Departure Procedures, Enroute/Area Charts, Enroute Procedures, Holding Procedures

Updated April 2025

References/Resources

Syllabus References:

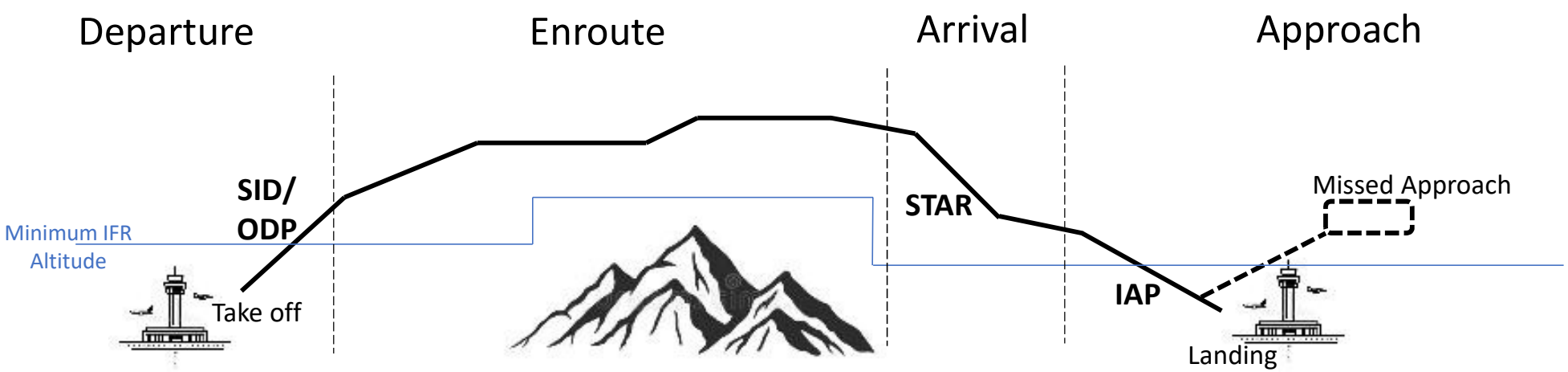
Ground Lesson # 10: Departure Procedures

Ground Lesson # 11: Enroute, Area Charts; Enroute Procedures Ground Lesson # 12: Holding Procedures

Instrument/Commercial Book: DVD/Video:

- GFD I/C Part II, Chapter 4, Sections A & B
  - Chapter 4, Departure
- GFD I/C Part II, Segment 1, Chapter 5, Sections A & B
  - Chapter 5, Section A “Enroute & Area Charts”
  - Chapter 5, Section B “Enroute Procedures”
- GFD I/C Part II, Segment 1, Chapter 5, Section C
  - Chapter 5: Section C “Holding Procedures”

Phases of IFR Flights



Departures

Overview

DEPARTURE CHARTS

- Obtaining Charts
- Departure Standards
- SID, ODP, DVA
- Pilot Nav DP
- Vector DP
- Chart Format and Symbology

DEPARTURE PROCEDURES

- Takeoff Minimums
- Departure Options
- Textual Departure Procedures
- Radar Departures
- VFR Departures
- Selecting a Departure Method

What are our options for departure?

- In visual conditions:
  - Depart VFR and pick up IFR clearance in the air
  - Visual climb
  - Visual Climb Over Airport (VCOA)
- We're going to look into each of these

- In visual or instrument conditions:
  - At the absence of SID or ODP:
    - Standard departure, radar or pilot navigated
    - May require non-standard weather and/or climb gradient
  - Standard Instrument Departure (SID):
    - In your clearance
  - Obstacle Departure Procedure (ODP):
    - Self-flown, no clearance for ODP
  - Diverse Vectoring Area (DVA):
    - Standard departure, ATC vectors
    - May require non-standard weather and/or climb gradient

Example – KRUT Rutland VT

19

RUTLAND, VT

RUTLAND/SOUTHERN VERMONT RGNL (RUT)

TAKEOFF MINIMUMS AND (OBSTACLE) DEPARTURE PROCEDURES

AMDT 4A 07FEB13 (22307) (FAA)

TAKEOFF MINIMUMS:

Rwy 1, std. w/min. climb of 439' per NM to 3000, or 3600-3 for climb in visual conditions.
Rwy 13, NA-Obstacles.
Rwy 19, std. w/min. climb of 470' per NM to 3300, or 3600-3 for climb in visual conditions.
Rwy 31, std. w/min. climb of 500' per NM to 4500, or 3600-3 for climb in visual conditions.

DEPARTURE PROCEDURE:

Rwy 1, climb on 013°course to DYO NDB, cross DYO NDB at or above 6000, if not at 6000, depart DYO NDB on bearing 325° to 6000 before proceeding on course. For climb in visual condition: cross Rutland/Southern Vermont Rgnl airport at or above 4300 before proceeding on course. When executing VCOA, notify ATC prior to departure.
Rwy 19, climb heading 194° to 1400, then climbing right turn on 025° course to DYO NDB, cross DYO NDB at or above 6000, if not at 6000, depart DYO NDB on bearing 325° to 6000 before proceeding on course. For climb in visual condition: cross Rutland/Southern Vermont Rgnl airport at or above 4300 before proceeding on course. When executing VCOA, notify ATC prior to departure.
Rwy 31, climb heading 329° to 1600, then climbing right turn on 025° course to DYO NDB, cross DYO NDB at or above 6000, if not at 6000, depart DYO NDB on bearing 325° to 6000 before proceeding on course. For climb in visual condition: cross Rutland/Southern Vermont Rgnl airport at or above 4300 before proceeding on course. When executing VCOA, notify ATC prior to departure.

TAKEOFF OBSTACLE NOTES:

Rwy 1, tree 79' from DER, 424' right of centerline, 80' AGL/805' MSL.
Rwy 19, trees beginning 167' from DER, 305' right of centerline, up to 42' AGL/843' MSL.
Trees beginning 393' from DER, 175' left of centerline, up to 100' AGL/967' MSL.
Rwy 31, trees beginning 334' from DER, 94' left of centerline, up to 100' AGL/1319' MSL.
Trees beginning 885' from DER, 201' right of centerline, up to 85' AGL/827' MSL.

Example - KBED Hanscom MA

BEDFORD, MA

LAURENCE G HANSCOM FLD (BED)

TAKEOFF MINIMUMS AND (OBSTACLE) DEPARTURE PROCEDURES

AMDT 6A 19MAY22 (22139) (FAA)

TAKEOFF MINIMUMS:

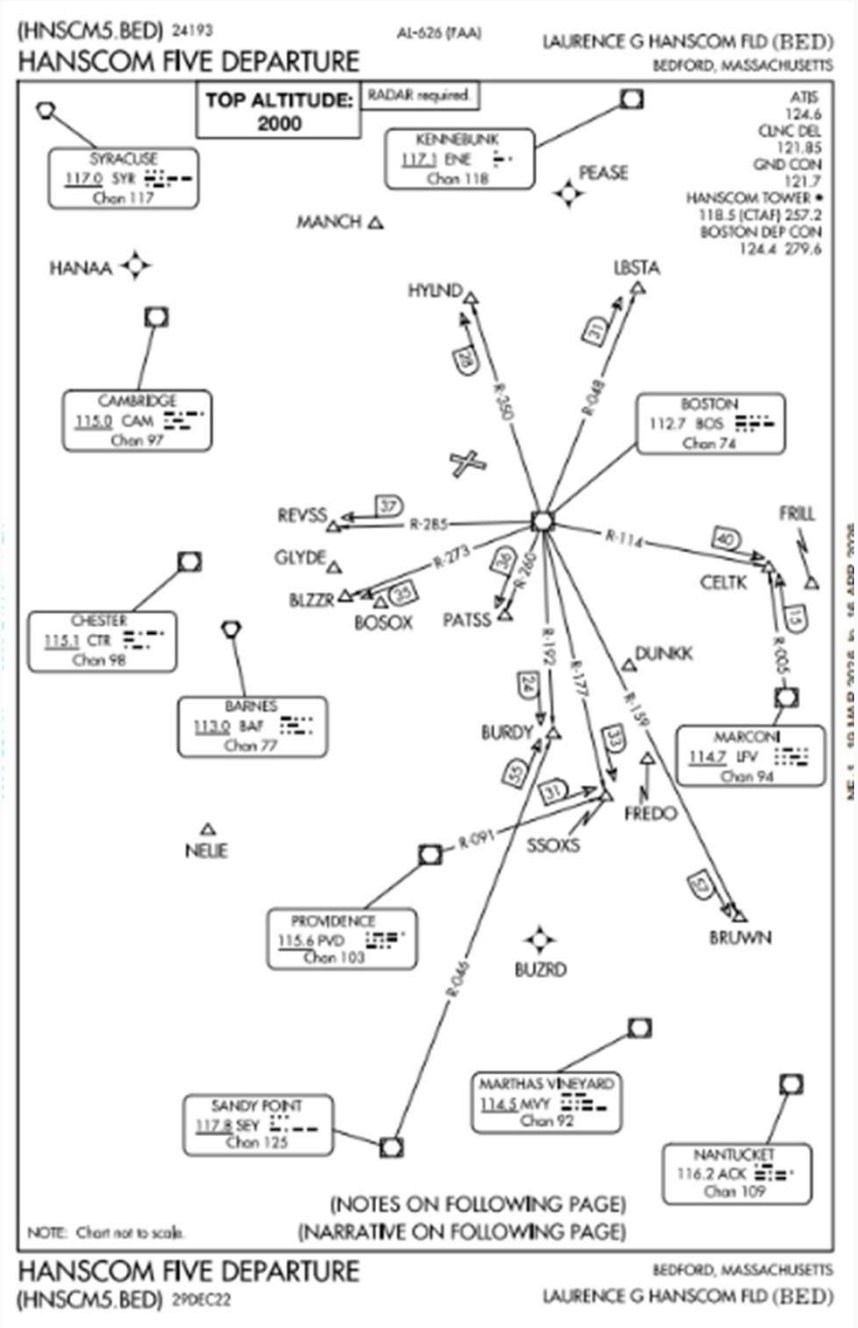
Rwy 11, 300-1 or std. w/min. climb of 258' per NM to 400.

Rwy 23, 300-1⅞ or std. w/min. climb of 439' per NM to 400.

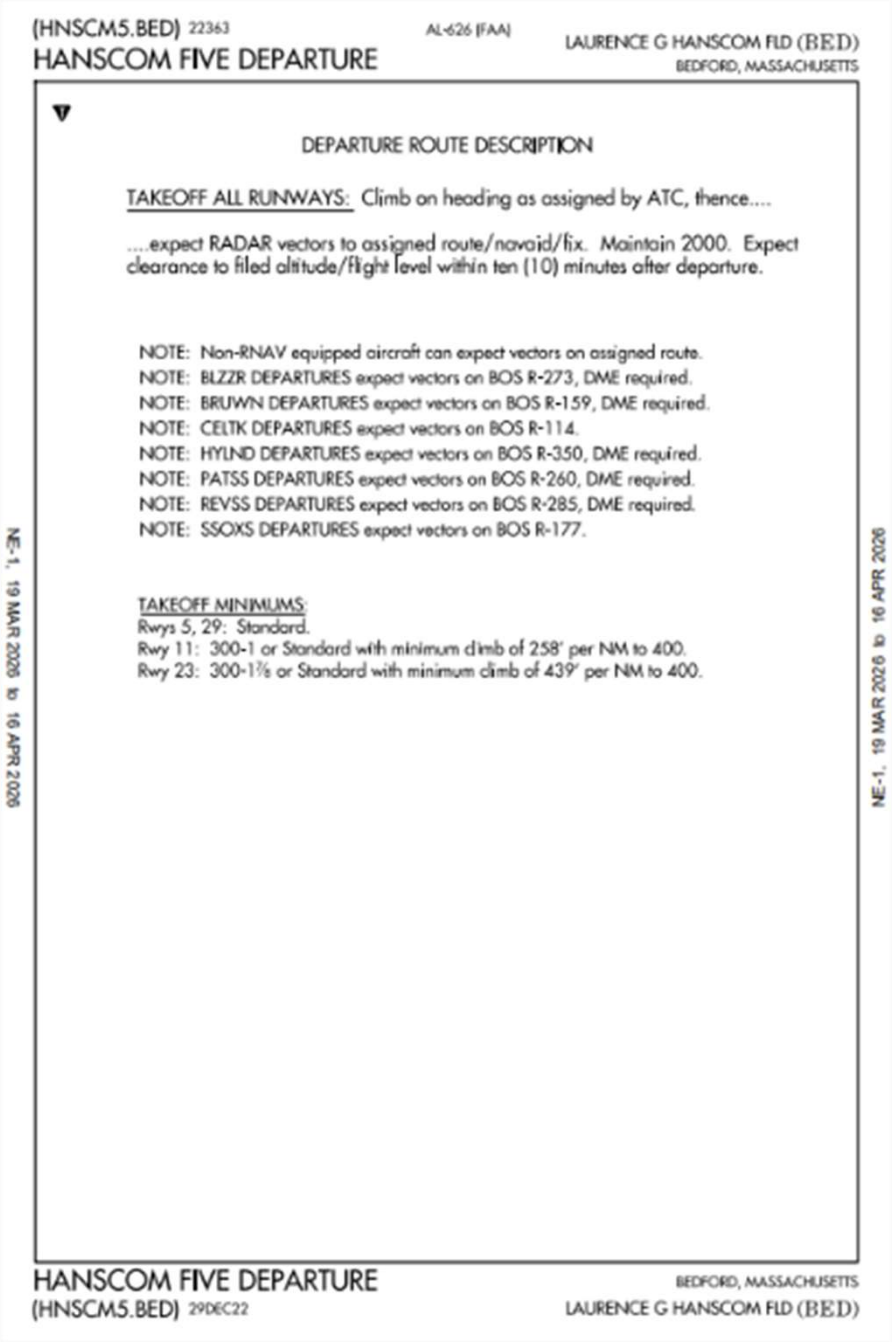
TAKEOFF OBSTACLE NOTES:

Rwy 5, trees, vegetation, building beginning 44' from DER, 309' left of centerline, up to 30' AGL/166' MSL.
Fence 152' from DER, 248' right of centerline, 6' AGL/132' MSL.
Trees beginning 255' from DER, 84' left of centerline, up to 39' AGL/171' MSL.
Tree 857' from DER, 203' right of centerline, 31' AGL/157' MSL.
Tree 964' from DER, 113' right of centerline, 34' AGL/161' MSL.
Trees, poles beginning 1153' from DER, 386' right of centerline, up to 197' MSL.
Trees beginning 1195' from DER, 11' left of centerline, up to 46' AGL/173' MSL.
Tree 1443' from DER, 433' left of centerline, 176' MSL.
Tree 1648' from DER, 402' left of centerline, 184' MSL.
Tree 1680' from DER, 213' left of centerline, 198' MSL.
Trees, pole beginning 1681' from DER, 117' right of centerline, up to 201' MSL.
Trees beginning 1761' from DER, 57' left of centerline, up to 202' MSL.
Trees beginning 2049' from DER, 56' left of centerline, up to 210' MSL.
Trees beginning 2400' from DER, 263' right of centerline, up to 209' MSL.
Trees beginning 2475' from DER, 515' right of centerline, up to 221' MSL.
Trees beginning 2594' from DER, 133' right of centerline, up to 229' MSL.
Trees beginning 2663' from DER, 84' left of centerline, up to 91' AGL/214' MSL.
Trees beginning 2838' from DER, 10' left of centerline, up to 224' MSL.
Tree 2859' from DER, 415' right of centerline, 230' MSL.
Trees beginning 2910' from DER, 235' right of centerline, up to 231' MSL.
Trees beginning 3233' from DER, 42' left of centerline, up to 231' MSL.
Trees beginning 3328' from DER, 2' right of centerline, up to 232' MSL.

