Air Traffic Control

Handbook

Version I

Effective: 14 July 2025

Purpose: This document provides general air traffic control procedures applicable to all Boston Virtual ARTCC controllers online.

Warning: This air traffic control procedural document is provided for virtual/online air traffic control provided by Boston Virtual ARTCC. **It is not for real-world ATC or aviation use.**

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Chapter 1: Administration

CHANGES

1.1. Changes from Previous Version

Changes from the previous version are listed below and emphasized with blue shading throughout the document.

Change 1:	**Updates to reflect CWT implementation.**
Section:	5.9, Multiple
Background:	Following CRC functionality updates, Consolidated Wake Turbulence procedures and separation minima are being implemented across VATUSA. The relevant sections of this document have been updated to reflect current procedures as outlined in FAA Order JO 7110.126B. The changes in Section 5.9 should be reviewed by all controllers. The other denoted changes align terms/language but generally do not change meaning (e.g., changing “Super” for “Category A”. All changes are emphasized with blue shading.

Change 2:	**Introduction of Automated Terminal Proximity Alert (ATPA)**
Section:	6.9
Background:	ATPA is a tool designed to assist controllers in proper arrival sequencing to the same runway. ATPA monitors the separation of aircraft on the final approach course and automatically attaches a TPA Cone (“P-Cone”) to an aircraft within a detection region. This functionality was recently added to CRC, and a description of the functionality and its use has been added to this document for controller awareness.

1.2. Table of Contents

This training reference is designed to provide a flight simulation version of the **FAA Order JO 7110.65** for use by virtual air traffic controllers at Boston Virtual ARTCC (BVA, also referred to as the ZBW ARTCC).

This document covers general air traffic control procedures that apply to the Clearance Delivery, Ground, Local, Approach, and Center positions. It complements material available in facility-specific SOPs and in the General SOP.

This document may **not** be used as a reference for Test Corrections.

All Boston Virtual ARTCC air traffic controllers are required to be familiar with the provisions of this order that pertain to their operational responsibilities and to exercise their best judgment and resourcefulness if they encounter situations that are not covered by it.

Chapter 2: General

2.1. Introduction to the FAA JO 7110.65

2.1.1. The FAA JO 7110.65, and related publications, are available on the FAA website. These policy documents govern real-world air traffic control in the United States National Airspace System (NAS).

2.1.2. In general, BVA documentation will be consistent with FAA procedures. However, in the event of conflict between BVA and FAA documentation, the BVA procedure shall take precedence. Controllers are encouraged to report instances where BVA procedure differs from the FAA using this forum thread.

2.1.3. BVA controllers are encouraged to become familiar with the 7110.65 so they can address situations that are outside of the scope of our SOPs. See **Section 8.1** for an overview and orientation to the 7110.65.

2.2. Using this Document

2.2.1. BVA recommends controllers review the portions of this document that are applicable to their training. For example, a controller completing their initial Class C Ground training would review **Chapters 2, 3, and 4**. When this controller moves to Class C Tower, they should read **Chapter 5**.

2.2.2. Controllers should also have sufficient working knowledge of this entire document so they may reference information during training or ATC sessions. This document may not be used as a reference for Test Corrections.

2.3. Radio Phraseology

2.3.1. Controllers should have an operational knowledge of radio communication prior to beginning training. Basic reminders are included below. Detailed information is available on the Radio Communications website page.

TRAINING TIP

One of the most effective ways to learn radio phraseology and gain confidence is to listen to the pros. The website www.liveatc.net allows anyone to listen to real ATC recordings. During your training, spend some time listening to Boston Ground, Tower, and other local frequencies.

2.3.2. **Initial Contact:**

2.3.2.1. Use the following format for communications with aircraft on initial contact:

2.3.2.1.1. Identification of the aircraft, identification of the ATC unit.

2.3.2.1.2. Message (if applicable).

> Delta Five, Boston Ground, clearance on request, number two.

2.3.2.2. Subsequent transmissions may omit identification of the ATC unit:

> Delta Five, cleared to…

2.3.3. **Callsign Use and Abbreviation**:

2.3.3.1. Do not abbreviate air carrier callsigns or similar-sounding aircraft identifications.

2.3.3.2. For N-number general aviation registrations, use the aircraft's full callsign on initial contact. Using Baron N181WM as an example:

> November One Eight One Whiskey Mike, Portland Ground…

2.3.3.3. After initial contact, the aircraft identification may be abbreviated to the N and the last 3 characters, as in "N1WM":

> November One Whiskey Mike…

2.3.3.4. When initiated by the pilot, the "November" may be replaced by the type/model/manufacturer, as in "Baron 1WM":

> Baron One Whiskey Mike…

CHANGE 1

2.3.4. **Category A, B, C, and D Aircraft**:

2.3.4.1. To increase awareness for Super/Heavy and/or Category A, B, C, and D, aircraft, use the word “Heavy” or “Super” as part of the identification:

> Delta One Heavy…

> Emirates Forty-Eight Super…

2.3.4.2. Also include the word “Heavy” or “Super” when describing the aircraft to another pilot:

> United Ten, cross Alpha behind the heavy Boeing seven forty seven.

2.3.5. **Radio Checks**:

2.3.5.1. Pilots or other air traffic controllers may request a “radio check” on frequency. The purpose of this check is to confirm two-way communications.

It is preferable to use plain language[1] (e.g., **“loud and clear”**, or **“loud but not entirely readable”**) in response to a radio check. However, five-point scales for the volume (strength) and readability of the transmission may also be used instead:

> Dot Com Four, radio check three by three.

The strength scales from one to five have the following meanings:

Strength	Readability
1 – Bad	1 – Unreadable
2 – Poor	2 – Readable now and then
3 – Fair	3 – Readable with difficulty
4 – Good	4 – Readable
5 – Excellent	5 – Perfectly readable

[1] See examples of plain language terms on Wikipedia.

2.4. ICAO Phonetics

2.4.1. Use the pronunciations below. Syllables to be emphasized are in bold.

Alphabet		
Character	**Word**	**Pronunciation**
A	Alfa	**AL**FAH
B	Bravo	**BRAH**VOH
C	Charlie	**CHAR**LEE
D	Delta	**DELL**TAH
E	Echo	**ECK**OH
F	Foxtrot	**FOK**STROT
G	Golf	GOLF
H	Hotel	HOH**TELL**
I	India	**IN**DEEAH
J	Juliett	**JEW**LEE ETT
K	Kilo	**KEY**LOH
L	Lima	**LEE**MAH
M	Mike	MIKE
N	November	NO**VEM**BER
O	Oscar	**OSS**CAH
P	Papa	PAH**PAH**
Q	Quebec	KEH**BECK**
R	Romeo	**ROW**ME OH
S	Sierra	SEE**AIR**AH
T	Tango	**TANG**GO
U	Uniform	**YOU**NEE FORM
V	Victor	**VIK**TAH
W	Whiskey	**WISS**KEY
X	X-ray	**ECK**SRAY
Y	Yankee	**YANG**KEY
Z	Zulu	**ZOO**LOO

Numbers		
Character	**Word**	**Pronunciation**
0	Zero	ZE-RO
1	One	WUN
2	Two	TOO
3	Three	TREE
4	Four	FOW-ER
5	Five	FIFE
6	Six	SIX
7	Seven	SEV-EN
8	Eight	AIT
9	Nine	NIN-ER

2.5. Basic VFR Weather Minima

2.5.1. An airport may be under Instrument Meteorological Conditions (IMC) or under Visual Meteorological Conditions (VMC). Generally, when an airport is IMC, an IFR flight plan must be filed, and an IFR clearance obtained. When an airport is under VMC, both VFR and IFR operations may take place.

2.5.2. A towered airport is IMC if the visibility is below 3 SM **or** the cloud ceiling is below 1000' AGL.

Note: A ceiling is the lowest reported cloud layer that is Broken (BKN), Overcast (OVC), or Indefinite (VV).

2.6. Wind

2.6.1. METAR and TAF wind directions are reported in degrees true. However, wind information provided to pilots verbally or via ATIS must be issued in degrees magnetic (which is also how runway numbers are created). This requires a conversion from true (in the METAR) to magnetic.

Magnetic variation is displayed on most airport diagrams and on sectional charts with variation lines. For west variations (as in ZBW), add the variation amount to the true wind direction to obtain the magnetic direction. For east variations, subtract the variation amount from the true wind direction.

For example, if the KALB METAR shows wind 24009KT (240° true), add the magnetic variation (14.2° W), round the result to the nearest multiple of ten, and report the wind to the aircraft as **"two five zero at niner"**.

2.6.2. If the wind is gusting, add the word "gusts" and the magnitude of the gust:

> Wind three six zero at one seven gusts two four.

Note: every digit of each number is spoken individually. The phrase "wind two-twenty at fourteen" would be incorrect.

2.6.3. Report **"wind calm"** when the magnitude is less than three knots.

2.7. Altimeter Settings

2.7.1. Altimeter settings must be obtained from the most valid updated METAR information for a given airport. Issue altimeter settings:

2.7.1.1. **Center:** To all enroute aircraft not in Class A airspace at least once within your area of jurisdiction, using the nearest available reporting station. For the destination airport when the aircraft is within 50nm of the destination, if an approach controller does not serve the airport.

2.7.1.2. **Approach and Local:** To all arriving aircraft upon initial contact. Tower may omit this if the aircraft has been vectored to final by the overlying controller.

2.7.1.3. **Ground:** To all departures, except if the aircraft reports having current weather information.

2.7.2. **Lowest Usable Flight Level**:

2.7.2.1. Altimeter settings less than 29.92” require an adjustment to the lowest usable flight level:

Altimeter Setting	Lowest Usable Flight Level
29.92” or higher	180
29.91” to 28.92”	190
28.91” to 27.92”	200

2.7.2.2. When required, inform the pilot their requested altitude is unavailable and provide alternative available altitudes:

> Brickyard Fifty-Five Ninety-Seven, flight level one eight zero unavailable for the altimeter setting. Would you prefer one-six thousand or flight level two zero zero?

2.8. ATIS Message Format

2.8.1. See **General SOP, Section 5.9** for VATSIM-specific client procedures, coordination requirements, and administrative practices.

2.8.2. This section provides the fundamentals for decoding METARs and creating an ATIS that are most applicable to BVA. For more information reference **FAA JO 7110.65, Chapter 2, Section 9** and a guide to decoding METARs.

2.8.3. The ATIS message should include, in the following order:

Element	Description
Facility Name	The name of the facility (e.g., “Nantucket Tower”).
Information Code	The letter identifying the current broadcast. Any letter may be chosen initially, but subsequent reports should use the next letter in sequence.
Time	The time the weather report was issued. Note: this is not the same as the time the ATIS message was issued; the time the ATIS was generated is not included.
Weather	Weather as reported in the METAR.
Airport Configuration	Identify the active runway(s). Instrument approaches should be stated before visual approaches. When applicable, include Land and Hold Short (LAHSO) information, including affected runways and available landing distance. Identify the landing and departure runways. When runways are used for both purposes, this may be combined.
NOTAMs	NOTAMs or other operationally-pertinent information specific to the airport.
Concluding Remarks	Any additional information and a repeat of the ATIS letter.

2.8.4. When creating a Voice ATIS, read **Weather Information** as follows:

2.8.4.1. Pronounce the word **"wind"** (not "winds"), omit any leading zeros in the wind speed, and do not say the word "knots".

2.8.4.2. When the wind is gusting, use the word **"gusts"** followed by the speed.

2.8.4.3. If the visibility is reported below 7SM, the obscuration is always present in the METAR. A plus sign (+) denotes "heavy", and a minus sign (-) denotes "light", either of which may appear before the obscuration.

2.8.4.4. In cases of low visibility, the runway visibility range (RVR) may also be present; this information is not included in the ATIS.

2.8.4.5. For the lowest layer of BKN, OVC, or VV cloud, preface the height and layer with the word **"ceiling"**, as in:

METAR Segment	Pronunciation
`OVC014`	**Ceiling one thousand four hundred overcast.**
`SCT070 BKN250`	**Seven thousand scattered, ceiling two-five thousand broken.**
`FEW006 SCT008 OVC010`	**Few clouds at 600, 800 scattered, ceiling one thousand overcast.**
`VV002`	**Indefinite ceiling 200.**

2.8.5. Anything after the "RMK" section is generally not included.

2.8.6. For a voice ATIS, record a five second period of silence before stopping the recording to allow a clear break between the beginning and end of transmission.

2.8.7. Voice ATIS Examples:

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KHYA 241756Z 01008KT 10SM SKC 25/13 A2989 RMK AO2 SLP123
```

> Hyannis Tower Information Uniform; one seven five six zulu; wind zero two zero at eight; visibility one zero; sky clear; temperature two five; dewpoint one three; altimeter two niner eight niner; VOR Runway Six Approach and Visual Approach to Runway Three Three in use; read back all hold short instructions and assigned altitudes; advise on initial contact you have information Uniform.

```
KRME 081355Z 17004KT 4SM HZ FEW008 BKN014 OVC019 26/22 A3007 RMK AO2
```

> Griffiss Tower Information Tango; one three five five zulu; wind one niner zero at four; visibility four, haze; few clouds at eight hundred, ceiling one thousand four hundred broken, one thousand niner hundred overcast; temperature two six, dewpoint two two; altimeter three zero zero seven; RNAV Runway One Five Approaches in use; notice to air missions: Runway One Five localizer out of service; advise on initial contact you have information Tango.

