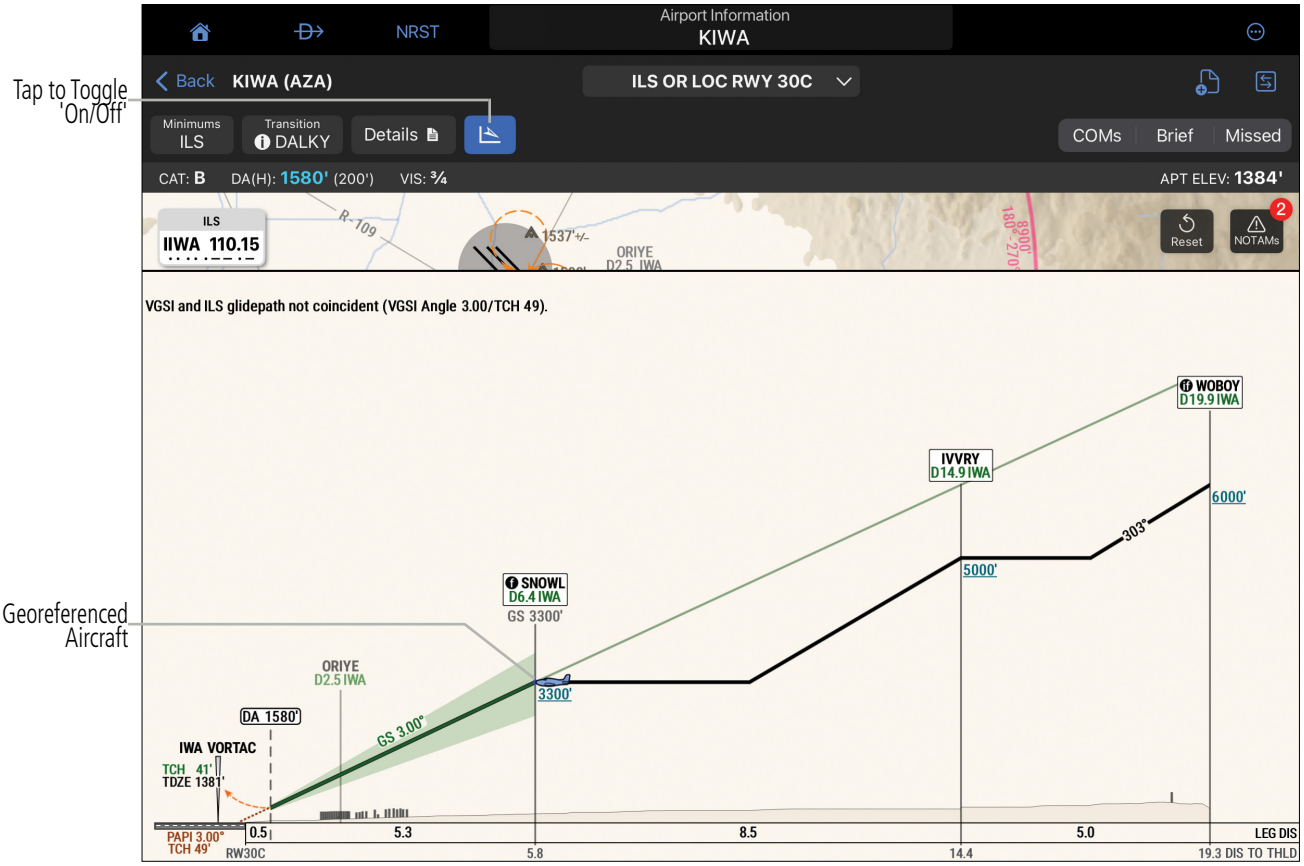


Garmin Pilot iOS - SmartCharts - KIWA - Approach - Chart Expired Banner

The Profile View button toggles the profile view on and off. Please note that if you are viewing the chart in landscape orientation, the planview and profile view cannot be viewed simultaneously. You will need to switch between the two using this Profile View button.

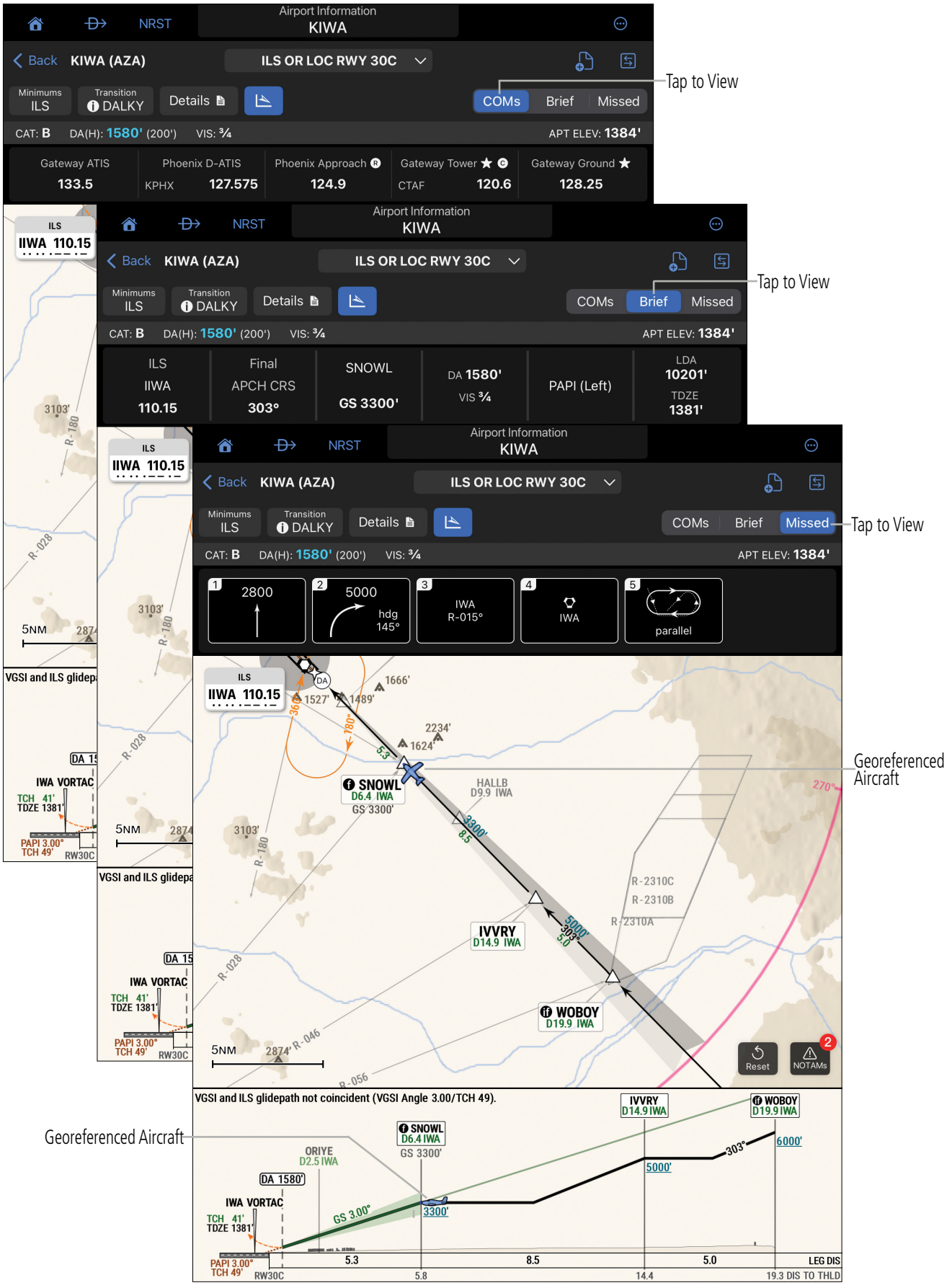


Garmin Pilot iOS - SmartCharts - KIWA - Approach - Profile View - Portrait Orientation



Garmin Pilot iOS - SmartCharts - KIWA - Approach - Profile View - Landscape Orientation

Individually access the **COMs**, **Brief,** and **Missed Approach** sections from the Details window for quick reference using these buttons.

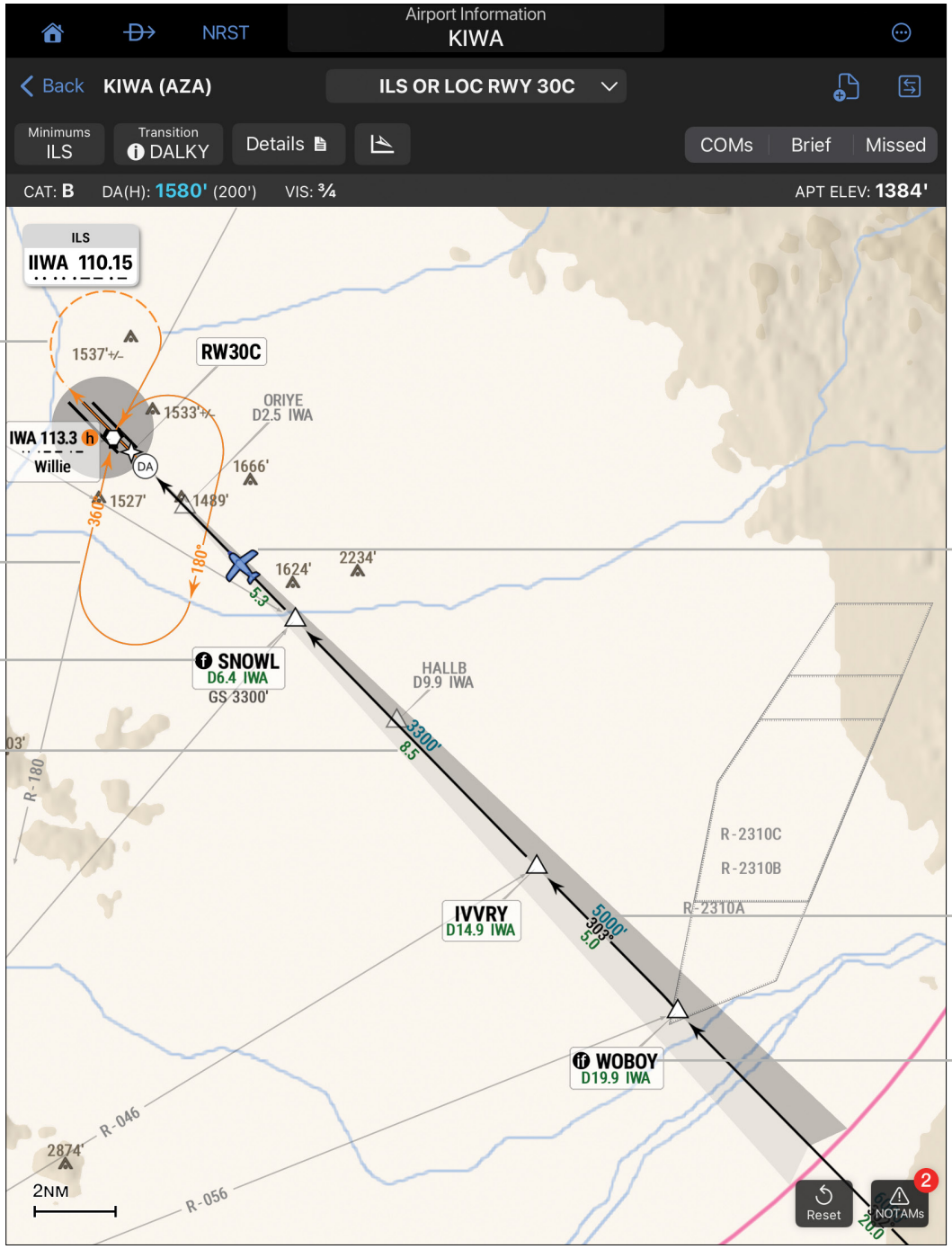


Garmin Pilot iOS - SmartCharts - KIWA - Approach - Profile View - Coms, Brief, & Missed

Just like the departure and arrival charts, the planview of the approach is drawn to scale and geo-referenced. Minimum altitude, magnetic course and distance for applicable route segments are provided. The MSA or TAA is also shown to-scale.

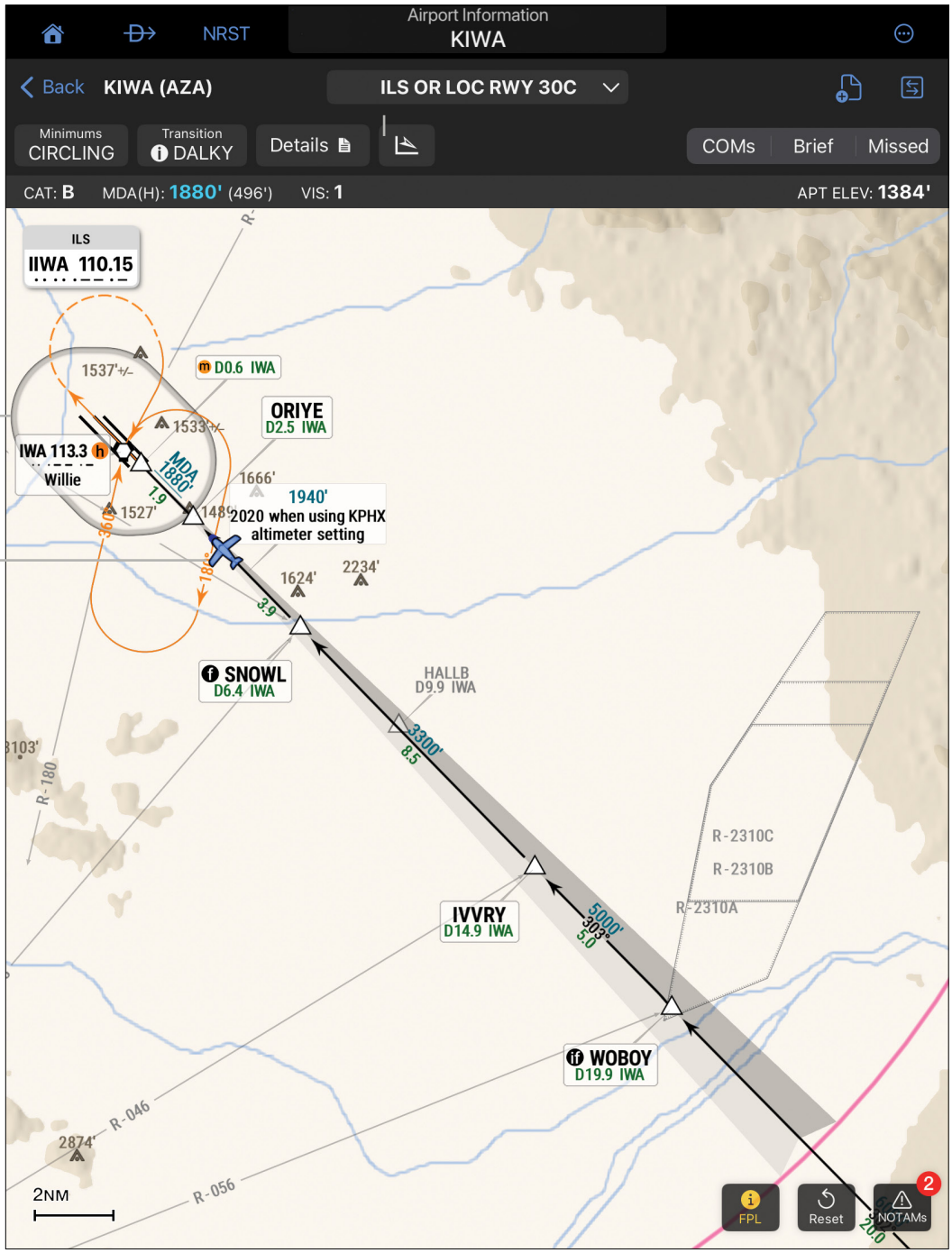
Waypoints containing speed or altitude constraints will be highlighted in magenta and cyan respectively if the planview is zoomed out such that the constraint labels are no longer visible. For route segments that overlap, such as the outbound and inbound segments of a procedure turn, one of the segments will be offset, along with a label showing the minimum altitude, initial and ending waypoints, magnetic course and distance of that segment.

Route segments shown in orange are for the missed approach procedure.



Garmin Pilot iOS - SmartCharts - KIWA - Approach - Planview

If a circling approach is selected in the Minimums window, the planview depicts the circling area to scale based on your approach category. Circling restrictions will be shown as well. Combined with geo-referencing, this can be a great tool for you to maintain situational awareness when circling.



Garmin Pilot iOS - SmartCharts - KIWA - Approach - Profile View - Circling Depiction

An industry first feature of SmartCharts is that the profile view is geo-referenced. When connected to a compatible data source, SmartCharts can depict the aircraft's GPS-derived altitude. The profile view is also drawn dynamically, so it refreshes when a different minimums or transition selection is made.

On the lateral scale of the profile view, the included waypoints may change when a different transition is selected. If the selected transition contains a procedure turn, the procedure turn will not be included in the to-scale depiction. Instead, the procedure turn segment is shown in grey with a "Not to scale" note. Geo-referencing on the profile view is not available when flying in this area.

At the bottom, you will see the terrain and obstacles along the approach course, along with two lines of distance information. The upper line is the leg distance of each segment. The bottom line is the cumulative distance to the threshold.

Occasionally the entire profile view may not fit on the screen. In that case, simply scroll left or right by swiping on the profile view.



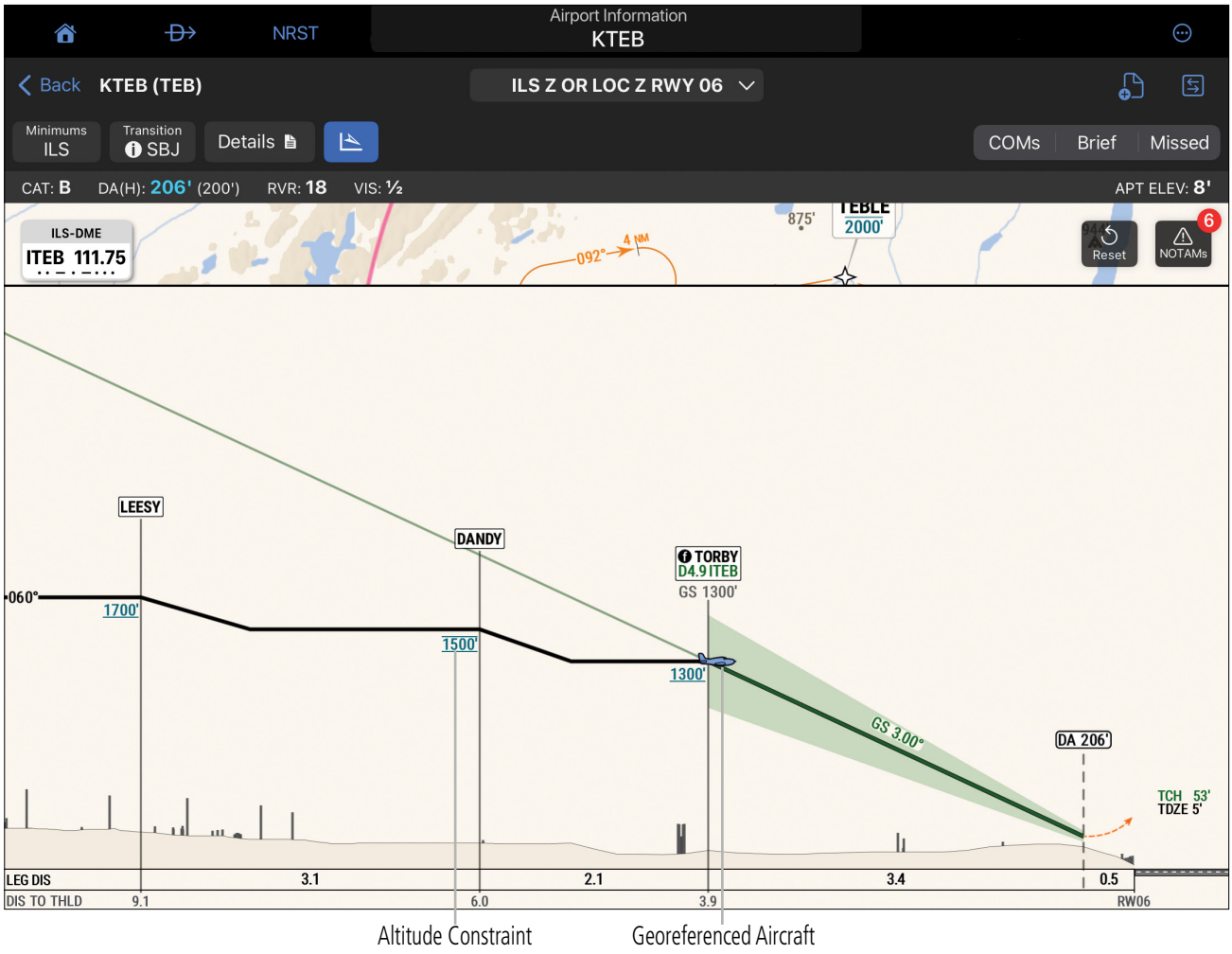
Garmin Pilot iOS - SmartCharts - KIWA - Approach - Profile View - Landscape Orientation

On the vertical scale, you can see the minimums being depicted as a decision altitude when ILS straight-in is selected, and as a minimum descent altitude when Circling or Localizer-only is selected.

Any adjustments to your DA or MDA based on your selections in the Minimums window will also be shown here.

Available vertical guidance is shown after the FAF. For this approach, if ILS is selected, the glideslope is displayed. When localizer-only is selected instead, the glideslope is replaced by the advisory descent angle. The to-scale depiction of the profile view can assist you with visualizing the descent profile.

For example, let's look at the ILS RW06 approach into Teterboro. With SmartCharts, you can easily see that you will miss the mandatory altitude at DANDY if you inadvertently intercept the glideslope too early. This may not be easily understood when using conventional approach charts.

