Getting Your Clearance - CRAFT

Lesson Objective

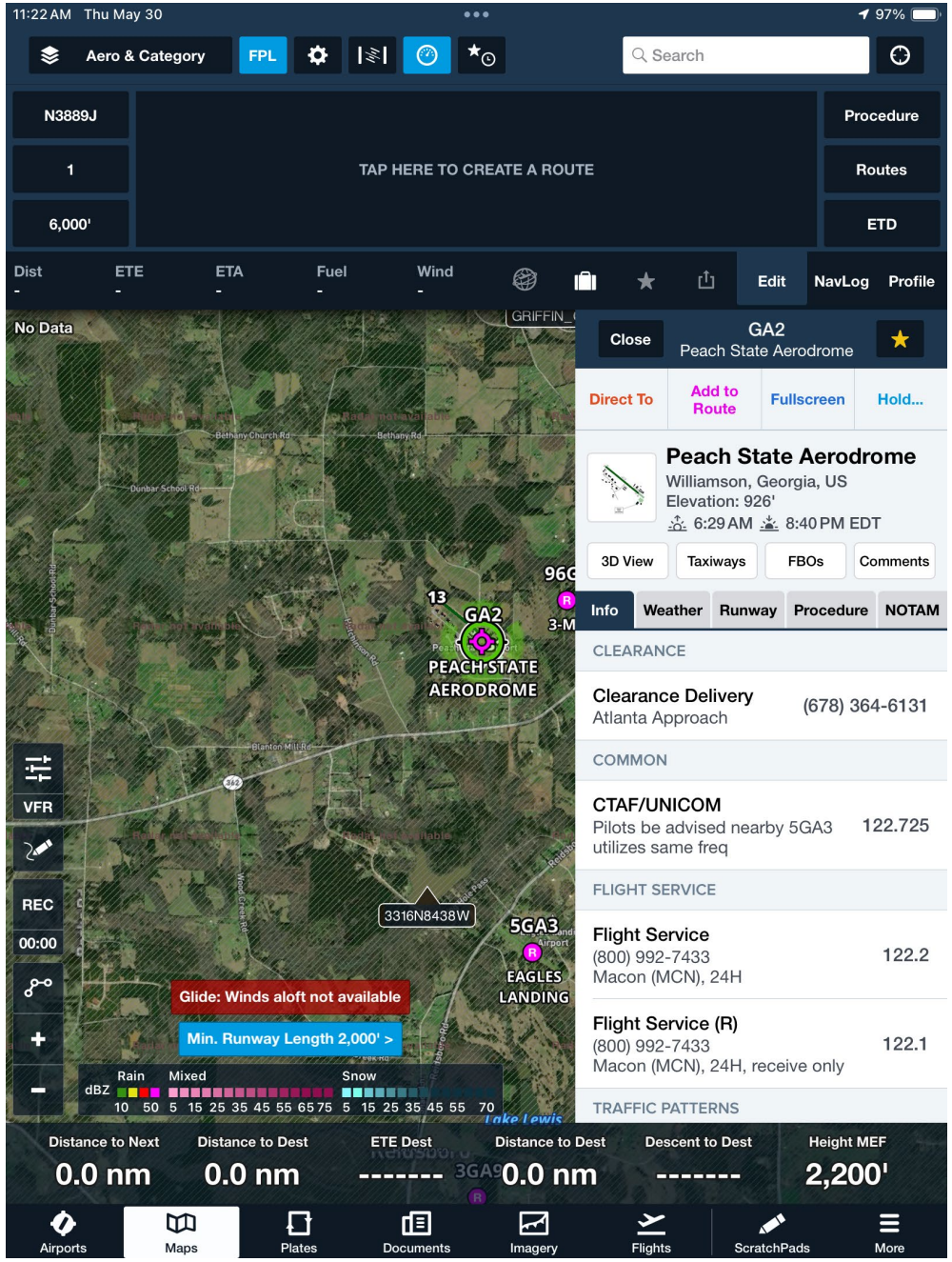
To develop understanding of how to get your clearance from ATC on the ground or in the air…it can intimidate a lot of people

Attention

“Chattanooga Clearance delivery Cessna 123AB at Wilson Air ready to pick up IFR clearance”

You need to get your IFR clearance from clearance delivery. If you depart from a non-controlled airport you will need to call them on a phone or you can call them on the radio using an RCO.

Calling on phone



CRAFT
C

Clearance limit

The end point of the clearance (usually, but not always, the destination airport).

I saw in one video a point being made that you can also get clearance to a VOR or a GPS point.

CRAFT
R

Route

The route that the flight is to follow as part of the clearance (often the route originally filed, although ATC may change this). This is where you better be prepared to listen and write. ATC will many times decide which way you are going.

CRAFT
A

Altitude

The initial altitude to be maintained by the flight, plus, in many cases, a time at which cruise altitude clearance may be expected.

CRAFT
F

Frequency

The frequency to which the pilot(s) should tune upon leaving the departure airport.

CRAFT
T

Transponder

The transponder code that must be set for the aircraft prior to departure and during the flight. T also stands for time, as in void time, if one is issued. A void time is an expiration time, meaning, the IFR clearance is voided if the aircraft is not airborne by the void time.

CRAFT

Example

C	KCHA
R	As filed
A	6000
F	121.0
T	4321

https://youtu.be/tGBZ2SFOqyI&t=70

https://youtu.be/WdkycU2ih7Q&t=73s

Any questions I can answer or follow up later on?

Minimum IFR Altitudes

Altitudes

Indicated altitude =

The altitude on the altimeter.

True altitude =

The expressed altitude above the sea level.

Height =

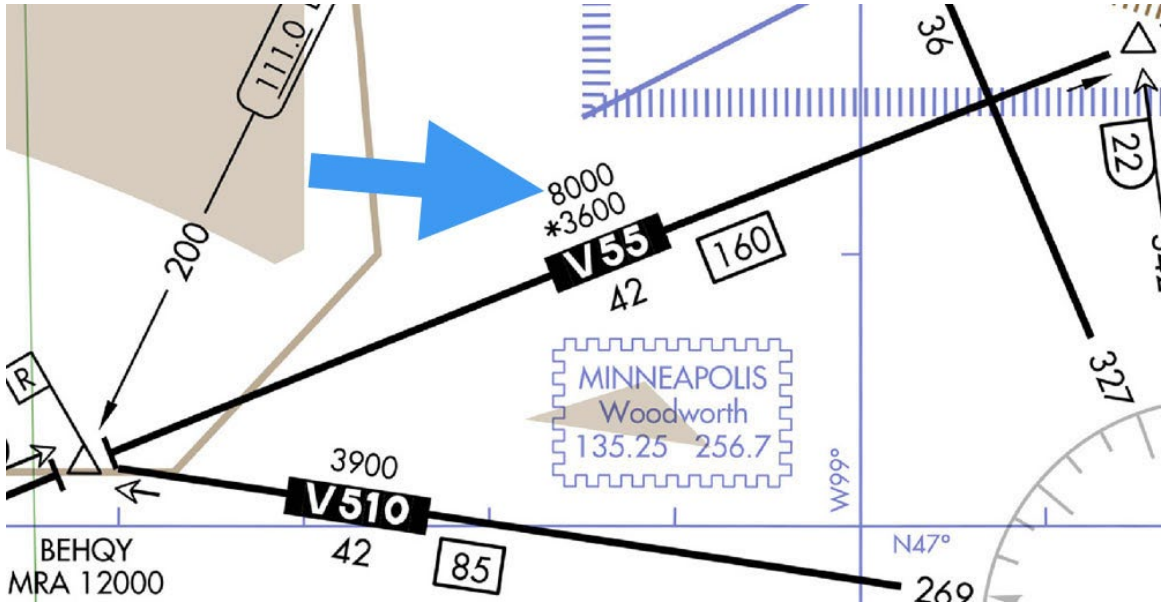
The altitude above a certain point (ground).

Minimum En Route Altitude (MEA)

The MEA is the lowest published altitude between radio fixes that ensures:

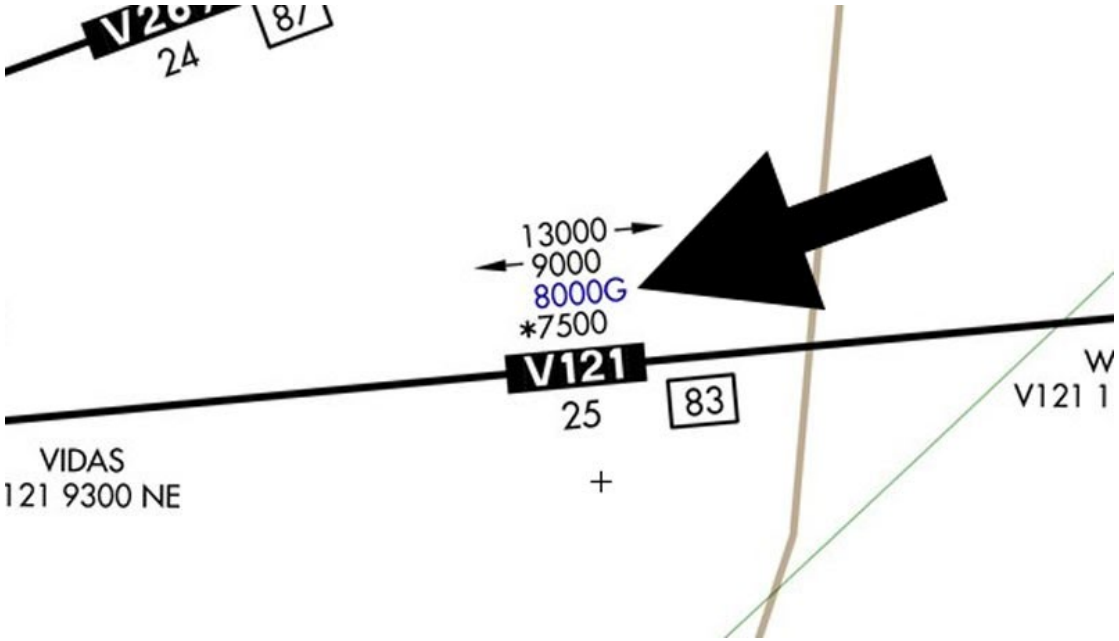
- Navigation signal coverage
- Obstacle clearance requirements between those fixes

Communications coverage is not guaranteed.



RNAV (GPS) MEA

RNAV MEAs are depicted on some IFR en route low altitude charts, allowing both RNAV and non-RNAV pilots to use the same chart for instrument navigation.

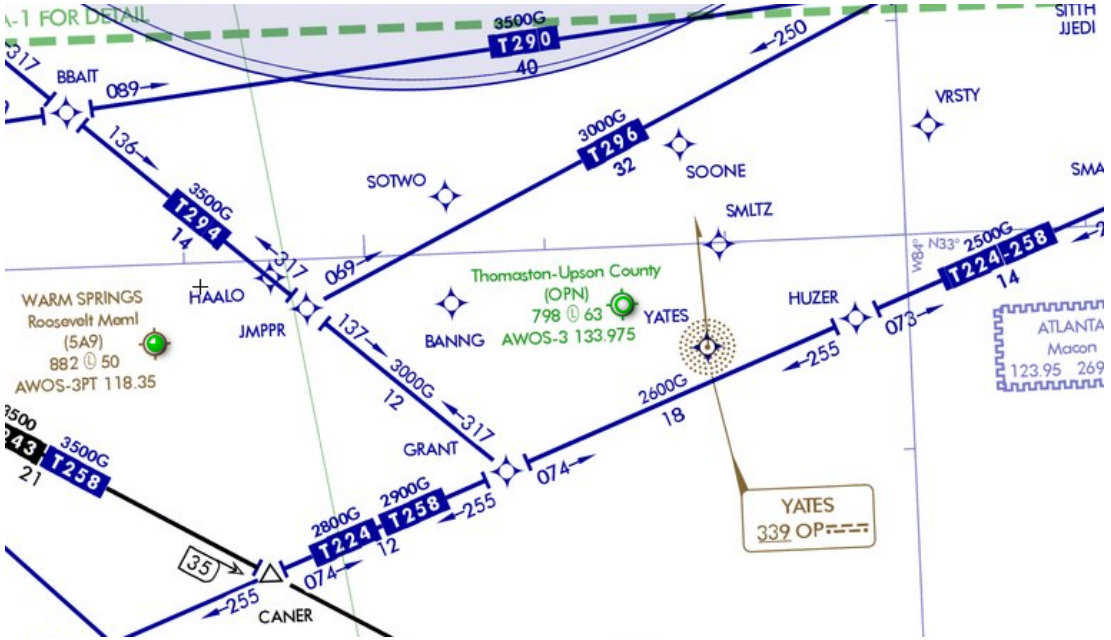


RNAV (GPS) MEA

RNAV "T-routes" are low-altitude Area Navigation routes primarily used by GPS-equipped aircraft, and ATC coverage is generally available.

This allows controllers to monitor and provide clearances for aircraft flying on these direct paths.

The specific level of ATC coverage can vary depending on the location and airspace complexity.

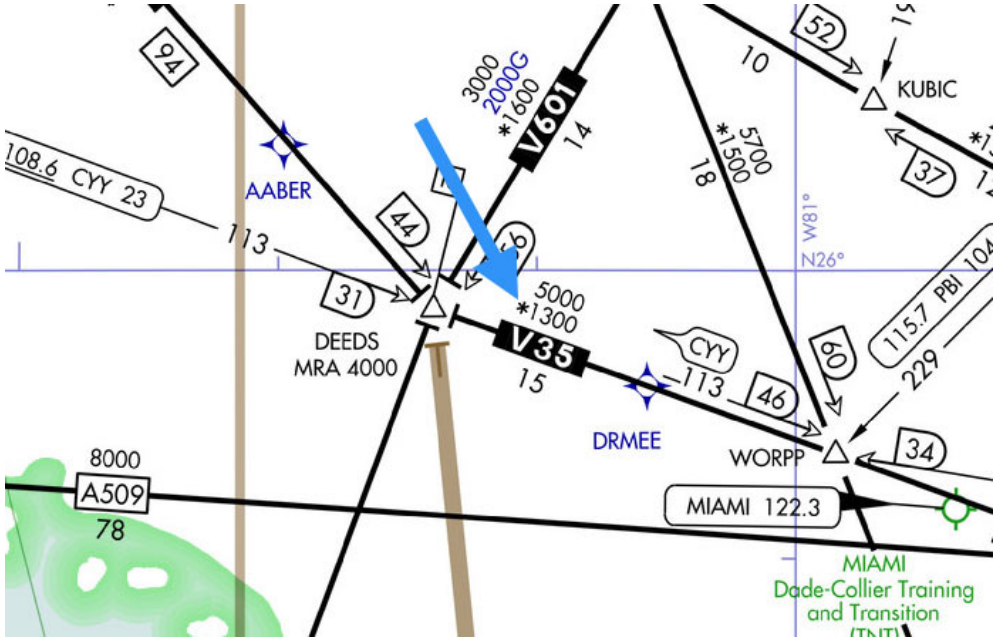


Minimum Obstruction Clearance Altitude (MOCA)

The MOCA is the lowest published altitude in effect between fixes on VOR airways, off-airway routes, or route segments that meets obstacle clearance requirements for the entire route segment.

MOCA will assure:

- Minimum vertical separation of 1000ft (300m) from the ground or landmarks.
- Within 22NM VOR reception range.



§ 91.177 Minimum altitudes for IFR operations.

(a) Operation of aircraft at minimum altitudes. Except when necessary for takeoff or landing, or unless otherwise authorized by the FAA, no person may operate an aircraft under IFR below—

(1) The applicable minimum altitudes prescribed in parts 95 and 97 of this chapter. However, if both a MEA and a MOCA are prescribed for a particular route or route segment, a person may operate an aircraft **below the MEA down to, but not below, the MOCA**, provided the applicable navigation signals are available. **For aircraft using VOR for navigation**, this applies only when the aircraft is within **22 nautical miles of that VOR** (based on the reasonable estimate by the pilot operating the aircraft of that distance); or

§ 91.177 Minimum altitudes for IFR operations.

(2) If no applicable minimum altitude is prescribed in parts 95 and 97 of this chapter, then—

(i) In the case of operations over an area designated as a mountainous area in part 95 of this chapter, an altitude of 2,000 feet above the highest obstacle within a horizontal distance of 4 nautical miles from the course to be flown; or

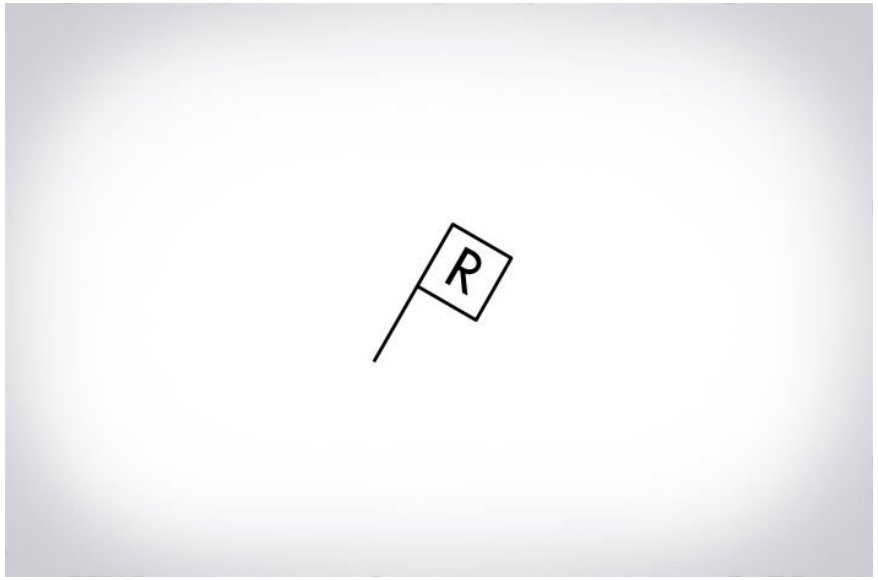
(ii) In any other case, an altitude of 1,000 feet above the highest obstacle within a horizontal distance of 4 nautical miles from the course to be flown.

(b) Climb. Climb to a higher minimum IFR altitude shall begin immediately after passing the point beyond which that minimum altitude applies, except that when ground obstructions intervene, the point beyond which that higher minimum altitude applies shall be crossed at or above the applicable MCA.

Minimum Reception Altitude (MRA)

The Minimum Reception Altitude (MRA) is the lowest altitude on an airway segment where an aircraft can be assured of receiving signals from navigation aids like VOR or NDB.

When the MRA at the fix is higher than the MEA, an MRA is established for the fix and is the lowest altitude at which an intersection can be determined.



Minimum Reception Altitude (MRA)

The MRA at intersection PRATZ is 3000 ft.

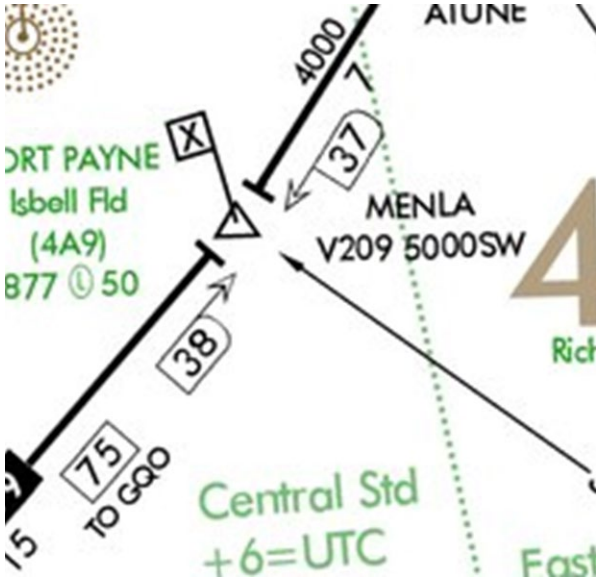
Minimum Crossing Altitude (MCA)

An MCA is the lowest altitude at certain fixes at which the aircraft must cross when proceeding in the direction of a higher minimum en route IFR altitude.

The pilot should climb to the MCA **before** reaching the intersection; in that way the MCA will not be violated.

Minimum Crossing Altitude (MCA)

V209 5000SW means if you are on V209 you need to be at 5000+ ft when heading SW.



Maximum Authorized Altitude (MAA)

An MAA is a published altitude representing the maximum usable altitude or flight level for an airspace structure or route segment.

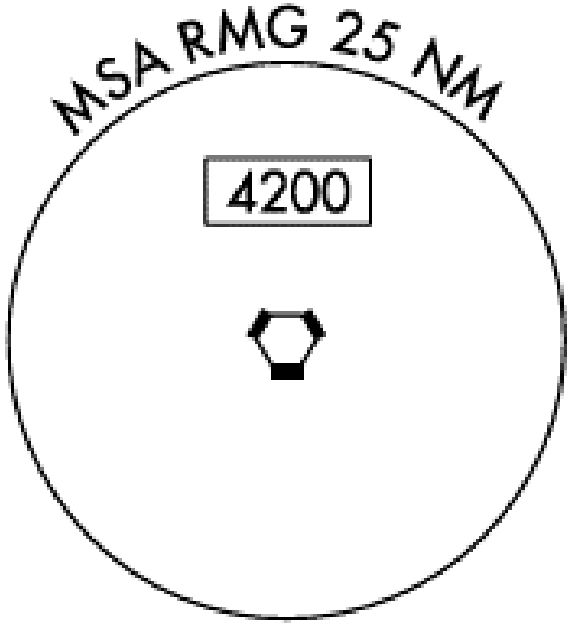
It is the highest altitude on a Federal airway, jet route, RNAV low or high route, or other direct route for which an MEA is designated. Adequate reception of navigation signals is assured.

Minimum Safe Altitude (MSA)

Altitudes depicted on approach charts which provide at least 1,000 feet of obstacle clearance within a 25-mile radius of the navigation facility, waypoint, or Airport Reference Point upon which the MSA is predicated.

MSAs are for emergency use only and do not necessarily assure acceptable navigational signal coverage.

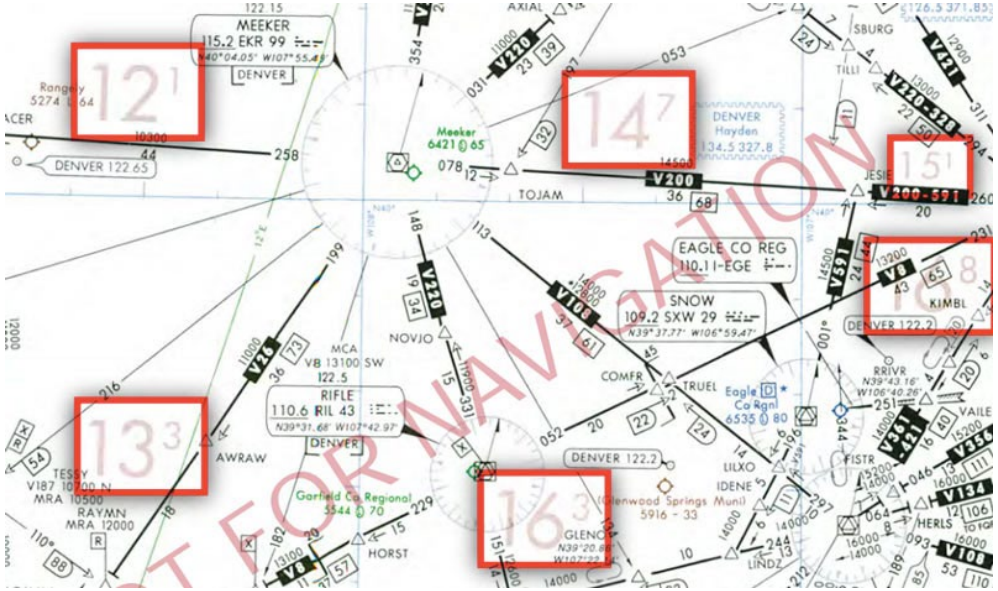
AKA Minimum Sector Altitude also



Off-Route Obstruction Clearance Altitude (OROCA)

An off-route obstruction clearance altitude (OROCA) is an off-route altitude that provides obstruction clearance with a 1,000-foot buffer in non-mountainous terrain areas, and a 2,000-foot buffer in designated mountainous areas.

This altitude doesn't guarantee signal coverage from ground-based NAVAIDs, ATC radar, or communications coverage.



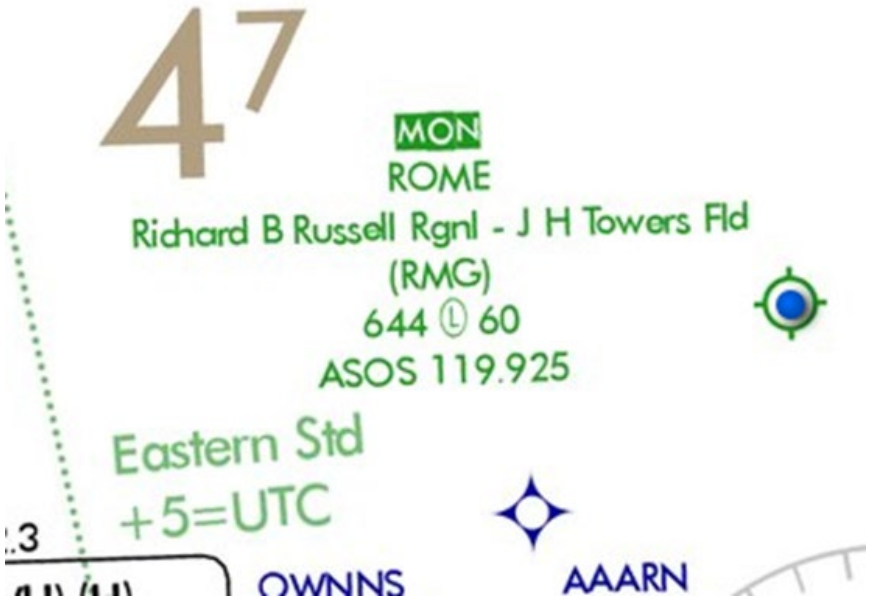
GRID MORA (IVAO Definition)

The minimum off route altitude (MORA) is an altitude which provides 2,000 feet of terrain clearance in mountainous areas and 1,000 feet in non-mountainous regions.

GRID MORA (IVAO Definition)

It provides a reference point of clearance of 10 nm from the route centerline.

The GRID MORA provides terrain and man-made structure clearance within the section outlined by latitude and longitude lines.



GRID MORA (IVAO Definition)

The Grid MORA value clears all terrain and man-made structures by 1000 ft in areas where the highest elevations are 5000 ft MSL or lower and by 2000 ft in areas where the highest elevations are 5001 ft MSL or higher.

GRID MORA (IVAO Definition)

The Grid MORA is a good value to determinate obstacle clearance whenever the pilot has to, or would like to divert from the airway, e.g. during an emergency descent or when flying direct to a point away from an airway.

The MORA around the Rome airport is 4700 ft.

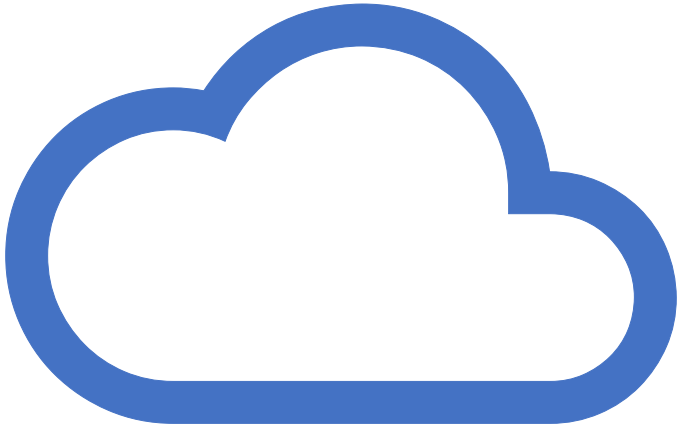
Minimum Vectoring Altitudes (MVA)

MVAs are established for use by ATC when radar ATC is exercised.

The MVA provides 1,000 feet of clearance above the highest obstacle in non-mountainous areas and 2,000 feet above the highest obstacle in designated mountainous areas.

Because of the ability to isolate specific obstacles, some MVAs may be lower than MEAs, MOCAs, or other minimum altitudes depicted on charts for a given location.

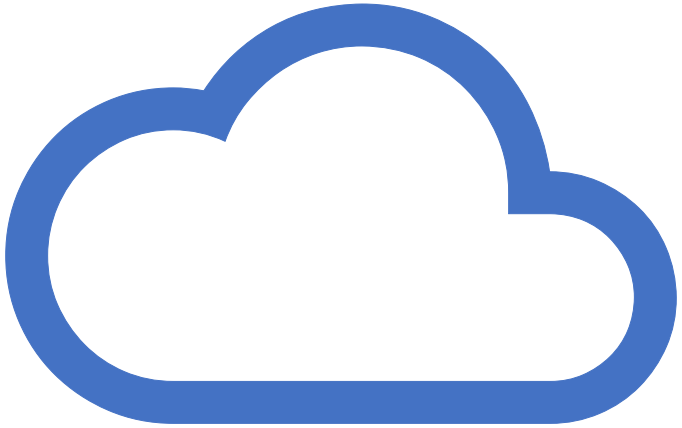
While being radar vectored, IFR altitude assignments by ATC are normally at or above the MVA.



VFR on Top

If you are in a situation where you have heavy cloud cover at say 2500 AGL but the clouds are only a couple hundred feet tall you can ask for VFR-on-top.

When you are above the clouds if you get this clearance you would use normal VFR cruising altitudes.



VFR on Top

You would not have to ask every time you wanted to change altitude or heading.

You would need to check in with ATC when you need to pass back through the clouds.

You still have to make required reports. You can not to VFR-on-top in class A airspace.

Minimum Turning Altitude (MTA)

Minimum turning altitude (MTA) is a charted altitude providing vertical and lateral obstruction clearance based on turn criteria over certain fixes, NAVAIDs, waypoints, and on charted route segments.

Check out Page 2-38 in Chapter 2 of the FAA's Instrument Procedures Handbook for more.

Minimum Turning Altitude (MTA)

The turn area provides obstacle clearance for both turn anticipation (turning prior to the fix) and flyover protection (turning after crossing the fix).

This does not violate the requirement to fly the centerline of the airway.

Many factors enter into the construction and application of the turning area to provide pilots with adequate obstacle clearance protection.

These may include aircraft speed, the amount of turn versus NAVAID distance, flight track, curve radii, MEAs, and MTA.

Any questions I can answer or follow up later on?