```
KLWM 201955Z 04015G23 1/2SM R05/2600V3600FT +RA VV003 18/16 A2974
```

> Lawrence Tower Information Kilo; one niner five five zulu; wind zero six zero at one five gusts two three; visibility one-half, heavy rain; indefinite ceiling three hundred; temperature one eight, dewpoint one six; altimeter two niner seven four; I-L-S Runway Five Approach in use; departing runway One Four; read back all hold short instructions and runway assignments; advise on initial contact you have information Kilo.

2.9. Receipt of Weather Information

2.9.1. On initial contact, controllers must ensure that pilots have received the most current pertinent information. Ask the pilot to confirm receipt of the current ATIS if the pilot does not initially state the appropriate ATIS code:

> November Three Delta Kilo, verify you have information Whiskey.

2.9.2. If the pilot is unable to receive the ATIS, issue runway in use, wind, altimeter, ceiling and visibility (when the airport is below VFR conditions), and other pertinent information. Runway, wind, and altimeter may be omitted if the pilot states they "have the numbers".

2.10. Runway Visual Range (RVR)

2.10.1. RVR is a measurement of visibility along the runway. It is measured by precise equipment and cannot be estimated/reported by pilots. You can find RVR information for major airports at http://rvr.fly.faa.gov/cgi-bin/rvr-status.pl.

2.10.2. Only report RVR information obtained from a live source such as the link above. RVR information in a METAR must not be issued to a pilot. If a live source is not available, do not furnish RVR information.

2.10.3. Report the RVR to an aircraft in conjunction with a landing or takeoff clearance when the prevailing visibility is 1 mile or less or when the RVR is below 6000:

> Runway One Four RVR two thousand four hundred.

2.10.4. Also issue midpoint and rollout RVR (if available) when the value of either is less than 2000 and the touchdown RVR is greater than the midpoint or rollout RVR:

> Runway Two RVR one thousand, mid eight hundred, rollout six hundred.

2.11. Pilot Reports (PIREPs)

2.11.1. Solicit reports from pilots when requested, or when any of the following conditions exist:

- Ceilings at or below 5000' (PIREPs must include cloud bases if feasible)
- Visibility at or less than 5 miles
- Thunderstorms
- Turbulence of moderate degree or greater
- Icing of light degree or greater
- Wind shear
- Less than good braking action is reported by a pilot

Record the aircraft position, type, and altitude as well as the time of the report. When the PIREP involves icing, also include icing type and intensity and air temperature in which icing is occurring. When the PIREP involves turbulence, obtain a description as either "light", "moderate", "severe", or "extreme", and identify whether it is "chop" or "turbulence".

2.11.2. Pass the pertinent information to other controllers and aircraft in a timely manner and enter the PIREP into the IDS when, in your judgement, it may be operationally relevant to other controllers and network pilots:

> Delta Seven Twenty One, a Boeing seven twenty seven previously reported wind shear, loss of two five knots at four hundred feet.

> United Seventy Six, preceding arrival, Boeing seven thirty seven, reported medium braking action.

2.11.3. For hazardous weather information, controllers may advise pilots of the availability of hazardous weather information if they become aware of it:

> Attention all aircraft, hazardous weather information (SIGMET, AIRMET, UUA, Center Weather Advisory, Number or Numbers) for (geographical area) available upon request.

2.11.4. When requested by the pilot, provide detailed information about the hazardous weather condition. This information may be found by locating the geographical area on SkyVector and reading the associated conditions.

2.11.5. Braking action may be described using the terms **"good"**, **"good to medium"**, **"medium"**, **"medium to poor"**, **"poor"**, or **"nil"**. If the pilot reports braking action in other than the approved terms, ask for a categorization in these terms.

2.12. Instructions Requiring Expeditious Compliance

2.12.1. Use the word **“immediately”** when expeditious compliance is required to avoid an imminent situation.

2.12.2. Use the word **“expedite”** when prompt compliance is required to avoid the development of an imminent situation.

Note: if an “expedite” climb or descent clearance is issued by ATC, and subsequently the altitude to maintain is changed or restated without an expedite instruction, the expedite instruction is canceled.

2.12.3. In either case, if time permits, include the reason for this action.

Chapter 3: Clearance Delivery (DEL)

3.1. Position Responsibilities

3.1.1. DEL is responsible for IFR clearances and VFR departure instructions at some airports. DEL generally does not issue aircraft movement instructions.

3.1.2. Once a clearance (or VFR squawk code/instruction) is issued and read back by the pilot, DEL generally switches the aircraft to the next controller.

3.2. Duty Priority

3.2.1. DEL should attempt to issue IFR clearances as soon as practical.

3.2.2. If the clearance is not immediately available, instruct the aircraft to wait:

> Delta Twenty-One Thirteen, clearance on request, number *(# in sequence)*.

3.2.3. If the clearance becomes available within the next two minutes, read the clearance to the aircraft. Otherwise, preface the clearance with the phrase:

> Delta Twenty-One Thirteen, clearance available, advise ready to copy.

3.2.4. Clearances must be given in the order requests were received, except when an operational advantage is gained by prioritizing a later request. VFR departure instructions should be given with no delay.

3.3. Elements of an IFR Clearance

3.3.1. The IFR clearance includes the elements from the acronym "CRAFT":

Clearance Limit: almost always the aircraft's destination *airport*.

Route: route as filed by the pilot or assigned by ATC. May include a SID.

Altitude: the pilot's requested altitude, a lower initial or top altitude, or the phrase *"climb via SID"*.

Frequency: the active departure control frequency, when required[2].

Transponder: assigned squawk code.

Note: Squawk codes are four digits and contain numbers 0 through 7 only.

> (Callsign), cleared to (clearance limit), (route). (Altitude information). Departure frequency (frequency), squawk (code).

"LOBO 7-1-2, cleared to Cherry Point Airport, BGR# departure, then as filed. Maintain 4000. Departure frequency 118.92, squawk 7312".

TRAINING TIP

When learning the IFR clearance elements, use a whiteboard, piece of paper, or electronic document with the basic elements applicable to your airport. Then, fill in the specifics for each flight as they come. That way, issuing the clearance is as simple as reading it directly to the pilot. (You'll need to modify your template based on the specific phraseology applicable to each airport.)

WIG8307, cleared to Boston Airport, BDL# departure, then as filed.

Maintain 4000. Departure frequency 123.95, squawk 7311.

[2] This is assigned with the IFR clearance to reduce communication immediately after departure. The General SOP encourages the departure frequency to be issued in all IFR clearances, but it may be omitted if the active departure frequency is the same as the one on the aircraft's assigned SID.

3.4. Standard Instrument Departures (SID)

3.4.1. Pilots are encouraged, but are not required, to file SIDs. If an applicable SID is not filed, assign the SID as part of the IFR clearance unless the pilot has specifically indicated they are unable (via flight plan remark or verbally).

3.4.2. When a SID is applicable, but the pilot indicates they are unfamiliar or unable to comply, issue the corresponding initial instructions so the aircraft flies the same path as an aircraft on the applicable radar vectored departure.

3.4.3. There are two main types of departure procedures: radar vectored departures and pilot navigation departures. An aircraft's IFR clearance involving a SID varies depending on the type of SID; examples of each will be provided.

3.4.4. **Radar Vector Departures:**

3.4.4.1. Involve guidance from the departure controller to get the aircraft onto the rest of its filed route.

3.4.4.2. May be identified by the phrase "expect radar vectors" in the Departure Route Description section.

3.4.4.3. Example: LOGAN# at KBOS.

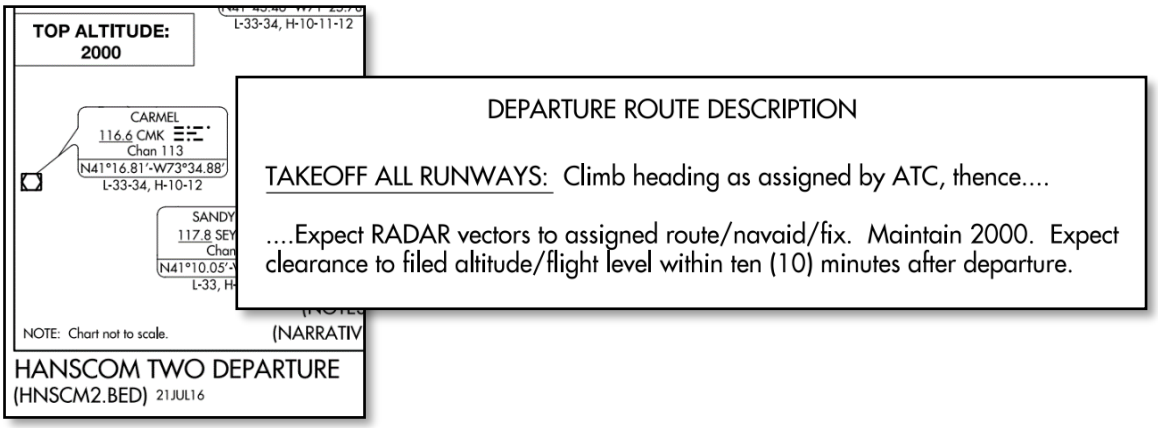
3.4.5. **Pilot Navigation Departures:**

3.4.5.1. Require the pilot to fly a predetermined route to transition to the en-route environment.

3.4.5.2. Can contain "transitions" which are published directly on the chart.

3.4.5.3. Examples: BLZZR# at KBOS, HSKEL# at KPWM.

3.4.6. Most SIDs include a published "top altitude". This altitude is the initial altitude restriction applicable to aircraft flying the SID. The "top altitude" will be published on the plan view, as well as referenced in the departure route description:



3.5. Route Assignment

3.5.1. When an aircraft's route does not require a change, read only the SID and, if necessary, the first waypoint, followed by the phrase **"then as filed"**. When no SID is assigned, the phrase **"as filed"** may be used.

3.5.2. When route amendments are required, first, instruct the aircraft to expect a **"full route clearance"**:

> Jetblue Seven Seventeen, full route clearance, advise ready to copy.

3.5.3. Then, read the clearance, providing phonetic spelling for each new waypoint:

> Jetblue Seven, cleared to Kennedy Airport, SSOXS# departure, SSOXS: Sierra Sierra Oscar Xray Sierra, direct BUZRD: Bravo Uniform Zulu Romeo Delta, direct Sandy Point: Sierra Echo Yankee, PARCH# arrival. Climb via SID…

3.5.4. High-level airways (at or above FL180) are pronounced as follows:

Example Airway	Type	Pronunciation
J533	Conventional	**"J Five Thirty-Three"**
Q75	RNAV	**"Q Seventy-Five"**

3.5.5. Low-level airways (below FL180) are pronounced as follows:

Example Airway	Type	Pronunciation
V12	Conventional	**"Victor Twelve"**
T300	RNAV	**"Tango Three Hundred"**

3.5.6. If an amendment is issued for only a portion of the flight plan, it is only necessary to read the portion that has been changed:

> United Thirty-One, cleared to Syracuse Airport, HYLND# departure, HYLND, direct Cambridge: Charlie Alpha Mike, then as filed…

> Southwest Five Fifty, cleared to Baltimore Airport, PATSS# departure, then as filed, except change route to read PATSS NELIE BIZEX…

3.5.7. If an IFR clearance has been issued and a portion must be amended, read only the amended portion of the clearance:

> November Five Five Six, clearance amendment, advise ready to copy.
> *(Then,)* November Five Five Six, cleared to Bradley Airport, LOGAN# departure, radar vectors BOSOX, direct. Rest of clearance unchanged.

3.6. Initial Altitude Assignment

3.6.1. The “Altitude” portion of CRAFT is phased based on SID assignment and the type of SID in use.

3.6.2. Radar Vector SID: **“maintain *(top altitude)*”**.

> Cleared to Milwaukee Airport, LOGAN# departure, then as filed. Maintain five thousand. Departure frequency…

3.6.3. Pilot Navigation SID without crossing restrictions with published top altitude: **“maintain *(top altitude)*”**. This phraseology is also used for Pilot Navigation SIDs with an initial vectored segment.

> Cleared to Chicago O’Hare Airport, HSKEL# departure, Syracuse Transition, then as filed. Maintain three thousand. Departure frequency…

3.6.4. Pilot Navigation SID with crossing restrictions with published top altitude: **“climb via SID”**:

> Cleared to Milwaukee Airport, HYLND# departure, then as filed. Climb via SID. Departure frequency…

3.6.5. If a Pilot Navigation SID with crossing restrictions is assigned, and the SID does not have a top altitude or it is necessary to issue a top altitude that differs from what is published, use the phrase **“climb via SID except maintain *(altitude)*”**:

> Cleared to Milwaukee Airport, HYLND# departure, then as filed. Climb via SID except maintain four thousand. Departure frequency…

Note: Use of “Climb via SID Except Maintain” to emphasize a published procedural constraint is an inappropriate use of this phraseology.

3.6.6. When no SID is assigned: **“maintain *(initial altitude)*, expect *(filed/assigned cruise altitude)* *(time)* after departure”**:

> Cleared to Presque Isle Airport as filed. Maintain five thousand, expect Flight Level One Niner Zero one zero minutes after departure. Departure frequency…

3.7. Cruise Altitudes

3.7.1. IFR aircraft normally fly at cruise (final) altitudes consistent with direction of flight: aircraft flying east normally use an odd cruising altitude, while westbound aircraft fly at even altitudes. These basic “direction of flight” rules help separate opposite-direction traffic.

3.7.2. For aircraft with cruise altitudes at or below FL410:

3.7.2.1. Odd altitudes when the magnetic course the aircraft will fly ranges between 360-179° (e.g., 15000, 17000, FL190, FL270).

3.7.2.2. Even altitudes when the magnetic course the aircraft will fly ranges between 180-359° (e.g., 14000, 16000, FL180, FL280).

3.7.3. Above FL410, altitudes are assigned in 2000’ increments per the table below:

Direction of Flight	Assign	Examples
Eastbound (0-179° magnetic course)	Odd flight levels, beginning at FL450	FL450 FL490 FL530
Westbound (180-359° magnetic course)	Odd flight levels, beginning at FL430	FL430 FL470 FL510

3.7.4. If a pilot has filed an obviously incorrect altitude for the direction of flight, controllers may ask the pilot if a correct altitude is acceptable or assign the next valid altitude below the pilot’s filed altitude verbally or via vTDLS. Examples:

> United Six Zero One, FL190 is not available for your direction of flight. Would you prefer FL180 or FL200?

(or)

> United Six Zero One, for direction of flight, expect FL180 as your final.

Note: DEL is not required to amend incorrect altitudes for direction of flight but may elect to do so.

3.8. Readback of IFR Clearance

3.8.1. An aircraft must correctly readback a minimum of any flight plan amendments as well as the transponder code assignment. Most pilots will readback the entire clearance. If an amendment was issued, a full readback is required.

3.8.2. Listen carefully to the pilot's readback and correct any errors. If the readback is accurate, inform the pilot:

> Readback correct.

3.8.3. If the readback is incorrect, correct the pilot by re-stating the correct information and obtaining a correct readback:

> *(Aircraft,)* departure frequency 119.75.
> (Upon receipt of correct readback:) readback correct.

3.9. IFR Clearance Examples

CHANGE 1

3.9.1. **Radar Vector SID:**

N107KR	1033	KBDL	KBDL PUT PUT105 WOONS KBOS			
I/BE58/G						
618	090		/V/			

3.9.1.1. At KBDL, the BDL# is the normal SID to use. Locate the BDL# chart.

3.9.1.2. The departure route description states: "expect radar vectors to filed/assigned route or depicted fix", indicating that the procedure is a radar vectored departure. Note the published top altitude.

> Cleared to Boston Airport, BRADLEY# departure, then as filed. Maintain four thousand. Departure frequency one three four point seven, squawk one zero three three.

CHANGE 1

3.9.2. **Pilot Navigation SID without crossing restrictions, published top altitude:**

N867DC	7332	KMHT	KMHT PPORT# CCC MANTA Q439 BRIGS JIIMS# KPHL			
H/LJ45/L						
713	280		/V/			

3.9.2.1. Locate the PPORT# SID at KMHT.

3.9.2.2. The departure route shows three transitions: Barnes (BAF), Calverton (CCC), and NELIE. Although radar vectors are provided initially, the Pilot Navigation SID phraseology is used to reference the filed transition.

3.9.2.3. Note the published top altitude. Although there is a published crossing restriction at TYLIR, the initial radar vector segment requires the use of ***"maintain (top altitude)"*** instead of "climb via SID".

> Cleared to Philadelphia Airport, PPORT# departure, Calverton transition, then as filed. Maintain three thousand. Squawk seven three three two.

CHANGE 1

3.9.3. **Pilot Navigation SID with crossing restrictions, published top altitude:**

UAL1712	3401	KBOS	KBOS HYLND# HYLND HANAA Q816 HOCKE Q935… KSFO			
F/B739/L						
554	380		/V/			

3.9.3.1. Locate the HYLND# SID at KBOS.

3.9.3.2. There are no transitions or "radar vectors". The published crossing restrictions and published top altitude require the use of **"climb via SID"**.

> Cleared to San Francisco Airport, HYLND# departure, then as filed. Climb via SID. Squawk three four zero one.

3.9.4. **Pilot Navigation SID with crossing restrictions, published top altitude that requires a change/amendment:**

3.9.4.1. Using the above example, if UAL1712 was required to maintain a lower altitude than the published top altitude, it can be amended as follows:

> Cleared to San Francisco Airport, HYLND# departure, then as filed. Climb via SID except maintain four thousand. Squawk three four zero one.

CHANGE 1

3.9.5. **“Then as filed” vs. “Direct”:**

KAP1810	1401	KBOS	KBOS LOGAN# LFV KACK			
I/C402/G						
301	050		/V/			

3.9.5.1. When a portion of a full route clearance does not end in a STAR, the word **“direct”** is added after reading the last waypoint. In this example, the **“direct”** tells the pilot to proceed direct to the airport after reaching the LFV (Marconi) VOR, since the clearance limit is the Nantucket Airport.

> Cleared to Nantucket Airport, LOGAN# departure, radar vectors Marconi, direct. Maintain three thousand. Departure frequency one three three point zero. Squawk one four zero one.

CHANGE 1

3.9.6. **Direct Routing:**

N24896	1305	KBOS	KBOS DCT KBED			
H/LJ45/L						
190	060		/V/			

3.9.6.1. In general, “direct” will only be available between small airports, primarily those within our ARTCC. “Direct” may also be required between airports in the same TRACON by Facility SOP or Preferred Route. If an applicable SID exists, it must be used.

> Cleared to Hanscom Airport, LOGAN# departure, radar vectors direct. Maintain five thousand. Squawk one three zero five.

CHANGE 1

3.9.7. **No SID:**

DCM193	5501	KPVD	KPVD WOONS BOS PSM ENE KPWM			
H/C750/G						
301	090	KBDL	/V/			

3.9.7.1. At KPVD, there are no published SIDs. Accordingly, an initial altitude must be issued, along with a time to expect the requested final altitude.

3.9.7.2. Because no SID is used, the departure frequency must also be specified.

> Cleared to Augusta Airport as filed. Maintain four thousand. Expect niner thousand one zero minutes after departure. Departure frequency one two three point six seven. Squawk five five zero one.

CHANGE 1

3.9.8. **Pilots Unable a SID:**

CNS5625	2015	KPWM	KPWM ENE PSM STEVO LWM KBOS			
I/PC12/G						
225	060		/V/ UNABLE SIDs			

3.9.8.1. At KPWM, the PWM# departure would normally be used for this aircraft. However, the flight plan indicates the pilot is not able to comply.

3.9.8.2. When a SID is applicable but the pilot indicates they are unfamiliar or unable to comply, issue the corresponding initial instructions so the aircraft flies the same path as an aircraft on the applicable radar vectored departure.

3.9.8.3. The PWM# reads: “Fly runway heading, or as assigned by ATC; for radar vectors to assigned ROUTE/NAVAID/FIX. Maintain 3,000 feet or as assigned by ATC. Expect clearance to filed altitude/flight level 5 minutes after departure”. Thus, the IFR clearance is read as follows:

> Cleared to Boston Airport, fly runway heading, radar vectors Kennebunk, then as filed. Maintain three thousand, expect six thousand five minutes after departure. Departure frequency one one niner point seven five. Squawk two zero one five.

Note: Unless otherwise coordinated, this “unable SID” scenario is the only one in which DEL will assign a heading in an IFR clearance.

CHANGE 1

3.9.9. Invalid Departure Gate/Route:

SWA232	1301	KBOS	KBOS KEYNN ALB KALB			
F/B738/W						
188	160		/V/			

3.9.9.1. Locate the LOGAN# SID at KBOS. Note that waypoint KEYNN is not depicted on the first page; furthermore, the preferred route in the IDS between KBOS and KALB is different from the filed route. Thus, the aircraft's route requires an amendment.

3.9.9.2. A preferred route is "GLYDE V270 CTR". Because GLYDE is listed on the LOGAN# departure, it is a valid departure gate. A re-route to LOGAN# GLYDE V270 CTR should be issued to this non-RNAV aircraft.

> Southwest Two Thirty-Two, full route clearance, advise ready to copy.
> (Then,)
> Southwest Two Thirty-Two, cleared to Albany Airport, LOGAN# departure, radar vectors GLYDE: Golf Lima Yankee Delta Echo, Victor Two Seven Zero, Chester: Charlie Tango Romeo, direct. Maintain five thousand. Departure frequency one three four point seven. Squawk one three zero one.

CHANGE 1

3.9.10. Invalid Cruise Altitude for Direction of Flight:

SWA554	1305	KBOS	KBOS PATSS# PATSS NELIE BIZEX Q75 MXE V378 NUGGY TRISH# KBWI			
F/B737/L		KBWI				
618	330	KIAD	/V/			

3.9.10.1. The aircraft has filed an eastbound altitude despite the westbound flight. If the altitude is changed with the IFR clearance, ensure the flight plan is amended to reflect the change.

> Southwest Five Fifty-Four, for direction of flight, expect flight level three two zero as your final. Cleared to Baltimore Airport, PATSS# departure, then as filed. Climb via SID. Squawk one three zero five.

3.10. VFR Departures: General

3.10.1. Acceptable VFR cruise altitudes follow the same rules as IFR aircraft, except 500’ is added to the altitude. For example, westbound VFR aircraft should cruise at the “even thousands” plus 500’ (such as 4500’, 12500’, 16500’, etc.). These altitudes only apply above 3000’ AGL.

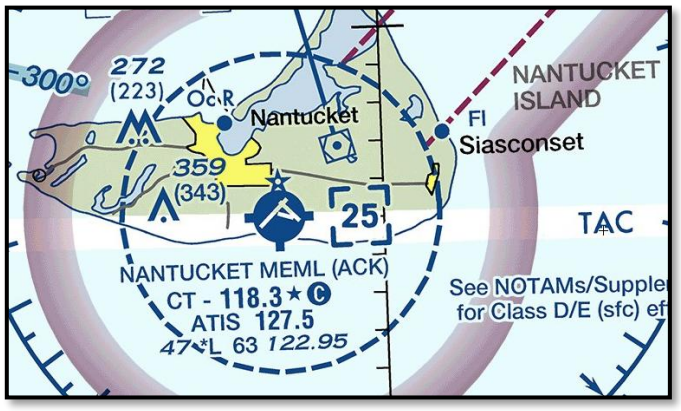
3.10.2. VFR aircraft are not permitted to fly in Class A airspace (at or above FL180), so the highest legal VFR altitude is 17500’.

3.10.3. VFR departures are handled by DEL/GND in different ways based on the airspace class of the airport the controller is working. Facility SOPs may prescribe specific VFR departure instructions and initial VFR altitudes.

3.11. VFR Departures: Class D Airports

Class D airspace is generally a four nautical mile ring around a towered airport that extends to 2500 AGL (above ground level). TWR provides Class D services.

An aircraft departing VFR from a Class D airport that does not want flight following is not required to contact a radar facility. Therefore, a VFR aircraft in this scenario is not given any type of clearance and receives taxi instructions only. A transponder code and departure frequency would only be issued if the aircraft explicitly requested flight following.



Class D airspace is charted by a blue dashed circle.

Shown to the left is the Nantucket Class D surface area, which extends to 2500 MSL.

This entire Class D surface area is “owned” by Nantucket Tower.

3.11.1. For Class D airport VFR departures, first, issue the aircraft taxi instructions:

> N134BC, Nantucket Ground, Runway 15, taxi via Golf.

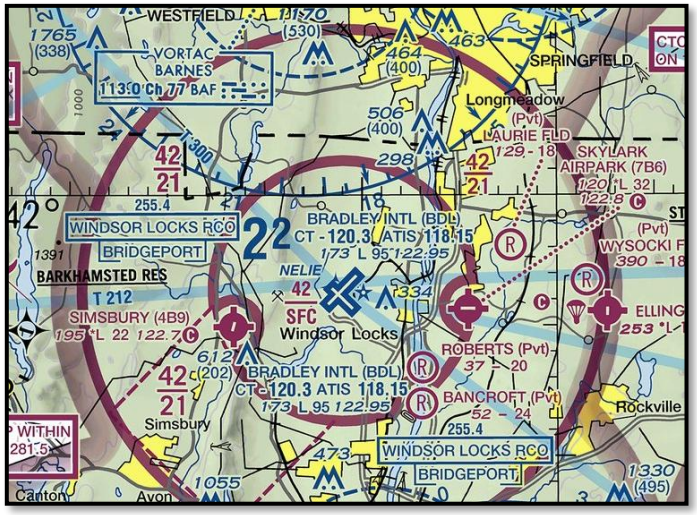
3.11.2. Then, create a flight plan if the aircraft has requested Flight Following. Ensure aircraft type, departure airport, arrival airport (or direction of flight), and altitude is included. Provide the departure frequency and squawk code to the pilot:

> N4BC, departure frequency one three three point zero, squawk 5501.

3.12. VFR Departures: Class C Airports

Class C airspace is split between a tower controller and a radar facility (an approach/departure controller). Therefore, an aircraft departing VFR from a Class C airport is handled differently than an aircraft departing a Class D airport.

In Class C, aircraft departing the area are normally given a squawk code, altitude to maintain, and an appropriate departure frequency. Aircraft remaining in the pattern do not require a squawk code unless required by Facility SOP or coordination.



Class C airspace is charted by solid magenta circles.

Shown to the left is the sectional chart that depicts the Windsor Locks Class C surface and outer areas.

The surface area (inner ring) extends from the surface to 4200’ MSL; the outer area from 2100’ MSL to 4200’ MSL.

The Class C airspace is split between Bradley Tower and Bradley Approach as described in the Y90 facility SOP.

3.12.1. For Class C airport VFR departures, the DEL controller will create a flight plan and issue squawk code, altitude to maintain (if required by facility SOP), and departure frequency.

3.12.2. The aircraft must be instructed **“readback correct”** and will then contact GND when ready for taxi:

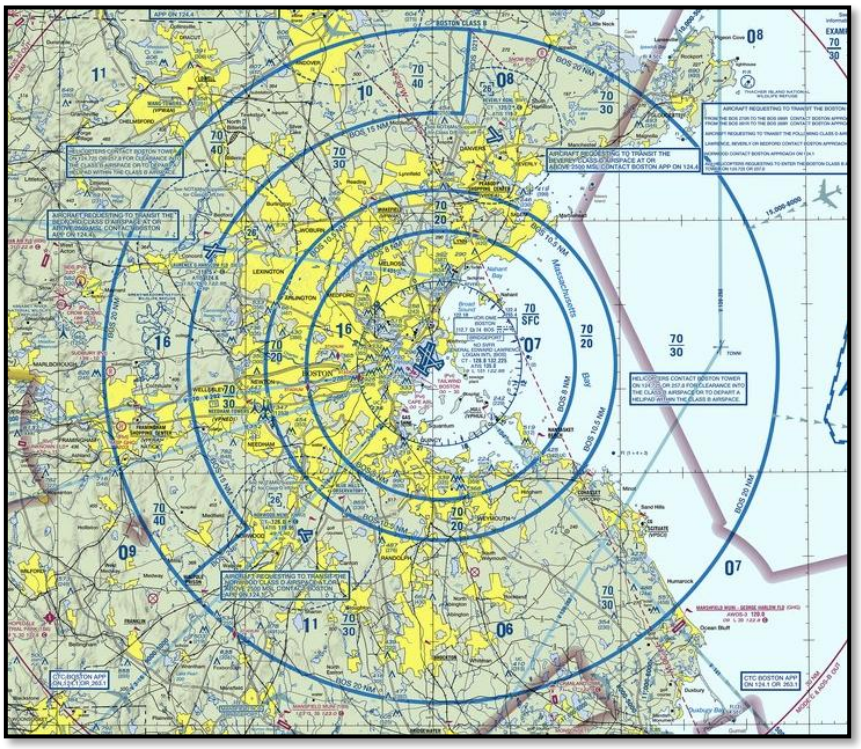
> N275AK, Bradley Clearance Delivery, maintain V-F-R at or below two thousand five hundred until advised, departure frequency one two three point niner five, squawk seven three zero five.
> *(Then,)* N5AK, readback correct. Contact Bradley Ground point niner when ready to taxi.

3.12.3. When GND is operating DEL, initial departure instructions and taxi instructions must be issued with minimal delay. Aircraft should not be told to “standby”.

> N383ME, Bradley Clearance Delivery, maintain V-F-R at or below two thousand five hundred until advised, departure frequency one two three point niner five, squawk seven three zero five.
> *(Then,)* N3ME, readback correct. Runway six, taxi via…

3.13. VFR Departures: Class B Airports

Class B airspace is like Class C airspace in that it is split between TWR and APP controllers. However, VFR aircraft require a clearance to operate within Class B airspace. This normally includes an altitude restriction, departure frequency, and squawk code, which will be given by DEL. More details are provided in the **BOS ATCT SOP**.



Class B airspace is charted as solid light blue circles.