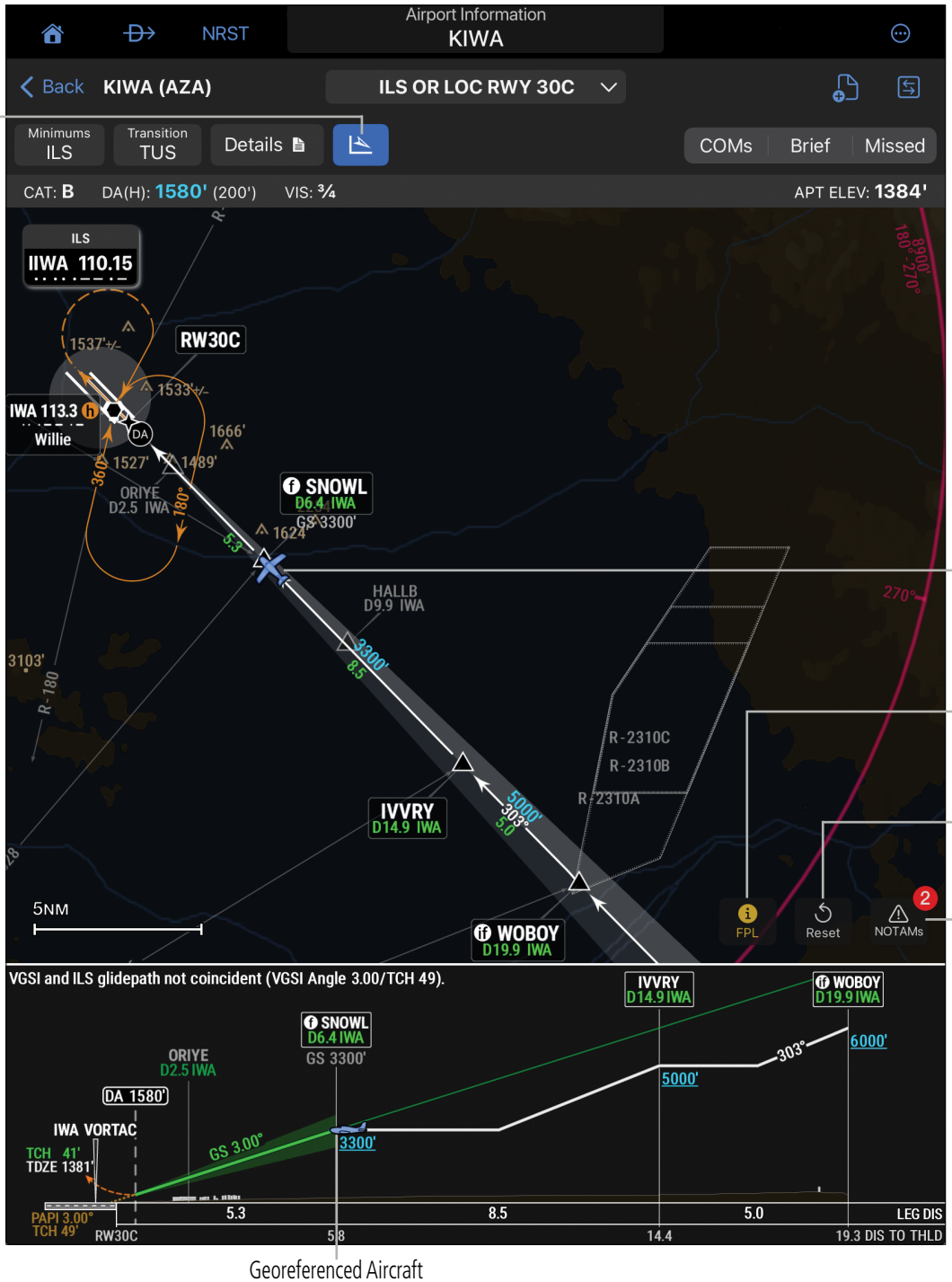


Garmin Pilot iOS - SmartCharts - KTEB - Approach - Profile View - Landscape Orientation - Altitude Constraint Prior to GS

Just like the other charts we looked at, here is the button to reset the chart. This can be a convenient way to modify your decluttering selections for situations such as a flight plan change or getting ready for a different flight.

The buttons to view relevant **NOTAMs**, and to revert to the conventional chart are also available.

You will also see this **Flight Plan Mismatch** caution if the approach you are viewing is not the one specified in your flight plan.



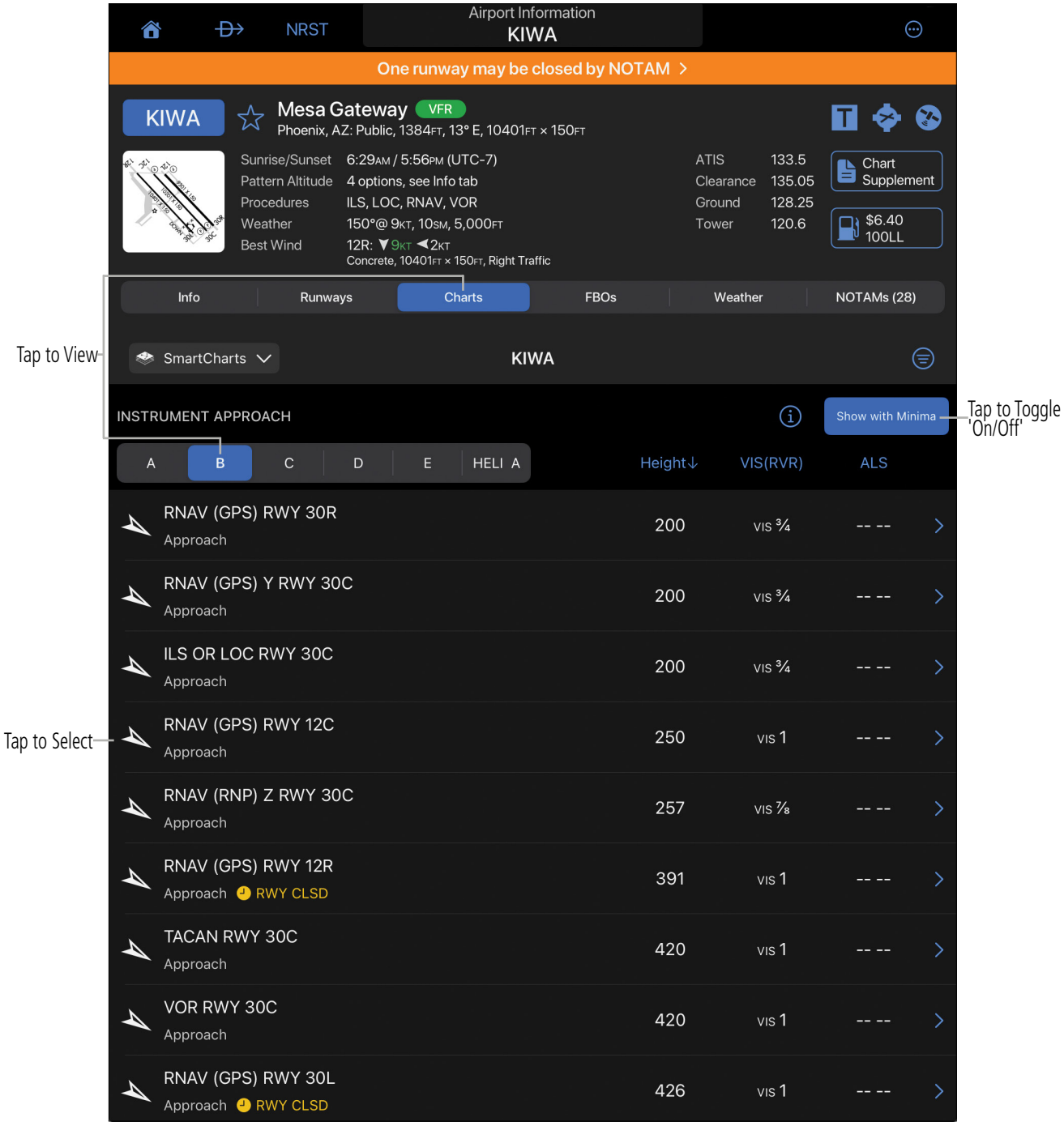
Garmin Pilot iOS - SmartCharts - KIWA - Approach - Profile View - Portrait Orientation - Night Mode

Now that we have explored instrument approaches on SmartCharts, let's see how it can help us choose a new approach should we need to deviate from our original flight plan. Let's assume that the winds have shifted and we can now expect landing to the southeast instead. We can use SmartCharts to help us find a new instrument approach. Start by navigating to the destination airport's chart binder.

When using SmartCharts, you will see the **Show with Minima** button for the Instrument Approach section of the chart binder or Airports page. Selecting **Show with Minima** shows the lowest published minima, both height and visibility or RVR, and, if available, the approach lighting system for each approach without having to open the chart.

Tap on a field to select the sorting criteria. The approach category for your aircraft can also be selected. We can use this to quickly compare the metrics of the available approaches. At a quick glance, we can see that, in this case, RNAV RWY 12C offers lower minimums than RNAV RWY 12R.

We hope you see how SmartCharts can help improve your IFR experience by removing unused information and reducing the amount of required manual calculations. Just remember to use a consistent workflow to make your customization selections, and you will be able to enjoy decluttered charts, customized for you.



Garmin Pilot iOS - SmartCharts - KIWA - Airport Info - Charts - Approach - Show With Minima

IPAD GUIDANCE

There area a few things to know about the iPad's basic features and settings that will enhance the Garmin Pilot experience on the iPad. These features are not hidden, but they may not be immediately apparent to the novice iPad User. To become completely familiar with the iPad, it is recommended to read the iPad User Guide.

DISPLAY ORIENTATION

The iPad has a default setting that will enable the unit to automatically rotate the display to either portrait or landscape according to which edge of the unit is facing upward. This automatic setting can be quite troublesome in the cockpit as the solid-state accelerometers in the iPad are very sensitive to movement and can cause the display to rotate unexpectedly.

There are two ways to enable/disable the rotation lock; first via the iPad control center, and second from within Garmin Pilot by selecting 'Lock Screen' under the Tools button.

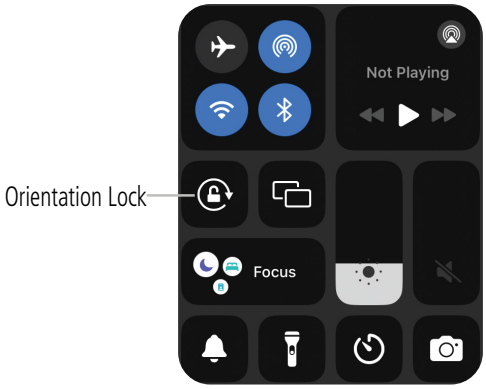
Locking Orientation in the iPad Control Center:

1) Swipe down from the top, right corner of any screen.

2) Tap the orientation lock icon to lock/unlock the automatic screen orientation feature.

Or:

Within Garmin Pilot, tap **Tools > Lock Screen**.



iPad Control Center - Orientation Lock

IPAD GLARE REDUCTION

One limitation of the iPad hardware in the cockpit is glare. There are number of ways to mitigate the effects of glare using aftermarket screen protectors and similar products. However, one can do reasonably well by simply adjusting the display brightness and/or selecting White on Black or "Night Mode" for operations in low light conditions.

Within Garmin Pilot, night mode is available from the menu ( ) on the Map Page, Flight Plan Page, and the Synthetic Vision page.

Adjusting Display Brightness:

1) Open the iPad Settings Menu.

2) Under the Settings column on the left, tap **Display & Brightness.**

3) Use the slider control to manually adjust the display brightness.

The iPad can also be configured to invert its display to improve contrast at night or in low light conditions. Even with Night Mode activated, it may be necessary to dim the display for low light conditions.

Selecting iPad Night Mode:

1) Open the iPad Settings Menu.
2) Tap the **Accessibility** submenu.
3) Tap **Display & Text Size** submenu.
4) Tap **Smart Invert**, or **Classic Invert** to select/deselect Night Mode.

Using the iPad's Home Icon to select Night Mode:

1) Open the iPad Settings Menu.
2) Tap the **Accessibility** submenu.
3) Tap **Accessibility Shortcut**, and choose **Classic Invert Colors** or **Smart Invert Colors**. Now, clicking the iPad Home Icon three times toggles Night Mode on/off.

Displaying the Garmin Pilot moving map in Night Mode:

Tap  > 

>  > **Night Mode.**

Displaying the Synthetic Vision in Night Mode:

Tap  > 

>  > **Night Mode.**

AIRPRINT WIRELESS PRINT CAPABILITY

Garmin Pilot uses Apple's wireless printing technology, AirPrint, to allow printing from your iOS device to an AirPrint-ready printer. This capability allows Users to print various items including, but not limited to, Charts, Airport Diagrams, FliteCharts, SmartCharts, Weight & Balance Load Sheets, FltPlan.com NavLogs, and IFR autorouting briefing packets for applicable Garmin Pilot Europe subscriptions.

To Print Documents, click  > **Print**, then select the desired printer options.

ADDITIONAL INFORMATION

SmartCharts is the new, revolutionary aviation charting solution launching via Garmin Pilot for iOS. With just a few selections in Garmin Pilot, the User can filter the chart data for a customized, decluttered display specific to the aircraft and approach, increasing situational awareness for the pilot(s). SmartCharts, like conventional charts, can be used to satisfy Federal Aviation Regulations (FAR) requirements on carrying appropriate aeronatical charts and data under Part 91.

OVERVIEW & FEATURES

SmartCharts provides an interactive, customizable, FAA recognized charting option. Once SmartCharts is downloaded, the User can view the enhancements to the following areas:

- Airport Diagram
- Instrument Approaches
  - ILS (CAT I, II, & III), LOC, LOC/BC, RNAV (GPS), RNAV (RNP), VOR, VOR/DME, & NDB.
- Arrival Procedures
  - Standard & RNAV.
- Departure Procedures
  - Standard & RNAV.

SmartCharts enhances the User experience in many ways, focusing on Airport Diagrams, Departure Procedures, Arrival Procedures, and Instrument Approaches. All SmartCharts have the following features:

- Quick Switch:  located in the upper right of the screen. Allows User to swap between SmartCharts and traditional charts, if needed.

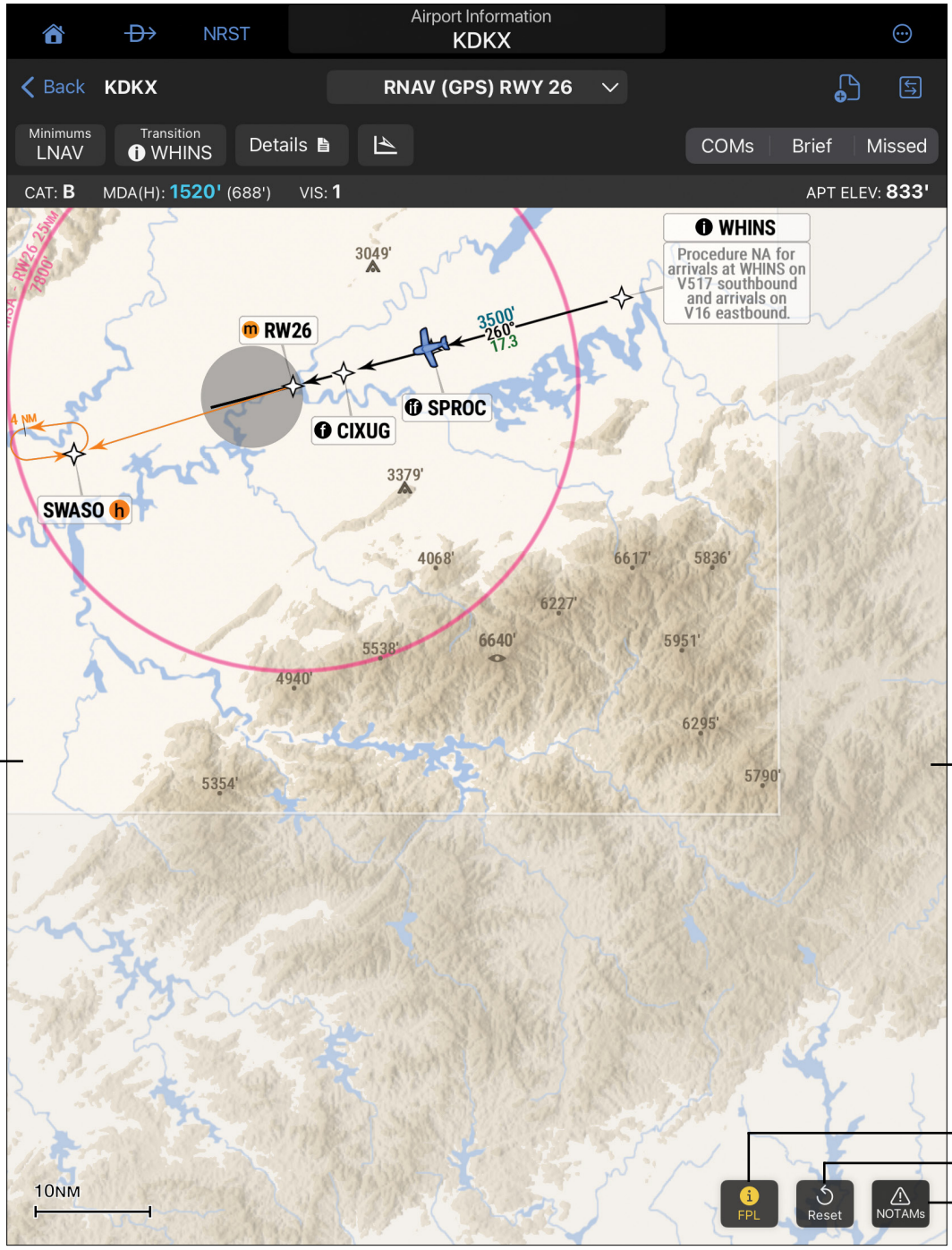
NOTE: *When*  *is selected by the User, the chart provider will be adjusted. When returning to the Charts or Airports page from a traditional chart, the User will need to reselect SmartCharts as the chart provider. To keep SmartCharts as the chart provider, Garmin suggests using*  *to return to the SmartChart prior to exiting the page.*

- NOTAMs: When any NOTAMs exist for the airport, 

will be displayed in the bottom right corner of the Planview area. When no NOTAMs are published, the NOTAM icon is not displayed.
- Reset: 

located in the bottom right corner of the Planview area.
- Flight Plan Mismatch: 

located in the bottom right corner when a Flight Plan discrepancy is prevalent.
- Planview Procedure Frame: This is the area on the Planview which contains the procedure and obstacles. The area outside the Procedure Frame is opaque and will show terrain, water, and other referenced features if they exist for the procedure. Obstacles will not be shown outside the Procedure Frame.



Airport Info - Chart - Planview Procedure Frame

LIMITATIONS OF THE CURRENT SYSTEM/DATA

Upon initial launch, SmartCharts will be available for the United States and the Bahamas. Some airports in the U.S. and Bahamas may not have all their charts available initially, e.g. Airport Diagram is still FliteCharts or Jeppesen, but the Instrument Approaches, Arrivals, and Departures, are available via SmartCharts. Additional coverage areas and features will be released and announced as SmartCharts continues to evolve, expand, and enhance the charting experience.

DATA VALIDATION, SOURCING, & LEGACY CHART COMPARISON

Both conventional and SmartCharts start with the same source data. With conventional charts, the cartographers transform the source data directly into charts in the familiar, traditional manner. With SmartCharts, the same source data is rendered to display the information in real-time. The use of such interactive information on an electronic flight bag is permitted by FAA Advisory Circular 91-78A.

CYCLE DATA & REQUIREMENTS

SmartChart data is scheduled to align with the Aeronautical Information Regulation And Control (AIRAC) cycle, every 28 and/or 56 days or on demand/requested by the FAA and/or ICAO. To enable SmartCharts on Garmin Pilot iOS, a Premium Tier Subscription is required. This feature is currently only available on Apple devices running iOS 17.4 or newer. To ensure proper functionality and capability, the Garmin Pilot application on your device should be updated to version 25.5 or newer.

GEOGRAPHIC AREAS

SmartCharts is available for the following geographic areas:

- United States (including Hawaii & Alaska)
- Bahamas

GEOREFERENCED AIRCRAFT DEPICTION

When the georeferenced aircraft is depicted on SmartCharts, the nose of the icon is located at the GPS position of the aircraft. This is also indicated by the animated "ping" that periodically emanates from the nose of the icon.

HOW TO DOWNLOAD SMARTCHARTS TO GARMIN PILOT

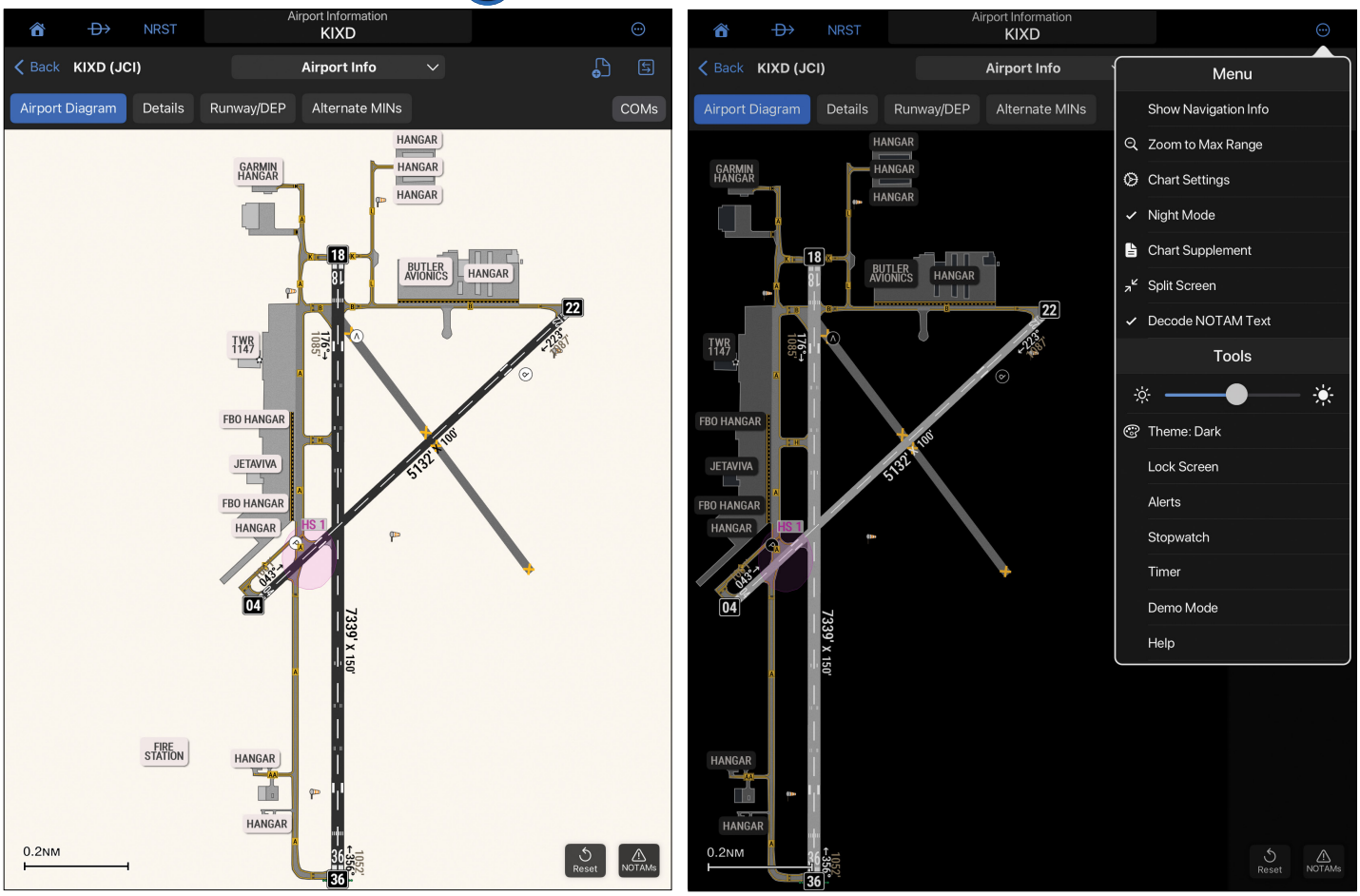
Current and New Garmin Pilot subscribers: flygarmin.com

NIGHT MODE

When the User is viewing the chart, they can toggle Night Mode 'On/Off', as desired.