Example - KBED Hanscom MA (cont.)



Example - KBED Hanscom MA (cont.)



(HNSCM5.BED) 22363 AL-626 (FAA)
LAURENCE G HANSCOM FLD (BED)
BEDFORD, MASSACHUSETTS

HANSCOM FIVE DEPARTURE

DEPARTURE ROUTE DESCRIPTION

TAKEOFF ALL RUNWAYS: Climb on heading as assigned by ATC, thence....

....expect RADAR vectors to assigned route/navaid/fix. Maintain 2000. Expect clearance to filed altitude/flight level within ten (10) minutes after departure.

NOTE: Non-RNAV equipped aircraft can expect vectors on assigned route.
NOTE: BLZZR DEPARTURES expect vectors on BOS R-273, DME required.
NOTE: BRUWN DEPARTURES expect vectors on BOS R-159, DME required.
NOTE: CELTK DEPARTURES expect vectors on BOS R-114.
NOTE: HYLND DEPARTURES expect vectors on BOS R-350, DME required.
NOTE: PATSS DEPARTURES expect vectors on BOS R-260, DME required.
NOTE: REVSS DEPARTURES expect vectors on BOS R-285, DME required.
NOTE: SSOXS DEPARTURES expect vectors on BOS R-177.

TAKEOFF MINIMUMS:
Rwys 5, 29: Standard.
Rwy 11: 300-1 or Standard with minimum climb of 258' per NM to 400.
Rwy 23: 300-1⅞ or Standard with minimum climb of 439' per NM to 400.

NE-1, 19 MAR 2026 to 16 APR 2026

NE-1, 19 MAR 2026 to 16 APR 2026

HANSCOM FIVE DEPARTURE
(HNSCM5.BED) 29DEC22

BEDFORD, MASSACHUSETTS
LAURENCE G HANSCOM FLD (BED)

Example - KTEB Teterboro NJ

TETERBORO, NJ

TETERBORO (TEB)

TAKEOFF MINIMUMS AND (OBSTACLE) DEPARTURE PROCEDURES

AMDT 8A 07SEP23 (23250) (FAA)

TAKEOFF MINIMUMS:

Rwy 1, 400-2¼ or std w/min climb of 294' per NM to 500.
Rwy 6, 300-1½ or std w/min climb of 283' per NM to 400.
Rwy 19, 600-2¼ or std w/min climb of 352' per NM to 700.
Rwy 24, 400-1¾ or std w/min climb of 444' per NM to 500.

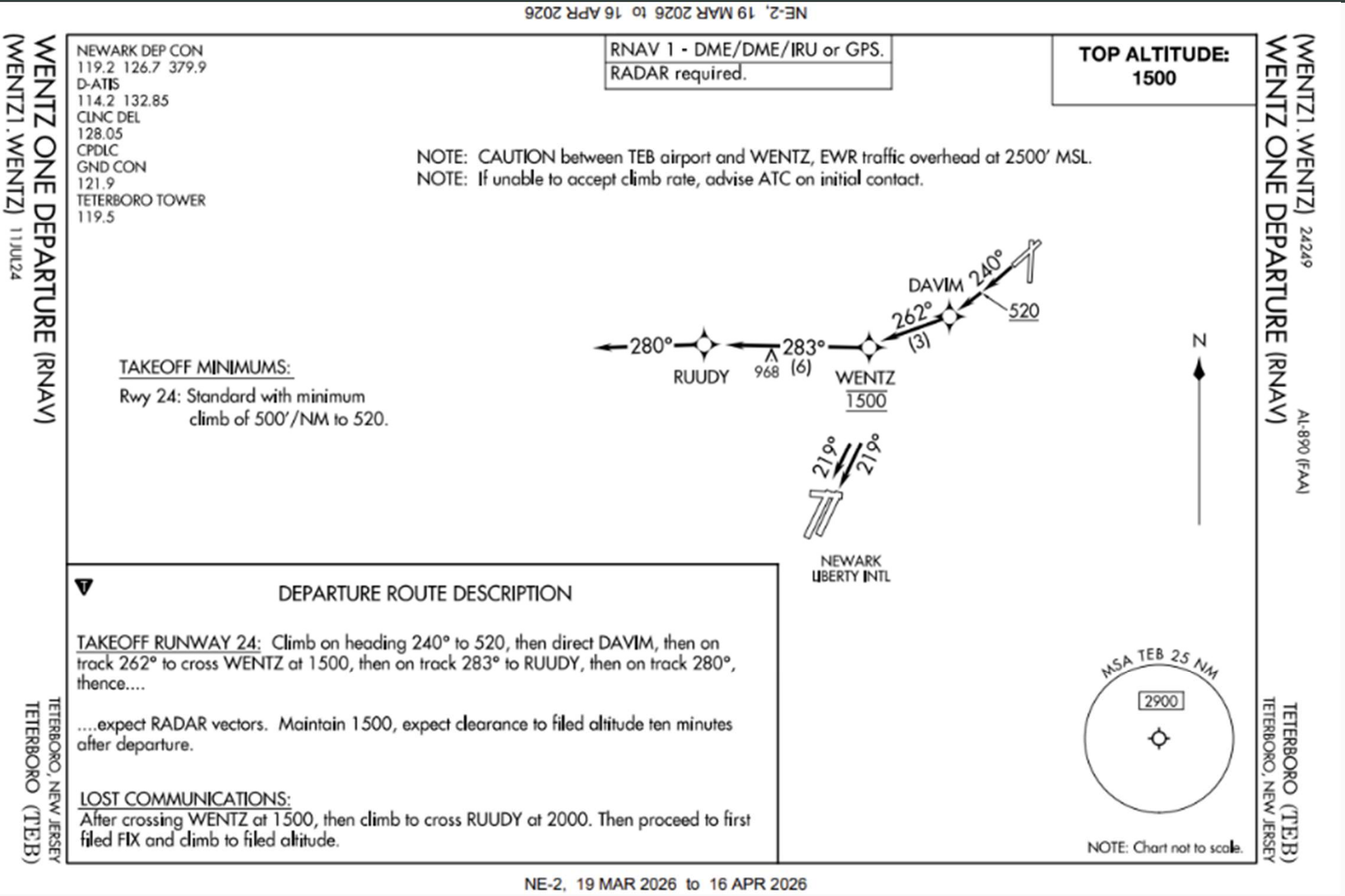
DEPARTURE PROCEDURE:

Rwy 1, climbing right turn heading 040° to 900 before proceeding on course.
Rwy 6, climbing left turn heading 040° to 900 before proceeding on course.
Rwy 19, climb on heading 195° to 900 then climbing right turn to intercept BWZ VOR/DME R-104 to 2000 before proceeding on course.
Rwy 24, climb heading 240° to 1500 before proceeding on course.

TAKEOFF OBSTACLE NOTES:

Rwy 1, building, poles, and trees beginning 198' from DER, 147' left of centerline, up to 77' AGL/86' MSL.
Building, poles, and trees beginning 906' from DER, 135' right of centerline, up to 65' AGL/74' MSL.
Tree 1771' from DER, on centerline, 49' AGL/58' MSL.
Buildings and trees beginning 4753' from DER, 127' left of centerline, up to 146' AGL/265' MSL.
Building 5903' from DER, 1521' left of centerline, 160' AGL/224' MSL.
Buildings beginning 1.5 NM from DER, 320' right of centerline, up to 206' AGL/285' MSL.
Buildings beginning 1.8 NM from DER, 752' right of centerline, up to 249' AGL/314' MSL.
CON'T

Example – KTEB Teterboro NJ (cont.)



Departure - Introduction

- Departure Procedures are pre-planned terminal instrument flight rule (IFR) procedures, designed for two reasons:
  - The primary purpose is to provide obstacle clearance protection information to pilots
  - A secondary goal, at busier airports, is to increase efficiency and reduce communications and departure delays through the use of Standard Instrument Departures (SIDs)
- There are two types of Departure Procedures, Obstacle Departure Procedures (ODP), printed either textually or graphically, and Standard Instrument Departures (SID), always printed graphically (with a textual portion).
- All DPs, either textual or graphic may be designed using either conventional or RNAV criteria
- ODPs specifically ensure obstacle protection, routing aircraft through potential hazards and onto the enroute structure

Departure – Introduction (cont)

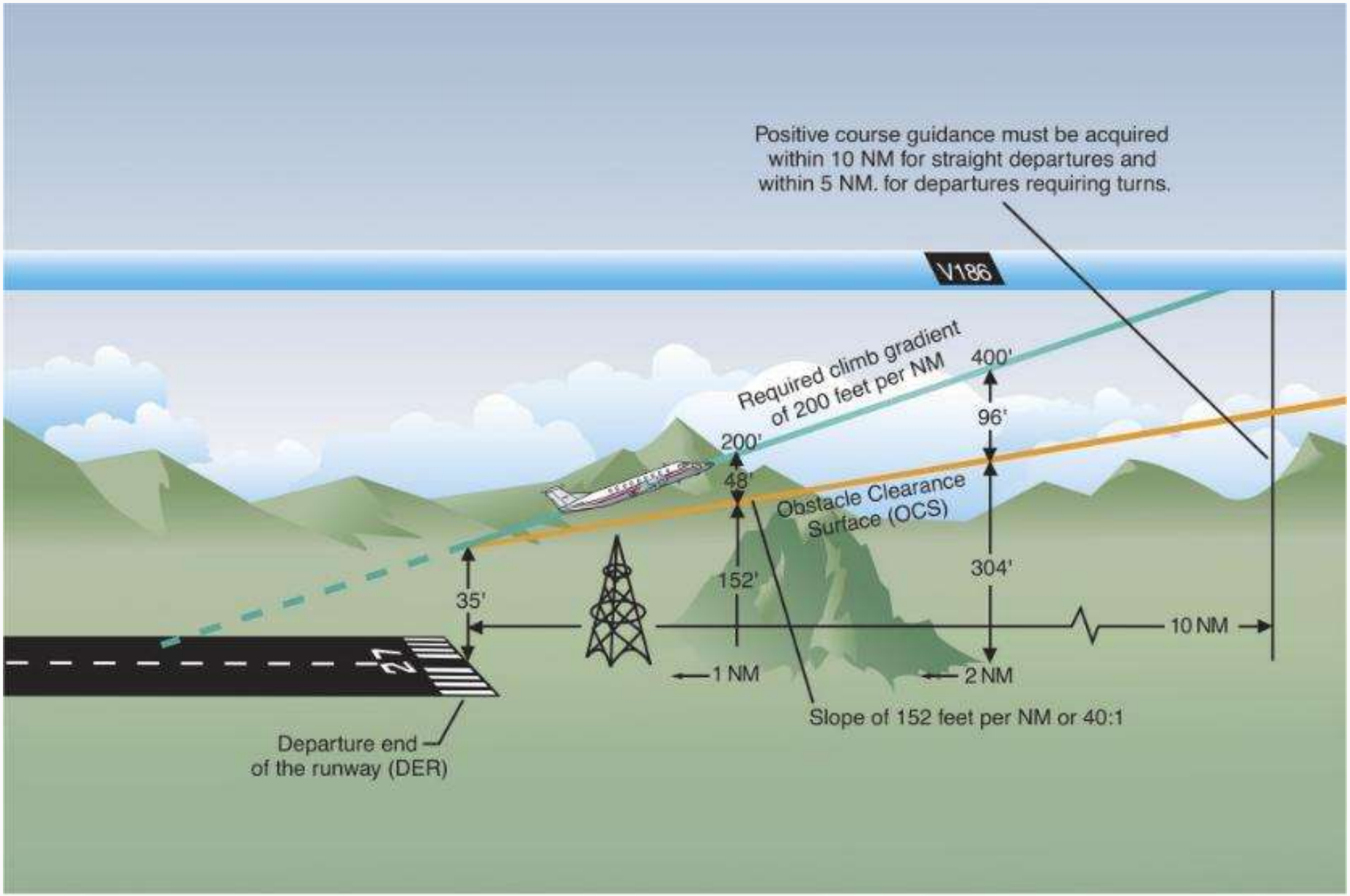
- Starting with clearance delivery on the ground control, ATC manages traffic flow through departure control's issuance of a departure clearance
- Your departure clearance then issues restrictions, and may even be abbreviated, facilitating planned traffic flows
  - Even abbreviated clearance will contain:
    - Clearance limit (usually destination airport)
    - Departure procedure (if applicable)
    - Altitude/flight level
- Many airports in the National Airspace System (NAS) are equipped with the Terminal Data Link System (TDLS) which allow for the use of automated pre-departure procedures
- Both pilots and controllers share certain responsibilities, in different capacities
- Ultimately, departure procedures found in the FAA Terminal Procedure Publications provide guidance as to how a pilot must fly the procedure

Departure Charts: Departure Standards

Climb Gradients & Obstacle Clearances:

- Based on TERPS - Terminal Instrument Procedures criteria (in the US) and PANSOPS outside US
- Assumes you cross departure end of Runway at 35ft AGL
- Assumes you climb at or greater than 200 ft/NM
- Examines a slope of 152 ft/NM for obstacles
  - *If obstacles penetrate this plane, instrument departure procedures are required (visibility, climb gradient, equipment limitations)*
- Requires climb to 400 ft above airport elevation before any turns are required
- Departure routes based on positive course guidance up to 10 NM from Departure End of Runway - DER for straight departures and 5 NM after completion of turns for departures requiring turns.

