This air traffic control procedural document is provided for virtual air traffic control in the ZBW ARTCC of the VATSIM network only. It is not for real-world ATC use. These procedures are approved for use as defined by the Boston Virtual ARTCC Administration Team only.

For more information about Boston Virtual ARTCC, visit www.bvartcc.com.
Version Log & Changes from Previous Version

Changes from the previous three versions are listed at the top of every SOP. Changes within the document are emphasized with a vertical blackline beside changed text.

Version Z – February 4, 2019

Amends Special VFR section to include coordination between Tower and Radar Page 53

Version Y – January 21, 2019

Adds Opposite Direction Operations procedures Page 56

Version X – September 27, 2018

Requires controllers to emphasize the changed runway number when issuing a landing clearance Page 44
Purpose

This document prescribes air traffic control procedures and phraseology for use by persons providing air traffic control services on Boston Virtual ARTCC. It is designed as a training reference for controllers, and supplements the learning material available on the VATUSA website. In essence, it provides a simpler version of the FAA Order JO 7110.65 that has been customized for simulator operations.

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.

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.

Structure

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Chapter 1: General

Scope of SOPs

This document is based entirely upon FAA documentation, including Order JO 7110.65 and the Aeronautical Information Manual (AIM). In some cases, real-world standards are simplified or removed for simplicity. If you encounter a scenario for which you require more detail, you are encouraged to seek out the real-world regulation in the FAA’s official document: http://www.faa.gov/documentLibrary/media/Order/ATC.pdf.

In addition to reading FAA procedures, you are encouraged to use http://liveatc.net to listen to real-world FAA controllers in airspaces you are training for.

Facility-specific SOPs have been developed for all Class B and C airports within ZBW. SOPs for a specific facility take precedence over this documentation.
Aircraft Types

The aircraft type field in a flight plan/strip contains three parts:

1. Weight category (included as a prefix only for Heavy or Super)
2. Type designator
3. Equipment type suffix

The weight category and type designator may be found in FAA Order 7360.1D, available from the FAA Document Library.

The following abbreviations are used to identify weight category:

- S = Small (S+ = Small Plus)
- L = Large
- H = Heavy
- J = Super

The following abbreviations to identify engine types:

- P = Piston
- T = Turboprop
- J = Jet

DEHAVILLAND (Canada/UK)
(Also AIRTECH, HAWKER-SIDDELEY, OGMA, RILEY, SCENIC)

<table>
<thead>
<tr>
<th>Model</th>
<th>Type Designator</th>
<th>Description</th>
<th>Performance Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>DHC8 – 400 Dash 8</td>
<td>DH8D</td>
<td>2T/L</td>
<td>2.500 2.500 III 6</td>
</tr>
<tr>
<td>DH-104 Dove, Sea Devon</td>
<td>DOVE</td>
<td>2P/S</td>
<td>1.420 1.420 II 4</td>
</tr>
</tbody>
</table>

The example above shows the DHC8 – 400 Dash 8 has a type designator of ‘DH8D’, has two turboprop engines, and is considered a ‘Large’.

Please view our website for more information about Type Abbreviations. More information about equipment type suffixes is included below.
Equipment Type Suffixes

Equipment type suffixes provide controllers with information about aircraft navigation capabilities. For ground controllers, an equipment suffix can be used to assign aircraft the appropriate departure procedure or route (i.e., where RNAV DPs or route segments are in use, aircraft filing the appropriate RNAV code can be re-assigned those procedures). For tower and radar controllers, suffix information is vital when assigning instrument approach procedures and providing control instructions.

The table below lists all equipment type suffixes approved for use.