Toggle Night Mode On/Off:

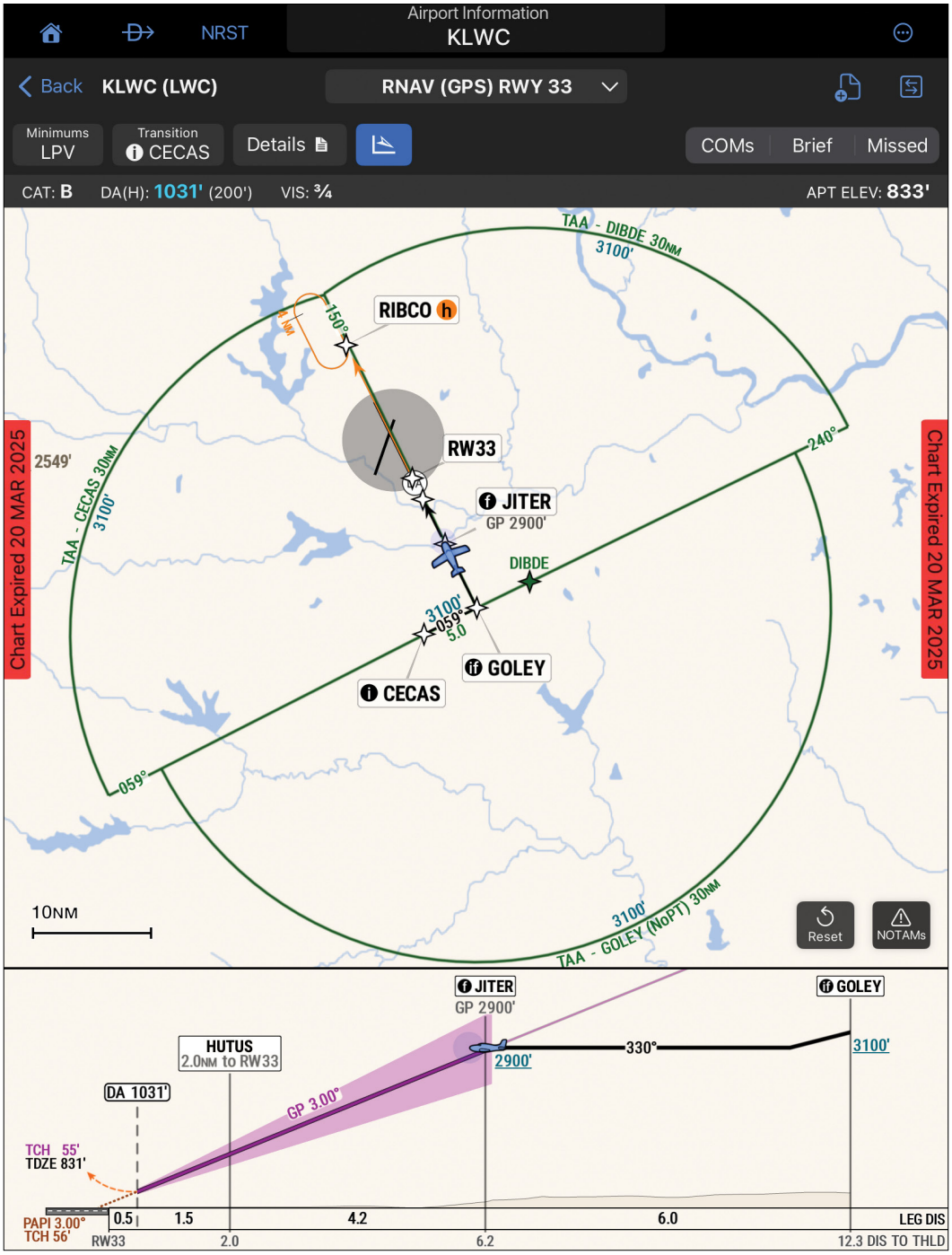
1) Select  >  > **Charts > SmartCharts > Airport Diagram**.
2) In the upper right-hand corner, tap  > **Night Mode**. Toggle 'On'/Off', as desired.



Garmin Pilot iOS - SmartCharts - More/Tools Menu - Night Mode

EXPIRED SMARTCHART

In the event a SmartChart has expired and needs to be updated, a "Chart Expired" banner will be displayed.



Approach - Day Mode - Chart Expired

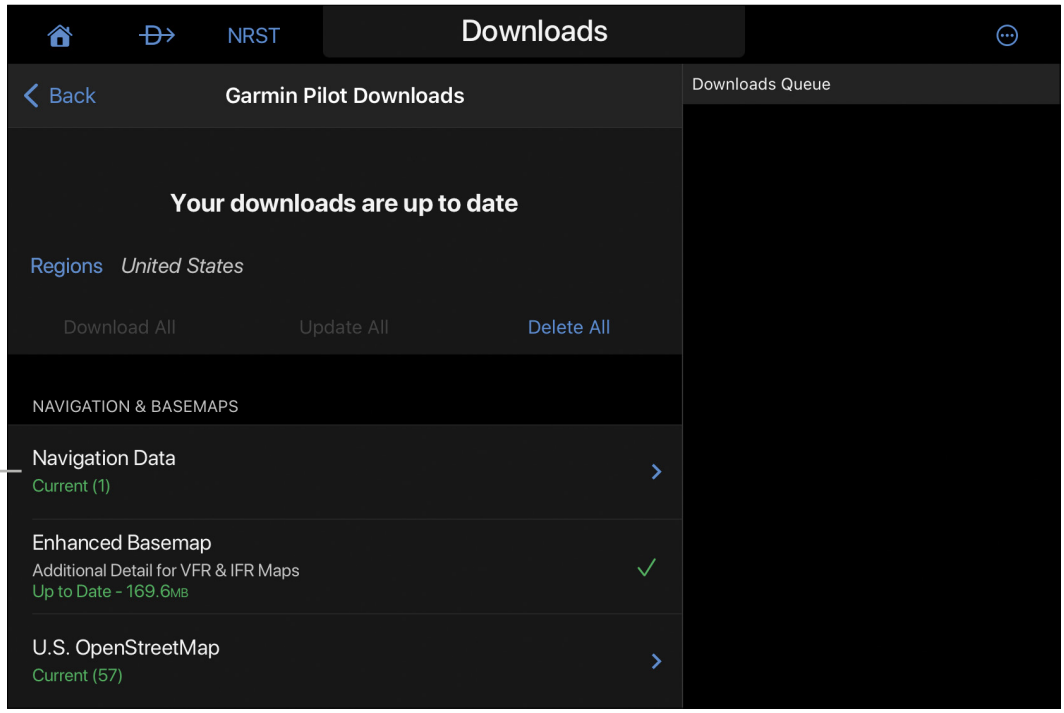
HOW TO UPDATE SMARTCHARTS IN GARMIN PILOT

Updating SmartCharts:

1) Tap  > 

.

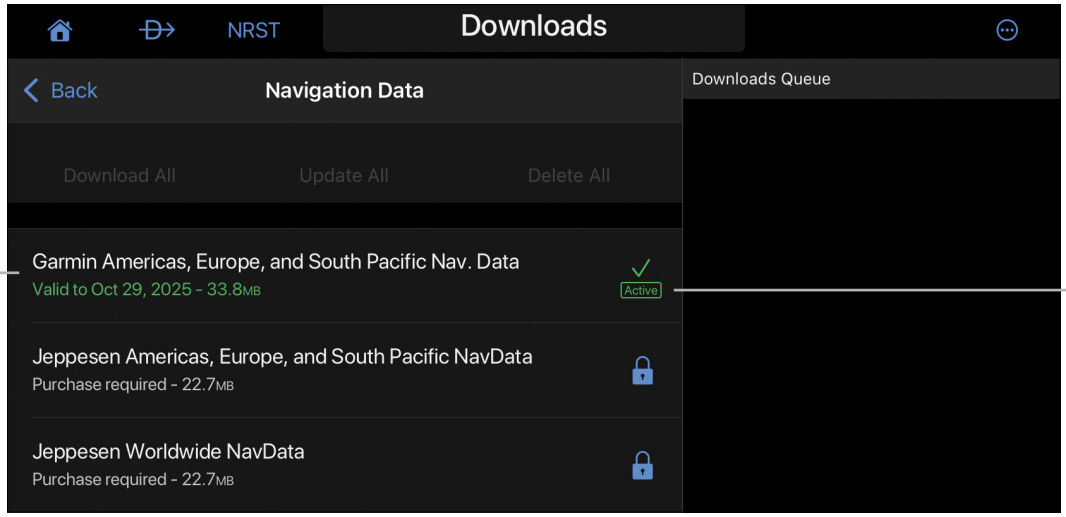
2) In the Navigation & Basemaps section, tap **Navigation Data.**



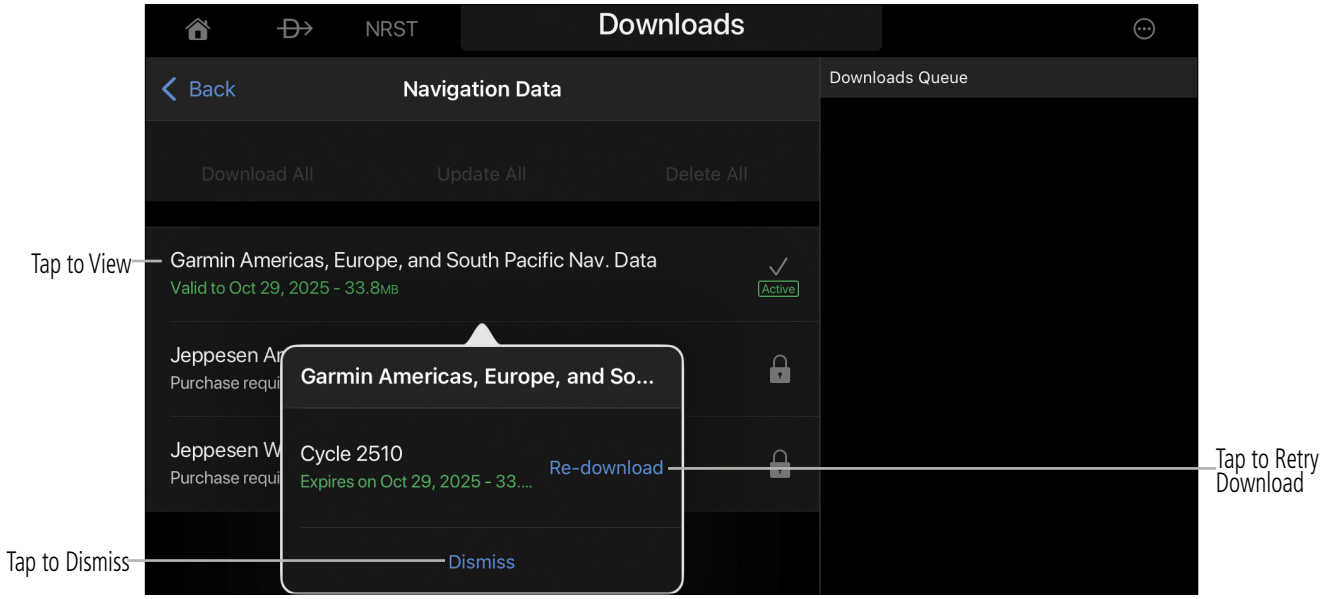
Downloads - Garmin Pilot Downloads

3) If a download is needed, tap  begin the download. The download progress bar will be displayed until complete. Once the download is successful, 

will be displayed along with the chart cycle number, expiration date, and file size.



Downloads - Garmin Pilot Downloads - Garmin Americas - Active



Downloads - Garmin Pilot Downloads - Garmin Americas - Active - Cycle Info

CYCLE UPDATE CALENDAR

FAA Pacific charts (e.g. Hawaii, Guam) have 56-day expiration dates while all other FAA charts have 28-day expiration dates. SmartCharts may show Pacific chart expiration dates on the 28-day cycle date. This would be accurate for the later portion of the 56-day cycle, but not the latter, (e.g. Pacific charts may show premature expiration dates for the first half of the 56-day cycle, but the date will be updated and correct for the second half of the 56-day cycle.

HOW TO REPORT ISSUES OR PROBLEMS

Should the User experience any issues with SmartCharts in an active coverage area, please contact:

» Online - Garmin Aviation Product Support - support.garmin.com/en-US/aviation/

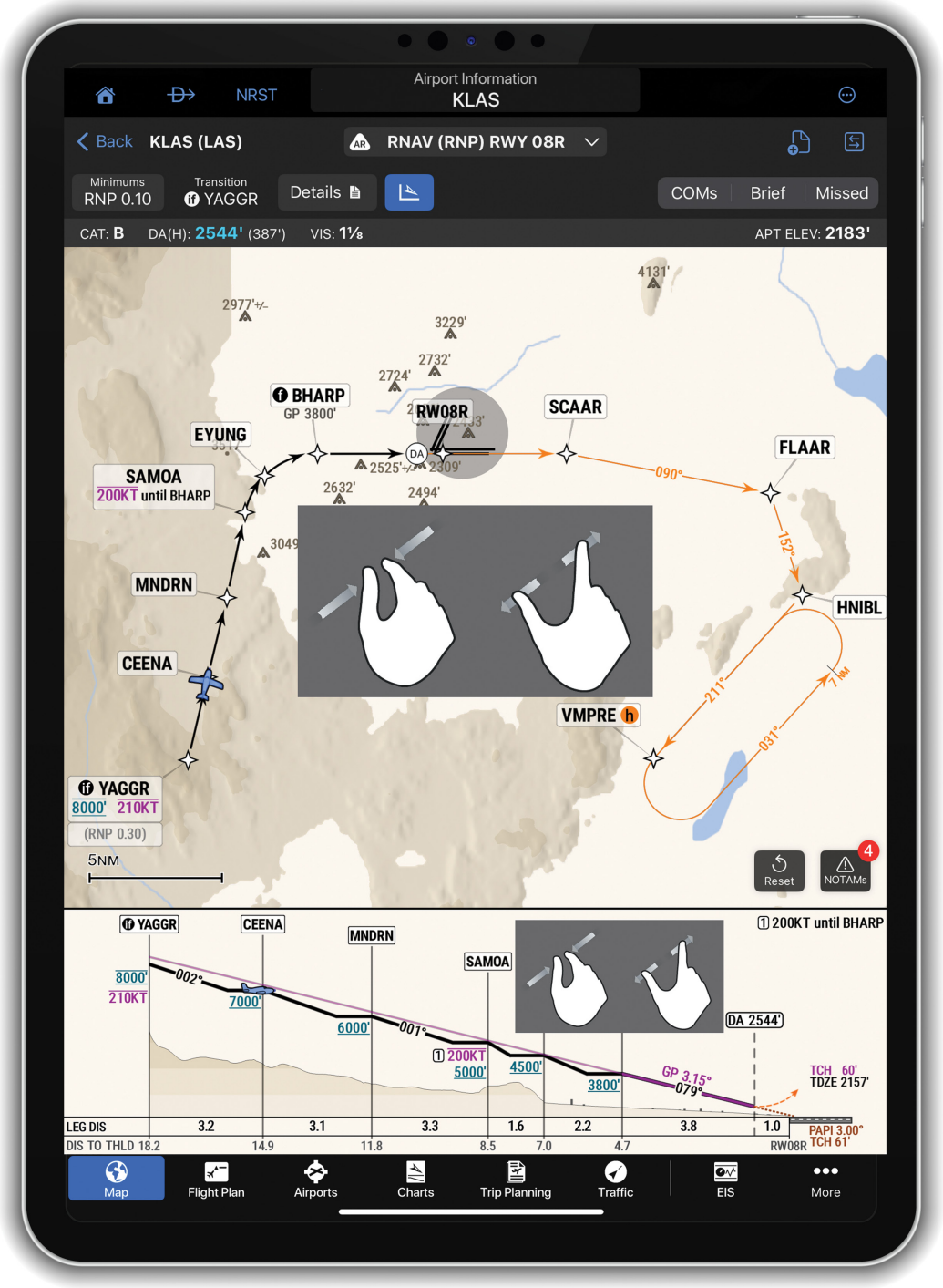
» Phone - Aviation Support: Americas - U.S./Canada: 1-866-739-5687

- Monday - Friday, 7:00 a.m. - 7:00 p.m., CST (Closed U.S. Holidays).

GENERAL SMARTCHARTS OPERATING GUIDELINES

SmartCharts, much like other Garmin Pilot features, allows the User access to various features by tapping, flicking, and/or dragging a finger on the active areas of the display that appear as buttons, slide controls, lists, text fields, or icons. As with most iPad applications, text fields automatically open a QWERTY keyboard for easy text entry.

Also like other iPad applications that use maps, panning is done by "tap-dragging" the finger across the display, and magnifying or zooming is done by pinching. Reversing the pinch gesture with two fingers will de-magnify or zoom out. Additionally, there is no SmartChart input that requires any specific weight or pressure on the display. In other words, tapping or pressing forcefully on the screen will produce the same result as a light tap.



General Operation - Pinch Zoom

GARMIN

SETTING SMARTCHARTS AS PRIMARY PROVIDER

NOTE: *Not all charts are available in SmartCharts. When another chart provider is used, i.e. FliteCharts or Jeppesen, the chart(s) will be used and displayed accordingly.*

NOTE: *When updated and/or downloaded successfully, SmartCharts will be indicated by the following icons next to the appropriate chart: Instrument Approach =* , *Arrival Procedure =* , *Departure Procedure =* .

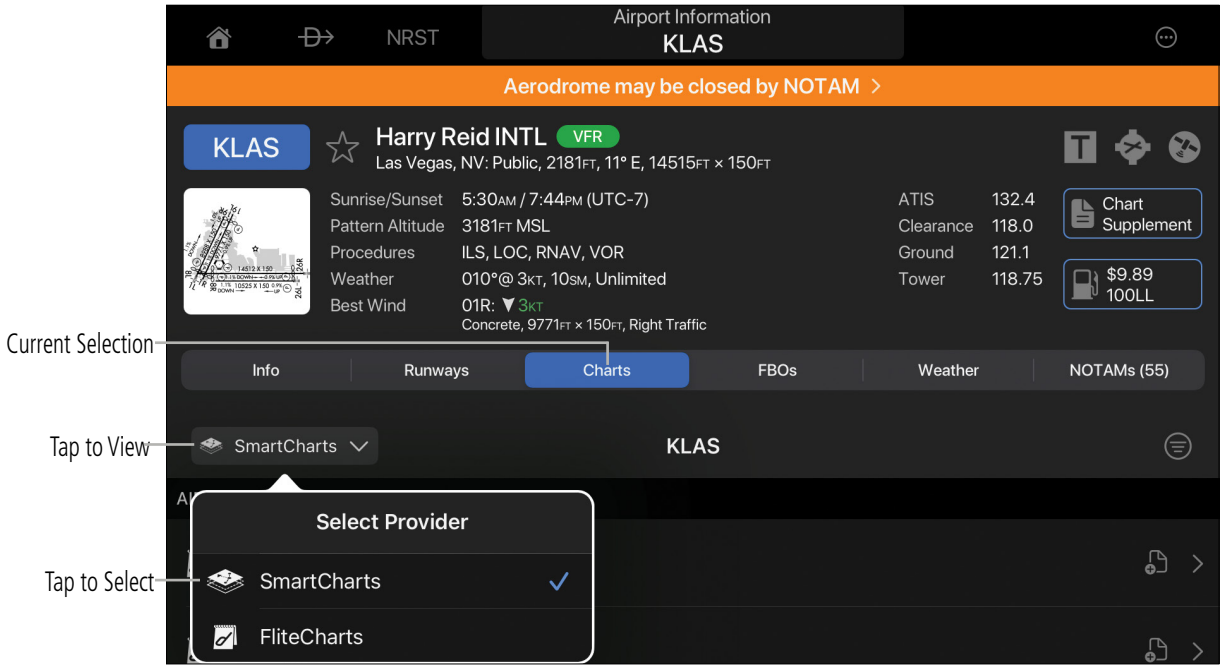
NOTE: *When updated and/or downloaded successfully, FliteCharts will be indicated by* *next to the chart.*

NOTE: *When updated and/or downloaded successfully, Jeppesen charts will be indicated by* *next to the chart.*

Initially, when SmartCharts is successfully downloaded, they will not be the primary Chart provider. Selecting SmartCharts as the primary chart provider can be easily accomplished by the User in a couple ways, the easiest path via the Airport Information page.

Selecting Chart Provider:

1) Select > > **Charts.**
2) Select **FliteCharts** to display the Select Provider menu, then tap **SmartCharts**. A blue checkmark will be displayed next to the active chart provider.