The Boston Bravo airspace (from the Boston TAC) is shown to the left. There is a single surface (inner) area to 7000' MSL and multiple outer areas/shelves.

Boston Tower provides Class B services to aircraft within the inner ring (BOS 8 NM) from the surface to 2000'. The overlying radar controllers own the rest of the Class B airspace.

Chapter 4: Ground (GND)

4.1. Position Responsibilities

4.1.1. GND is responsible for aircraft and vehicles operating on movement areas other than active runways (i.e., taxiways and inactive runways). GND will sequence departing aircraft in a logical fashion to ensure efficient operation of the airport.

4.1.2. GND has no authority over starting or shutting down aircraft engines.

4.2. Duty Priority

4.2.1. Aircraft that are moving (or on movement areas like taxiways and runways) should be given more attention than those who are outside movement areas or are parked awaiting a clearance.

4.2.2. Especially during busy scenarios and if DEL is offline, it may become more important to provide an instruction to a moving aircraft (for example, to get that aircraft off a runway or to prevent a conflict) than to issue an IFR clearance.

4.2.3. In equal priority scenarios, arrivals are prioritized over departures.

4.3. Coordination

4.3.1. GND must maintain clear communication with TWR to ensure safe movement of aircraft. At all times, GND and TWR should be aware of the active runway(s), procedures for crossing active runways, and how and when aircraft will be transferred between the two (i.e., “contact” or “monitor” the next frequency).

4.3.2. Unless otherwise coordinated, the transfer of control between GND and TWR will be as the aircraft approaches the first active runway. The transfer of control between TWR and GND must be the terminal side of the closest active runway.

4.3.3. When no traffic conflict exists, aircraft should be switched in a fashion allowing them to receive the next clearance/instruction without having to stop.

Note: If a frequency change is not provided by the time an aircraft reaches the hold short line for its departure runway, the pilot is permitted to switch to the next frequency without being issued an instruction to do so.

4.4. Use of “Cleared”

4.4.1. “Cleared” is a reserved word. It must not be used in reference to taxi, pushback, or runway crossing instructions.

4.4.2. Except in IFR or VFR clearances, the word “cleared” is not used by GND.

4.5. Movement Areas

4.5.1. The **movement area** includes taxiways, runways, and other areas of an airport used for taxiing, takeoff, and landing, excluding ramps and parking areas.

4.5.2. The **non-movement area** includes taxiways and apron/ramp areas not under the control of air traffic.

4.5.3. Generally, ATC only has jurisdiction over the movement area, and not parking locations. However, GND will still assist in managing conflicts in non-movement areas without ramp controllers.

4.6. Pushback Instructions

4.6.1. For aircraft not requiring a pushback, or if the aircraft will push entirely on a non-movement area, following a correct readback, instruct the aircraft to advise ready to taxi:

> Readback correct. *(Optional: Pushback your discretion.)* Advise ready to taxi.

When more than one runway is in use for departures, you may provide a runway to expect:

> Readback correct. *(Optional: Pushback your discretion.)* Expect Runway Two Four, advise ready to taxi.

If the aircraft still requests to push, use the phraseology **"pushback your discretion"** to indicate that the aircraft is on a non-movement area:

> American Thirty-Three, pushback your discretion. Advise ready to taxi.

4.6.2. When aircraft is parked in such a way that pushback onto a taxiway will be necessary, or if an operational advantage is gained by receiving a call prior to an aircraft's pushback, instruct the aircraft to advise ready to push:

> Readback correct. Advise ready to push.

4.6.3. When the aircraft requests to push, use the phraseology **"push approved"** if the aircraft will enter a movement area:

> Delta Twelve Zero One, push approved. (Optional: taxiway, direction, traffic.)

4.7. Taxi Instructions

4.7.1. If authorizing vehicle/personnel movement, use the instruction **"proceed"**. For aircraft, use the prefix **"taxi"**.

4.7.2. Specify taxi instructions on the movement area. When authorizing an aircraft to taxi to an assigned takeoff runway, state the departure runway followed by the specific taxi route.

> Runway Two, taxi via Alpha, Charlie, Mike, cross Runway One Zero.

> Taxi to the ramp via Alpha.

4.7.3. When a taxi clearance to a runway is issued to an aircraft, confirm the aircraft has the correct runway assignment.

> *GND:* United One, Runway One Eight, taxi via Alpha.
> *Aircraft:* Taxi via Alpha, United One.
> *GND:* United One, Confirm Runway One Eight.
> *Aircraft:* Runway One Eight, United One.

4.7.4. If it is the intent to issue a runway hold short instruction, issue the route up to the runway hold short point only:

> Runway Two, taxi via Alpha, hold short of Runway One Zero.

Note: If it is the intent to hold short of a point other than a runway, the controller may choose to either issue the route only to the hold short point or may issue the entire route and then state the hold short instruction at the end.

4.7.5. A full readback of any "hold short" instructions is required by the pilot. The absence of holding instructions authorizes an aircraft/vehicle to cross all taxiways that intersect the taxi route.

> *GND:* Runway One Eight, taxi via Alpha, hold short of Charlie.
> *Aircraft:* Runway One Eight, taxi via Alpha.
> *GND:* Read back hold short instructions.
> *Aircraft:* Hold short of Charlie.

4.7.6. Aircraft may request to reposition on the airport. Although repositioning is a lower priority than other aircraft movements, issue instructions in a timely manner. The aircraft may use a callsign, or a description of the aircraft if it is repositioning for purposes other than flight:

> Endeavor Fifty Four Zero Three, taxi to the Juliet pad via Alpha, Kilo, Bravo.
> Delta Maintenance Seven Sixty-Seven, taxi to the company hangar via Alpha.
> United Tug, proceed to Gate Four via Uniform.

4.8. Progressive Taxi Instructions

4.8.1. Progressive taxi instructions may be requested by newer pilots or those who are unfamiliar with the taxiway and runway layout at their airport. GND must always accommodate these requests. GND may elect to provide progressive taxi instructions when it becomes obvious they would benefit the pilot.

4.8.2. Progressive taxi phraseology will be more informal than a normal taxi instruction to ensure clear communication. A controller must issue simple instructions and if necessary, issue taxi instructions with cardinal directions to aid a pilot. A ground controller may also have an aircraft follow another to a runway or destination on the airport to aid a pilot.

> Cessna 1BX, proceed eastbound on Echo, make second right on Charlie.

4.9. Runway Crossings

4.9.1. A crossing instruction is required for any runway, active or inactive. Aircraft must have crossed a previous runway before another crossing may be issued:

> Cross Runway Four Left at Charlie, hold short of Runway Four Right.

At airports where taxi distance between runway centerlines is less than 1300', and if specifically authorized by Facility SOP, multiple runway crossings may be issued with a single clearance:

> Cross Runway 19 and Runway 15 at Echo.

4.9.2. Crossing or operation on closed/inactive runways may be issued by GND. Instruct the aircraft to **"cross (runway)"** and specify the location if not mentioned in the taxi instruction:

> FDY37, Runway 24, taxi via Golf, cross Runway 15.

> GPD88, Runway 33, taxi via Alpha, Sierra, hold short of Runway 24.
> *(Then,)* GDP88, cross Runway 24 at Sierra.

4.9.3. Without coordination, aircraft must contact TWR to cross any active runways. Where it is possible for aircraft to switch to and remain on the TWR frequency after a runway crossing, this frequency change is preferred. However, a coordinated crossing (see next section) should be used to prevent an aircraft from switching from GND to TWR and back again.

4.10. Coordinated Runway Crossings

4.10.1. GND may request authorization from TWR to cross or use any portion of an active runway. The coordination must include the point/intersection at the runway where the operation will occur. State the request with runway, intersection, number to cross, and type if not an aircraft:

> *GND:* Cross Runway 33 at Echo with one.
> *Ground:* Cross Runway 24 at Charlie with two vehicles.

4.10.2. TWR can authorize another controller to cross an active runway by verbally specifying the runway and point/intersection of the crossing:

> *TWR:* Cross Runway 33 at Echo with one, A-B.
> *GND:* C-D.

4.10.3. GND must advise TWR when the coordinated runway operation is complete, at which point runway jurisdiction returns to TWR:

> *GND:* Runway 33 crossing complete, C-D.
> *TWR:* A-B.

4.10.4. When an aircraft is required to hold short of the runway, TWR will specify the requirement to “hold short”, which must then be read back by GND:

> *TWR:* Hold Short of Runway 33, A-B.
> *GND:* Hold Short of Runway 33, C-D.

4.11. Sequencing

4.11.1. Sequence (organize) departing aircraft in a logical order considering route of flight, aircraft type, and overall efficiency of the airport. Additional spacing can be required for wake turbulence, or between aircraft departing in the same direction or to the same destination. The airport can be more efficient if the GND controller can sequence aircraft to optimize the departure flow.

CHANGE 1

4.11.2. Examples:

4.11.2.1. A B772 (Category B / upper heavy turbojet) and B190 (Category H / upper small, multiengine prop) request taxi at the same time. Instruct the B772 to taxi behind the B190 to the departure runway to minimize wake turbulence delays for the entire airport (if the B772 is ahead, the B190 will be delayed for wake turbulence, also delaying any subsequent departures).

4.11.2.2. An SF34 (multiengine, turboprop) and a C402 (multiengine, piston prop) request taxi clearance at the same time, going to the same departure gate. Instruct the C402 to taxi behind the SF34: the SF34 will fly much faster and will build separation along the route.

4.11.2.3. Three aircraft request taxi at the same time: two SSOXS departures and one HYLND departure. Without undue delay, the departure sequence should be SSOXS, HYLND, SSOXS.

CHANGE 1

4.11.2.4. An A343 (Category B / upper heavy turbojet) and a B738 (Category F / upper large turbojet), both inbound to JFK via SSOXS, request to taxi at the same time. There are no other departures available to use as “splitters”. Sequence the A340 first: the delay for wake turbulence for the B738 will help build required spacing between the two.

4.11.3. To establish sequence, instruct aircraft to:

4.11.3.1. **"Hold short of":** hold short of a runway, taxiway, or other point.

4.11.3.2. **"Follow"**: taxi behind and along the same route as another aircraft.

Note: any applicable hold short or crossing instructions must also be issued.

4.11.3.3. **"Behind":** let another aircraft go first, then taxi/continue.

4.11.3.4. **"Hold position"**: Instructs an aircraft to stop all movement. Permission to **"continue"** must be issued when the aircraft may begin taxiing again.

4.11.3.5. **"Continue"**: Resume taxiing.

> Follow an American Boeing Seven Thirty-Seven, cross Runway One Five Right at November, hold short of Runway One Five Left.

> Behind the LearJet, Runway Two Two Right, taxi via…

> Runway Two Two Right, taxi via Bravo, hold short of November.
> (Then,)
> Continue on November behind a Cessna One Seventy Two, hold short of Kilo.

4.12. Intersection Departures

4.12.1. Intersection departures are often used to reduce an aircraft's taxi time when the aircraft does not require the full length of the runway for departure.

4.12.2. Intersection departures may be initiated by the controller or pilot.

4.12.3. If requested by the pilot, and for all military aircraft, issue an available distance remaining rounded down to the nearest 50 feet. This information will be published in Facility SOPs where available.

4.12.4. Assigning an intersection departure to an aircraft can provide you with an operational advantage (for example, you may depart an aircraft from an intersection so that aircraft doesn't have to cross an active runway). You should not assign an intersection departure to an aircraft unless you are certain the aircraft is able to accept such an intersection.

4.12.5. If you are unsure of the aircraft type or performance characteristics, offer the intersection departure to the pilot:

> November Three Two Two, Runway Two Four, taxi via Charlie, Echo. Intersection departures are available.

4.12.6. Authorization from TWR is required for all intersection departures:

> *GND:* Request Runway Two Three at Mike for Cair 322.
> *TWR:* Runway Two Three at Mike approved, A-B.
> *GND:* C-D.

4.12.7. Do not delay aircraft for the purposes of coordinating an intersection departure. If coordination takes more than a few seconds, issue full length taxi instructions and change the instructions to an intersection departure later.

4.12.8. When issuing intersection departures, specify the runway and departure point:

> Runway Two Niner at Charlie, Taxi via Alpha, Charlie.

4.13. ILS Critical Areas

4.13.1. When weather conditions are less than reported ceiling 800 feet or visibility less than 2 miles, do not authorize vehicle or aircraft operations in or over an ILS critical area when an arriving aircraft is inside the final approach fix, unless the arrival has reported the runway in sight or is circling to land on another runway.

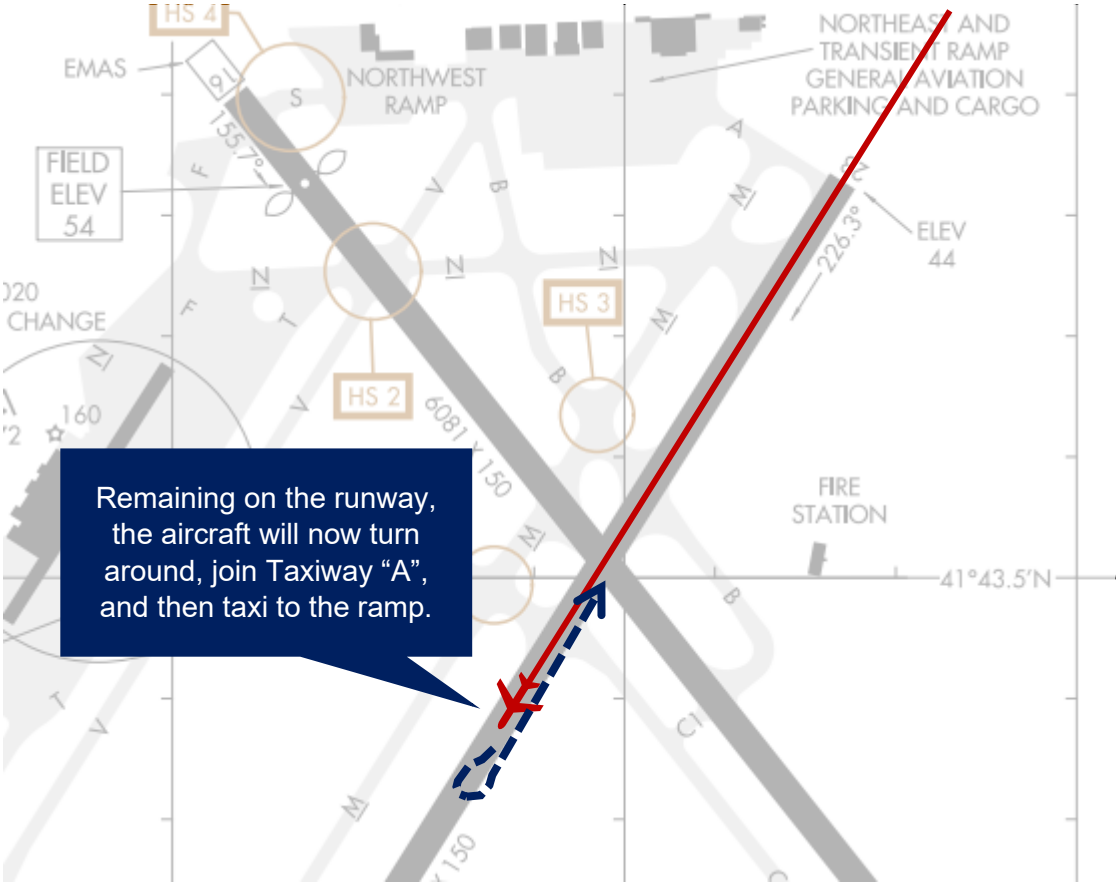
> Hold short of Runway 22R ILS Critical Area.

4.13.2. TWR is responsible for coordinating this requirement with GND.

4.14. Back-Taxi

4.14.1. Back-taxi instructions are used in circumstances where a controller requires an aircraft to operate on a runway opposite of the designated traffic flow, for the purposes of departure or exiting the runway. This instruction may be issued by ground controllers on inactive runways, or on active runways after prior coordination with the tower controller.

> November Five Juliet Mike, back-taxi Runway 23, taxi to the ramp via Alpha.



4.15. Helicopter Operations

4.15.1. Except as specified below, helicopters are treated the same as fixed-wing.

4.15.2. It may be advantageous for helicopters to depart from a non-movement area, or from an off-runway movement area like a taxiway or helipad.

4.15.3. As required, helicopters may be instructed to taxi (if they have wheels), hover taxi, or air taxi:

4.15.3.1. **"Hover taxi"** means the helicopter will move just above the airport surface at speeds less than 20 knots:

> Runway Two Niner, hover taxi via Alpha.
> Runway One Five, hover taxi via Sierra, Uniform, cross Runway Two Four.
> Hover taxi to the ramp via Kilo.

4.15.3.2. **"Air taxi"** means the helicopter will remain below 100' AGL. The helicopter may be issued a specific taxi route or may be authorized to proceed directly to the assigned location:

> Air taxi to the helipad.
> Runway Two Niner, air taxi via Alpha.

4.15.4. Issue any applicable advisories/cautions in conjunction with the taxi instructions. Because of increased prop wash from hover taxiing, air taxi is preferred.

4.15.5. Regardless of which taxi method is used, standard runway crossing and hold short procedures apply.

Chapter 5: Local (TWR)

5.1. Position Responsibilities

5.1.1. TWR must select active runways, issue takeoff and landing clearances, maintain and/or delegate the ATIS, and separate departures, arrivals, and overflights where applicable.

5.1.2. Close coordination with GND and APP is required to maintain a smooth flow of traffic in and out of the airport.

5.2. Duty Priority

5.2.1. TWR is primarily responsible for sequencing and, where required, separating airborne aircraft.

5.2.2. Prioritize operations as follows:

5.2.2.1. Sequencing (and, where required, separation) of airborne aircraft.

5.2.2.2. Aircraft on the runway.

5.2.2.3. Aircraft moving on the airport surface.

5.2.2.4. All other requests, including GND or DEL requests.

5.3. Coordination

5.3.1. Reserved.

5.4. Active Runway Selection

5.4.1. Runways are generally selected based on wind direction: the active runway should allow traffic to land and depart into wind. Wind direction is always reported in the direction the wind is coming from. For example, if the wind is reported as “360 at 14,” it is out of the north and blowing south. So, choosing active runways is as easy as selecting runways whose headings are close to the reported wind direction.

Example: at KPWM, Runway 29 should be in use with wind `28014KT`.

5.4.2. Factors such as runway length, preferred runway configurations, available instrument approaches, weather, noise abatement, airport capacity, and real-world airport operation should be considered when selecting active runways.

5.4.3. Coordinate the advertised instrument approach with APP.

5.5. Traffic Advisories

5.5.1. Non-radar traffic advisories are issued to aircraft that are not radar identified, or by non-radar towers. Reference the distance and direction from a fix or airport, direction of the traffic, and the type of aircraft and altitude if known:

> Traffic, Cessna 172, midfield left downwind Runway 24.

> Traffic, one zero miles east of the airport, southbound Boeing 737, 3000.

> Traffic, King Air, reported 3 miles west of the airport at 3500.

> Traffic, 5 miles east of Long Harbor, westbound, aircraft type unknown, altitude indicates 1500.

At non-radar facilities, general information from the radar may be used to assist with sequencing. General information may be given in an easy to understand manner, such as **"to your right"** or **"ahead of you"**:

> Follow the aircraft ahead of you passing the river at the stacks.

> King Air passing left to right.

5.5.2. Radar traffic advisories may be given to both IFR and VFR aircraft that have been radar identified. There are four elements involved:

1. Location (in terms of the 12 hour clock).
2. Distance in miles.
3. Direction of movement (cardinal direction or relative direction).
4. Aircraft type and altitude (if known).

> Traffic one o'clock, seven miles, southbound Cessna Citation level at niner thousand.

> Traffic ten o'clock, eight miles, left to right, Boeing 737 descending through seven thousand.

5.5.3. If the traffic is not radar identified, report the displayed altitude as "altitude indicates", and do not specify a type:

> Traffic twelve o'clock, five miles, opposite direction, type unknown, altitude indicates two thousand five hundred.

TRAINING TIP

Just like the IFR clearance elements ("CRAFT"), radar traffic advisories consist of specific items, in the specified order. Consider writing a sticky note and attaching it to your monitor so you can readily provide traffic advisories to pilots as necessary.

5.6. Forms of Separation

There are several forms of separation that can apply between aircraft. This section provides definitions of important terms that can be used by TWR and APP.

5.6.1. **Target resolution** is a process to ensure that radar targets do not touch. Mandatory traffic advisories and safety alerts must be issued when this procedure is used. Target resolution may be obtained by observing the targets, or by issuing instructions so pilots remain sufficiently apart to prevent the targets from touching:

> *To one aircraft:* Remain west of the river.
> *To the other aircraft:* Remain east of the river.

If the radar targets appear likely to merge, use radar vectors or another form of separation as required.

5.6.2. **Lateral separation** means ensuring the aircraft remain at least the prescribed distance apart (often, as observed on the radar).

5.6.3. **Vertical separation** means the aircraft's reported or Mode C observed altitudes remain at least the prescribed vertical distance apart.

5.6.4. **Visual separation** is used to separate aircraft without relying on radar/lateral or vertical separation, effectively alleviating the controller of keeping two aircraft separated. Communication must be maintained with at least one of the aircraft involved, but can be transferred between controllers with appropriate coordination. Visual separation is not authorized:

CHANGE 1

5.6.4.1. In Class A airspace – it may only be applied up to but not including FL180.

5.6.4.2. When the lead aircraft is a Super / is in Category A.

5.6.5. There are two types of visual separation: tower-applied visual separation and pilot-applied visual separation. These are defined on the next page.

TRAINING TIP

Separation rules are summarized in the **Separation Quick Reference**, accessible via the ATC Hub. Print or bookmark this document for quick reference during training and on-network sessions.

5.6.6. **Tower-applied visual separation:** the controller sees the aircraft involved[3] and issues instructions, as necessary, to ensure the aircraft avoid each other.

5.6.6.1. Tower-applied visual separation is not authorized when wake turbulence separation is required.

5.6.6.2. Pilots do not need to be informed when Tower-applied visual separation is being provided. However, timely control instructions must be issued to ensure continued separation.

5.6.7. **Pilot-applied visual separation:** the pilot sees the other aircraft involved and, upon instructions from the controller, provides their own separation.

5.6.7.1. To effect pilot-applied separation, tell the pilot about the other aircraft using a traffic advisory, obtain an acknowledgement from the pilot that the other aircraft is in sight, and then instruct the pilot to **"maintain visual separation"** or **"follow"** the traffic:

> *ATC:* N7ZU, traffic, twelve o'clock, six miles, northbound King Air at 5000. Report traffic in sight *(or, "do you have it in sight")*.
> *Pilot:* Traffic in sight, N7ZU.
> *ATC:* N7ZU, maintain visual separation.
> *Pilot:* Maintain visual separation, N7ZU.

> *ATC:* ENY3430, traffic, two o'clock, six miles, northbound regional jet at 3000. Report traffic in sight.
> *Pilot:* Traffic in sight, ENY3430.
> *ATC:* ENY3430, follow the regional jet, cleared visual approach Runway 33.

> *ATC:* KAP426, traffic, eleven o'clock, eight miles, westbound heavy Boeing 767 3000. Do you have it in sight?
> *Pilot:* Traffic in sight, KAP426.
> *ATC:* KAP426, follow the heavy Boeing 767, caution wake turbulence, enter downwind Runway 24.

[3] For online purposes, the aircraft may be "seen" by TWR when it could reasonably be seen from the location of the tower. Weather and obstructions must be considered when making this determination.

5.6.7.2. If a pilot reports the traffic in sight and specifically states they will maintain visual separation, the controller may simply “approve”:

> *ATC:* N7ZU, traffic, twelve o’clock, six miles, northbound King Air at 5000. Report traffic in sight *(or, “do you have it in sight”)*.
> *Pilot:* Traffic in sight, will maintain visual separation, N7ZU.
> *ATC:* N7ZU, approved.

5.6.7.3. Pilot-applied visual separation between aircraft is only achieved when the controller has instructed the pilot to maintain visual separation and the pilot acknowledges with their call sign or when the controller has approved pilot-initiated visual separation.

5.6.7.4. Inform the pilots if either aircraft is a heavy and issue wake turbulence cautionary advisories as appropriate.

5.7. Separation in the TWR Environment

5.7.1. Separation between arriving and departing aircraft may consist of:

- Runway separation.
- Wake turbulence.
- IFR separation (airborne).

Each of these is discussed in the following sections. TWR controllers must apply the most restrictive separation that applies.

5.7.2. Clearances need not be withheld until prescribed separation exists if there is a reasonable assurance it will exist when a departure starts its takeoff roll and/or an arrival crosses the landing threshold. This is referred to as “anticipated separation” and the concept applies to all separation rules below.

5.8. Runway Separation

5.8.1. Runway separation is what identifies that a runway is ‘clear’ or ‘available’ for the takeoff, landing, or crossing. Two aircraft can be on the runway at the same time, under specific circumstances. Runway separation consists of Same Runway Separation (SRS) separation rules for intersecting runways/paths.

5.8.2. Runway-Based Separation Rules:

	Operation	Runway Separation Requirement
Same Runway	Successive Departures	The first departure has passed the end of the runway, or turned to avoid conflict, before the second departure begins its takeoff roll.
	Successive Arrivals	The first arrival has cleared the runway before the second arrival crosses the threshold.
	Departure behind Arrival	The arrival must have cleared the runway before the departure can begin its takeoff roll.
	Arrival behind Departure	The departure must have departed and crossed the runway end before the arrival crosses the threshold.
Intersecting Runways or Flight Paths	Successive Departures	The departure must not begin takeoff roll until the preceding aircraft has departed and passed the intersection or is turning to avert any conflict.
	Successive Arrivals	The preceding arrival must be: • Clear of the landing runway **OR** • Completed landing roll and will hold short of the intersection/flight path **OR** • Past the intersection/flight path.