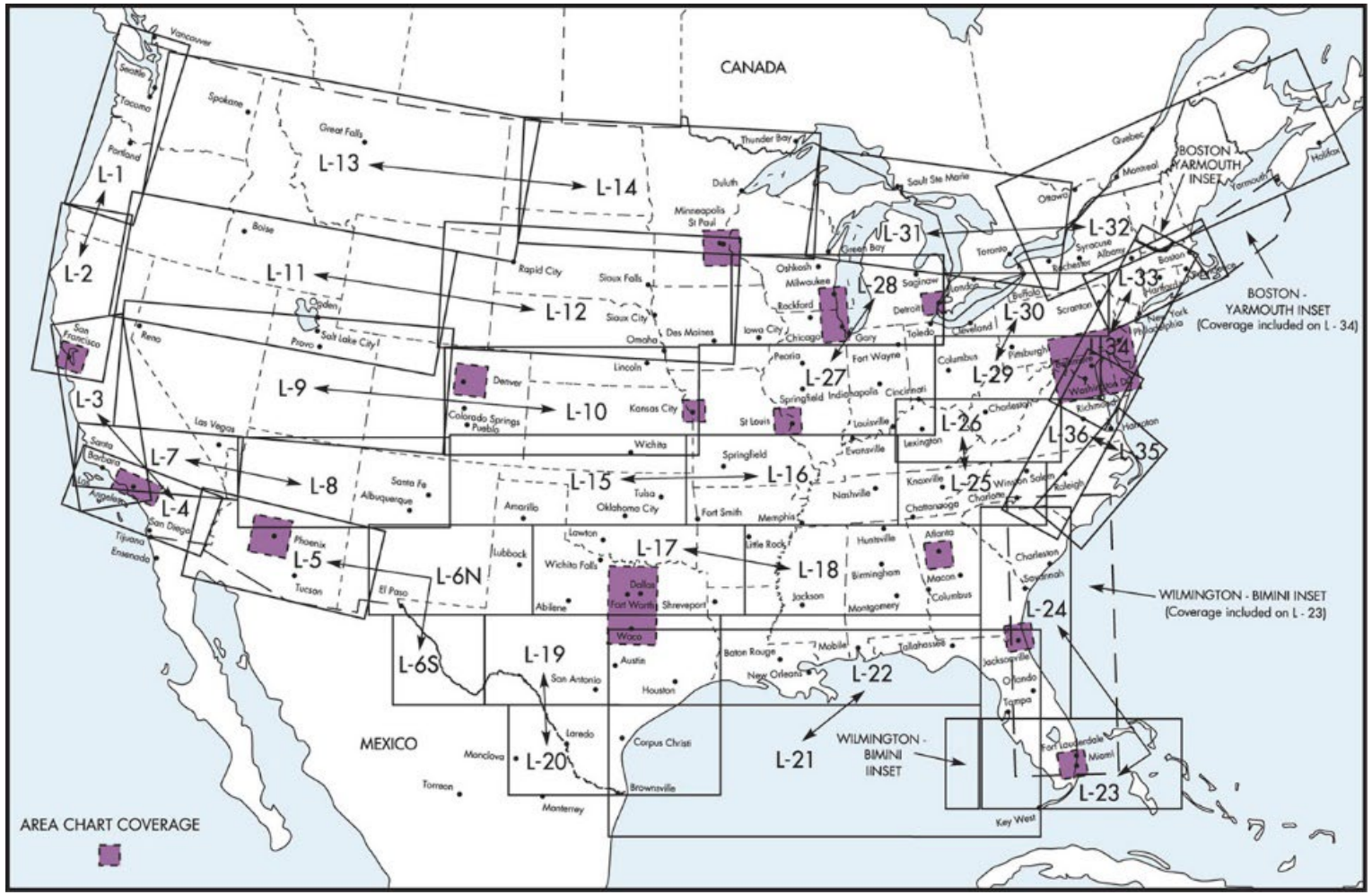
IFR Enroute Low Altitude Charts

Lesson Objective

To develop understanding of IFR Enroute Low Altitude Charts.

This is an overview…for more details see the IFR section of the Aeronautical Chart User's Guide.

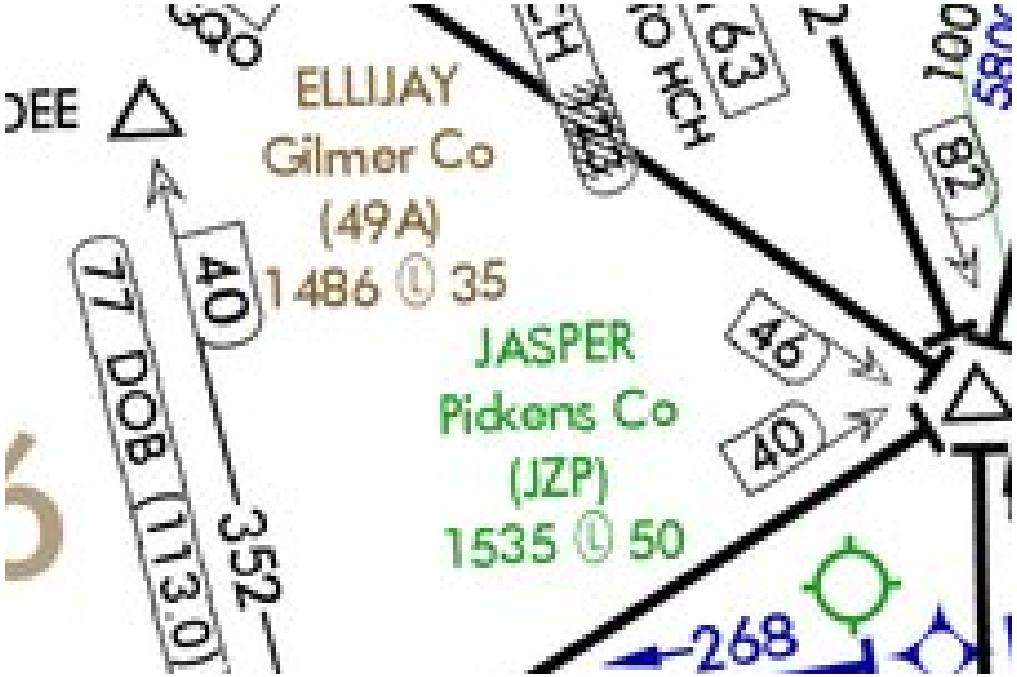
All the Charts



Airports

Airports in green have instrument approaches, the ones in brown do not.

If you are in the clouds, you can count the brown airports out.



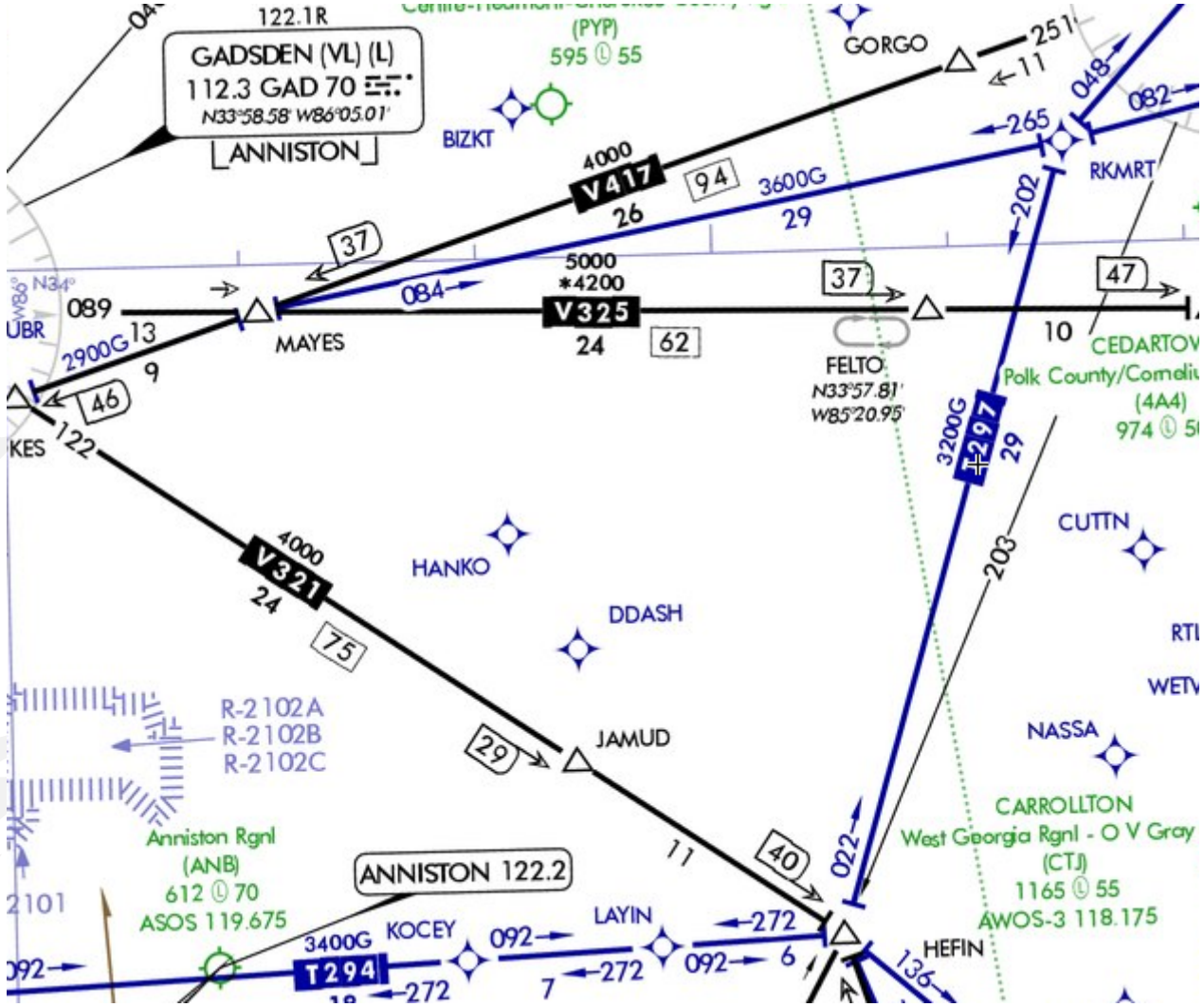
Airways

Airways using VOR Nav

V417, V325, V321

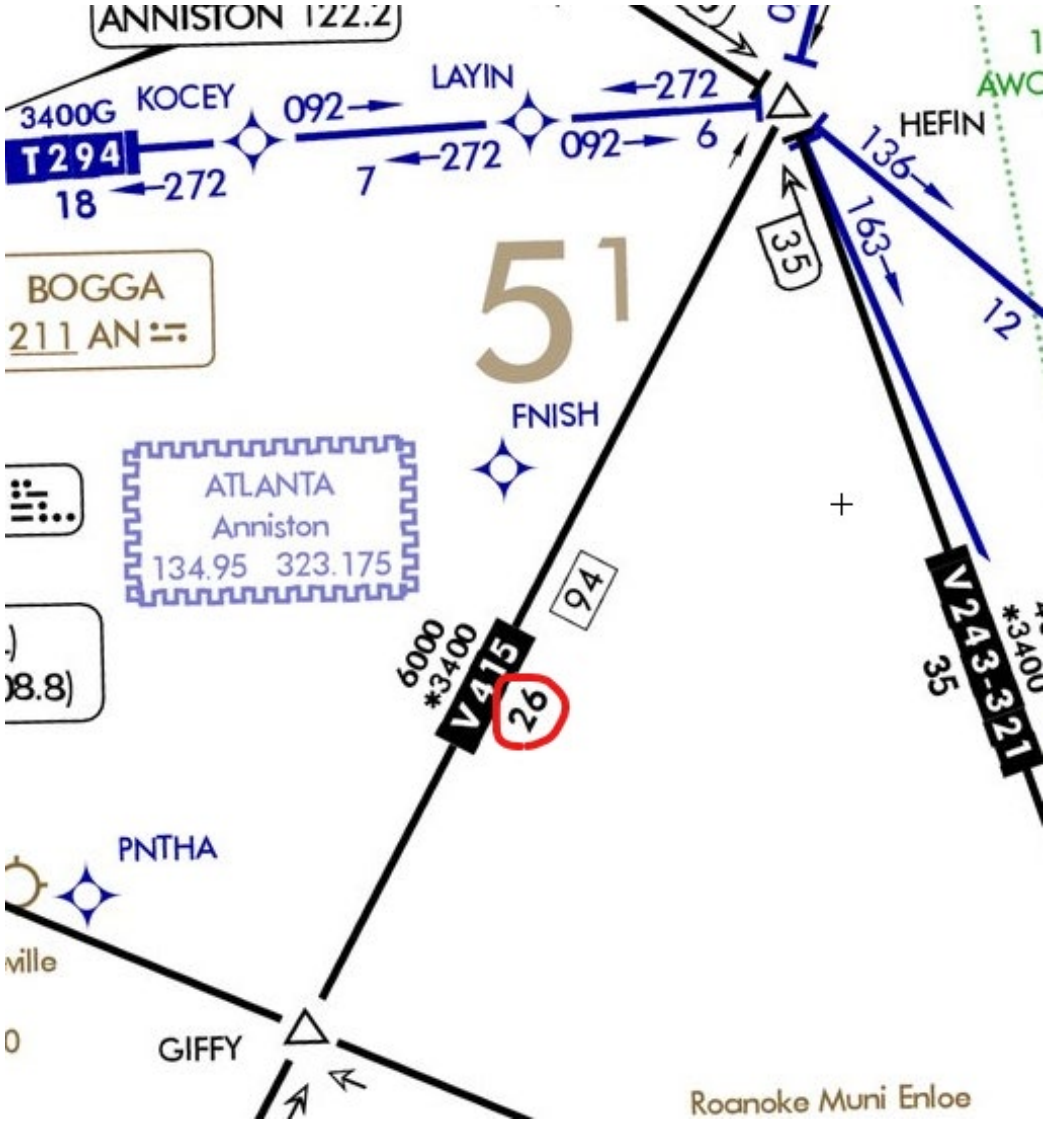
Airways using GPS

T294, T297



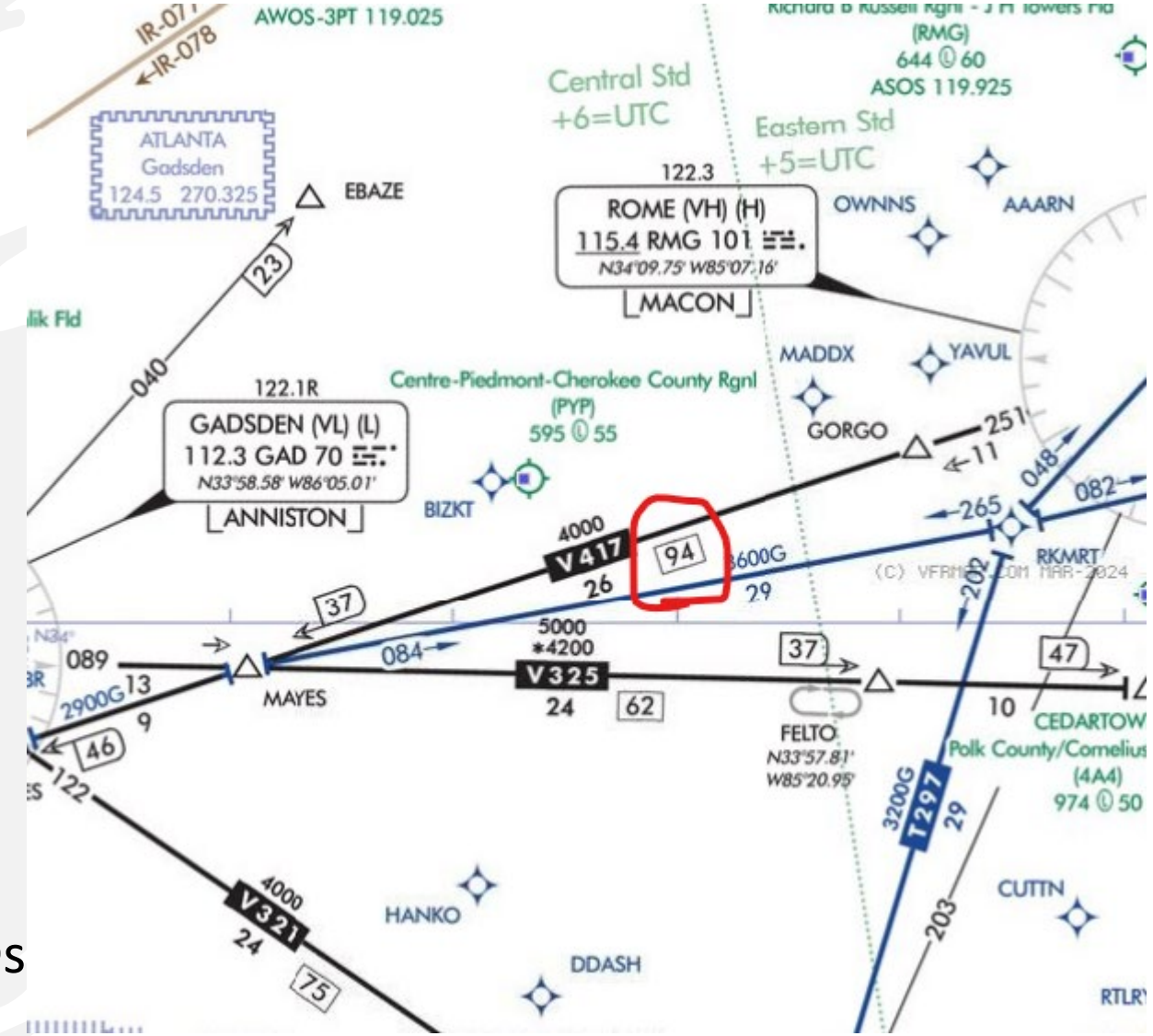
Distance

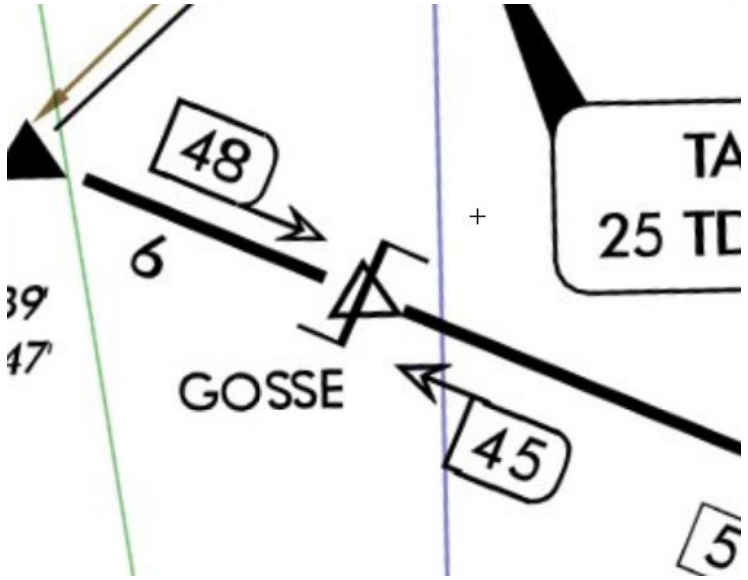
GIFFY <-> HEFIN = 26 NM



Distance

The 94 in the rectangle is distance between compulsory fixes/NAVAIDs

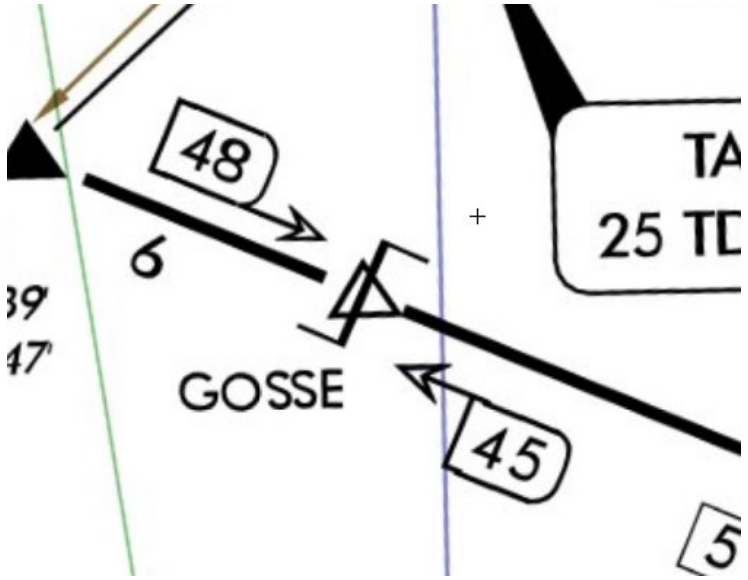




DME

45 NM from VOR LGC

48 NM from VOR VH



Changeover point

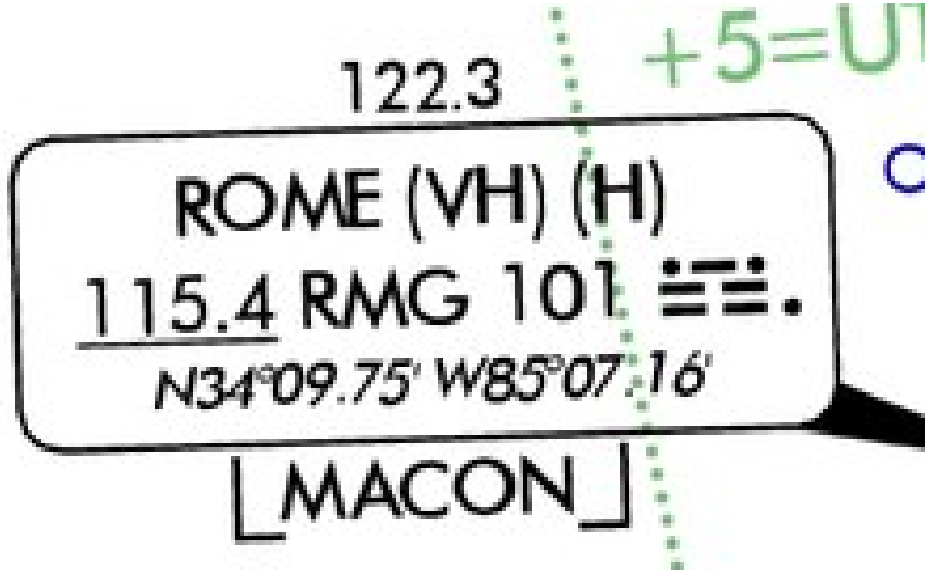
Where to change VOR frequency from one VOR to another

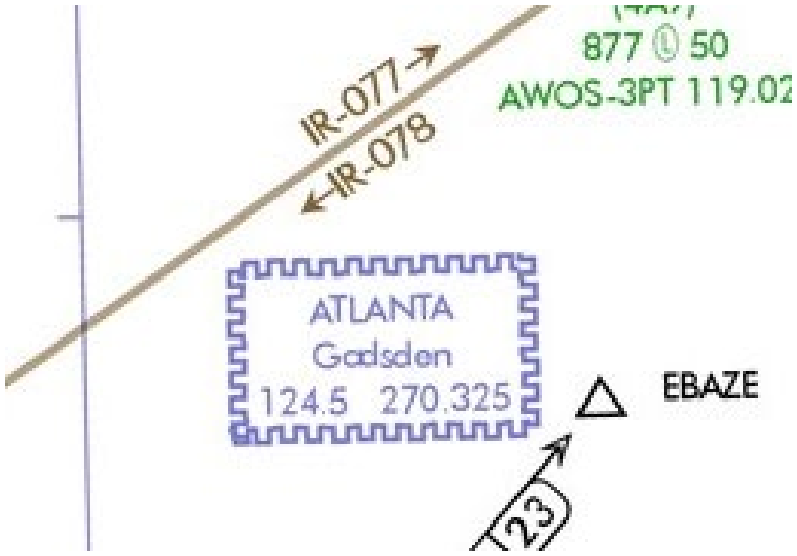
FSS/HIWAS

Call 122.3 Macon Radio for Flight Service Station for weather, flight plans/ATC relay, and other help.

H means HIWAS used to be available ‘WAS’

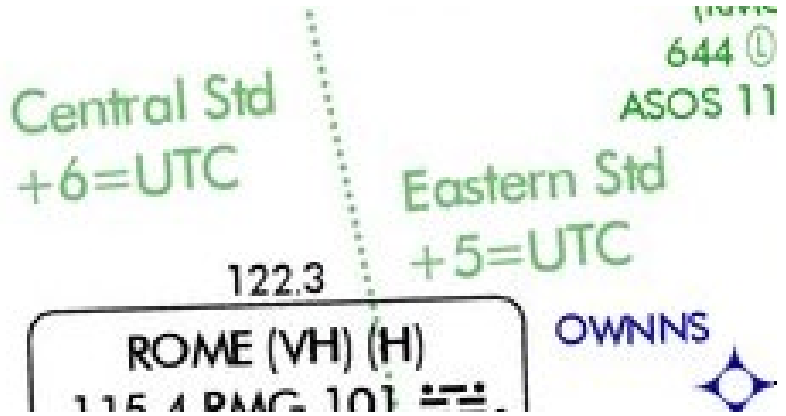
Discontinued the Hazardous Inflight Weather Advisory Service in the contiguous United States, effective January 8, 2020.



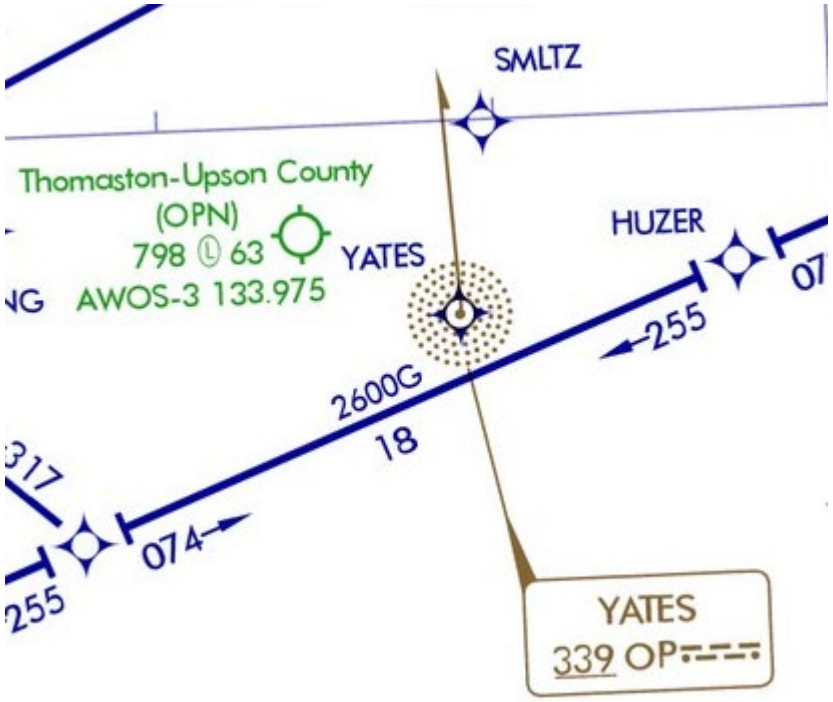


ATC

Reach Atlanta Center on 124.5


644 L
ASOS 11
Central Std
+6=UTC
Eastern Std
+5=UTC
122.3
ROME (VH) (H)
OWNNS

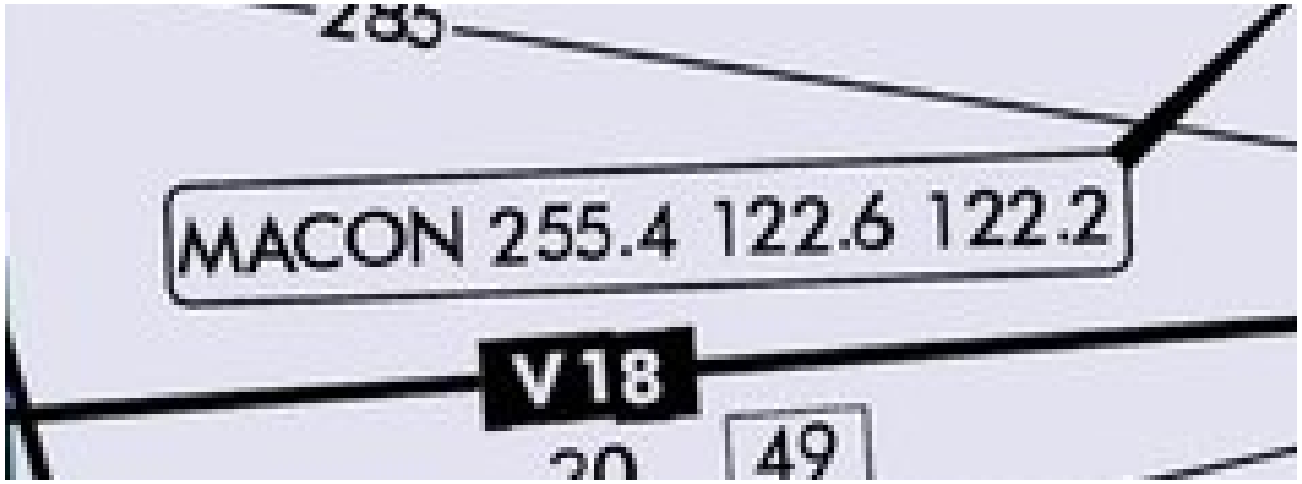
Time Change



NDB

YATES on 339 (kHz)

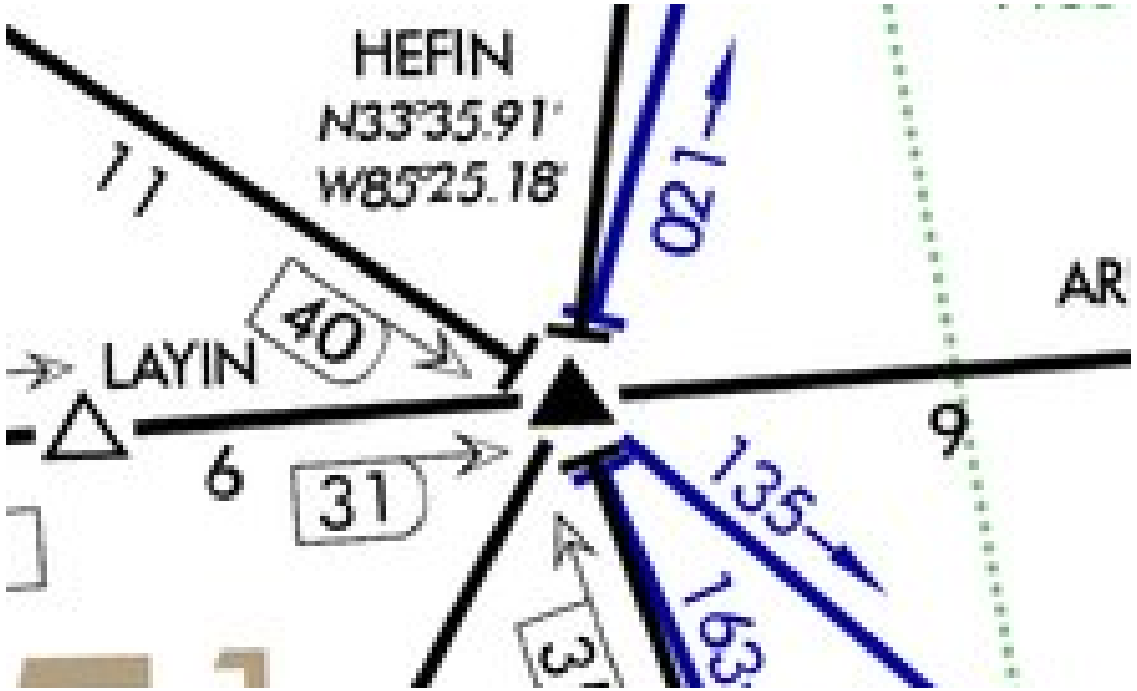
The arrow points to magnetic north



RCO

122.6 is an RCO.