<table>
<thead>
<tr>
<th>Nav. Capability</th>
<th>Transponder Capability</th>
<th>Suffix</th>
</tr>
</thead>
<tbody>
<tr>
<td>RVSM¹</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any</td>
<td>Failed transponder or failed Mode C capability</td>
<td>/H²</td>
</tr>
<tr>
<td>No GNSS, No RNAV</td>
<td>Transponder with Mode C</td>
<td>/W</td>
</tr>
<tr>
<td>RNAV, No GNSS</td>
<td>Transponder with Mode C</td>
<td>/Z</td>
</tr>
<tr>
<td>GNSS</td>
<td>Transponder with Mode C</td>
<td>/L</td>
</tr>
<tr>
<td>RVSM¹</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No DME</td>
<td>No transponder</td>
<td>/X³</td>
</tr>
<tr>
<td></td>
<td>Transponder with no Mode C</td>
<td>/T</td>
</tr>
<tr>
<td></td>
<td>Transponder with Mode C</td>
<td>/U</td>
</tr>
<tr>
<td>DME</td>
<td>No transponder</td>
<td>/D</td>
</tr>
<tr>
<td></td>
<td>Transponder with no Mode C</td>
<td>/B</td>
</tr>
<tr>
<td></td>
<td>Transponder with Mode C</td>
<td>/A</td>
</tr>
<tr>
<td>No RVSM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TACAN</td>
<td>No transponder</td>
<td>/M</td>
</tr>
<tr>
<td></td>
<td>Transponder with no Mode C</td>
<td>/N</td>
</tr>
<tr>
<td></td>
<td>Transponder with Mode C</td>
<td>/P</td>
</tr>
<tr>
<td>RNAV, No GNSS</td>
<td>No transponder</td>
<td>/Y</td>
</tr>
<tr>
<td></td>
<td>Transponder with no Mode C</td>
<td>/C</td>
</tr>
<tr>
<td></td>
<td>Transponder with Mode C</td>
<td>/I</td>
</tr>
<tr>
<td>GNSS</td>
<td>No transponder</td>
<td>/V</td>
</tr>
<tr>
<td></td>
<td>Transponder with no Mode C</td>
<td>/S</td>
</tr>
<tr>
<td></td>
<td>Transponder with Mode C</td>
<td>/G</td>
</tr>
</tbody>
</table>

¹ For BVA purposes, aircraft that are able to cruise at altitudes above FL290 may be considered RVSM capable
² ATC assigned only
³ On VATSIM, all aircraft have a transponder (by means of their pilot client). Even pilots who do not have a built-in transponder in their aircraft can use ‘dot commands’ in the pilot client to squawk an assigned code.
Every flight strip that you process should include one valid equipment type suffix. Pilots are encouraged to file the most advanced navigation equipment, even if that particular capability is not going to be used on the flight. For example, if a pilot will fly at 10,000’ on a flight but is FL290+/RVSM capable, the FL290+/RVSM code should be filed. Similarly, if a pilot has filed for an altitude at or above FL290 but has not filed a FL290+/RVSM code, change the pilot’s equipment suffix to the appropriate RVSM code. You may optionally inform the pilot of the change.

*The slant Lima suffix is used for aircraft capable of Flight Level Two Niner Zero or above with the type of navigation equipment you have, so I have amended your equipment suffix to slant Lima.*

It is the pilot’s responsibility to file an equipment suffix. For flight plans that do not include a suffix, solicit the suffix from the pilot using in part the following phraseology:

*(Aircraft), say your equipment type suffix.*

If a pilot is unaware of the equipment type suffix, ask the following question:

*Are you RNAV capable?*

If the pilot indicates RNAV capability, assign a suffix of /G or /L based on the aircraft’s performance capabilities. If not, then use the code /A.

**Application of Equipment Type Suffixes**

Assign procedures in accordance with the aircraft’s capabilities. For example, do not assign a /A aircraft (non-RNAV) direct to a fix, or an RNAV departure procedure.

Only RNAV (or GNSS) capable aircraft are able to accept RNAV procedures, or to proceed “direct” to fixes without using conventional navigation aids.

**Radio Phraseology**

Before beginning training, BVA members are expected to have an operational knowledge of radio communication. Some basic reminders are included below. More detailed information is available on the Radio Communications page of the Pilot References hub of BVA’s website.

**Initial Contact**

Use the following format for radio communications with an aircraft on initial contact with your sector or position:

1. Identification of the aircraft;
2. Identification of the ATC unit; and,
3. Message (if applicable).
Delta 274, Boston Ground, clearance on request, number 2.