	Departure behind Arrival	The departure must not begin takeoff roll until the preceding arrival is: • Clear of the landing runway **OR** • Completed the landing roll and will hold short of the intersection **OR** • Completed the landing roll and is observed turning at an exit point prior to the intersection **OR** • Past the intersection.
	Arrivals behind Departures	The arriving aircraft must not cross the landing threshold, or the intersecting flight path of the other aircraft, until: • The preceding aircraft has departed and passed the intersection **OR** • The preceding aircraft is airborne and turning to avoid conflict.

Note: An aircraft exiting or crossing a runway is “clear” when all parts are beyond the runway edge and there are no restrictions to its continued movement beyond the applicable runway holding position marking. The aircraft can still be inside the holding position marking and be “clear of the runway”.

5.8.3. Distance-Based Separation Rules

When distances can be determined using landmarks or other means, distance-based separation may be used instead of the rules specified in the previous paragraph.

For this purpose, aircraft are assigned one of three categories:

Category	Description
Category I	Small single-engine propeller aircraft weighing 12500 lbs. or less. All helicopters, regardless of size/configuration.
Category II	Small twin-engine propeller aircraft weighing 12500 lbs. or less.
Category III	All other aircraft.

The distance-based rules can be applied to:

- Consecutive arrivals between sunrise and sunset
- An arrival behind a departure, if the departure is airborne.
- Consecutive departures.

Aircraft	Separation
Only Category I Aircraft Involved[4]	3000’
Category II ahead of Category I	3000’
Succeeding or Both Aircraft are Category II	4500’
Either aircraft is Category III	6000’

When applying these rules to consecutive arrivals, if either aircraft is a Category III, the 6000’ rule cannot be applied; the lead aircraft must be clear of the runway.

[4] When the succeeding aircraft is a helicopter, visual separation may be applied.

5.8.4. SRS on Parallel Runways:

5.8.4.1. Simultaneous same direction operations may be authorized on parallel runways when operations are conducted in VFR conditions (unless visual separation is applied), two-way radio communication is maintained with aircraft involved and pertinent traffic information is passed, and the distance between the two runways is in accordance with the table below.

Aircraft Category	Minimum Distance (ft.) Between Parallel…	
	Runway Centerlines	Edges of Adjacent Runways/Strips
Category I or II	300	200
If either aircraft is Category III	500	400
If either aircraft is a Heavy	700	600

5.9. Wake Turbulence

5.9.1. Wake turbulence is a phenomenon that occurs when an aircraft develops lift and forms a pair of counter-rotating vortices. Any aircraft, including helicopters, produce wake turbulence between takeoff and touchdown. Wake turbulence can be hazardous to aircraft that follow or cross the flight path of another.

5.9.2. Generally, wake turbulence will apply whenever a smaller aircraft will fly through the airborne path of a larger aircraft. It applies to the same runway, parallel runways separated by less than 2500', and crossing flight paths.

5.9.3. Do not issue "line up and wait" to apply wake turbulence separation when a Category H or I aircraft will follow a previously-departed Category A, B, C, or D aircraft.

5.9.4. Issue wake turbulence advisories if in your opinion wake turbulence may have an adverse effect on the aircraft. In general, advisories should be issued to an aircraft following a heavier wake category. Advisories should also be issued to landing aircraft following departing larger aircraft, in case of a go around.

> Wind zero six zero at eight, Runway 4R, cleared to land. Caution wake turbulence, following a heavy Boeing 767 on a two mile final.

CHANGE 1

5.9.5. A departure wake turbulence advisory should be issued in the aircraft's "line up and wait" or takeoff clearance, whichever comes first.

> KAP3531, Runway 22R, line up and wait. Caution wake turbulence, preceding departure Boeing 757.

5.9.6. For arrivals, issue wake turbulence advisories and the position, altitude if known, and direction of flight of:

5.9.6.1. Category B, C, D, E, F, G, H, I aircraft behind Category A, B, or D aircraft.

5.9.6.2. Category E, F, G, H, or I aircraft behind Category C aircraft

5.9.6.3. Category I aircraft behind Category E aircraft

5.9.7. Reference **Section 5.30 Opposite Direction Operations** for wake turbulence application when using opposite direction takeoffs and landings on the same or parallel runways separated by less than 2500'.

5.9.8. If an intersection departure is 500' or less from the departure point of the preceding aircraft and the take off is in the same direction, treat the intersection as a full-length departure.

5.9.9. Reference the table below for time-based wake turbulence separation.

CHANGE 1

5.9.10. Wake Turbulence Time-Based Separation Table

Location	Lead	Trail	Separation	Waivable?
Same runway, or parallel runway separated by less than 2500'	A	B, C, D, E, F, G, H, I	3 min. *	No
	B or D	B, C, D, E, F, G, H, I	2 min. *	No
	C	E, F, G, H, I	2 min. *	No
Same runway, or parallel runway separated by less than 700 feet	E	I	2 min. *	No
Intersection on same runway	F, G, H	I	3 min.	Yes
Intersection on same runway or parallel runway separated by less than 700 feet	E	I	3 min.	No
Intersection on the same runway or parallel runways separated by less than 2500 feet	A	B, C, D, E, F, G, H, I	4 min.	No
	B or D	B, C, D, E, F, G, H, I	3 min.	No
	C	E, F, G, H, I	3 min.	No
Trail passing through airborne path of lead	A	B, C, D, E, F, G, H, I	3 min. *	No
	B or D	B, C, D, E, F, G, H, I	2 min. *	No
	C	E, F, G, H, I	2 min. *	No
	E	I	2 min. *	No

5.9.10.1. For highlighted intervals marked with *, distances in the **Wake Turbulence Distance-Based Separation Table** may be used in lieu of the timer.

5.9.10.2. The timer for full-length departures begins with the takeoff roll of the lead.

5.9.10.3. The timer for intersection departures begins from rotation of the lead.

TRAINING TIP

The table above summarizes the requirements to provide wake turbulence; if a scenario is not in the table, wake turbulence separation is not required.

For example, it may seem like a C402 (I) following a B737 (F) would require a wake turbulence interval. However, no wake turbulence interval is required (that's why it doesn't appear in the table above). The pilot of the C402 does need to be informed "caution wake turbulence" prior to departure.

5.9.11. Touch-and-go or stop-and-go operations are treated as intersection departures. However, except behind Category A, the wake turbulence requirement is not required if the pilot is maintaining visual separation/spacing behind the preceding aircraft. Issue a wake turbulence cautionary advisory and the position of the larger aircraft. In these cases, do not restrict the aircraft in such a way that it will be unable to avoid wake turbulence. For example, do not specify an immediate takeoff or restrict the aircraft to touch-and-go only; allow the aircraft to extend downwind or deviate as necessary to avoid wake turbulence.

> Cessna 6PK, follow Boeing 737 traffic abeam your left wing, caution wake turbulence, Runway 24, cleared for the option.

> N236PB, caution wake turbulence, just-departed E170, Runway 24, cleared for the option.

5.9.12. **Wake Turbulence Distance-Based Separation Table**

CHANGE 1

5.9.12.1. At radar facilities, the distances below can be used in lieu of the time-based separation table minima above.

The table below also applies when following aircraft conducting instrument approaches and/or operating within 2,500 feet and less than 1,000 feet below the flight path of a Category A, B, C, or D aircraft or less than 500 feet below the flight path of a Category E aircraft.

		FOLLOWER								
		A	B	C	D	E	F	G	H	I
LEADER	A		5	6		7			8	
	B		3	4		5				5 (6)
	C					3.5			5	5 (6)
	D		3	4		5			5 (6)	
	E									4
	F									(4)
	G									
	H									
	I									

5.9.12.2. Where minima in parentheses are shown, this additional milage must be present for landing when the lead aircraft is over the landing threshold.

For example, a Category I aircraft may initially be separated 5 miles behind a Category B aircraft. However, once the Category B aircraft reaches the threshold, spacing must have increased to 6 miles.

5.10. IFR Departure Separation

5.10.1. Separate successive IFR departures by 3nm.

5.10.1.1. This is “anticipated separation”: takeoff clearance will be issued so the second aircraft will have 3nm or more of increasing separation at the time both aircraft are airborne.

5.10.1.2. When a slower aircraft departs ahead of a faster aircraft, along the same route, more than 3nm will be required at takeoff to achieve the required 3nm of anticipated separation.

5.10.2. Separation between successive IFR departures may be reduced to 1nm if:

5.10.2.1. Heading assignments or SID courses diverge by at least 15 degrees or more immediately after departure, or

5.10.2.2. The aircraft are flying RNAV SIDs with courses diverging by 10 degrees or more immediately after departure.

5.10.3. Simultaneous departures from parallel runways are authorized if the runway centerlines are separated by at least 2500’ and the aircraft courses diverge by at least 15 degrees (10 degrees if flying an RNAV SID).

5.11. IFR Separation: Departures and Arrivals

5.11.1. Separate an IFR departure and arrival by a minimum of 2 miles, if separation will increase to 3 or more miles within 1 minute after takeoff.

This procedure permits a departing aircraft to be released so long as an arriving aircraft is no closer than 2 miles from the runway at the time. This separation is determined at the time the departing aircraft commences takeoff roll. Consider the effect of surface conditions on the pilot's ability to commence takeoff roll.

Note: whenever practical, tower-applied visual separation should be used in lieu of this standard.

5.12. IFR Arrival Separation

5.12.1. APP is responsible for separation of radar arrivals unless visual separation is applied by TWR through SOP/LOA or coordination.

5.12.2. TWR should work to help prevent the need for a go around if spacing is tight. Coordination must occur for TWR to change a speed issued by APP.

> DAL814, minimum time on the runway, traffic 3 mile final behind you.
>
> EDV5293, turn left on K, expedite, traffic 1 mile final.
>
> N1MS, reduce to final approach speed, 4 miles in-trail of a Boeing 737.

CHANGE 1

5.13. (Removed)

5.14. Runway Crossings

5.14.1. TWR is generally responsible for all movement on or across all active runways. Because GND cannot authorize traffic to cross an active runway without coordination, inbound aircraft should generally be sent to the ground controller only after they have crossed all remaining active runways:

> Exit right on Echo, cross Runway 22R, then contact ground point niner.

5.14.2. For the purposes of issuing crossing instructions, the runway is considered "clear", and a crossing may be issued when:

5.14.2.1. A departing aircraft is observed to be in a turn to avoid the crossing point, or has passed the point where the crossing will occur, regardless of the departing aircraft's altitude.

5.14.2.2. An arriving aircraft is far enough back that the crossing can be completed before the arrival reaches the runway threshold.

5.14.2.3. An arriving aircraft has landed and the pilot has verbally confirmed that the aircraft will exit the runway prior to the crossing point.

5.14.2.4. An arriving aircraft has exited the runway prior to the point at which the crossing is intended, or has passed the crossing point.

5.15. Line Up and Wait (LUAW) Instructions

5.15.1. Authorize LUAW when takeoff clearances cannot be issued because of traffic, and issue information about this traffic to the LUAW aircraft:

> Runway Two Niner, line up and wait. Traffic crossing downfield.

5.15.2. Do not use conditional phrases such as “behind landing traffic” or “after the departing aircraft”.

5.15.3. LUAW is intended to position an aircraft for an imminent departure. Generally, aircraft should not be in LUAW status for more than 90 seconds without additional instructions.

5.15.4. When authorizing an aircraft to LUAW from an intersection, state the runway intersection:

> Runway Six at Alpha, line up and wait.

5.15.5. LUAW may not be issued for an intersection departure at night, except where authorized by Facility SOP.

5.15.6. At non-ASDEX facilities without a safety logic system:

5.15.6.1. Do not issue any form of landing clearance to an aircraft on the same runway with an aircraft that is in LUAW. Landing clearance must be withheld until the aircraft in position starts takeoff roll:

> Runway Four, continue, traffic holding in position.

5.15.6.2. Do not authorize an aircraft to LUAW if an aircraft has received any form of landing clearance on the same runway.

5.15.7. At facilities using the safety logic system in full core alert mode, when reported weather conditions are at least 800’ ceiling and 2 miles visibility:

5.15.7.1. Landing clearance may be issued to an arriving aircraft with another aircraft holding in position on the same runway.

5.15.7.2. An aircraft may be authorized to LUAW when another aircraft has been cleared to land on the same runway.

Note: KBOS, KBDL, and KPVD have a safety logic system. To be operating in the “full core alert mode”, the runway configuration must match the configuration in use and the “TWR CFG” must show “LC/GC”.

5.15.8. An aircraft in LUAW must be advised of:

5.15.8.1. The closest traffic within 6 flying miles landing on the same runway.

> UAL164, Runway One Eight, line up and wait. Traffic, Boeing Seven Thirty Seven, five mile final.

5.15.8.2. Aircraft can be authorized to LUAW, depart, or arrive on crossing runways. In this case, traffic must be exchanged with the crossing runway operation.

> UAL5, Runway Four, line up and wait, traffic holding Runway Three One.
> DAL1, Runway Three One, line up and wait, traffic holding Runway Four.

> DAL1, Runway Four, line up and wait, traffic landing Runway Three One.
> UAL5, Runway Three One, cleared to land. Traffic holding in position Runway Four.

> DAL1, Runway Three One, line up and wait, traffic departing the crossing runway.
> UAL5, Runway Four, cleared for takeoff, traffic holding in position Runway Three One.

5.15.9. Traffic information may be omitted if the traffic is another aircraft that has landed on or is taking off on the runway and is clearly visible to the holding aircraft.

5.16. Takeoff Clearances

5.16.1. State the runway number followed by the takeoff clearance:

> Runway Two Niner, cleared for takeoff.

5.16.2. Turbine-powered aircraft may be considered ready for takeoff once they reach the departure runway unless they advise otherwise. Other aircraft are expected to call when ready.

5.16.3. If an aircraft needs to be assigned a heading to fly upon departure, include that prior to the takeoff clearance. If an airport does not have any departure procedures or the departure specifically states “climb on assigned heading”, a heading must be assigned in the takeoff clearance for IFR aircraft.

> Fly heading two seven zero, Runway Two Four, cleared for takeoff.

5.16.4. The wind should normally be given as part of the takeoff clearance, before the words “cleared for takeoff”:

> Wind two seven zero at eight, Runway Two Niner, cleared for takeoff.

> Fly heading two eight zero, wind two niner zero at one two gusts one six, Runway Two Four, cleared for takeoff.

Note: inclusion of wind information is only required if a tailwind component exists.

5.16.5. When conducting simultaneous parallel runway departures utilizing RNAV SIDs, advise aircraft of the initial fix/waypoint on the RNAV route. The pilot is expected to acknowledge the advisory as any other ATC communication.

> RNAV to MPASS, Runway 26L, cleared for takeoff.

Note: there are currently no airports within ZBW with a configuration requiring this “RNAV to” phraseology.

5.16.6. Aircraft cleared via RNAV SIDs designed to begin with a vector to the initial waypoint are assigned a heading before departure. The SID transition is not restated as it is contained in the initial IFR clearance.

5.16.7. If an aircraft is departing in front of traffic on final and needs to expedite its takeoff roll, include traffic information at the end of the takeoff clearance.

> Runway 24, cleared for immediate takeoff, traffic a Citation, two mile final.

5.16.8. When clearing an aircraft for takeoff from an intersection, state the intersection:

> Runway 24 at Alpha, cleared for takeoff.

5.16.9. Cancel a previously issued clearance for takeoff and inform the pilot of the reason if circumstances require. Once an aircraft has started takeoff roll, cancel the takeoff clearance only for the purpose of safety:

> Cancel takeoff clearance (reason), (alternate instructions if needed).
> *Example:* United Three, cancel takeoff clearance due to traffic in the departure corridor, Runway Three One, line up and wait.

5.17. Handoff to Departure

5.17.1. Once a departing aircraft has passed the end of the runway, has established a positive rate of climb, and is clear of any potential traffic in your airspace, instruct the aircraft to change to departure:

> Contact Bradley Departure.

> Contact Boston Center.

5.17.2. The frequency is not specified when instructing an aircraft to change to departure because it was provided in the initial clearance. If the departure frequency will change from what is issued in the aircraft's initial clearance, this information must be issued prior to takeoff:

> JIA5054, departure frequency 123.95, Runway 24, line up and wait.

5.17.3. If an aircraft has not begun a SID or ATC-assigned turn, add that instruction to the handoff:

> Turn left heading two two zero, contact Bradley Departure.

5.17.4. Upon aircraft request, or for aircraft that have been approved for an "unrestricted climb", provided further communication with you will not be required, instruct the aircraft to contact departure with the takeoff clearance:

> Mace Two-One, change to departure, Runway Six, cleared for takeoff.

5.18. Landing Clearances

5.18.1. State the runway number, followed by the landing clearance:

> Runway Two Four, cleared to land.

5.18.2. The wind should normally be given as part of the landing clearance:

> Wind zero seven zero at seven, Runway Four Left, cleared to land.

Note: wind information is only required if a tailwind component exists.

5.18.3. Issue traffic information when there is traffic authorized to LUAW on the same runway, or if traffic will arrive or depart prior to the aircraft:

> American 245, Runway 18, cleared to land, number two following a United 737 two mile final. Traffic will depart prior to your arrival.

5.18.4. Aircraft may be issued any of the following clearances:

Clearance	Meaning
"Cleared to land"	Aircraft will land and taxi clear of the runway.
"Cleared touch and go"	Aircraft will land and depart on the runway without stopping or exiting.
"Cleared stop and go"	Aircraft will land, make a complete stop on the runway, then commence takeoff from that point.
"Cleared low approach"	Aircraft will approach, then conduct a go around prior to contacting the runway.
"Cleared for the option"	Aircraft is cleared to land, touch and go, stop and go, or low approach at their option.
"Cleared low approach at or above *(altitude)*. Traffic *(description and location)*"	A low approach with an altitude restriction of not less than 500' over the airport. This may not be authorized over an aircraft departing or in takeoff position.

Note: controllers should be aware that an aircraft may go around for any time, at any reason.

Note: use caution when issuing "cleared for the option" or "cleared stop and go" to aircraft ahead of traffic. These operations can require additional time on the runway and can affect separation.

5.18.5. If the landing runway is changed, controllers must preface the landing clearance with “change to”, restate the runway number, then issue the landing clearance:

> Change to Runway 29, Runway 29 cleared to land.

Note: for IFR aircraft, a new approach clearance, as well as coordination with Approach, may be required when an aircraft’s landing runway is changed.

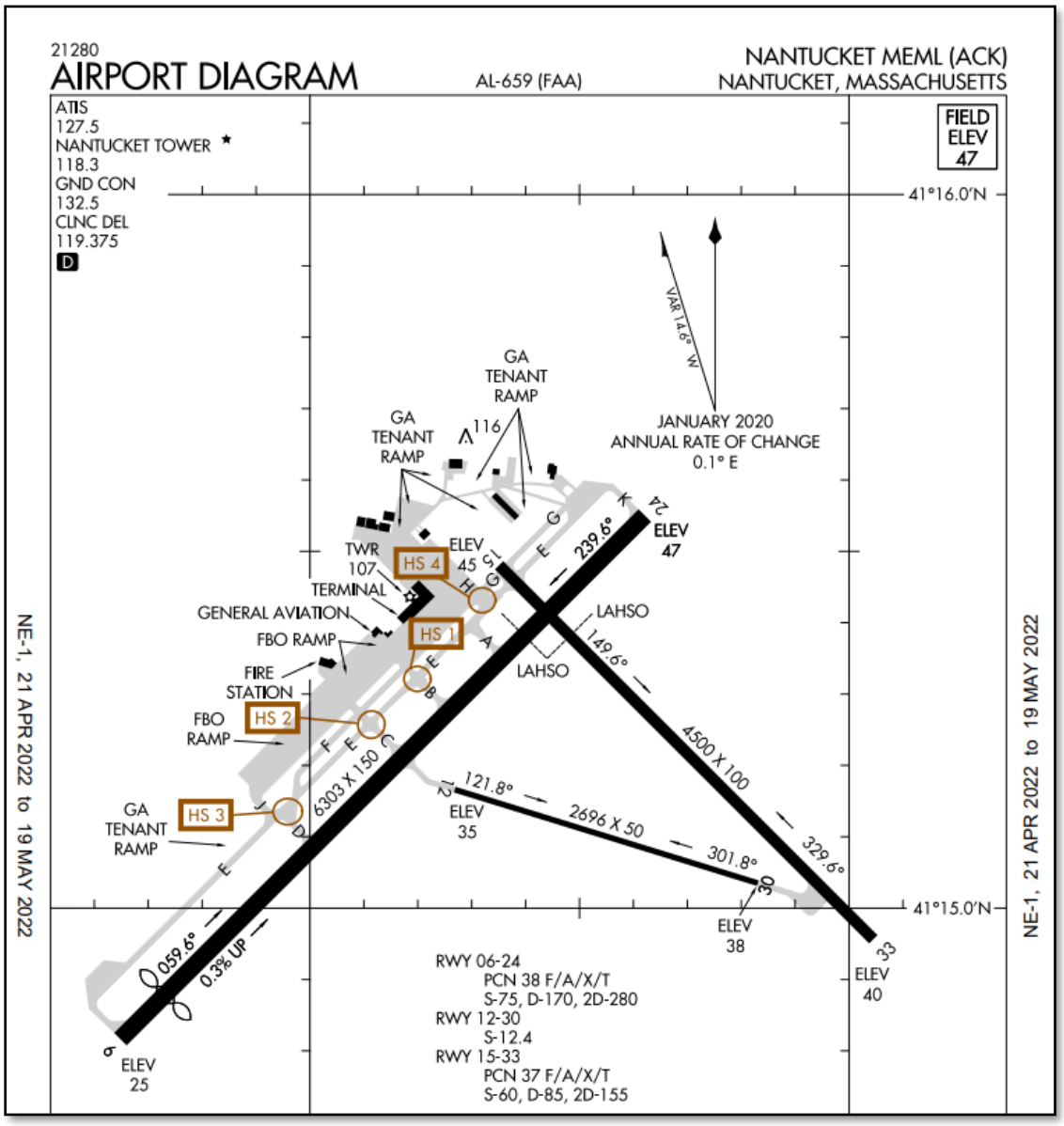
5.18.6. If you become aware that an aircraft is aligned with the wrong surface (incorrect runway, a taxiway, or any other incorrect location), inform the pilot and either verify the pilot is aligned with the correct runway or issue control instructions/clearances to prevent a wrong surface landing.

> United four twenty three, you appear to be aligned with the wrong runway. Verify you are aligned with Runway 22L.

> Southwest two thirty nine, go around, you appear to be aligned with the wrong runway.

5.19. Land and Hold Short Operations (LAHSO)

5.19.1. LAHSO may be conducted at airports where a LAHSO marking is indicated on the airport diagram as shown in the example below. LAHSO authorizes simultaneous operations on intersecting runways during VFR conditions.



In this example, any of the following could be authorized:

- An arrival lands on Runway 6 with aircraft landing or departing Runway 33.
- An arrival lands Runway 33 with aircraft landing or departing Runway 6.

5.19.2. Issue traffic information to both aircraft involved and obtain an acknowledgment from each. Request a read back of hold short instructions when they are not received from the pilot of the restricted aircraft.

> *To the restricted aircraft:* Runway Six, cleared to land, hold short of Runway Three Three, traffic, King Air landing Runway Three Three.
>
> *To the other aircraft:* Runway Three Three, cleared to land, traffic landing Runway Six will hold short of the intersection.

> *To the restricted aircraft:* Runway Three Three, cleared to land, hold short of Runway Six, traffic, Embraer E-190 departing Runway Six.
>
> *To the other aircraft:* Traffic, Citation, landing Runway Three Three will hold short of the intersection, Runway Six, cleared for takeoff.

5.19.3. The following weather conditions apply:

5.19.3.1. The airport must be under VFR conditions.

5.19.3.2. Runways must be free of contamination with no reports braking action is less than “good”.

5.19.3.3. There must be no tailwind for the landing aircraft restricted to hold short of the intersection.

5.20. Missed Approaches and Go Arounds

5.20.1. A missed approach is a published procedure for an instrument approach that ends in a published hold. Clearance for a missed approach is automatically included with an instrument approach clearance given to an IFR aircraft.

5.20.2. A go around is an instruction for a pilot to abandon the approach for landing, when initiated by ATC (e.g., for traffic or other reasons). A pilot may also commence a go around due to traffic, an unstable approach, weather, etc.

5.20.3. Based on weather conditions, traffic, and type of aircraft/operation, a TWR controller may offer the aircraft the option of remaining in the traffic pattern or returning to the radar controller for resequencing:

> N3B, would you like to remain this frequency to join right traffic for Runway 2?

5.20.4. Reference **General SOP, Chapter 9** for specific go around procedures.

5.21. VFR Traffic: General

Handling of VFR varies by airspace (e.g., Class E, Class C, etc.) and, because it is less common and structured, may require more coordination than standard IFR operations.

In general, controllers should avoid the desire to 'over control' VFR aircraft. Aircraft are flying VFR for a reason, and controllers should intervene only to the extent necessary to provide required separation, sequencing, and traffic information.

5.21.1. Based on the airspace class of the airport, controllers may need to provide sequencing, separation, or a combination of these:

"Sequencing" means organizing the flow of arriving and departing aircraft by requiring them to adjust flight operation as necessary to achieve proper spacing.

"Separation" is providing lateral, vertical, and/or visual distance between aircraft as prescribed by the airspace class and operation.

5.21.2. The following examples show techniques for managing VFR and IFR aircraft:

Instruction	Meaning
"Make right three-sixty"	Turn 360° to the right.
"Make left two-seventy"	Turn 270° to the left (i.e., "the long way around").
"Make short approach"	Turn base and final closer to the runway than normal.
"Follow…"	Follow the traffic (description and location).
"Number…"	Priority in landing sequence.
"Turn direct the threshold/numbers"	Turn/proceed directly to the runway threshold and/or landing area.
"Extend downwind"	Extend the leg of the traffic pattern being flown (e.g., "extend crosswind", "extend downwind").
"Make straight in" **"Enter left base"**	Pattern entry instructions.

5.21.3. Altitude restrictions may be used to separate VFR aircraft. Altitudes may be assigned at any point in a VFR flight but must meet MVA, MSA, or minimum IFR altitude criteria. Examples:

> Cleared into the Boston Bravo airspace at or below two thousand.

> Maintain VFR at or above three thousand.

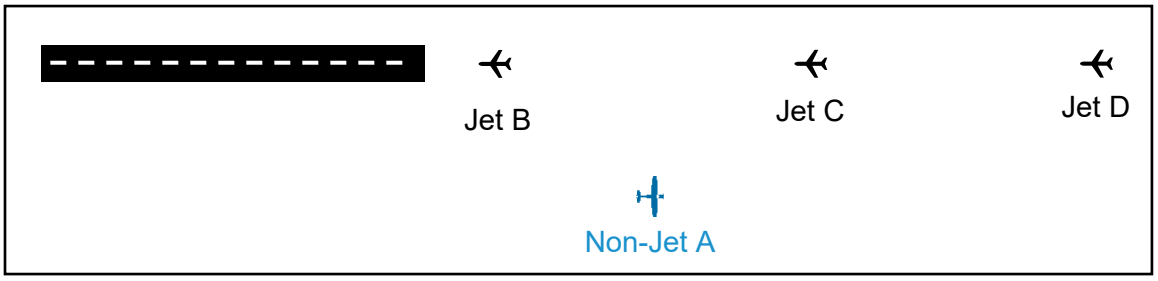
> Maintain five thousand five hundred while in Bravo airspace.

> Maintain VFR at or below two thousand, fly heading two six zero, Runway Two Four, cleared for takeoff.

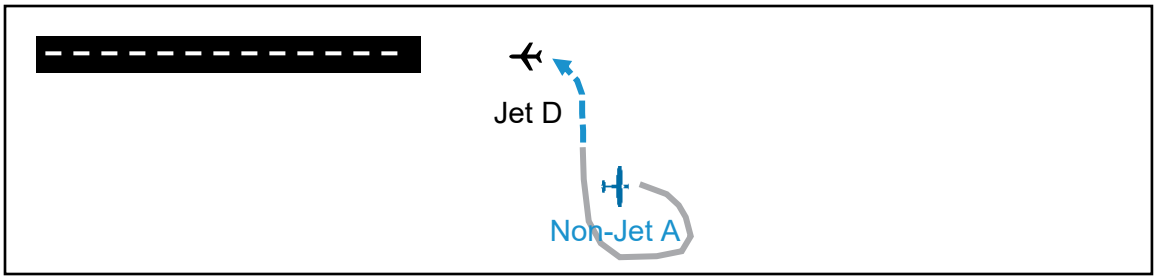
5.21.4. "Cancel" a VFR altitude restriction by instructing the aircraft to "resume appropriate VFR altitudes" once the restriction is no longer needed:

> Resume appropriate VFR altitudes.

5.21.5. Consider the impacts of aircraft speed on distance. In this example, aircraft B, C, and D are all jets:



It may be tempting to instruct Aircraft 'A', a non-jet, to extend downwind. However, doing so will require 'A' to join final several miles from the airport and then fly back toward the runway at a slower speed than other inbound jets. A better option is to instruct 'A' to hold or complete a right two-seventy near the right base area to join a gap in the arrival sequence:



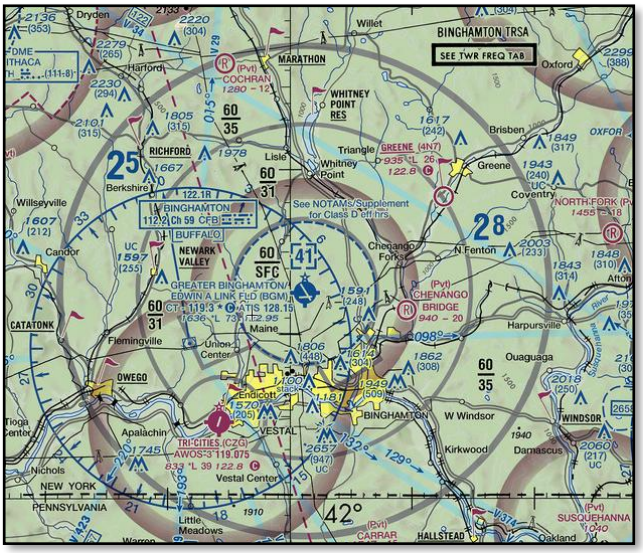
5.22. VFR Separation Requirements

5.22.1. At towered airports, VFR aircraft will always be *sequenced* (i.e., provided a priority/space within the landing flow). However, some airspaces also require fixed-wing VFR aircraft to receive *separation*.

5.22.2. Regardless of airspace, basic radar services for VFR aircraft must include safety alerts, traffic advisories, limited radar vectoring, and sequencing.

5.22.3. In Class D and E airspaces, separation is only provided between IFR aircraft; VFR aircraft are not separated from other VFR or IFR aircraft (but will be sequenced). In Class C airspace, VFR aircraft receive separation from IFR aircraft, but not other VFR traffic. In Class B airspace, all aircraft must receive a form of separation (thus, a clearance is required). These requirements are summarized in the table below.

In some areas, a Terminal Radar Service Area (TRSA) may be established. In this airspace, ATC provides vectoring, sequencing, and separation for all IFR and participating VFR aircraft. VFR aircraft are urged, but not required, to participate in a TRSA. There are no TRSAs in Boston Center airspace.



Shown left is the Binghamton TRSA, surrounding the KBGM airport near the ZBW-ZNY boundary. The TRSA may be identified by the dark concentric lines surrounding the airport.

5.22.4. Separation requirements and/or airspace entry can be predicated on two-way radio communication, which is established if a controller responds to a radio call with "*(aircraft callsign)*, standby". If workload or traffic prevent immediate provision of requisite services, inform the aircraft to remain outside the airspace until conditions permit:

> Remain outside Charlie airspace and standby.

5.22.5. VFR separation requirements by airspace are shown in the tables below.

5.22.5.1. VFR helicopters need not be separated from VFR or IFR helicopters. Traffic advisories and safety alerts must be issued as appropriate.

CHANGE 1

5.22.5.2. If vertical separation is being applied with a Super/Heavy (Category A, B, C or D aircraft), and the smaller aircraft is below the larger aircraft, 500' separation increases to 1000' for aircraft operating laterally within 2500' of the flight path of the leading aircraft.

5.22.5.3. When aircraft are being vectored for separation, wake turbulence minima apply. When vectoring is discontinued and/or visual separation has been applied, aircraft must be provided a wake turbulence cautionary advisory.

5.22.6. **Class B Airspace:**

Aircraft	Gross Weight < 19000 lbs.	Gross weight > 19000 lbs. or Turbojet
Separation Requirement	Target resolution or 500' vertical or Visual separation	1 ½ miles or 500' vertical or Visual separation
Separate	VFR from other VFR/IFR aircraft	
Entry	Class B Airspace Clearance	

5.22.7. **Class C, TRSA, and Class D Airspace:**

Airspace	**Class C**	**TRSA**	**Class D**
Separation Requirement	Target resolution or 500' vertical or Visual separation		N/A
Separate	VFR from IFR aircraft	VFR from other VFR/IFR aircraft	No VFR or VFR/IFR separation
Entry	Two-way radio communication	Two-way radio communication (participation optional)	Two-way radio communication

5.23. VFR Operations in Class D Airspace

5.23.1. Class D airspace is owned by TWR, which provides:

- Safety alerts and traffic advisories.
- Limited radar vectoring when requested by the pilot.
- Sequencing to the primary airport.

5.23.2. **VFR Departures** in Class D do not require separation from other VFR or IFR traffic. They are seldom assigned specific headings and may simply be issued **"cleared for takeoff"**. However, to alleviate confusion, controllers should issue departure instructions corresponding to the legs of the traffic pattern, such as:

> Left downwind departure approved, Runway 24, cleared for takeoff.

> On course *(/straight-out)* departure approved, Runway 1, cleared for takeoff.

> Northbound departure approved, Runway 6, cleared for takeoff.

For a departing VFR *without* flight following, keep the aircraft on your frequency until it is (or reports) clear of the Class D surface area, then issue:

> Frequency change approved.
> *or*
> Change to advisory frequency approved.

For a departing VFR *with* flight following, retain the aircraft as long as needed to resolve any traffic conflicts, then instruct the aircraft to **"contact departure"**.

5.23.3. **VFR arrivals** may be handed off to TWR from APP or make initial contact directly. APP will generally not sequence VFR arrivals at Class D airports[5]. Ensure aircraft are in receipt of weather information and assign landing runway and sequence, including pattern entry instructions as appropriate:

> Enter right base Runway 24.

> Runway 6. Expect left downwind, report five miles southwest of the airport.

> Enter left downwind Runway 33. Number two, following a Baron on right base.

[5] Aircraft that have been sequenced will have the corresponding scratchpad entry or will be coordinated.

5.24. VFR Operations in Class C Airspace

5.24.1. The responsibilities for VFR aircraft increase in Class C airspace and are now shared between TWR and radar. Class C service includes:

- Sequencing of all aircraft to the primary airport.
- For IFR aircraft: standard IFR services.
- Between IFR and VFR aircraft: visual separation, 500’ vertical separation, or target resolution, traffic advisories, and safety alerts.
- Between VFR aircraft: mandatory traffic advisories and safety alerts.

5.24.2. Per the **General SOP**, **VFR Departures** are normally issued a heading within the departure corridor and instructed to **“contact departure”**.

5.24.3. Per the **General SOP**, **VFR Arrivals** are normally sequenced with other arrival traffic by APP.

5.24.4. Coordination for on course departures and/or arrivals to contact TWR directly may be employed. Class C service must be provided.

5.25. VFR Operations in Class B Airspace:

5.25.1. The requirements for VFR aircraft increase once again in Class B airspace; now, controllers are responsible for the separation between all aircraft, even two that are both VFR. Class B service includes:

- Sequencing of all aircraft to the primary airport.
- Mandatory traffic advisories and safety alerts between all aircraft.
- For IFR aircraft: standard IFR services.
- Between IFR and VFR aircraft, if either weighs more than 19000 lbs. or is a turbojet: 1 ½ miles, 500' vertical separation, or visual separation.
- Between IFR and VFR aircraft, when both aircraft weigh 19000 lbs. or less: visual separation, 500' vertical separation, or target resolution.

5.25.2. As a result of this increased responsibility, pilots must be issued a specific clearance to operate in Class B airspace:

> Cleared through/to enter/out of Bravo airspace,
> *(and as appropriate,)* via *(route)*. Maintain *(altitude)* while in Bravo airspace.

5.25.3. Deny requests from VFR aircraft to operate in Class B airspace based on workload and traffic. Inform the pilot when to expect further clearance when aircraft are held inside or outside Class B airspace:

> Remain outside Bravo airspace.
> (When necessary, reason and/or additional instructions.)

5.25.4. Inform VFR aircraft when leaving Class B airspace:

> Leaving Boston Bravo airspace. Resume appropriate V-F-R altitudes, radar service terminated. Squawk V-F-R, change to advisory frequency approved.

5.25.5. Vector aircraft to remain in Class B airspace after entry. Inform the aircraft when leaving and reentering Class B airspace if it becomes necessary to extend the flight path outside Class B airspace for spacing.

5.26. VFR Closed Traffic

5.26.1. Closed traffic means the pilot will remain in the pattern for successive operations. Approve/disapprove these requests based on traffic:

> Left closed traffic approved. Report *(position if required)*. Runway Two Four, cleared for takeoff.
> Or
> Unable closed traffic (additional information as required).

Class C and Class B service/separation requirements should be considered prior to approving VFR closed traffic at Class C or Class B airports.

5.26.2. TWR can use numerous methods to sequence VFR closed traffic aircraft, including those outlined in **Section 5.21**. When traffic is not a factor, aircraft do not require specific turn instructions and will be given a landing clearance when appropriate. As necessary, TWR may instruct aircraft to **"extend downwind, Tower will call base"**, **"turn base now"**, or apply other sequencing as needed:

> Extend downwind, tower will call base. Traffic, Cessna 172, joining a three-mile final.

> Turn base, Runway Two Four, cleared for the option.

> Number two, follow traffic, Bonanza, turning left base over the shoreline.

5.27. VFR Release of IFR Departure

5.27.1. If an aircraft that has filed an IFR flight plan requests a VFR departure, APP may be able to authorize the procedure.

5.27.2. The pilot must be informed of the proper frequency, if appropriate, and where/when to contact that frequency for clearance:

> VFR departure authorized. Contact *(facility)* on *(frequency)* at *(location or time if required)* for clearance.

5.28. Special VFR (SVFR)

5.28.1. SVFR is a clearance issued to VFR aircraft operating in Class B, C, D, and E surface areas below 10000 MSL upon pilot request. SVFR operations are permitted for fixed-wing aircraft with a reported ground visibility of 1 mile or greater (there is no visibility restriction for helicopter SVFR operations). Pilots may request SVFR when weather conditions do not permit VFR operations.

> N220CH, cleared to enter/out of/through Nantucket surface area, maintain special V-F-R conditions.

5.28.2. Additional directional or altitude restrictions may be applied in the SVFR clearance if it is operationally advantageous:

> KAP31, cleared to enter the Augusta surface area west of I-195, maintain special V-F-R conditions at or below 2000.

5.28.3. Fixed-wing SVFR is prohibited at most Class B airports, including KBOS (see 14 CFR Part 91 or the SkyVector TAC for KBOS). Helicopter SVFR is *not* restricted by 14 CFR Part 91.

5.28.4. Apply non-radar or visual separation between:

- SVFR fixed-wing aircraft.
- SVFR fixed-wing aircraft and SVFR helicopters.
- SVFR fixed-wing aircraft and IFR aircraft.

Note: radar separation is not authorized during fixed-wing SVFR operations. Radar vectors may be used to expedite the entrance, exit, and transition of SVFR fixed-wing aircraft through the appropriate surface area.

5.28.5. Apply non-radar, visual, or IFR radar separation between:

- SVFR helicopters.
- SVFR helicopters and IFR aircraft.

5.28.6. Do not assign a fixed altitude when applying vertical separation; clear the SVFR aircraft at or below an altitude that is at least 500’ below conflicting IFR traffic.

5.29. Circling Instructions

5.29.1. A “circling approach” is used when a pilot will land on a runway that is not aligned with the instrument approach procedure. Based on traffic, runway in use, and operational factors, circling instructions may specify a direction or pattern entry instructions:

> Circle east, Runway 28, cleared to land.

> Circle northwest of the *(airport/runway)* for a right downwind to Runway 22.

5.29.2. Circling instructions must be issued prior to the landing clearance.

5.30. Formation Flights

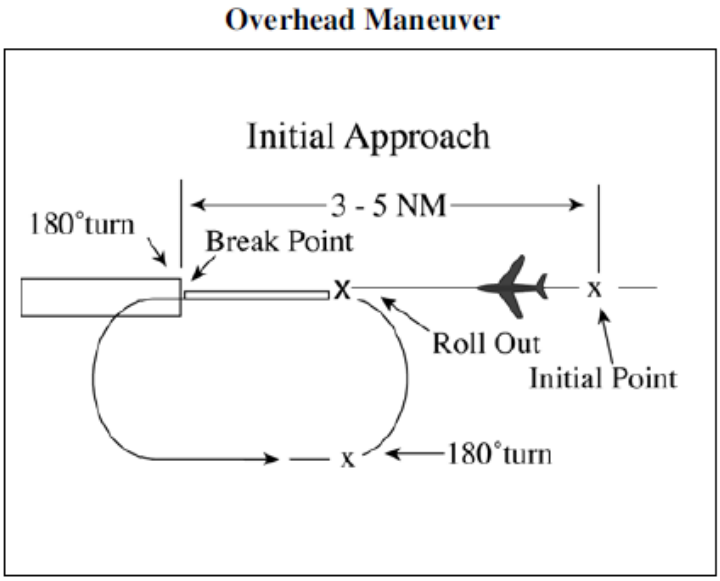
5.30.1. Military and civil aircraft will occasionally request formation flight operations. In most cases, you can treat a formation flight as if it were one aircraft, adding the word “flight” to the call sign of the aircraft. A single IFR clearance and squawk code must be issued to standard formation aircraft:

> MUSKET01 flight, Runway 24, taxi via Alpha, November.

5.30.2. Formation flights may initially call “check” to verify their other pilots are on frequency. This is not a “radio check”; the controller should not reply:

> *MACE21:* MACE Two-One Flight Check.
> MACE22: Two.
> *MACE23:* Three.

5.30.3. Aircraft, especially formation flights, may request overhead maneuvers where they will fly to a break point and then do a circling turn to land:



Formation flight aircraft requesting an overhead will normally be radar vectored to an appropriate point on final, or direct to the airport, and be asked to report the airport in sight by APP. Once the airport is reported, the following phraseology may be used to authorize the maneuver:

> MACE21 flight, cleared 10 mile initial, report initial with Bradley Tower on 120.3, frequency change approved.

Use the following phraseology to instruct an aircraft that will conduct an overhead maneuver:

> *TWR:* Air Force Three Six Eight, Runway 6, wind 070 at 8, pattern altitude 2000, right turns, report initial.
> *Pilot:* Air Force Three Six Eight.

Note: omit the pattern altitude and direction of traffic if standard.

> *Pilot:* Air Force Three Six Eight, initial, Runway 6.

Request the pilot to “report break” if operationally advantageous. Otherwise, issue the landing clearance:

> *TWR:* Air Force Three Six Eight, break at midfield, report break.
> Or,
> *TWR:* Air Force Three Six Eight, cleared to land.

An aircraft conducting an overhead maneuver is VFR and the IFR flight plan is canceled when the aircraft reaches the “initial point” on the initial approach portion of the maneuver.

5.31. Opposite Direction Operations (ODO)

5.31.1. An Opposite Direction Operation (ODO) is an IFR/VFR operation conducted to the same or parallel runway where an aircraft is operating in a reciprocal direction of another aircraft arriving, departing, or conducting an approach.

5.31.2. ODO is considered complete when:

- A departure is airborne and issued a turn/track to avoid conflict;
- An arrival has landed; or,
- An arrival that has executed a go around or missed approach has been issued a turn or track to avoid conflict

5.31.3. **Coordination** to initiate an ODO must include the phrase **"opposite direction"**, along with callsign, type, and runway.

5.31.3.1. APP must input "ODO" in the scratchpad of the arrival's data block.

5.31.3.2. When issuing a release, APP must issue an initial heading to TWR for the departure if required to avoid conflict.

5.31.3.3. Once an approval is given to land opposite the active runway, Local must coordinate releases for all departures until the approved arrival is no longer a factor.

5.31.4. The use of visual separation is not authorized.

5.31.5. Facility SOPs prescribe distance-based "cutoff points" that represent minimum lateral separation. ODO is not authorized inside the cutoff point unless an emergency exists. APP must not allow an arrival to reach the cutoff point until the ODO is complete. If the integrity of the cutoff point has been or is about to be compromised, APP must ensure recovery actions are taken.

5.31.6. Traffic advisories must be issued to the arriving and departing aircraft. These advisories must include the phrase **"opposite direction"**:

> Opposite direction traffic 15 mile final, Airbus A320.
> Opposite direction traffic departing Runway 15R, Cessna 402.

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5.31.7. Wake Turbulence for ODO:

Lead	Trail	Separation	Waivable?
A	B, C, D, E, F, G, H, I	4 min.	No
B or D	B, C, D, E, F, G, H, I	3 min.	No
C	E, F, G, H, I	3 min.	No
E	I	3 min.	No
F or G	I	3 min.	Yes

5.32. Helicopter Operations

TWR handles helicopters in different ways based on the location on the field they are operating (movement or non-movement areas):

5.32.1. **Movement areas:** from movement areas (runways, taxiways, and helipads), issue any specific instructions followed by the clearance:

> Remain west of Runway 4L, Runway 15R, cleared for takeoff.

> Fly heading 260, Taxiway C at A, cleared for takeoff.

> Make right circling approach, Helipad 1, cleared to land.

5.32.2. **Non-movement areas** such as ramps or off-airport locations are not controlled and thus a takeoff or landing clearance cannot be issued. Inform the pilot that the operation will be at their own risk:

> Takeoff/landing at the northeast ramp will be at your own risk (additional instructions, "caution", etc. as necessary).

5.32.3. The landing/takeoff area for helicopters is considered clear when a preceding helicopter has left or taxied off the takeoff/landing area.

Chapter 6: Approach/Departure (APP)

6.1. Position Responsibilities

6.1.1. APP deals primarily with the separation and control of airborne IFR aircraft and provision of VFR services as required based on airspace class, workload, and pilot request. This includes ensuring IFR separation while sequencing arrivals to the final approach course, and climbing departures and turning them on course before handing them off to CTR.

6.1.2. In addition to serving the primary airport, APP provides ATC services to all other airports within the position's defined airspace[6].

6.1.3. In the United States, this position is often referred to as a TRACON (Terminal Radar Approach Control) facility.

6.1.4. When working a "Departure" position, controllers should identify as **"(facility) Departure"**. If working a position that handles both arrival and radar identification of initial departures, the controller can identify as **"(facility) Departure"** when speaking to departures and **"(facility) Approach"** when communicating with other aircraft.

6.2. Duty Priority

6.2.1. Give first priority to separating aircraft and issuing safety alerts. Judgment must be used in prioritizing all other provisions of this order based on the requirements of the situation at hand.

6.2.2. APP tasks, such as separating airborne aircraft, issuing vectors to final, and issuing climb and descent instructions, are prioritized ahead of TWR tasks such as aircraft on the runway. GND and DEL requests receive the lowest priority.

[6] Online, this includes providing "top-down" services at all towered airports within the controller's airspace.

6.3. Coordination

6.3.1. APP must coordinate effectively with underlying TWR controllers regarding arrival and departure flight information, IFR releases, go arounds, SVFR approaches, VFR arrivals, and other operational items. Coordination may be achieved verbally or through automation (e.g., handoff, scratchpads, etc.).

6.3.2. The idea that one controller is solely responsible for a single block of airspace is the cornerstone of the ATC system. An aircraft may not enter an adjacent controller's airspace until approval is obtained from the receiving controller, either through a handoff or coordinated approval.

6.4. Sector Team Concept

6.4.1. It may be advantageous to operate an airspace sector in a team, where multiple controllers are jointly responsible for the sector's safe and efficient operation. Although sector teams are most used in Center sectors, they are also used for Approach sectors when advantageous.

6.4.2. There is no absolute division of responsibilities within a sector team: it is incumbent upon the team to operate the airspace in a safe and efficient manner. Workload permitting, team members should discuss specific responsibilities prior to commencing team sector operation, and continually assist each other in meeting sector objectives.

6.4.3. All members of a sector team are authorized to initiate and approve/deny control actions within their responsibilities. It is not necessary for any team position to receive "permission" from the rest of the team to make a control action. However, the sector team must be immediately made aware of control actions, which is normally done by updating information on the radar display.

6.4.4. **Definitions:**

Position Name	Common Responsibilities
Radar Position (R), commonly called "R-Side" or "Radar"	Operates radio frequencies and is in direct communication with aircraft to: • Separate aircraft and initiate control instructions. • Accept and initiate automated handoffs. • Complete computer entries for clearances you issue.
Radar Associate (RA), commonly called "D-Side" or "Handoff"	Primarily completes required coordination and ensures aircraft are separated entering the airspace, including: • Separate aircraft, including coordination with other sectors for aircraft entering the airspace. • Complete initiation and acceptance of automated and non-automated point outs. • Accept and initiate non-automated handoffs. Accept automated handoffs if an aircraft is within 2 flying minutes of the boundary. • Ensure all required computer entries are completed. • Monitor radio frequencies when not performing higher priority duties (e.g., coordination). • Conduct the functions of the Radar Coordinator, when not staffed.

Radar Coordinator (RC), commonly called "Tracker" or "Sequencer"	Serves as 'another set of eyes over the sector' that can assist any team member as necessary, including: • Coordination of traffic actions. • Advising the sector team of actions required to accomplish overall objectives. • Disseminate weather or NOTAM information to other members of the sector team. • Coordinate opening and closure of adjacent sectors and/or reconfiguration of the airspace.

6.4.5. Sector Team Best Practices:

6.4.5.1. **Separation.** The R directly communicates with aircraft and separates aircraft operating within the sector, while the RA primarily ensures aircraft are separated when they enter the sector. If a conflict exists near the sector boundary, the RA should initiate coordination with the adjacent sector for a control instruction resolving the conflict. Any required coordination (e.g., APREQs, point outs, etc.) is typically handled by the RA.

6.4.5.2. **Handoffs.** Both the R and RA should initiate automated handoffs when appropriate. However, the R primarily accepts automated handoffs. Radar Associates should only accept automated handoffs when the aircraft is within 2 minutes' flying time of the sector boundary. Manual handoffs, when required, are typically handled by the RA.

6.4.5.3. **Point Outs.** Both the R and RA may send and receive/approve automated point outs as appropriate. Manual point outs and/or required coordination regarding a point out (e.g., if the aircraft will do something other than what is indicated by the data block) is typically handled by the RA.

6.4.5.4. **Computer Entries.** Each position normally completes computer entries pertaining to actions they initiate. Depending on sector objectives (especially during training), this responsibility may be primarily placed on one position or another. The sector team as a whole is responsible for ensuring that computer information is accurate and that all required entries are completed.

6.5. Radar Identification

6.5.1. When an airborne aircraft contacts a radar facility for the first time, it must be radar identified before the controller can provide radar services to it. This is accomplished by the phrase **"radar contact"**, which is only necessary when the aircraft initially begins receiving radar services. When an aircraft is handed off from one radar facility to another, it is not given "radar contact" by the receiving controller, as it has already been radar identified by another controller and has not been out of radar contact since.

6.5.2. Radar identification may be established by:

Method	Phraseology
a) Observing a departing aircraft target within 1 mile of the takeoff runway end at airports with an operating control tower[7].	**"Radar contact."**
b) Observing a target whose position with respect to a fix or a visual reporting point corresponds with a direct position report received from an aircraft, and the observed track is consistent with the reported heading or route of flight.	
c) When the aircraft is already squawking a discrete code, requesting the aircraft to activate the "IDENT" feature of the transponder.	**"Radar contact"**, plus the aircraft's location with respect to a fix/navaid: **"Radar contact one zero miles northwest of the Providence VOR"**
d) Observing a target make an identifying turn or turns of 30° or more.	
e) Requesting the aircraft to squawk a code and observing the change.	
f) Requesting the aircraft to change the transponder to "standby" and then, after you see the target change, back to normal operation.	

[7] A verbal or automated rolling call is required to apply this method of radar identification. At KACK, and all Class C and B facilities, an automated rolling call is accomplished by online network functionality that inhibits tracking of the wrong aircraft. If at any point identification of a departure is in doubt (e.g., aircraft departs with an incorrect squawk code, does not auto-acquire on departure, cannot be tracked, etc.), another form of identification must be used.

6.5.3. Inform an aircraft when radar service is terminated:

> Radar service terminated.
> *(and as required,)* Squawk VFR. Contact Tower *(or)* change to advisory frequency approved.

Aircraft receiving VFR flight following or that cancel IFR must be informed of radar service termination and instructed to squawk VFR or 1200.

Radar service is automatically terminated an aircraft needs not be advised of termination when:

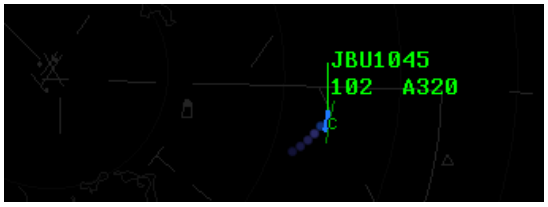
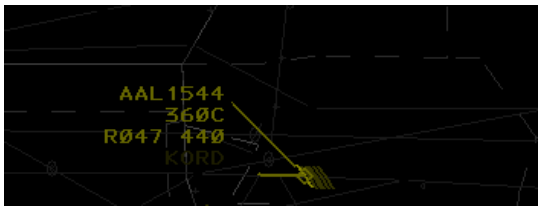
6.5.3.1. An aircraft cancels its IFR flight plan, except within Class B, Class C, TRSA, or where basic radar service is provided.

6.5.3.2. An aircraft conducting an instrument, visual, or contact approach has landed or has been instructed to change to advisory frequency.