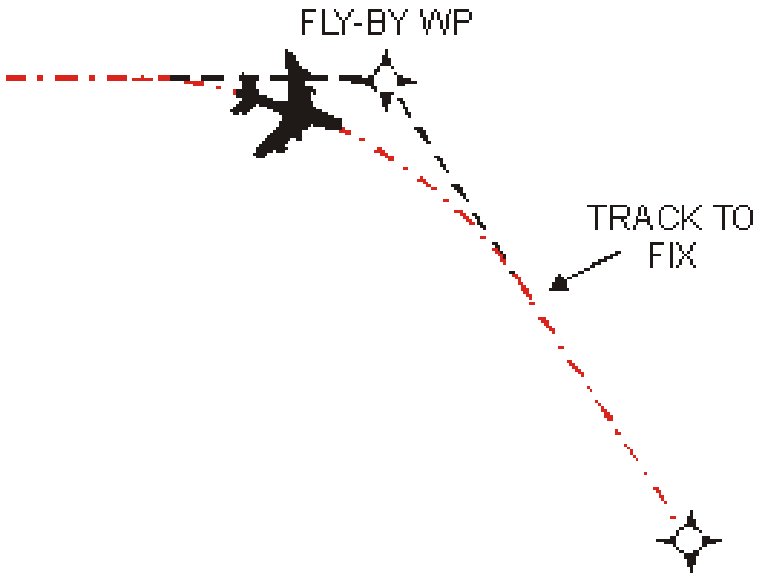
Reporting Point

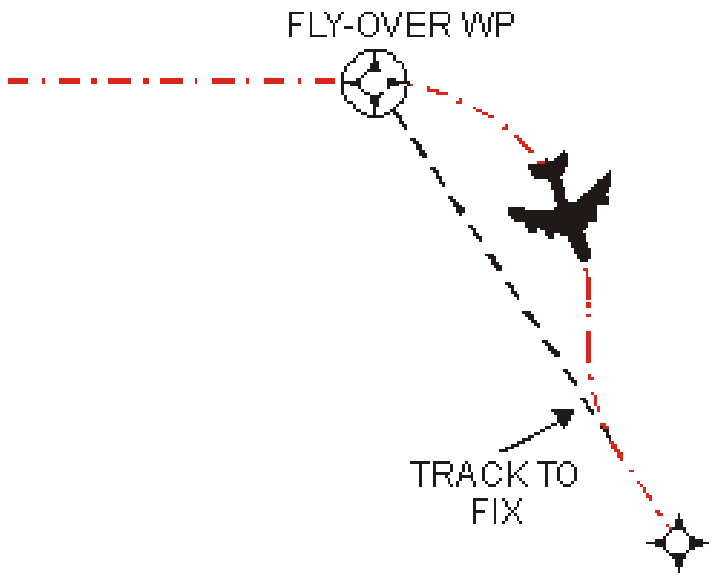


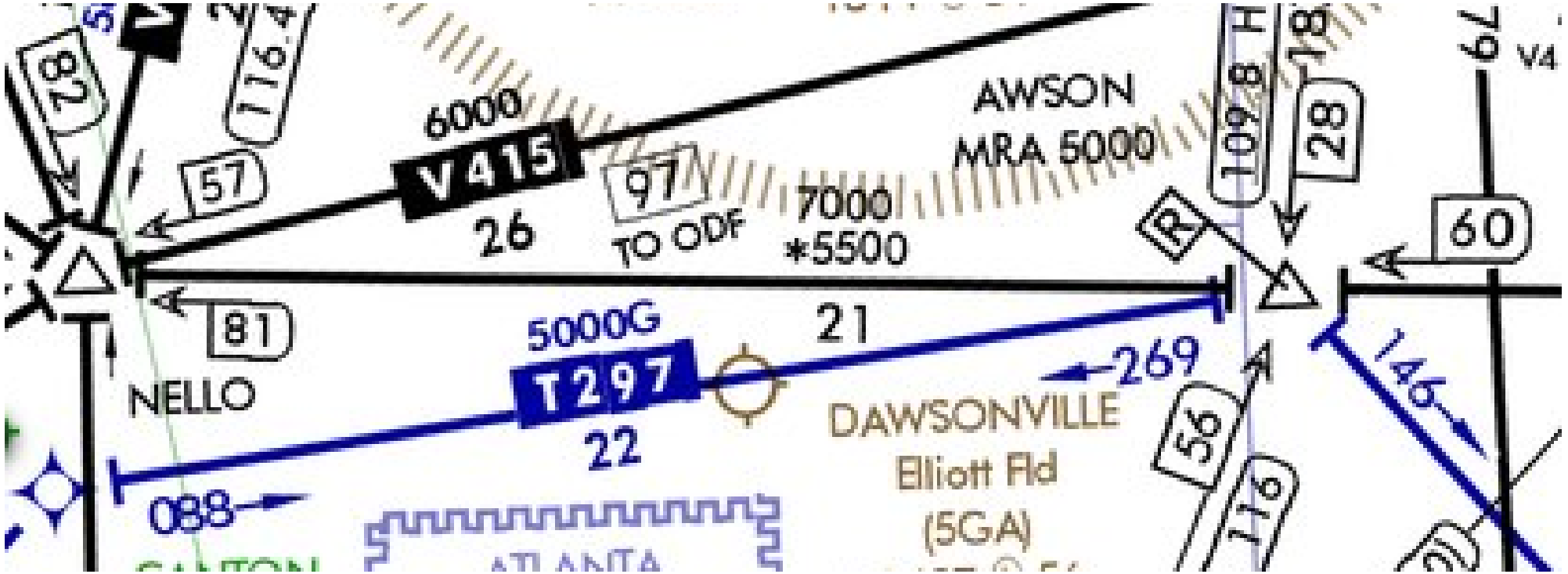
If a GPS point is filled in black it is a mandatory reporting point.

You will always tell ATC when you pass it.

Fly Over vs Fly By







GNSS MEA

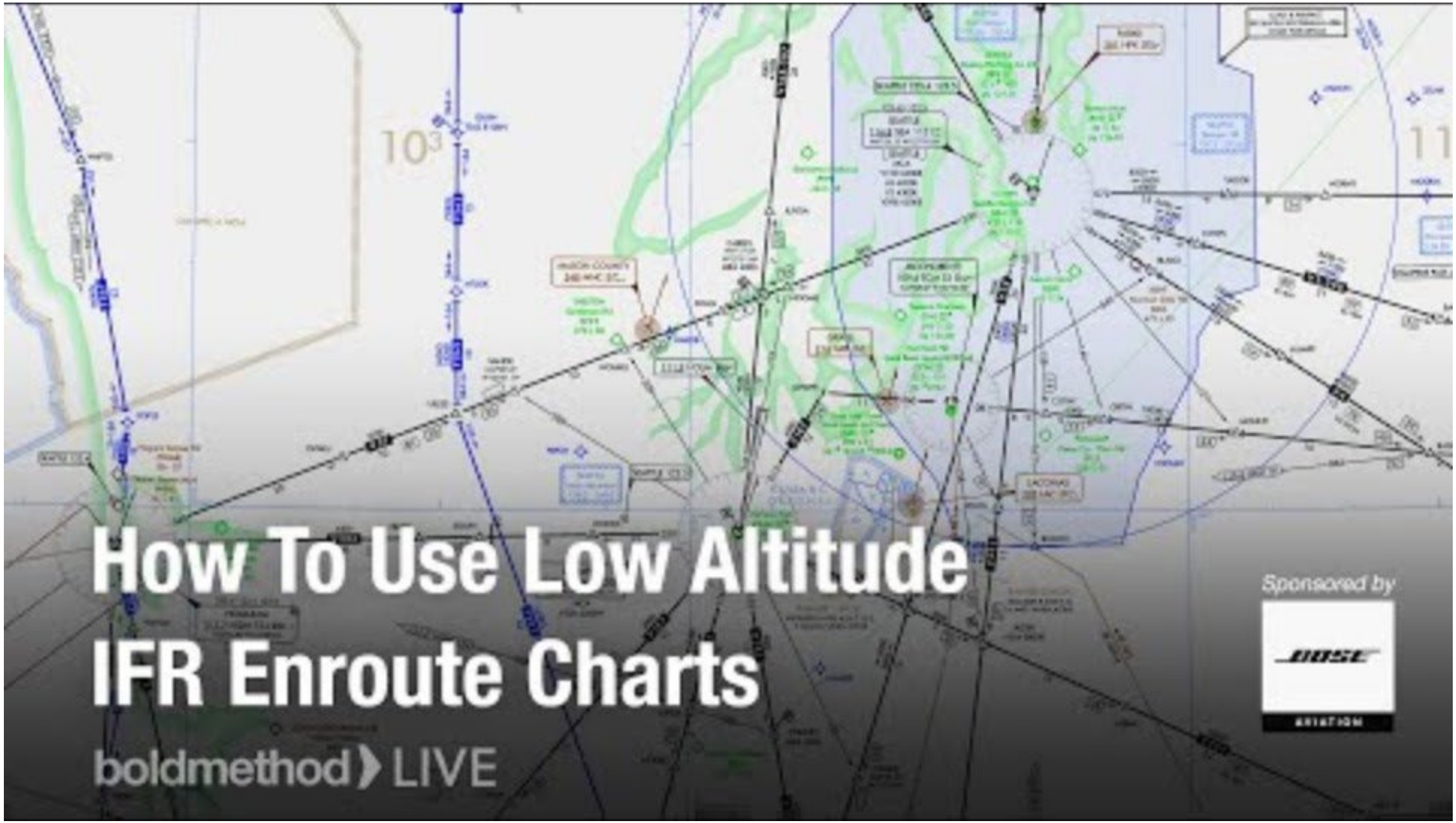
GNSS MEA for each segment is established to ensure obstacle clearance and communications reception.

GNSS MEAs are identified with a "G" suffix.

In the example, 5000G gives you obstacle clearance and has been tested to reach ATC.

NAVAIDs reception are not needed.

https://youtu.be/sOJTK3aA4eE



Any questions I can answer or follow up later on?

Holding Patterns

Lesson Objective

To develop understanding of the elements of holding patterns and then be able to fly a proper holding pattern

What

What

A hold is an IFR maneuver used to keep an airplane in a specific, protected area for a certain amount of time.

Aircraft do not have the ability to pull over like a car.

A holding pattern is used to wait in the air.

I have animals separated into different areas while some are allowed to free travel. I have to highly control some of the animals and keep them separated.

Why

Why

There are various reasons an aircraft may be requested to hold:

- Congestion at the destination airport
- Weather
- Runway closures
- Another aircraft on the IFR approach
- You are at 8000 feet but need to get to 3000 feet

Why Not

You should NOT do holding patterns when ATC does not expect you to. If they expect you to go straight in then request a hold to give yourself more time. They are responsible for you and would have to separate traffic from you.

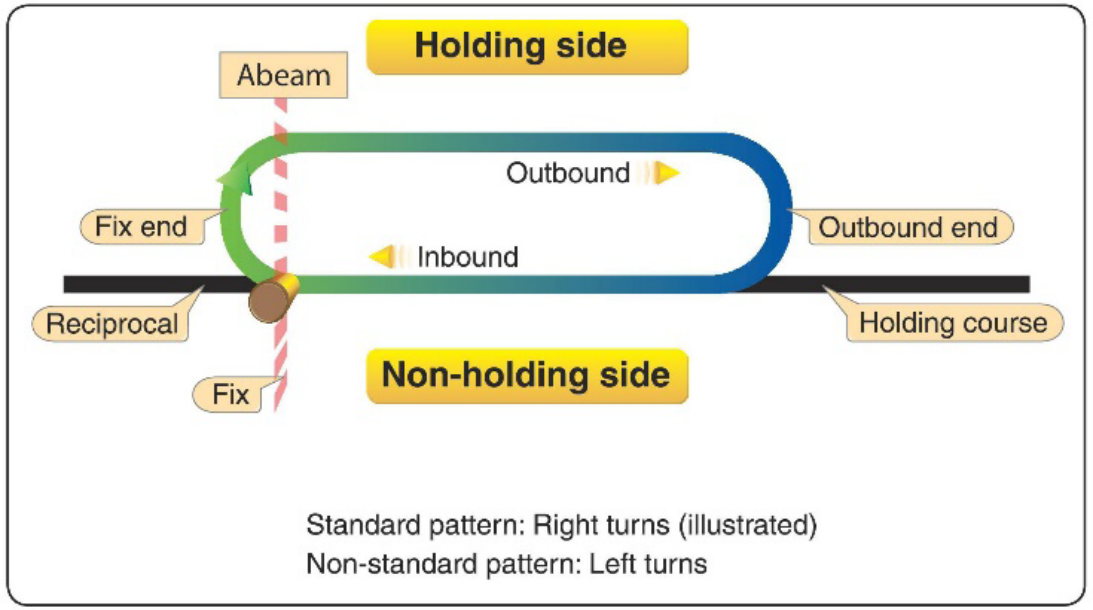
Holding pattern components

- The radial for the inbound leg
- The number of miles or minutes to hold
- Right or left turns

If not specified use right turns

The outbound leg is the reciprocal of the inbound leg

In some cases, you will go around the ‘race track’ once, while other times you are told to hold for 10 or 15 minutes

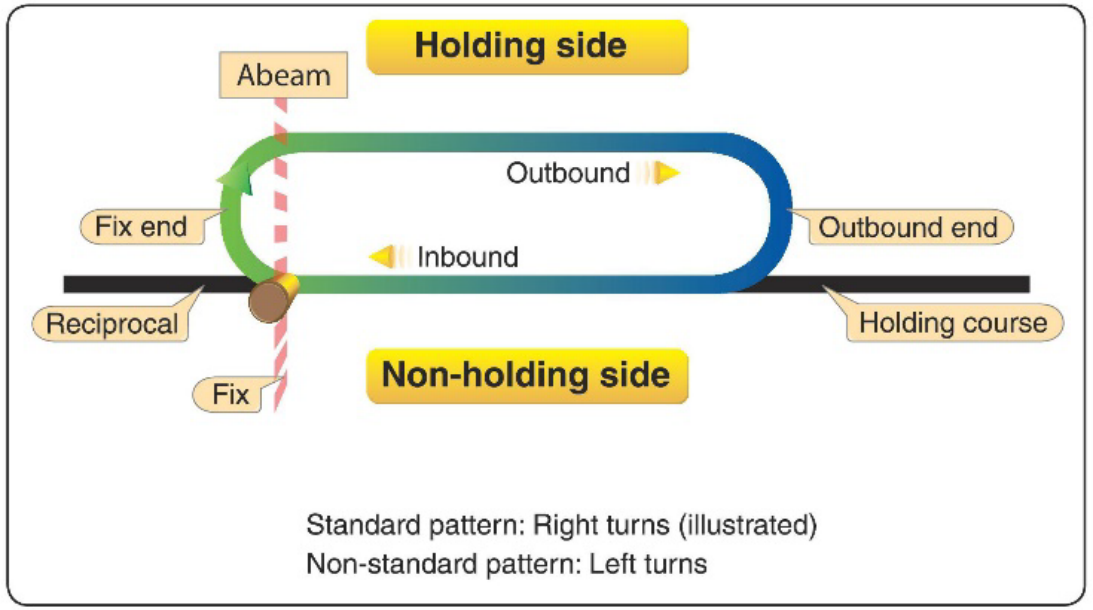


Holding pattern components

Shows a holding pattern holding East with standard turn

Inbound leg = 270

Outbound leg = 090

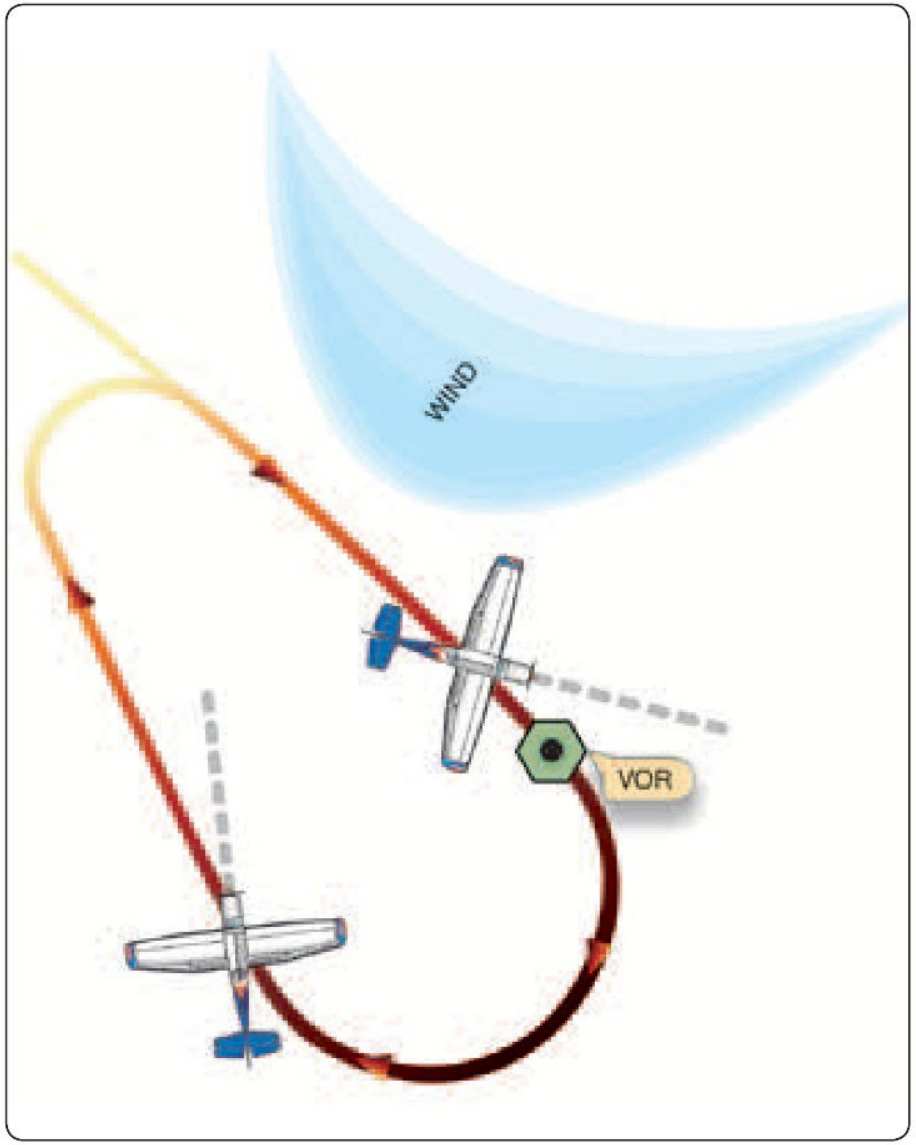


Wind correction

Be aware the outbound and inbound legs are using ground tracks.

You always need to take in consideration the winds.

This shows a plane turning its nose toward the wind to keep on track.

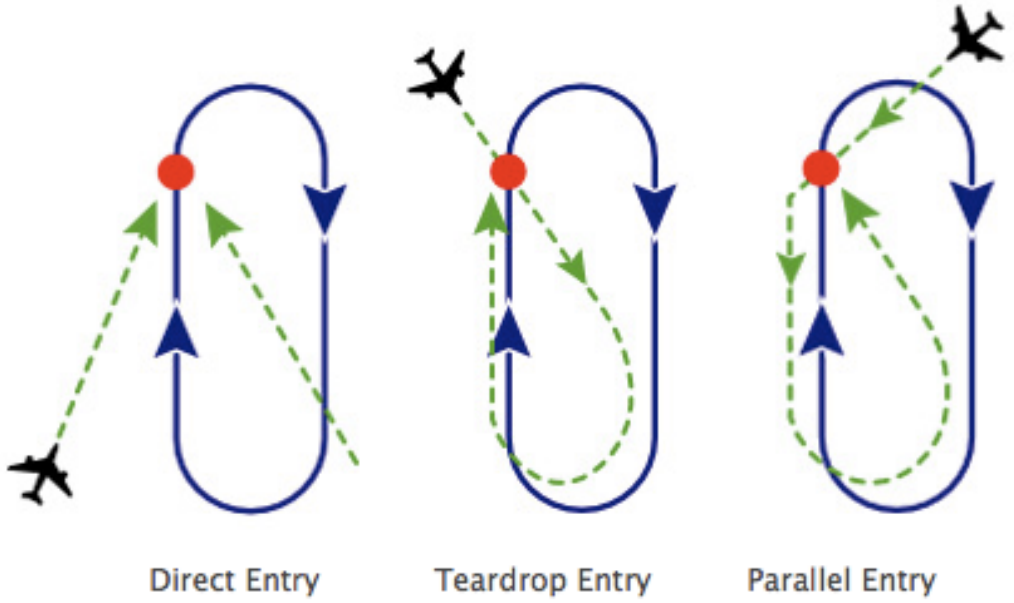


Entry types

Most people can easily fly a holding pattern.

The confusing part can be how you enter it.

Stay in the protected space.



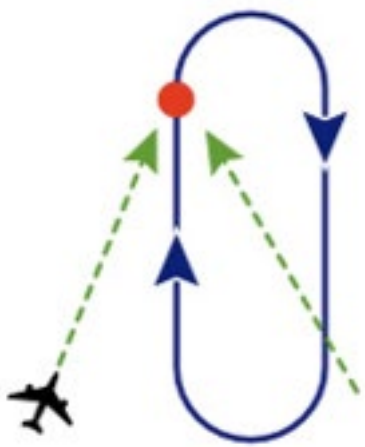
Direct

If you fly over the fix and turn around, it's Direct

Fly towards the VOR/fix

When you pass over it, turn to a heading that matches the outbound leg which will be offset from the inbound leg

Turn to the inbound leg after the specified time/distance



Direct Entry

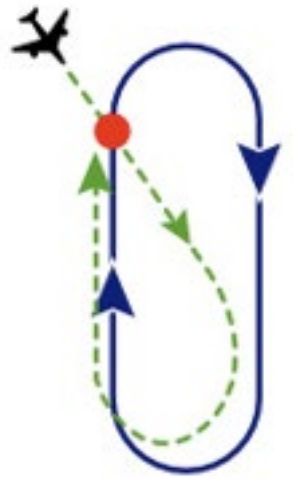
Teardrop

If you fly over the fix into the protected space, it’s a Teardrop

Fly towards the VOR/fix

Fly roughly 30 degrees off the radial you were told to hold on

Turn to the inbound leg after the specified time/distance



Teardrop Entry

Parallel

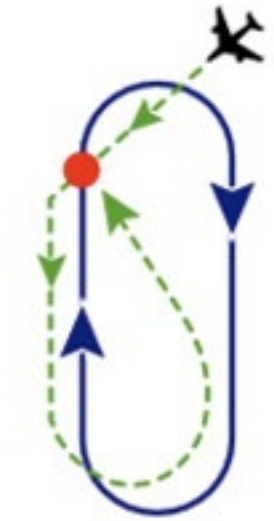
If you fly over the fix and need to fly on the radial to keep inside the protected space, it's Parallel

Fly towards the VOR/fix

When you pass over it, turn to a heading that matches the outbound leg which will be OVER the inbound leg

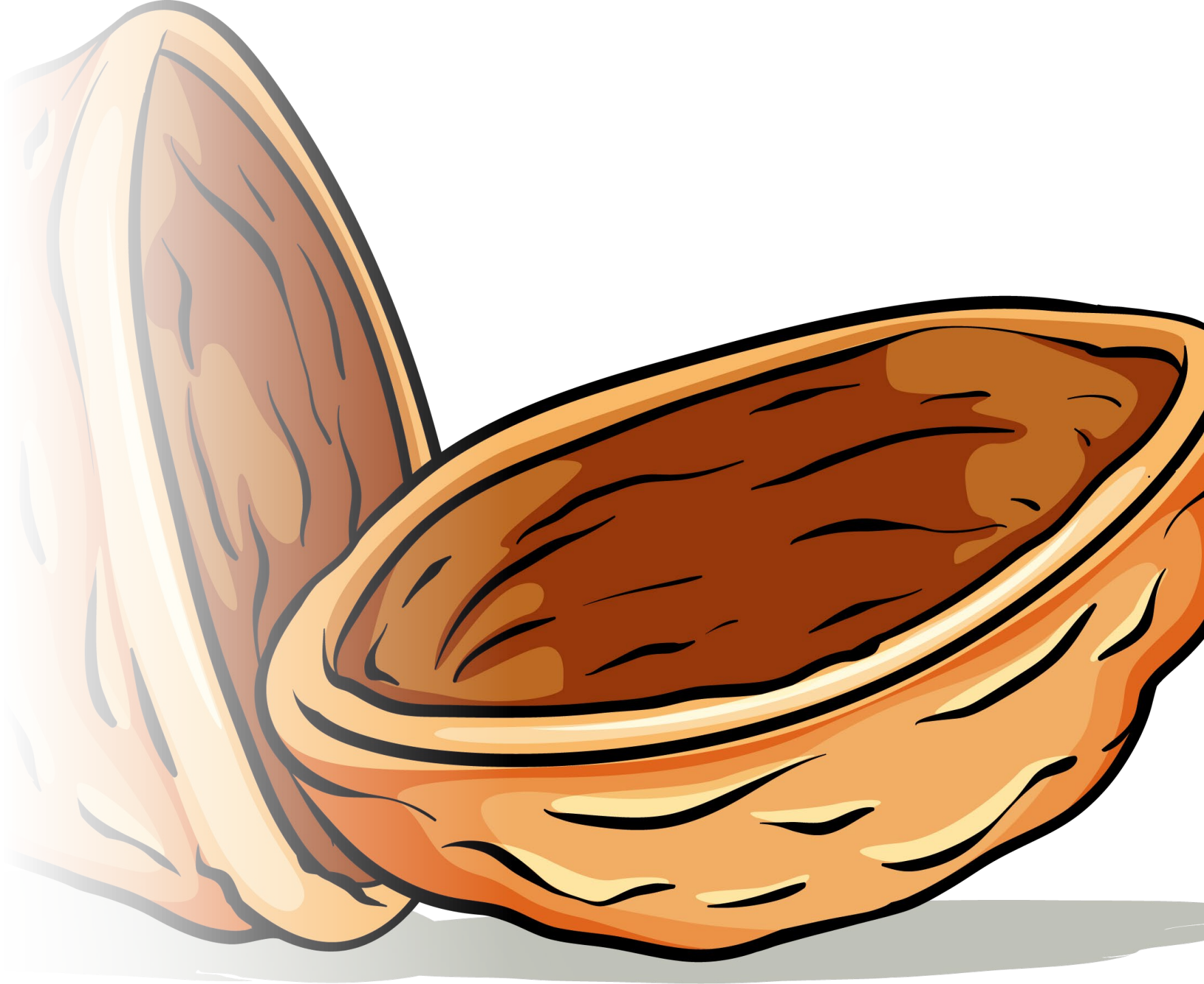
Turn back toward the VOR/fix after the specified time/distance

Then if you are going to 'go around again' do so now as a direct entry



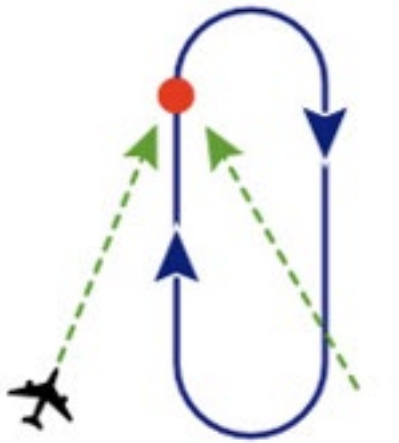
Parallel Entry

In a nutshell…



Direct

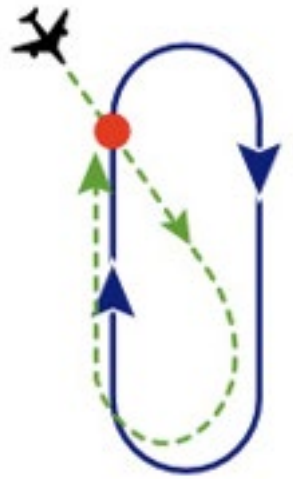
If you fly over the VOR/fix and need to turn back around…it is direct entry



Direct Entry

Teardrop

If you fly over the VOR/fix **into** the holding pattern protected space…it is a teardrop entry

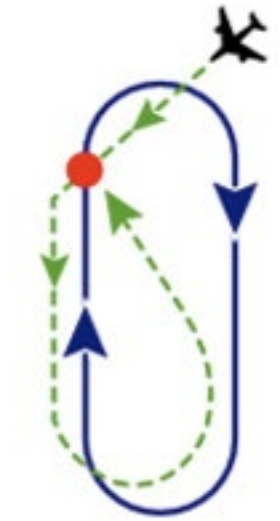


Teardrop Entry

Parallel

If you fly over the VOR/fix and you would end up outside of the protected space if you kept on that heading…it is a parallel entry

You do an opposite turn towards the VOR/fix

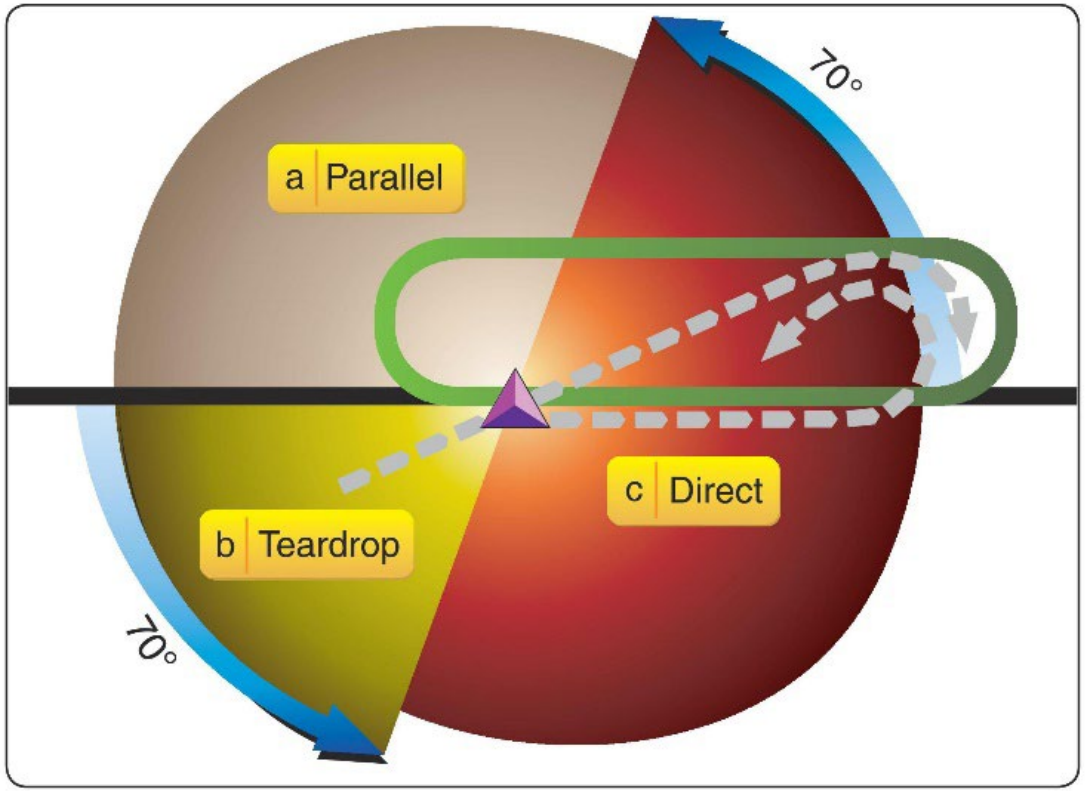


Parallel Entry

How to determine which entry type

To me this is just confusing

Most of the people I know that learned from these type of diagrams still don’t get it



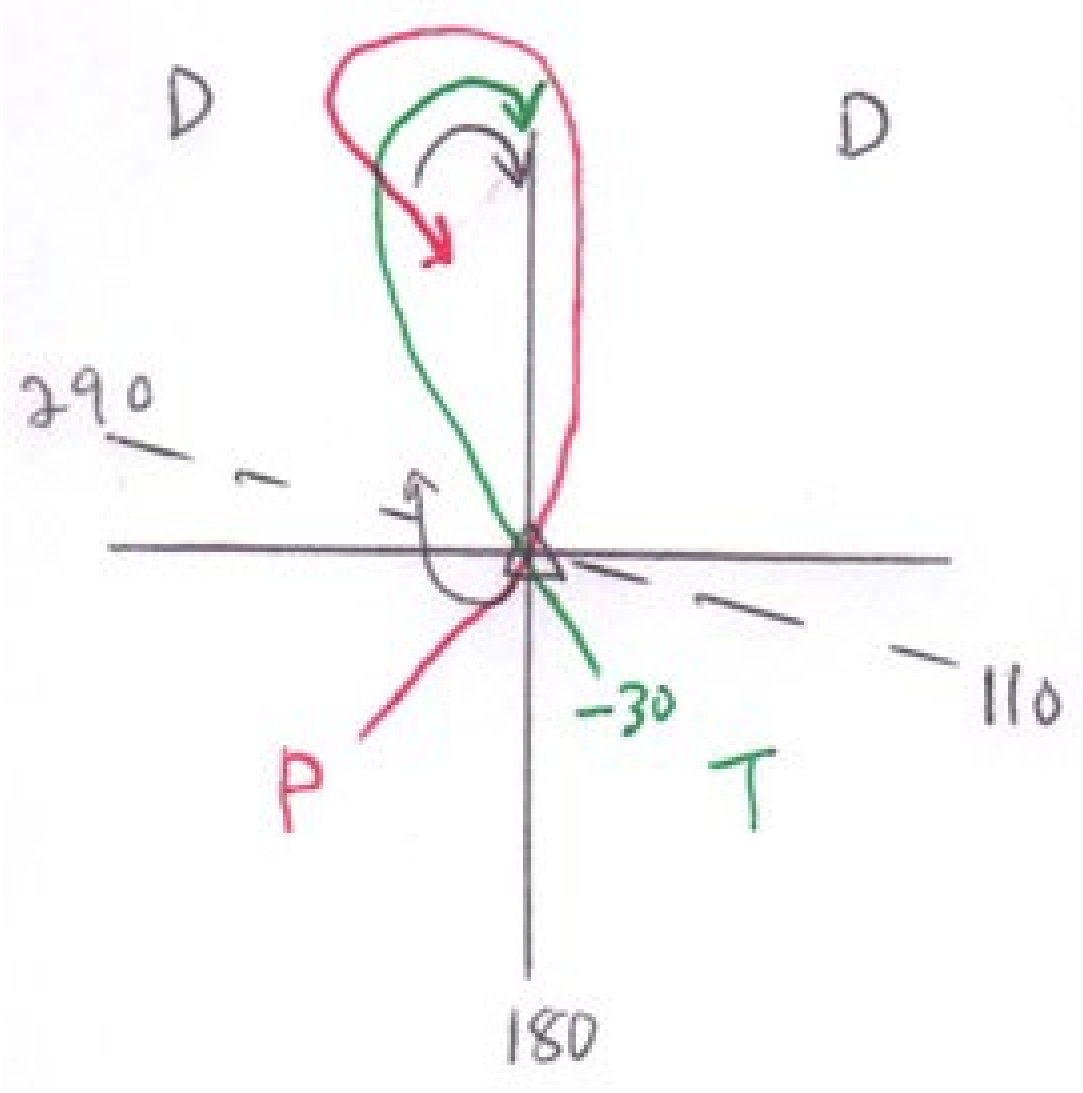
My Standard Holding Pattern Diagram (R)