Departure Charts: Departure Standards



Climb/Descent Chart

If a climb gradient table is not available, the rate of climb can be calculated manually.

Example:

If a climb gradient of 200 ft per nautical mile is required and our ground speed in the climb is 90 knots we will need a rate of climb of 300 feet per minute.

90 Nautical Miles Per Hour divided by 60 minutes per hour = 1.5 nautical miles per minute. 1.5 nautical miles per minute times 200 feet per nautical mile = 300 feet per minute.

CLIMB/DESCENT TABLE 10042

INSTRUMENT TAKEOFF OR APPROACH PROCEDURE CHARTS
RATE OF CLIMB/DESCENT TABLE
(ft. per min)

A rate of climb/descent table is provided for use in planning and executing climbs or descents under known or approximate ground speed conditions. It will be especially useful for approaches when the localizer only is used for course guidance. A best speed, power, altitude combination can be programmed which will result in a stable glide rate and altitude favorable for executing a landing if minimums exist upon breakout. Care should always be exercised so that minimum descent altitude and missed approach point are not exceeded.

CLIMB/ DESCENT ANGLE (degrees and tenths)		ft/NM	GROUND SPEED (knots)										
			60	90	120	150	180	210	240	270	300	330	360
	2.0	210	210	320	425	530	635	743	850	955	1060	1165	1275
	2.5	265	265	400	530	665	795	930	1060	1195	1325	1460	1590
VERTICAL PATH ANGLE	2.7	287	287	430	574	717	860	1003	1147	1290	1433	1576	1720
	2.8	297	297	446	595	743	892	1041	1189	1338	1486	1635	1783
	2.9	308	308	462	616	770	924	1078	1232	1386	1539	1693	1847
	3.0	318	318	478	637	797	956	1115	1274	1433	1593	1752	1911
	3.1	329	329	494	659	823	988	1152	1317	1481	1646	1810	1975
	3.2	340	340	510	680	850	1020	1189	1359	1529	1699	1869	2039
	3.3	350	350	526	701	876	1052	1227	1402	1577	1752	1927	2103
	3.4	361	361	542	722	903	1083	1264	1444	1625	1805	1986	2166
	3.5	370	370	555	745	930	1115	1300	1485	1670	1860	2045	2230
	4.0	425	425	640	850	1065	1275	1490	1700	1915	2125	2340	2550
	4.5	480	480	715	955	1195	1435	1675	1915	2150	2390	2630	2870
	5.0	530	530	795	1065	1330	1595	1860	2125	2390	2660	2925	3190
	5.5	585	585	880	1170	1465	1755	2050	2340	2635	2925	3220	3510
	6.0	640	640	960	1275	1595	1915	2235	2555	2875	3195	3510	3830
	6.5	690	690	1040	1385	1730	2075	2425	2770	3115	3460	3805	4155
	7.0	745	745	1120	1490	1865	2240	2610	2985	3355	3730	4105	4475
	7.5	800	800	1200	1600	2000	2400	2800	3200	3600	4000	4400	4800
	8.0	855	855	1280	1710	2135	2560	2990	3415	3845	4270	4695	5125
	8.5	910	910	1360	1815	2270	2725	3180	3630	4085	4540	4995	5450
	9.0	960	960	1445	1925	2405	2885	3370	3850	4330	4810	5295	5775
	9.5	1015	1015	1525	2035	2540	3050	3560	4065	4575	5085	5590	6100
	10.0	1070	1070	1605	2145	2680	3215	3750	4285	4820	5355	5890	6430

CLIMB/DESCENT TABLE 10042

First a little Math …

Convert your IAS to TAS, correct to ground speed by wind correction, then:

Converting Ground Speed from Knots to NM/Min: Speed ÷ 60 = NM/Min

- 60 K = 1 NM/Min
- 90 K = 1.5 NM/Min
- 100 K = 1.6 NM/Min
- 120 K = 2.0 NM/Min
- 150 K = 2.5 NM/Min
- 180 K = 3.0 NM/Min
- 200 K = 3.2 NM/Min

Converting [Climb, Descent] Gradient to Rate of Climb [or Descent]

Ground Speed (NM/Min) X Gradient (Ft/NM) = Rate of Climb [or Descent]

Departure Charts: Departure Procedures

- **Instrument Departure Procedures (DP)**
  - Two types: **Obstacle Departure Procedure** (ODP) and **Standard Instrument Departure** (SID)
  - Could be textual or graphical
  - Could be a Pilot Navigated or Vector procedure
- Designed to take you safely from the runway to the enrouteenvironment
- **Pilot Navigated DP**
  - Common in Non-Radar environments
  - May include a radar vector segment
  - Provides for one or more transition routes
- **Radar Vectors DP**
  - ATC provides radar vectors to filed or assigned routes

- Use appropriate SID code in your IFR flight plan

Departure Procedures: SID vs ODP

Standard Instrument Departure (SID)

A SID is designed to separate aircraft on departure (helps ATC to separate traffic) and an ODP are designed to avoid obstacles on the departure (helps pilots avoid hitting something on departure). Sometimes these are combined.

Obstacle Departure Procedure

An airport that has an instrument approach will be evaluated to see if there are any obstacles that would interfere with a plane climbing at 200' per/NM. If there is an obstacle that penetrates this 200' per/NM climb the FAA will develop a obstacles departure procedure for this airport.

Airports with an instrument approach but no ODP imply that an aircraft can be assured to climb at 200' per/NM - or 3.3% climb gradient.

ODP may be flown in departure, does not need to be explicitly assigned.

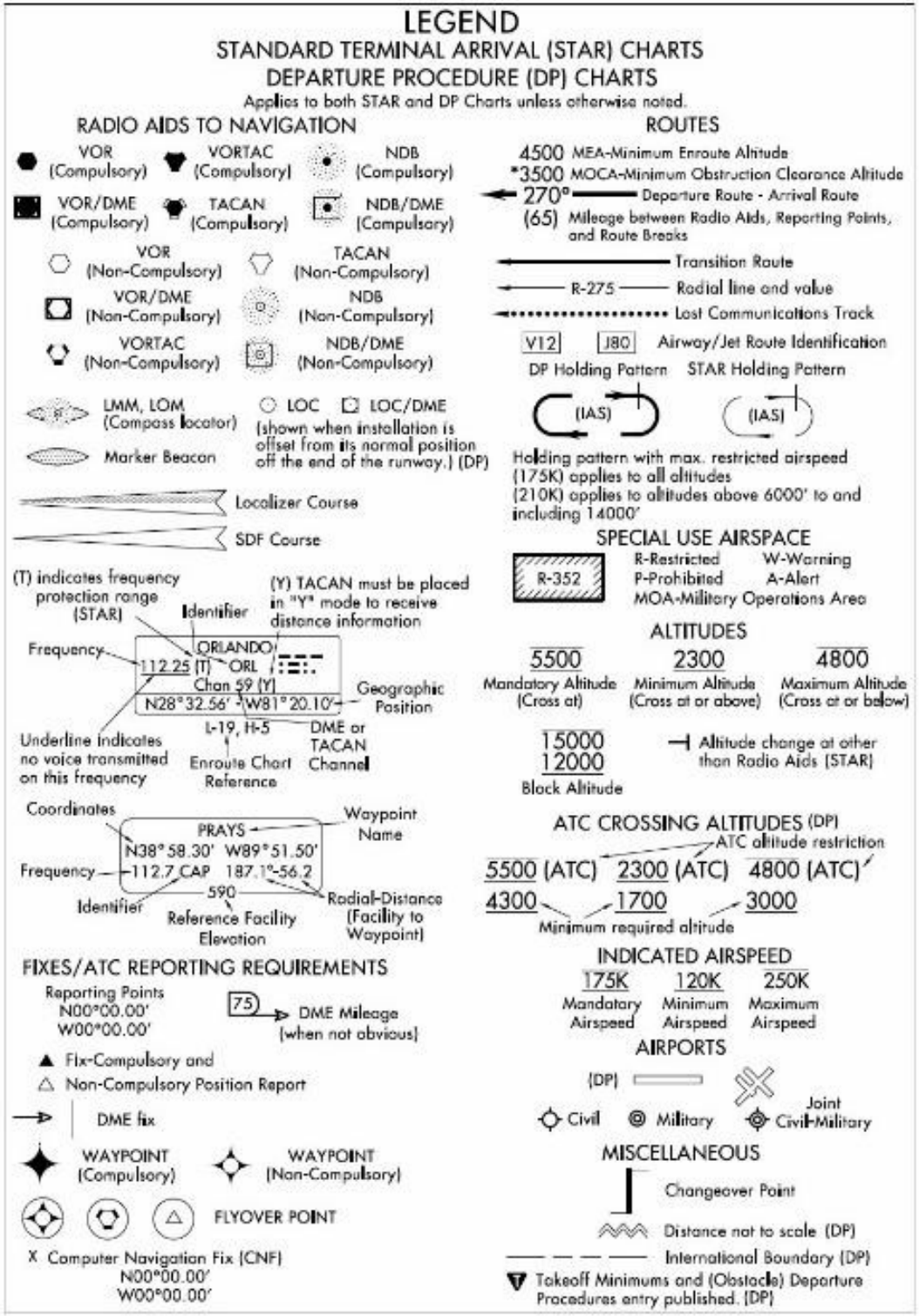


Chart Symbology

Departure Procedure Chart

Departure Airport, Procedure Name and Computer Code
Ensure that you have the correct chart and have filed the appropriate computer code with your flight plan based on your intended transition route.

Restrictions and Notes
This departure does not have any restrictions.

Communication Frequencies
Review the published communications frequencies.

Initial Departure Instructions
This procedure includes two sets of initial departure instructions. The departure runway determines which instructions to use.

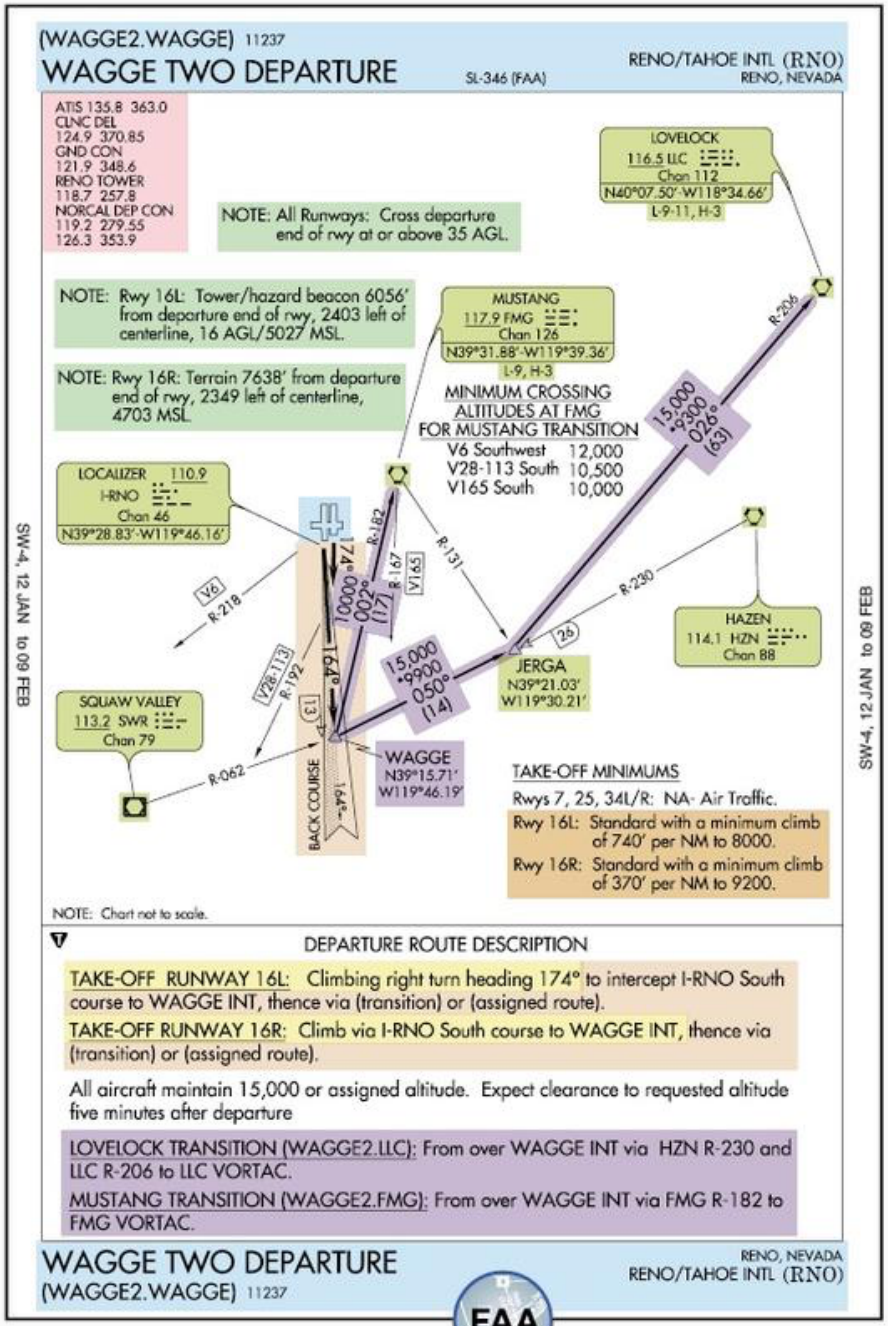
Departure Route
Review the heading, altitude, and distance for the departure route, which is shown with a bold line and often ends at the point for which the procedure is named—WAGGE in this case.

Transition Route
Make sure you know what to do next after completing the initial departure. The transition routes begin at WAGGE where the departure route ends, and are shown with thinner lines (dashed lines on Jeppesen charts). The MEA on the Lovelock transition is 15,000 feet; on the Mustang transition it is 10,000 feet.