6.5.3.3. An arriving VFR aircraft receiving radar service to a radar tower-controlled airport has landed.

Note: an aircraft landing at a tower-controlled airport where radar coverage does not exist to within 1/2 mile of the end of the runway must be informed when radar service is terminated.

6.5.4. When you have a separation responsibility for an aircraft, retain full data blocks until an aircraft has completely exited your sector/airspace and all potential conflicts have been resolved. This applies to aircraft that have been handed off to another frequency and to aircraft that are point outs. For example:

Approach	Center
Although the aircraft has been transferred to CTR, retain the data block until the aircraft has exited the airspace; then it may become a limited data block.	Although the aircraft has been switched to Cleveland Center, the data block must be retained until crossing the common boundary.
	

6.6. Point Outs

6.6.1. A point out is an action taken by a controller to transfer the radar identification of an aircraft to another controller if the aircraft will or may enter the airspace or protected airspace of another controller and communications will not be transferred. Use a point out if your aircraft will or may enter another controller's airspace, even momentarily.

6.6.2. A point out may be accomplished by:

6.6.2.1. Physically pointing to the target on the receiving controller's display.

6.6.2.2. Using voice coordination procedures, as defined below.

6.6.2.3. Use of automation capabilities.

6.6.3. A point out must include:

- The phrase "point out".
- The location of the aircraft.
- The aircraft callsign, or squawk code if no callsign is displayed.
- The aircraft's altitude.
- Any additional pertinent information not included in the data block.
- Your intentions.

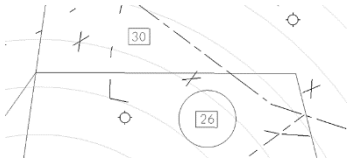
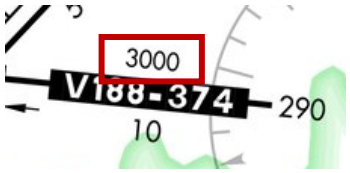
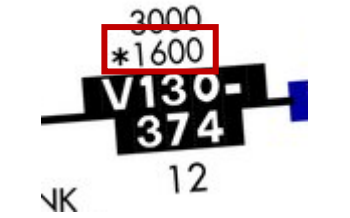
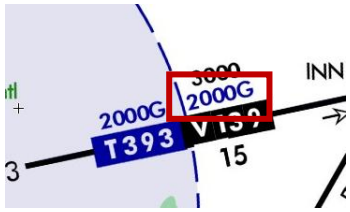
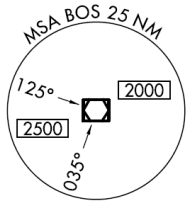
The receiving controller can use one or more of the following phrases once the aircraft has been identified or use automation to approve the point out. A verbal response is not required when automated approval has been received.

- **"Point out approved"** – aircraft may enter the airspace; communications will not be transferred.
- **"Radar contact"** – the pointout becomes a handoff and the aircraft may enter the airspace. Communications must be transferred.
- **"Unable"** – aircraft must remain outside the other controller's airspace.
- **"Traffic"** – you must separate your aircraft from the specified aircraft. Use the phrase **"traffic observed"** to indicate you see the traffic and will keep your aircraft clear of it.

> *PVD_APP:* Plymouth, Rhody, point out.
> BOS_S_APP: Plymouth.
> *PVD_APP:* Point out, 10nm east of Plymouth, N31398, 6,000', direct PUT.
> *BOS_S_APP:* point out approved, DM.
> PVD_APP: WN.

6.7. Minimum IFR Altitudes

6.7.1. Altitude assignments must ensure separation from other aircraft and terrain. The following altitudes are applicable for this purpose:

Altitude	Example	Description
Minimum Vectoring Altitude (MVA)		The lowest altitude at which an aircraft may be vectored to meet IFR obstacle clearance. May be lower than published MEA/MIA.
Minimum IFR Altitude (MIA)		Lowest IFR altitude that may be substituted for an MVA when no MVA is published.
Minimum En-route IFR Altitude (MEA)		The minimum altitude the aircraft may fly along that portion of an applicable SID, STAR, or airway for terrain and signal coverage.
Minimum Obstacle Clearance Altitude (MOCA)		The minimum altitude an aircraft may fly on a route segment to guarantee terrain clearance (signal coverage is not guaranteed).
GPS Minimum Altitude		The MEA for aircraft that are GPS equipped. The lower altitude is possible because radio signal coverage isn't required.
Minimum Safe Altitude (MSA)		Altitudes depicted on approach charts that provide at least 1000' of obstruction clearance in the published area. MSAs are for emergency use only and do not assure signal coverage.
Off Route Obstruction Clearance Altitude (OROCA)		An off route altitude that provides obstruction clearance, but not necessarily signal coverage.

Note: MVAs and MIAs are available in facility files (i.e., on the radar). Other altitudes are shown on IFR charts and low- or high-altitude enroute charts.

6.7.2. An aircraft may be cleared below the MEA but not below the MOCA for the route segment being flown if the assigned altitude is at least 300’ above the floor of controlled airspace and the aircraft is GPS equipped.

6.7.3. When referencing the MEA:

6.7.3.1. If a lower MEA is applicable, issue the lower MEA only after the aircraft is over or past the fix/navaid beyond which the lower MEA applies, or issue a crossing restriction at or above the higher MEA.

6.7.3.2. Where a higher altitude is required because of an MEA, the aircraft must be cleared to begin climb to the higher MEA prior to or immediately after passing the fix where the higher MEA is designated, unless an MCA is specified. If an MCA is specified, the aircraft must cross the fix at or above the higher MEA.

6.7.3.3. An aircraft may be cleared to operate on jet routes below the MEA (but not below the prescribed minimum altitude for IFR operations) or above the maximum authorized altitude if, in either case, radar service is provided.

6.8. IFR Radar Separation

6.8.1. Basic IFR separation between non-heavy aircraft of the same weight class is 3 miles or vertical separation of at least 1000'. When aircraft of different weight classes are involved, apply Wake Turbulence procedures when aircraft operate directly behind, within 2500' laterally, or less than 1000' below heavier aircraft.

6.8.2. Assign an altitude to an aircraft after the aircraft previously at that altitude has been issued a climb/descent clearance and is observed or reports leaving the previous altitude. Consider known aircraft performance characteristics and Mode C information when applying this procedure.

6.8.3. A minimum of 1000' of vertical separation must be provided between aircraft being vectored for opposite base legs unless another form of approved separation is established during turn-on to final approach.

6.8.4. Basic IFR separation may be discontinued if:

6.8.4.1. Aircraft are on opposite courses, and they have passed each other.

6.8.4.2. Aircraft are on the same or crossing courses/vectors, one aircraft has crossed the projected path of the other, and their courses diverge by at least 15 degrees.

Note: in these cases, the aircraft are considered "passing or diverging". However, wake turbulence must still be applied.

6.8.5. When transferring aircraft from APP to CTR, aircraft must be separated by 3 miles, increasing to 5 miles, if:

6.8.5.1. They are on diverging routes/courses, and/or,

6.8.5.2. The leading aircraft is and will remain faster than the following aircraft.

6.8.6. If coordination has not been effected, separate radar-controlled aircraft from the boundary of adjacent airspace by a minimum of 1 ½ miles.

6.8.7. Separate aircraft from prominent obstructions depicted on the radar display by 3 miles, when the aircraft is below the minimum vectoring altitude (MVA) or another applicable minimum altitude. Vertical separation of an aircraft above a prominent obstruction depicted on the radar display and contained within a buffer area may be discontinued after the aircraft has passed the obstruction.

6.9. Automatic Terminal Proximity Alert (ATPA)

CHANGE 2

6.9.1. ATPA is a tool designed to assist controllers in proper arrival sequencing to the same runway. ATPA monitors the separation of aircraft on the final approach course and automatically attaches a TPA Cone ("P-Cone") to an aircraft within a detection region.

6.9.1. The length of the P-Cone is the minimum separation required between aircraft. A mileage readout displayed in the trailing aircraft's datablock indicates current distance between the two aircraft.

Note: If reduced separation is permitted within 10 miles of the landing runway, the P-Cone length will automatically update. Wake turbulence requirements will override the reduced minima, if necessary.

6.9.2. A graphical notification is displayed when a potential loss of separation is detected. The warning cone (yellow) will display at 45 seconds and the alert cone (red) will display at 24 seconds prior to predicted loss of separation. Additionally, current distance between two aircraft on final will be displayed in the full data block of the trailing aircraft in corresponding colors.

6.9.3. Scratchpad entries can exclude or inhibit ATPA processing for a runway. For example, on parallel runways, scratchpad entries can help ensure ATPA processes the correct aircraft.

6.10. Visual Separation

6.10.1. Below FL180, visual separation may be used in lieu of altitude or radar separation as described in **Chapter 5**.

6.10.2. When two aircraft are on converging courses, the other aircraft should be told **"traffic has you in sight and will maintain visual separation"**:

> GPD416, traffic, twelve o'clock, 6 miles, opposite direction King Air at 4000 on converging course, has you in sight and will maintain visual separation.

6.11. Vectoring

6.11.1. Issuing vectors to an aircraft is one of the most frequent instructions an approach controller gives. The controller may instruct an aircraft to:

Instruction	Examples
Turn a specific direction to a specified heading.	**"Turn right heading three four zero"**
	"Turn left heading one two zero"

Fly a particular heading.	**“Fly heading two one zero”**
Turn a number of degrees in a specified direction. Notice that the number of degrees is spoken in group form.	**“Turn twenty degrees right”**
Fly its present heading.	**“Fly present heading”**
Depart a navaid/fix on a specific heading.	**“Depart PROVI heading zero one zero”**

6.11.2. When issuing a vector, advise the aircraft of the purpose of the vector(s). Common purposes for vectors are (but are not limited to) vectors for the final approach course, spacing, descent, or to a specific fix or airway. When vectoring an IFR departure on course, there is no need to include the reason.

6.11.3. When vectoring an aircraft off a procedure that includes published altitude or speed restrictions, inform the pilot if you intend on clearing the aircraft to resume the procedure. An altitude assignment may also be required:

> Fly heading 340, maintain 6000. Expect to resume the DEEPO# arrival *(optional: at CONDN)*.

6.11.4. Vectoring an aircraft to a fix and/or onto a final approach course or its assigned route is done by instructing aircraft to:

6.11.4.1. Proceed direct to a fix; the aircraft will turn in the shortest direction:

> "Proceed direct Providence" *(or)* "cleared direct Manchester".

6.11.4.2. Proceed direct to a fix after assigning a heading. In this case, the phrase **"when able"** must be included. The aircraft is required to begin turning to the assigned heading, and then proceed direct to the fix as soon as able:

> Turn right heading one niner zero, when able, proceed direct BOSOX.

6.11.4.3. Fly a particular heading, followed by instructions to join a specific radial/airway or intercept a final approach course:

> Fly heading zero one zero, join the LaGuardia two two five radial inbound.

> Turn left heading three four zero, join Victor one, resume own navigation.

> Turn right heading two four zero, intercept the runway two seven localizer.

6.11.5. Aircraft issued radar vectors must be at or above the MVA or MIA, except VFR aircraft not at an altitude assigned by ATC may be vectored at any altitude. Before turning an aircraft off the Tower-assigned or SID heading, or before vectoring an aircraft off a published minimum IFR altitude (like an MEA or MOCA), ensure a radar identified aircraft is at or above the MVA or MIA where no MVA is published.

Note: IFR aircraft may also be vectored below the MVA provided the conditions of **FAA JO 7110.65 5-6-3** are met.

6.12. Altitude Assignment

6.12.1. IFR aircraft must be assigned altitudes at or above the MVA or MIA.

6.12.2. Instruct an aircraft to:

Instruction	Examples
Climb/descend and maintain an altitude.	**"Climb and maintain niner thousand"**
	"Descend and maintain three thousand five hundred"
Cross a fix "at or above" or "at or below" an altitude.	**"Cross PROVI at or above eight thousand"**
	"Cross BRISS at or below six thousand"
Cross a fix at an altitude, normally given as part of an approach clearance.	**"Cross Lawrence at three thousand"**
Cross a fix at an altitude, then continue.	**"Cross WOONS at seven thousand, then descend and maintain six thousand"**
	"Comply with the previous restriction, then descend and maintain two thousand"
Cross a fix at an altitude, then maintain it.	**"Cross BASYE at and maintain eight thousand"**
Allow the pilot to initiate climb or descent when they wish, using a climb/descent rate they wish to.	**"Descend at pilot's discretion, maintain six thousand"**
	"Climb at pilot's discretion, maintain one zero thousand"
Begin a climb/descent now, and then allow the pilot to continue it as they wish to.	**"Descend now to one zero thousand, then descend at pilot's discretion maintain five thousand"**

6.12.3. When an aircraft is issued a crossing restriction, initiation and rate of climb or descent is at the pilot's discretion, but the crossing restriction(s) must be met. It is inappropriate to combine terms (e.g., "descend at pilot's discretion, cross WOONS at 7000" is incorrect). Pilots may also be instructed to reach an altitude at a specific time, or within a number of minutes:

> Climb/descend to reach/leave *(altitude)* within *(number)* of minutes.

6.12.4. Unless specified, a "climb and maintain", "descend and maintain", or "cross" altitude clearance cancels any previously-issued altitude restrictions.

6.12.5. When a pilot's discretion portion of a climb/descent clearance is being canceled by assigning a new altitude, inform the pilot the new altitude is an "amended altitude":

> AAL83, amend altitude, descend and maintain FL260.

6.12.6. Altitude assignments may involve more than one altitude:

> Maintain block *(altitude)* through *(altitude)*.

6.12.7. A **cruise clearance** authorizes an aircraft to conduct flight at any altitude from the minimum IFR altitude up to and including the altitude specified in the clearance. The pilot may level off at any intermediate altitude within the block, and climb/descent is made at the discretion of the pilot. However, once the pilot starts descent and verbally reports leaving an altitude, they may not return to that altitude without additional ATC clearance. It is further an authorization for the pilot to proceed to and make an approach at the destination airport.

> N11K, cruise FL190.

When issuing cruise in conjunction with an airport clearance limit and an unpublished route will be used, issue an appropriate crossing altitude to ensure terrain clearance until the aircraft reaches a fix, point, or route where the altitude information is available to the pilot. When issuing a cruise clearance to an airport which does not have a published instrument approach, a cruise clearance without a crossing restriction may be issued.

6.13. Speed Adjustment

6.13.1. Keep speed adjustments to the minimum necessary. Avoid adjustments that require alternate decreases and increases. Terminate speed adjustments when no longer needed. Instruct aircraft to:

Instruction	Examples
Maintain its present speed or an assigned speed.	**"Maintain present speed"**
	"Maintain two five zero knots"
Maintain greater or less than a specified speed.	**"Maintain two one zero knots or greater"**
	"Do not exceed two two zero knots"
	"Maintain present speed or greater"
Maintain its highest or lowest practical speed	**"Maintain maximum forward speed"**
	"Maintain slowest practical speed"
Increase or reduce speed by a specified number of knots. Note the amount is spoken in group form.	**"Increase speed twenty knots"**
Cross a waypoint at a specified speed.	**"Cross PROVI at two five zero knots"**
Cross a waypoint at a combined speed and altitude constraint.	**"Cross Robinsville at and maintain six thousand at two three zero knots"**
Increase or reduce to a specific speed. Note that the word "knots" is not used.	**"Increase speed to two one zero"**
	"Reduce speed to one seven zero"
Resume its normal speed / cancel a previously-issued restriction	**"Resume normal speed"**

6.13.2. Speeds below FL240 are given in indicated airspeed in 5-knot increments.

6.13.3. When issuing a speed restriction in conjunction with a descent, specify which instruction the pilot should accomplish first:

> Descend and maintain seven thousand, then reduce speed to two one zero.

6.13.4. A pilot operating at or above 10000 on an assigned speed adjustment greater than 250 knots is expected to reduce speed to 250 knots when cleared below 10000 without notifying or requiring instruction from ATC.

6.13.5. An approach clearance automatically cancels a speed assignment. If a speed restriction is still necessary, it must be re-stated after the clearance:

> Cleared I-L-S Runway Two Seven Approach, maintain one seven zero knots until RIPIT.

Do not assign speed restrictions so as to apply inside of the FAF or a five-mile final, whichever is closer to the runway.

6.13.6. Unless an operational advantage will be realized, do not assign a speed restriction below the following recommended minima:

Arrivals:

Location	Aircraft Type	Minima
Between 10000 – FL280	Any	250 knots
More than 20 flying miles from runway threshold	Turbojet	210 knots
	Piston and Turboprop	200 knots
Less than 20 flying miles from the runway threshold	Turbojet	170 knots
	Piston and Turboprop	150 knots

Departures:

Aircraft Type	Minima
Turbojets	230 knots
Piston and Turboprop	150 knots
Helicopters	60 knots

6.13.7. Do not assign a speed of more than 200 knots to aircraft operating beneath Class B airspace or in a VFR corridor designated through Class B airspace.

6.13.8. Radars display groundspeed, not airspeed. Groundspeed is affected by wind, temperature, and pressure, and will normally be faster than indicated airspeed, especially at higher altitudes. For example, an aircraft's speed may show as 270 knots on the radar screen, but the indicated airspeed may only be 240 knots. Because of this discrepancy, it may be useful to ask an aircraft to report its current indicated airspeed to accurately assign another speed:

> Say airspeed.

6.13.9. In general, speed restrictions take time to build separation; aircraft configuration, altitudes, and speed determine the time and distance required to accomplish the adjustment. Additionally, different simulators or weather engines can mean that two aircraft assigned the same indicated speed restriction may have vastly different groundspeeds.

6.13.9.1. When two aircraft are in-trail, compensate for compression by reducing the trailing aircraft or increasing the lead aircraft first.

6.13.9.2. Allow increased time and distance for aircraft at higher altitudes, greater speed, and in clean configurations.

6.13.10. Speed restrictions may be issued indefinitely (i.e., until **"resume normal speed"** is used) or until a specified point, as is commonly heard in approach clearances:

> Maintain one seven zero knots until RIPIT.

6.13.11. On procedures with published speed restrictions, the speed restrictions are mandatory unless specifically canceled by ATC:

> Delete speed restrictions.

Canceled speeds may be re-issued using a **"climb/descend via"** clearance or the phrases **"resume published speeds"** and **"comply with speed restrictions"**, including with a crossing restriction if required:

> Cross PROVI at two five zero knots, then descend via the ROBUC# arrival.

> Maintain two two zero knots until BALTR, then resume published speed *(or: then comply with speed restrictions)*.

6.14. Holding

6.14.1. Clearing an aircraft to hold may be required for traffic density, weather, or other factors. A holding clearance may include the following:

Element	Details
Clearance Limit	Change of the aircraft's clearance limit to the holding fix (e.g., **"cleared to PVD"**)
Holding Course/Instructions	Direction of hold (relative to waypoint) and course/radial information as required.
Leg Length	Length of the inbound leg of the hold, in miles or minutes.
Direction of Turns	Specified if left turns are to be used (otherwise, all turns will be made to the right).
Expect Further Clearance (EFC) Time	The time when aircraft can expect to resume the filed route.

> Cleared to Providence, hold west on the two seven zero radial, expect further clearance one niner two zero.

> Cleared to PROVI, hold east on the zero niner zero inbound course, 2 minute legs, expect further clearance zero five three zero.

> Cleared to Martha's Vineyard, hold west on Tango 216, seven mile leg, left turns, expect further clearance two one zero zero.

6.14.2. If an aircraft will hold as published/charted, holding course, leg length, and turn direction may be replaced with **"as published"**. For example, consider the PARCH# arrival at KJFK. A holding clearance could be as simple as:

> Cleared to TRAIT, hold northeast as published, expect further clearance two six one six.

6.14.3. If further delays are expected in adjacent sectors, advise the pilot:

> Anticipate additional *(time)* minute delay at *(fix)*.

> Anticipate additional *(time)* minute terminal delay.

6.14.4. The maximum holding airspeeds (if not otherwise published) are:

Altitude (MSL)	Details
Up to 6000	200 knots
6001 – 14000	230 knots
14001 and above	265 knots

ATC may relieve aircraft of these requirements but must be aware that this increases size of an aircraft's holding pattern and thus the airspace that must be protected for the hold.

6.14.5. Instructions for exiting a holding pattern must include a clearance beyond the holding fix (usually to the destination airport) and a route. If the aircraft may simply resume its previously cleared route, the phrase **"via last routing cleared"** is acceptable. In all other cases, a full route must be read to the pilot. An altitude must only be assigned if different than the present altitude. Continuing with the PARCH# arrival, the following are two examples of acceptable clearances beyond a holding fix:

> Cleared to Kennedy Airport via last routing cleared.

> Cleared to Kennedy Airport, direct PARCH, ROBER# arrival. Descend and maintain flight level two four zero.

6.15. IFR Departures

6.15.1. Generally, IFR departures are given the following instructions once airborne and in contact with the departure controller:

6.15.1.1. Radar identification (i.e., **"radar contact"**).

6.15.1.2. A climb to the ceiling of APP airspace or the aircraft's cruise altitude, whichever is lower.

6.15.1.3. Vectors to join the aircraft's assigned route (if required), once the aircraft is above the applicable MVA.

6.15.1.4. Handoff to CTR or an adjacent approach controller, whichever is appropriate, with same-direction aircraft separated at 3 miles, increasing to 5 miles.

Note: the handoff should happen early enough for the aircraft to climb, uninterrupted, into CTR airspace. However, conflicts must be resolved and/or coordinated before transfer of control and communication.

6.15.2. Aircraft that were cleared to "climb via SID" in the initial IFR clearance are expected to report this information to ATC on initial contact:

> *Pilot:* Boston Departure, UAL570, two thousand, climbing via the HYLND# departure.

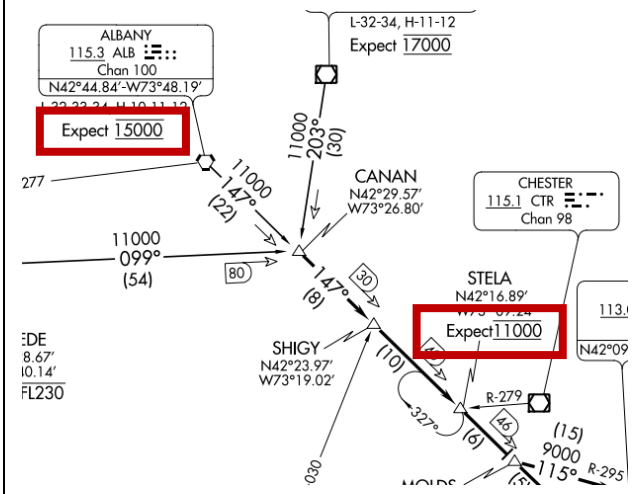
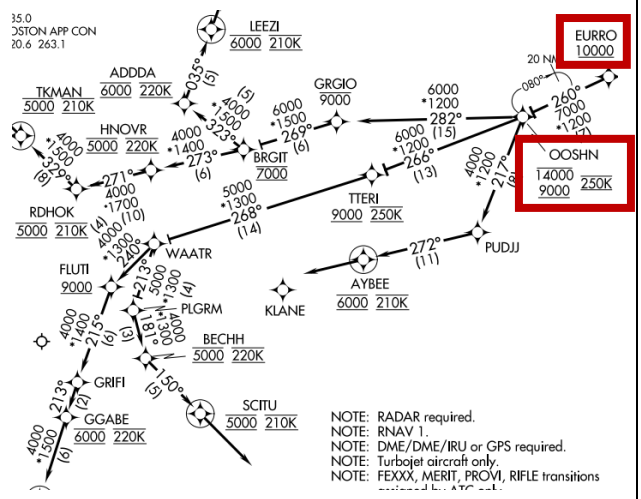
6.15.3. If the controller responds with "radar contact, climb and maintain *(altitude)*", the published altitude restrictions are now canceled. However, speed restrictions remain mandatory. If the pilot is expected to comply with altitude restrictions, the APP controller should use the following phraseology:

> *ATC:* UAL570, Boston Departure, radar contact, climb via the HYLND# departure except maintain one four thousand.

6.16. Standard Terminal Arrival Routes (STARs)

Like a SID, a STAR is designed to improve traffic flows in busy terminal areas. STARs are used for arriving aircraft. Inbound aircraft will be routed via a STAR or a preferred route as described in facility SOPs.

STARs may either have “expect” altitude information, such as the STELA# at KBDL, or published crossing restrictions, like the RNAV arrivals at KBOS:

STELA# at KBDL	OOSHN# at KBOS
	
The “expect” restrictions at ALB and STELA make this STAR ineligible for “descend via”. Aircraft are given descent and/or crossing instructions.	The published altitudes at EURRO, OOSHN, and other waypoints identify this STAR as a “descend via” procedure.

6.16.1. Published speed restrictions are always mandatory unless specifically canceled by ATC.

6.16.2. Pilots navigating on all STAR procedures, including RNAV arrivals, are expected to maintain the last assigned altitude until receiving authorization to descend further. The presence of required crossing altitudes on an arrival does not alone authorize the pilot to comply with those restrictions; the pilot must receive a specific instruction.

6.16.3. On a **STAR with "expect" or no crossing restrictions** (like the STELA#), ATC must instruct aircraft to **"cross"** the waypoints at altitudes required by facility SOP and traffic:

> Cross STELA at and maintain one one thousand.

Using this example, the aircraft will maintain 11000 until speaking to APP, who will issue further descent clearance using **"descend and maintain"**. The use of "descend via" is not authorized on a STAR that only contain published "expect" altitude and/or speed restrictions.