000 – 110 Direct

110 – 180 Teardrop

180 – 290 Parallel

290 – 360 Direct



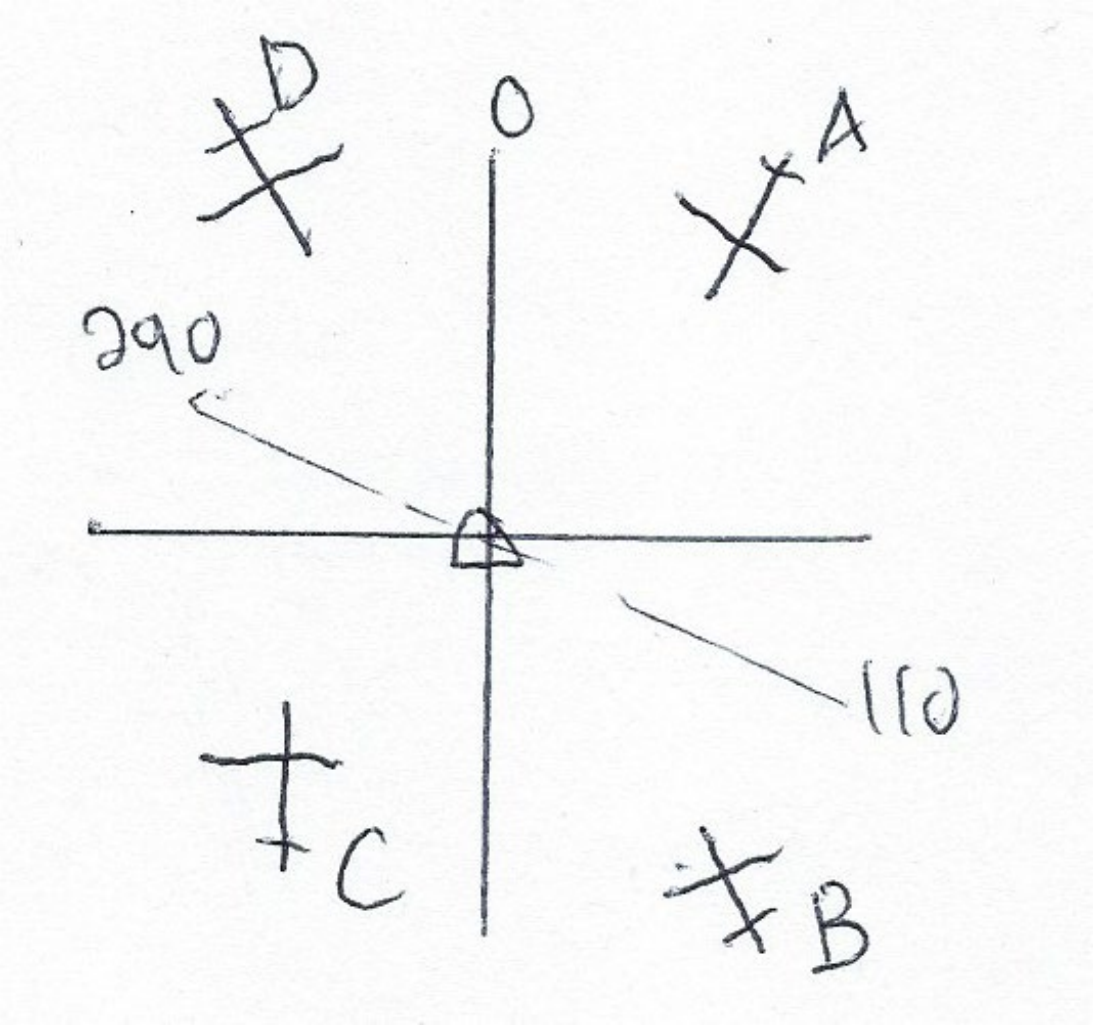
Sketch

A direct

B teardrop

C parallel

D direct



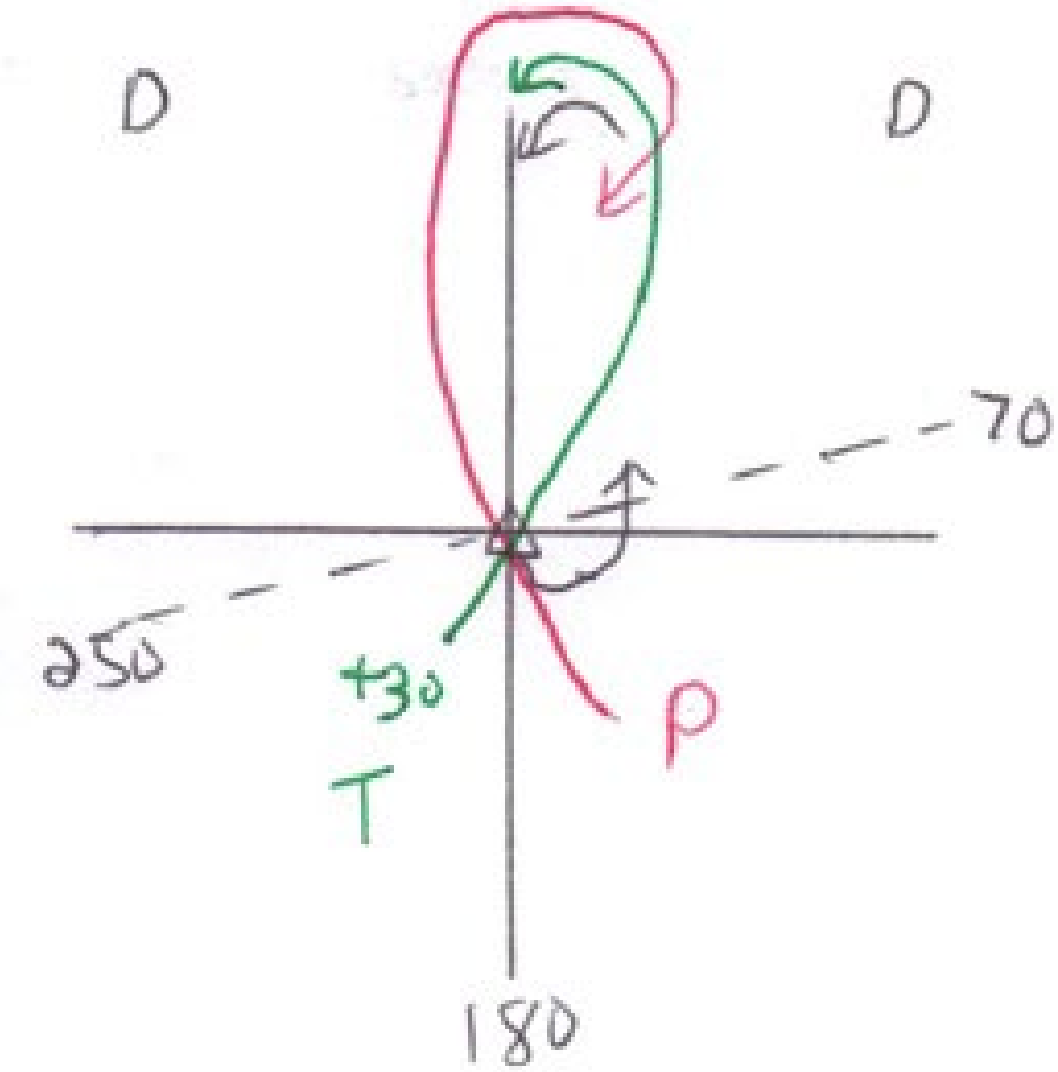
My Standard Holding Pattern Diagram (L)

000 – 070 Direct

070 – 180 Parallel

180 – 250 Teardrop

250 – 360 Direct



Method 1…The Arc

Arc = Opposite of Airplane Heading – Radial

Example #1

Hold west (270) at RMG VOR heading 330

Heading = 330

Bottom of heading indicator = 150

Radial = 270

Arc = 150 – 270 = -120

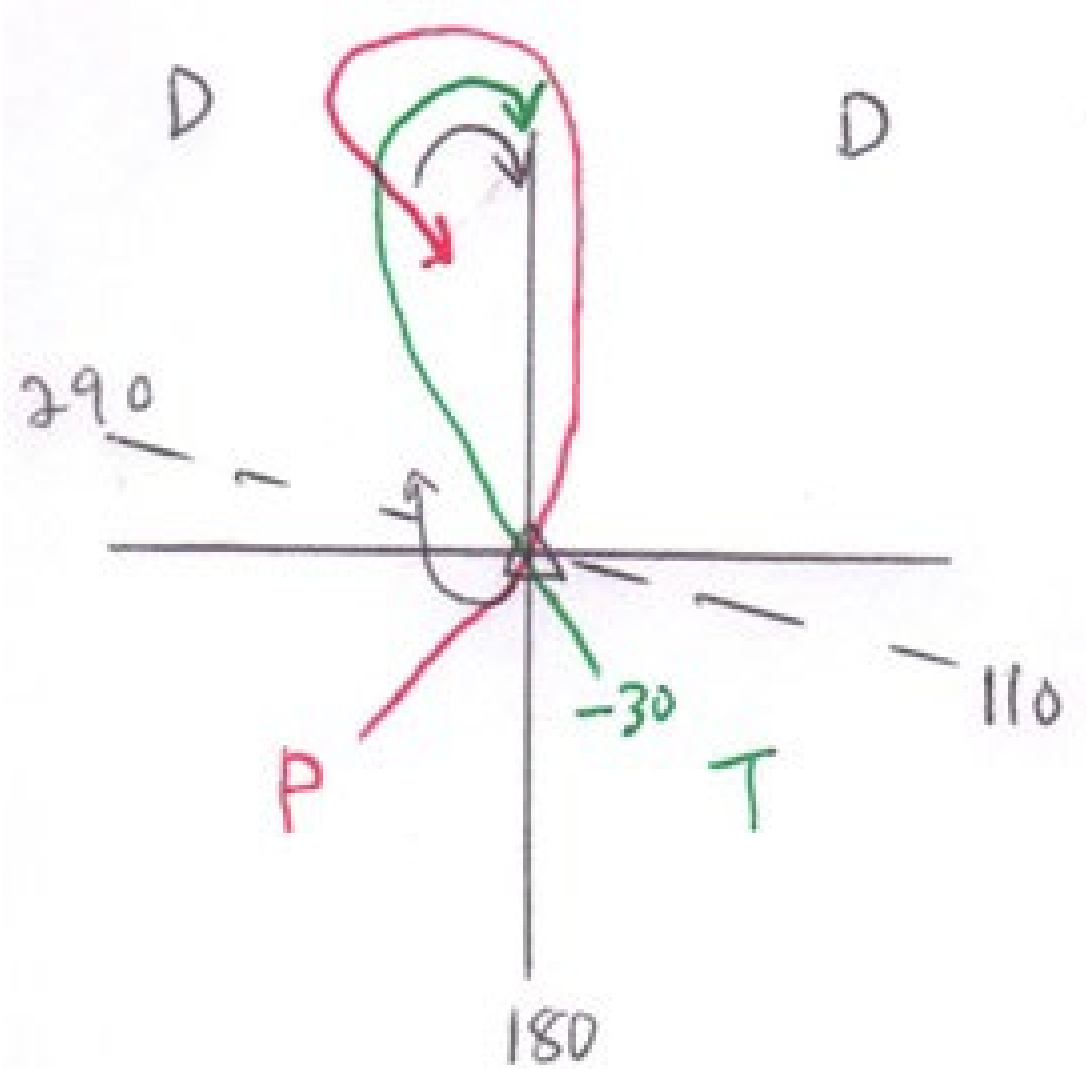
-120 + 360 => 240

Method 1…The Arc

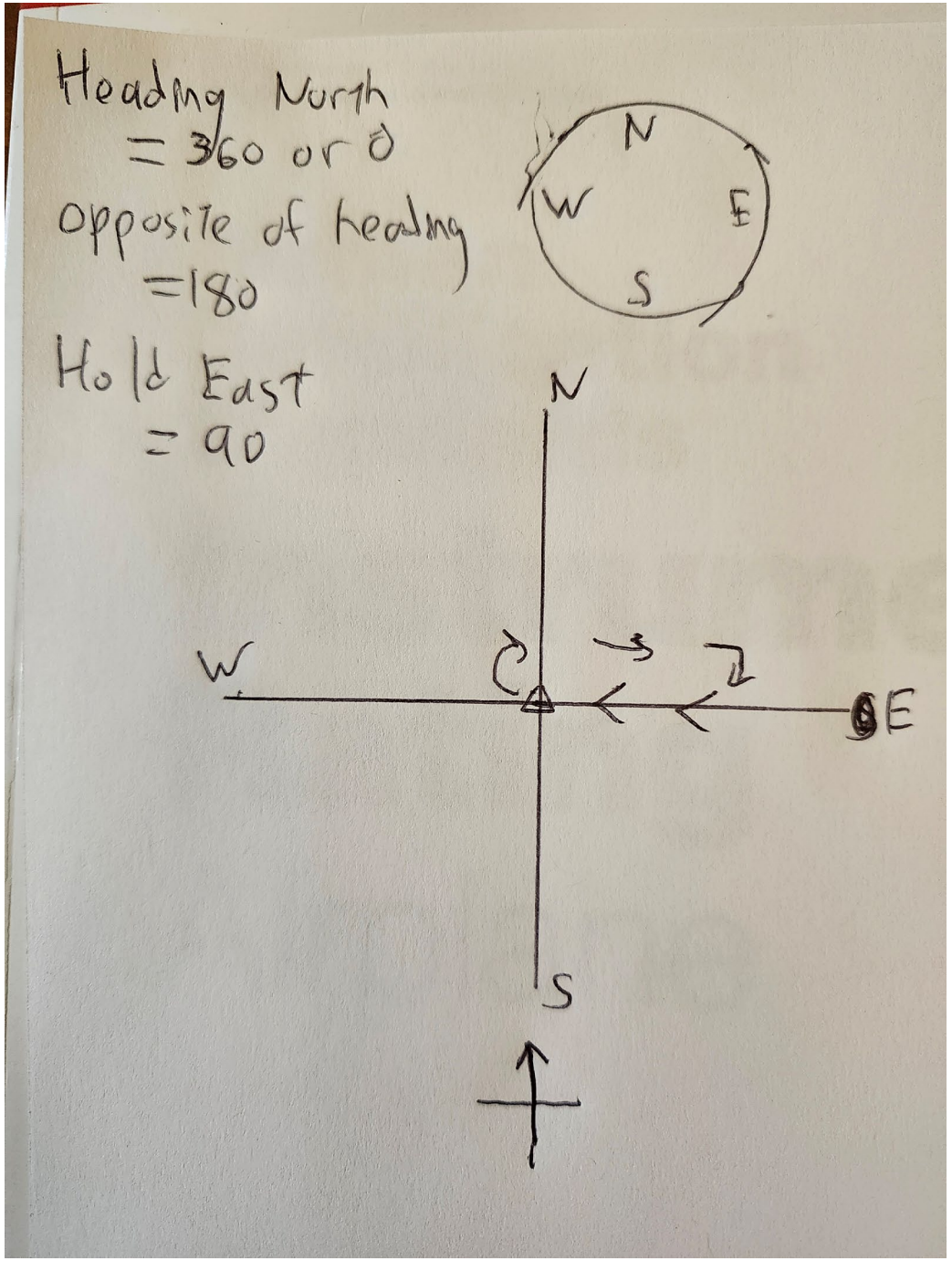
<u>Example #1</u>

Arc = -120 or 240

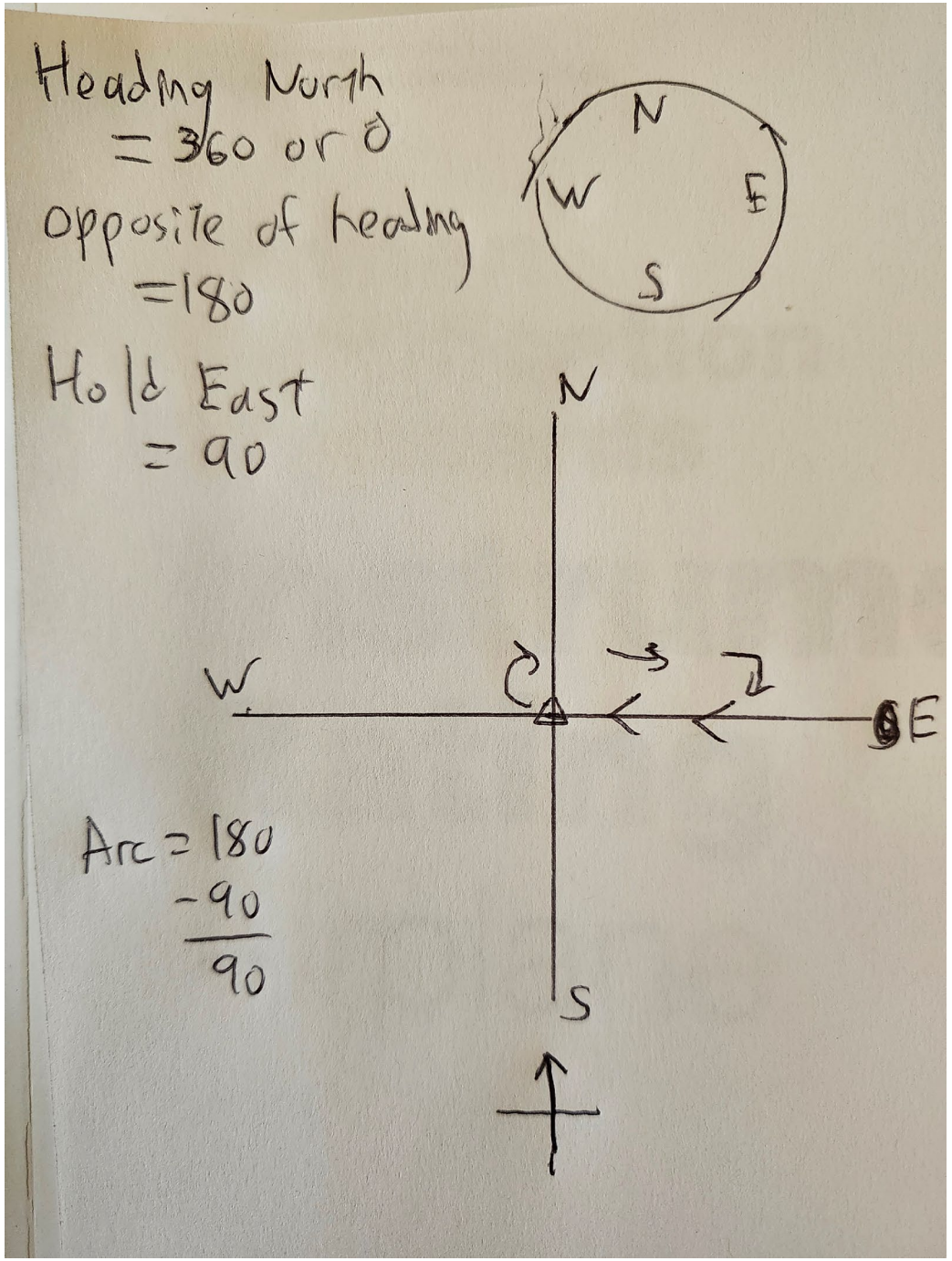
Parallel Entry



Example #2


Heading North
= 360 or 0
opposite of heading
= 180
Hold East
= 90
N
W
E
S
N
W
E
S

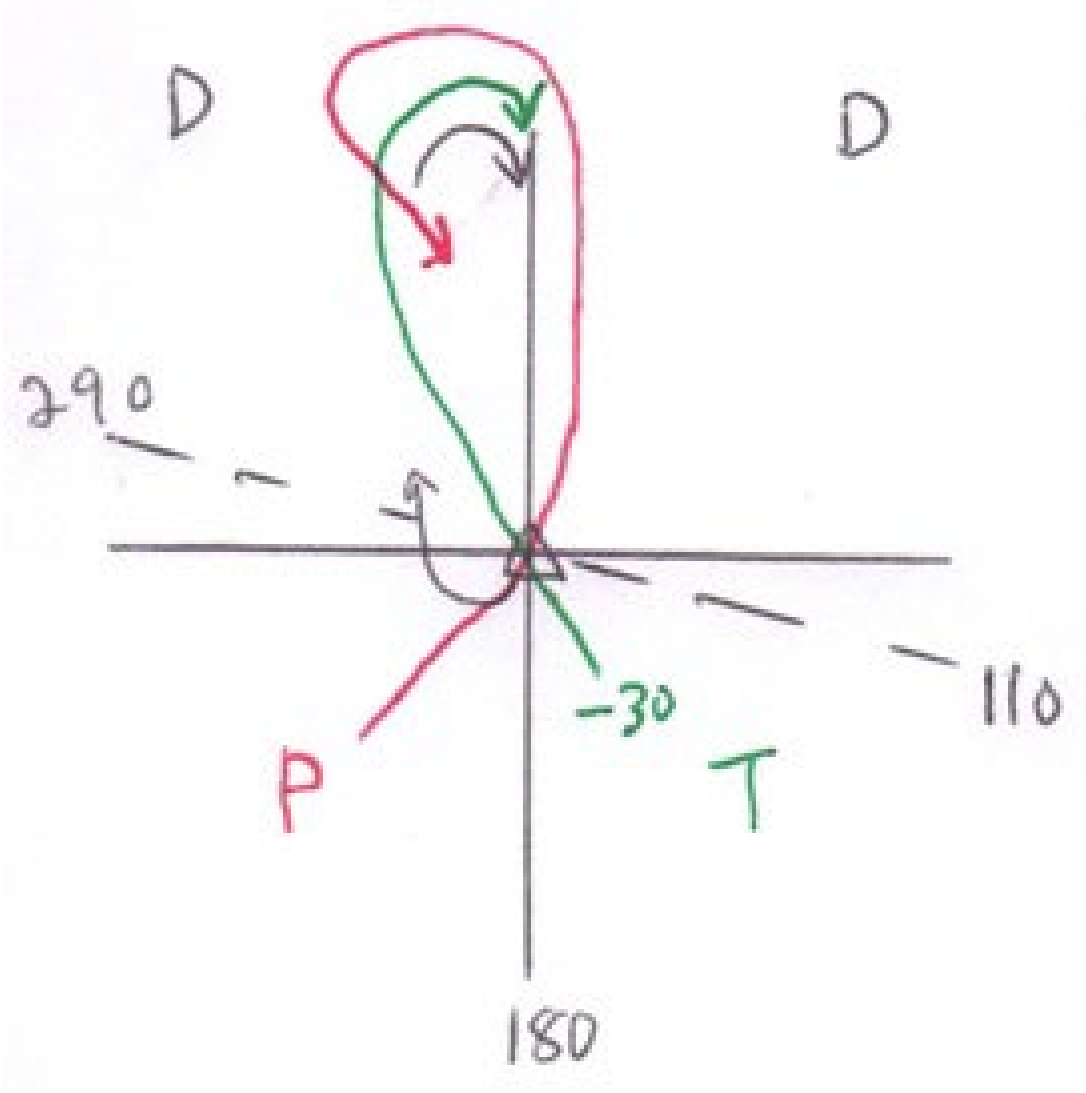
Example #2


Heading North
= 360 or 0
opposite of heading
= 180
Hold East
= 90
N
W
E
S
N
W
E
S
Arc = 180
-90
90

Example #2

Arc = 90

Direct is 0 to 110



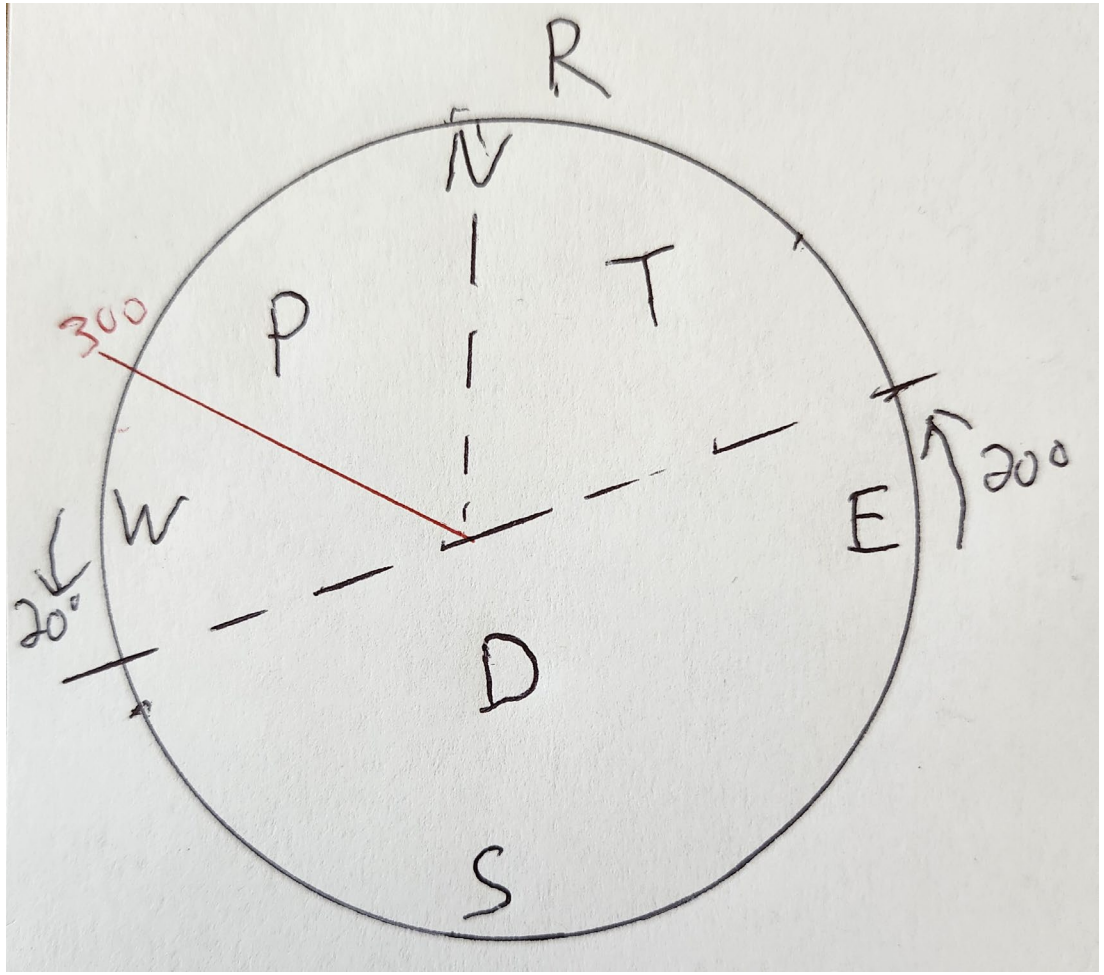
Method 2

<u>For right turns</u>

- Draw a horizontal line that is rotated up on the <u>right</u> side (CCW) 20 degrees
- Draw a vertical line from the middle to the top
- The large section is Direct
- The small section is Teardrop
- The medium section is Parallel

<u>Example</u>

If the outbound leg = 300 then do a Parallel entry



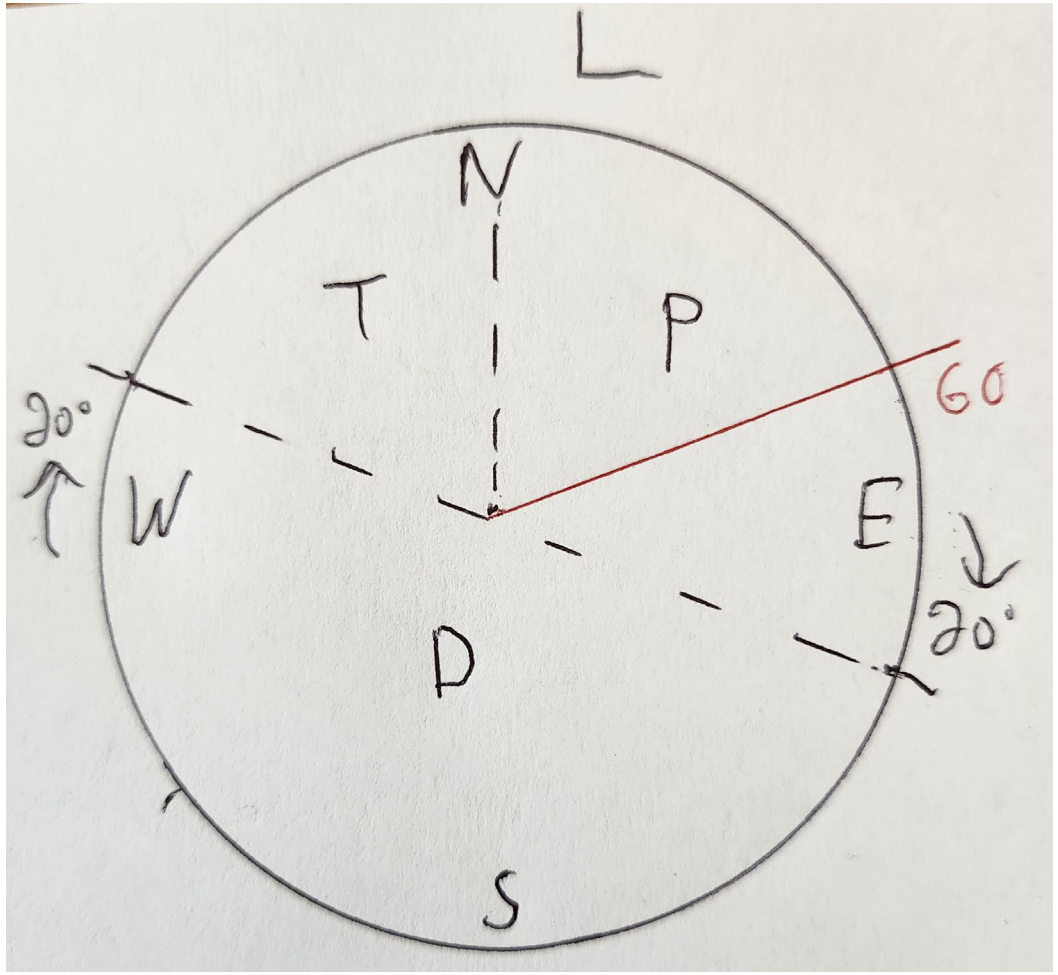
Method 2

<u>For left turns</u>

- Draw a horizontal line that is rotated up on the <u>left</u> side (CW) 20 degrees
- Draw a vertical line from the middle to the top
- The large section is Direct
- The small section is Teardrop
- The medium section is Parallel

<u>Example</u>

If the outbound leg = 60 then do a Parallel entry



Imagining on an HI

Hold on radial 210 right turns

180-210 = -30 => 330

Direct entry

Picture yourself turning around

Imagining on an HI

Hold on radial 330 right turns

180-330 = -150 => 210

Parallel entry

Picture entering and wanting to stay in protected space

Now let's play the holding game

- Pick a spot in the room on the floor…that becomes your VOR/GPS fix
- Stand south facing the VOR/GPS fix
- Hold on 210 right turns

(If needed look back 2 slides)

Now let's play the holding game

- Imagine you are pushing a grocery cart in a store down an aisle…what you are looking for must be on one of the next aisles…you have to do a left or right 180 to the next aisle…direct entry

Now let’s play the holding game

- Use the AvKnow App for random numbers for heading & holding radial
- Have a family member or friend pick two numbers from 0 to 35, then say right or left

Speed Limits

There are speed limits. Maximum holding speeds are established to keep aircraft within the protected holding area during their one-minute (one-minute and a half above 14,000 ft MSL) inbound and outbound legs. For civil aircraft (not military) in the United States, these airspeeds are:

Up to 6,000 ft MSL: 200 KIAS

From 6,001 to 14,000 ft MSL: 230 KIAS

14,001 ft MSL and above: 265 KIAS

Lost Communications

91.185 (c)

(3) Leave clearance limit.