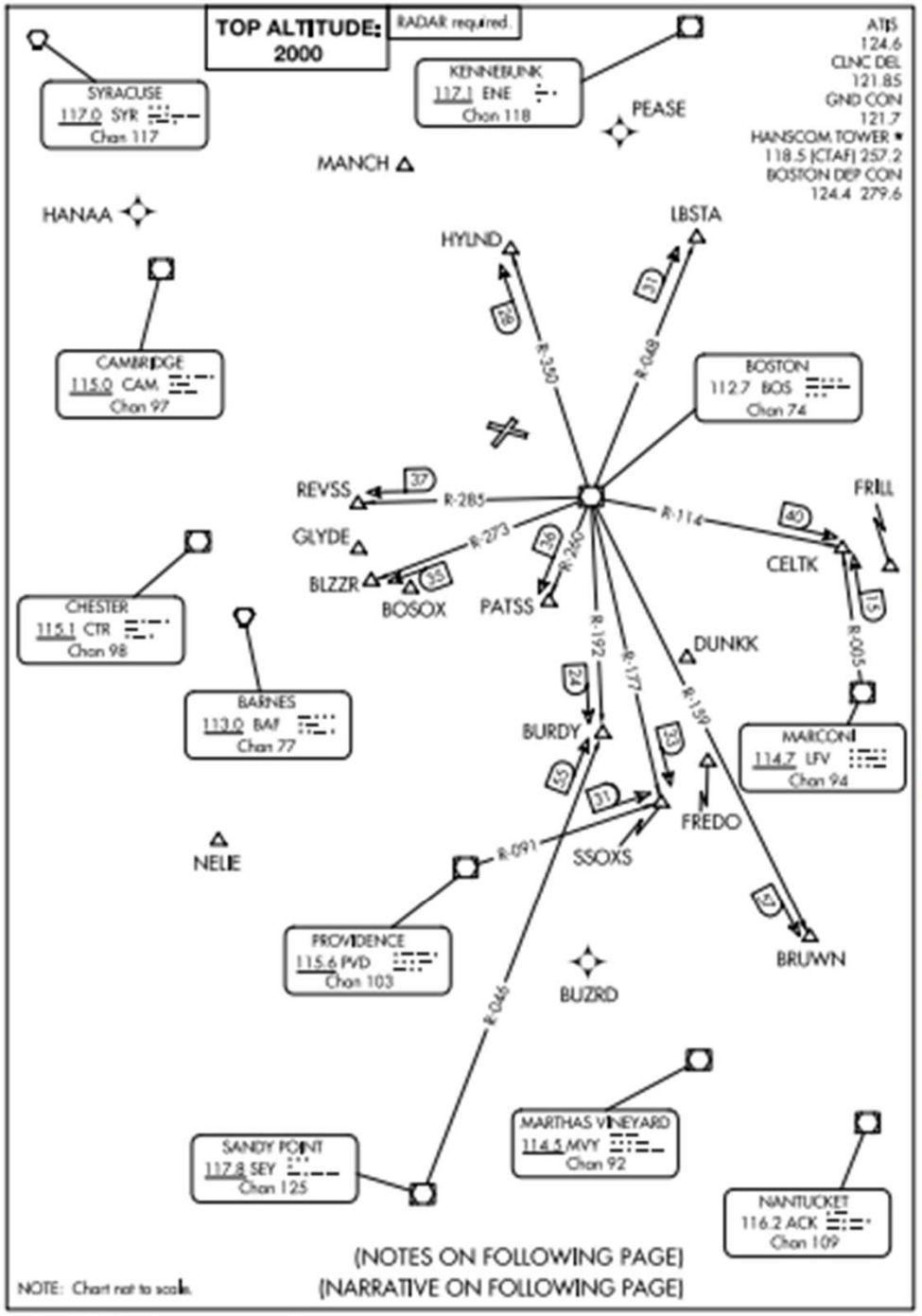
Navaid and Fix Information
Review the navaids and fixes you need for identifying your route during the departure procedure.

Lost Communications Procedures
If you lose radio communications while flying a pilot navigation SID like this one, ATC expects you to fly your clearance. If using a vector SID, like the one in Figure 4-5, review the lost communications procedures published on the chart.

Minimum Climb Gradient
Ensure that your aircraft's performance is sufficient to fly the procedure safely with the current ceiling and visibility. Also calculate the engine-out performance if flying a multi-engine airplane.



HANSCOM FIVE DEPARTURE



NE-1, 23 JAN 2025 to 20 FEB 2025

NE-1, 23 JAN 2025 to 20 FEB 2025

HANSCOM FIVE DEPARTURE

DEPARTURE ROUTE DESCRIPTION

TAKEOFF ALL RUNWAYS: Climb on heading as assigned by ATC, thence....

....expect RADAR vectors to assigned route/navaid/fix. Maintain 2000. Expect clearance to filed altitude/flight level within ten (10) minutes after departure.

NOTE: Non-RNAV equipped aircraft can expect vectors on assigned route.
NOTE: BLZZR DEPARTURES expect vectors on BOS R-273, DME required.
NOTE: BRUWN DEPARTURES expect vectors on BOS R-159, DME required.
NOTE: CELTK DEPARTURES expect vectors on BOS R-114.
NOTE: HYLND DEPARTURES expect vectors on BOS R-350, DME required.
NOTE: PATSS DEPARTURES expect vectors on BOS R-260, DME required.
NOTE: REVSS DEPARTURES expect vectors on BOS R-285, DME required.
NOTE: SSOXS DEPARTURES expect vectors on BOS R-177.

TAKEOFF MINIMUMS:
Rwys 5, 29: Standard.
Rwy 11: 300-1 or Standard with minimum climb of 258′ per NM to 400.
Rwy 23: 300-1⅞ or Standard with minimum climb of 439′ per NM to 400.

Departure Procedures

- Jeppesen Charts: Take off minimums located on airport page
- FAA/NOS Non-Standard Minimums in front of TPP.
- Pilots required to have DP chart or at least textual description. Otherwise state "No DP" in flight plan
- You may file or get a SID assigned, ODP is not assigned. VCOA needs to be requested.
- Take Off [Visibility] Minimums: *Applies to other than Part 91 operations*
  - Prevailing Visibility, RVV, RVR
  - **Standard Minimums: 1 SM for single and twin engine; ½ SM for three or more engines**
- DP restrictions: Ceiling/Vis Minimums, Min. Climb Gradients
- "Radar Contact" = Positive ID and radar flight following provided
- You got vectored? You are now off the DP.
- If using GPS for SID – must be current, load from the DB (no self-created SID). GPS does not have ODPs.

Is it legal for a Part 91 (private) flight take off into zero visibility and/or with a 0' AGL ceiling?

Radar vs VFR Departures

- Radar Departures:
  - Usually assigned at towered airports, tower assigns departure heading
  - Tower “hands off” to TRACON or ARTCC radar facility
  - “Radar Contact” = Positive ID and radar flight following provided
  - “Resume own Navigation” = you’re now responsible for navigation
- VFR Departures:
  - Depart VFR and obtain clearance airborne
  - You are responsible for your terrain clearance & maintaining VMC
  - “Are you able to maintain your own terrain clearance to [MVA]?”
- Visual Climb Over Airport (VCOA):
  - Visual Climb Over Airport (VCOA): a departure option for an IFR aircraft, operating in meteorological conditions equal to or greater than the specified visibility and ceiling, to visually conduct climbing turns over the airport to the published "at or above" altitude
  - At this point, the pilot may proceed in instrument meteorological conditions to the first enroute fix using a diverse departure, or to proceed via a published routing to a fix from where the aircraft may join the IFR enroute structure, while maintaining a climb gradient of at least 200 feet per nautical mile

Diverse Departures

Some airports have a published instrument approach procedure (IAP), but no published departure procedure. Are you able to depart IFR in poor weather? Yep, you can do a diverse departure!

Diverse Vector Area (DVA)

ATC gives you radar vectors to keep you from hitting stuff on takeoff and climb.

How it works: You can turn any direction from the runway as long as you meet three criteria.

1. Pass at least 35’ AGL over the departure end of the runway
2. Don’t turn until at least 400' above the departure end of the runway
3. Maintain 200 ft per NM climb gradient (standard) or published rate

Visual (You have to ask! ATC won’t voluntarily give you VFR climbs*)

If weather conditions allow, you may depart VFR while on an IFR clearance. This is typically done if you’re departing from a VFR only airport or if you’re unable to meet the required climb gradient for a departure procedure.

*If you request a visual climb, you must maintain VFR and your own obstacle clearance until you reach the minimum IFR altitude in that area. In addition to a VFR climb, ATC may not give you specific departure procedures and simply say something like “after departure, cleared on course.” If that’s the case, you can navigate however you want to get from the runway to the top of climb.

BOSTON, MA

GENERAL EDWARD LAWRENCE LOGAN INTL (BOS)

DIVERSE VECTOR AREA (RADAR VECTORS)
ORIG 28APR16 (16119) (FAA)

Rwy 14, heading as assigned by ATC; requires min. climb of 240' per NM to 1100.
Rwy 22L, heading as assigned by ATC; requires min. climb of 330' per NM to 1200.
Rwy 22R, heading as assigned by ATC; requires min. climb of 310' per NM to 500.
Rwy 33L, heading as assigned by ATC; requires min. climb of 300' per NM to 1200.

TAKEOFF MINIMUMS AND (OBSTACLE) DEPARTURE PROCEDURES
AMDT 15 07OCT21 (21280) (FAA)

TAKEOFF MINIMUMS:
Rwys 32, 33R, NA-Environmental.
Rwy 4L, 300-1 or std. w/min. climb of 369' per NM to 300.
Rwy 9, 300-1¼ or std. w/min. climb of 266' per NM to 300.
Rwy 14, std. w/min. climb of 233' per NM to 1100.
Rwy 22L, 300-1 or std. if tower reports no tall vessels in the departure area.
Rwy 22R, 300-1¾ or std. w/min. climb of 320' per NM to 300.
Rwy 27, std. w/min. climb of 487' per NM to 1000.
Rwy 33L, 300-1¾ or std. w/min. climb of 232' per NM to 400, or alternatively, with std. takeoff minimums and a normal 200' per NM climb gradient, takeoff must occur no later than 2100 feet prior to DER.

DEPARTURE PROCEDURE:
Rwys 4L/R, climb on heading 035° to 500 before turning left.
Rwy 22L, climb on heading 215° to 800 before turning right.
Rwy 22R, climb on heading 215° to 900 before turning right.
Rwy 33L, climb on heading 330° to 700 before turning left.

TAKEOFF OBSTACLE NOTES:
Rwy 4L, ships beginning 693' from DER, on centerline, up to 50' MSL.
Pole, tree beginning 1803' from DER, 724' right of centerline, up to 56' AGL/65' MSL.
Trees beginning 1989' from DER, 27' right of centerline, up to 74' MSL.
Tree 2091' from DER, 91' left of centerline, 65' AGL/77' MSL.
Trees beginning 2152' from DER, 33' left of centerline, up to 81' MSL.
Trees beginning 2279' from DER, 101' right of centerline, up to 57' AGL/77' MSL.
Trees beginning 2401' from DER, 211' left of centerline, up to 82' MSL.
Trees, pole beginning 3656' from DER, 1068' left of centerline, up to 120' MSL.
Stack 3763' from DER, 1142' left of centerline, 123' MSL.
Trees, stacks, vehicles on road beginning 3796' from DER, 627' left of centerline, up to 154' MSL.
Trees beginning 4021' from DER, 791' left of centerline, up to 156' MSL.
Tree 4085' from DER, 1069' left of centerline, 159' MSL.
Stacks, trees, vehicles on road beginning 4087' from DER, 476' left of centerline, up to 160' MSL.
Trees, pole, building beginning 4264' from DER, 638' left of centerline, up to 166' MSL.
Rwy 4R, ships beginning 578' from DER, on centerline, up to 50' MSL.
Pole, trees beginning 1806' from DER, 731' left of centerline, up to 56' AGL/65' MSL.
Vehicles on road 1842' from DER, 964' right of centerline, 62' MSL.
Vehicles on road 1948' from DER, 984' right of centerline, 66' MSL.
Trees beginning 1992' from DER, 380' left of centerline, up to 74' MSL.
Trees beginning 2282' from DER, 691' left of centerline, up to 57' AGL/77' MSL.
Rwy 9, lighting 11' from DER, 150' right of centerline, 17' MSL.
Lighting 11' from DER, 149' left of centerline, 16' MSL.
Ships beginning 761' from DER, on centerline, up to 65' MSL.
Tank 5904' from DER, 1456' left of centerline, 114' AGL/211' MSL.
Tank 5924' from DER, 1455' left of centerline, 205' MSL.
Rwy 14, lighting 10' from DER, 127' left of centerline, 20' MSL.
Lighting 10' from DER, 127' right of centerline, 21' MSL.
Terrain 82' from DER, 479' left of centerline, 26' MSL.
Antenna 480' from DER, 321' left of centerline, 68' MSL.
NAVAID 497' from DER, 317' left of centerline, 71' MSL.
Ship rig 5439' from DER, 1822' right of centerline, 176' MSL.
Rwy 15L, sign 8' from DER, 281' right of centerline, 5' AGL/17' MSL.
Rwy 15R, lighting 1' from DER, on centerline, 16' MSL.
Rwy 22L, lighting 40' from DER, 253' right of centerline, 20' MSL.
Pole 395' from DER, on centerline, 15' AGL/31' MSL.
Ship rig, tower beginning 2440' from DER, 34' left of centerline, up to 176' MSL.
Crane 3675' from DER, 439' right of centerline, 145' AGL/145' MSL.
Cranes, vehicles on road beginning 3720' from DER, 447' right of centerline, up to 147' MSL.
Rwy 22R, ship rig 4064' from DER, 8' right of centerline, 176' MSL.
Ship rig 4585' from DER, 1534' left of centerline, 176' MSL.
Vehicles on road 1 NM from DER, 1850' right of centerline, 208' MSL.
Stack 1.4 NM from DER, 2796' right of centerline, 238' AGL/263' MSL.
Stack 1.4 NM from DER, 2793' right of centerline, 260' MSL.
Rwy 27, sign 18' from DER, 139' left of centerline, 18' MSL.
Building 1211' from DER, 750' right of centerline, 50' MSL.
Tree 1617' from DER, 820' right of centerline, 59' MSL.
Pole, lighting beginning 1690' from DER, 750' right of centerline, up to 84' AGL/100' MSL.
CON'T

19 MAR 2026 to 16 APR 2026

BOSTON, MA (CON'T)

GENERAL EDWARD LAWRENCE LOGAN INTL (BOS) (CON'T)