Airport Info - Charts - Select Provider - SmartCharts

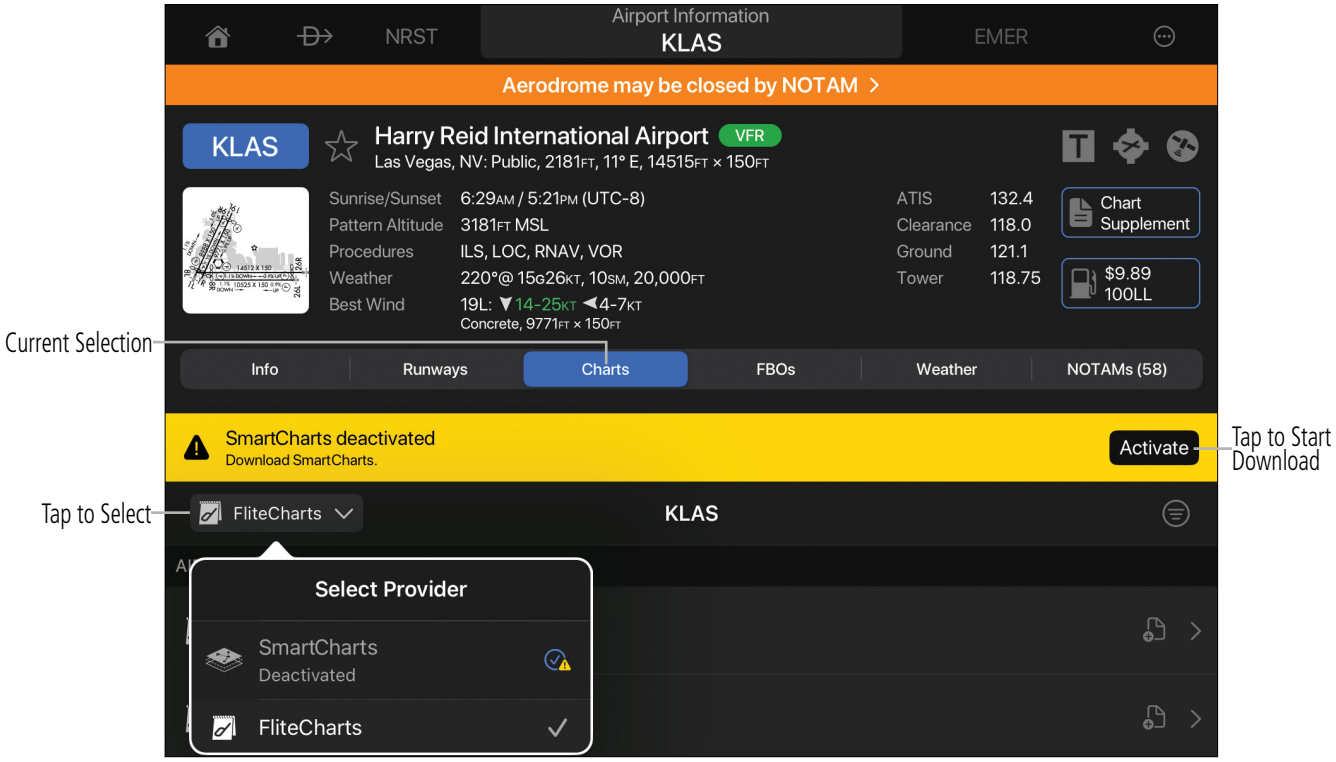
RE-ACTIVATING SMARTCHARTS

NOTE: *When using SmartCharts, please ensure the* ***Garmin Americas*** *Navigation Data is downloaded and set as the active source.*

In the event a SmartCharts download has not been activated on the particular device, or if the incorrect Navigation Data is set as the Active source, Garmin Pilot will alert the User with an amber annunciation stating "SmartCharts deactivated. Download SmartCharts". Selecting the **Activate** button will start the SmartChart download process and switch to the Garmin Americas navigation database.

Re-activating SmartCharts:

1) Select > > **Charts.**
2) An amber annunciation will be displayed indicating SmartCharts needs to be activated on this device. Select the **Activate** button to initiate the download.
3) Once the download is complete, SmartCharts will be available for the User to select as the primary Chart Provider.

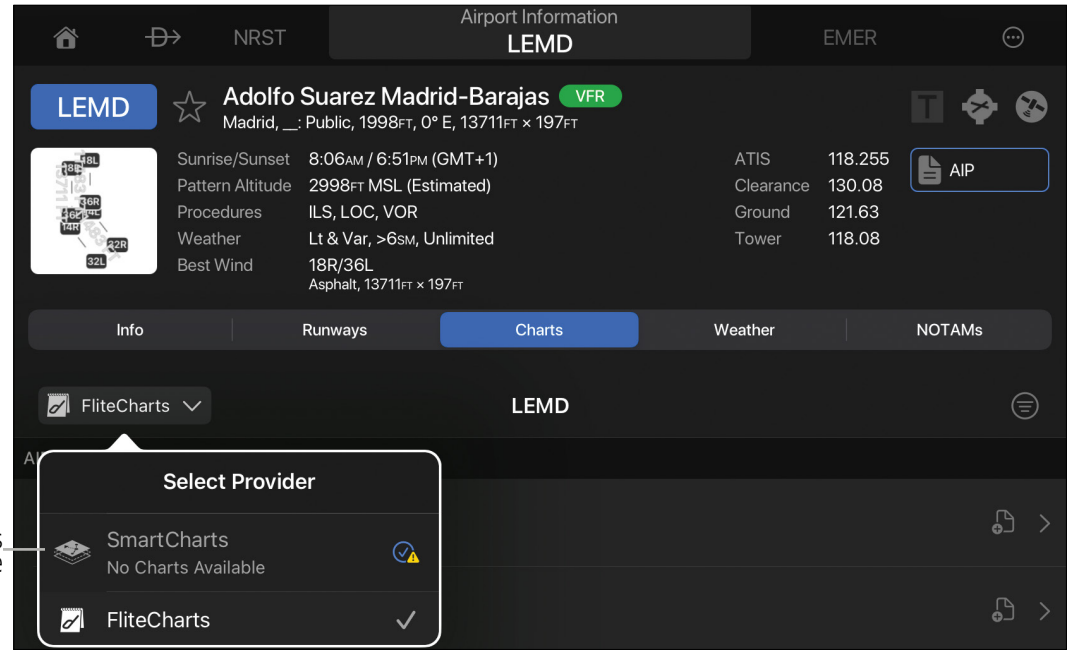


Airport Info - Charts - SmartCharts Deactivated

SMARTCHARTS UNAVAILABLE

SmartCharts will initially launch with coverage in the U.S. and the Bahamas, with global expansion on the horizon. If the User is attempting to access SmartCharts outside of the coverage area, they will receive a "No Charts Available" annunciation alongside a deactivated SmartCharts option in the Chart Provider menu.

Should the User experience this issue in an active coverage area, please contact Aviation Product Support.



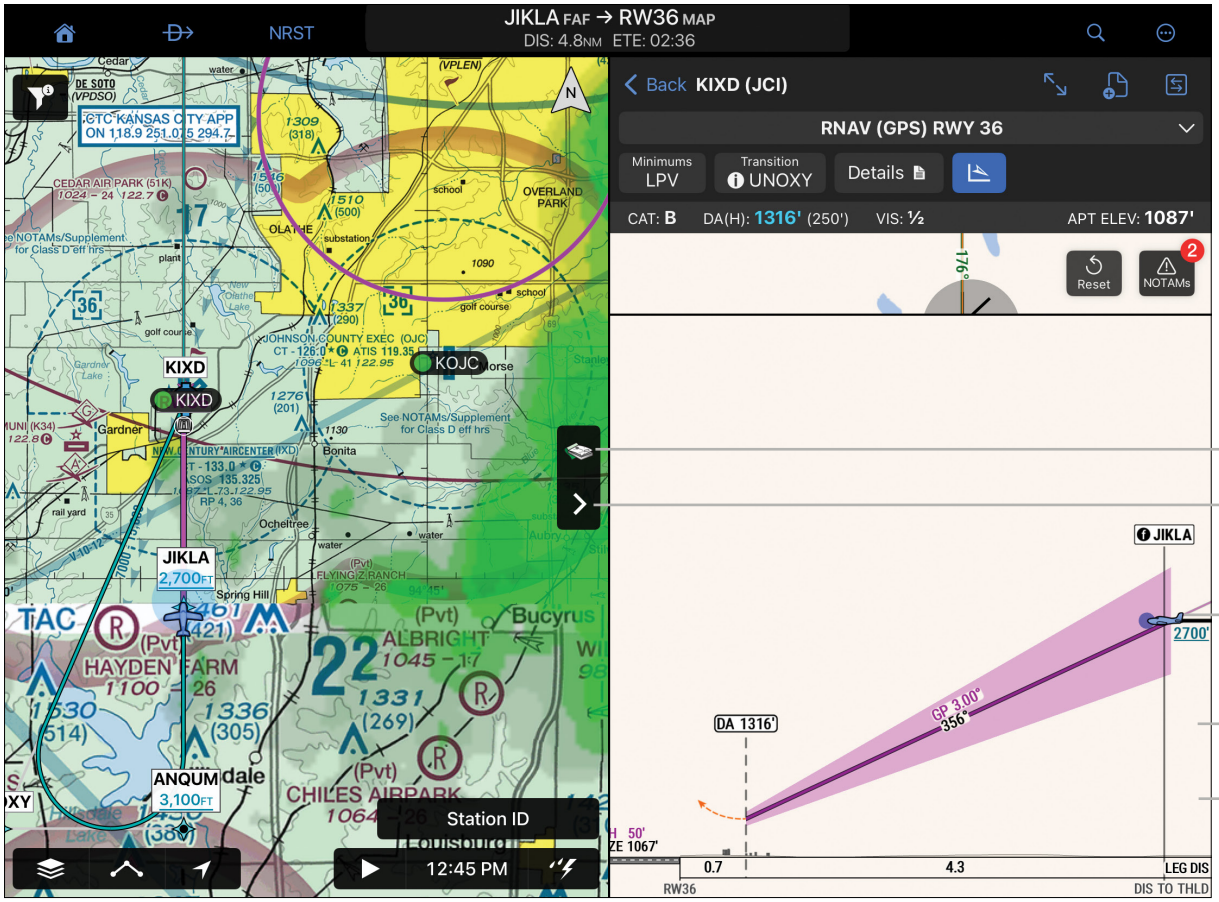
Airport Info - Charts - No SmartCharts Available

SPLIT SCREEN

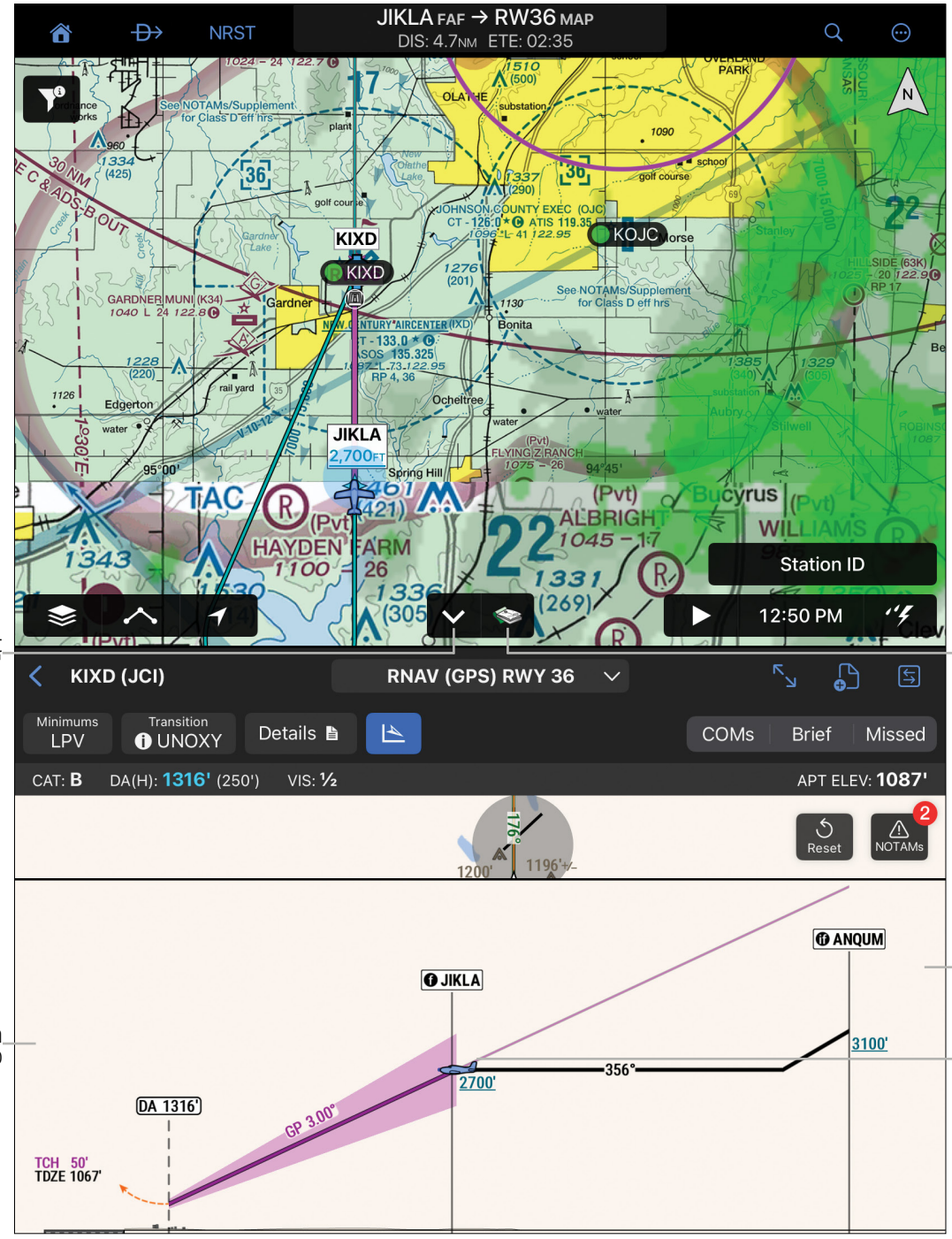
SmartCharts can be used in either portrait or landscape orientation and will respond to the iPad's automatic orientation feature. SmartCharts may be displayed in either full screen or split screen, in either orientation, and have the same functionality and capabilities as the full screen version.

Viewing SmartCharts in Split Screen:

1) Select > > **Charts** > **SmartCharts**.
2) Select the desired chart.
3) In the upper right-hand corner, select > **Split Screen**.
4) Tap to toggle Split Screen 'On/Off'.
5) Tap the widget icon to view options, then select **Charts**.



Garmin Pilot iOS - Overview - Split Screen - Landscape - RNAV (GPS)



Garmin Pilot iOS - Overview - Split Screen - Portrait - RNAV (GPS)

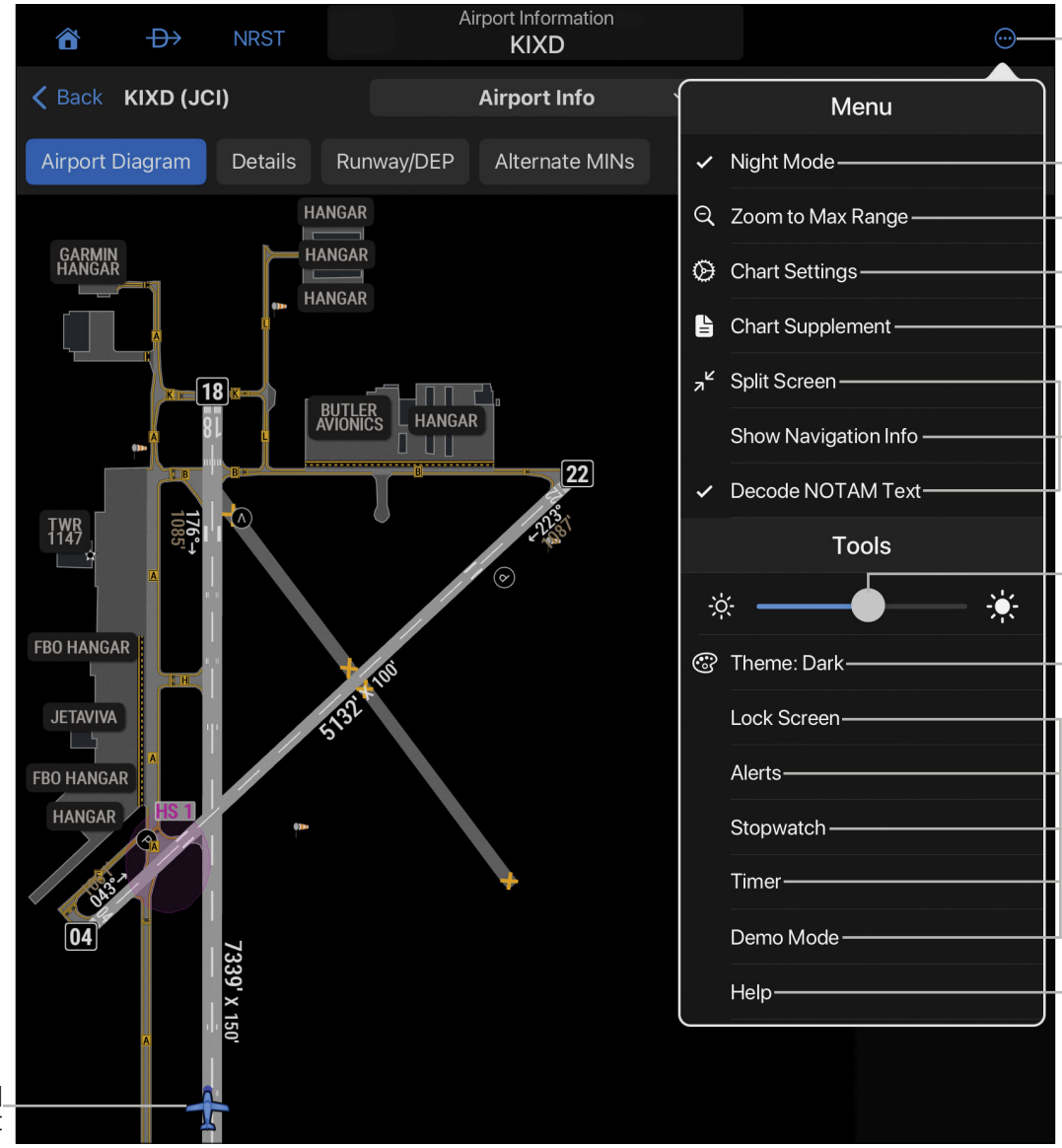
MORE/TOOLS MENU

SmartCharts provides a page-sensitive menu which lists the traditional Tools options, along with additional settings and features, which may include some, or all, of the following items:

- Night Mode.
- Zoom to Max Range.
- Chart Settings (Center Point & Zoom Level).
- Chart Supplement.
- Split Screen.
- Show Navigation Info.
- Decode NOTAM Text.
- Screen Brightness.
- Theme (Dark or Light).
- Lock Screen.
- Alerts.
- Stopwatch.
- Timer.
- Demo Mode.
- Help.

Viewing More/Tools Menu:

1) Select  >  > **Charts > SmartCharts > Airport Diagram**.
2) In the upper right-hand corner, tap  to display a drop-down menu.



Garmin Pilot iOS - SmartCharts - Airport Info - Night Mode - More/Tools Menu

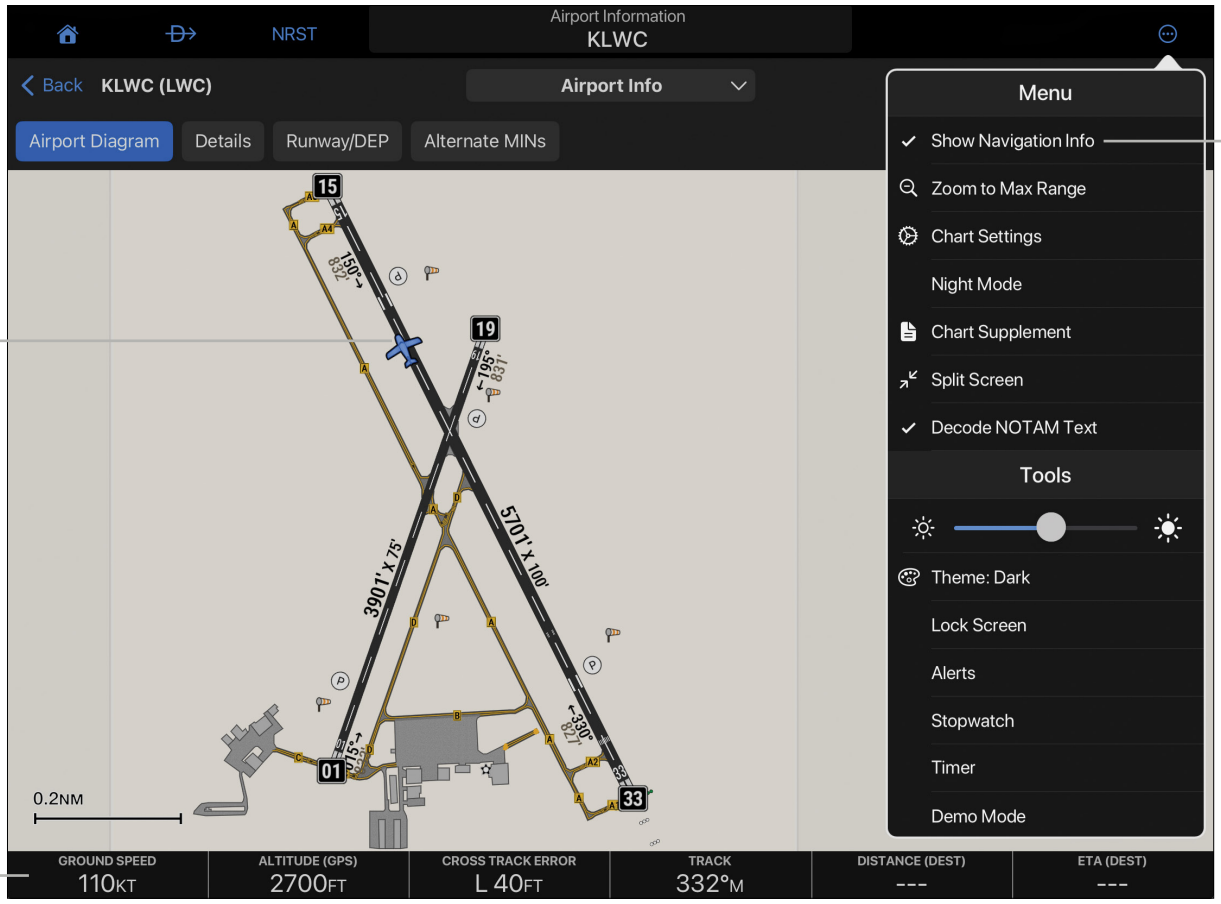
SHOW NAVIGATION INFO

One of the features in the More/Tools Menu is **Show Navigation Info**, which allows the User to view real-time navigation information. When this feature is toggled 'On' the navigation information will be displayed on the bottom of the screen. Once displayed, the User can configure the information to show up to six (6) data points, which include the following items:

- Accuracy (Horizontal).
- Accuracy (Vertical).
- Altitude.
- Altitude AGL (w/GPS).
- Bearing.
- Biometric Data.
- Cross Track Error
- ETA (Next).
- ETE (Dest).
- ETE (Next).
- Ground Speed.
- Latitude.
- Longitude.
- Minimum Safe Altitude.
- Next Waypoint.
- Pitch.
- Roll.
- Time (UTC).
- Track.
- Vertical Speed.
- WX-Station.
- WX-Altimeter.
- WX-Ceiling.
- WX-Visibility.
- WX-Wind.