(i) When the clearance limit is a fix from which an approach begins, commence descent or descent and approach as close as possible to the expect-further-clearance (EFC) time if one has been received, or if one has not been received, as close as possible to the estimated time of arrival as calculated from the filed or amended (with ATC) estimated time en route.

(ii) If the clearance limit is not a fix from which an approach begins, leave the clearance limit at the expect-further-clearance (EFC) time if one has been received, or if none has been received, upon arrival over the clearance limit, and proceed to a fix from which an approach begins and commence descent or descent and approach as close as possible to the estimated time of arrival as calculated from the filed or amended (with ATC) estimated time en route.

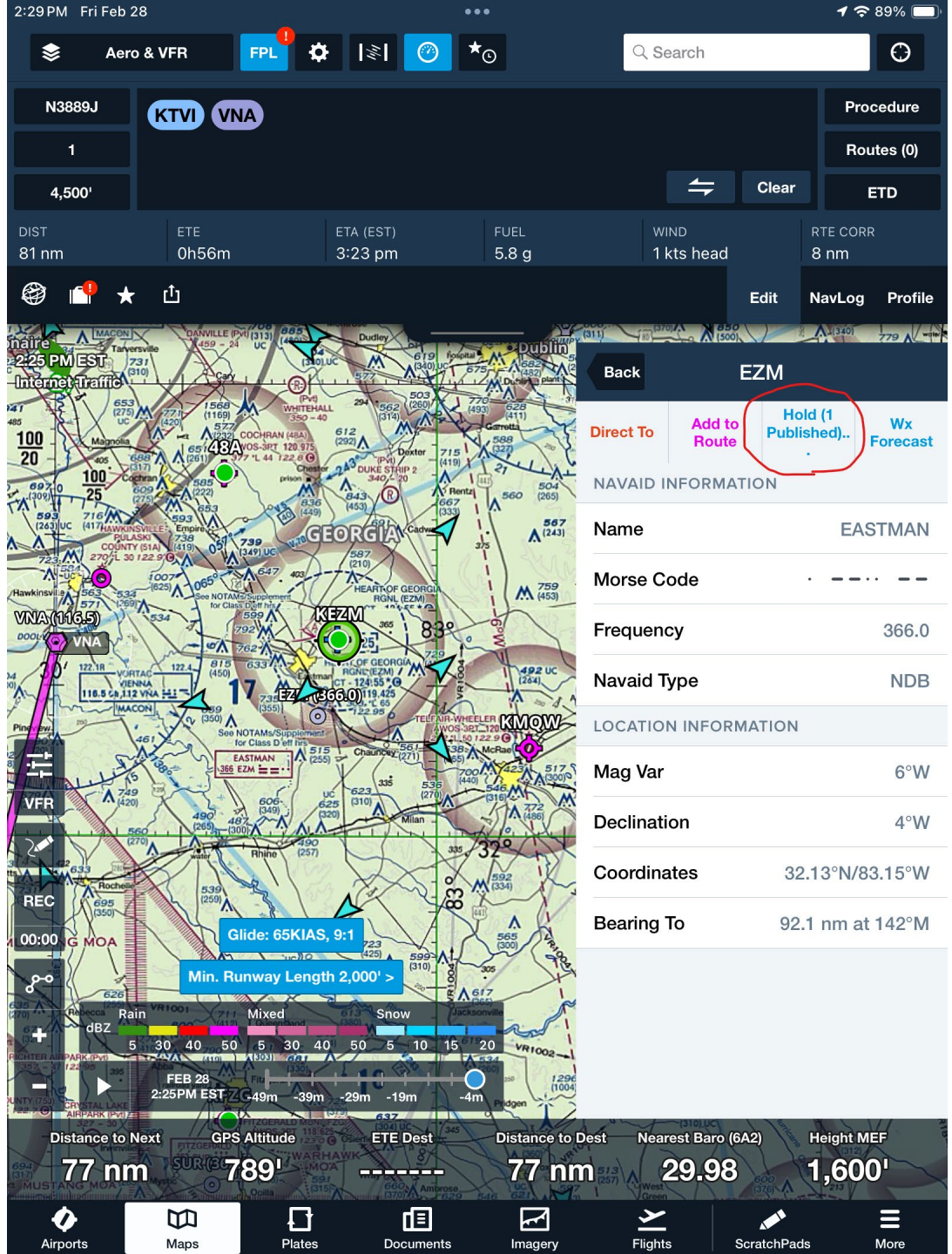
Lost Communications Translation

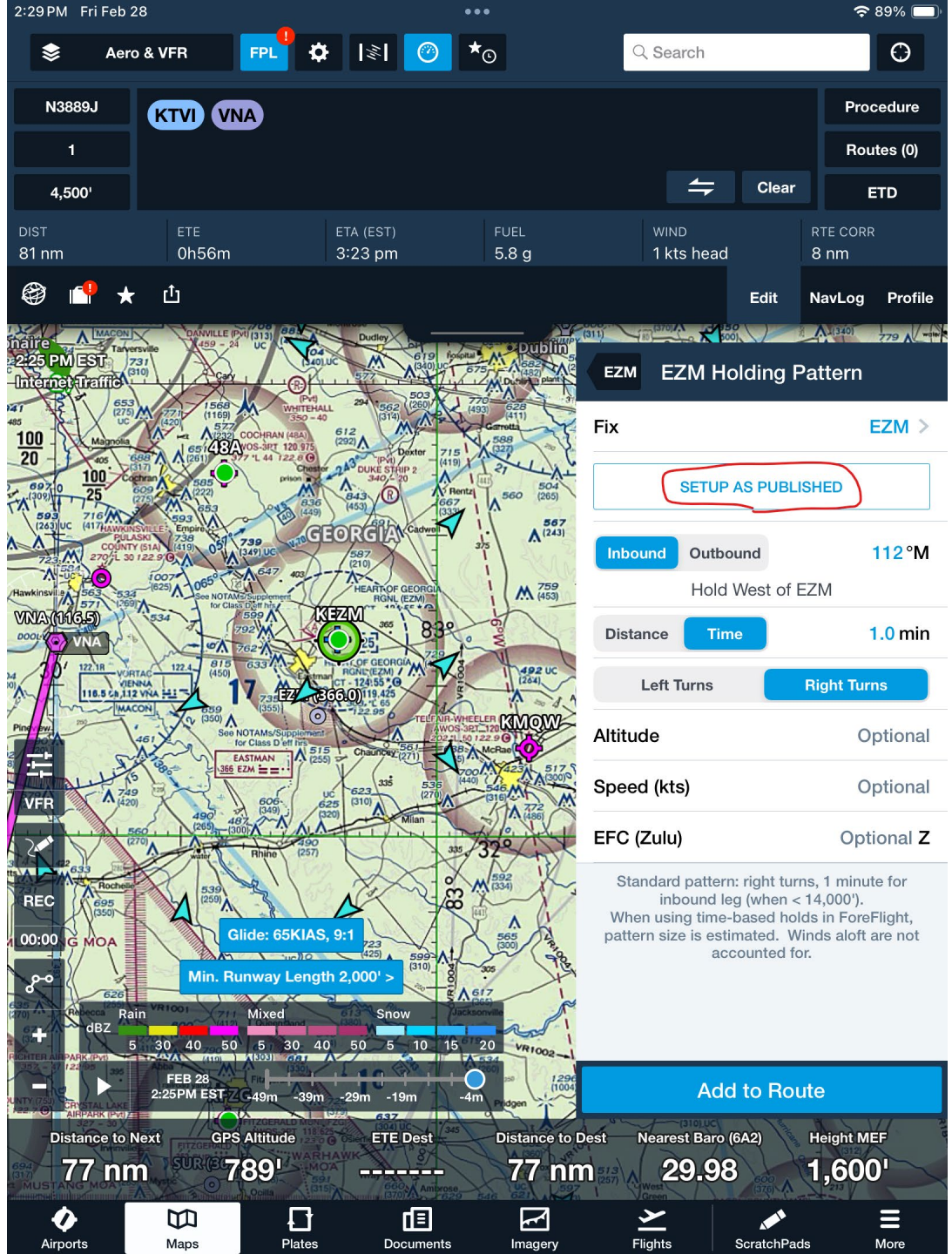
If the clearance limit is an IAF, leave as close as possible to the EFC time, if one has been issued.

If one has not been issued, leave as close as possible to the ETA calculated on the flight plan.

If the clearance limit is not an IAF, leave the fix as close as possible to the EFC time if one has been issued.

If there was no EFC time to leave, depart the fix to where an approach begins and begin descent/approach as close as possible to the ETA calculated on the flight plan.


2:29 PM Fri Feb 28
89%
Aero & VFR
FPL
Search
N3889J
1
4,500'
KTVI
VNA
Procedure
Routes (0)
ETD
Clear
DIST 81 nm
ETE 0h56m
ETA (EST) 3:23 pm
FUEL 5.8 g
WIND 1 kts head
RTE CORR 8 nm
Edit
NavLog
Profile
2:25 PM EST
Internet Traffic
VNA (116.5)
KEZM
KMOW
GEORGIA
Glide: 65KIAS, 9:1
Min. Runway Length 2,000' >
Rain
Mixed
Snow
dBZ
FEB 28
2:25PM EST
Back
EZM
Direct To
Add to Route
Hold (1 Published)..
Wx Forecast
NAVAID INFORMATION
Name EASTMAN
Morse Code · – – · ·· – –
Frequency 366.0
Navaid Type NDB
LOCATION INFORMATION
Mag Var 6°W
Declination 4°W
Coordinates 32.13°N/83.15°W
Bearing To 92.1 nm at 142°M
Distance to Next 77 nm
GPS Altitude 789'
ETE Dest --------
Distance to Dest 77 nm
Nearest Baro (6A2) 29.98
Height MEF 1,600'
Airports
Maps
Plates
Documents
Imagery
Flights
ScratchPads
More


2:29 PM Fri Feb 28
89%
Aero & VFR
FPL
Search
N3889J
1
4,500'
KTVI
VNA
Procedure
Routes (0)
ETD
Clear
DIST 81 nm
ETE 0h56m
ETA (EST) 3:23 pm
FUEL 5.8 g
WIND 1 kts head
RTE CORR 8 nm
Edit
NavLog
Profile
2:25 PM EST
Internet Traffic
GEORGIA
KEZM
VNA (116.5)
VNA
KMOW
48A
Glide: 65KIAS, 9:1
Min. Runway Length 2,000' >
Rain
Mixed
Snow
dBZ
FEB 28
2:25PM EST
VFR
REC
00:00
EZM
EZM Holding Pattern
Fix
EZM
SETUP AS PUBLISHED
Inbound
Outbound
112 °M
Hold West of EZM
Distance
Time
1.0 min
Left Turns
Right Turns
Altitude
Optional
Speed (kts)
Optional
EFC (Zulu)
Optional Z
Standard pattern: right turns, 1 minute for inbound leg (when < 14,000').
When using time-based holds in ForeFlight, pattern size is estimated. Winds aloft are not accounted for.
Add to Route
Distance to Next
77 nm
GPS Altitude
789'
ETE Dest
Distance to Dest
77 nm
Nearest Baro (6A2)
29.98
Height MEF
1,600'
Airports
Maps
Plates
Documents
Imagery
Flights
ScratchPads
More

Any questions I can answer or follow up later on?

The Pilots

§ 61.51 Pilot logbooks

(g) Logging instrument time.

(1) A person may log instrument time only for that flight time when the person operates the aircraft solely by reference to instruments under actual or simulated instrument flight conditions.

(2) An authorized instructor may log instrument time when conducting instrument flight instruction in actual instrument flight conditions.

(3) For the purposes of logging instrument time to meet the recent instrument experience requirements of § 61.57(c) of this part, the following information must be recorded in the person's logbook—

(i) The location and type of each instrument approach accomplished; and

(ii) The name of the safety pilot, if required.

§ 61.51 Pilot logbooks

(4) A person may use time in a full flight simulator, flight training device, or aviation training device for acquiring instrument aeronautical experience for a pilot certificate or rating provided an authorized instructor is present to observe that time and signs the person's logbook or training record to verify the time and the content of the training session.

(5) A person may use time in a full flight simulator, flight training device, or aviation training device for satisfying instrument recency experience requirements provided a logbook or training record is maintained to specify the training device, time, and the content.

§ 61.51 Pilot logbooks

<u>How I log practice approaches using the TD2 BATD</u>

GA62 PECAT KFFC EQQ KCCO PILRE KFFC PECAT KFFC

Approach(es): KFFC ILS 31 KCCO ILS 33 KFFC GPS 13 KFFC ILS 31 (VECTORS)

3 ILS Approach(es)

1 RNAV/GPS Approach(es)

KHMP PRATZ SSONY KPXE

used VOR and LOC for NAV mostly after passing PRATZ

did not have a slide slope

Approach(es): KPXE ILS 36 (2)

2 Localizer Approach(es)

When is Instrument Rating Required

§ 61.3 Requirement for certificates, ratings, and authorizations.

(e) Instrument rating. No person may act as pilot in command of a civil aircraft under IFR or in weather conditions less than the minimums prescribed for VFR flight unless that person holds:

(1) The appropriate aircraft category, class, type (if required), and instrument rating on that person's pilot certificate for any airplane, helicopter, or powered-lift being flown;

(2) An airline transport pilot certificate with the appropriate aircraft category, class, and type rating (if required) for the aircraft being flown;

When is Instrument Rating Required

§ 61.133 Commercial pilot privileges and limitations.

(1) A person who applies for a commercial pilot certificate with an airplane category or powered-lift category rating and does not hold an instrument rating in the same category and class will be issued a commercial pilot certificate that contains the limitation, “The carriage of passengers for hire in (airplanes) (powered-lifts) on cross-country flights in excess of 50 nautical miles or at night is prohibited.” The limitation may be removed when the person satisfactorily accomplishes the requirements listed in § 61.65 of this part for an instrument rating in the same category and class of aircraft listed on the person's commercial pilot certificate.

When is Instrument Rating Required

§ 91.135 Operations in Class A airspace.

Except as provided in paragraph (d) of this section, each person operating an aircraft in Class A airspace must conduct that operation under instrument flight rules (IFR) and in compliance with the following:

(a) Clearance. Operations may be conducted only under an ATC clearance received prior to entering the airspace.

(b) Communications. Unless otherwise authorized by ATC, each aircraft operating in Class A airspace must be equipped with a two-way radio capable of communicating with ATC on a frequency assigned by ATC. Each pilot must maintain two-way radio communications with ATC while operating in Class A airspace.

(c) Equipment requirements. Unless otherwise authorized by ATC, no person may operate an aircraft within Class A airspace unless that aircraft is equipped with the applicable equipment specified in § 91.215, and after January 1, 2020, § 91.225.

(d) ATC authorizations. An operator may deviate from any provision of this section under the provisions of an ATC authorization issued by the ATC facility having jurisdiction of the airspace concerned. In the case of an inoperative transponder, ATC may immediately approve an operation within a Class A airspace area allowing flight to continue, if desired, to the airport of ultimate destination, including any intermediate stops, or to proceed to a place where suitable repairs can be made, or both. Requests for deviation from any provision of this section must be submitted in writing, at least 4 days before the proposed operation. ATC may authorize a deviation on a continuing basis or for an individual flight.

When is Instrument Rating Required

§ 91.157 Special VFR weather minimums.

(a) Except as provided in appendix D, section 3, of this part, special VFR operations may be conducted under the weather minimums and requirements of this section, instead of those contained in § 91.155, below 10,000 feet MSL within the airspace contained by the upward extension of the lateral boundaries of the controlled airspace designated to the surface for an airport.

(b) Special VFR operations may only be conducted—

(1) With an ATC clearance;

(2) Clear of clouds;

(3) Except for helicopters, when flight visibility is at least 1 statute mile; and

(4) Except for helicopters, between sunrise and sunset (or in Alaska, when the sun is 6 degrees or less below the horizon) unless—

(i) The person being granted the ATC clearance meets the applicable requirements for instrument flight under part 61 of this chapter; and

(ii) The aircraft is equipped as required in § 91.205(d).

When is Instrument Rating Required

(c) No person may take off or land an aircraft (other than a helicopter) under special VFR—

(1) Unless ground visibility is at least 1 statute mile; or

(2) If ground visibility is not reported, unless flight visibility is at least 1 statute mile. For the purposes of this paragraph, the term flight visibility includes the visibility from the cockpit of an aircraft in takeoff position if:

(i) The flight is conducted under this part 91; and

(ii) The airport at which the aircraft is located is a satellite airport that does not have weather reporting capabilities.

Safety Pilot

- Must have at least a Private Pilot Certificate
- Must be rated in the category and class (ASEL etc)
- Current medical
- Aircraft must have dual controls

Currency

§ 61.57 Recent flight experience: Pilot in command.

(c) Instrument experience. Except as provided in paragraph (e) of this section, a person may act as pilot in command under IFR or weather conditions less than the minimums prescribed for VFR only if:

(1) Use of an airplane, powered-lift, helicopter, or airship for maintaining instrument experience. **Within the 6 calendar months preceding the month of the flight**, that person performed and logged at least the following tasks and iterations in an airplane, powered-lift, helicopter, or airship, as appropriate, for the instrument rating privileges to be maintained in actual weather conditions, or under simulated conditions using a view-limiting device that involves having performed the following—

(i) **Six instrument approaches**.

(ii) **Holding procedures and tasks**.

(iii) **Intercepting and tracking** courses through the use of navigational electronic systems.

Currency

(2) Use of a full flight simulator, flight training device, or aviation training device for maintaining instrument experience. A pilot may accomplish the requirements in paragraph (c)(1) of this section in a full flight simulator, flight training device, or aviation training device provided the device represents the category of aircraft for the instrument rating privileges to be maintained and the pilot performs the tasks and iterations in simulated instrument conditions. A person may complete the instrument experience in any combination of an aircraft, full flight simulator, flight training device, or aviation training device.

Currency

(d) Instrument proficiency check.

(1) Except as provided in paragraph (e) of this section, a person who has failed to meet the instrument experience requirements of paragraph (c) of this section for more than six calendar months may reestablish instrument currency only by completing an instrument proficiency check.

Currency

Basically within 6 months

6 Approaches

At least one holding procedure

Intercept and track courses which is usually part of getting to the start of the approach or the en route environment

You can do them in an approved simulator like a TD2 without an instructor or another pilot watching over you

If not, you have another 6 months to do it but you can not legally file IFR without someone who is current

If you go past a year, only an IPC by a CFII or exminer will get you current

Any questions I can answer or follow up later on?

IFR Navigation and Flight Planning

In Addition to the VFR Navigation and Flight Planning Lesson

Slides with * are also in VFR slides

From airport to airport

Our plan is to get from here to there…without hitting anything along the way

IFR Phases

Departure

En route

Arrival

Approach

§ 91.103 Preflight action *

Each pilot in command shall, before beginning a flight, become familiar with all available information concerning that flight. This information must include—

(a) For a flight under IFR or a flight not in the vicinity of an airport, weather reports and forecasts, fuel requirements, alternatives available if the planned flight cannot be completed, and any known traffic delays of which the pilot in command has been advised by ATC;

§ 91.103 Preflight action *

(b) For any flight, runway lengths at airports of intended use, and the following takeoff and landing distance information:

(1) For civil aircraft for which an approved Airplane or Rotorcraft Flight Manual containing takeoff and landing distance data is required, the takeoff and landing distance data contained therein; and

(2) For civil aircraft other than those specified in paragraph (b)(1) of this section, other reliable information appropriate to the aircraft, relating to aircraft performance under expected values of airport elevation and runway slope, aircraft gross weight, and wind and temperature.

§ 91.103 Preflight action – NW KRAFT

N - NOTAMs

W - Weather reports and forecasts

K - Known traffic delays

R - Runway length of intended use

A - Alternatives

F - Fuel Requirements

T - Takeoff and landing performance data

§ 91.169 1-2-3 Forecast Rule

- For +/- **1** hour, if less than **2**000 feet and/or **3** SM visibility then you need an alternate
- Alternate must have VFR, 600/2 for precision, or 800/2 for non-precision
- If there are no approaches at alternate you must be able to land VFR
- When you **arrive** at the alternate, the minimums can be approach minimums

Alternate Airports

Does your chosen alternate have non-standard alternate requirements that can be complied with?

Look for the black triangle around a letter A

Is your airplane equipped with a WAAS GPS?

Yes = You may plan your flight to airports with only RNAV approaches at BOTH the destination AND the alternate

No = You may plan your flight to airports with only RNAV approaches at EITHER the destination OR the alternate, but not both

§ 91.173 When MUST you file a flight plan

- When operating in Class A airspace
- In Class E airspace when IMC exists
- Must be filed PRIOR to entering controlled airspace in IMC

§ 91.167 Fuel requirements

(a) No person may operate a civil aircraft in IFR conditions unless it carries enough fuel (considering weather reports and forecasts and weather conditions) to—

(1) Complete the flight to the first airport of intended landing;

(2) Except as provided in paragraph (b) of this section, fly from that airport to the alternate airport; and

(3) Fly after that for 45 minutes at normal cruising speed or, for helicopters, fly after that for 30 minutes at normal cruising speed.

AIM 5-3-3 Required Reporting

- Any un-forecasted weather conditions (§ 91.183)
- When vacating any previously assigned altitude for a newly assigned altitude
- When unable to climb/descend at a rate of at least 500 feet per minute
- A change in the average true airspeed by 10 knots or varies by 5% (whichever is greater) from the flight plan
- Any loss of or anomalies in navigation equipment
- Reaching a holding fix or a point to where you were previously cleared
- Any information relating to the safety of flight

Airways *

Are there any airways that are established that you could use?

If you fly them correctly you will not have to worry about terrain or communications.

Be aware there might be more traffic to be cautious of.

Stay above the MEA whenever possible…at least above the MOCA.

There are now more GPS airways being established but most airways were made using VORs.

Using VORs adds another layer of safety in case there is a GPS issue.

Altitudes

IFR east – 5000, 7000, 9000

IFR west – 4000, 6000, 8000

OROCA *

The Off Route Obstruction Clearance Altitude (OROCA) is represented in thousands and hundreds of feet above mean sea level.

The OROCA represents the highest possible elevation including both terrain and other vertical obstructions (towers, trees, etc.) bounded by the ticked lines of latitude and longitude.

OROCA is computed just as the Maximum Elevation Figure (MEF) found on Visual charts except that it provides an additional vertical buffer of 1,000 feet in designated non-mountainous areas and a 2,000 foot vertical buffer in designated mountainous areas within the United States.

OROCA *

Unlike a MEF, when determining an OROCA the area 4 NM around each quadrant is analyzed for obstructions.

OROCA does not provide for NAVAID signal coverage, communication coverage and would not be consistent with altitudes assigned by Air Traffic Control. OROCAs can be found over all land masses and open water areas containing man-made obstructions (such as oil rigs).

OROCAs are shown in every 30 x 30 minute quadrant on Area Charts, every one degree by one.

It is a good value to determinate obstacle clearance whenever the pilot has to, or would like to divert from the airway, e.g. during an emergency descent or when flying direct to a point away from an airway.

Approaches *

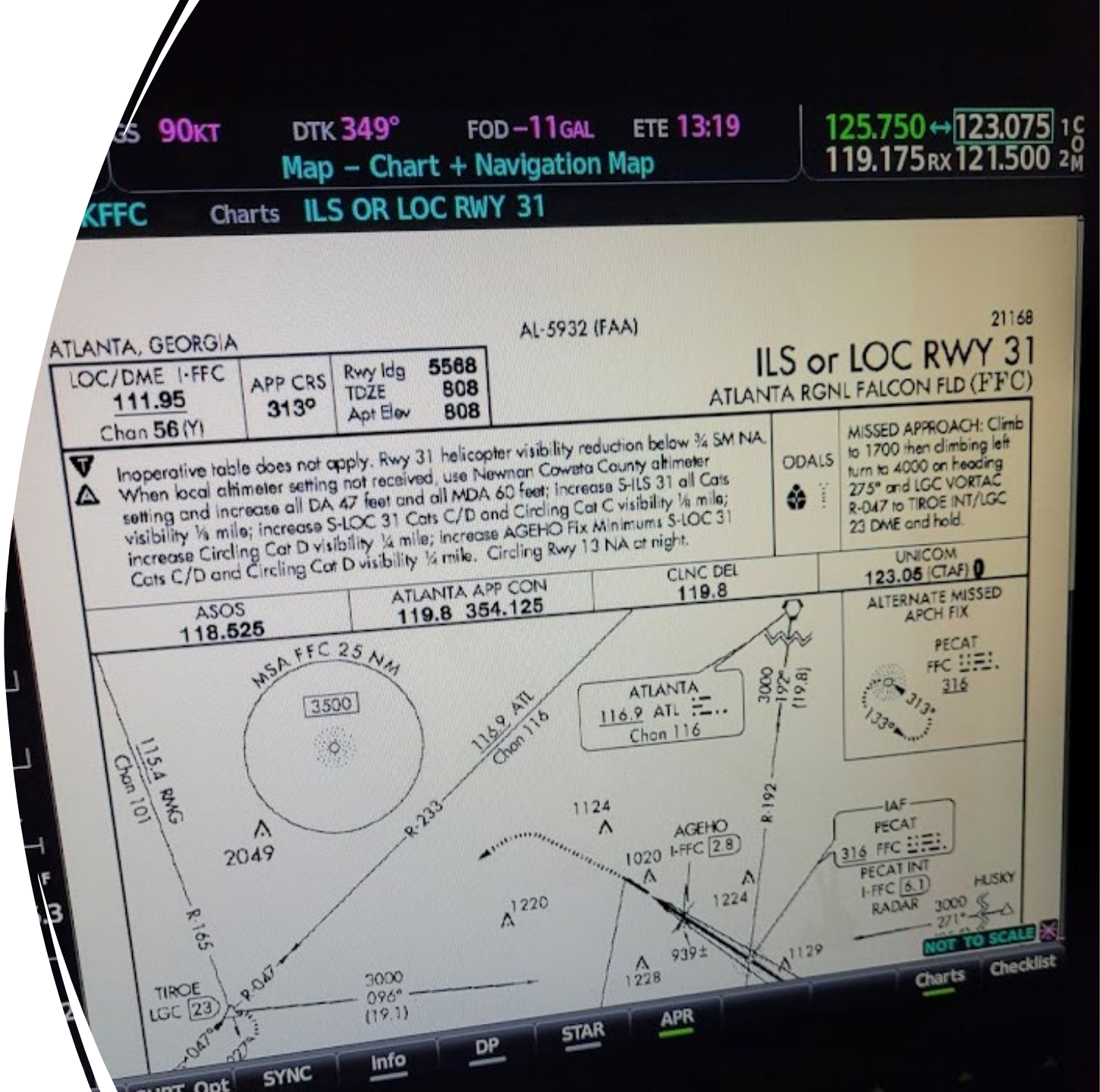
Review all the approaches for the airport you are going to especially if you have never been there before. The approaches safely lead you from the enroute environment to the airport. You can incorporate one of the initial fixes into your route plan. I strongly suggest printing the approach in case something happens to your tablet in flight.

Remember that the approaches have all the necessary info for that airport that you will need including, runway numbers, runway lengths, elevation for touchdown zones, coordinates, and frequencies.

But what if the approach I choose does not make sense because the winds do not favor it? You can either come up with a plan to approach from the other side or do a circle to land.

Good idea to file to a fix that is included in the approach. That will give ATC info on your thoughts.

Approaches


90KT DTK 349° FOD –11GAL ETE 13:19
Map – Chart + Navigation Map
125.750 123.075
119.175 RX 121.500
KFFC Charts ILS OR LOC RWY 31
ATLANTA, GEORGIA
AL-5932 (FAA)
21168
ILS or LOC RWY 31
ATLANTA RGNL FALCON FLD (FFC)
LOC/DME I-FFC
111.95
Chan 56 (Y)
APP CRS
313°
Rwy Idg 5568
TDZE 808
Apt Elev 808
Inoperative table does not apply. Rwy 31 helicopter visibility reduction below ¾ SM NA. When local altimeter setting not received, use Newnan Coweta County altimeter setting and increase all DA 47 feet and all MDA 60 feet; increase S-ILS 31 all Cats visibility ⅛ mile; increase S-LOC 31 Cats C/D and Circling Cat C visibility ⅛ mile; increase Circling Cat D visibility ¼ mile; increase AGEHO Fix Minimums S-LOC 31 Cats C/D and Circling Cat D visibility ¼ mile. Circling Rwy 13 NA at night.
ODALS
MISSED APPROACH: Climb to 1700 then climbing left turn to 4000 on heading 275° and LGC VORTAC R-047 to TIROE INT/LGC 23 DME and hold.
ASOS
118.525
ATLANTA APP CON
119.8 354.125
CLNC DEL
119.8
UNICOM
123.05 (CTAF)
ALTERNATE MISSED APCH FIX
MSA FFC 25 NM
3500
2049
115.4 RNG
Chan 101
116.9 ATL
Chan 116
ATLANTA
116.9 ATL
Chan 116
R-233
R-165
R-047
R-192
3000
192°
(19.8)
PECAT
FFC
316
313°
133°
1124
AGEHO
1020 I-FFC 2.8
1220
1224
939±
1228
1129
IAF
PECAT
316 FFC
PECAT INT
I-FFC 6.1
RADAR
HUSKY
3000
271°
TIROE
LGC 23
3000
096°
(19.1)
NOT TO SCALE
Charts
Checklist
APR
STAR
DP
Info
SYNC

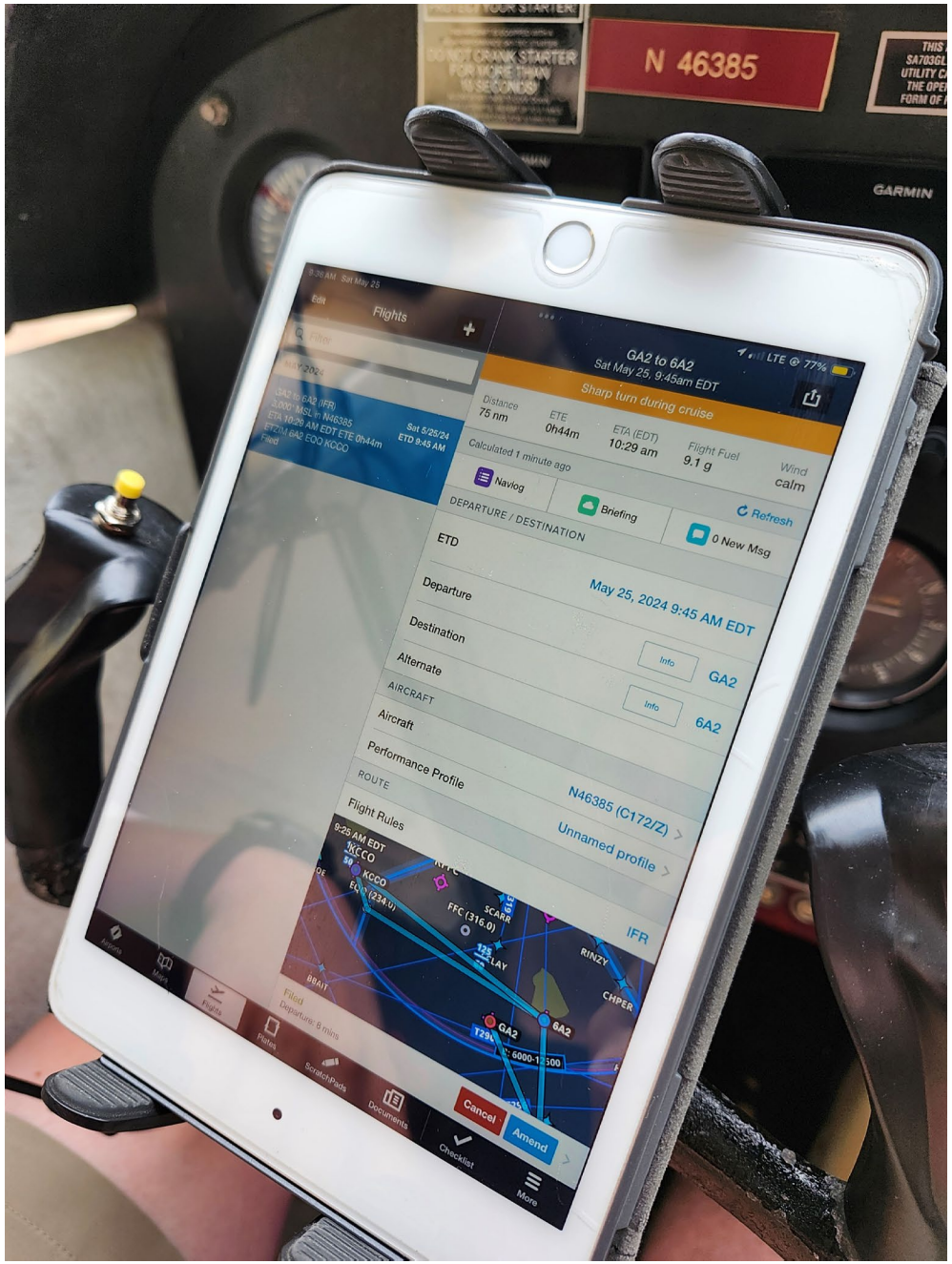
* File

You can electronically file the plan before you leave for the airport or at the airport during pre-flight.