Subsequent transmissions with the aircraft from the same sector/position may omit the identification of the ATC unit:

Delta 274, cleared to...

After initial contact with the aircraft, the aircraft identification may be abbreviated. Use the identification prefix or aircraft type and the last 3 digits or letters of the aircraft identification. For example, Beech Baron N181WM may be abbreviated to:

November One Whiskey Mike

If initiated by the pilot, the “November” prefix may be replaced by the aircraft type, the model, or the manufacturer’s name:

Baron One Whiskey Mike

Do not abbreviate similar sounding aircraft identifications or identifications of air carriers having an FAA/airline call sign.

Refer to BVA’s website or the list of FAA/airline call signs if you are unsure of a call sign used in the server. If a fictional call sign is being used, the call sign will normally be included in the “Remarks” section of the flight progress strip for other controllers to reference.

On initial contact with an aircraft, controllers must ensure that pilots have received the most current pertinent information. Depending on facility-specific procedures, this may be accomplished by Clearance Delivery prior to issuance of clearance, or by Ground when the aircraft is ready to taxi. Ask the pilot to confirm receipt of the current ATIS information if the pilot does not initially state the appropriate ATIS code. If the pilot is unable to receive the ATIS, issue the current weather, runways in use, approach information, and NOTAMS as necessary. Any time the ATIS information changes, ensure that all pilots are notified of the ATIS change as well as any pertinent operational changes.

N183DK, verify you have information Whiskey.

Attention all aircraft, Boston airport information Xray now current, wind 200 at 12, ceiling 3000 overcast, altimeter 30.04.
ICAO Phonetics

Use the pronunciation per the table below. Syllables to be emphasized are in bold.

<table>
<thead>
<tr>
<th>Character</th>
<th>Word</th>
<th>Pronunciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Alfa</td>
<td>ALFAH</td>
</tr>
<tr>
<td>B</td>
<td>Bravo</td>
<td>BRAHVOH</td>
</tr>
<tr>
<td>C</td>
<td>Charlie</td>
<td>CHARLEE</td>
</tr>
<tr>
<td>D</td>
<td>Delta</td>
<td>DELTLEAH</td>
</tr>
<tr>
<td>E</td>
<td>Echo</td>
<td>ECKOH</td>
</tr>
<tr>
<td>F</td>
<td>Foxtrot</td>
<td>FOKSTROT</td>
</tr>
<tr>
<td>G</td>
<td>Golf</td>
<td>GOLF</td>
</tr>
<tr>
<td>H</td>
<td>Hotel</td>
<td>HOHTELL</td>
</tr>
<tr>
<td>I</td>
<td>India</td>
<td>INDEEAH</td>
</tr>
<tr>
<td>J</td>
<td>Juliet</td>
<td>JEWLEETT</td>
</tr>
<tr>
<td>K</td>
<td>Kilo</td>
<td>KEYLOH</td>
</tr>
<tr>
<td>L</td>
<td>Lima</td>
<td>LEEMAH</td>
</tr>
<tr>
<td>M</td>
<td>Mike</td>
<td>MIKE</td>
</tr>
<tr>
<td>N</td>
<td>November</td>
<td>NOVEMBER</td>
</tr>
<tr>
<td>O</td>
<td>Oscar</td>
<td>OSSCAH</td>
</tr>
<tr>
<td>P</td>
<td>Papa</td>
<td>PAHPAH</td>
</tr>
<tr>
<td>Q</td>
<td>Quebec</td>
<td>KEHBECK</td>
</tr>
<tr>
<td>R</td>
<td>Romeo</td>
<td>ROWME OH</td>
</tr>
<tr>
<td>S</td>
<td>Sierra</td>
<td>SEEAIRAH</td>
</tr>
<tr>
<td>T</td>
<td>Tango</td>
<td>TANGGO</td>
</tr>
<tr>
<td>U</td>
<td>Uniform</td>
<td>YOUNEE FORM</td>
</tr>
<tr>
<td>V</td>
<td>Victor</td>
<td>VIKTAH</td>
</tr>
<tr>
<td>W</td>
<td>Whiskey</td>
<td>WISSKEY</td>
</tr>
<tr>
<td>X</td>
<td>X-ray</td>
<td>ECKSRAY</td>
</tr>
<tr>
<td>Y</td>
<td>Yankee</td>
<td>YANGKEY</td>
</tr>
<tr>
<td>Z</td>
<td>Zulu</td>
<td>ZOOLOO</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Character</th>
<th>Word</th>
<th>Pronunciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Zero</td>
<td>ZE-RO</td>
</tr>
<tr>
<td>1</td>
<td>One</td>
<td>WUN</td>
</tr>
<tr>
<td>2</td>
<td>Two</td>
<td>TOO</td>
</tr>
<tr>
<td>3</td>
<td>Three</td>
<td>TREE</td>
</tr>
<tr>
<td>4</td>
<td>Four</td>
<td>FOW-ER</td>
</tr>
<tr>
<td>5</td>
<td>Five</td>
<td>FIFE</td>
</tr>
<tr>
<td>6</td>
<td>Six</td>
<td>SIX</td>
</tr>
<tr>
<td>7</td>
<td>Seven</td>
<td>SEV-EN</td>
</tr>
<tr>
<td>8</td>
<td>Eight</td>
<td>AIT</td>
</tr>
<tr>
<td>9</td>
<td>Nine</td>
<td>NIN-ER</td>
</tr>
</tbody>
</table>
Heavy and Super Aircraft