Adjusting Show Navigation Info Display:

1) Select > > **Charts > SmartCharts > Airport Diagram**.
2) In the upper right-hand corner, tap to display a drop-down menu.
3) Tap **Show Navigation Info** to toggle display 'On/Off'.



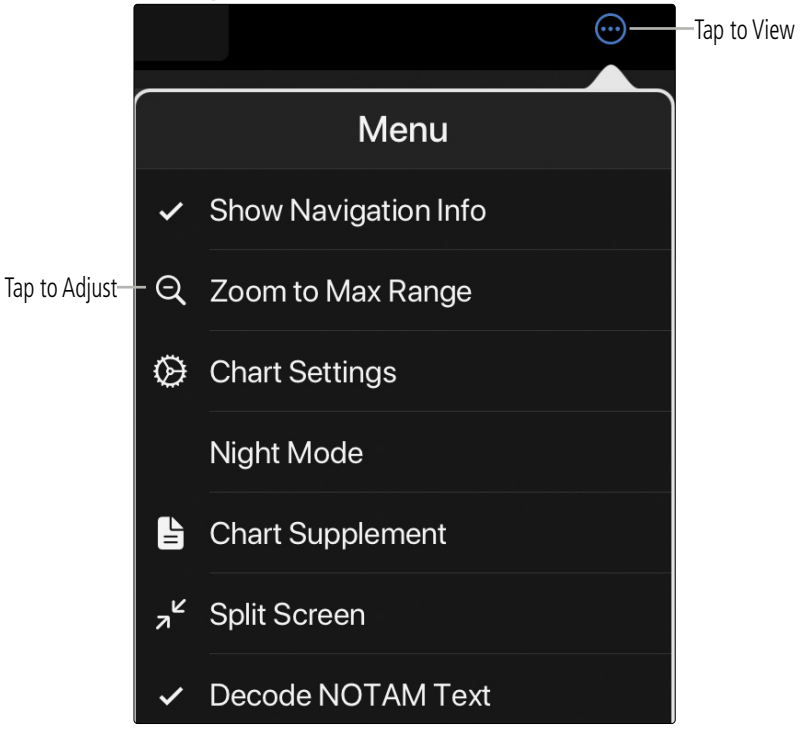
Garmin Pilot iOS - SmartCharts - Airport Info - More/Tools Menu - Show Navigation Info

ZOOM TO MAX RANGE

When the User adjusts the Zoom on the chart and wants to return to the 'default' chart view, this can be obtained quickly by selecting the '**Zoom to Max Range**' option.

Selecting Zoom to Max Range:

1) Select  >  > **Charts** > **SmartCharts** > **Airport Diagram**.
2) In the upper right-hand corner, tap  > **Zoom to Max Range**.



Garmin Pilot iOS - SmartCharts - More/Tools Menu - Zoom to Max Range

CHART SETTINGS

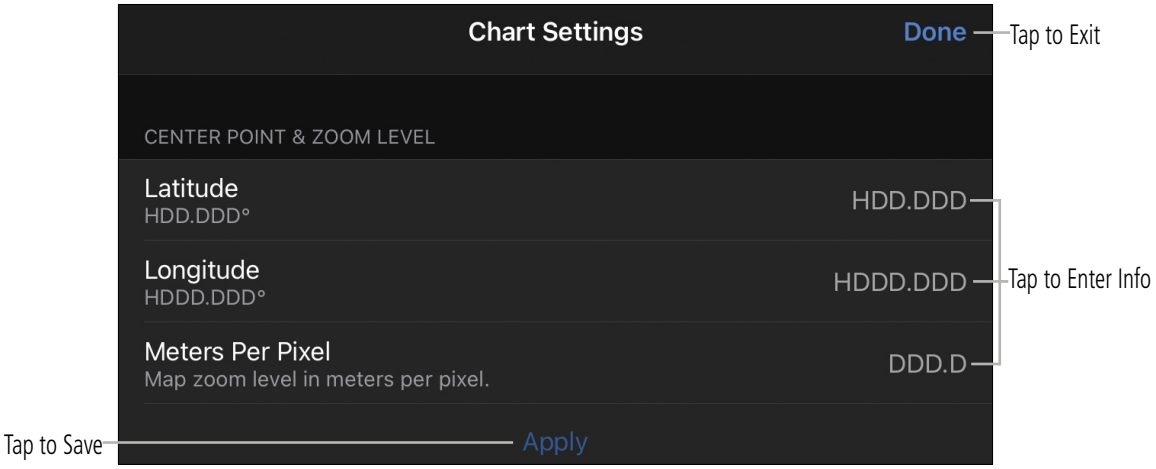
When the User is viewing the chart, they can adjust the Center Point (Latitude & Longitude) and Zoom Level (Meters Per Pixel).

Adjusting Center Point:

1) Select > > **Charts** > **SmartCharts** > **Airport Diagram**.
2) In the upper right-hand corner, tap > **Chart Settings**.
3) Enter the desired information for **Latitude** (HDD.DDD) and **Longitude** (HDDD.DDD) > **Apply** > **Done.**

Adjusting Zoom Level:

1) Select > > **Charts** > **SmartCharts** > **Airport Diagram**.
2) In the upper right-hand corner, tap > **Chart Settings**.
3) Enter the desired information for **Meters Per Pixel** (DDD.D) > **Apply** > **Done.**



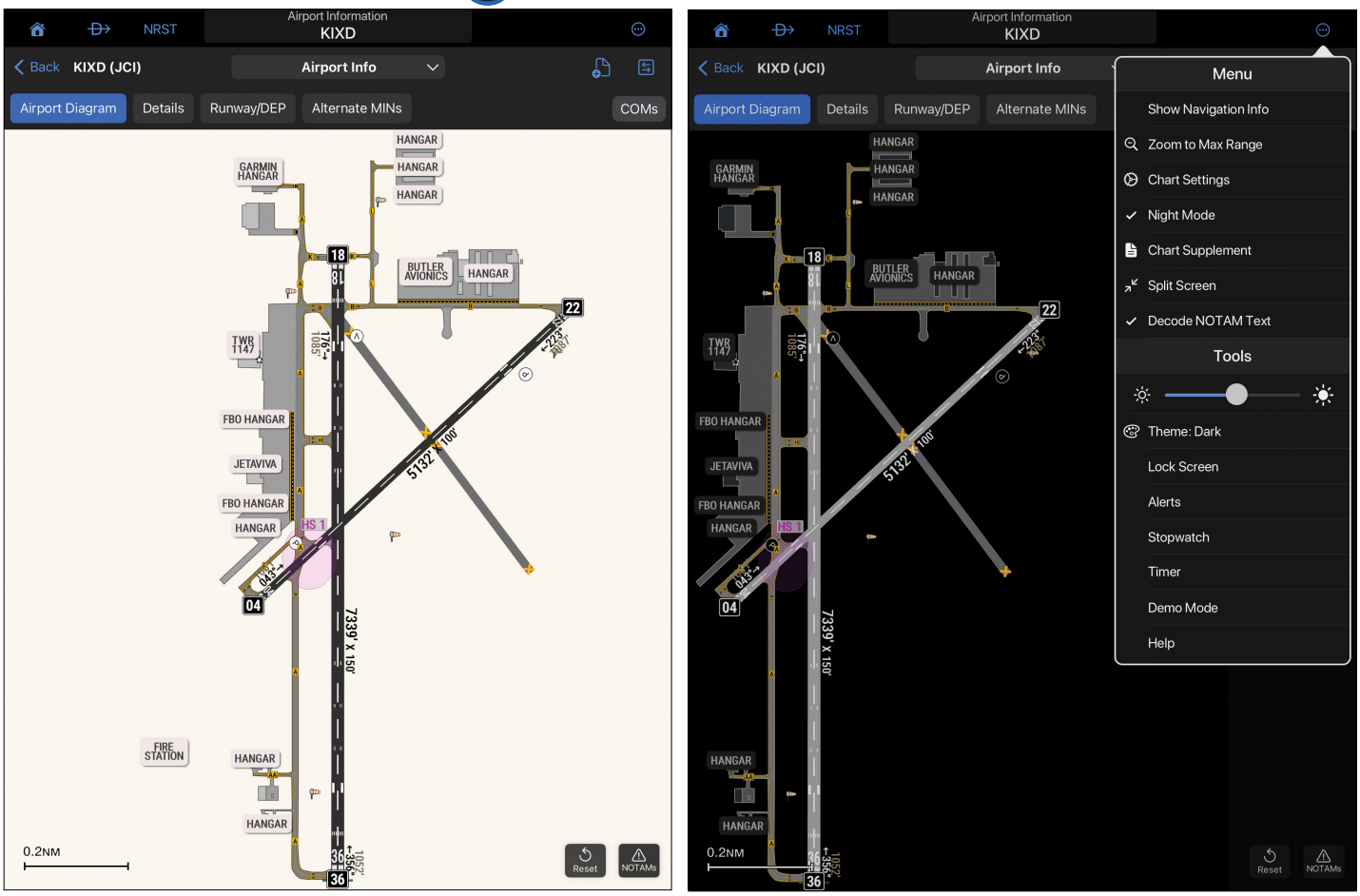
Garmin Pilot iOS - SmartCharts - More/Tools Menu - Chart Settings

NIGHT MODE

When the User is viewing the chart, they can toggle Night Mode 'On/Off', as desired.

Toggle Night Mode On/Off:

1) Select  >  > **Charts > SmartCharts > Airport Diagram**.
2) In the upper right-hand corner, tap  > **Night Mode**. Toggle 'On'/Off', as desired.



Garmin Pilot iOS - SmartCharts - More/Tools Menu - Night Mode

CHART SUPPLEMENT

NOTE: *Prior to flight, ensure the desired region(s) has been downloaded from the Downloads Page.*

SmartCharts include an electronic version of the Chart Supplement (formerly known as the Airport Facility Directory or A/FD) a publication of the National Aeronautical Navigation Products (AeroNav). There are nine regional directories containing public-use airports, seaplane bases, heliports, military facilities and selected private use facilities.

Tap the General button to view the following:

Table of Contents	Seaplane Landing Areas	Airport/Facility Directory Legend
City/Military Airport Cross Reference	Abbreviations	

Chart Supplement - General Options

Tap the Supplemental button to view the following:

Aeronautical Chart Bulletins	VOR Test Facilities
Special Notices	Parachute Jumping Areas
Regulatory Notices	Supplemental Communication Reference
FAA & NWS Telephone Numbers	Preferred IFR Routes
PIREP Form	Q-Routes
Flight Service Station Communications Frequencies	High Altitude Redesign Phase 1 RNAV Routing
Flight Standards District Offices	Airport Diagrams
VOR Receiver Checkpoints	Hot Spots
Air Route Traffic Control Center Frequencies	TEC Routes (California)

Chart Supplement - Supplemental Options

Viewing Chart Supplement:

1) Select > > **Chart Supplement**.
2) Tap the airport I.D. button to view airport specific information.

   Or: Tap **General** to view the Chart Supplement General section.

   Or: Tap **Supplemental** to view the Chart Supplemental Regional Supplement.

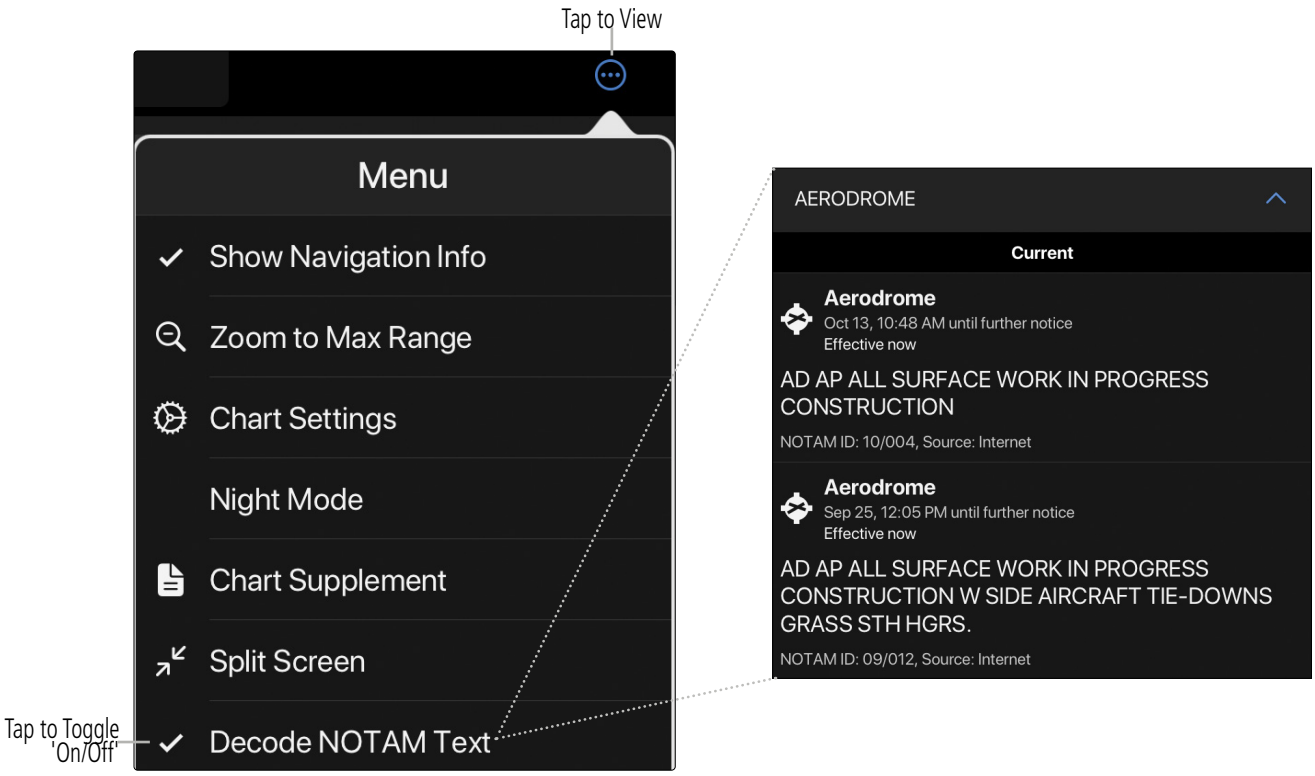
Garmin Pilot iOS - SmartCharts - Airport Info - More/Tools Menu - Chart Supplement

DECODE NOTAM TEXT

When possible, the Decode NOTAM Text feature will decode the raw NOTAM text into plain language. This feature is enabled by default but can be disabled at anytime by the User.

Toggle Decode NOTAM Text On/Off:

1) Select > > **Charts > SmartCharts > Airport Diagram**.
2) In the upper right-hand corner, select > **Decode NOTAM Text.** Toggle 'On/Off', as desired.



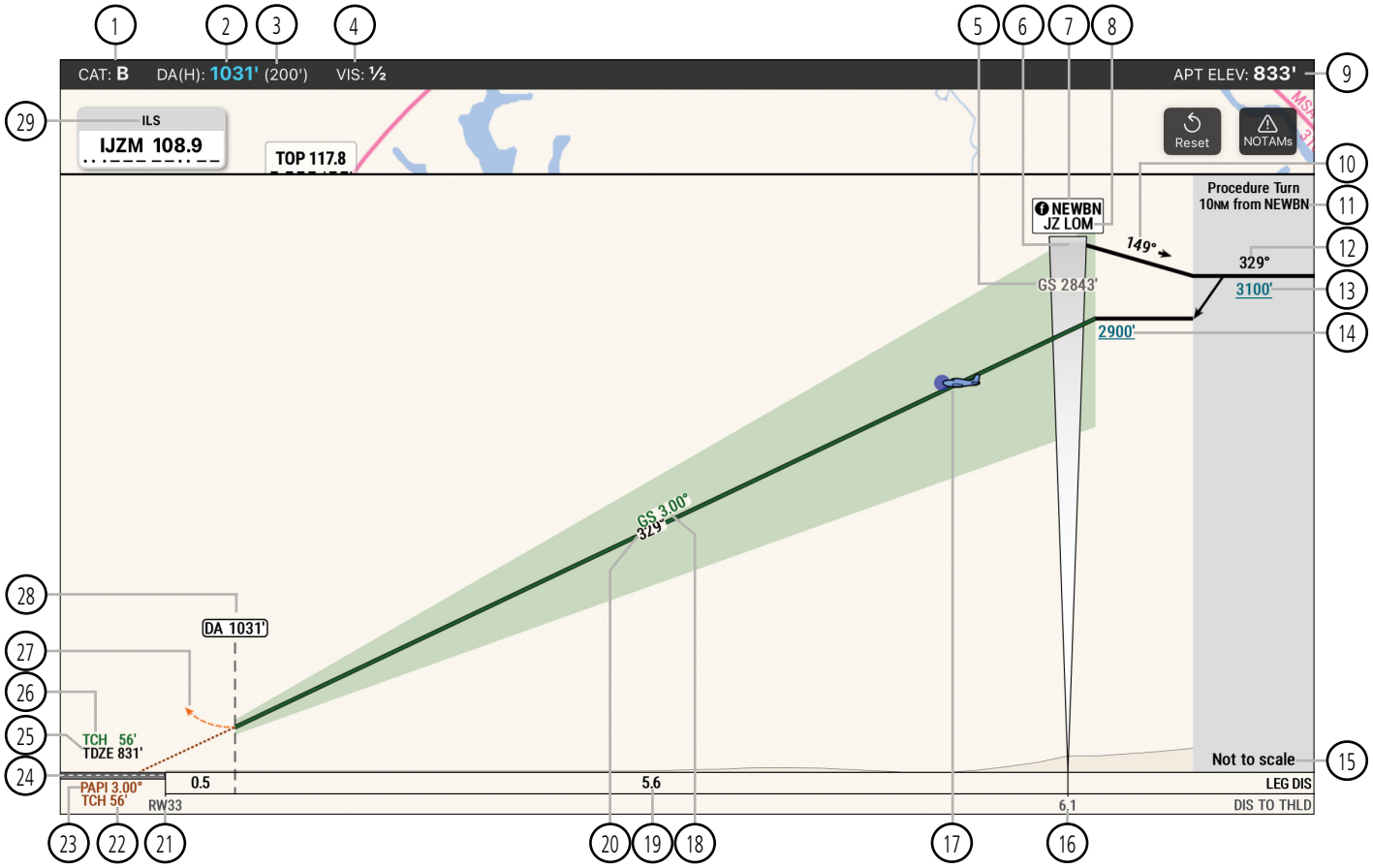
Garmin Pilot iOS - SmartCharts - More/Tools Menu - Decode NOTAM Text

Blank Page

INSTRUMENT APPROACH PROCEDURES - PROFILE VIEW

SmartCharts uses multiple methods to depict approach guidance in the Profile View: "GS", "GP", "VNAV" or "VDA".