ForeFlight is the easiest method.

You do not have to call 1-800-WXBRIEF anymore, but you can if you wish or do not have internet.

* File


N 46385
GARMIN
Flights
GA2 to 6A2
Sat May 25, 9:45am EDT
Sharp turn during cruise
Distance
75 nm
ETE
0h44m
ETA (EDT)
10:29 am
Flight Fuel
9.1 g
Wind
calm
Calculated 1 minute ago
Navlog
Briefing
Refresh
0 New Msg
DEPARTURE / DESTINATION
ETD
Departure
May 25, 2024 9:45 AM EDT
Destination
GA2
Alternate
AIRCRAFT
6A2
Aircraft
Performance Profile
N46385 (C172/Z)
ROUTE
Flight Rules
Unnamed profile
IFR
KCCO
FFC (316.0)
SCARR
RINZY
CHPER
BBAIT
GA2
6A2
Cancel
Amend
Checklist
More

Plane Requirements

§ 91.409 Inspections.

Annual inspections

100 Hour inspections if used for hire or instruction

§ 91.411 Altimeter system and altitude reporting equipment tests and inspections.

Static Pressure System and Altimeter tests required for IFR flight

Required every 24 calendar months

§ 91.413 ATC transponder tests and inspections.

Transponder tests and inspections required

Required every 24 calendar months

Plane Requirements

§ 91.207 Emergency locator transmitters.

Inspection requirements

Every 12 calendar months

The batteries must be replaced (or recharged)

When the transmitter has been in use more than 1 cumulative hour

When 50% of their useful life has expired

Plane Requirements

VOR Check within 30 days

Date

Place

Bearing error

Signature

Plane Requirements

VFR Day (+ VFR Night) + GRABCARD

Generator/Alternator

Radios (appropriate for flight)

Altimeter (sensitive/adjustable)

Ball (Turn coordinator)

Clock (second hand sweep or digital)

Attitude indicator

Rate of turn

Directional gyro

The Pilots

Remember IMSAVE and PAVE

Pilot in command (PIC), Aircraft, environment, External pressures

When using CRM, one pilot should be briefing & monitoring while the other is hands on & checking the call outs

Be prepared for the unexpected…you have the plan but be ready to adjust

Football coaches come up with weekly game plans…some scripts the first 10 plays…but then start adjusted

Just because the ILS minimums are 200 feet doesn't mean they should be yours…it is ok if your personal minimum is 400 feet

You might have different personal mins for different airports like somewhere in Florida vs Utah

See other lessons

- AROW
- Task A 3ab - Hypoxia Hyperventilation (oxygen rules)
- Task C - Visual Scanning and Collision Avoidance
- VFR Minimums
- Task K - National Airspace System
- Task G - Navigation and Flight Planning (most applies)
- Minimum IFR Altitudes
- IFR Enroute Low Altitude Charts
- Instrument Approaches
- The Pilots

Any questions I can answer or follow up later on?

Instrument Approaches

Lesson Objective

To develop understanding of Instrument Approaches.

Atlanta Approach: “N123AB you are cleared for the KPUJ ILS 31 approach.”

What

An instrument approach, or instrument approach procedure (IAP), is a series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing or to a point from which a landing may be made visually.

These approaches are approved in the United States by the FAA or the United States Department of Defense for the military.

What

The ICAO defines an instrument approach as:

A series of predetermined maneuvers by reference to flight instruments with specific protection from obstacles from the initial approach fix, or where applicable, from the beginning of a defined arrival route to a point from which a landing can be completed and thereafter, if landing is not completed, to a position at which holding or enroute obstacle clearance criteria apply.

Why

If you are in the clouds or in an area of near complete darkness, you need to be able to find the runway as well as not hit anything.

An instrument approach is basically a 3D map.

Secondary, an approach will make sure as you get set up to land, you will be lined up for the runway, not too high, and not too low.

Why

It would be smart to have available the IAPs for any airport you are not familiar with…even when flying VFR.

Not only will it guide you to the runway safely, it also gives you most of the important information.

You have all the frequencies, the elevation, the mini airport diagram, and where to go if you can’t see the runway when you get there (missed approach).

Types

There are three types of IAPs:

Precision Approach (PA)

Approach with vertical guidance (APV)

Non-Precision approach (NPA).

A precision approach (PA) uses a navigation system on the ground that provides course using a localizer signal and glidepath deviation.

The only system you will typically use that the FAA considers a precision approach is an instrument landing system (ILS).

ILS components = localizer, glide slope, DME, Approach lights, Marker beacons (optional)

Types

A non-precision approach (NPA) uses a navigation system for course deviation but does not provide glidepath information.

These approaches include VOR, NDB and LNAV. NPAs are flown to a minimum descent altitude (MDA).

An approach with vertical guidance (APV) also uses a navigation system for course and glidepath.

Examples include baro-VNAV, localizer type directional aid (LDA) with glidepath, LNAV/VNAV, and LPV.

An LPV is basically the same as using an ILS but without the airport having to maintain equipment.

LDA is basically an offset course localizer.

https://youtu.be/y7QqAIbQPiE

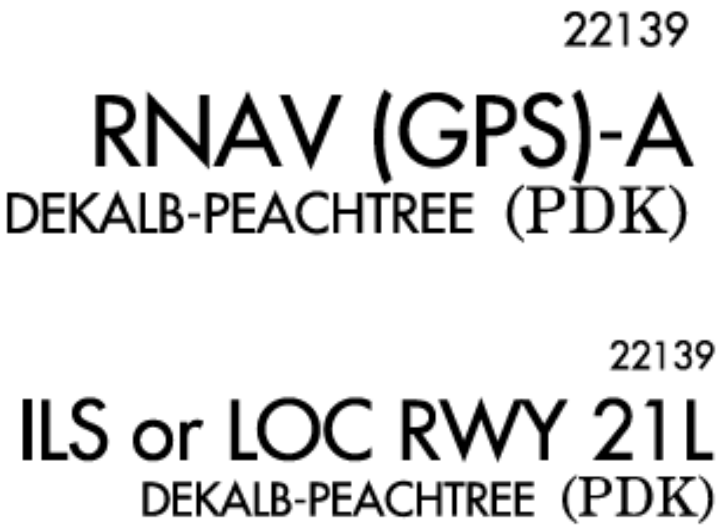
Types

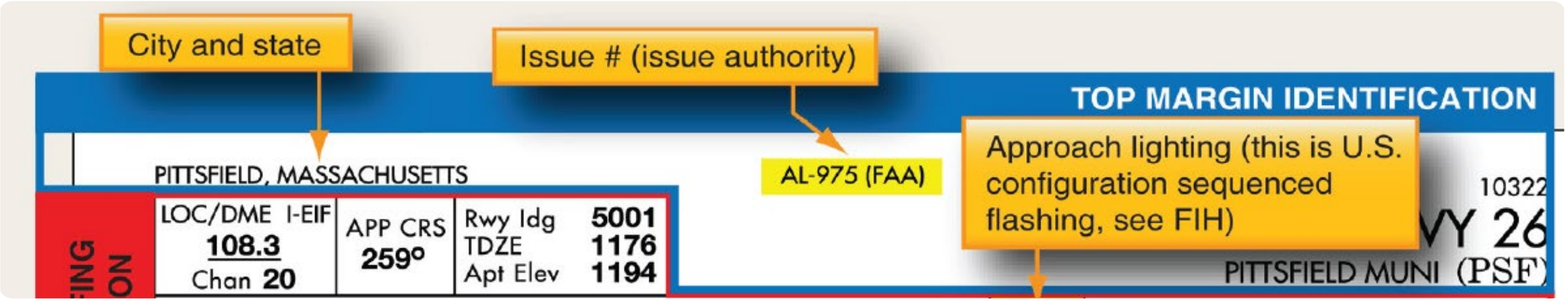
Each procedure chart uses a specific type of electronic navigation system such as an NDB, VOR, ILS, LOC, and RNAV/GPS.

The chart name reflects the primary navigational aid (NAVAID), if there is more than one straight-in procedure or if it is just a circling-only procedure.

A runway number is listed when the approach course is aligned within 30° of the runway centerline to straight-in landing.

If it is more than 30° from the centerline, a letter is assigned instead: "VOR-A"





Top Margin Identification

The header at top and bottom of the chart. It depicts the airport location and procedure identification, among other information.

The number at the top center over the margin is the FAA chart reference number.

AL-9190 (FAA)

22083

ILS or LOC RWY 30

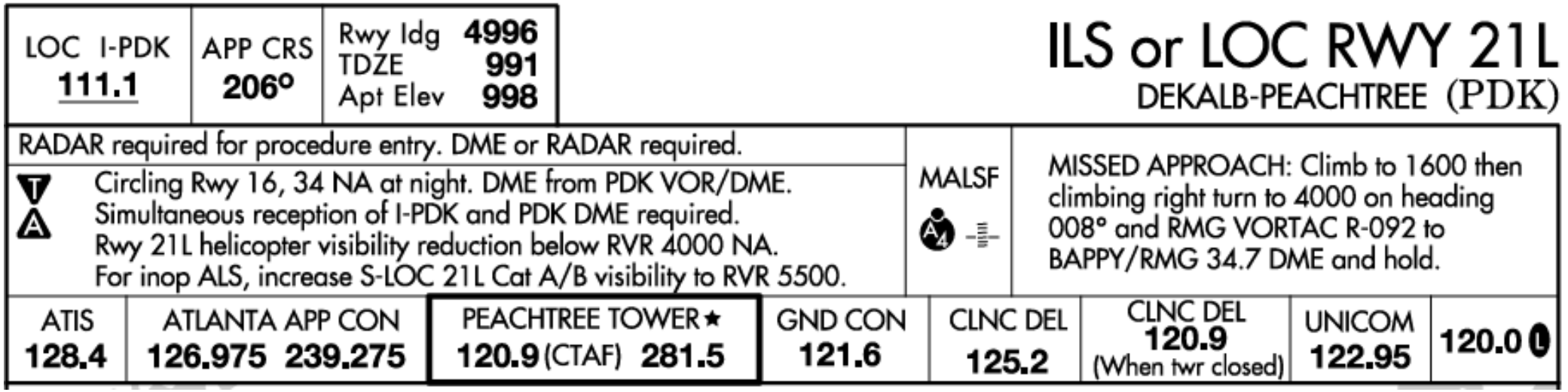
THOMASTON-UPSON COUNTY (OPN)

Top Margin Identification

22083 = Released on day 83 of 2022

The Date of Latest Revision is shown on the top margin above the procedure title. The Date of Latest Revision identifies the Julian date the chart was last revised for any reason. The first two digits indicate the year, the last three digits indicate the day of the year (001 to 365/6).

Updates to the amendment number and effective date represent procedural/criteria revisions to the charted procedure, e.g., course, fix, altitude, minima, etc.

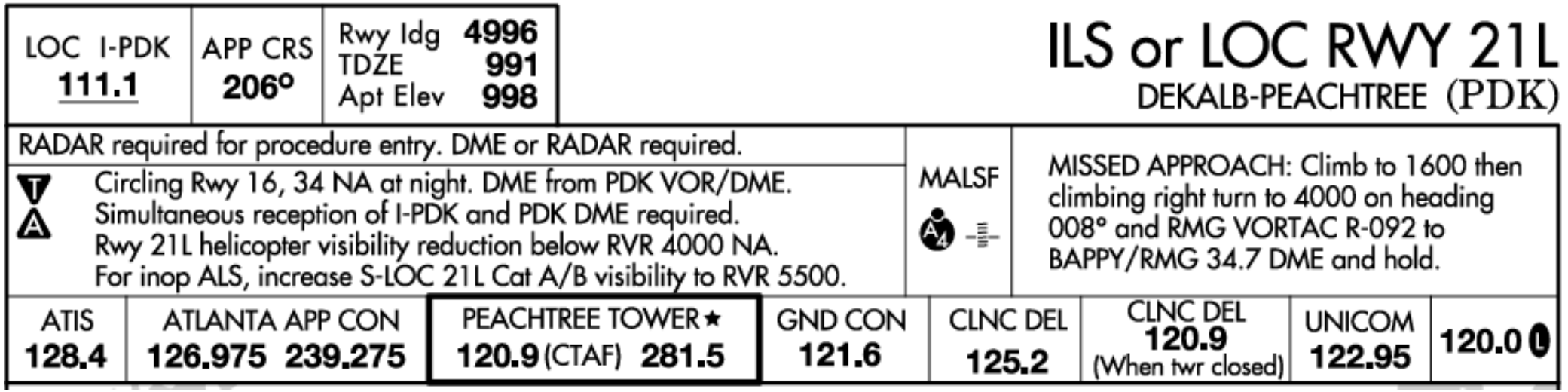


Pilot Briefing

The top row of the boxes contains the ILS/localizer/VOR frequency, the final approach course, the runway landing length, touchdown zone elevation, and the airport elevation.

The middle row has two boxes: a notes box, and a box for information on the missed approach. You'll note a bolded "T" and "A" in the notes section.

The "T" signifies that the airport has non-standard IFR takeoff minimums. This applies to 121 and 135 operators, as there are no regulatory IFR takeoff minimums for Part 91 operations.



LOC I-PDK 111.1	APP CRS 206°	Rwy Idg 4996 TDZE 991 Apt Elev 998

ILS or LOC RWY 21L
DEKALB-PEACHTREE (PDK)

RADAR required for procedure entry. DME or RADAR required.

T A Circling Rwy 16, 34 NA at night. DME from PDK VOR/DME.
Simultaneous reception of I-PDK and PDK DME required.
Rwy 21L helicopter visibility reduction below RVR 4000 NA.
For inop ALS, increase S-LOC 21L Cat A/B visibility to RVR 5500.

MALSF

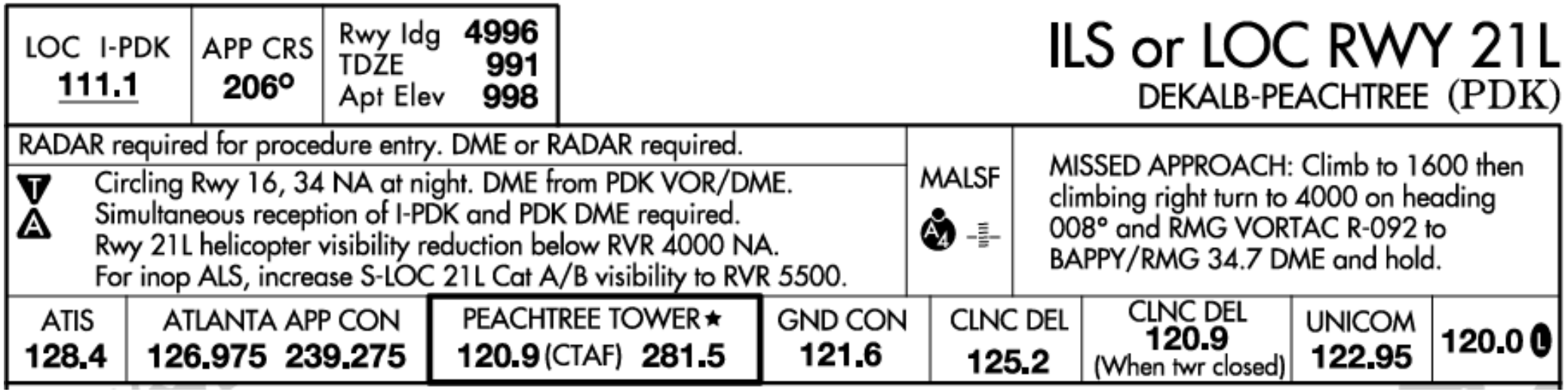
MISSED APPROACH: Climb to 1600 then climbing right turn to 4000 on heading 008° and RMG VORTAC R-092 to BAPPY/RMG 34.7 DME and hold.

ATIS	ATLANTA APP CON	PEACHTREE TOWER★	GND CON	CLNC DEL	CLNC DEL	UNICOM	
128.4	126.975 239.275	120.9 (CTAF) 281.5	121.6	125.2	120.9 (When twr closed)	122.95	120.0 L

Pilot Briefing

The bolded "A" signifies that non-standard alternate minimums exist for the airport.

If "NA" is specified it indicates that alternate minimums are not authorized due to it being an unmonitored facility or lack of a weather reporting service.



LOC I-PDK 111.1	APP CRS 206°	Rwy Idg 4996 TDZE 991 Apt Elev 998

ILS or LOC RWY 21L
DEKALB-PEACHTREE (PDK)

RADAR required for procedure entry. DME or RADAR required.

T A Circling Rwy 16, 34 NA at night. DME from PDK VOR/DME.
Simultaneous reception of I-PDK and PDK DME required.
Rwy 21L helicopter visibility reduction below RVR 4000 NA.
For inop ALS, increase S-LOC 21L Cat A/B visibility to RVR 5500.

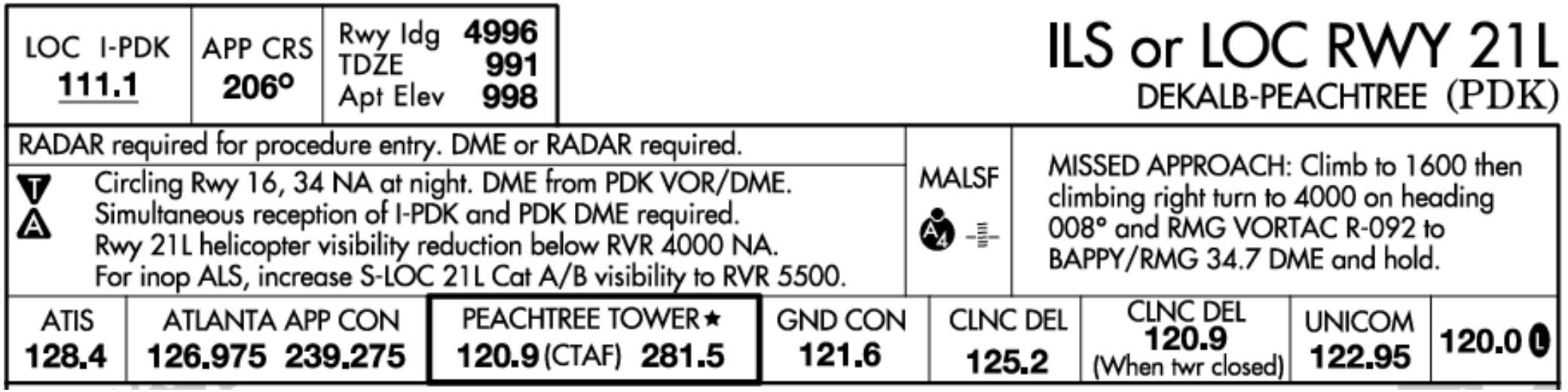
MALSF

MISSED APPROACH: Climb to 1600 then climbing right turn to 4000 on heading 008° and RMG VORTAC R-092 to BAPPY/RMG 34.7 DME and hold.

ATIS	ATLANTA APP CON	PEACHTREE TOWER★	GND CON	CLNC DEL	CLNC DEL	UNICOM	
128.4	126.975 239.275	120.9 (CTAF) 281.5	121.6	125.2	120.9 (When twr closed)	122.95	120.0 L

Pilot Briefing

The missed approach section will give you a textual description of the missed approach procedure and should be reviewed carefully each time you brief the approach.



LOC I-PDK 111.1	APP CRS 206°	Rwy Idg 4996 TDZE 991 Apt Elev 998

ILS or LOC RWY 21L
DEKALB-PEACHTREE (PDK)

RADAR required for procedure entry. DME or RADAR required.

T A Circling Rwy 16, 34 NA at night. DME from PDK VOR/DME.
Simultaneous reception of I-PDK and PDK DME required.
Rwy 21L helicopter visibility reduction below RVR 4000 NA.
For inop ALS, increase S-LOC 21L Cat A/B visibility to RVR 5500.

MALSF

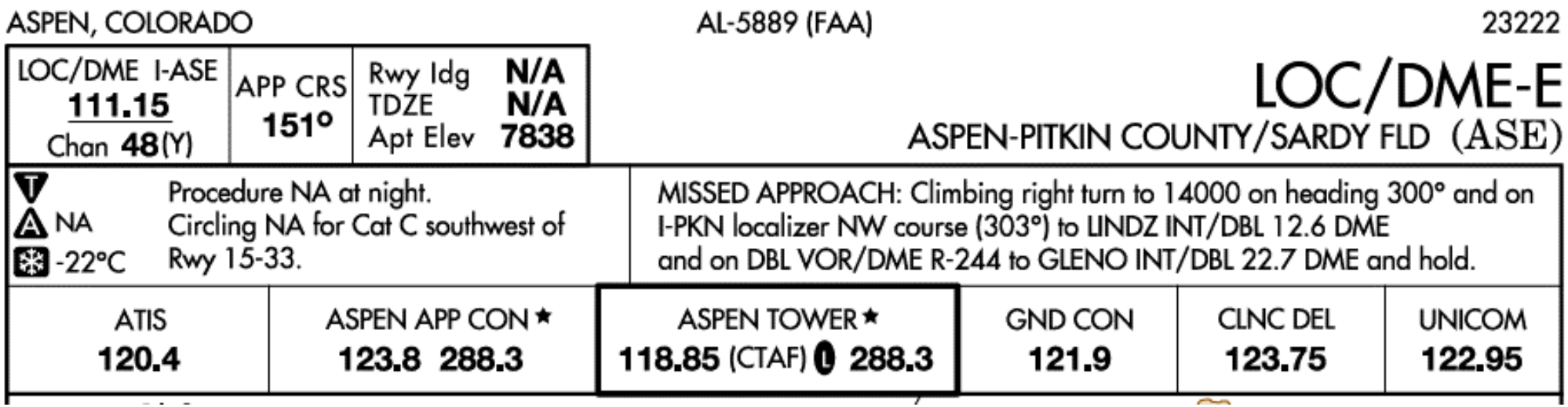
MISSED APPROACH: Climb to 1600 then climbing right turn to 4000 on heading 008° and RMG VORTAC R-092 to BAPPY/RMG 34.7 DME and hold.

ATIS	ATLANTA APP CON	PEACHTREE TOWER★	GND CON	CLNC DEL	CLNC DEL	UNICOM	
128.4	126.975 239.275	120.9 (CTAF) 281.5	121.6	125.2	120.9 (When twr closed)	122.95	120.0 L

Pilot Briefing

The bottom row in the margin identification section has the important frequencies for the airport.

These include the weather, approach/departure, unicom, tower, ground, etc frequencies.



ASPEN, COLORADO AL-5889 (FAA) 23222

LOC/DME-E

ASPEN-PITKIN COUNTY/SARDY FLD (ASE)

LOC/DME I-ASE 111.15 Chan 48(Y)	APP CRS 151°	Rwy Idg TDZE Apt Elev	N/A N/A 7838

T
A NA
-22°C

Procedure NA at night.
Circling NA for Cat C southwest of Rwy 15-33.

MISSED APPROACH: Climbing right turn to 14000 on heading 300° and on I-PKN localizer NW course (303°) to LINDZ INT/DBL 12.6 DME and on DBL VOR/DME R-244 to GLENO INT/DBL 22.7 DME and hold.

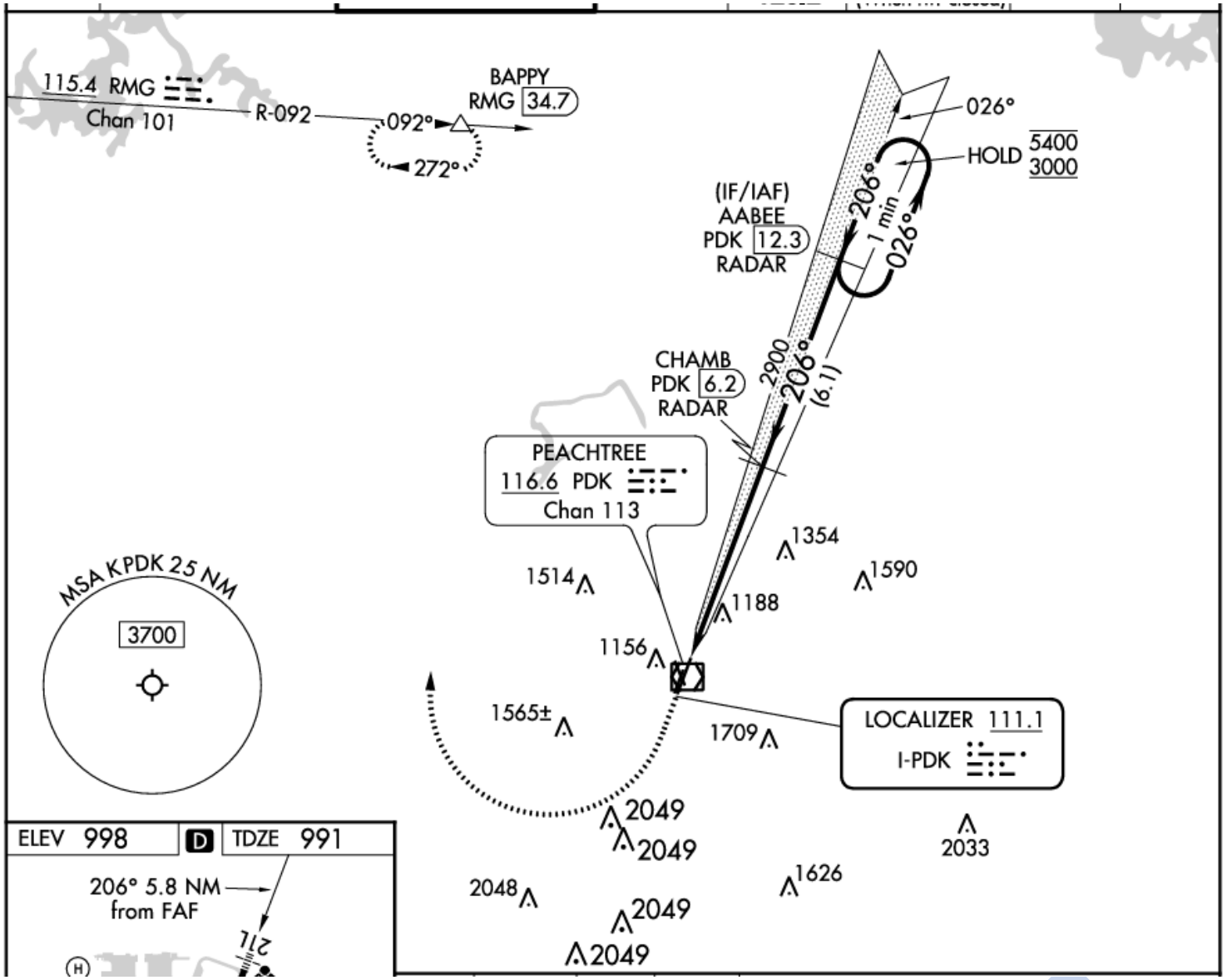
ATIS	ASPEN APP CON ★	ASPEN TOWER ★	GND CON	CLNC DEL	UNICOM
120.4	123.8 288.3	118.85 (CTAF) L 288.3	121.9	123.75	122.95

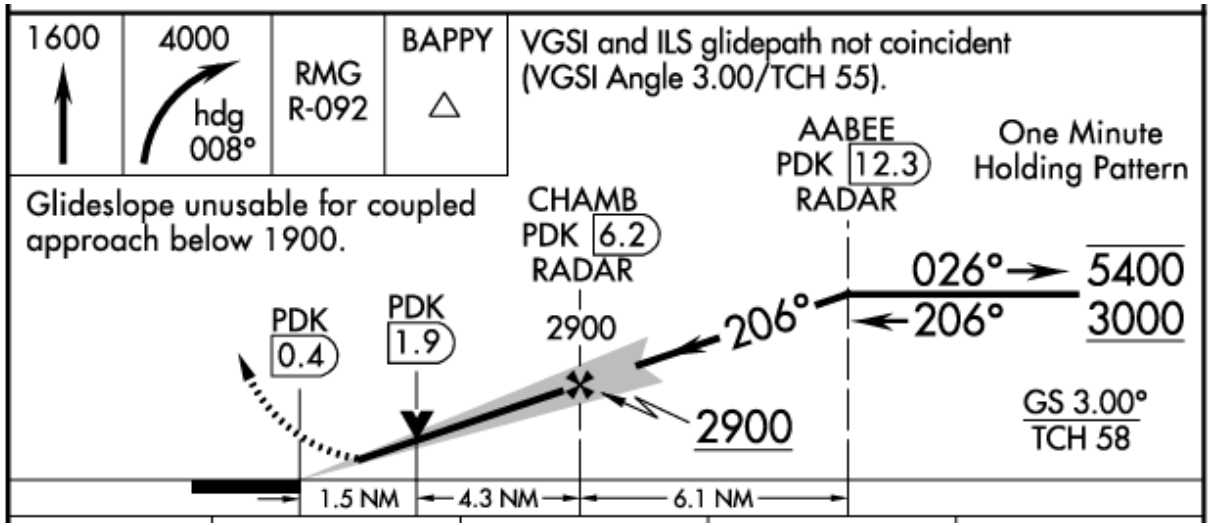
Pilot Briefing

The snowflake icon indicates a cold temperature altitude correction will be required on an approach when the reported temperature is, “at or below” the temperature specified for that airport.