Rwy 27 (CON'T), building 1.2 NM from DER, 1178' left of centerline, 238' MSL.
Building 1.2 NM from DER, 988' left of centerline, 240' MSL.
Building 1.2 NM from DER, 971' left of centerline, 230' AGL/242' MSL.
Buildings beginning 1.2 NM from DER, 1040' left of centerline, up to 243' MSL.
Buildings beginning 1.2 NM from DER, 533' left of centerline, up to 248' MSL.
Buildings, stack beginning 1.3 NM from DER, 501' left of centerline, up to 250' MSL.
Buildings beginning 1.3 NM from DER, 137' right of centerline, up to 250' AGL/260' MSL.
Building 1.3 NM from DER, 185' left of centerline, 252' MSL.
Buildings beginning 1.3 NM from DER, 112' left of centerline, up to 251' AGL/261' MSL.
Building 1.3 nm from DER, 95' right of centerline, 259' AGL/269' MSL.
Buildings beginning 1.3 NM from DER, 118' left of centerline, up to 259' AGL/269' MSL.
Cranes, buildings beginning 1.4 NM from DER, 62' right of centerline, up to 411' MSL.
Building 1.4 NM from DER, 106' left of centerline, 261' AGL/271' MSL.
Building 1.5 NM from DER, 207' left of centerline, 267' AGL/278' MSL.
Antenna, buildings beginning 1.6 NM from DER, 2984' right of centerline, up to 414' MSL.
Buildings beginning 1.6 NM from DER, 2511' right of centerline, up to 484' MSL.
Building 1.6 NM from DER, 2655' right of centerline, 548' AGL/560' MSL.
Building 1.6 NM from DER, 2468' right of centerline, 635' MSL.
Buildings, antennas, stack, building tower beginning 1.6 NM from DER, 1533' right of centerline, up to 615' AGL/639' MSL.
Buildings, poles, antennas beginning 1.8 nm from DER, 1114' right of centerline, up to 677' AGL/690' MSL.
Buildings, antenna beginning 1.9 NM from DER, 1507' right of centerline, up to 701' AGL/720' MSL.
Building tower, buildings, crane beginning 2 NM from DER, 1775' right of centerline, up to 698' AGL/730' MSL.
Crane 2.2 NM from DER, 1690' right of centerline, 512' MSL.
Rwy 33L, tree 248' from DER, 377' right of centerline, 16' AGL/27' MSL.
Building 1346' from DER, 705' right of centerline, 41' AGL/51' MSL.
Tanks beginning 1677' from DER, 925' left of centerline, up to 51' AGL/67' MSL.
Building 1933' from DER, 862' left of centerline, 70' MSL.
Buildings beginning 1946' from DER, 602' left of centerline, up to 58' AGL/73' MSL.
Trees beginning 2119' from DER, 52' right of centerline, up to 82' MSL.
Trees beginning 2214' from DER, 43' right of centerline, up to 72' AGL/84' MSL.
Trees beginning 2328' from DER, 35' right of centerline, up to 85' MSL.
Tree 2437' from DER, 1033' right of centerline, 96' MSL.
Tree 2448' from DER, 928' right of centerline, 99' MSL.
Signs, tank beginning 3015' from DER, 860' right of centerline, up to 73' AGL/101' MSL.
Tree 3969' from DER, 567' left of centerline, 63' AGL/118' MSL.
Tree 3987' from DER, 594' left of centerline, 122' MSL.
Building 4364' from DER, 1080' left of centerline, 64' AGL/129' MSL.
Trees beginning 4511' from DER, 1142' left of centerline, up to 134' MSL.
Building, stack beginning 4925' from DER, 1491' left of centerline, up to 151' MSL.
Bridge 1.3 NM from DER, 2564' left of centerline, 262' AGL/262' MSL.

BRIDGEPORT, CT

BRIDGEPORT/SIKORSKY (BDR)

TAKEOFF MINIMUMS AND (OBSTACLE) DEPARTURE PROCEDURES
AMDT 5A 21MAR24 (24081) (FAA)

TAKEOFF MINIMUMS:
Rwy 29, 600-2¾ or std w/min climb of 300'/NM to 700.

TAKEOFF OBSTACLE NOTES:
Rwy 6, fence 14' from DER, 95' left of centerline, 17' AGL/18' MSL.
Traverse way 114' from DER, 438' left of centerline, 23' MSL.
Electrical system 131' from DER, 289' right of centerline, 6' AGL/13' MSL.
Traverse way 196' from DER, 345' left of centerline, 24' MSL.
Traverse ways, sign beginning 202' from DER, 149' right of centerline, up to 23' MSL.
Pole, traverse way, fence, sign beginning 252' from DER, 196' left of centerline, up to 20' AGL/25' MSL.
Traverse ways, sign beginning 313' from DER, 38' left of centerline, up to 26' MSL.
Traverse ways beginning 404' from DER, on and right of centerline, up to 24' MSL.
Tree 819' from DER, 236' right of centerline, 36' MSL.
Tree 850' from DER, 246' right of centerline, 46' MSL.
Tree 869' from DER, 232' right of centerline, 51' MSL.
Trees beginning 873' from DER, 34' right of centerline, up to 73' MSL.
Trees beginning 983' from DER, 4' left of centerline, up to 76' MSL.
Trees beginning 1883' from DER, 8' right of centerline, up to 94' MSL.
Rwy 11, traverse way 50' from DER, 342' left of centerline, 23' MSL.
Vegetation 57' from DER, 301' right of centerline, 18' MSL.
Pole 96' from DER, 451' right of centerline, 17' AGL/35' MSL.
Traverse way, fence, sign beginning 108' from DER, 133' left of centerline, up to 25' MSL.
Pole, traverse way, fences beginning 152' from DER, 3' left of centerline, up to 17' AGL/29' MSL.
Tree, signs, poles, fences, traverse ways beginning 163' from DER, on centerline, up to 38' MSL.
Tree 191' from DER, 330' left of centerline, 30' AGL/32' MSL.
Tree, traverse way beginning 196' from DER, 114' left of centerline, up to 38' MSL.
Trees, signs, pipeline, fences, vegetation, traverse ways, terrain beginning 219' from DER, 61' left of centerline, up to 46' MSL.
CON'T

19 MAR 2026 to 16 APR 2026

Take off minimums, ODP and VCOA

FITCHBURG, MA
FITCHBURG MUNI (FIT)
TAKEOFF MINIMUMS AND (OBSTACLE) DEPARTURE PROCEDURES
AMDT 6A 16MAY24 (24137) (FAA)

TAKEOFF MINIMUMS:
Rwy 14, NA - Obstacles.
Rwy 32, std w/min climb of 360'/NM to 2600, or 1900-3 for VCOA.
DEPARTURE PROCEDURE:
Rwy 32, climb on heading 325° to 1100 before proceeding on course.
VCOA:
Rwy 32, obtain ATC approval for VCOA when requesting IFR clearance. Climb in visual conditions to cross Fitchburg Muni airport at or above 2100 before proceeding on course.
TAKEOFF OBSTACLE NOTES:
Rwy 32, vegetation 8' from DER, 197' right of centerline, 349' MSL.
Trees, vegetation, building beginning 33'from DER, 17' right of centerline, up to 438' MSL.
Trees beginning 2128' from DER, 28' right of centerline, up to 59 ' AGL/441' MSL.
CON'T

TAKEOFF MINS NE-1

26078 L24

L25

TAKEOFF MINS

26078

FITCHBURG, MA (CON'T)
FITCHBURG MUNI (FIT) (CON'T)
Rwy 32 (CON'T), trees, stack beginning 3368' from DER, 152' right of centerline, up to 449' MSL.
Building 3757' from DER, 192' left of centerline, 92' AGL/465' MSL.
Trees beginning 4464' from DER, 29' right of centerline, up to 518' MSL.
Trees, pole beginning 5505 ' from DER, 95' left of centerline, up to 589' MSL.
Trees beginning 1.2 NM from DER, 640' left of centerline, up to 685' MSL.
Trees, building beginning 1.6 NM from DER, 506' left of centerline, up to 52' AGL/691' MSL.
Trees beginning 1.6 NM from DER, 1' right of centerline, up to 721' MSL.
Tree 2 NM from DER, 3238' left of centerline, 790' MSL.
Tree 2.3 NM from DER, 1717' left of centerline, 836' MSL.
Antenna, pole, trees beginning 2.3 NM from DER, 1296' left of centerline, up to 134' AGL/954' MSL.

Summary - Departures

- Note that it is not mandatory to accept and fly a departure procedure however, it is then the pilot's responsibility to avoid obstacles until at or above the minimum vectoring altitude
- As part of your preflight planning, always be sure that you can first meet the takeoff minimums
- Pilots operating under 14 CFR Part 91 are strongly encouraged to file and fly a DP at night, during marginal Visual Meteorological Conditions (VMC) and Instrument Meteorological Conditions (IMC), when one is available
- Departure procedures may be substituted for Radar Vectors
- DPs may be assigned by ATC but they can always be requested by the pilot
- Pilots can practice listening to, copying down, and understanding departure instructions through the use of LiveATC
- When you enter IMC, ensure your scan, and pitch attitude has been established, in order to ensure a smooth transition from visual references to none. This is especially true at night
- Part 91 pilots are not required to adhere to any takeoff minimums, but could be found in violation of FAR 91.13 for careless and reckless operation
- All DPs provide the pilot with a way to depart the airport and transition to the en route structure safely

Enroute

Overview

Enroute & Area Charts

- Enroute Charts
- Front Panel
- Navigation Aids
- Victor Airways
- Communications
- Airports
- Airspace

Area Charts Enroute Procedures

- Enroute Radar Procedures
- Communication
- Reporting Procedures
- Enroute Navigation using GPS
- Special Use Airspace
- IFR Cruising Altitudes
- Descending from Enroute Segment

Enroute Charts: the basics

- Enroute Charts
  - Two types: Low Altitude & High Altitude
  - Victor Airways below 18,000 ft. shown on Low Alt
  - Jet Routes FL 180 and higher shown on High Alt.
  - Localizers & BC: shown if they serve an ATC function
- Victor Airways:
  - Width is 8 NM (4 NM each side of centerline)
  - If segment is more than 102 NM additional airspace allocated
- **T routes** – Terminal routes (RNAV). **TK routes** – similar, but for helicopter use.
- Jet Routes:
  - FL 180 or higher
  - Used by turboprops or jets
  - In Class A airspace
- **Q Routes** – High altitude RNAV routes.

Enroute Charts: Key Altitudes (1 of 2)

- **Minimum Enroute Altitude (MEA)**
  - Obstacle Clearance: 1000 ft (2000 ft in mountainous areas)
  - Lowest altitude that guarantees navaid reception
  - Signal coverage gaps up to 65 NM may exist (noted on charts)
  - MEA for Jet Routes is 18,000 ft. MSL unless otherwise specified
- **Minimum Obstacle Clearance Altitude (MOCA)**
  - Obstacle Clearance: 1000 ft (2000 ft in mountainous areas)
  - Navaid reception assured up to 22 NM from facility
- **Off-Route Obstacle Clearance Altitude (OROCA/FAA)**
- **Minimum Off--Route Altitude (MORA/Jeppesen)**
  - Specified for grid/quadrangle
  - Assures Obstacle clearance 1000 ft or 2000 ft in mountainous areas

Enroute Charts: Key Altitudes (2 of 2)

- **Maximum Authorized Altitude (MAA)**
  - Designed to avoid reception of two VORs simultaneously on same frequency
- **Minimum Reception Altitude (MRA)**
  - Minimum alt. needed to receive navaid when off–airway
- **Minimum Crossing Altitude (MCA)**
  - Typically, you commence climb reaching fix beyond which higher MEA applies.
  - Assumed climb gradients:
    - 150 ft/NM SL to 5,000 ft.
    - 120 ft/NM from 5,000 to 10,000 ft.
    - 100 ft/NM above 10,000 ft.
  - MCA is published if rising terrain penetrates this path, or navaid signal reception issues necessitate an earlier climb
  - Obstacle clearance 1,000 ft (or 2,000 ft. in mountainous areas)
- **Minimum Turning Altitude (MTA)**
  - If off-airway terrain is high and there's potential for the turning radius of aircraft to conflict an MTA may be specified

Enroute Charts: Altitudes Summary

Please Remember

The MAA, MCA, MRA, MOCA, and MEA all guarantee 1,000 feet of obstacle clearance in non-mountainous areas. In designated mountainous areas the clearance is 2,000 feet.

A flag with an X signifies the MCA on FAA charts. The altitude and applicable flight direction appear near the symbol. Plan your climb so that you will reach the MCA before crossing the fix

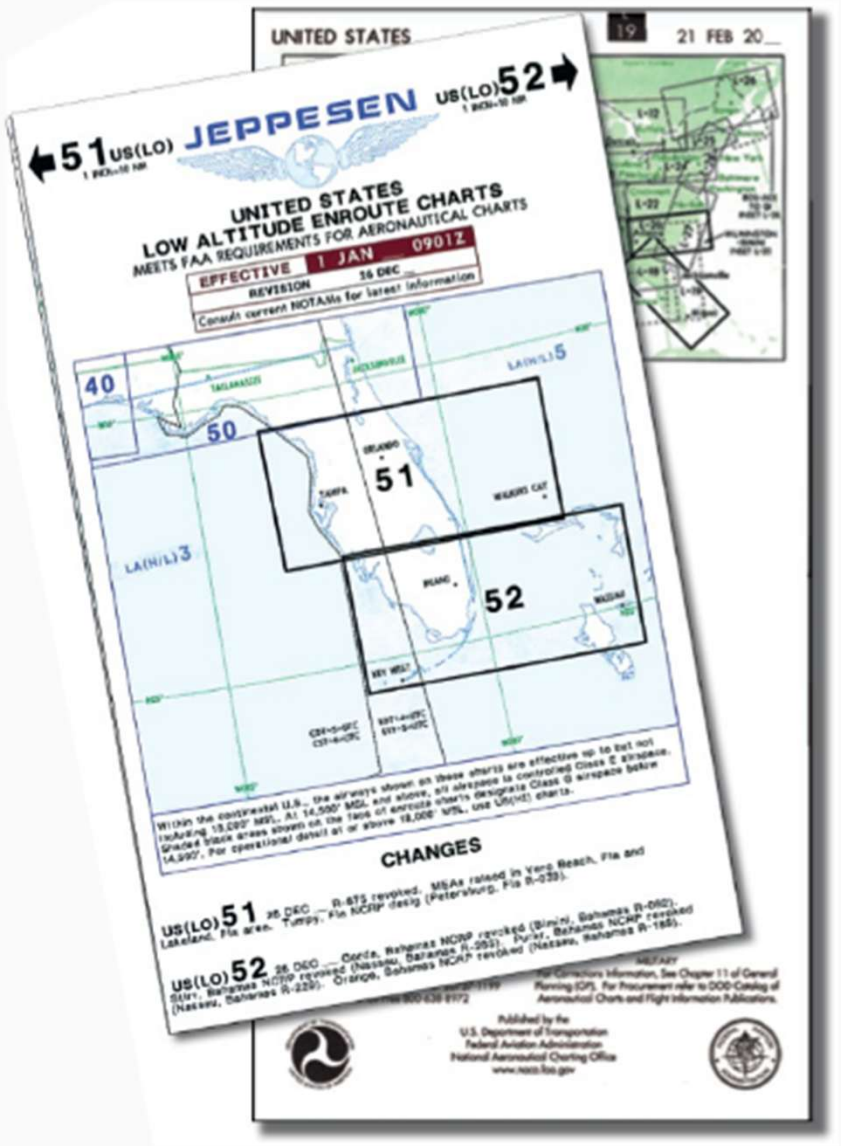
An MRA is designated where a minimum altitude is needed to **receive a navaid** away from the airway being flown in order to identify an intersection.