The FAA categorizes all aircraft into one of four wake turbulence categories: Small, Large, Heavy, and Super. Heavy aircraft are those aircraft with a maximum takeoff weight of 300,000 pounds or greater (e.g., B767, C5, A340). The Super is a category reserved specifically for the Airbus A380 and the Antonov AN225.

Heavy and Super aircraft must include a wake turbulence designator in their filed aircraft type abbreviation. The aircraft type should be preceded by H/ or S/ as appropriate. For example, a Boeing 747-400 might file: H/B744/Z; an A380 might file: S/A388/L.

To increase awareness for heavy and super aircraft on the frequency, use the word “Heavy” or “Super” as part of the identification of these aircraft. For example:

* Delta 251 Heavy *
* Speedbird 48 Super *

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

* United 1807, give way to the heavy Boeing 747 right to left on alpha. *

Radio Check

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 (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.

The strength scale from one to five has the following meanings:

1. Bad;
2. Poor;
3. Fair;
4. Good; and,
5. Excellent

The readability scale has the following meanings:

1. Unreadable;
2. Readable now and then;
3. Readable with difficulty;
4. Readable; and,
5. Perfectly readable

When responding to a radio check, inform the pilot of the strength and readability in plain language. Alternatively, a pilot that is loud and clear may be told “radio check five by five”. An aircraft that is loud, but not entirely readable, might be told “radio check five by three”.

Weather

Wind

METAR and TAF wind directions are reported in degrees true. However, runways are numbered based on magnetic heading and aircraft use magnetic directional indicators. Therefore, any wind provided to the pilot in an ATIS or verbally must be converted to magnetic heading.

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 to obtain magnetic direction.

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

Basic VFR Weather Minima

There are two criteria required to determine whether an airport is Instrument Meteorological Conditions (IMC) or Visual Meteorological Conditions (VMC). The visibility must be 3 SM or greater, and the cloud ceiling must be at or above 1,000’ AGL. A ceiling is defined as the lowest Broken (BKN), Overcast (OVC), or obscuration.

Altimeter Settings

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

1. Center: To all en-route aircraft not in Class A airspace at least once within your area of jurisdiction, using the nearest available reporting station.
2. Center: For the destination airport when the aircraft is within 50nm of the destination, if an approach controller does not serve the airport.
3. Approach and Tower: To all arriving aircraft upon initial contact. Tower may omit this information if the aircraft has been vectored to final by the overlying controller.
4. Ground: To all departures.
Lowest Usable Flight Level

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

<table>
<thead>
<tr>
<th>Altimeter Setting</th>
<th>Lowest Usable Flight Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>29.92” or higher</td>
<td>180</td>
</tr>
<tr>
<td>29.91” to 28.92”</td>
<td>190</td>
</tr>
<tr>
<td>28.91” to 27.92”</td>
<td>200</td>
</tr>
</tbody>
</table>

*N313KR, FL180 is unavailable for the altimeter setting. Would you prefer 16,000 or FL200?*

Lost Communications

In the event of lost communications with an aircraft under your control jurisdiction use all appropriate means available to reestablish communications with the aircraft. This may include using text messaging capability.