See the AIM 7-2-3, ICAO Cold Temperature Error Table

Plan View


115.4 RMG
Chan 101
R-092
092°
272°
BAPPY
RMG 34.7
026°
HOLD
5400
3000
(IF/IAF)
AABEE
PDK 12.3
RADAR
206°
1 min
026°
CHAMB
PDK 6.2
RADAR
2900
206°
(6.1)
PEACHTREE
116.6 PDK
Chan 113
MSA KPDK 25 NM
3700
1514
1354
1590
1188
1156
1565±
1709
LOCALIZER 111.1
I-PDK
2049
2049
2033
2048
1626
2049
2049
ELEV 998
D
TDZE 991
206° 5.8 NM
from FAF
21L



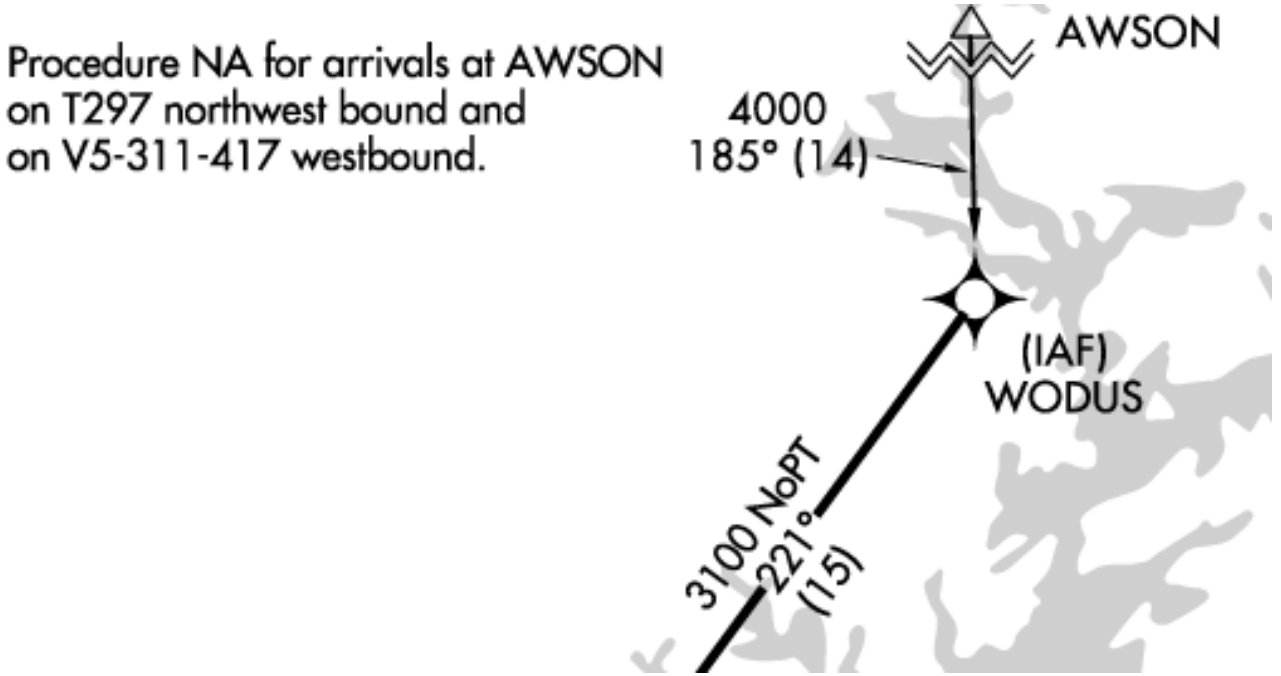
Profile View

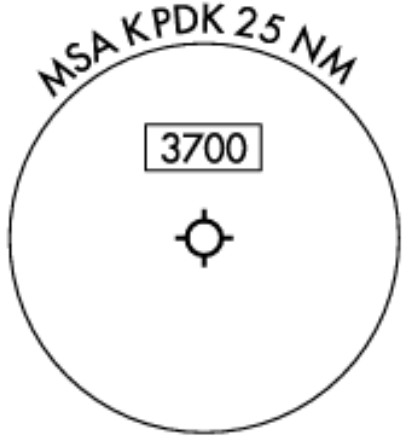
The profile view is a drawing of the side view of a procedure that illustrates the vertical approach path altitudes, headings, distances, and fixes.

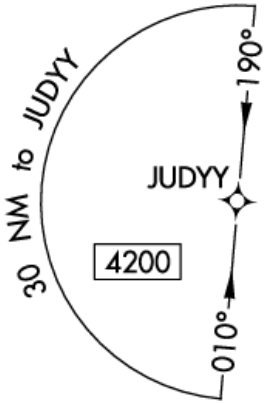
It includes the minimum altitudes and maximum distance for a procedure turn, altitudes over prescribed fixes, distances between fixes, and the missed approach procedure.

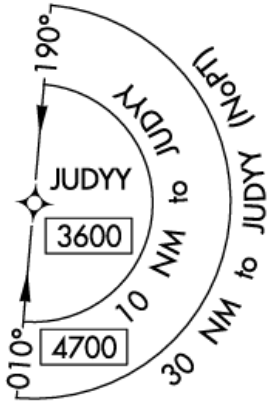
Plan View

When a route segment outside the circle is drawn to scale, the symbol is two jagged lines and it interrupts the segment.









Plan View

The MSA (Minimum Safe Altitude) circle appears in the plan view except in approaches for which the navaid is unavailable.

The MSA circle guarantees 1000 ft clearance over obstacles and terrain.

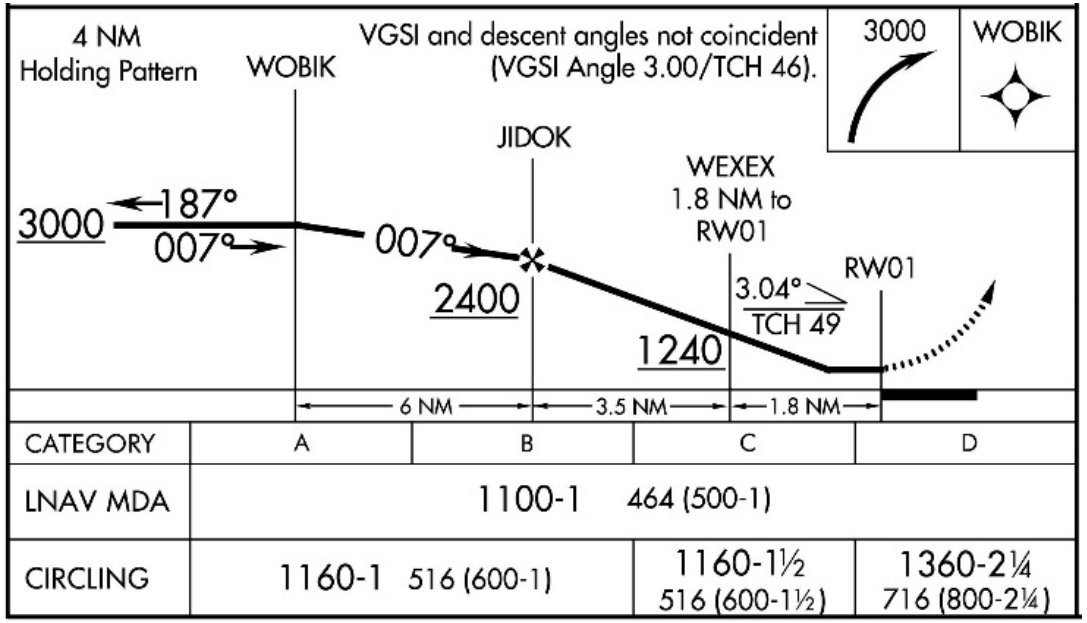
The Terminal Arrival Area (TAA) provides a transition from the en route structure to the terminal environment with little required pilot/air traffic control interface for aircraft equipped with Area Navigation (RNAV) systems. A TAA provides minimum altitudes with standard obstacle clearance when operating within the TAA boundaries.

“Chop and Drop”

If you are more than 11.3 NM from the runway, anything up to WOBIK you must stay above 3000 ft MSL.

Between WOBIK and JIDOK you must stay above 2400.

The moment you pass WOBIK you can immediately drop if you wish but there is no need to.

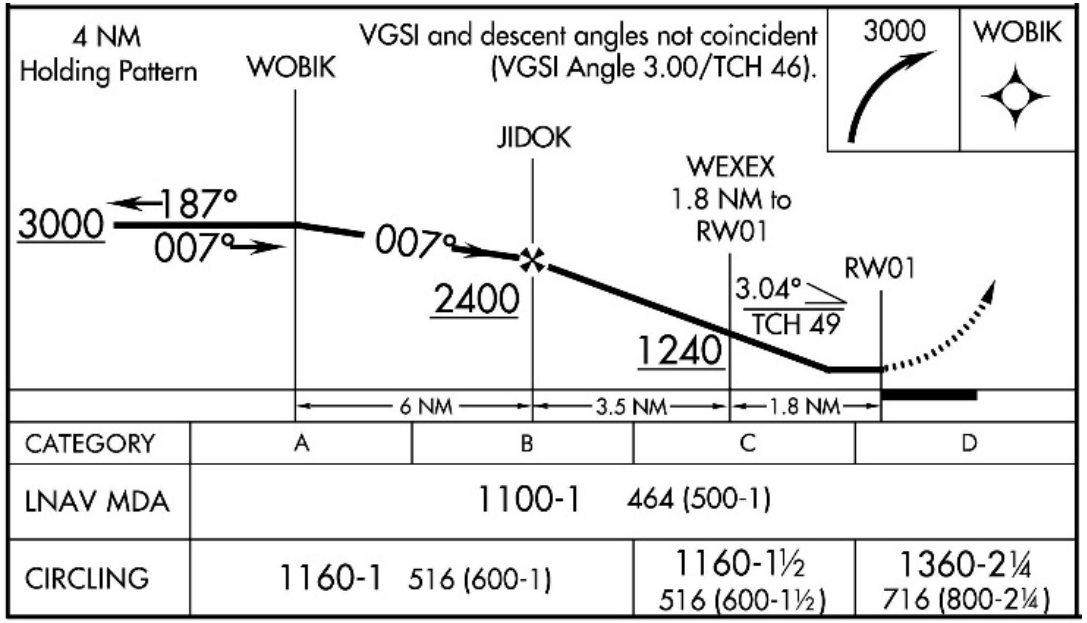


Step Down Minimums

This approach does not have VNAV.

Between JIDOK and WEXEX you must stay above 1240.

After WEXEX you must stay above LNAV MDA/CIRCLING minimums until you can see the runway.

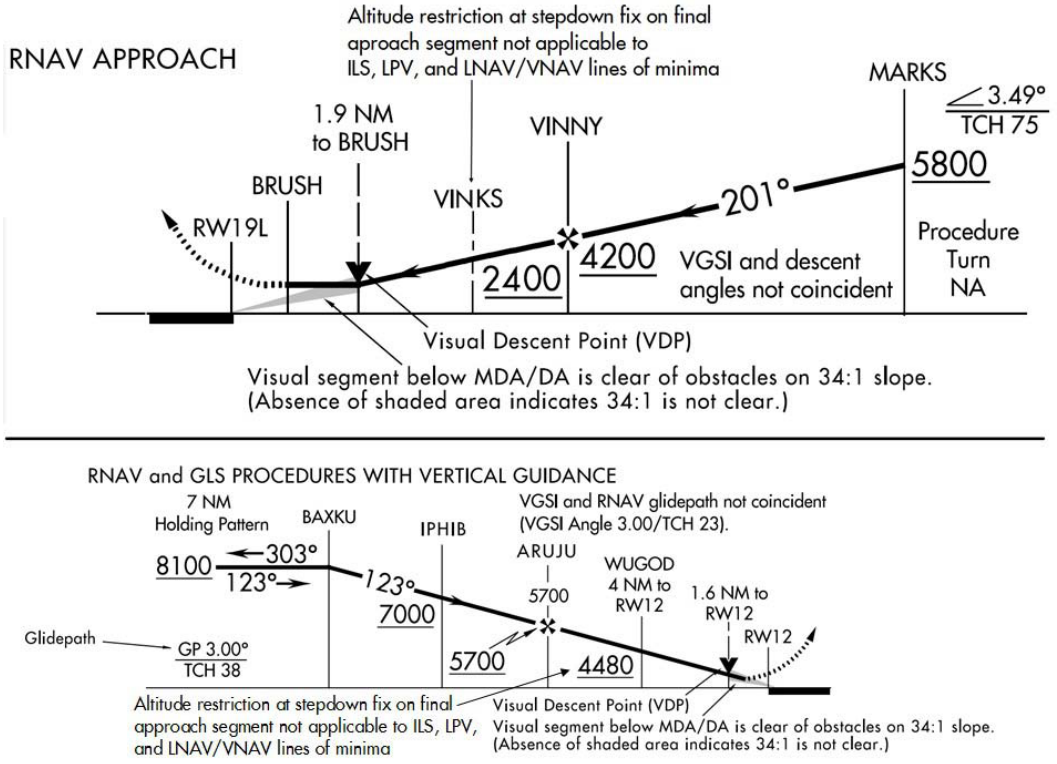


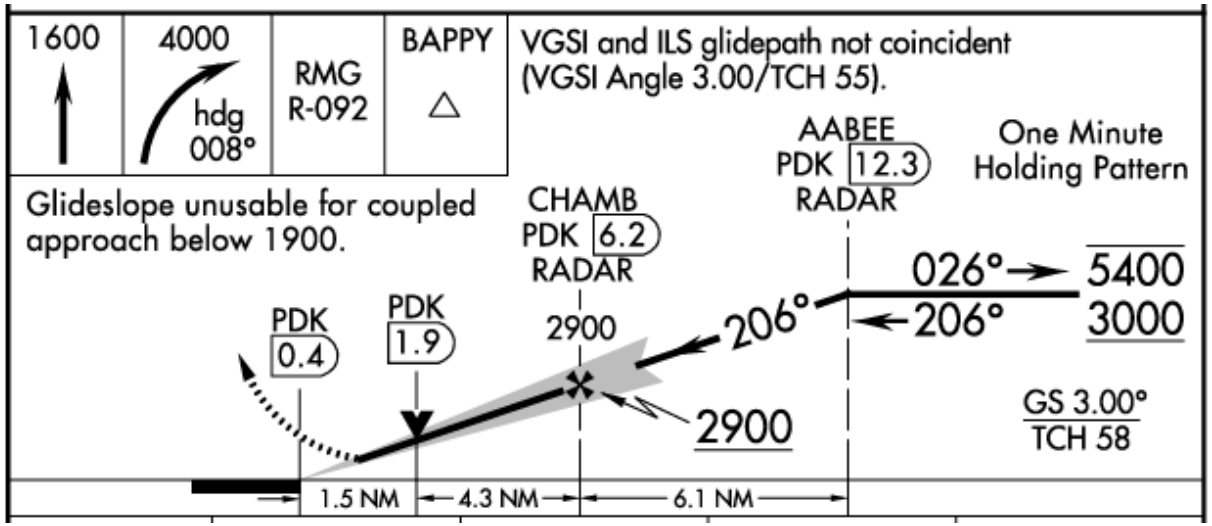
CATEGORY	A	B	C	D
LNAV MDA	1100-1 464 (500-1)			
CIRCLING	1160-1 516 (600-1)		1160-1½ 516 (600-1½)	1360-2¼ 716 (800-2¼)

Stepdown Fix

AIM 5-4-5

Altitude restrictions depicted at stepdown fixes within the final approach segment are applicable only when flying a Non-Precision Approach to a straight-in or circling line of minima identified as an MDA (H). These altitude restrictions may be annotated with a note “LOC only” or “LNAV only.” Stepdown fix altitude restrictions within the final approach segment do not apply to pilots using Precision Approach (ILS) or Approach with Vertical Guidance (LPV, LNAV/VNAV) lines of minima identified as a DA(H), since obstacle clearance on these approaches is based on the aircraft following the applicable vertical guidance. Pilots are responsible for adherence to stepdown fix altitude restrictions when outside the final approach segment (i.e., initial or intermediate segment), regardless of which type of procedure the pilot is flying.



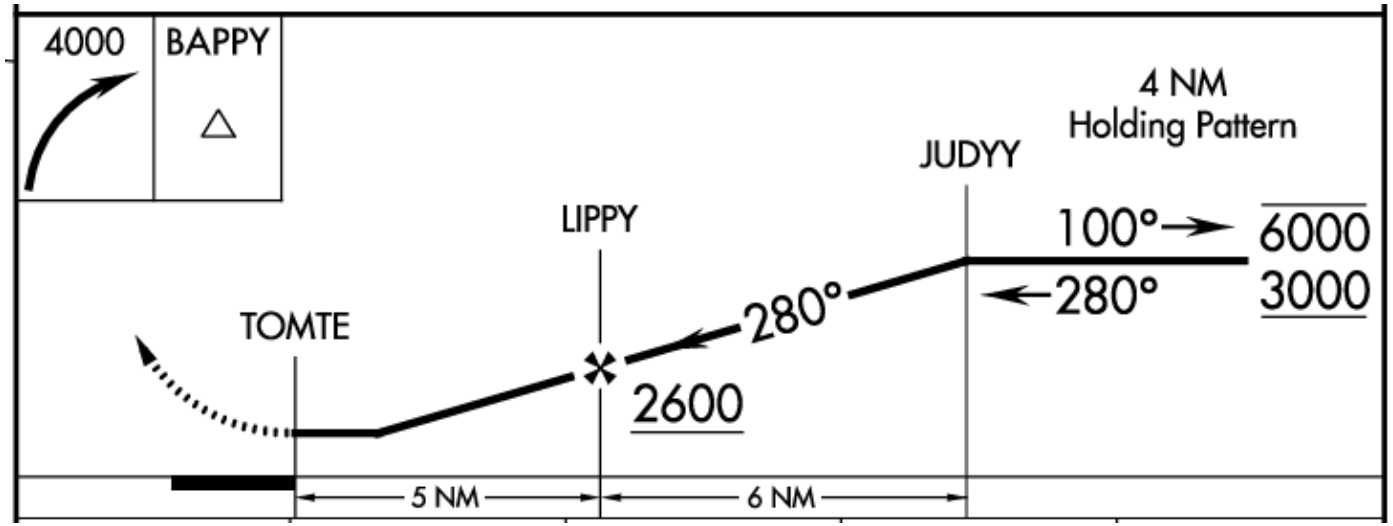


Final Approach Fix (FAF)

Glide-slope intercept altitude is represented by lightning symbol.

When a fix is incorporated in a non-precision final segment, two sets of minimums may be published, depending upon whether or not fix can be identified.

Precision approaches use a decision altitude (DA) charted in MSL followed by decision height (DH) referenced in height above threshold elevation (HAT).



Final Approach Fix (FAF)

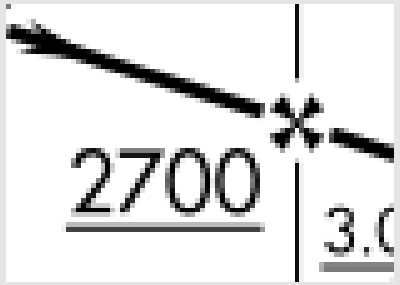
Precision approaches use a decision altitude (DA).

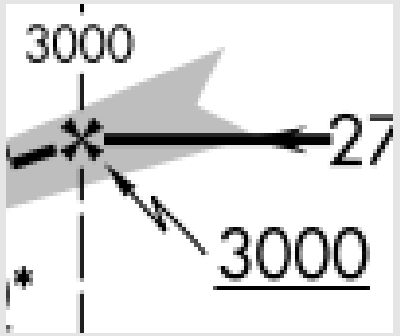
Non-precision approaches use a minimum descent altitude (MDA).

The primary difference being that when a pilot reaches a DA, the missed approach must immediately be executed if the runway environment is not yet in sight.

With an MDA, the pilot levels off at or above that altitude and continues until either the missed approach point, or the runway environment comes into view.

Final Approach Fix (FAF)





Lighting bolt = precision FAF determined by altitude

Which is determined by altimeter setting

X = non precision FAF

Determined by NM away

MDA vs DA vs DH

Minimum Descent Altitude (MDA), Decision Altitude (DA), And Decision Height (DH):

MDA (MSL) — the lowest altitude, expressed in feet MSL, to which descent is authorized on final approach or during circle-to land maneuvering in execution of a standard instrument approach procedure (SIAP) where no electronic glideslope is provided.

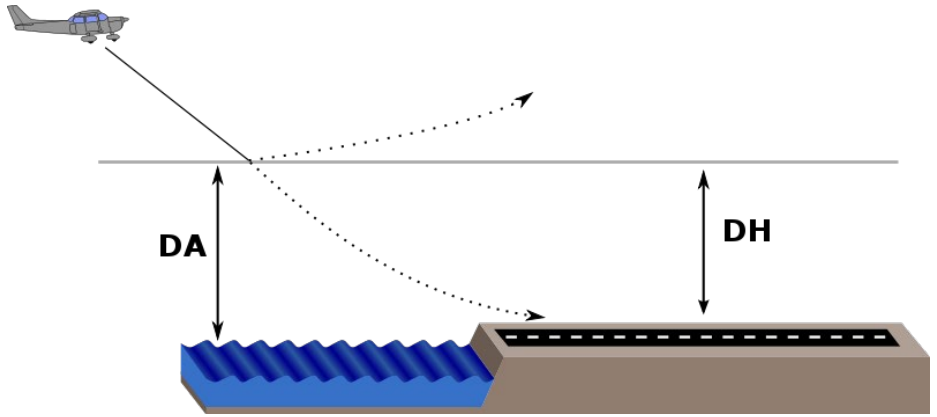
DA (MSL) — a specified altitude in the precision approach at which a missed approach must be initiated if the required visual reference to continue the approach has not been established.

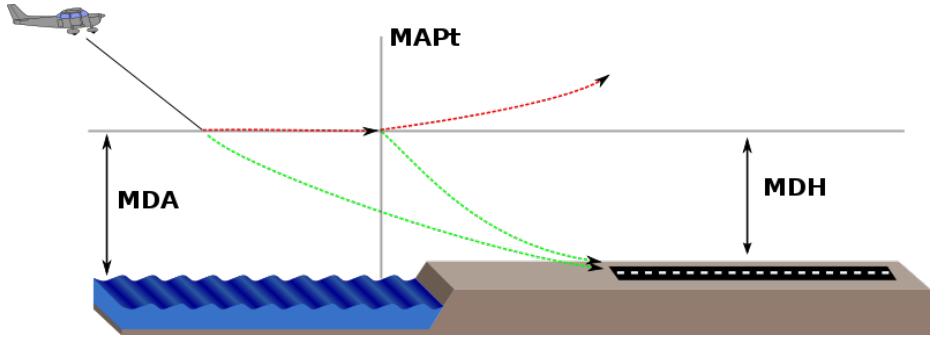
DH (AGL) — with respect to the operation of aircraft, means the height at which a decision must be made during an ILS to either continue the approach or to execute a missed approach.

Go Around Decisions

DA/DH = Precision Approach land or go around decision

MDA/MDH = Non-Precision Approach land or go around decision





https://youtu.be/ETEe6aQwwuE

Minimums and Categories

The altitude minimums for the approach are located at the bottom of the profile section.

The minimums are separated by approach "category", which is determined by the speed of the aircraft flying the approach.

Aircraft approach category means a grouping of aircraft based on a reference landing speed (VREF), if specified, or if VREF is not specified, 1.3 VSO at the maximum certified landing weight.

VREF, VSO, and the maximum certified landing weight are those values as established for the aircraft by the certification authority of the country of registry.

A pilot must use the minima corresponding to the category determined during certification or higher.

Minimums and Categories

Helicopters may use Category A minima.

If it is necessary to operate at a speed in excess of the upper limit of the speed range for an aircraft's category, the minimums for the higher category must be used.

For example, an airplane that fits into Category B, but is circling to land at a speed of 145 knots, must use the approach Category D minimums.

Minimums and Categories

Category	Speed
A	0-90
B	91-120
C	121-140
D	141-165
E	166+

For a category A plane

S-ILS 31 - If the ILS is working then 1483 ft MSL/200 ft AGL is your minimum. If you do not see the runway environment, follow the Missed Approached Procedure (MAP).

Also notice you must be able to see for ¾ of a mile.

CATEGORY	A	B	C	D
S-ILS 31	1483-¾ 200 (200-¾)			
S-LOC 31	1680-1 397 (400-1)			1680-1¼ 397 (400-1¼)
CIRCLING	1880-1 591 (600-1)		1880-1½ 591 (600-1½)	1940-2 651 (700-2)

For a category A plane

S-LOC 31 – If the glide slope is not working but the localizer is working then 1680 ft MSL/400 ft AGL is your minimum. Also notice you must be able to see for a mile.

CATEGORY	A	B	C	D
S-ILS 31	1483-¾ 200 (200-¾)			
S-LOC 31	1680-1 397 (400-1)			1680-1¼ 397 (400-1¼)
CIRCLING	1880-1 591 (600-1)		1880-1½ 591 (600-1½)	1940-2 651 (700-2)

For a category A plane

Circling – If the winds favor runway 13, then 1880 ft MSL/600 ft AGL above is your minimum.

If the glide slope and localizer are not working, you should use GPS 31 instead.

CATEGORY	A	B	C	D
S-ILS 31	1483-¾ 200 (200-¾)			
S-LOC 31	1680-1 397 (400-1)			1680-1¼ 397 (400-1¼)
CIRCLING	1880-1 591 (600-1)		1880-1½ 591 (600-1½)	1940-2 651 (700-2)

LPV DA for category A

LPV DA – If you have vertical and lateral guidance 1483 ft MSL/200 ft AGL is your minimum.

This is the same as when you use the ILS. Not bad considering no equipment to maintain on the ground.

Localizer Performance with Vertical Guidance (LPV) approaches take advantage of the refined accuracy of WAAS lateral and vertical guidance to provide an approach very similar to a Category I ILS.

CATEGORY	A	B	C	D
LPV DA	1483-¾ 200 (200-¾)			
LNAV/ VNAV DA	1635-1¼ 352 (400-1¼)			
LNAV MDA	1720-1 437 (500-1)		1720-1¼ 437 (500-1¼)	1720-1½ 437 (500-1½)
CIRCLING	1880-1 591 (600-1)		1880-1½ 591 (600-1½)	1940-2 651 (700-2)

LPV DA for category A

Like an ILS, an LPV has vertical guidance and is flown to a Decision Altitude (DA).

The design of an LPV approach incorporates angular guidance with increasing sensitivity as an aircraft gets closer to the runway (or point in space (PinS) type approaches for helicopters).

Sensitivities are nearly identical to those of the ILS at similar distances.

CATEGORY	A	B	C	D
LPV DA	1483-¾ 200 (200-¾)			
LNAV/ VNAV DA	1635-1¼ 352 (400-1¼)			
LNAV MDA	1720-1 437 (500-1)		1720-1¼ 437 (500-1¼)	1720-1½ 437 (500-1½)
CIRCLING	1880-1 591 (600-1)		1880-1½ 591 (600-1½)	1940-2 651 (700-2)

LNAV/VNAV DA for category A

LNAV/VNAV DA – 1635 ft MSL/400 ft AGL

Lateral Navigation/Vertical Navigation (LNAV/VNAV) approaches provide both horizontal and approved vertical approach guidance.

Vertical Navigation (VNAV) utilizes an internally generated glideslope based on WAAS or baro-VNAV systems.

CATEGORY	A	B	C	D
LPV DA	1483-¾ 200 (200-¾)			
LNAV/ VNAV DA	1635-1¼ 352 (400-1¼)			
LNAV MDA	1720-1 437 (500-1)		1720-1¼ 437 (500-1¼)	1720-1½ 437 (500-1½)
CIRCLING	1880-1 591 (600-1)		1880-1½ 591 (600-1½)	1940-2 651 (700-2)

LNAV MDA DA for category A

LNAV MDA – 1720 ft MSL/500 ft AGL

Localizer Performance without Vertical Guidance (LP) and Lateral Navigation (LNAV).

LPs are non-precision approaches with WAAS lateral guidance.

They are added in locations where terrain or obstructions do not allow publication of vertically guided LPV procedures.

CATEGORY	A	B	C	D
LPV DA	1483-¾ 200 (200-¾)			
LNAV/ VNAV DA	1635-1¼ 352 (400-1¼)			
LNAV MDA	1720-1 437 (500-1)		1720-1¼ 437 (500-1¼)	1720-1½ 437 (500-1½)
CIRCLING	1880-1 591 (600-1)		1880-1½ 591 (600-1½)	1940-2 651 (700-2)

LNAV MDA DA for category A

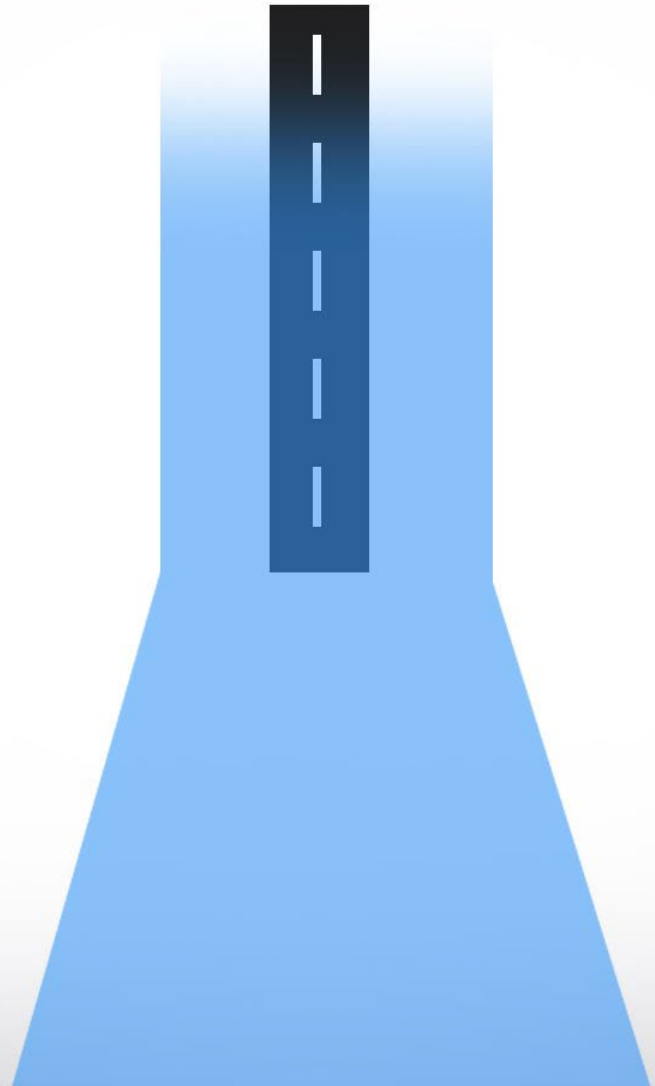
Lateral sensitivity increases as an aircraft gets closer to the runway (or PinS type approaches for helicopters). LP is not a fail-down mode for an LPV.

LP and LPV are independent.

LP minimums will not be published with lines of minima that contain approved vertical guidance (LNAV/VNAV or LPV).