In mountainous areas where no other minimum altitude is prescribed, IFR operations must remain 2,000 feet above the highest obstacle within a horizontal distance of 4 nautical miles from the intended course.

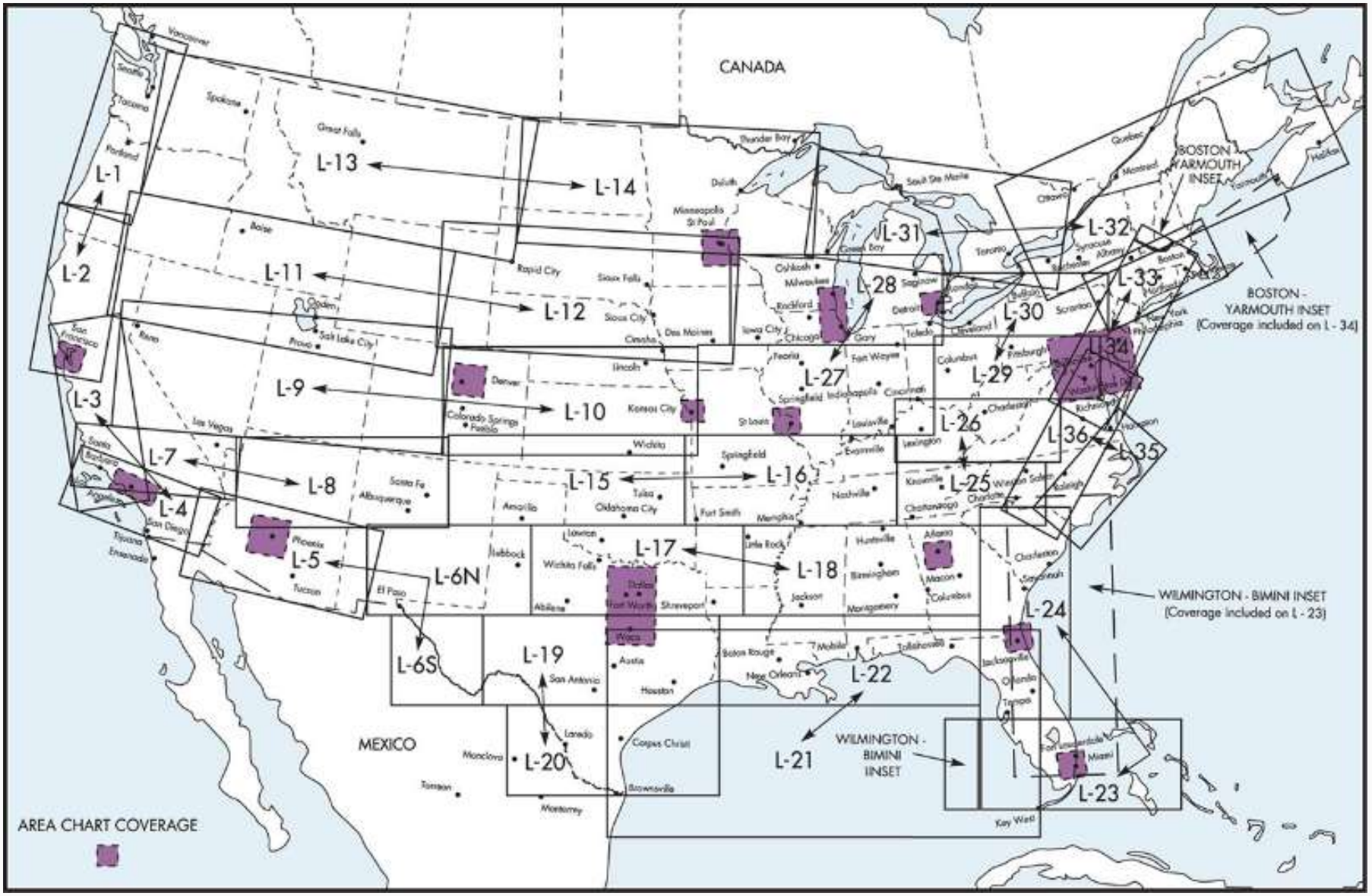
ATC may assign the MOCA when certain special conditions exist, and when within 22 nautical miles of a VOR. A MOCA does not guarantee you will receive a reliable navigation signal if you are more than 22 nautical miles from the facility. MOCAs are preceded by an asterisk on FAA charts.

Front Panel

- **Front Panel**
  - The front panels of both Jeppesen and FAA show the area covered by that chart.



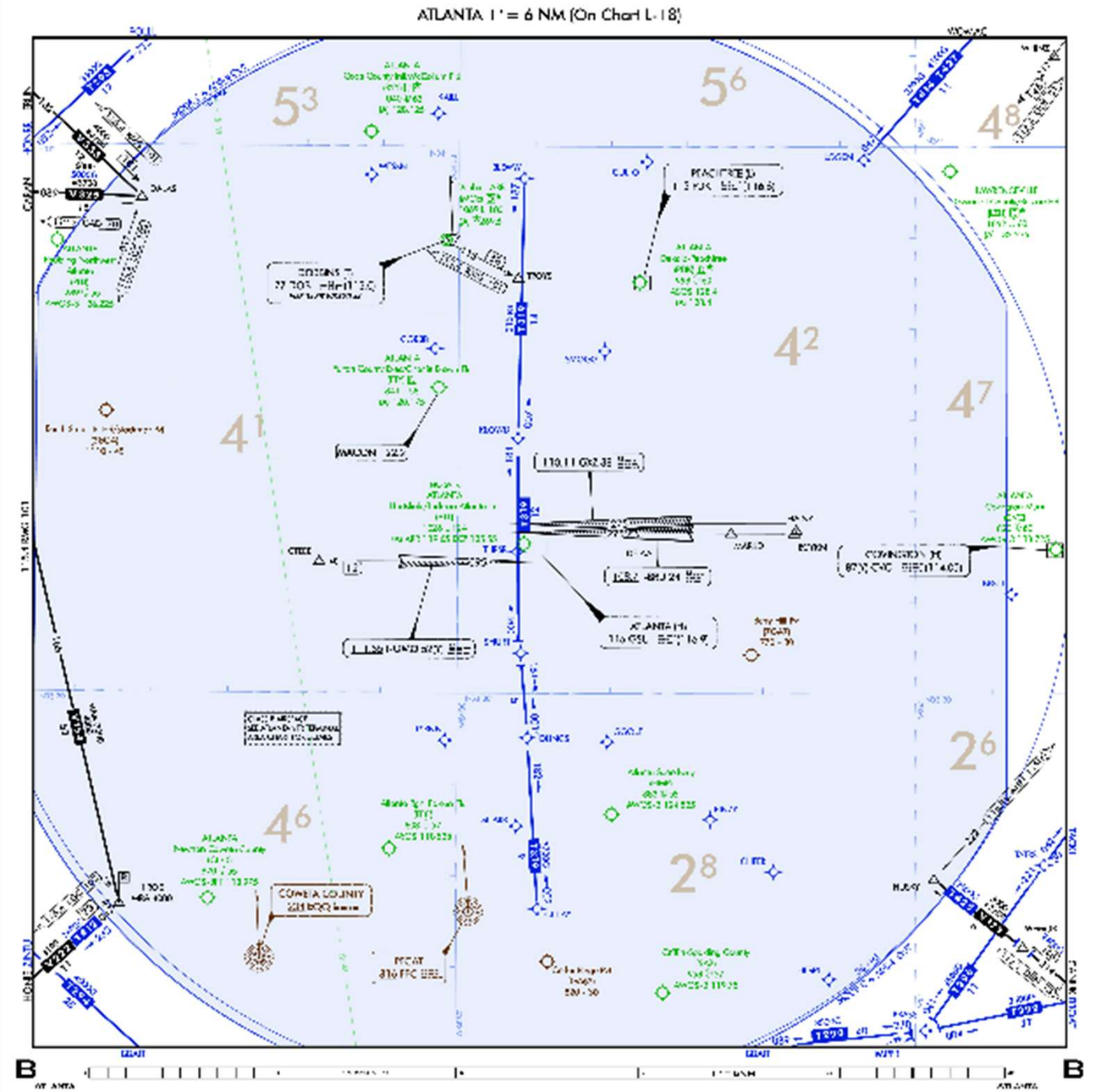
Area Chart Coverage



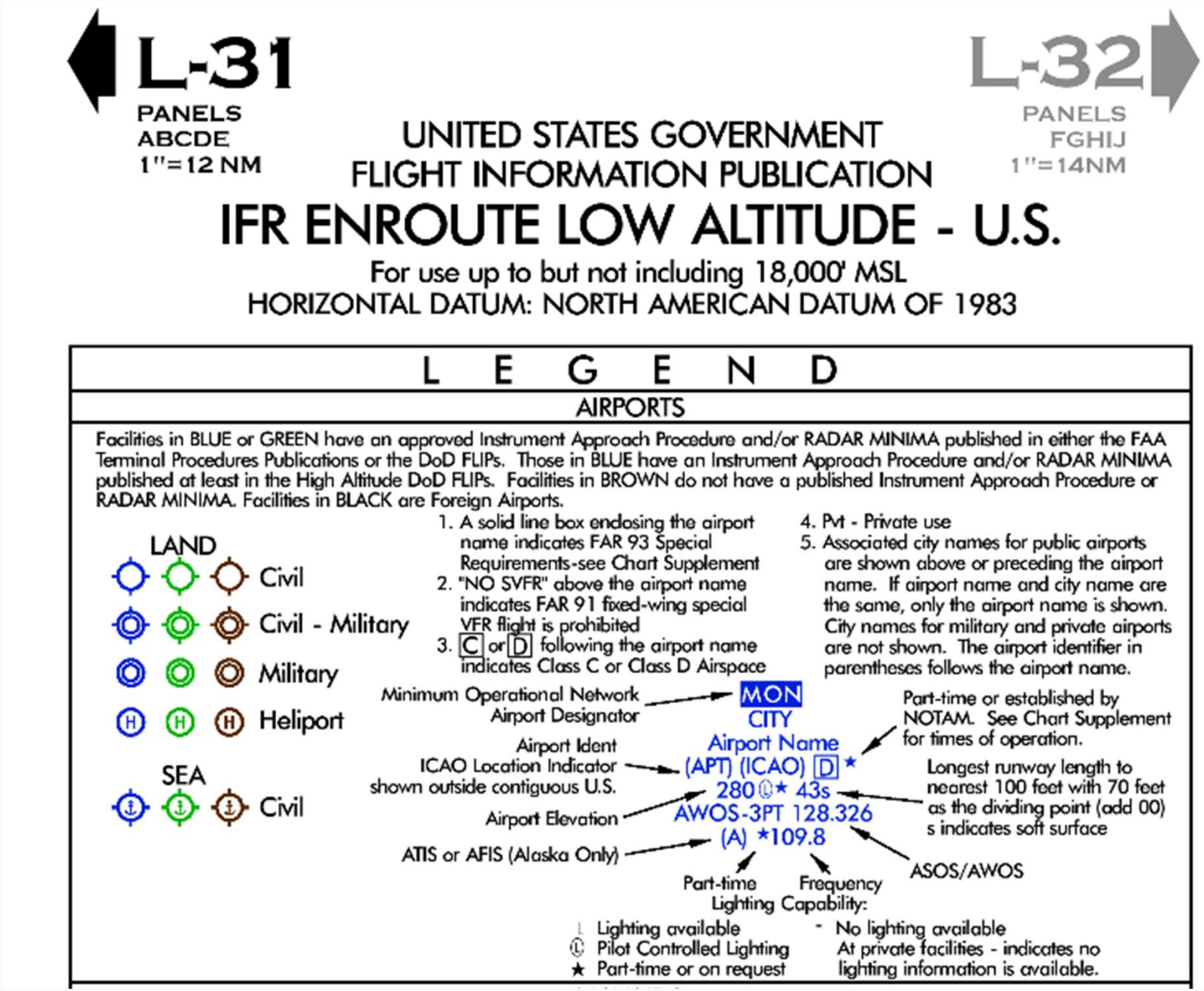
Area Charts: The basics

- **Area Charts**
  - Provided for major air traffic hubs where density of information on Enroute Charts can make it difficult to read or interpret
  - Larger scale than enroute charts
  - No approach or departure information; help transition departures/arrivals to/from enroute structure
  - Jeppesen includes terrain in excess of 4,000 ft above airport elevation.
  - Terrain contours provided.