- A Glideslope (GS) angle is provided for conventional VHF-based precision approaches.
- An ILS approach, notwithstanding emerging RNAV technology, is the most precise and accurate NAVAID currently in use throughout the National Airspace System (NAS).
  - ✈ There are three general classifications of ILS approaches: CAT I, CAT II, and CAT III (autoland). The basic ILS approach is a CAT I approach and requires only that pilots be instrument rated and current, and that the aircraft be equipped appropriately. CAT II and CAT III ILS approaches have lower minimums and require special certification for operators, pilots, aircraft, and airborne/ground equipment. The minimums for a CAT II ILS are predicated on a radio altimeter altitude (RA). Because of the complexity and high cost of the equipment, CAT III ILS approaches are used primarily in air carrier and military operations.
- The profile view section of an ILS procedure depicts a GS descent angle (degrees), Threshold Crossing Height (TCH), Touchdown Zone Elevation (TDZE), missed approach track, and, if available, Touchdown Zone lighting system or PAPI/VASI, as displayed in the image below:

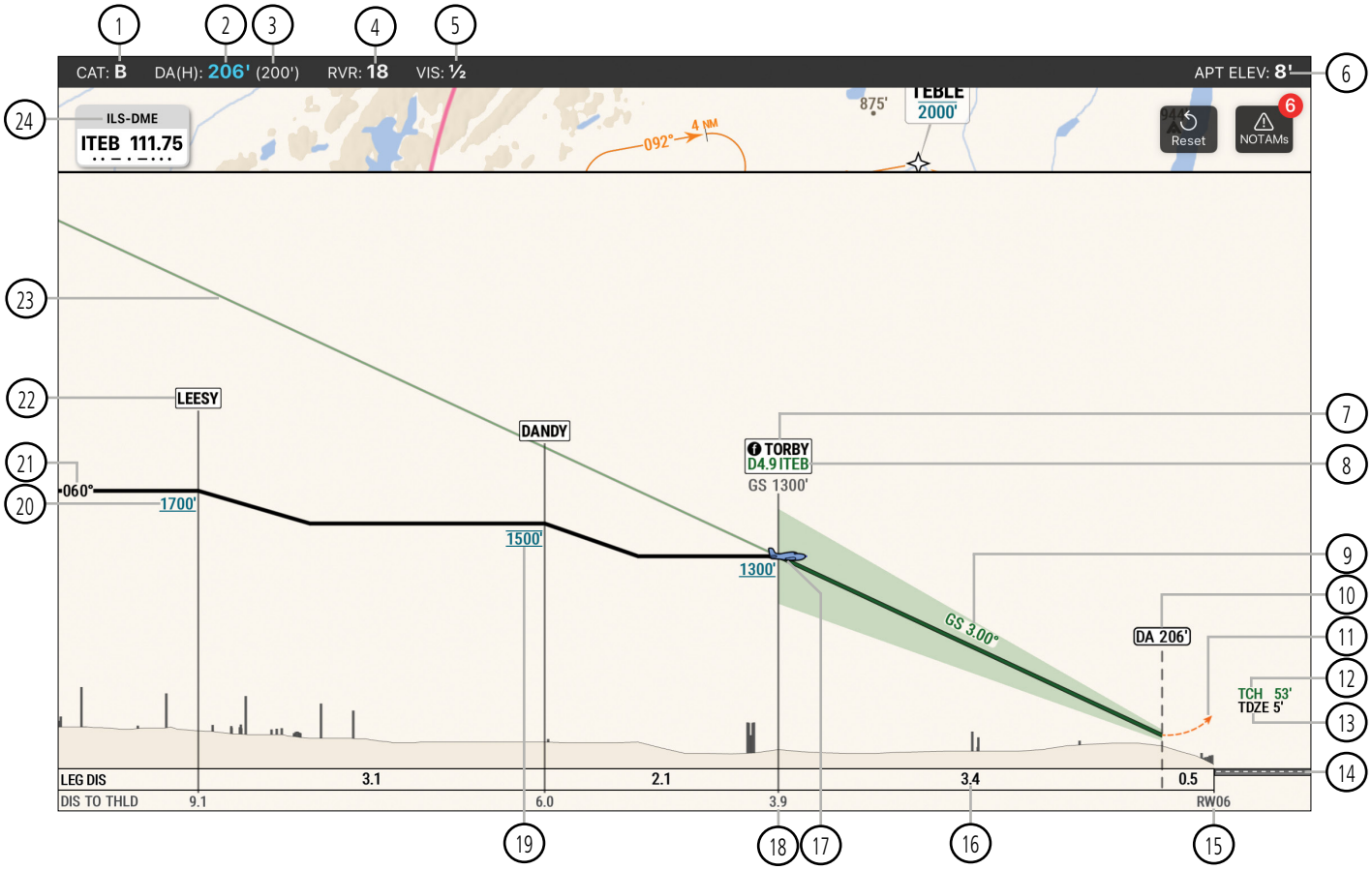


SmartCharts - Profile View Symbols - Legend - Instrument Approach Procedure - ILS w/LOM & PAPI

1. Aircraft Category.
2. Decision Altitude (MSL').
3. Height Above Touchdown (ft).
4. Minimum Flight Visibility (statute miles).
5. Glideslope crossing altitude (MSL').
6. Locator Outer Marker (LOM) reception depiction.
7. Final Approach Fix.
8. Locator Outer Marker ID.
9. Airport Elevation (MSL').
10. Outbound Course (degrees).
11. Procedure Turn must remain within 10 nautical miles of Fix.
12. Inbound Course (degrees).
13. Procedure Turn Completion Altitude (MSL').
14. Glideslope Intercept Altitude (MSL').
15. Portion of Chart depiction is not to scale.
16. Distance to runway threshold (nautical miles).
17. Georeferenced aircraft.
18. Glide Slope descent angle (degrees).
19. Leg Distance (nautical miles).
20. Inbound Course (degrees).
21. Runway ID.
22. Threshold Crossing Height (AGL') for VGSI.
23. VGSI descent angle (degrees).
24. Runway Depiction.
25. Touchdown Zone (TDZE) elevation (MSL').
26. Threshold Crossing Height (AGL') for ILS Glide Slope.
27. Missed Approach Track.
28. Decision Altitude (MSL').
29. Primary NAVAID.

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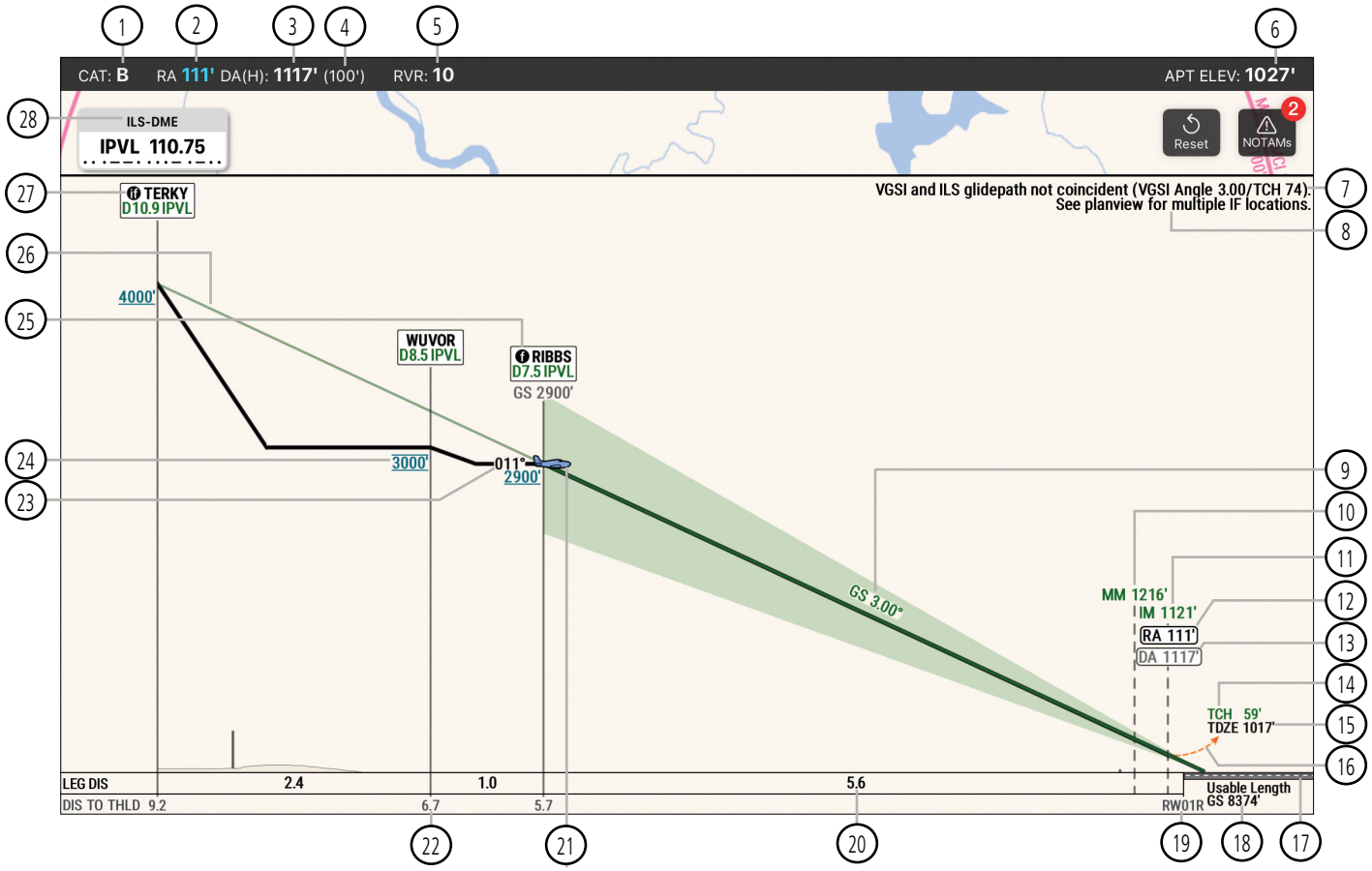
ILS - CATEGORY I



SmartCharts - Profile View Symbols - Legend - Instrument Approach Procedure - ILS

1. Aircraft Category.
2. Decision Altitude (MSL').
3. Height Above Touchdown (ft).
4. Minimum Runway Visual Range (100's of feet).
5. Minimum Flight Visibility (statute miles).
6. Airport Elevation (MSL').
7. Final Approach Fix.
8. Distance from NAVAID (nautical miles) & Name.
9. Glide Slope descent angle (degrees).
10. Decision Altitude (AGL').
11. Missed Approach Track.
12. Threshold Crossing Height (AGL').
13. Touchdown Zone (TDZE) Elevation (MSL').
14. Runway depiction.
15. Runway I.D.
16. Leg Distance (nautical miles).
17. Georeferenced aircraft.
18. Distance to runway threshold (nautical miles).
19. Mandatory Altitude (MSL').
20. Minimum Altitude (MSL').
21. Inbound Course (degrees).
22. Initial Approach Fix.
23. Advisory Glide Slope depiction.
24. Primary NAVAID.

ILS - CATEGORY II

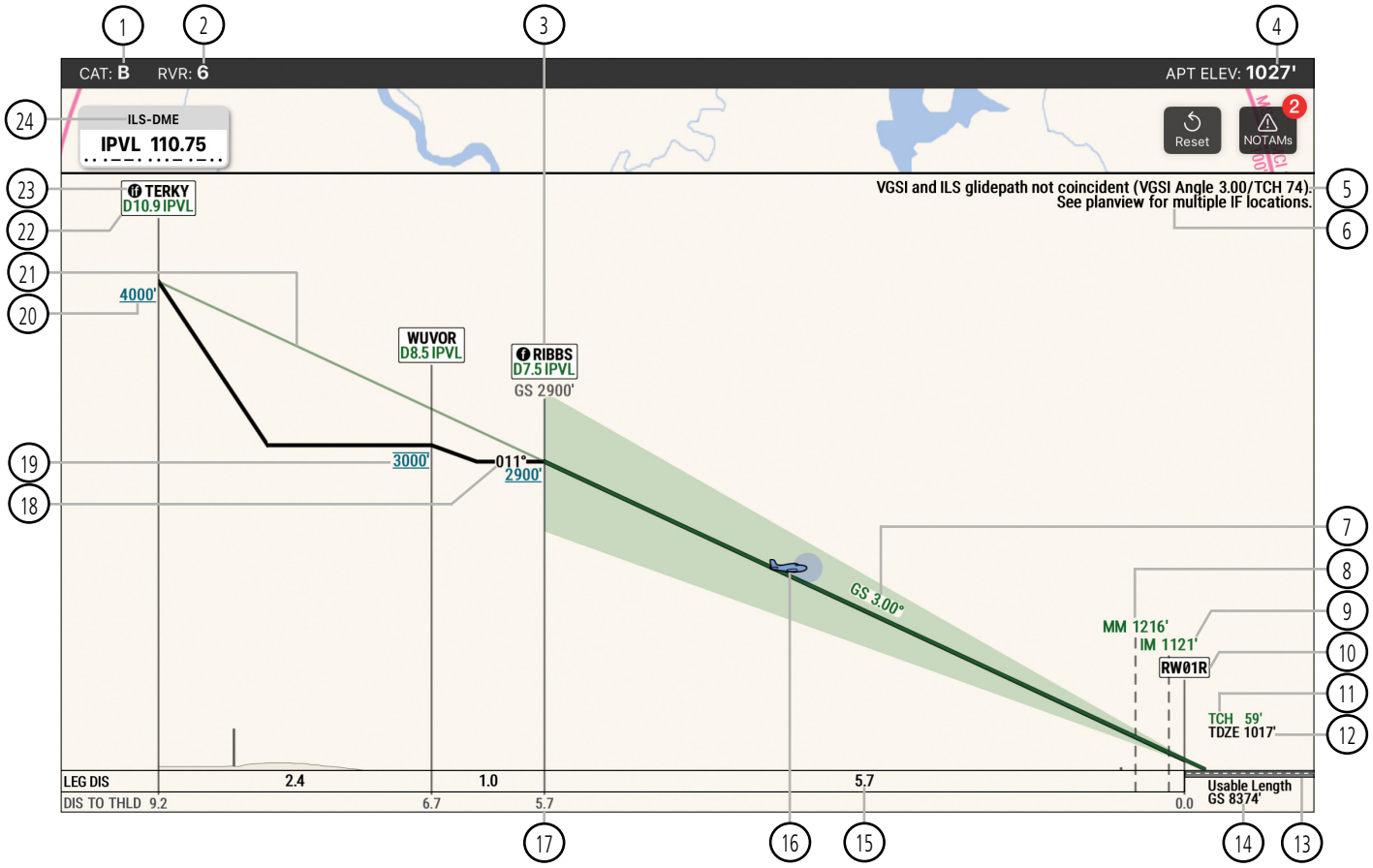


SmartCharts - Profile View Symbols - Legend - Instrument Approach Procedure - ILS - CAT II

1. Aircraft Category.
2. Radar Altimeter Minimums (MSL').
3. Decision Altitude (MSL').
4. Height Above Touchdown (ft).
5. Runway Visual Range Minimums (100's of feet).
6. Airport Elevation (MSL').
7. Visual Glide Slope Indicator (VGSI) and glidepath angles are not coincident.
8. Planview displays additional Initial Approach options.
9. Glide Slope descent angle (degrees).
10. Middle Marker Minimums (MSL').
11. Inner Marker Minimums (MSL')
12. Radar Altimeter Minimums (AGL').
13. Decision Altitude Minimums (MSL').
14. Threshold Crossing Height (AGL').
15. Touchdown Zone (TDZE) Elevation (MSL').
16. Missed Approach Track.
17. Runway depiction.
18. Usable Runway Length when on Glide Slope (ft.).
19. Runway I.D.
20. Leg Distance (nautical miles).
21. Georeferenced aircraft.
22. Distance to runway threshold (nautical miles).
23. Inbound Course (degrees).
24. Mandatory Altitude (MSL').
25. Final Approach Fix.
26. Advisory Glide Slope depiction.
27. Intermediate Fix.
28. Primary NAVAID.

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ILS - CATEGORY III

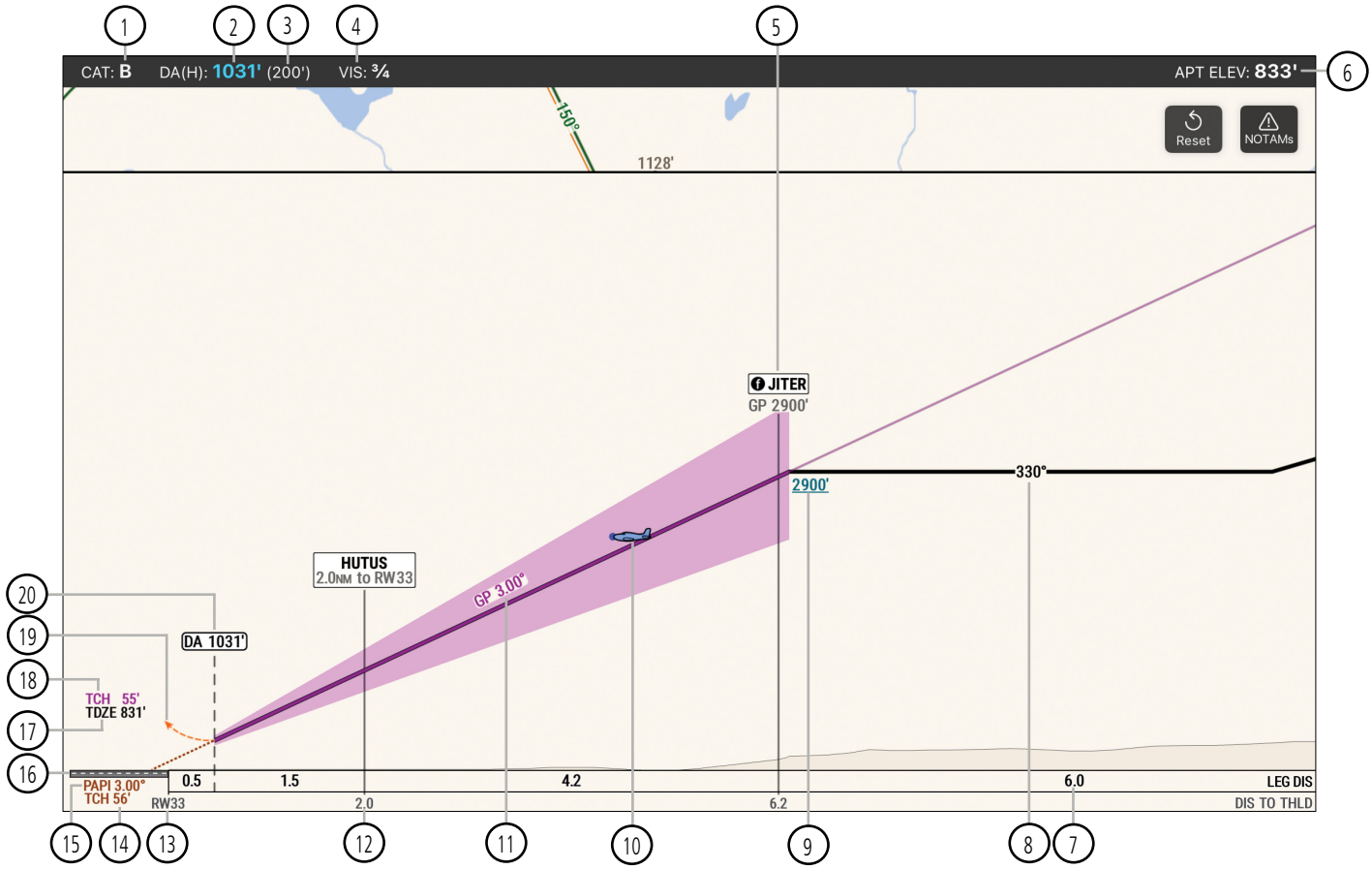


SmartCharts - Profile View Symbols - Legend - Instrument Approach Procedure - ILS - CAT III

1. Aircraft Category.
2. Runway Visual Range Minimum (100's of feet).
3. Final Approach Fix.
4. Airport Elevation (MSL').
5. Visual Glide Slope Indicator (VGSI) and glidepath angles are not coincident.
6. Planview displays additional Initial Approach options.
7. Glide Slope descent angle (degrees).
8. Middle Marker Minimums (MSL').
9. Inner Marker Minimums (MSL')
10. Runway I.D.
11. Threshold Crossing Height (AGL').
12. Touchdown Zone (TDZE) Elevation (MSL').
13. Runway depiction.
14. Usable Runway Length when on Glide Slope (ft.).
15. Leg Distance (nautical miles).
16. Georeferenced aircraft.
17. Distance to runway threshold (nautical miles).
18. Inbound Course (degrees).
19. Mandatory Altitude (MSL').
20. Minimum Altitude (MSL').
21. Extended Glide Slope depiction.
22. Distance from NAVAID (nautical miles) & Name.
23. Intermediate Fix.
24. Primary NAVAID.

RNAV - LOC WITH LPV

- "GP" on GLS and RNAV procedures indicates that either electronic vertical guidance (via Wide Area Augmentation System - WAAS or Ground Based Augmentation System - GBAS) or barometric vertical guidance is provided.
- The profile view section of GLS and RNAV procedures with a published decision altitude (DA/H) depict a GP descent angle (degrees), Threshold Crossing Height (TCH), Touchdown Zone Elevation (TDZE), missed approach track, and, if available, Touchdown Zone lighting system or PAPI/VASI, as displayed in the image below:



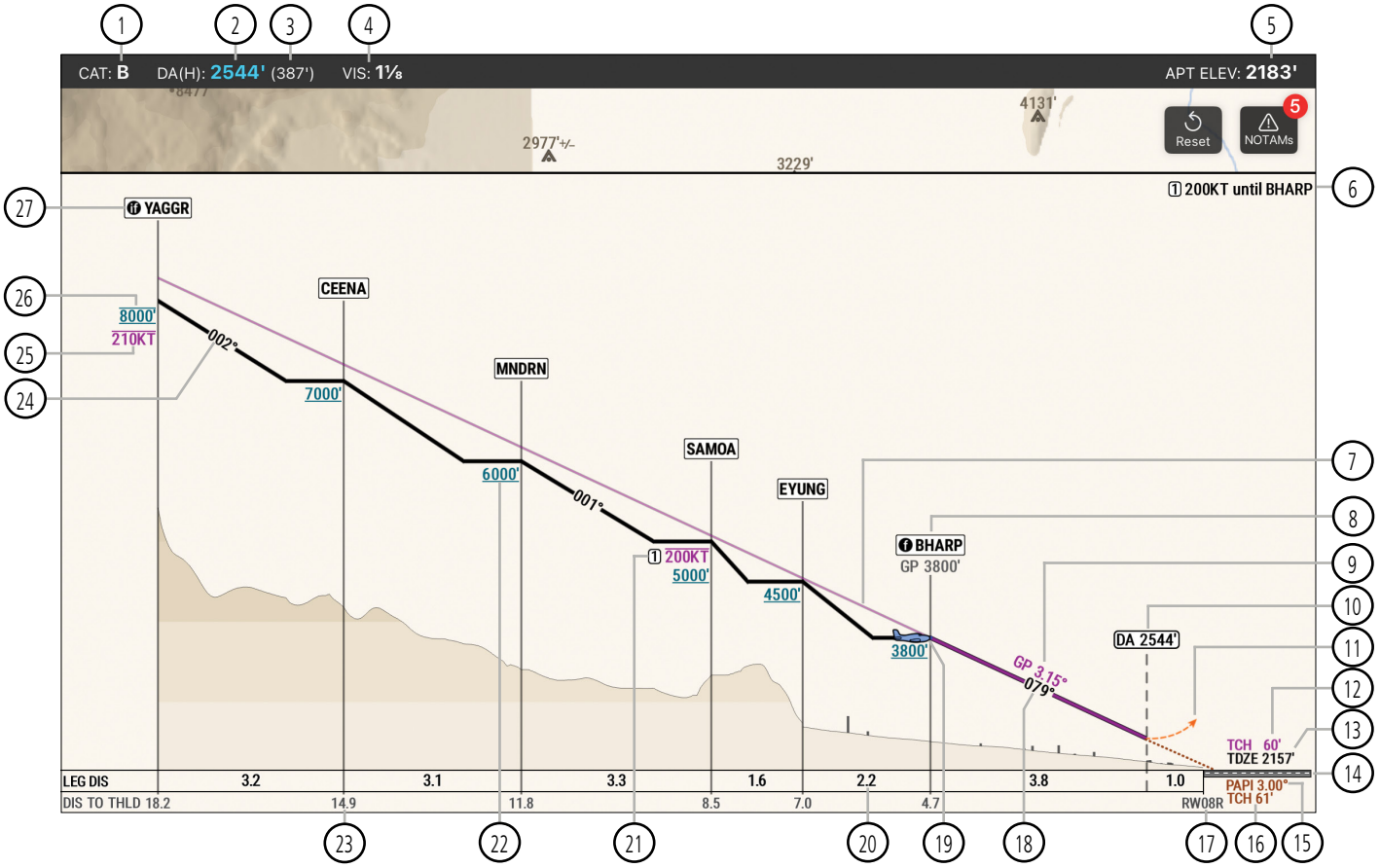
SmartCharts - Profile View Symbols - Legend - Instrument Approach Procedure - RNAV - LPV Minimums

1. Aircraft Category.
2. Decision Altitude (MSL').
3. Height Above Touchdown (ft).
4. Minimum Flight Visibility (statute miles).
5. Final Approach Fix.
6. Airport Elevation (MSL').
7. Leg Distance (nautical miles).
8. Inbound Course (degrees).
9. Glidepath Intercept Minimum Altitude (MSL').
10. Georeferenced aircraft.
11. Glidepath descent angle (degrees).
12. Distance to runway threshold (nautical miles).
13. Runway ID.
14. Threshold Crossing Height (AGL') for Precision Approach Path Indicator (PAPI).
15. Precision Approach Path Indicator (PAPI) descent angle (degrees).
16. Runway Depiction.
17. Touchdown Zone (TDZE) Elevation (MSL').
18. Threshold Crossing Height (AGL') for LPV Glidepath.
19. Missed Approach Track.
20. Decision Altitude (MSL').