*Via Text: N39183, I see we have lost radio communications. Would you like to proceed via lost communications procedures or would you like me to communicate instructions via text?*

If a pilot wishes to simulate lost communications (i.e., not using text), treat this like any other emergency. Attempt to re-establish communication by having the aircraft use its transponder or make turns to acknowledge clearances and answer questions. For example, you can suggest the aircraft uses the “ident” feature, changes a squawk code, or cycles the transponder to “standby” in order to confirm receipt of a transmission.

If the pilot is entirely via voice (and wishes to simulate lost communications procedures rather than using text), protect the airspace along its original route of flight and keep other aircraft away so it can land safely.
Transponder Codes

When using VRC in Ground or Tower mode, controllers will need to reference the aircraft’s datablock and target symbol to determine the aircraft is squawking correctly.

The symbols appear as follows:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>✗ — FDIC320 000 00</td>
<td>Squawking Mode C, correct beacon code.</td>
</tr>
<tr>
<td>✗ — FDIC320 000 52CL</td>
<td>Squawking Mode C, incorrect code (wrong code shows).</td>
</tr>
<tr>
<td>● — FDIC320 320*8722</td>
<td>Squawking VFR.</td>
</tr>
<tr>
<td>● — FDIC320 KIHM*8722</td>
<td>Squawking standby, incorrect code.</td>
</tr>
</tbody>
</table>

At ASDE airports, ensure the aircraft is squawking the appropriate Mode C code before it reaches the departure runway. At non-ASDE airports, confirm aircraft are squawking Mode C before instructing the aircraft to change to the departure frequency.

Frequency Changes

In some situations, it may be advantageous to instruct pilots to “monitor” the next frequency (rather than “contact”). “Monitor” instructions are most commonly used between DEL, GND, and TWR, and a rarely used for aircraft in the air.

Controllers may coordinate the use of “contact” or “monitor” at their discretion. Controllers who are using “monitor” should be aware of and prepared for pilots who do not understand to “contact” even when instructed to “monitor”. A system should also be in place to ensure that a pilot is not “left hanging” after being instructed to “monitor” a next frequency.
Chapter 2: Clearance Delivery

Position Responsibilities

Clearance Delivery (DEL) is responsible for IFR clearances and VFR departure instructions. DEL coordinates with radar controllers (APP, DEP, CTR) concerning preferred departure routes. Clearance Delivery does not issue any instructions involving aircraft movement.

Once the clearance (or VFR squawk code/instruction) is issued and read back by the pilot, Clearance Delivery hands the aircraft off to the next controller.

IFR Clearances

For more information on IFR clearances, see FAAO JO 7110.65, Chapter 4, Sections 2-5.

Initial Request

The controller should attempt to issue IFR clearances when requested by the pilot. If the clearance is not immediately available, instruct the aircraft to wait:

\[ \text{DAL2113, clearance on request, number (# in sequence).} \]

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

\[ \text{DAL2113, clearance available, advise ready to copy.} \]

Elements of a Clearance

A simple way to remember all that needs to be included in an IFR clearance is memorizing the acronym “CRAFT”.

- **Clearance Limit**: This is the aircraft’s destination airport 99.9% of the time.
- **Route**: Usually, the route the pilot has filed in the flight plan. This may also include a SID, as described below.
- **Altitude**: Any of the pilot’s requested altitude, a lower initial altitude, or the phrase “climb via SID” as further described below.
- **Frequency**: The departure controller’s frequency, which is assigned in clearances to reduce communications after takeoff. The frequency may be omitted from a clearance if published on an assigned SID.
- **Transponder**: This is the assigned squawk code, which should be unique to every aircraft. Squawk codes are four digits and only contain numbers zero through seven.
“[CALLSIGN], cleared to [CLEARANCE LIMIT] via [ROUTE]. Maintain [ALTITUDE]. Departure frequency [FREQUENCY], squawk [TRANSPONDER CODE].”