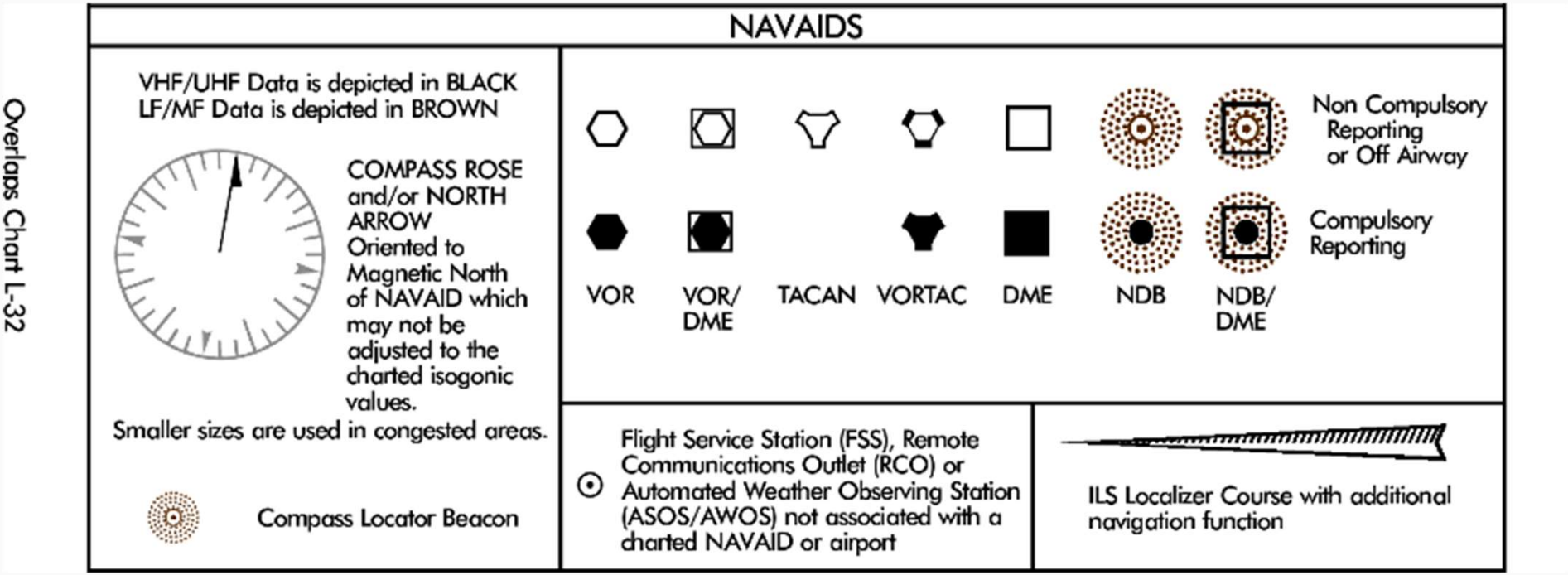
Area Charts: Atlanta



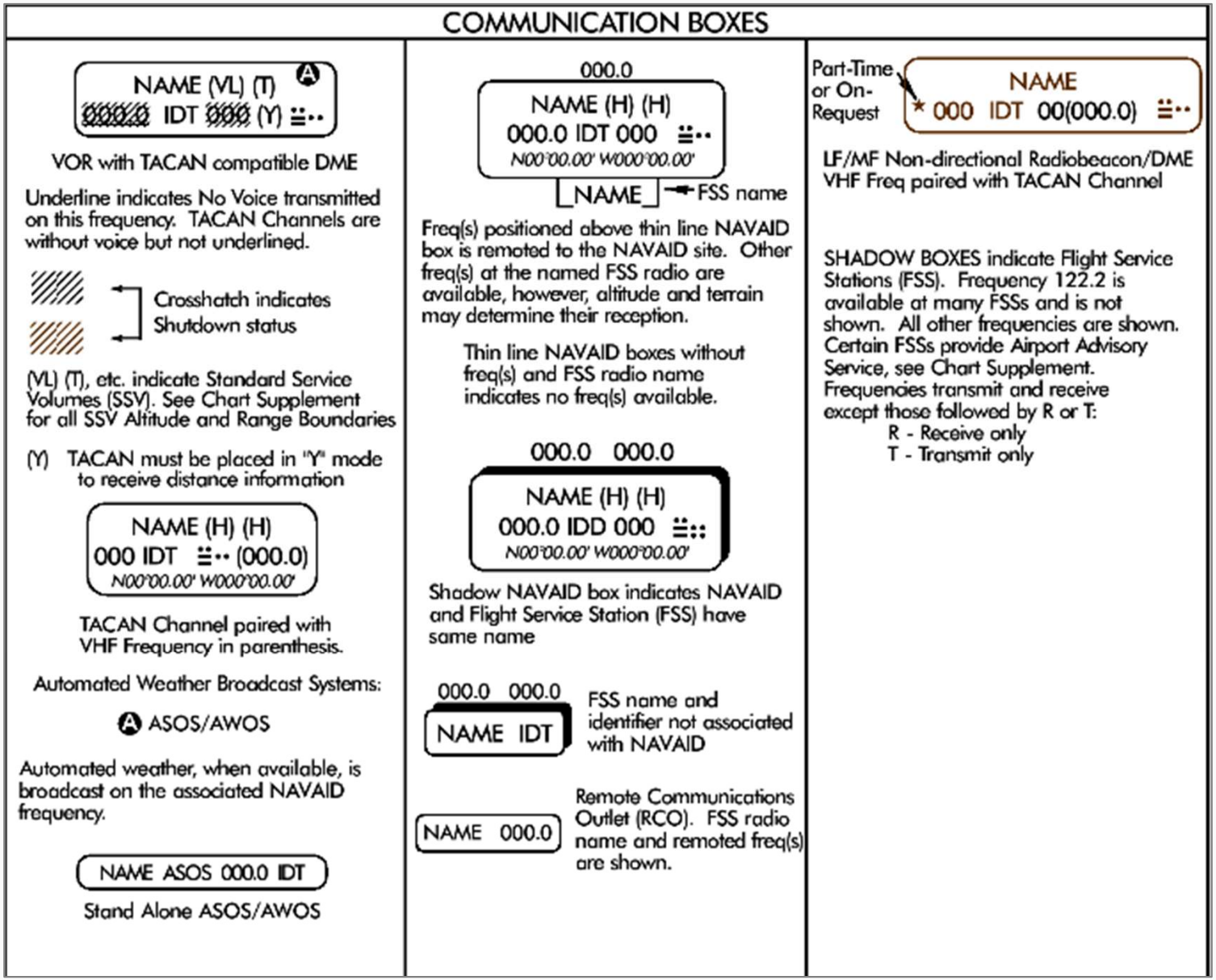
IFR Enroute Low Altitude Chart Information



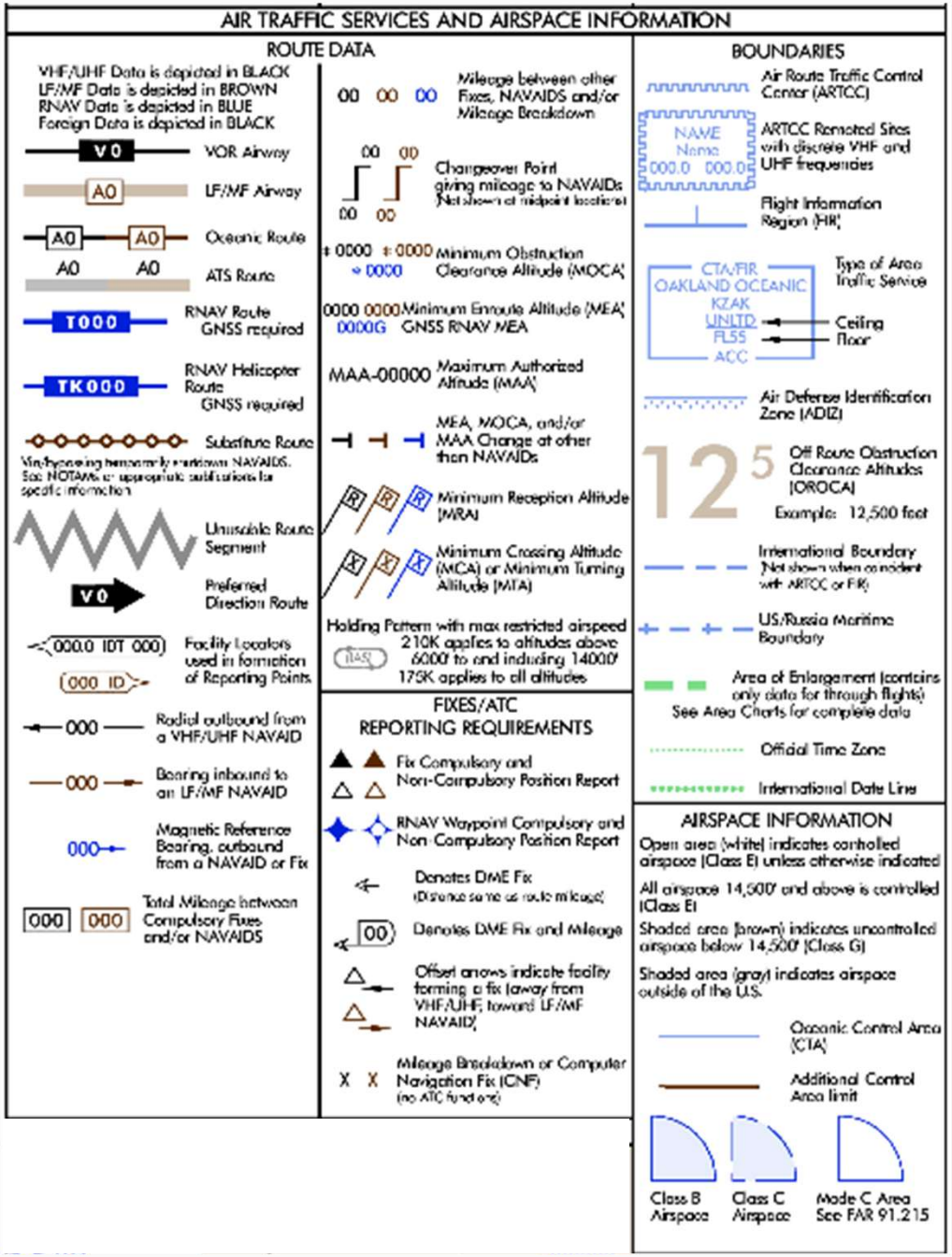
IFR Enroute Low Altitude Chart Information



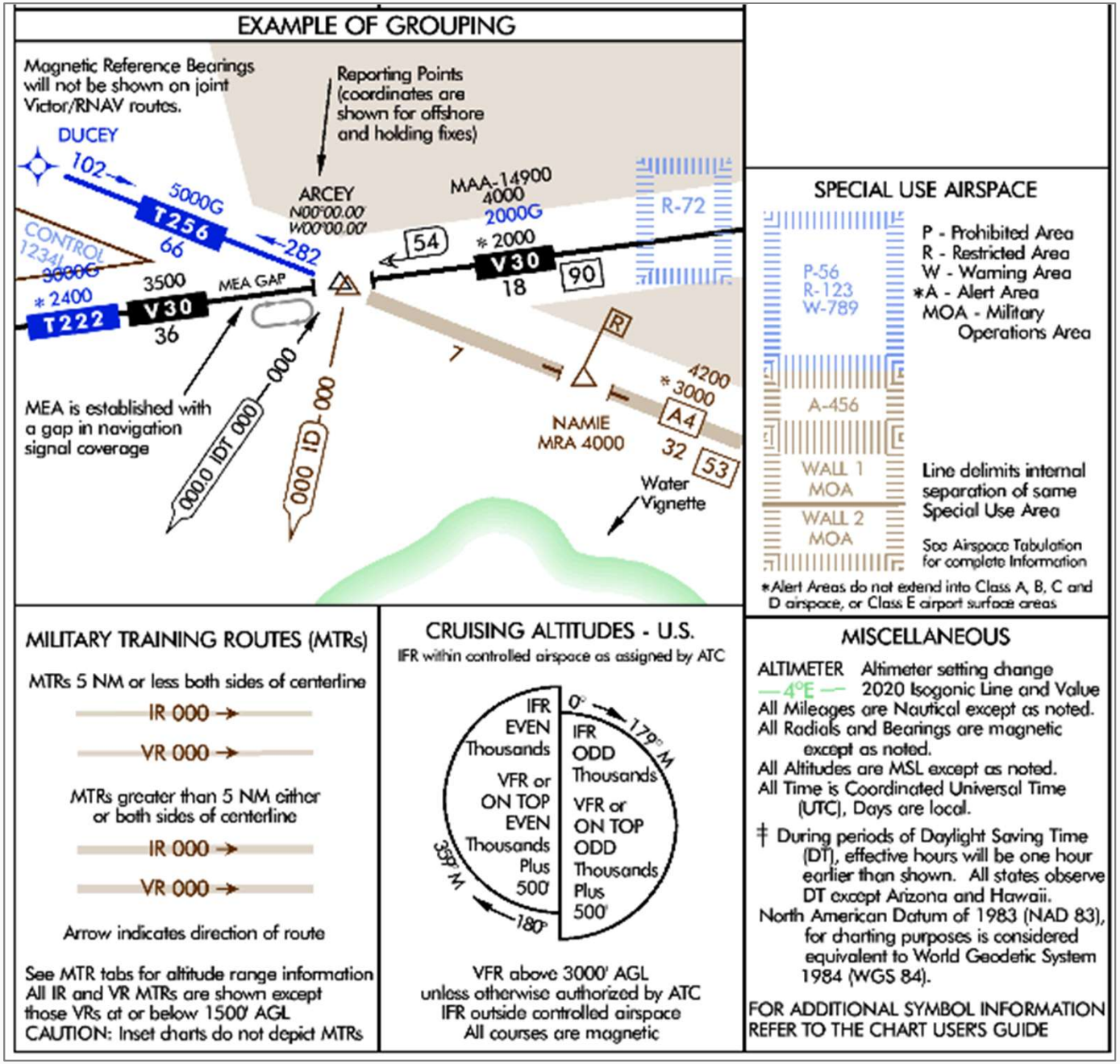
IFR Enroute Low Altitude Chart Information



IFR Enroute Low Altitude Chart Information



IFR Enroute Low Altitude Chart Information



Enroute Charts: Navigation & Communication

- **VOR Changeover Point**
  - Typically halfway between navaids used to define segment
  - Change Over Points (COP) specified if navaid reception considerations dictate
  - Mileage Break: Course changes but no intersection defined
- **Communications**
  - Remote Communications Outlet (RCO)
    - Used by ARTCC or FSS Enroute
  - Ground Communications outlet (GCO)
    - Used for obtaining clearances or closing flight plans
  - Flight Service Stations:
    - 122.5 MHz, RCO for example Fitchburg RCO
    - Duplex: Transmit on 122.1 and receive on VOR Frequency

Enroute Procedures: Reporting Procedures

Whether Radar or Non-Radar:

- Report leaving previous assigned altitude, not necessary to report reaching assigned altitude
- VFR-on–top: need to advice of altitude changes
- Report reaching/leaving holding fix or clearance limit (include altitude)
- Missed approach
- Loss of nav/com equipment (Transponder, DME etc) or unforecasted weather conditions
- Inability to climb or descend at 500 ft/Min
- Actual TAS varies by [the greater of 5% or 10kts] from flight planned TAS

Non-Radar Environment:

- Requires position reports at compulsory reporting points
  - PTAPTP: Callsign, Position, Time, Altitude, Next RP (Position, Time), Subsequent RP (Position) plus pertinent remarks
- Revised ETA over 3 minutes
- Leaving FAF or OM inbound on final approach

Enroute Procedures: IFR Cruising Altitudes

- **Below 18,000 ft:**
  - Hemisphere rules apply based on magnetic course
    - 000 to 179: Odd Thousand
    - 180 to 359: Even Thousand
  - In controlled airspace can request/receive "wrong way" altitudes
- **FL 180 and above:**
  - Non RVSM: 2,000 ft. separation
  - RVSM: 1,000 ft. separation
    - Between FL 290 to FL 410 inclusive
    - Requires both aircraft and crew comply with FAR 91.706 Appendix G
- **Lowest Usable Flight Levels:**
  - When Altimeter Setting drops below 29.92" lowest usable flight levels rise.
  - Designed to protect aircraft in Class A airspace and underlying airspace