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RNAV - RNP

- The operational advantages of a Required Navigation Performance (RNP) approach include accuracy, onboard performance monitoring, and alerting, which provide increased navigation precision and lower minimums than conventional RNAV. Besides lower minimums, the benefits of RNP include improved obstacle clearance limits, as well as reduced pilot workload. To attain the benefits of RNP approach procedures, a key component is curved flight tracks. Constant radius turns around a fix are called "radius-to-fix legs" (RF legs). These turns, which are encoded into the navigation database, allow the aircraft to avoid critical areas of terrain or conflicting airspace while preserving positional accuracy by maintaining precise, positive course guidance along the curved track.
- The profile view section of RNP procedure with a published decision altitude (DA/H) depict a GP descent angle (degrees), Threshold Crossing Height (TCH), Touchdown Zone Elevation (TDZE), missed approach track, and, if available, Touchdown Zone lighting system or PAPI/VASI, as displayed in the image below:



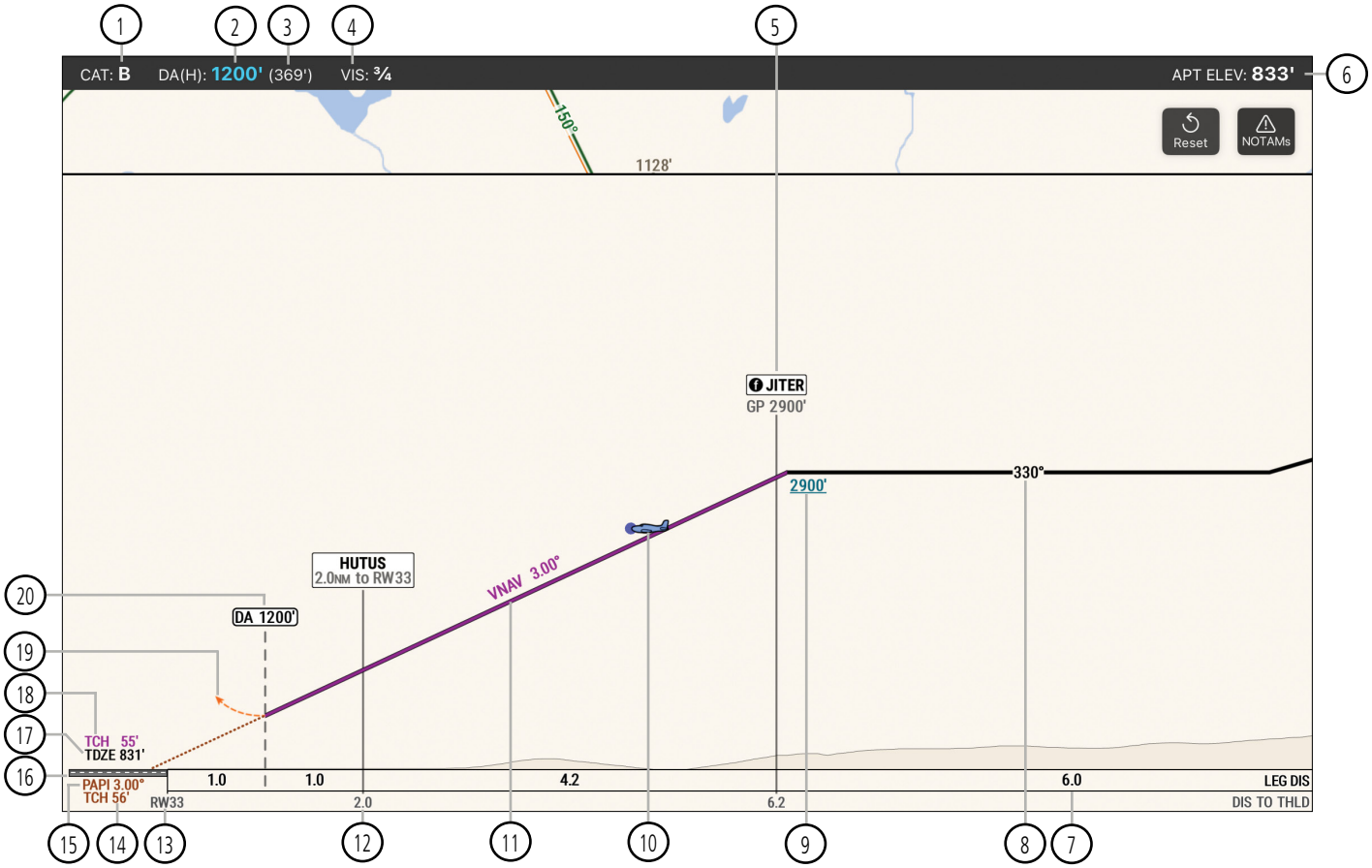
SmartCharts - Profile View Symbols - Legend - Instrument Approach Procedure - RNAV - RNP Minimums

1. Aircraft Category.
2. Decision Altitude (MSL').
3. Height Above Touchdown (ft).
4. Minimum Flight Visibility (statute miles).
5. Airport Elevation (MSL').
6. 200 knots until fix.
7. Extended glide path depiction.
8. Final Approach Fix.
9. Glide Path descent angle (degrees).
10. Decision Altitude (MSL').
11. Missed Approach Track.
12. Threshold Crossing Height (AGL') for Glidepath.
13. Touchdown Zone (TDZE) Elevation (MSL').
14. Runway Depiction.
15. Precision Approach Path Indicator (PAPI) descent angle (degrees).
16. Threshold Crossing Height (AGL') for Precision Approach Path Indicator (PAPI).
17. Runway ID.
18. Inbound Course (degrees).
19. Georeferenced aircraft.
20. Leg Distance (nautical miles).
21. Approach NOTE - See Info.
22. Minimum Altitude (MSL').
23. Distance to runway threshold (nautical miles).
24. Inbound Course (degrees).
25. Maximum Airspeed.
26. Mandatory Altitude (MSL').
27. Initial Approach Fix.

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RNAV - LNAV / VNAV

- "VNAV" on a RNAV procedure was originally designed for baro-aided GPS units, but most Wide Area Augmentation System (WAAS) receivers can use them as well. The main difference between an LPV and LNAV / VNAV approach is they don't have increasing angular guidance as the aircraft approaches the runway threshold. Typically, the LNAV / VNAV minimums are higher than 250' above the Touchdown Zone (TDZE) vs. an LPV, which typically has 200' minimums.
- The profile view section of RNAV procedures with LNAV / VNAV minima depict a VNAV descent angle (degrees), Threshold Crossing Height (TCH), Touchdown Zone Elevation (TDZE), missed approach track, and, if available, Touchdown Zone lighting system or PAPI/VASI, as displayed in the image below:

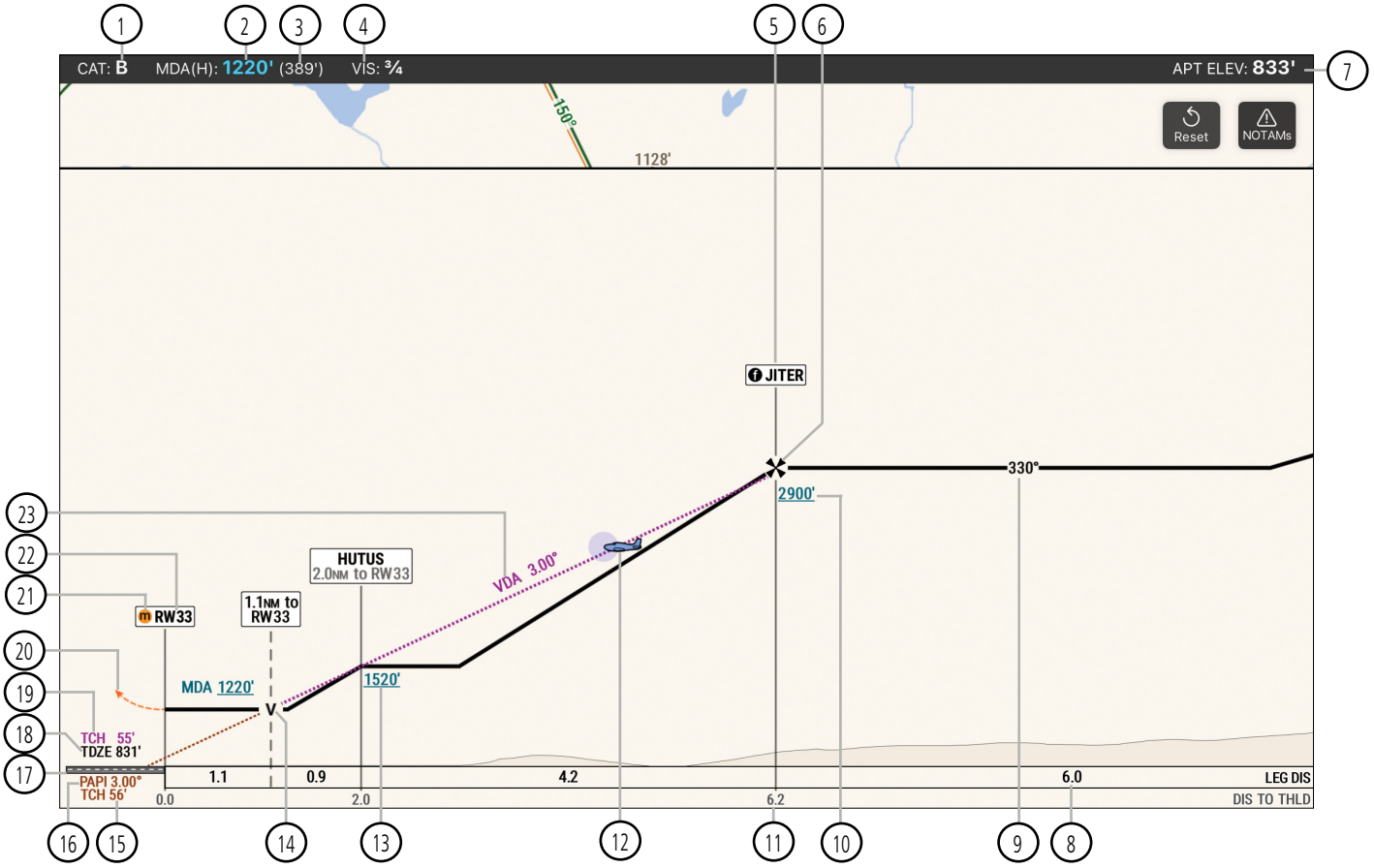


SmartCharts - Profile View Symbols - Legend - Instrument Approach Procedure - RNAV - LNAV / VNAV Minimums

1. Aircraft Category.
2. Decision Altitude Minimums (MSL').
3. Height Above Touchdown (ft).
4. Minimum Flight Visibility (statute miles).
5. Final Approach Fix.
6. Airport Elevation (MSL').
7. Leg Distance (nautical miles).
8. Inbound Course (degrees).
9. Glidepath Intercept Altitude (MSL').
10. Georeferenced aircraft.
11. Vertical Navigation descent angle (degrees).
12. Distance to runway threshold (nautical miles).
13. Runway ID.
14. Threshold Crossing Height (AGL') for Precision Approach Path Indicator (PAPI).
15. Precision Approach Path Indicator (PAPI) descent angle (degrees).
16. Runway Depiction.
17. Touchdown Zone (TDZE) Elevation (MSL').
18. Threshold Crossing Height (AGL') for VNAV Glide Path.
19. Missed Approach Track.
20. Decision Altitude (MSL').

RNAV - LNAV

- An advisory vertical descent angle (VDA) is provided on non-vertically guided conventional procedures and RNAV procedures with only a minimum descent altitude (MDA) to assist in preventing controlled flight into terrain (CFIT). On civil FAA procedures, this information is placed above or below the procedure track following the fix it is based on. Absence of a VDA or a note that the VDA is not authorized indicates that the prescribed obstacle clearance surface is not clear and the VDA must not be used below MDA.
- The Visual Descent Point (VDP) is indicated by the 'V' symbol, and is a defined point on the final approach course of a nonprecision straight-in approach procedure from which a stabilized visual descent from the MDA to the runway Touchdown point may be commenced.
- The profile view section of non-vertically guided conventional procedure and a RNAV procedure with only a published Minimum Descent Altitude (MDA) depict a Vertical Decent Angle (VDA) in degrees, Visual Descent Point (VDP), Threshold Crossing Height (TCH), Touchdown Zone Elevation (TDZE), Missed Approach Point (MAP), Minimum Descent Altitude (MDA), and, if available, Touchdown Zone lighting system or PAPI/VASI, as displayed in the image below:

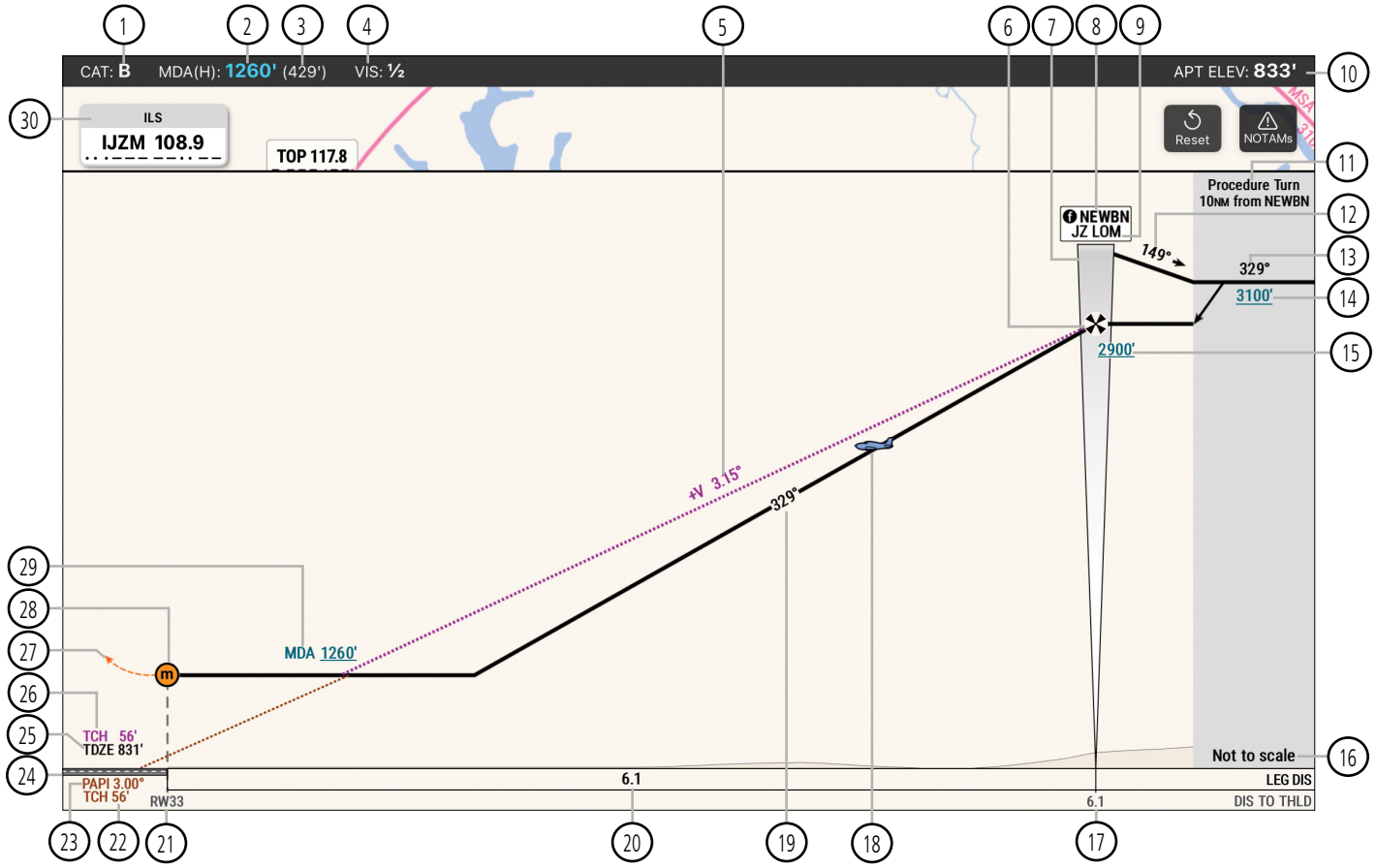


SmartCharts - Profile View Symbols - Legend - Instrument Approach Procedure - RNAV - LNAV Minimums

1. Aircraft Category.
2. Minimum Descent Altitude (MSL').
3. Height Above Touchdown (ft).
4. Minimum Flight Visibility (statute miles).
5. Final Approach Fix.
6. Final Approach Fix icon for Non-precision approach.
7. Airport Elevation (MSL').
8. Leg Distance (nautical miles).
9. Inbound Course.
10. Minimum Altitude (MSL').
11. Distance to runway threshold (nautical miles).
12. Georeferenced aircraft.
13. Minimum Altitude (MSL').
14. Visual Descent Point (VDP).
15. Threshold Crossing Height (AGL') for Precision Approach Path Indicator (PAPI).
16. Precision Approach Path Indicator (PAPI) descent angle (degrees).
17. Runway Depiction.
18. Touchdown Zone (TDZE) Elevation (MSL').
19. Threshold Crossing Height (AGL').
20. Missed Approach Track.
21. Missed Approach Point (MAP).
22. Runway ID.
23. Visual Descent Angle (degrees).

LOC WITH +V

- On a localizer approach, when available, "+V" will be visible and indicates the FAA has approved "advisory vertical guidance", which will be displayed on a properly installed, equipped, and configured WAAS-capable GPS system.
- The profile view section of a non-vertically guided conventional localizer approach with only a published Minimum Descent Altitude (MDA) depict "advisory vertical guidance" (+V) in degrees, Locator Outer Marker (LOM) location/reception, LOM ID, outbound course, procedure turn (if necessary), inbound course, procedure turn (if necessary), Final Approach Fix for non-precision approach, Threshold Crossing Height (TCH), Touchdown Zone Elevation (TDZE), Missed Approach Point (MAP), Minimum Descent Altitude (MDA), and, if available, Touchdown Zone lighting system or PAPI/VASI, as displayed in the image below:

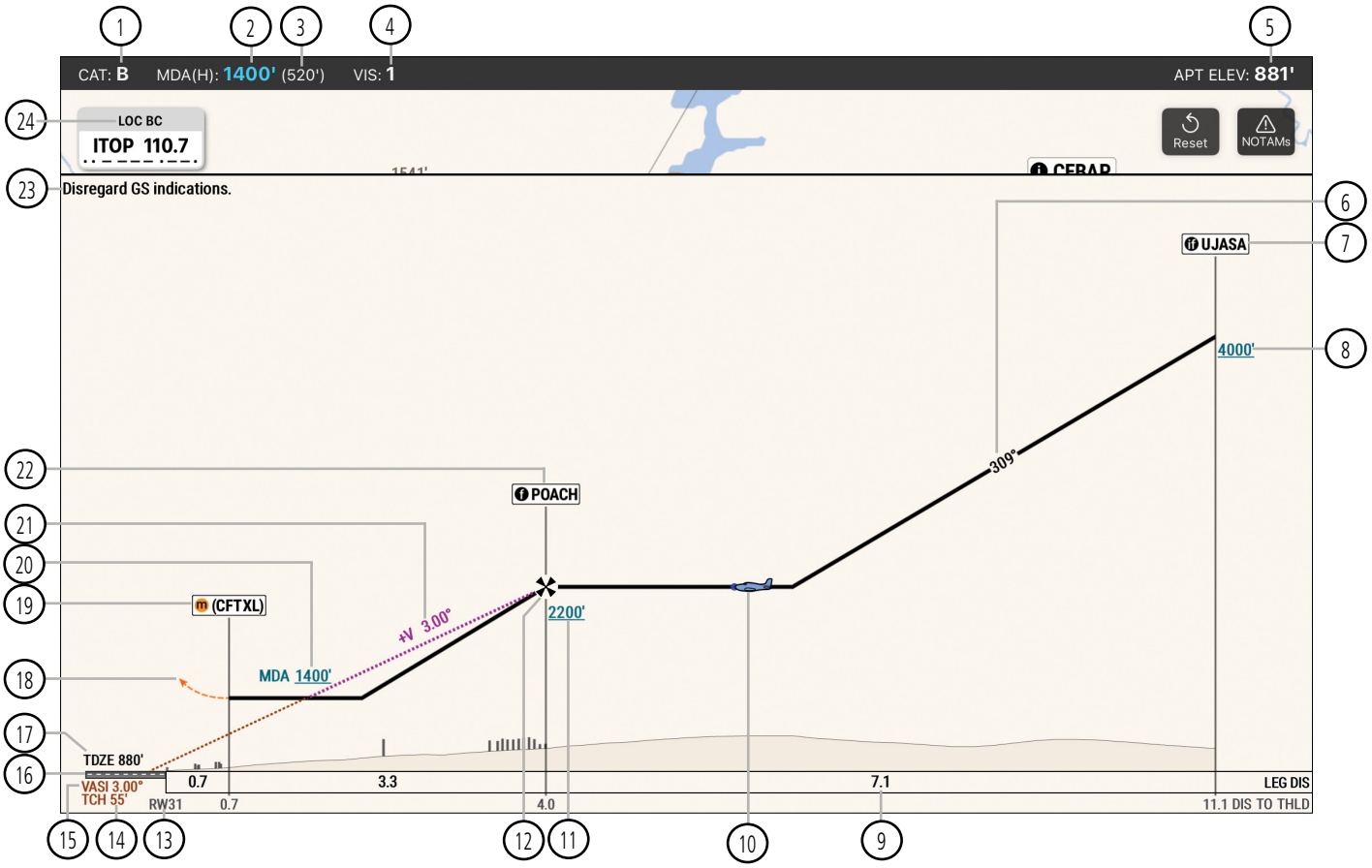


SmartCharts - Profile View Symbols - Legend - Instrument Approach Procedure - LOC with +V Minimums

1. Aircraft Category.
2. Minimum Descent Altitude (MSL').
3. Height Above Touchdown (ft).
4. Minimum Flight Visibility (statute miles).
5. Advisory Vertical Guidance Descent Angle (degrees).
6. Final Approach Fix icon for Non-precision approach.
7. Locator Outer Marker (LOM) reception depiction.
8. Final Approach Fix.
9. Locator Outer Marker ID.
10. Airport Elevation (MSL').
11. Procedure Turn must remain within 10 nautical miles of Fix.
12. Outbound Course (degrees).
13. Inbound Course (degrees).
14. Procedure Turn Completion Altitude (MSL').
15. +V Intercept Altitude (MSL') (if properly equipped) or VDA if not properly equipped.
16. Chart depiction is not to scale.
17. Distance to runway threshold (nautical miles).
18. Georeferenced aircraft.
19. Inbound Course (degrees).
20. Leg Distance (nautical miles).
21. Runway ID.
22. Threshold Crossing Height (AGL') for Precision Approach Path Indicator (PAPI).
23. Precision Approach Path Indicator (PAPI) descent angle (degrees).
24. Runway Depiction.
25. Touchdown Zone (TDZE) elevation (MSL').
26. Threshold Crossing Height (AGL').
27. Missed Approach Track.
28. Missed Approach Point (MAP).
29. Minimum Descent Altitude (MSL').
30. Primary NAVAID.