The clearance delivery controller needs to be very familiar with the published Standard Instrument Departures (SIDs) at the airport so that an accurate clearance can be given. The following sections describe how to issue IFR clearances in various situations.

**Standard Instrument Departures (SIDs)**

**Types of SIDs**

There are two main types of departure procedures: radar vectored departures and pilot navigation departures. Radar vector departures involve guidance from the departure controller to get the aircraft onto the rest of its filed route (typically, the term “radar vectors” is then included in the IFR clearance). Radar vector departures almost always include the phrase “expect radar vectors” in the Departure Route Description section.

Pilot navigation departures require the pilot to fly a predetermined route to transition to the en-route environment. These departures can contain “transitions” which are published directly on the chart. Normally, the phrase “radar vectors” will not be used in the IFR clearance. An aircraft’s IFR clearance involving a SID therefore varies depending on the type of SID.

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:
Altitude Information

The “Altitude” segment of CRAFT differs based on SID assignment.

If a radar vectored SID is to be assigned, and the SID contains a top altitude and information about when to expect higher, we use the phrase “maintain (initial altitude)” with the clearance:

*Cleared to the Milwaukee Airport via the LOGAN1 departure, radar vectors Manchester, then as filed. Maintain five thousand. Departure frequency...*

If a pilot navigation SID with a top altitude is to be assigned, and the SID contains published crossing restrictions, we use the phrase “climb via SID”:

*Cleared to the Milwaukee Airport via the HYLND4 departure, then as filed. Climb via SID. Departure frequency...*

If a pilot navigation SID without a top altitude is to be assigned, or if it is necessary to issue a top altitude that differs from what is published, we use the phrase “climb via SID except maintain”:

*Cleared to the Milwaukee Airport via the HYLND4 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.

If there is no SID to be assigned, or if the assigned SID does not specify a top altitude, then we use the phrase “maintain (initial altitude)” and advise the pilot when to expect higher.

*Cleared to the Presque Isle Airport as filed. Maintain five thousand. Expect Flight Level One Niner Zero one zero minutes after departure. Departure frequency...*
Examples

The following is an example of a radar vectored departure. Locate the Bradley # Departure (BDL#) from KBDL. The departure route description specifically says “expect radar vectors to filed/assigned route or depicted fix”, indicating that the procedure is a radar vectored departure. Note that the top altitude is also directly stated on the chart.

<table>
<thead>
<tr>
<th>N107KR</th>
<th>BE58/G</th>
<th>1033</th>
<th>KBDL</th>
<th>PUT PUT105 WOONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>618</td>
<td>090</td>
<td>090</td>
<td>KMHT</td>
<td>/V/</td>
</tr>
</tbody>
</table>

Using the above “CRAFT” format, the clearance for N107KR is read as follows:

_Cleared to the Boston airport, Bradley # departure, radar vectors Putnam, then as filed. Maintain four thousand. Departure frequency one two three point niner five, squawk one zero three three._

On a SID where no altitude information is available, issue altitude instructions as part of the IFR clearance. Where no initial altitude is published on the chart, coordinate with the overlying radar controller to determine the initial altitude and the time to expect it.

_Cleared to the Boston Airport via radar vectors Albany, then as filed. Maintain five thousand, expect one five thousand one zero minutes after departure..._

Unless otherwise specified in a facility SOP, the first waypoint of a flight departing on a departure procedure is almost always listed as a departure gate on the appropriate chart (i.e., it should be one of the nav aids/waypoints listed on the map of waypoints the departure procedure shows). If this is not the case, confirm the pilot is able to accept a re-route and provide that pilot with a new departure gate that is applicable (displayed as a waypoint) for that procedure.