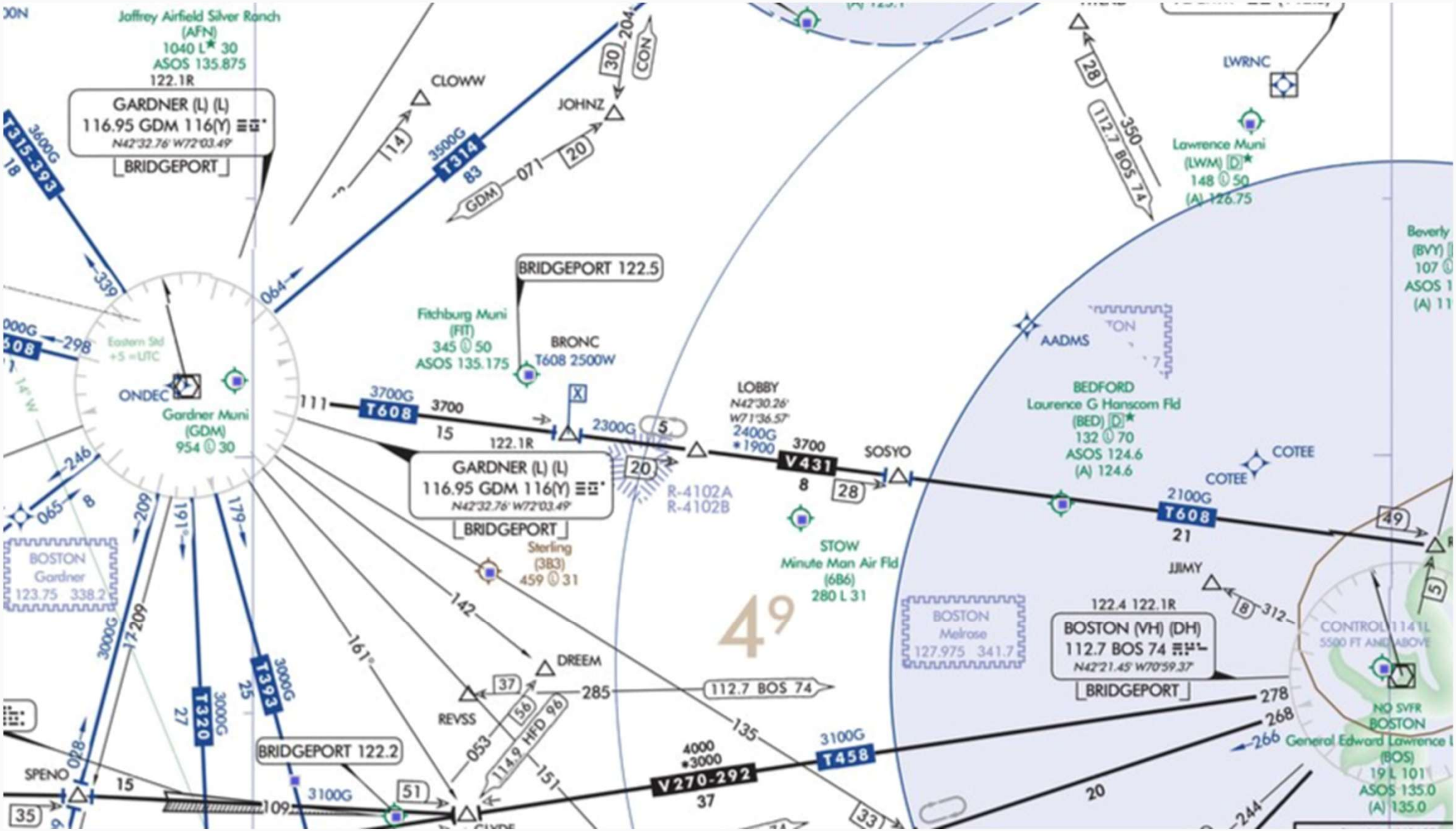
Enroute Procedures: Descent from Enroute Segments

Two types of descent clearances

- **Descent to specified altitude**
  - Commence descent immediately at optimum rate till 1,000 ft. above assigned altitude then descend between 500 ft/min and 1,500 ft/min
  - Could include partial discretion: e.g. crossing restriction (pilot has discretion on when to leave previous altitude and rate of descent)

- **Descend at pilot's discretion**
  - Allows pilot to descend at their discretion, level off temporarily at intermediate altitudes
  - You may not return to an altitude you just vacated

Enroute Procedures: Victor V431 GDM to BOS



IFR Holding

Overview

HOLDING PROCEDURES

- Standard and Nonstandard Pattern
- Outbound and Inbound Timing
- Crosswind Correction
- Maximum Holding Speed
- Direct Entry
- Teardrop Entry
- Parallel Entry
- Visualizing Entry Procedures
- ATC Holding Instructions

Holding Patterns: Background

Holding Patterns

- A method of delaying airborne aircraft to help maintain separation; provide smooth flow of traffic
- Especially helpful in non radar environments
- Define clearance limits for missed approaches; climbing in protected airspace
- Assigned by ATC or requested by pilots

Standard vs. Non-Standard Holding Pattern

- Standard: Turns to the right
- Non-Standard: Turns to the left

Elements of a Holding Pattern

- Holding Fix: can be intersection, navaid or DME distance from navaid
- Inbound Leg (towards the holding point)
- Holding (protected) Side vs. Non-Holding (unprotected) Side

Distances & Timing

- **Length of Holding Patterns**
  - Below 14,000 MSL: 1 minute straight segment
  - Above 14,000 MSL: 1 ½ minute straight segment
  - GPS RNAV fixes: ATC provides leg length
  - Based on the inbound leg (adjust outbound accordingly)
- **Timing of Holding Patterns**
  - Begin Timing on Outbound Leg:
    - When abeam the fix and turn completed (whichever happens last)
    - If abeam unknown: completion of turn outbound
- **Headwind/Tailwind:**
  - Headwind on Inbound: Decrease timing on outbound leg
  - Tailwind on Inbound: Increase timing on outbound leg
- **Physical Size of Holding Pattern**
  - Depends on the speed
  - Reduced Speeds: Tighter patterns, less fuel burn

Adjusting for Winds Aloft

- Crosswind: Adjust to stay on holding (protected side)

- Wind Correction Angle (WCA):
  - Use bracketing techniques to determine WCA
  - Triple the WCA on the outbound (why triple?)
  - Inadequate WCA: cause plane to overshoot into non holding side

- Headwind/Tailwind:
  - Headwind on Inbound: Decrease timing on outbound leg
  - Tailwind on Inbound: Increase timing on outbound leg

- Physical Size of Holding Pattern
  - Depends on the speed
  - Reduced Speeds: Tighter patterns, less fuel burn

Altitudes & Speeds

- **Maximum Holding Speeds**
  - Minimum Holding Altitude to 6,000 MSL: 200 KIAS
  - 6,001 MSL to 14,000 MSL: 230 KIAS
  - 14,001 MSL and higher: 265 KIAS
  - Military Airfields: 310 KIAS

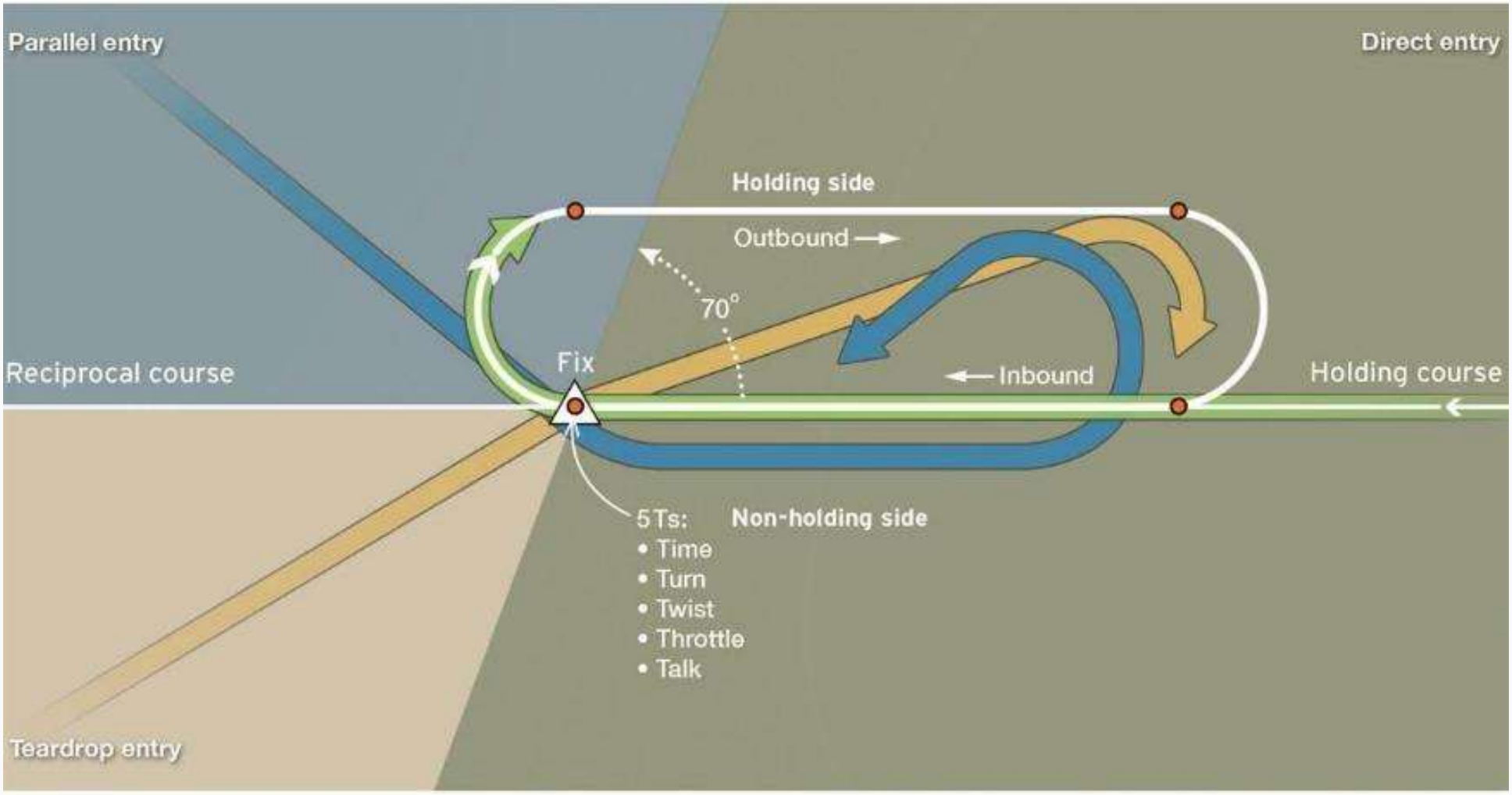
- Some holding patterns have non standard speed restrictions (depicted by icon on chart)

- Turns & Banks
  - Standard Rate Turns at lower speeds
  - Flight director 25 degrees of bank

Holding Pattern Entries

- Entry Procedure depends on your heading relative to the fix
- **Direct Entry**
  - Fly across fix, turn right (or left for non standard patterns) to outbound heading
  - Once established on outbound, fly 1 minute, then turn right (or left for non standard patterns) to intercept inbound
- **Teardrop Entry**
  - Fly across the fix, turn 30 degrees away from outbound heading to join outbound
  - Once established on heading, fly 1 minute, then turn right (or left for non standard patterns) to intercept inbound
- **Parallel Entry**
  - Fly across the fix, turn to heading parallel to inbound leg (but outbound)
  - Fly 1 minute, then turn left (or right for non standard patterns) to re–-intercept inbound leg to fix
- When are you considered “Established in the hold”?

Holding Pattern Entries



Holding Pattern Entries

ATC Holding Instructions

- If approaching clearance limit and no instructions - then
  - Call ATC for further clearance
  - Hold as published
- Holding Instructions:
  - (if anticipated) issued at least 5 minutes prior to holding fix
  - Hold as published on chart unless otherwise instructed
  - If no holding pattern charted, complete holding instructions provided by ATC
    - **Fix**, direction from fix
    - Holding course (outbound course)
    - leg lengths: for outbound legs in minutes or Nm if DME used
    - **EFC Time**
- Maintain last assigned altitude
- Expect Further Clearance (EFC) Time (Lost Communications: leave fix at EFC)

Thumb Rule

Heading Indicator: Holding Pattern with Right Turns

- Identify the outbound heading
  - "Hold north on the 360 radial"
  - Outbound heading is 360 (inbound is 180)
- Right or left turns

Thumb Rule

Heading Indicator: Holding Pattern with Left Turns

- Identify the outbound heading
  - "Hold north on the 360 radial"
  - Outbound heading is 360 (inbound is 180)
- Right or left turns

Practice

- N3021C, hold northeast of the 300 radial, left turns, expect further clearance at 0100Z

- What is the expected pattern entry?

Practice

- N3021C, hold south on the 150 radial, right turns, expect further clearance at 0100Z

- What is the expected pattern entry?

Practice

- N3021C, hold southeast on the 210 radial, right turns, expect further clearance at 0100Z

- What is the expected pattern entry?

Practice

- N3021C, hold southeast on the 210 radial, left turns, expect further clearance at 0100Z

- What is the expected pattern entry?

Hold-in-Lieu of Procedure Turn

Hold-in-Lieu of Procedure Turn

A hold-in-lieu of procedure turn shall be established over a final or intermediate fix when an approach can be made from a properly aligned holding pattern. The hold-in-lieu of procedure turn permits the pilot to align with the final or intermediate segment of the approach and/or descend in the holding pattern to an altitude that will permit a normal descent to the final approach fix altitude. The hold-in-lieu of procedure turn is a required maneuver (the same as a procedure turn) unless the aircraft is being radar vectored to the final approach course, when "NoPT" is shown on the approach chart, or when the pilot requests or the controller advises the pilot to make a "straight-in" approach.

Holding Training Apps

Holding Trainer Pro App

Holding Pattern Entry Trainer & Calculator

https://www.pilotscafe.com/hold-trainer/

References

Departure Procedures:

- https://www.cfinotebook.net/notebook/aircraft-operations/departure-procedures

VFR and IFR Enroute Charts

- https://vfrmap.com/
- http://www.skyvector.com

FAA IFR Procedures and Charts

- https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/ifr/