6.16.4. On a **STAR with published crossing restrictions**, aircraft may be authorized to **"descend via"** the procedure. The following examples use the JFUND# STAR at KBOS and the ZELKA# STAR at KBED.

Instruction	**"Descend via the JFUND# arrival, Runway 4R"**
Meaning	Descend at pilot's discretion to meet published restrictions on the STAR, using the published Runway 4R transition waypoints and restrictions.

Instruction	**"Descend via the ZELKA# arrival"**
Meaning	Descend at pilot's discretion to meet published restrictions on the STAR.

Instruction	**"Proceed direct MNSTA, cross MNSTA at or above FL240, then descend via the JFUND# arrival, Runway 22L"**
Meaning	Descend at pilot's discretion to cross MNSTA at or above FL240, then meet published restrictions on the STAR, using the Runway 22L transition.

Instruction	**"Descend via the ZELKA# arrival, except cross TERIA at or above FL260"**
Meaning	Descend at pilot's discretion to meet the published crossing restrictions on the STAR, except cross TERIA at FL260 instead of the published FL240.

Instruction	**"Descend via the ZELKA# arrival except maintain 11000"** **or "Descend via the ZELKA# arrival except after EXXRO, maintain 5000"**
Meaning	Descend at pilot's discretion to meet published restrictions on the STAR, except as specified.

Instruction	***When assigned to an aircraft cleared for the JFUND# arrival:* "Descend and maintain 17000"**
Meaning	Disregard all published altitude constraints and descend now to 17000 (published speeds remain mandatory).

Note: Crossing restrictions may also be used with "descend via" STARs.

6.16.5. Aircraft vectored off a "descend via" procedure must be issued an altitude to maintain. If an aircraft is to rejoin the arrival, a new "descend via" clearance can be issued:

> Turn left heading 070, vectors for sequencing. Expect to resume the arrival at GGABE. Maintain 8000.
> *(Then,)* Cleared direct GGABE, descend via the JFUND# arrival, Runway 4R.

6.17. Initial Contact with IFR Arrivals

6.17.1. Aircraft issued a "descend via" clearance are expected to advise ATC:

> Boston Approach, ASA326, FL190, descending via the JFUND# arrival, Runway 4R, information Kilo.

6.17.2. For all inbound/arriving aircraft, verify receipt of weather information.

6.17.3. For arrivals to the primary airport, issue an approach or runway assignment:

> ASA326, Boston Approach, altimeter three zero zero zero, expect I-L-S Runway Four Right Approach.

6.17.4. For arrivals into a satellite or uncontrolled airport, obtain the aircraft's approach request or assign an approach as conditions warrant:

> Verify you have weather at Springfield, say approach request.

6.18. Referencing Approach Procedures

6.18.1. Refer to instrument approaches by their type:

> Cleared (RNAV/VOR/Localizer/ILS/NDB) Runway 24 Approach.

6.18.2. Refer to visual approaches as “visual approach”:

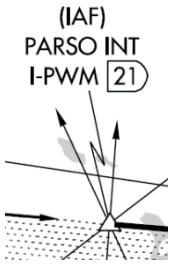
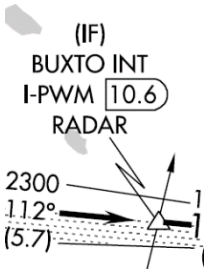
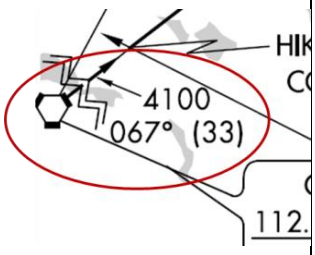
> Cleared Visual Approach Runway 24.

6.18.3. Omit information in parentheses when referencing an approach. For example, `RNAV (GPS) RWY 01` would be **“RNAV Runway 1 Approach”**.

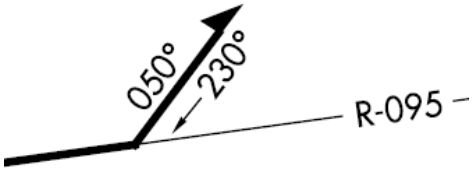
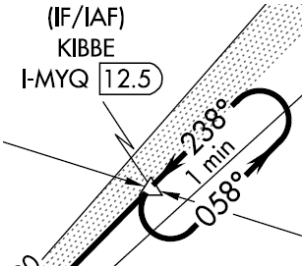
6.18.4. Where multiple approaches of the same type exist for the same runway, they will be lettered (e.g., **`“RNAV (GPS) Y RWY 33”`** and **`“RNAV (RNP) Z RWY 33”`**). Refer to these approaches as **“RNAV Y Runway 33 Approach”**.

6.19. Instrument Approach Clearances

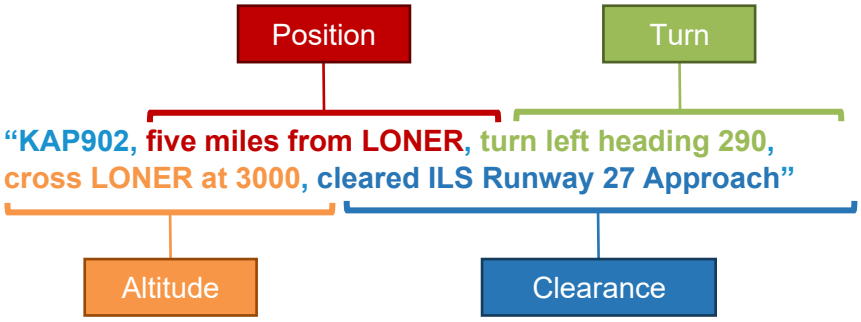
6.19.1. Aircraft can be vectored to final or cleared via any of an Initial Approach Fix (IAF), Intermediate Fix (IF), and/or Feeder Route:

Initial Approach Fix	Intermediate Fix	Feeder Route
Fixes depicted on approach charts identifying the beginning of initial approach segment(s).	The fix that identifies the beginning of the intermediate approach segment. (Not always identified on approach charts.)	Route segments leading to an IAF. Always includes an MEA, heading/radial, and distance.
		

Additionally, there are two means by which an aircraft may "turn around" as part of an approach clearance from an IAF, IF, or Feeder Route:

Procedure Turn	Hold-in-Lieu of Procedure Turn
The maneuver prescribed when it is necessary to reverse direction to establish an aircraft on the approach. The outbound course, direction of turn, distance within which the turn must be completed, and minimum altitude are specified in the procedure. However, unless otherwise restricted, the point at which the turn may be commenced and the type and rate of turn are at the pilot's discretion.	A procedure established over a final or intermediate fix when an approach can be made from a properly aligned holding pattern. The pilot is expected to perform a hold entry (e.g., parallel, direct, or teardrop) to become aligned with the procedure, then complete the approach. The aircraft does *not* fly a leg of the hold once established on the final approach course unless specifically authorized to do so.
	

6.19.2. The instrument approach clearance consists of four elements abbreviated "PTAC" (pronounced "Pee-Tack"). PTAC will be issued for any instrument approach (ILS, VOR, RNAV, etc.):



Like an IFR or holding clearance, elements of PTAC that are not required/pertinent can be omitted:

Element	Details
Position	Distance from a waypoint published on the procedure. May be omitted if the aircraft is navigating directly to an IAF, IF, or feeder route, or is otherwise on a published approach segment.
Turn	Used when the aircraft is being vectored. Omit for aircraft direct to an approach segment or on a heading that allows it to intercept the final approach course.
Altitude	Altitude (at or above applicable MVA/MIA) to maintain until established on a segment of the procedure, phrased as **"cross (fix) at/above (altitude)"** or **"maintain (altitude) until (location/time)"**. May be omitted if the aircraft is on a published MEA or approach segment, or within a Terminal Arrival Area.
Clearance	The phrase **"cleared approach"** authorizes a pilot to fly *any* published approach at the destination. **"Cleared (type) approach"** may be used if there is only one approach of that type at the airport. However, in almost all cases, the approach clearance will include the full name of the approach, as in **"cleared ILS Runway 29 Approach"**.

6.19.3. Aircraft being vectored to final must intercept the final approach course at least 3 miles from the FAF except:

Approach Details	Minimum Distance from FAF
Reported ceiling is at least 500' above MVA, visibility is at least 3 miles, and the approach is not an RNAV	1 mile
Pilot specifically requests to be vectored to intercept the final approach course inside 1 mile from the FAF, and the approach is not an RNAV	0 miles (must be outside of FAF)

6.19.4. The maximum angle at which an aircraft may intercept the final approach course is:

Condition	Maximum Angle
Aircraft being vectored will intercept inside of 3 miles from the FAF.	20°
Aircraft being vectored 3 or more miles from the FAF, or cleared direct to a fix 3 or more miles along the final approach course.	30° (45° for helicopters)
Aircraft will be cleared direct to an IAF or IF at which no procedure turn or hold-in-lieu is depicted.	90°

6.19.5. If a procedure turn or hold-in-lieu is depicted, the aircraft may intercept the IAF or IF at any angle. When the intercept angle is 90 degrees or less, aircraft may be cleared for a **"straight-in approach"**, alleviating the requirement to fly the hold entry:

> Cross SAPPE at or above 3000, cleared straight-in ILS Runway 29 approach.

6.19.6. Except for visual approaches, do not clear an aircraft direct to the FAF unless it is also an IAF, wherein the aircraft is expected to execute the depicted procedure turn or hold-in-lieu of procedure turn.

6.19.7. Aircraft may only be vectored to the final approach course if a line depicting that course is displayed on the radar. If not, the aircraft will require a clearance via an IAF or IF.

6.19.8. Inform the aircraft whenever a vector will take it across the final approach course and state the reason for such action:

> Expect vectors across final for spacing.

Note: in the event you are unable to inform the aircraft, the pilot is not expected to turn inbound on the final approach course unless approach clearance has been issued.

6.19.9. **Circling Approaches:** If an instrument approach into a towered airport does not have a runway number associated with it (e.g., "VOR-A") or if a runway other than what is specified is active, circling instructions are included at the end of the approach clearance:

> Cleared V-O-R Alpha approach, circle to runway two four.

Circling instructions are not given in an approach clearance into an un-towered airport; the pilot may elect to circle:

> Cleared RNAV Foxtrot approach.

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When applicable, and particularly if an aircraft will follow a Super/Heavy/B757 (Category A, B, C, D, or E aircraft), inform the following aircraft of the possibility for wake turbulence before or during the approach clearance:

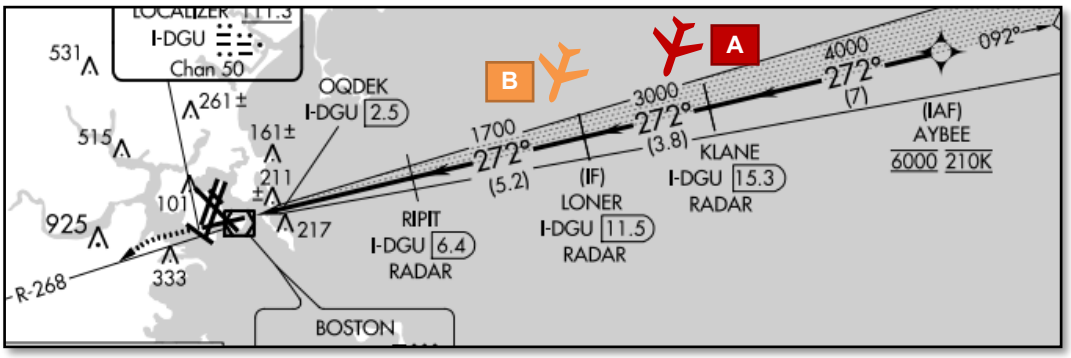
> PEN224, caution wake turbulence, following a Heavy Airbus A330.

6.19.10. Required wake turbulence in-trail separation is discussed in **Chapter 5**.

6.20. Instrument Approach Clearance Examples

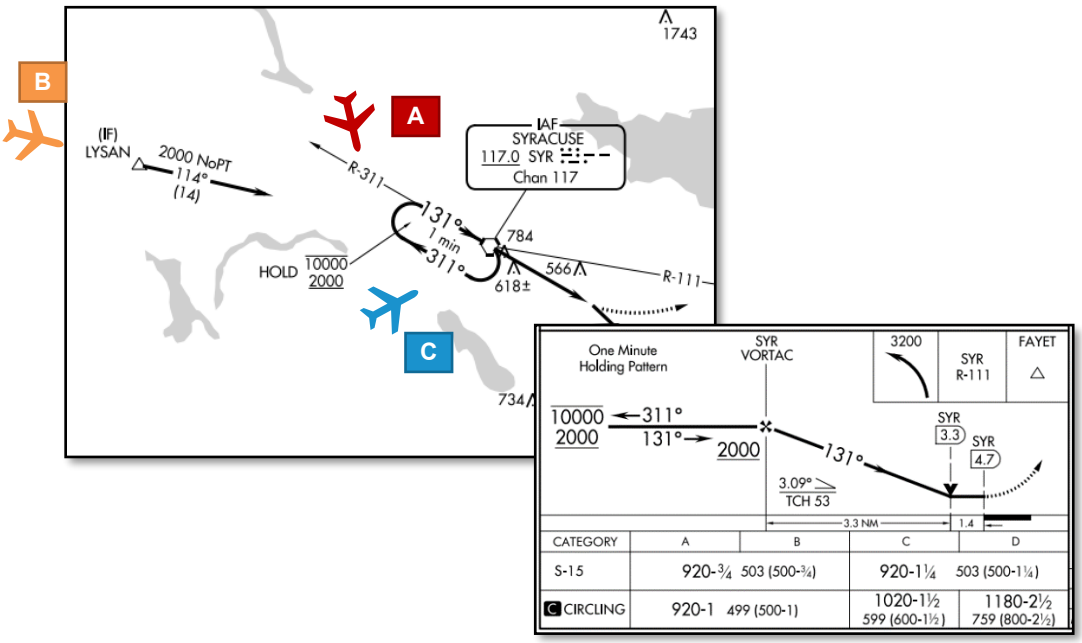
The examples are designed to put the rules in the previous section into action. Because approaches may have changed since the creation of this document, reference the images of the chart. The MVAs are fictional and do not represent MVAs depicted on radar screens.

6.20.1. **KBOS ILS or LOC RWY 27**, MVA 2000:



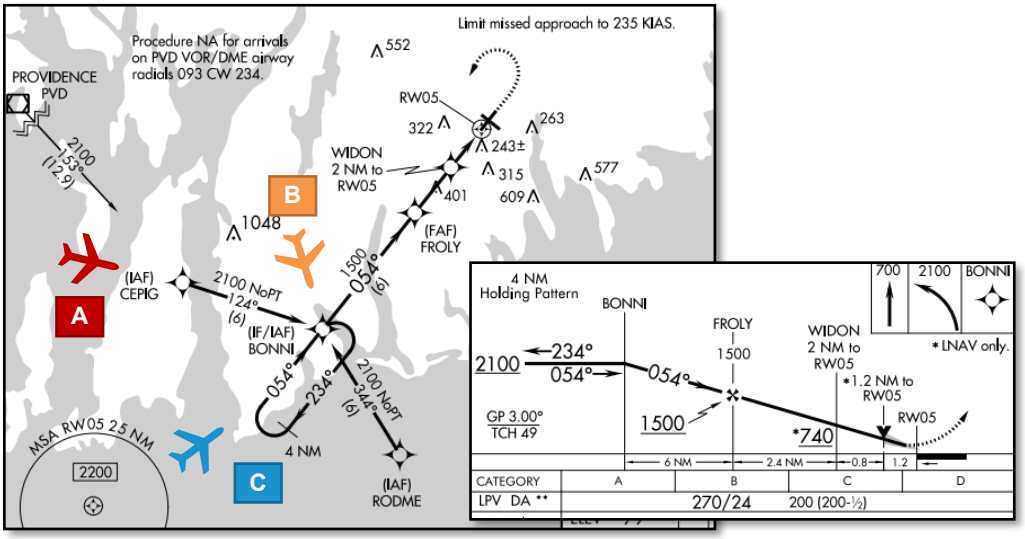
Aircraft	Approach Clearance	Explanation
A	“Five miles from LONER, turn right heading 250, cross LONER at or above 3000, cleared ILS Runway 27 Approach”	PTAC for vectors to final
B	“Five miles from RIPIT, turn right heading 250, maintain 2000 until established on the localizer, cleared ILS Runway 27 Approach”	PTAC for vectors to final. “Cross RIPIT at 1700” would be below the MVA, so “maintain *(MVA)*” is used instead.
B	“Five miles from RIPIT, turn left heading 250, maintain 2000 until established on the localizer, cleared **Localizer** Runway 27 Approach”	The same PTAC format is used for other types of approaches (RNAV, LOC, VOR, etc.)

6.20.2. **KSYR VOR RWY 15**, MVA 2000:



Aircraft	Approach Clearance	Explanation
A	"Six miles from SYR, turn left heading 150, maintain at or above 2000 until established on the final approach course, cleared VOR Runway 15 Approach"	PTAC for vectors to final. Note phraseology difference for non-localizer approach.
B	*If aircraft is inbound to LYSAN on a published airway with an MEA:* "Cleared VOR *(Runway 15)* Approach"	Position, Turn, and Altitude, and "Runway 15" can all be omitted (this is the only VOR approach available).
B	*If aircraft is inbound to LYSAN via "direct" without an MEA:* "Cross LYSAN at or above 2000, cleared VOR *(Runway 15)* Approach"	Position and Turn can be omitted, but an altitude is required because the aircraft does not have a published MEA to reference.
C	"Five miles from SYR, cleared direct SYR. Cross SYR at or above 2000, cleared VOR Approach"	Because SYR is the FAF and also an IAF, the aircraft can only be cleared direct if it will fly the hold-in-lieu of procedure turn. A "straight-in" clearance is not available.

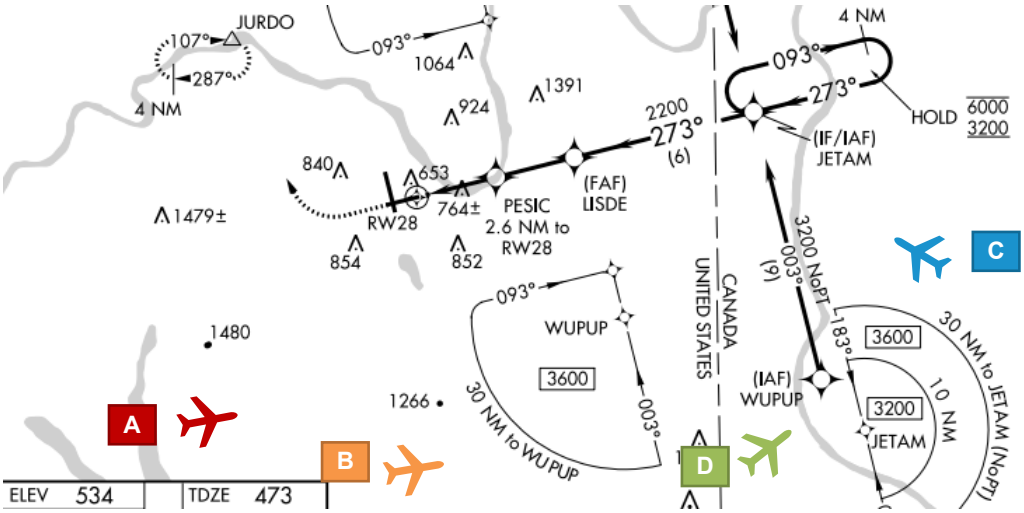
6.20.3. **KEWB RNAV (GPS) RWY 5**, MVA 3000:



Aircraft	Approach Clearance	Explanation
A	*Aircraft is direct CEPIG:* "Maintain at or above 3000 until established on a segment of the approach, cleared RNAV Runway 5 Approach"	The "NoPT" symbol between CEPIG and BONNI indicates the aircraft will fly CEPIG-BONNI-FROLY without flying the hold-in-lieu.
B	*Aircraft is direct BONNI:* "Cross BONNI at or above 3000, cleared RNAV Runway 5 Approach"	The aircraft is not eligible for a "straight-in" clearance (more than 90° intercept); the hold-in-lieu will be flown.
C	*Aircraft is direct BONNI, within 90 degrees of final approach course:* "Cross BONNI at or above 3000, cleared **straight-in** RNAV Runway 5 Approach"	The aircraft will fly from BONNI to FROLY. If the aircraft wishes to enter/fly the hold, specific approval is required from ATC.
C	*If Aircraft C requests to circle to Runway 32 due to wind:* "Cross BONNI at or above 3000, cleared **straight-in** RNAV Runway 5 Approach, circle to Runway 32"	Circling instructions must be coordinated with TWR, who will issue additional circling information and a landing clearance.

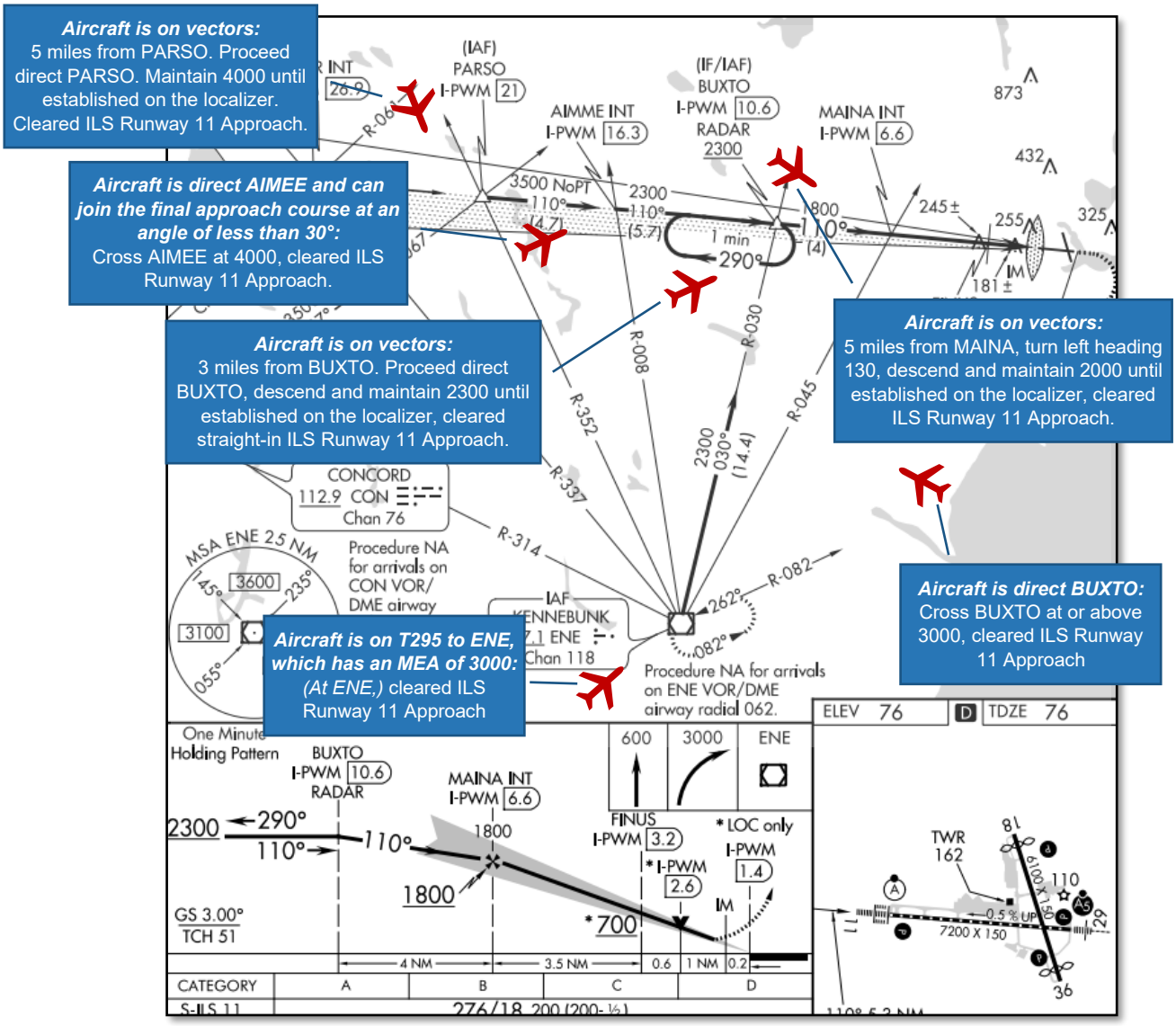
6.20.4. **KPQI RNAV (GPS) RWY 28,** no MVA, the MIA is 6000.

This approach uses a Terminal Arrival Area (TAA) instead of an MSA. TAA altitudes are shown for OLKEE, WUPUP, and JETAM. Use standard PTAC or issue clearance referencing the TAA. “NoPT” symbols indicate the procedure turn is not required for aircraft joining via an IAF, including JETAM.



Aircraft	Approach Clearance	Phraseology	Aircraft Will…
A	*Aircraft is direct WUPUP:* “Cross WUPUP at or above 6000, cleared RNAV Runway 28 Approach”	PTAC phraseology	Cross WUPUP at 6000+, then comply with published MEAs.
B	*Aircraft is direct WUPUP:* “Maintain at or above 8000 until entering the TAA, cleared RNAV Runway 28 Approach”	TAA phraseology	Maintain 8000+ until within 30nm of WUPUP. May descend to 3600 until WUPUP, then follow MEAs on the approach.
C	*Aircraft is direct JETAM:* “Maintain at or above 8000 until established in the TAA, cleared RNAV Runway 28 Approach”	TAA phraseology	Maintain 8000+ until within 30nm of JETAM. Within 30nm of JETAM, may descend to 3600. Within 10 miles, to 3200.
D	*Aircraft is within the TAA, direct WUPUP.* “Cleared RNAV Runway 28 Approach”	TAA phraseology	Maintain at least 3600 until WUPUP, then comply with the published MEAs. (Because the aircraft is already within the TAA, altitude information is not required.)

6.20.5. **KPWM ILS RWY 11,** MVA 2000.



6.21. Visual Approach Clearances

6.21.1. Visual approaches are useful tools for reducing a controller's workload. A vector for a visual approach may be initiated if the reported ceiling is at least 500' above the MVA/MIA and the visibility is 3 miles or greater.

6.21.2. Controllers may initiate, or pilots may request, a visual approach when the pilot reports the airport or a preceding aircraft in sight.

> *ATC:* Boston Airport eleven o'clock, one two miles, report it in sight.

Once the aircraft reports the airport in sight, at towered airports, state the name of the runway in the approach clearance:

> *Pilot:* Airport in sight.
> *ATC:* Cleared Visual Approach Runway Two Two Left.

6.21.3. If an aircraft is to follow another aircraft already on approach, simply give a traffic advisory and instruct the aircraft to **"report the traffic in sight"**. Once the traffic is reported in sight, the approach clearance is given followed by the runway number at towered airports:

> *ATC:* EJA812, traffic, one o'clock, seven miles, northbound regional jet at two thousand five hundred.
> *Pilot:* Traffic in sight.
> *ATC:* Follow the regional jet, cleared Visual Approach Runway Three Three.

Note: Because the term "follow" implies it, there is no need to state "maintain visual separation".

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6.21.4. Visual separation is not approved when the lead aircraft is a Super (Category A). Aircraft following a Heavy (Category B, C, or D aircraft) must be informed of the airplane manufacturer and/or model:

> Cessna 34J, following a Heavy Boeing 767, 12 o'clock, six miles.

6.21.5. At an untowered airport, visual approach clearances do not include a runway number as a runway may not be assigned by the controller. Phraseology for a visual approach clearance unto an uncontrolled airport simply includes the airport name:

> Cleared visual approach to the Provincetown Airport.

6.21.6. An aircraft being vectored for a visual approach does not necessarily have to be vectored to final, and may be instead be turned onto a downwind or base leg for the runway in use and given an approach clearance when able. Additional instructions may be given following the approach clearance as needed in such scenarios. For example:

> Cleared visual approach Runway 24, turn base at or above two thousand.

6.21.7. A visual approach clearance relieves ATC of the responsibility of terrain separation and for traffic separation between the involved aircraft.

6.22. Charted Visual Flight Procedures (CVFPs)

6.22.1. CVFPs are published to provide more flexibility than a regular visual approach and may be used to assist in reducing noise or expediting traffic. Like any other visual approach, pilots can report the field or a preceding aircraft in sight. They can also report any of the other visual references on the chart in sight (or may be vectored onto a navaid).

6.22.2. Using the **Great Point Visual Runway 24 Approach at KACK** as an example, an inbound pilot would be asked to report a visual reference in sight, and then be cleared for the approach. Note any restrictions that may be associated with the approach (in this case, a ceiling of 2,100' and 5 miles or more visibility):

> JBU1289, the Great Point Lighthouse is your 12 o'clock and 8 miles, report the lighthouse in sight.
> *(Then,)* JBU1829, Cleared Great Point Visual Approach Runway 24.

6.23. Contact Approaches

6.23.1. Clear aircraft for contact approaches when requested by the pilot and a standard or special instrument approach procedure has been published and is functioning for the airport of intended landing. Approved separation must be provided between IFR or SVFR aircraft.

6.23.2. Contact approaches are available when the reported ground visibility is at least one mile.

> CNS3409, cleared Contact Approach. *(If required: at or below (altitude); routing)*. If not possible, fly the Provincetown ILS Runway 7 missed approach procedure and advise climbing through 1,500'.

6.24. IFR Operations at Non-Towered Airports

An IFR aircraft arriving or departing a non-towered Class E or Class G airport is handled differently than it would be at a towered airport.

Because no tower services are provided, and there may be limited or no radar coverage close to the ground, only non-radar separation is available. This means that separation between two IFR aircraft is only assured by allowing one IFR aircraft into or out of the airport at a given time. This is known as the "one-in/one-out" rule. For instance, if a departing aircraft has been issued an IFR departure release, any arriving IFR aircraft must be held until the first aircraft has departed and radar separation can be assured.

This section explains the differences for handling IFR departures and IFR arrivals at non-towered airports.

6.24.1. **IFR Departures:**

6.24.1.1. An Obstacle Departure Procedure (ODP) is a preplanned IFR departure procedure, provided in textual or graphical form, designed to provide obstruction clearance from the terminal area to an enroute structure (something like a SID). However, unlike a SID, the ODP may be flown whether or not it is assigned by ATC. ODPs are published with instrument charts. More information is available in **WINGS IFR 9**.

6.24.1.2. Due to the uncertainty of terrain, obstacles, and traffic at non-towered airports, the best practice is to simply clear the aircraft **"as filed"** or **"via direct [fix/route]"** without specifying an ODP or heading. This allows the pilot to establish its own terrain clearance and navigate on course, even below the applicable MVA.

> N123RX, hold for release, cleared to Boston Airport as filed…
> Or, if routing is required:
> N123RX, cleared to Boston Airport, direct TOMIE, then as filed…

If it is necessary to specify an initial heading to be flown after takeoff:

6.24.1.2.1. At locations within a Class E surface area, specify a heading only if necessary. Obtain the pilot's concurrence concerning a heading before issuing it in the clearance:

> Verify this clearance will allow compliance with terrain or obstruction avoidance.

6.24.1.2.2. At all other airports, issue the heading so as to apply only within controlled airspace:

> When entering controlled airspace, fly heading *(degrees)* until reaching *(altitude, point, or fix)* before proceeding on course.

6.24.1.3. Where an Obstacle Departure Procedure (ODP) has been published for a location and pilot compliance is necessary to ensure separation, include the procedure as part of the clearance:

> Depart via the *(airport name) (airport runway)* departure procedure.
> Or
> Depart via the *(graphic ODP name)* obstacle departure procedure.

Note: pilots may elect to fly an ODP absent other instructions from ATC. In some cases, the ODP may require the pilot to advise, or obtain approval, from ATC. It is the pilot's responsibility to meet these requirements.

6.24.1.4. When traffic permits, IFR departures may be issued an IFR release with a clearance void time. Issue the void time wisely: the airspace is effectively reserved for the IFR departure from the moment it is released until radar separation can be achieved (clearance void times will not normally exceed 10 minutes). When issuing a clearance void time, provide alternative instructions requiring the pilots to advise ATC of their intentions no later than 30 minutes after the time if not airborne:

> N0LM, cleared to Bradley Airport as filed. Maintain 8000. Squawk 4612.
> (Then,)
> N0LM, readback correct, released for departure, clearance void if not off in two minutes. If not off in two minutes, advise Boston Center of intentions within one zero minutes. Report airborne this frequency, change to advisory frequency approved.

Note: if the clearance void time expires, it does not cancel the IFR flight plan; it withdraws the pilot's authority to depart IFR until a new departure release has been issued by ATC and acknowledged by the pilot.

Alternatively, the pilot may be instructed to **"hold for release"** and advise you when ready or be provided with known delay information.

> N0LM, cleared to Bradley Airport as filed. Maintain 8000. Squawk 4612.
> Hold for release.
> (Then,),

> N0LM, readback correct, hold for release, advise number one ready for departure.
> (Or,),
> N0LM, readback correct, hold for release, expect nine minute departure delay due to inbound traffic.

When able, issue the departure release with a clearance void time and alternative instructions requiring the pilots to advise ATC of their intentions no later than 30 minutes after the clearance void time if not airborne:

> N0LM, released for departure; clearance void if not off by 0030 Zulu. If not off by 0045 Zulu advise of intentions. Time now 0020 Zulu. Report airborne this frequency, change to advisory frequency approved.

6.24.1.5. Release times and clearance void times may be issued ("released at 0100Z"), or a number of minutes may be used ("clearance void if not off in 2 minutes"). If a time is used, a check of the current time is also required.

6.24.2. **IFR Arrivals:**

6.24.2.1. When issuing an approach clearance at non-towered airports, state the name of the airport:

> Cleared ILS Runway 35 Approach to Concord Airport.
> *or, to authorize a pilot to execute their choice of instrument approach:*
> Cleared approach to North Central State Airport.

6.24.2.2. Once cleared for an approach, the airspace "belongs" to the IFR arrival until it has landed, canceled IFR, or returned to the radar environment on a missed approach.

6.24.2.3. Once established on the final approach course and prior to reaching the FAF, release the aircraft using the phrase **"change to advisory frequency approved"**:

> Report IFR cancellation or missed approach on this frequency. Change to advisory frequency approved.

6.24.2.4. Acknowledge the cancellation of IFR and provide additional instructions if required:

> To an aircraft on the ground: IFR cancellation received.
> *To an aircraft that has canceled IFR in the air:* IFR cancellation received.
> Squawk V-F-R, change to advisory frequency approved.

6.25. VFR Traffic: General

6.25.1. Avoid over-controlling VFR traffic. They operate in a “see and be seen” environment and are responsible for avoiding terrain and other aircraft. The only time separation for a VFR aircraft is required by the controller is when it is operating in TRSA, Class C, or Class B airspace as described in **Chapter 5**.

6.25.2. Flight following to VFR aircraft must be provided on a workload permitting basis. Once the aircraft is radar identified, radar service and traffic advisories are given until the aircraft exits the controller’s airspace, cancels flight following, or the controller becomes unable to provide flight following.

6.26. Practice Approaches

6.26.1. Except for military aircraft operating at military airfields, ensure that neither VFR nor IFR practice approaches disrupt the flow of other arriving and departing IFR or VFR aircraft. Authorize, withdraw authorization, or refuse to authorize practice approaches as traffic conditions require. Normally, approaches in progress should not be terminated.

6.26.2. VFR aircraft are not automatically authorized to execute the missed approach procedure. This authorization must be specifically requested by the pilot and approved by the controller. When a missed approach has been approved, separation must be provided throughout the missed approach.

6.26.3. For all VFR practice approaches, coordinate the following when transferring communications to another controller:

6.26.3.1. If separation is being provided.

6.26.3.2. Authorization, if given, for the missed approach.

6.26.3.3. Any other special instructions, including alternate missed approach instructions, traffic information, etc.

6.26.4. Controllers may elect to provide IFR separation to VFR practice approach aircraft, or to authorize a practice approach without providing separation. In general, separation should be provided for approaches to Class C and B towered airports.

6.26.5. **If IFR separation will be provided:**

6.26.5.1. Instruct the aircraft to **"maintain VFR"** on initial contact.

6.26.5.2. Issue an approach clearance.

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6.26.5.3. Apply standard IFR separation once the approach clearance becomes effective. Vertical separation may be reduced from 1000' to 500' except when operating below a Heavy (Category A, B, C, or D aircraft).

> N311CB, five miles from UFTAC, turn right heading 040, maintain 3000 until established on the localizer, cleared ILS Runway 6 Approach.

6.26.6. **If IFR separation will not be provided:**

6.26.6.1. Instruct the aircraft to **"maintain VFR"** on initial contact.

6.26.6.2. Issue headings and altitudes only as required or on request.

6.26.6.3. Use the phrase **"maintain VFR, practice approach approved, no separation services"** to authorize the practice approach.

> N602TL, cross Nantucket at or above 2500, V-F-R practice V-O-R Runway Two Four Approach approved, no separation services provided.

> N789PF, six miles from PHONY, turn right heading zero niner zero, maintain 2000 until established on the localizer, V-F-R practice I-L-S Runway Seven Approach approved, no separation services provided.

6.27. VFR-on-top

6.27.1. VFR-on-top is an ATC authorization for an IFR aircraft to operate in VFR conditions at any appropriate VFR altitude. You may clear an aircraft to **"maintain VFR-on-top"** if the pilot of an aircraft on an IFR flight plan requests to. When an aircraft has been cleared to maintain VFR-on-top, the pilot is responsible for flying at appropriate VFR altitudes, complying with VFR visibility and distance from cloud criteria, and being vigilant as to see and avoid traffic.

6.27.2. Standard IFR separation is not applied but controllers must continue to provide traffic advisories and safety alerts and apply merging target procedures.

6.27.3. When a pilot has reached VFR conditions and requests "VFR-on-top" instruct the pilot to maintain VFR on top:

> N220CH, maintain VFR-on-top (altitude restrictions as needed).

6.27.4. If the pilot is in IMC, you can also clear an aircraft to climb through clouds and then to maintain VFR-on-top. In this situation, you must inform the pilot of the reported tops of the meteorological formation or that no tops report is available. During the climb to VFR-on-top, you must ensure separation from all other traffic that requires separation (i.e., in the climb to VFR-on-top, you need to still treat the aircraft like it is IFR; only once the aircraft reports reaching VFR-on-top and has been instructed to maintain it do the requirements change).

> N115, climb to and report reaching VFR-on-top. Tops reported at *(altitude)*.
> Or,
> N115, climb to and report reaching VFR-on-top. No tops report.
> Then,
> N115, if not on top at *(altitude)*, maintain *(altitude)* and advise.
>
> (When the pilot reports VFR-on-top:) Maintain VFR on top.

6.27.5. When requested by the pilot, or when required for additional instructions, you can instruct the pilot to resume the previous IFR clearance (and associated separation minimums) by issuing an IFR altitude instruction. This cancels VFR-on-top and resumes standard IFR flight.

> N115, descend and maintain eight thousand.

6.27.6. VFR-on-top, which requires ATC authorization, is not to be confused with VFR operations 'over-the-top', in which VFR aircraft—with no specific requirement to contact ATC—operate above or between unbroken cloud layers while maintaining VFR but without reference to ground.

6.28. Airborne IFR Clearances

Occasionally, VFR aircraft request an IFR clearance once airborne. This is sometimes referred to as a “pop-up” IFR clearance. This section explains how to issue an IFR clearance to an airborne VFR aircraft.

6.28.1. First, assign a squawk code and radar identify the aircraft if the aircraft is not already radar identified.

6.28.2. Next, verify the aircraft is at or above the MVA/MIA. If so, a clearance may be issued with an altitude to maintain:

> Cleared to Bangor Airport via direct. Maintain 7000.

6.28.3. If the aircraft is below the MVA/MIA, ask if the pilot is able to maintain terrain and obstruction clearance during a climb to the minimum IFR altitude:

> Are you able to maintain your own terrain and obstruction clearance until reaching *(minimum IFR altitude)*?

If the pilot can maintain their own terrain and obstruction clearance, issue the IFR clearance. Otherwise, instruct the pilot to maintain VFR and state intentions. Aid the pilot to the extent practical as described in **FAA JO 7110 Chapter 10**.

6.28.4. Example: a VFR aircraft is 20 miles south of the PVD VOR, above the MVA, and requests an IFR clearance to KBOS:

> N31GJ, Providence Approach, squawk 5501.
>
> *(Once radar identified,)* N1GJ, radar contact 20 miles south of PVD. Cleared to Boston Airport, direct WOONS, direct. Descend and maintain 7000.
>
> *(Then,)* N1GJ, readback correct.

Chapter 7: Center (CTR)

7.1. Position Responsibilities

7.1.1. CTR provides positive separation and ATC services to aircraft operating on IFR flight plans within ZBW controlled airspace not already being controlled by a TRACON or lower facility/controller, and, workload permitting, must provide services to VFR aircraft within its lateral and vertical boundaries.

7.1.2. CTR controllers may be providing services for enroute aircraft, aircraft conducting approaches and departures, and aircraft at nontowered airports. For this reason, CTR controllers must possess a full understanding of the IFR system and the ZBW airspace.

7.1.3. CTR must be comfortable and competent with all procedures for coordination with the adjacent Air Route Traffic Control Centers (ARTCCs) in the United States and Flight Information Regions (FIRs) in Canada. This includes knowledge of and proficiency with the Letters of Agreement (LOA) in place with adjacent and underlying facilities.

7.1.4. Controllers must identify on radio as **"Boston Center"**, regardless of the airspace/operation being conducted.

7.1.5. The use of the words "super" and "heavy" may be omitted except as follows:

7.1.5.1. In communications with APP about super or heavy aircraft operations.

7.1.5.2. In communications with or about super or heavy aircraft at an airport where CTR is providing approach control service.

7.1.5.3. In communications with or about super or heavy aircraft when the approved separation from a following aircraft may become less than 5 miles.

7.1.5.4. When issuing traffic advisories.

7.2. Duty Priority

7.2.1. CTR will constantly handle competing priorities that may not be exclusive to the enroute environment. For example, a CTR controller may simultaneously be handling:

- Vectors to final at KALB.
- A line of jet arrivals into KBOS “descending via” the ROBUC#.
- Takeoff and landing clearances at KBOS.

At times, each of these three scenarios could demand the controller’s sole attention at the same time.

A CTR controller’s skill will only take them so far. CTR controllers must constantly be alert to expected and actual traffic demand and request additional staffing proactively. Consider the need for underlying controllers, such as TWR or APP, and the need to split the enroute environment.

7.2.2. In general, and particularly while working “top-down”, prioritize on-frequency operations and adjacent ATC coordination on a “first come, first served” basis while ensuring the airspace is operated as efficiently as possible. **ZBW SOP, Section 2.2** provides additional detail on prioritizing service during top-down coverage periods.

7.3. Coordination

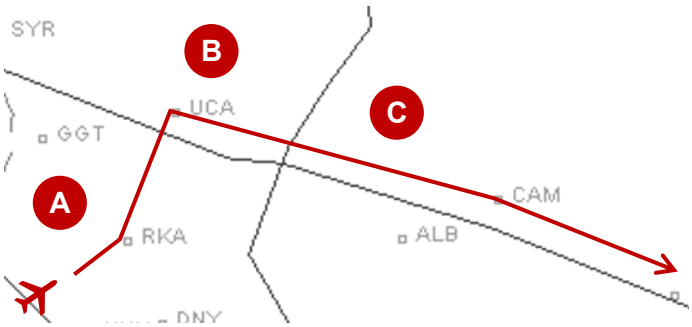
7.3.1. A “shortcut” or “direct to” route amendment may be issued to an aircraft if the point is within your airspace, or as prescribed by LOA. Shortcuts or amendments to preferred routes outside of your airspace/sector will require coordination with the affected sector(s) and/or TMU, when staffed.

7.3.2. If not otherwise specified by LOA, transfer radar identification of aircraft:

Transferring To…	No sooner than…	No later than…
Adjacent Center Facility	50nm from boundary	10nm from boundary
Internal ZBW Sector	50nm from boundary	5nm from border
TRACON	30nm from boundary	10nm from boundary

Issue communications transfer once the handoff is complete and there is no further need for communication with the aircraft. The verbal handoff should be completed no later than when the aircraft crosses the common boundary.

7.3.3. **Automated Information Transfer (AIT):** Where specifically authorized by SOP, AIT is used to prevent a “double switch” for an aircraft that will briefly pass through a sector. For example:



To prevent the aircraft from having to briefly speak to Sector B, the following is accomplished:

1. Sector A initiates a transfer of radar identification to Sector B.
2. Sector B upon acceptance of radar handoff, initiates radar handoff to Sector C.
3. Sector A, after observing acceptance of radar handoff by Sector C, transfers communication of the aircraft to Sector C.

7.4. Airspace

7.4.1. Deleted.

7.5. Data Block Management

7.5.1. ERAM facilities, beginning with initial audio contact with an aircraft, must utilize the Voice Communication Indicator (VCI) to reflect the current status of voice communications.

7.5.2. The altitude field of the data block must reflect the status of the aircraft.

7.5.3. Whenever an aircraft is cleared to maintain an altitude different from that in the flight plan, enter one of the following:

Altitude Assignment	Computer Entry
Clearance to climb or descend to, and maintain, the new altitude.	Assigned Altitude (QZ).
Clearance to maintain a new altitude when it is expected a controller will issue the aircraft a new altitude in a short period of time (often during intermediate level-offs during climb).	Interim Altitude (QQ).
Clearance to vertically navigate along a SID/STAR with published restrictions.	Procedure Altitude (QQ P).
When appropriate during interfacility handoffs, when the assigned altitude differs from the coordinated altitude.	Local Interim Altitude (QQ L).

7.6. Separation Requirements

In addition to IFR Radar Separation (see **Chapter 6**), these requirements apply to CTR:

7.6.1. Lateral IFR separation of non-vertically separated targets: 5 miles.

7.6.2. Lateral separation from an airspace boundary: 2.5 miles.

7.6.3. Arrival handoffs to APP of like types on the same/similar routes: 10 miles.

7.6.4. Separation behind a Super may be reduced to 5 miles except if the Super is operating at or below FL240 and below 250 knots, in which case separate aircraft operating behind a Super as follows:

7.6.4.1. Heavy – 5 miles.

7.6.4.2. Large – 7 miles.

7.6.4.3. Small – 8 miles.

7.6.5. Vertical separation:

7.6.5.1. At or below FL410 – 1000’.

7.6.5.2. Above FL410 – 2000’, at odd cardinal altitudes (e.g., FL450, FL490).

7.7. Speed Adjustment

7.7.1. At or above FL240, speed adjustments may be issued in “Mach number” in 0.01 increments:

> Maintain Mach Point Seven Four.

Most aircraft will transition between indicated airspeed and Mach number between FL280-FL320. As a result, indicated airspeed restrictions should be used to aircraft in a descent, while Mach number restrictions are more common for high-altitude cruise flight above FL290.

7.7.2. When an aircraft assigned a speed adjustment will transition between Mach number and indicated airspeed, inform the pilot of the new speed to maintain:

> Climb and maintain Flight Level Three Four Zero, transition to Mach point eight zero.

> Descend and maintain Flight Level Two Four Zero, transition to two five zero knots or less.

Note: on a standard day, the Mach numbers equivalent to 250 knots are:

Flight Level	250 Equivalent Mach
FL240	0.60
FL250	0.61
FL260	0.62
FL270	0.64
FL280	0.65
FL290	0.66

7.7.3. Do not assign speed adjustments to aircraft at or above FL390 without consent:

> Reduce speed to Mach point eight zero, if unable advise.

7.8. Hazardous Weather

7.8.1. An **AIRMET** is issued to amend the area forecast concerning certain weather phenomena which could be potentially hazardous to aircraft that have limited equipment, instruments, or pilot qualifications. There are three types:

- Sierra: issued for mountain obscuration or IFR.
- Tango: issued for turbulence.
- Zulu: issued for icing or freezing levels.

7.8.2. A **SIGMET** is a more severe advisory issued in cases of severe and extreme turbulence, icing, or visibility reductions. There are two types:

- Convective, issued for an area of thunderstorms
- Non-convective, issued for other SIGMET phenomena

7.8.3. Controllers may forward AIRMET and SIGMET updates to pilots, and/or provide information about them upon request.

7.8.4. Areas of **precipitation** that can be cross-referenced from SkyVector or the TMU map may be issued to pilots. Define the coverage area in terms of azimuth and distance, or the general width of the area. Use the term “precipitation” when describing radar-derived weather, and describe the area as “light”, “moderate”, “heavy”, or “extreme”:

> JBU917, area of moderate precipitation between 10 o’clock and 2 o’clock, 20 miles in diameter.

7.8.5. Approve **pilot requests to deviate** around areas of precipitation whenever possible, or issue alternative instructions if the request is not possible. When approving the deviation, state the word “approved” and issue instructions for the aircraft to return on course once clear of the area:

> AAL469, deviation 10 degrees right approved, advise when able to resume own navigation.

> AAL46, deviation approved, when able, proceed direct MANCH and advise.

> DAL12, unable deviation, turn thirty degrees right, vector for traffic, advise clear of weather.

7.9. Fuel Dumping

7.9.1. When information is received that an aircraft plans to dump fuel, determine the route and altitude it will fly and the weather conditions in which the operation will be conducted.

7.9.2. If an aircraft is dumping fuel in IFR conditions, assign an altitude at least 2000' feet above the highest obstacle within 5 miles of the route or pattern flown.

7.9.3. Separate known aircraft from aircraft dumping fuel as follows:

7.9.3.1. Above – 1000'

7.9.3.2. Below – 2000'

7.9.3.3. Laterally – 5 miles

7.9.4. If you are in contact with an aircraft when it starts dumping fuel, advise adjacent controllers.

7.9.5. Controllers aware of fuel dumping must broadcast an advisory every three minutes until fuel dumping stops:

> Attention all aircraft, fuel dumping in progress 10 miles east of Provincetown Airport at 11,000 by a Boeing 767, eastbound.

7.9.6. Broadcast an advisory when the fuel dumping operation is complete:

> Attention all aircraft, fuel dumping 10 miles east of Provincetown Airport terminated.

7.10. Formation Flight Form-Up, Break-Up, and Separation

7.10.1. Formation flights can take place between any group of pilots; they are not restricted to military aircraft (although those are the most common).

7.10.2. When receiving a request for a formation flight, the flight lead becomes the only person responsible for communicating with ATC. Other aircraft are no longer required to speak with the controller. Transmit to the formation using the lead's callsign.

7.10.3. Support formation flight join-up when all the following occur:

7.10.4. The participating pilot (or the flight lead) requests it.

7.10.5. All participating pilots (or the flight lead) concur.

7.10.6. Each of the participating pilots (or the flight lead) reports the other/s in sight.

> *ROOK01:* ROOK01 has EAGLE03 in sight, request formation join-up with EAGLE03 at FL220. EAGLE03 will be the lead.
> *ATC:* EAGLE03, verify requesting flight join-up with ROOK01 and you have ROOK01 in sight.
>
> *(If affirmative, ATC:)* ROOK01, climb and maintain FL220. Advise when formation join-up is complete.

7.10.7. When aircraft are in a standard formation (no more than 1nm laterally and 100' vertically separated), only the lead aircraft should have a squawk code. All other aircraft can be instructed to **"squawk standby"**. Otherwise, each aircraft should be assigned a discrete squawk code, but may be instructed to squawk standby if operationally advantageous.

7.10.8. When formation break-up is requested, issue control instructions or clearances which will result in approved separation through the lead or directly to the requesting aircraft in the formation:

> *N5817S:* N5817S requesting flight break-up with N731K. N731K is changing destination to MHT.
> *ATC:* N731K, squawk 4702, turn right heading 270.

> *BAMA21:* Center, BAMA21. BAMA23 is requested to RTB.
> *ATC:* BAMA21, have BAMA23 squawk 4702, descend and maintain FL190, and change to my frequency.
> Or,
> *ATC:* BAMA23, squawk 4702. *(Then,)* BAMA23, radar contact, *(position if required)*. Cleared to KMHT via direct. Descend and maintain FL190.

7.10.9. Separate a formation flight from other aircraft by adding 1 mile to the appropriate radar separation minima.

7.10.10. Separate two standard formation flights from each other by adding 2 miles to the appropriate separation minima.

7.11. Aerial Refueling

7.11.1. Authorize aircraft to conduct aerial refueling along published or special tracks at their flight plan altitude, unless otherwise requested.

> Army 365, cleared to conduct refueling between PONCT and BOS along Q935. Maintain FL230.

> TAHOE41, cleared to conduct refueling along AR212E, maintain block FL190 through FL230.

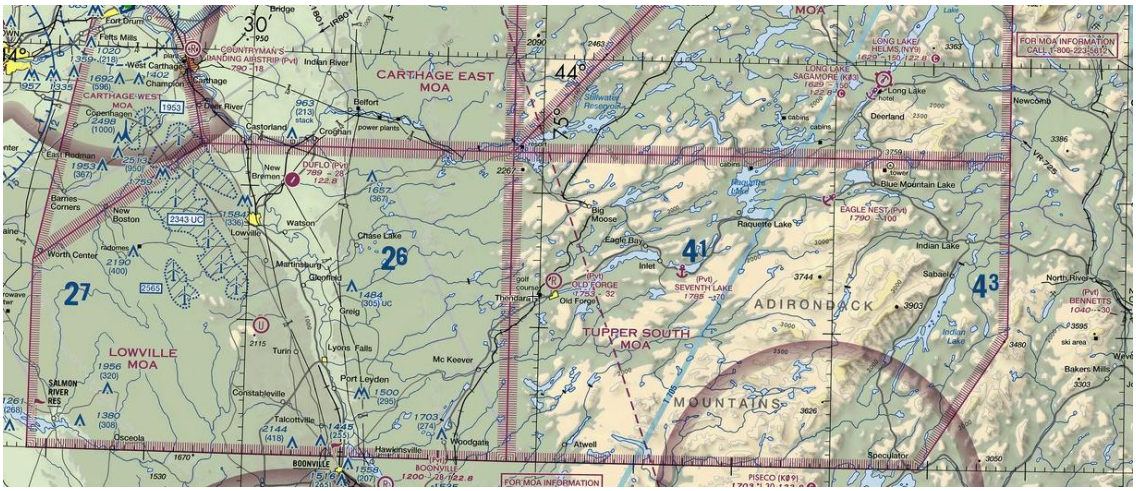
7.11.2. During aerial refueling, tanker aircraft are responsible for receiver aircraft communication with ATC and for their navigation along the track. Aerial refueling airspace is not sterilized airspace and other aircraft may transit this airspace provided vertical or lateral separation is provided from refueling aircraft.

7.11.3. MARSA begins between the tanker and receiver when the tanker and receiver(s) have entered the air refueling airspace and the tanker advises ATC that MARSA has been accepted. MARSA ends between the tanker and receiver when the tanker advises ATC that the tanker and receiver aircraft are vertically positioned within the air refueling airspace and ATC advises MARSA is terminated.

7.11.4. Unless a vector or alternative route has been furnished, clear the aircraft to depart the refueling track at a navigational reference point or egress fix.

7.12. Military Operating Areas (MOAs) & Special Use Airspace (SUA)

7.12.1. An MOA is airspace of defined vertical and lateral limits used for military flight operations. These areas are shown on VFR and low-IFR charts:



Associated altitudes are shown in chart margins:

MOA NAME	ALTITUDE*	TIME OF USE†	CONTROLLING AGENCY/ CONTACT FACILITY	FREQUENCIES
ADIRONDACK B	2500	0800-1700 MON-FRI 1 MAY—31 AUG; 0800-2200 MON-FRI 1 SEP—30 APR	BOSTON CNTR	135.25 377.1
ADIRONDACK C	100 AGL	0800-1700 MON-FRI 1 MAY—31 AUG; 0800-2200 MON-FRI 1 SEP—30 APR	BOSTON CNTR	135.25 377.1
ADIRONDACK D	5000	0800-1700 MON-FRI 1 MAY—31 AUG; 0800-2200 MON-FRI 1 SEP—30 APR	BOSTON CNTR	135.25 377.1
CARTHAGE EAST	100 AGL	0800-1700 MON-FRI 1 MAY—31 AUG; 0800-2200 MON-FRI 1 SEP—30 APR	BOSTON CNTR	135.25 377.1

*Altitudes indicate floor of MOA. All MOAs extend to but do not include FL 180 unless otherwise indicated in tabulation or on chart.
†Other times by DoD NOTAM.

7.12.2. Other forms of Special Use Airspace often used and designated in similar fashion include ATC-assigned airspace (ATCAA), prohibited, restricted, and warning areas, and stationary or moving altitude reservations (ALTRV). The phraseology examples below can be adapted to apply to any of these airspaces as appropriate.

7.12.3. Military aircraft can be cleared into special use airspace upon request using phraseology such as:

> Cleared into the CONDOR 1 MOA between 9000 and 17000.

> Cleared to fly within W-104 A, maintain published altitudes.

> Cleared into the ADIRONDACK MOA, maintain FL190 until (fix/location).

7.12.4. If an aircraft cleared into SUA requests to change frequencies, approve the request, and instruct the aircraft to contact you prior to exiting the SUA. Examples of this phraseology include:

> Reaching (fix/location), radar service terminated, change to discrete frequency approved.

> Radar service terminated, frequency change approved. Contact me on 134.7 at (altitude) prior to exiting the MOA.

7.12.5. An aircraft operating in SUA must be radar identified and issued a new clearance to exit the MOA:

> [If required: ident/say altitude.] Radar contact (location), cleared to (destination) via (routing and altitude).

7.12.6. An SUA is considered “hot” or active when a military aircraft has been issued a clearance into the airspace. In most cases, such as with MOAs, there is no requirement to keep aircraft clear of the airspace and IFR traffic can be cleared through MOAs if standard IFR traffic separation criteria can be met. VFR traffic can pass through an MOA at any time, but VFR aircraft receiving Flight Following must be advised of active MOAs.

7.13. Military Training Routes (MTRs)

7.13.1. MTRs are mutually developed for use by the military for the purpose of conducting low-altitude, high-speed training. Generally, MTRs are established below 10000’ MSL for operations at speeds above 250 knots. However, route segments may be defined at higher altitudes for purposes of route continuity.

7.13.2. MTRs are depicted on sectional and IFR enroute charts.

7.13.3. IFR routes (IR) are conducted in accordance with IFR, regardless of the weather. VFR routes (VR) are conducted in accordance with VFR, in weather conditions of 5nm visibility or greater, and ceilings at or above 3000’ AGL.

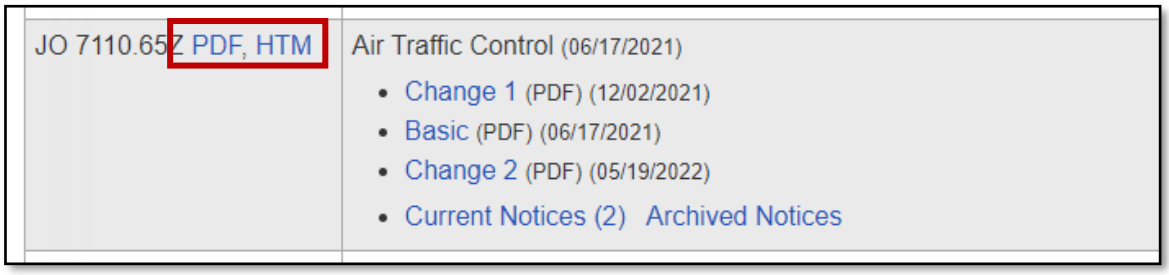
7.13.4. Four number characters (e.g., IR1206, VR1207, etc.) identify MTRs with no segment above 1500’ AGL. MTRs that include one or more segments above 1500’ AGL are identified by three number characters (e.g. IR206, VR207, etc.).

Chapter 8: Appendices

8.1. Introduction to the 7110.65

8.1.1. The 7110.65 is the general FAA policy governing real-world air traffic control in the United States National Airspace System and the document that this ATC Handbook is based on.

8.1.2. The 7110.65 is available from the FAA's Document Library; scroll the table to find JO 7110.65. The page also provides links to other FAA documentation that may be helpful:



8.1.3. The "PDF" or "HTM" links will direct to the latest version of the 7110.65 with any official "Change #" documents incorporated. This is the version of the 7110.65 that should be referenced for Test Corrections. In the example shown above, this would include Change 1 and Change 2. This version will not include any pending changes, called "Notices". Controllers wishing to see the most up-to-date information may consult these "Notices" on an optional basis.

8.1.4. Controllers wishing to receive email alerts when a new 7110.65 document is released may subscribe here and select the documents they wish to follow. The documents relevant to the 7110 are: "AT Notice FAAO JO 7110.65", "Orders", and "Air Traffic Publications".

8.1.5. The ATC Handbook and other BVA documents are organized by position (e.g., DEL, GND, etc.). The 7110.65 is (generally) structured by topic. A controller may need to read several sections to gain a full understanding of the items relevant to the position being operated.

8.1.6. There are 13 chapters in the document, each of which contains sub-sections:

Chapter	Description of Key Concepts	Relevant To
1. General	An overview of the document. Definitions and terms of reference.	All BVA Positions
2. General Control	Flight plans, weather information, phraseology, and managing the ATIS.	All BVA Positions
3. Airport Traffic Control – Terminal	Taxi, spacing/separation, takeoff and landing clearances.	GND, TWR
4. IFR	The basics of IFR, including clearances, altitude assignments, and procedures for arrivals, holds, and approaches. This section covers these procedures in general, and without referring to (or requiring the use of) radar.	DEL, APP, CTR
5. Radar	Covers many of the same elements as Chapters 3 and 4, but in the radar environment. Spacing, vectoring, speed restrictions, and vectors for approaches are all covered in this section.	DEL, TWR, APP, CTR
6. Non-Radar	Procedures applicable to separating aircraft in non-radar environments	APP, CTR
7. Visual	Procedures for all visual operations, including VFR and SVFR operations and IFR aircraft assigned Visual Separation, VFR-On-Top, or Visual Approaches.	TWR, APP, CTR
8. Offshore/Oceanic Procedures	Procedures for oceanic control (ZBW does not provide any oceanic control).	None
9. Special Flights	Operations including fuel dumping, military operations, formation flights, etc.	APP, CTR
10. Emergencies	Information on providing assistance to emergency aircraft.	APP, CTR
11-13	Sections addressing further procedures that are not relevant to ZBW controllers.	None
Appendices	Information about aircraft types, wake categories, and SRS information.	All BVA Positions
Pilot/Controller Glossary	Definition of key air traffic control terms used by pilots and controllers. This information appears in both the 7110.65 as well as the AIM.	All BVA Positions