LOC BC WITH +V

- In some cases where an ILS is installed, a back course may be available in conjunction with the localizer. The back course does not offer a glideslope, but the back course can project a false glideslope signal and the glideslope should be ignored. Reverse sensing can occur on the back course using standard VOR equipment. With a Horizontal Situation Indicator (HSI) system, reverse sensing is eliminated if it is set appropriately to the front course.
- The profile view section of a non-vertically guided conventional localizer back course approach with only a published Minimum Descent Altitude (MDA) depicts an "advisory vertical guidance" (+V) in degrees, Final Approach Fix for non-precision approach, Threshold Crossing Height (TCH), Touchdown Zone Elevation (TDZE), Missed Approach Point (MAP), Minimum Descent Altitude (MDA), and, if available, Touchdown Zone lighting system or PAPI/VASI, as displayed in the image below:

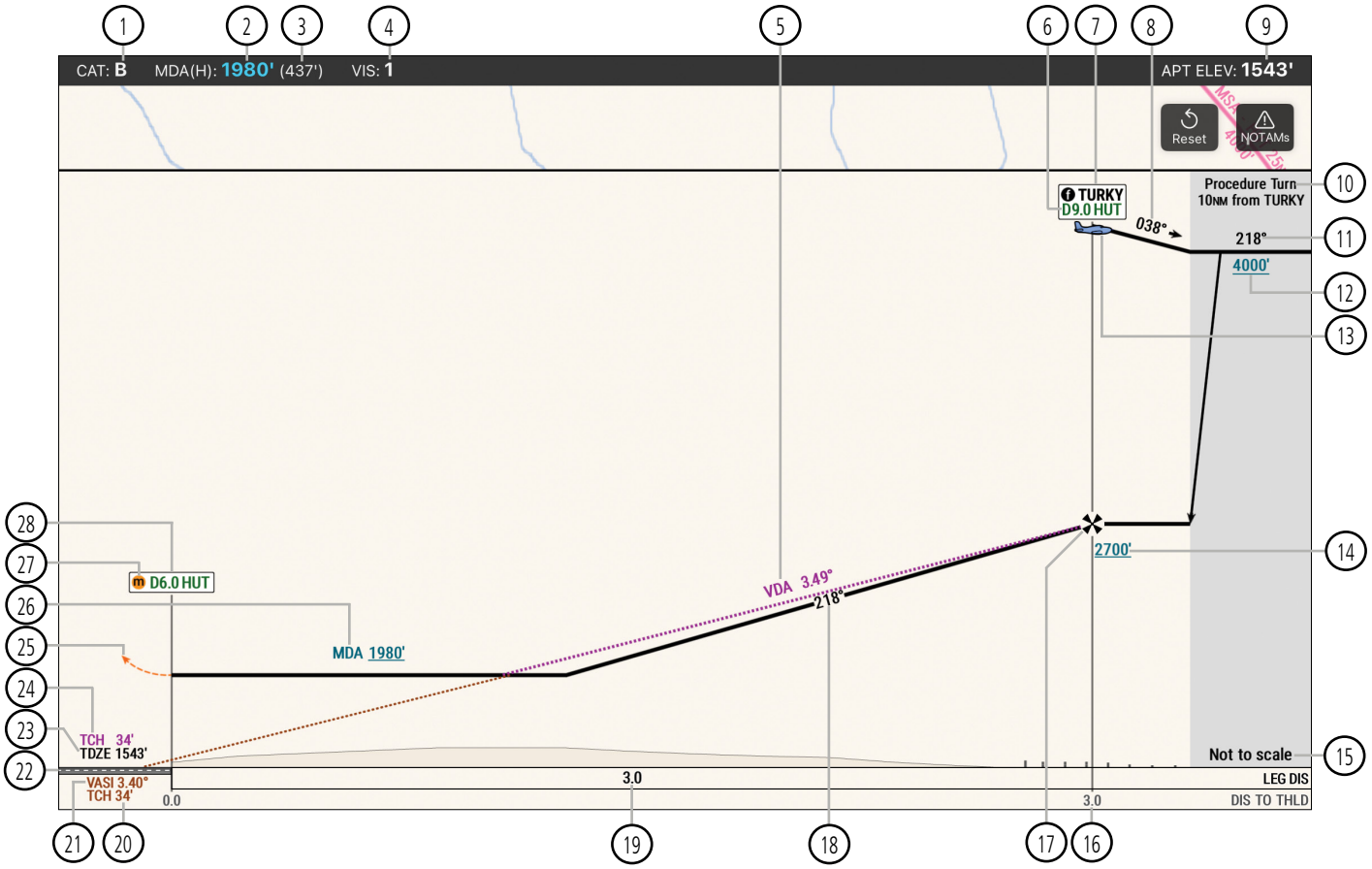


SmartCharts - Profile View Symbols - Legend - Instrument Approach Procedure - LOC Back Course with +V Minimums

1. Aircraft Category.
2. Minimum Descent Altitude (MSL').
3. Height Above Touchdown (ft).
4. Minimum Flight Visibility (statue miles).
5. Airport Elevation (MSL').
6. Inbound Course (degrees).
7. Initial Approach Fix.
8. Minimum Altitude (MSL') at Initial Approach Fix.
9. Distance to runway threshold (nautical miles).
10. Georeferenced aircraft.
11. Minimum Altitude (MSL') at Final Approach Fix.
12. Final Approach Fix icon for Non-precision approach.
13. Runway ID.
14. Threshold Crossing Height (AGL') for Visual Approach Slope Indicator (VASI).
15. Visual Approach Slope Indicator (VASI) angle (degrees).
16. Runway Depiction.
17. Touchdown Zone (TDZE) Elevation (MSL').
18. Missed Approach Track.
19. Missed Approach Point.
20. Minimum Descent Altitude (MSL').
21. Advisory Visual Guidance Descent Angle (degrees).
22. Final Approach Fix.
23. Approach limitation.
24. Primary NAVAID.

VOR WITH PROCEDURE TURN

- On a VOR approach, VOR's both on and off the field are used to establish approaches and include the use of a wide variety of equipment, such as DME and TACAN. All VOR approaches are non-precision approaches, require the presence of properly operating VOR equipment, and can provide MDA's as low as 250 feet above the runway. VOR's also offer a flexible advantage in that an approach can be made toward or away from the navigational facility.
- The profile view section of non-vertically guided conventional VOR procedure with only a published Minimum Descent Altitude (MDA) depict a Vertical Decent Angle (VDA) in degrees, Threshold Crossing Height (TCH), Touchdown Zone Elevation (TDZE), Missed Approach Point (MAP), Minimum Descent Altitude (MDA), and, if available, Touchdown Zone lighting system or PAPI/VASI, as displayed in the image below:

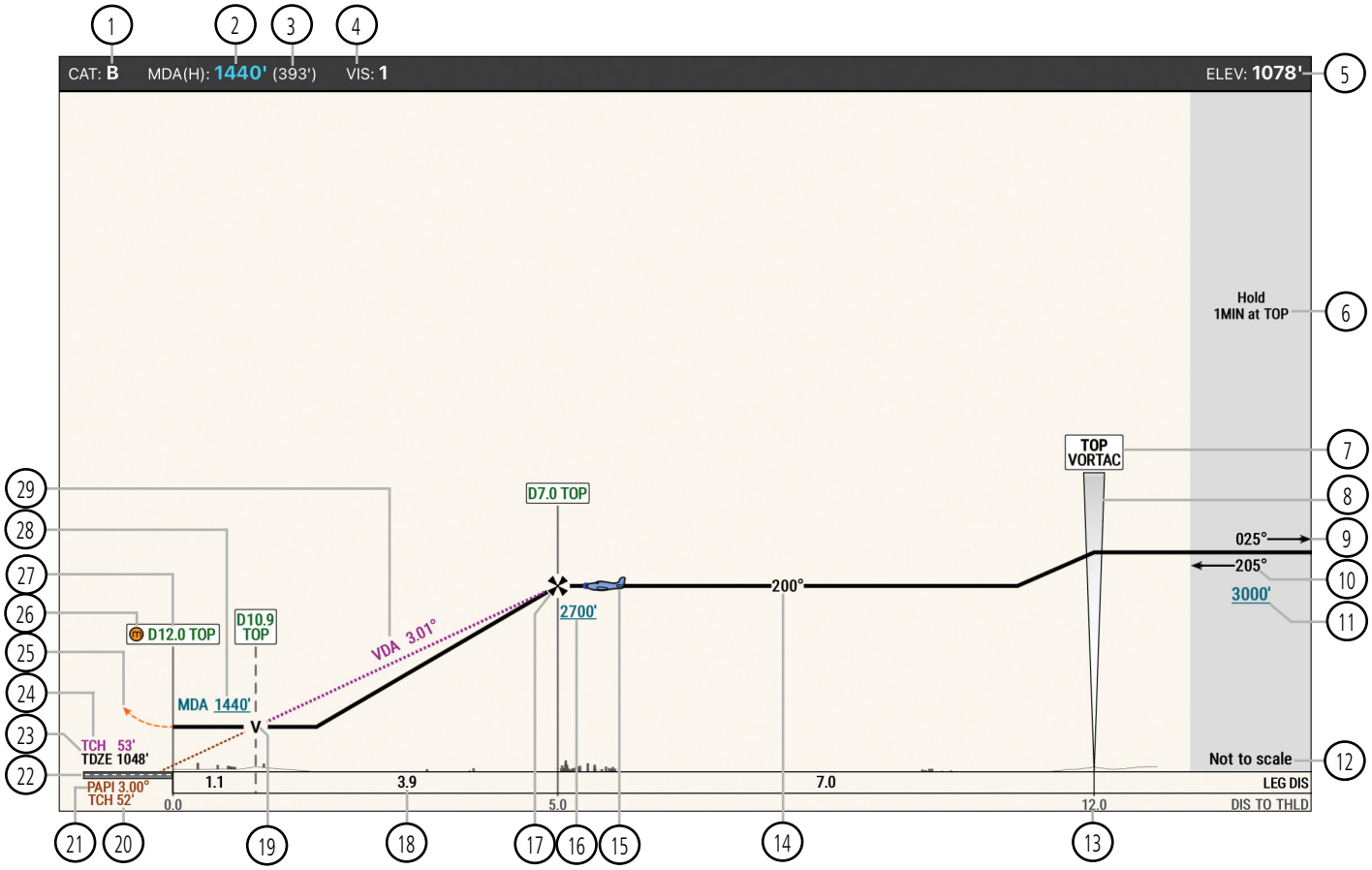


SmartCharts - Profile View Symbols - Legend - Instrument Approach Procedure - VOR with Procedure Turn

1. Aircraft Category.
2. Minimum Descent Altitude (MSL').
3. Height Above Touchdown (ft).
4. Minimum Flight Visibility (statue miles).
5. Visual Descent Angle (degrees).
6. Distance from VOR (nautical miles) & VOR ID.
7. Final Approach Fix.
8. Procedure Turn Outbound Course (degrees).
9. Airport Elevation (MSL').
10. Procedure Turn must remain within 10 nautical miles of Fix.
11. Procedure Turn Inbound Course (degrees).
12. Procedure Turn Fix Altitude (MSL') Established Outbound.
13. Georeferenced aircraft.
14. Procedure Turn Completion Altitude (MSL') Established Inbound.
15. Chart depiction is not to scale.
16. Distance to runway threshold (nautical miles).
17. Final Approach Fix icon for Non-precision approach.
18. Inbound Course (degrees).
19. Leg Distance (nautical miles).
20. Threshold Crossing Height (AGL') for Visual Approach Slope Indicator (VASI).
21. Visual Approach Slope Indicator (VASI) descent angle (degrees).
22. Runway Depiction.
23. Touchdown Zone (TDZE) Elevation (MSL').
24. Threshold Crossing Height (AGL') for vertical descent angle.
25. Missed Approach Track.
26. Minimum Descent Altitude (MSL').
27. Missed Approach Point.
28. Missed Approach Point Distance (nautical miles) from VOR & VOR ID.

VOR / DME

- On a VOR/DME approach, operable DME must be installed in the aircraft in order to fly the approach from the Final Approach Fix. The use of DME allows for an accurate determination of position without timing, which greatly increases situational awareness throughout the approach.
- The profile view section of a non-vertically guided conventional VOR procedure with only a published Minimum Descent Altitude (MDA) depicts a Vertical Decent Angle (VDA) in degrees, Threshold Crossing Height (TCH), Touchdown Zone Elevation (TDZE), Missed Approach Point (MAP), Minimum Descent Altitude (MDA), and, if available, Touchdown Zone lighting system or PAPI/VASI, as displayed in the image below:

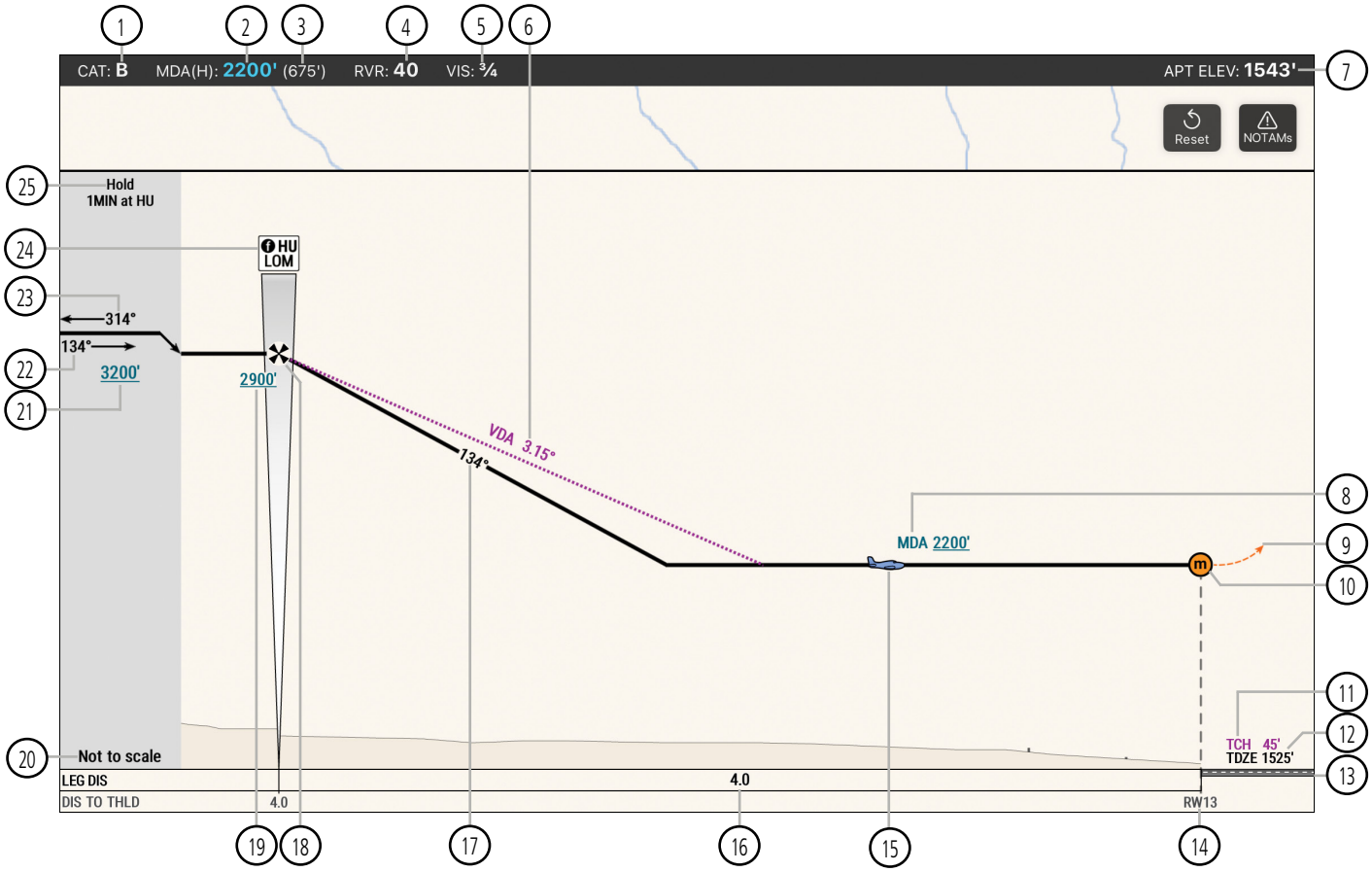


SmartCharts - Profile View Symbols - Legend - Instrument Approach Procedure - VOR/DME

1. Aircraft Category.
2. Minimum Descent Altitude (MSL').
3. Height Above Touchdown (ft).
4. Minimum Flight Visibility (statute miles).
5. Airport Elevation (MSL').
6. Hold Instructions.
7. VOR/VORTAC ID.
8. VOR/VORTAC reception depiction.
9. Procedure Turn Outbound Course (degrees).
10. Procedure Turn Inbound Course (degrees).
11. Procedure Turn Completion Altitude (MSL') Established Inbound.
12. Chart depiction is not to scale.
13. Distance to runway threshold (nautical miles).
14. Inbound Course (degrees).
15. Georeferenced aircraft.
16. Visual Descent Angle Intercept Minimum Altitude (MSL').
17. Final Approach Fix icon for Non-precision approach.
18. Leg Distance (nautical miles).
19. Visual Descent Point (VDP).
20. Threshold Crossing Height (AGL') for Precision Approach Path Indicator (PAPI).
21. Precision Approach Path Indicator (PAPI) descent angle (degrees).
22. Runway Depiction.
23. Touchdown Zone (TDZE) Elevation (MSL').
24. Threshold Crossing Height (AGL') for vertical descent angle.
25. Missed Approach Track.
26. Missed Approach Point.
27. Missed Approach Point Distance from VOR/VORTAC (nautical miles).
28. Minimum Descent Altitude (MSL').
29. Visual Descent Angle (degrees).

NDB WITH VDA

- A NDB approach, much like a VOR approach, can be designed using facilities both on and off the airport, with or without a Final Approach Fix (FAF), and with or without DME availability. The long-term FAA plan includes the gradual phase out of NDB facilities, and eventually, the NDB approach becomes nonexistent as new RNAV approaches replace them. Until that time, the NDB provides additional availability for instrument pilots into many smaller, remotely located airports.
- The profile view section of a non-vertically guided conventional NDB procedure with only a published Minimum Descent Altitude (MDA) depicts a Visual Decent Angle (VDA) in degrees, Threshold Crossing Height (TCH), Touchdown Zone Elevation (TDZE), Missed Approach Point (MAP), and a Minimum Descent Altitude (MDA), as displayed in the image below:



SmartCharts - Profile View Symbols - Legend - Instrument Approach Procedure - NDB with VDA

1. Aircraft Category.
2. Minimum Descent Altitude (MSL').
3. Height Above Touchdown (ft).
4. Runway Visual Range (ft).
5. Minimum Flight Visibility (statute miles).
6. Visual Descent Angle (degrees).
7. Airport Elevation (MSL').
8. Minimum Descent Altitude (MSL').
9. Missed Approach Track.
10. Missed Approach Point.
11. Threshold Crossing Height (AGL') for visual descent angle.
12. Touchdown Zone (TDZE) Elevation (MSL').
13. Runway Depiction.
14. Runway ID.
15. Georeferenced aircraft.
16. Leg Distance (nautical miles).
17. Inbound Course (degrees).
18. Final Approach Fix icon for Non-precision approach.
19. Visual Descent Angle Intercept Minimum Altitude (MSL').
20. Portion of Chart is not to scale.
21. Procedure Turn Completion Altitude (MSL') Established Inbound.
22. Inbound Course (degrees).
23. Outbound Course (degrees).
24. Final Approach Fix.
25. Hold Instructions.

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