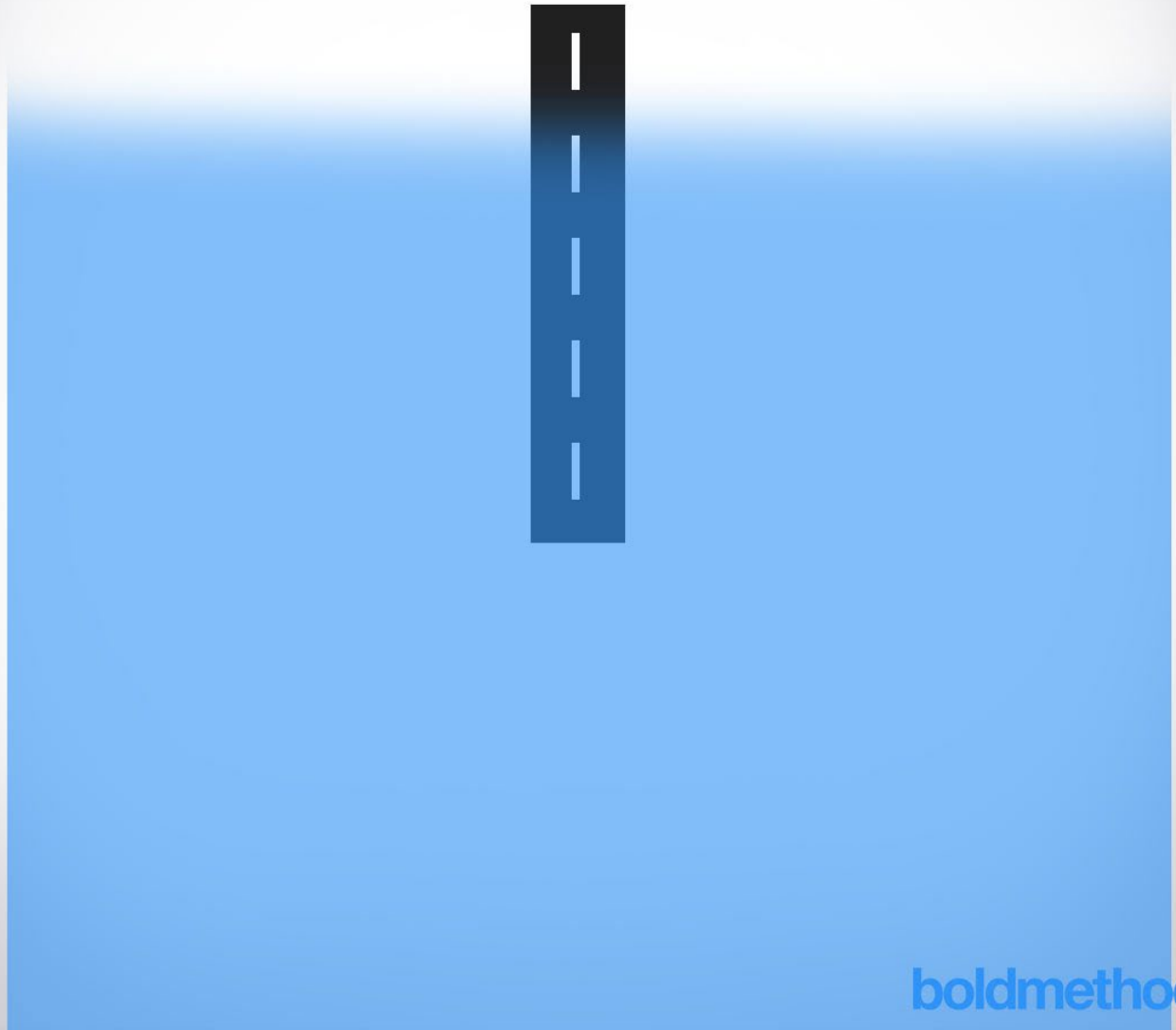
CATEGORY	A	B	C	D
LPV DA	1483-¾ 200 (200-¾)			
LNAV/ VNAV DA	1635-1¼ 352 (400-1¼)			
LNAV MDA	1720-1 437 (500-1)		1720-1¼ 437 (500-1¼)	1720-1½ 437 (500-1½)
CIRCLING	1880-1 591 (600-1)		1880-1½ 591 (600-1½)	1940-2 651 (700-2)

An LPV Approach Gets Increasingly Sensitive, Then Becomes Linear As You Approach The Threshold



boldmethod

An LNAV/VNAV Approaches Are Less Sensitive, And Linear Throughout The Final Approach Course



LPV vs LNAV/VNAV vs LNAV +V

https://www.boldmethod.com/learn-to-fly/navigation/what-is-the-difference-between-lpv-and-lnav-vnav-and-plus-v-gps-approaches/

Circling for category A

Circling – 1880 ft MSL/600 ft AGL

Same as the ILS approach.

CATEGORY	A	B	C	D
LPV DA	1483-¾ 200 (200-¾)			
LNAV/ VNAV DA	1635-1¼ 352 (400-1¼)			
LNAV MDA	1720-1 437 (500-1)		1720-1¼ 437 (500-1¼)	1720-1½ 437 (500-1½)
CIRCLING	1880-1 591 (600-1)		1880-1½ 591 (600-1½)	1940-2 651 (700-2)

Expanded Circling area

CIRCLING MDA IN FEET MSL	APPROACH CATEGORY AND CIRCLING RADIUS (NM)				
	CAT A	CAT B	CAT C	CAT D	CAT E
1000 or less	1.3	1.7	2.7	3.6	4.5
1001-3000	1.3	1.8	2.8	3.7	4.6
3001-5000	1.3	1.8	2.9	3.8	4.8
5001-7000	1.3	1.9	3.0	4.0	5.0
7001-9000	1.4	2.0	3.2	4.2	5.3
9001 and above	1.4	2.1	3.3	4.4	5.5

Circling Only Approaches

• Circling-only approaches are approaches not design for any specific runway, requiring a circle to land maneuver in the visual segment to land

• There are no Federal Aviation Regulations (FARs) specific to the circling maneuver

• Why #1: The final approach course alignment with the runway centerline exceeds 30 degrees.

• Why #2: The descent gradient is greater than 400 ft/NM from the FAF to the threshold crossing height (TCH). When this maximum gradient is exceeded, the circling only approach procedure may be designed to meet the gradient criteria limits. This does not preclude a straight-in landing if a normal descent and landing can be made in accordance with the applicable CFRs.

• Why #3: A runway is not clearly defined on the airfield.

Circling Only Approaches

• Circling-only approach plates are labeled with the Navigation Aid (NAVAID) and a letter (VOR-A)

KPDK RNAV (GPS)-A

• Airports with more than one circling-only approach will increase the letter designation (VOR-A, VOR-B)

PHMK VOR OR TACAN-A

PHMK RNAV (GPS)-B

NTSB released this:

https://www.ntsb.gov/Advocacy/safety-alerts/Documents/SA-084.pdf

Glide Path

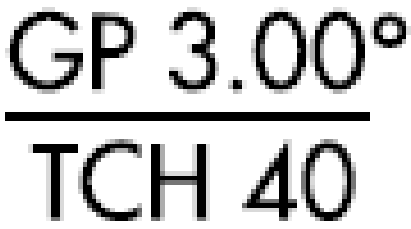
Large aircraft approaching to land normally use a 3 degree approach path.

This is equivalent to 3.14 nautical miles per 1000 ft of descent.

If exactly 3 NM are allowed per 1000 ft of descent, the glide path will be 3.14 degrees.

TCH = Standard Threshold Crossing Height

TCH 40 means you cross the threshold at 40 ft AGL

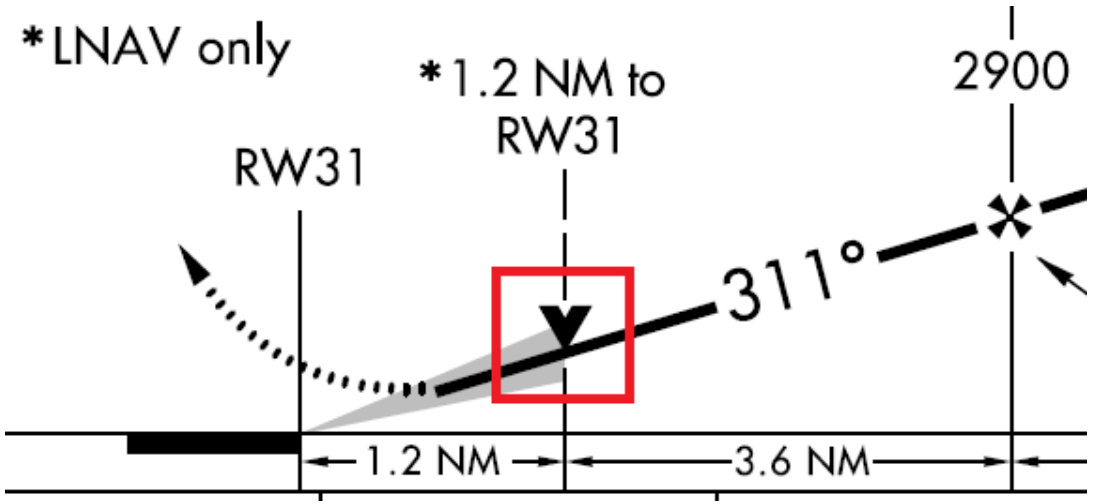


VDP

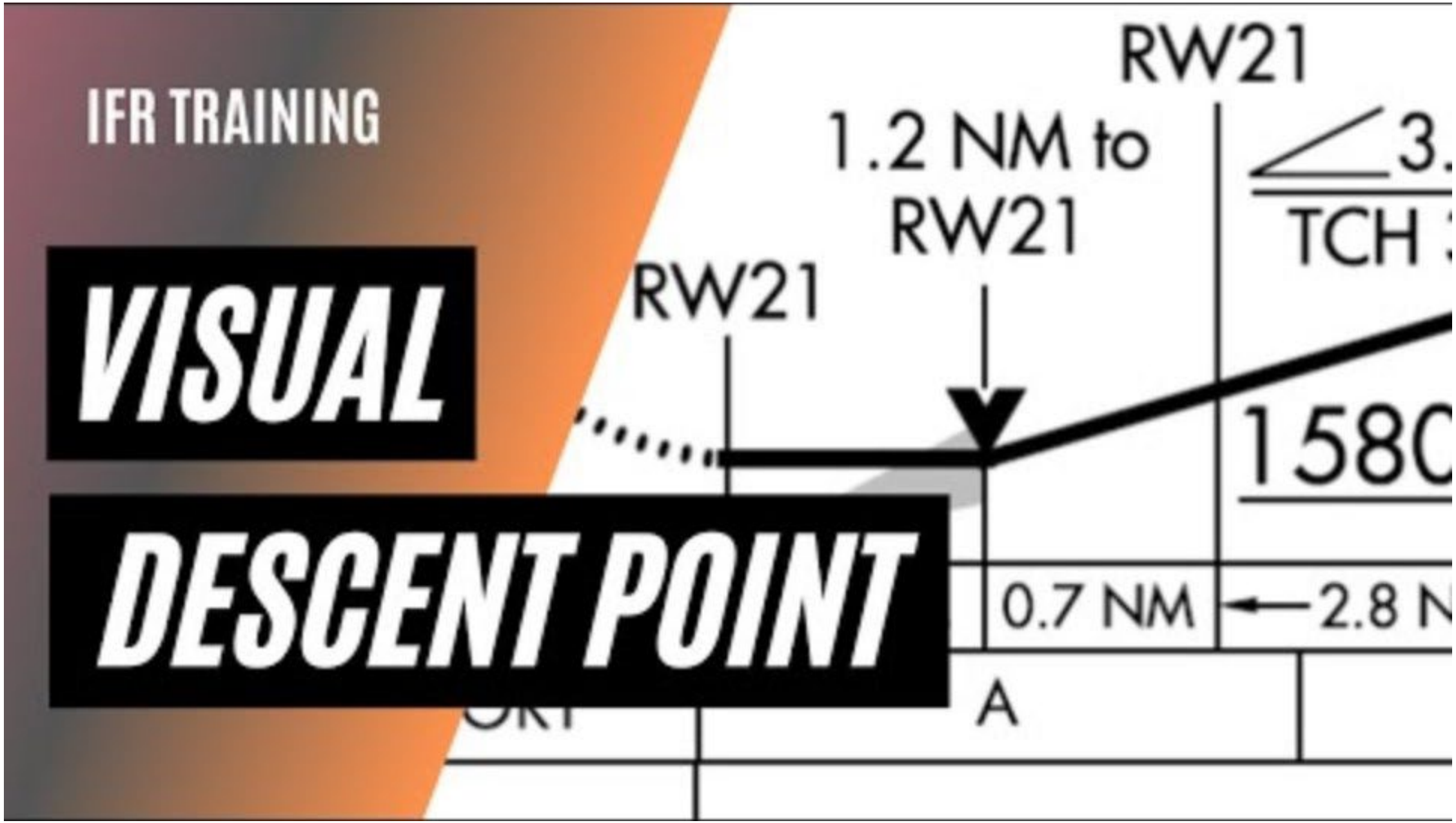
The Visual Descent Point (VDP) is a defined point on a straight-in, non-precision approach from which you can descend below the MDA, as long as you have the required visual reference.

If a VDP is available, it will be indicated by a "v" on the profile view portion of the instrument approach procedure chart.

Do not descend below MDA before reaching the VDP.



https://youtu.be/r8en5LGOjsA



VDP (from Amazon Gemini)

• **Definition:** It's a defined point on the final approach course where pilots can **begin a stabilized visual descent to the runway touchdown point**. They shouldn't descend below the Minimum Descent Altitude (MDA) before reaching this point.

• **Purpose:** It provides a safe reference for pilots to transition from instrument guidance to visual landing when appropriate. By starting the descent at the VDP, they can follow a standard 3-degree glide path, similar to precision approaches, and land smoothly.

• **Availability:** VDPs are only published for **straight-in instrument approaches** to specific runways. You won't find them on circling-only approaches or precision approaches like ILS.

• **Identification:** On approach plates, VDPs are usually marked with a **black "V" symbol**. Consult the specific approach information for details.

VDP (from Amazon Gemini)

• **Importance:** Reaching the VDP and making a safe visual descent depend on **having the required visibility and acquiring necessary visual references**. If these conditions aren't met, pilots must perform a missed approach.

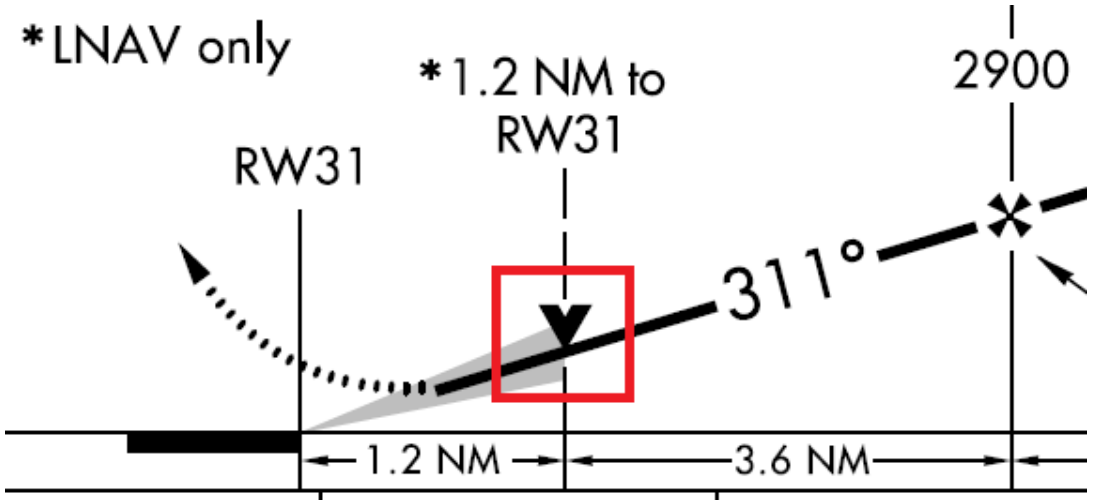
• **Estimating VDP:** While not ideal, a rule of thumb exists: divide the MDA height above touchdown by 300. However, referring to published information is always safer.

• **VDP vs. Missed Approach Point (MAPC):** VDP indicates when to start a visual descent, while MAPC specifies where a missed approach should be initiated if landing isn't achievable.

The Stipple

AeroNav GPS approaches indicate that the 34:1 slope on the visual segment is clear of obstructions through the depiction of a light grey stipple line connecting the course line to the runway in the profile view.

There is no indication at all on Jepp charts due to the requirement for international consistency.



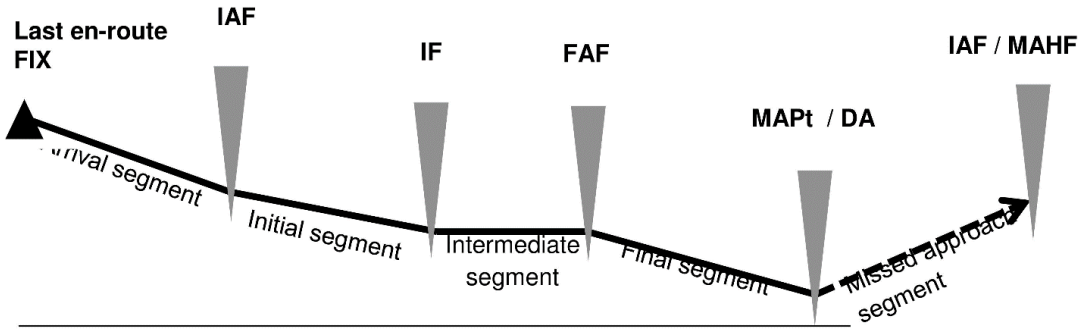
Segments

IAF = initial approach fix is a fix that marks the beginning of the initial segment and the end of the arrival segment, if applicable.

In RNAV application, this fix is normally defined by a fly-by waypoint.

IF = intermediate fix is a fix that marks the end of an initial segment and the beginning of the intermediate segment.

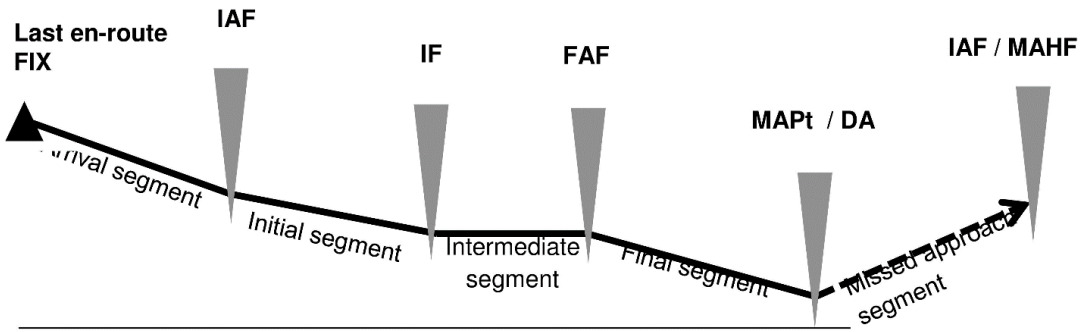
In RNAV application, this fix is normally defined by a fly-by waypoint.



Segments

FAF = final approach fix is a fix that marks the end of an intermediate segment and the beginning of the final approach segment for non-precision approach.

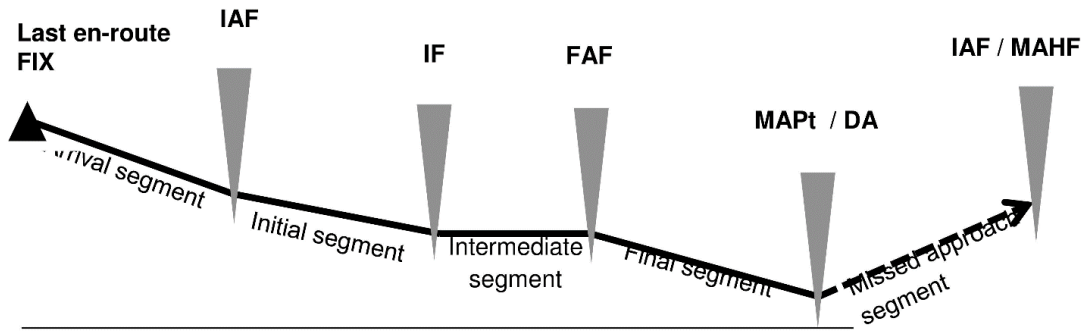
FAP = final approach point is a fix that marks the end of an intermediate segment and the beginning of the final approach segment for precision approach.



Segments

MAPt = Missed approach point is a point in an instrument approach procedure at or before which the prescribed missed approach procedure must be initiated in order to ensure that the minimum obstacle clearance is not infringed.

MAHF = Missed approach holding fix is a fix used in RNAV application that marks the end of the missed approach segment and the center point for the missed approach holding.

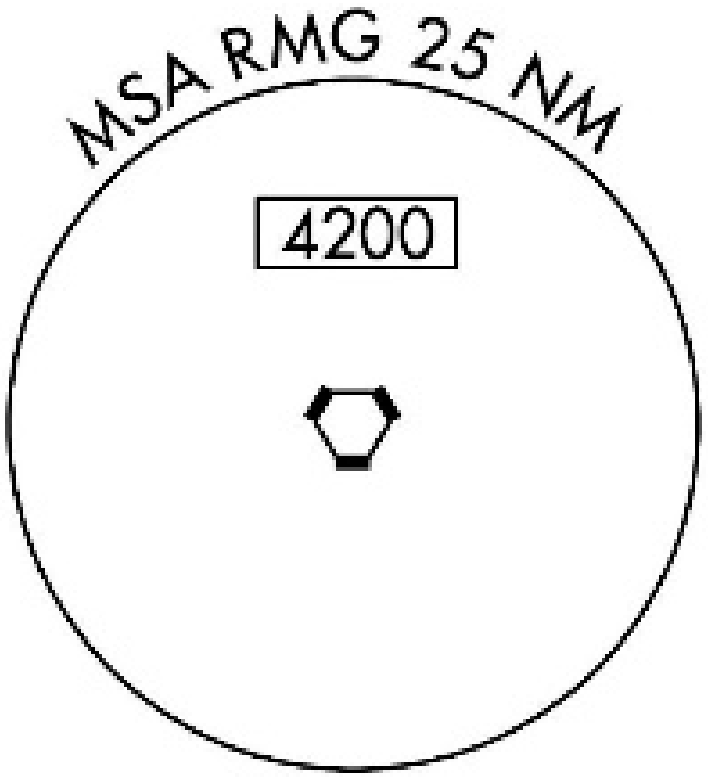


MSA

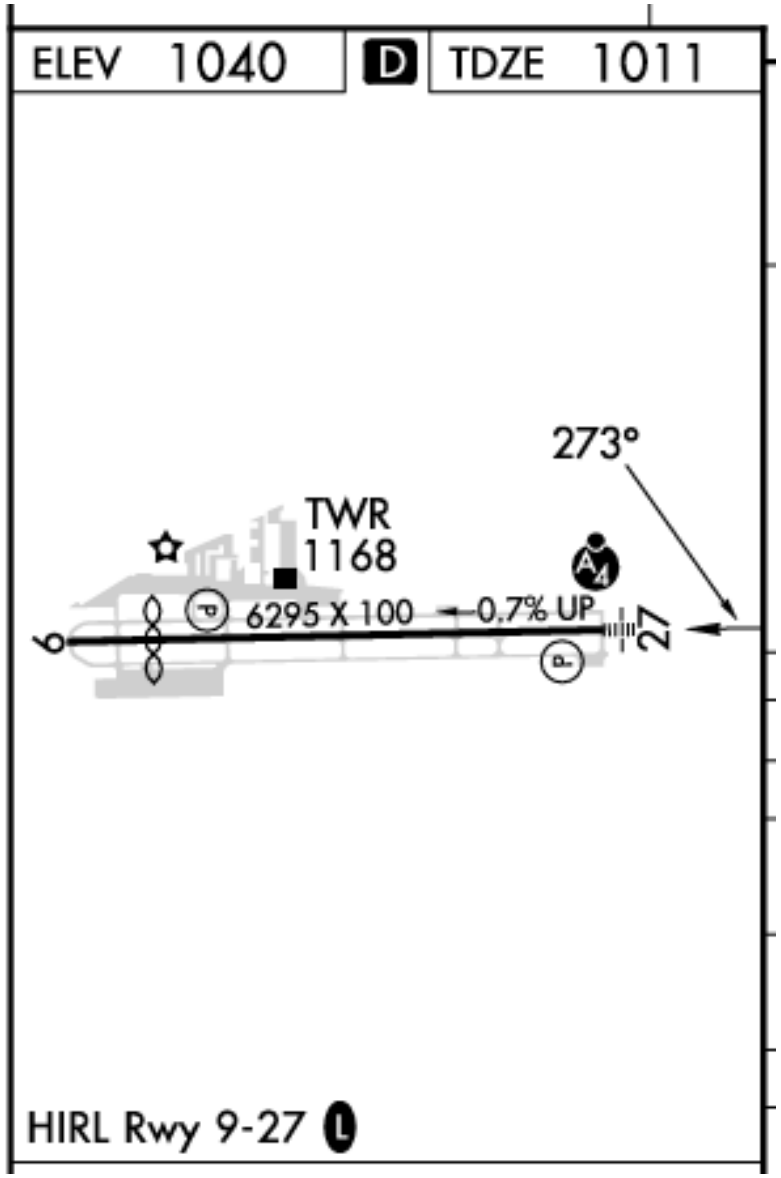
Minimum Sector Altitude named MSA is the lowest altitude which may be used which will provide a minimum clearance of 300 m (= 1000ft) above all objects located in the area contained within a sector of a circle of 46 km (=25 NM) radius centered on a radio navigation aid.

This does not guarantee acceptable navigational aid reception.

Figure shows an MSA of 4200 within 25 NM of VOR RMG



Airport Diagram



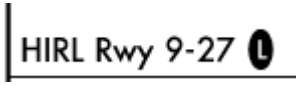
The D

There is runway declared distance information available in the Chart Supplement for takeoff and landing

See my lesson called Runways

The L

There is pilot controlled lighting



For airports with towers when the tower is closed

For More Detailed Info

See Instrument Procedure Handbook FAA-H-8083-16

https://www.flyingmag.com/everything-you-need-to-know-about-rnav-gps-approaches/

https://www.faa.gov/air_traffic/publications/atpubs/atc_html/chap5_section_9.html

Any questions I can answer or follow up later on?

Other Types of Approaches

Lesson Objective

To develop understanding of ways to approach an airport other than the usual ILS, RNAV/GPS, VOR, LOC.

Special VFR

According to Federal Aviation Regulations, SVFR operations can only be conducted in the controlled airspace around an airport where that controlled airspace extends down to the surface (so-called surface area). SVFR can only be conducted below 10,000 feet MSL in such areas.

SVFR at night requires an IFR-equipped aircraft and an IFR-rated pilot in command.

In helicopters, there is no minimum flight visibility requirement, or a requirement for an IFR-equipped aircraft or an IFR-rated pilot in command.

Special VFR

The aircraft need not necessarily be equipped for flight under IFR, and the aircraft must remain clear of clouds with the surface in sight, and maintain one statute mile visibility in the US.

The pilot continues to be responsible for obstacle and terrain clearance.

An example of the use of SVFR is when a flight wishes to leave an airport in a control zone, to fly VFR in uncontrolled airspace, when the visibility is below the minimum for VFR flight in the control zone but not below the lower minimum for VFR flight in uncontrolled airspace.

SVFR is never offered by ATC, it must be requested.

Visual Approach

A visual approach is an approach to a runway at an airport conducted under instrument flight rules (IFR) but where the pilot proceeds by visual reference and clear of clouds to the airport.

The pilot must at all times have either the airport or the preceding aircraft in sight.

This approach must be authorized and under the control of the appropriate air traffic control (ATC) facility.

Contact Approach

A Contact Approach is an approach available to aircraft operating on an IFR flight plan, where the pilot may deviate from the published instrument approach procedure (IAP) and proceed to the destination airport by visual reference to the surface.

Only pilots may initiate a request for this type of approach, as regulations prohibit air traffic control (ATC) from asking pilots to perform them.

A contact approach will only be issued if the aircraft is operating clear of clouds with at least 1-mile of flight visibility, with a reasonable expectation of continuing to the destination airport under those conditions.

Additionally, the reported ground visibility at the destination airport must be at least 1 statute mile.

Contact Approach

In the execution of a contact approach, the pilot is responsible for obstruction clearance, but ATC will still provide separation from other IFR or Special VFR traffic.

If radar service is being received, it will automatically terminate when the pilot is instructed to change to the airport's advisory frequency.

Contact Approach

The pilot must advise ATC immediately if unable to continue the contact approach or if s/he encounters less than 1-mile flight visibility; new instructions will then be provided by ATC.

ATC may issue alternative instructions if, in their judgment, weather conditions may make completion of the approach impracticable.

The contact approach is often used as time- and fuel-savings method of working the air traffic control system to a pilot's advantage.

It is essentially a legalized form of scud-running, a potentially very dangerous practice.

It works safely only if the pilot is completely familiar with local terrain.

PAR Approach

Precision Approach Radar (PAR)

A PAR approach is similar to an ILS.

Both vertical and lateral navigation guidance is provided to the pilot, all without the use of navigation-reliant cockpit instrumentation.

Air Traffic Controllers use radar to track the aircraft's position, then tell pilots over the radio what corrections they should make.

These approaches are most commonly found at military bases around the country.

ASR Approach

Approach Surveillance Radar (ASR)

The only equipment required for an ASR approach is a functioning radio.

The controller vectors the aircraft to align it with the runway centerline, and continues to do so until the aircraft can make a landing visually.

It's flown in a similar fashion to many non-precision approaches, where step-down altitudes are used along the final approach path.

Precision Runway Monitoring

Precision Runway Monitoring (PRM) approaches are simultaneous ILS approaches to closely spaced parallel runways that are less than 4,300 feet apart.

ILS PRM approaches have their own approach charts with a special page of instructions called "Attention All Users of ILS Precision Runway Monitor (PRM)" that must be read by the pilot before the approach is flown.

PRM approaches involve two air traffic controllers: a Tower Controller and a Monitor Controller.

Specific Air Traffic procedures have been established at airports conducting ILS PRM approaches.

All pilots must meet FAA pilot requirements to accept an ILS PRM or LDA PRM approach clearance.

Precision Runway Monitoring

PRM ILS approaches require an ILS navigation receiver and two communication receivers — one for the Tower Controller and one for the Monitor Controller (or one communication receiver with the ability to monitor two frequencies simultaneously).

Pilots both transmit and receive on the Tower frequency, but the Monitor frequency is for receiving only.

Pilots should never transmit on the Monitor frequency.

Precision Runway Monitoring

Once a pilot accepts a PRM ILS approach, the pilot must fly the ILS approach and monitor the two frequencies (Tower and Monitor). If the "no transgression zone" (space between the runways) is violated, the Monitor Controller will issue "breakout" instructions that must be complied with immediately. All breakout maneuvers must be hand flown (no autopilot).

Most breakout maneuvers will consist of a turn and a climb. However, if climbing is not an option, as in the case of conflicting traffic above, descending breakout instructions may be given. If instructed to descend, the descent altitude will always include a 1,000-foot obstacle clearance.

Any questions I can answer or follow up later on?

Primary and Supporting Instruments

Lesson Objective

To develop understanding of the instruments used for pitch, bank, and power control.

The Layout

<u>Top row left to right</u>

Airspeed indicator (ASI)

Attitude Indicator (AI)

Altimeter (Alt)

<u>Bottom row left to right</u>

Turn Coordinator (TC)

Heading Indicator (HI)

Vertical Speed Indicator (VSI)

Straight and Level

Primary

Pitch – Altimeter

Power – Airspeed Indicator

Trim

Rudder – Turn Coordinator

Bank – Heading Indicator

Straight and Level

Supporting

Pitch – VSI & AI

Power – Tach & MP

Trim

Rudder – Turn Coordinator

Bank – Turn Coordinator & AI

Standard-Rate Turn Establishing

Primary

Pitch – Altimeter

Power – Airspeed Indicator

Trim

Rudder – Turn Coordinator

Bank – AI then Turn Coordinator

Standard-Rate Turn Establishing

Supporting

Pitch – VSI & AI

Power – Tach & MP

Trim

Rudder – Turn Coordinator

Bank – Turn Coordinator & AI

Same as

Straight and Level - Supporting

Standard-Rate Turn Turning

Primary

Pitch – Altimeter

Power – Airspeed Indicator

Trim

Rudder – Turn Coordinator

Bank – Turn Coordinator

Standard-Rate Turn Turning

Supporting

Pitch – VSI & AI

Power – Tach & MP

Trim

Rudder – Turn Coordinator

Bank – Turn Coordinator & AI

Same as

Straight and Level - Supporting

Constant Speed Climb/Descent

Primary

Pitch – Attitude Indicator

Power – Tach & MP

Trim

Rudder – Turn Coordinator

Bank – Heading Indicator

Constant Speed Climb/Descent

Supporting

Pitch – VSI

Power – Airspeed Indicator

Trim

Rudder – Turn Coordinator

Bank – Turn Coordinator & AI

Constant Rate Climb/Descent Entry

Primary

Pitch – Attitude Indicator

Power – Tach & MP

Trim

Rudder – Turn Coordinator

Bank – Heading Indicator

Constant Rate Climb/Descent Entry

Supporting

Pitch – VSI

Power – Airspeed Indicator

Trim

Rudder – Turn Coordinator

Bank – Turn Coordinator & AI

Constant Rate Climb/Descent Stabilized

Primary

Pitch – VSI

Power – Airspeed Indicator

Trim

Rudder – Turn Coordinator

Bank – Heading Indicator

Constant Rate Climb/Descent Stabilized

Supporting

Pitch – Attitude Indicator

Power – Tach & MP

Trim

Rudder – Turn Coordinator

Bank – Turn Coordinator & AI

Changing Airspeed In Turns

Primary

Pitch – Altimeter

Power – Tach & MP then ASI

Trim

Rudder – Turn Coordinator

Bank – Turn Coordinator

Changing Airspeed In Turns

Supporting

Pitch – VSI & AI

Power – Tach & MP

Trim

Rudder – Turn Coordinator

Bank – Attitude Indicator

Any questions I can answer or follow up later on?