<table>
<thead>
<tr>
<th>SWA232</th>
<th>1301</th>
<th>KBOS</th>
<th>GDM V2 ALB</th>
</tr>
</thead>
<tbody>
<tr>
<td>B738/L</td>
<td>160</td>
<td>KALB</td>
<td></td>
</tr>
<tr>
<td>188</td>
<td>160</td>
<td>KBDL</td>
<td>/V/</td>
</tr>
</tbody>
</table>

SWA232 has filed GDM as an initial waypoint, not valid along the LOGAN# departure. You can verify this by loading up the LOGAN# departure and looking at the first page; on it, you will not see “GDM” listed. Therefore, you must provide the aircraft with a re-route. Assuming the aircraft can accept it, an appropriate route might be GLYDE V270 CTR (you can see that “GLYDE” is listed on the LOGAN# departure, and thus is a valid gate).

More information on re-routes is provided below.
The following is an example of a clearance involving a pilot nav departure with a radar vectored segment and no altitude crossing restrictions. Locate the CSTL# departure from KBDL. The departure route description indicates that there are two available transitions: GEDIC and SHERL.

<table>
<thead>
<tr>
<th>N867DC</th>
<th>7332</th>
<th>KBDL</th>
<th>CSTL# SHERL J121 BRIGS VCN8</th>
</tr>
</thead>
<tbody>
<tr>
<td>LJ45/G</td>
<td>200</td>
<td>KPHL</td>
<td></td>
</tr>
<tr>
<td>713</td>
<td>200</td>
<td>KBDL</td>
<td>/V/</td>
</tr>
</tbody>
</table>

Clearances for pilot nav departures also follow the “CRAFT” method. Note the differences in phraseology from the previous example:

_Cleared to the Philadelphia airport via the Coastal # departure, SHERL transition, then as filed. Maintain four thousand. Departure frequency one two three point niner five, squawk seven three three two._

In the example below, a pilot nav departure is used that includes crossing restrictions. Locate the HYLND# departure at KBOS. Notice the “at or above” crossing restrictions on waypoints like HURBE and CLAWW. Accordingly, the “climb via SID” phraseology is used.

<table>
<thead>
<tr>
<th>UAL1712</th>
<th>3401</th>
<th>KBOS</th>
<th>HYLND4 HYLND HANAA Q816 HOCKE Q935...</th>
</tr>
</thead>
<tbody>
<tr>
<td>B739/L</td>
<td>380</td>
<td>KSF0</td>
<td></td>
</tr>
<tr>
<td>554</td>
<td>380</td>
<td>KSJC</td>
<td>/V/</td>
</tr>
</tbody>
</table>

_Cleared to the San Francisco airport via the HYLND# departure, then as filed. Climb via SID. Departure frequency one two three point niner five, squawk three four zero one._

No SID

If an applicable SID is not filed in a flight plan, assign the SID with the clearance and follow the examples above. If the pilot indicates he or she is unable to comply with the SID, issue the corresponding initial instructions so the aircraft flies the same path as an aircraft on the applicable radar vectored departure.

<table>
<thead>
<tr>
<th>CNS5625</th>
<th>2015</th>
<th>KPWM</th>
<th>ENE PSM STEVO LWM</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC12/G</td>
<td>060</td>
<td>KBOS</td>
<td></td>
</tr>
<tr>
<td>225</td>
<td>060</td>
<td>KBDL</td>
<td>/V/ NO SID</td>
</tr>
</tbody>
</table>

Because the pilot has indicated “NO SID” in the remarks, assign the corresponding instructions in place of the SID when issuing the clearance.
The Portland Four chart specifically 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 clearance would be read as follows:

_Cleared to the Boston airport via 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._

If the airport itself does not have any applicable departure procedures, then the Clearance Delivery controller may not assign a heading unless specifically coordinated with the overlying controller. Take for example the following flight plan:

<table>
<thead>
<tr>
<th>KAP1810 3321</th>
<th>050</th>
<th>KPVD</th>
<th>C402/G 050</th>
<th>WOONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>C402/G 301 I</td>
<td>050</td>
<td>KBOS</td>
<td>50</td>
<td>KBDL</td>
</tr>
</tbody>
</table>

Since KPVD does not have any published SIDs, the clearance is read as follows:

_Cleared to the Boston airport via radar vectors WOONS, direct. Maintain four thousand, expect one two thousand one zero minutes after departure, departure frequency one two three point six seven, squawk three three two one._

Notice that the phrase “…then as filed” is not used in this scenario because, after ALB, no other waypoints are filed. If the route portion of a clearance does not end in a STAR, the word “direct” is added after reading the last waypoint. The “direct” in this example tells the pilot to proceed direct to the field after reaching Albany VOR, since the clearance limit is the Boston airport.

An aircraft may also be cleared to its destination simply “as filed” provided that its filed route is acceptable, and no SID is to be used. Clearances involving a SID may not be given “as filed”; the SID must be specifically issued in the clearance as shown in the multiple examples above.
Direct GPS Routing

Aircraft who simply file “direct” or “GPS direct” to their destination airport should be re-routed (if applicable). If the aircraft is unable to accept a preferred route, attempt to give at least some sort of routing, particularly for flights bound for airports outside of the ZBW ARTCC.

Assuming the non-standard or “direct” route is approved by the applicable radar controller, the clearance would be issued as follows:

<table>
<thead>
<tr>
<th>N24896</th>
<th>2020</th>
<th>KPWM</th>
<th>DCT</th>
</tr>
</thead>
<tbody>
<tr>
<td>B190/G</td>
<td>090</td>
<td>KACK</td>
<td></td>
</tr>
<tr>
<td>190</td>
<td>090</td>
<td>KHYA</td>
<td>/V/</td>
</tr>
</tbody>
</table>

Assuming the pilot is capable of the Portland Four departure, the clearance is issued as follows:

*Cleared to the Nantucket airport via the Portland # departure, radar vectors, direct. Maintain three thousand...*

If the pilot does not have the SID, refer to the above section, and follow the same guidelines:

*Cleared to the Nantucket Airport via runway heading, radar vectors, direct. Maintain three thousand, expect niner thousand one zero minutes after departure...*

Readback

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.

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

*Readback correct.*

Flight Plan Amendments and Full Route Clearances

Altitudes

A crucial part of clearances is checking the cruise altitude the aircraft will maintain while en route. Generally speaking, all eastbound traffic must fly at an odd cruising altitude or flight level, and all westbound traffic must fly at an even altitude or flight level. That way, if two aircraft are on the
exact same path on a head on course, this guarantees that they will be at different altitudes, thus preventing a head on collision. The official rule is:\footnote{FAAO JO 7110.65, Para 4-5-2, Flight Direction}:

- Aircraft cruising at a heading ranging from 360-179 are required to fly at an odd altitude or flight level (i.e., 15000’, 17000’, FL190, FL210, etc.).
- Aircraft cruising at a heading ranging from 180-359 are required to fly at an even altitude or flight level (i.e., 14000’, 16000’, FL180, FL200, etc.).

Above FL410, altitudes are assigned in 2,000’ increments per the table below:

<table>
<thead>
<tr>
<th>Direction of Flight</th>
<th>Assign</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastbound (0-179° headings)</td>
<td>Odd flight levels, beginning at FL450</td>
<td>FL450, FL490, FL530</td>
</tr>
<tr>
<td>Westbound (180-359° headings)</td>
<td>Odd flight levels, beginning at FL430</td>
<td>FL430, FL470, FL510</td>
</tr>
</tbody>
</table>

If a pilot has filed an incorrect altitude for the direction of flight, either ask the pilot if a correct altitude is acceptable, or assign the next valid altitude below the pilot’s filed altitude.

Certain flight levels may not be issued when the altimeter setting is below 29.92. If a pilot has filed FL180, FL190, or FL200, check the local altimeter setting prior to issuing the clearance.

<table>
<thead>
<tr>
<th>Altimeter Setting</th>
<th>Lowest Usable FL</th>
</tr>
</thead>
<tbody>
<tr>
<td>29.92” or higher</td>
<td>FL180</td>
</tr>
<tr>
<td>29.91” to 28.92”</td>
<td>FL190</td>
</tr>
<tr>
<td>28.91” to 27.92”</td>
<td>FL200</td>
</tr>
</tbody>
</table>

Routes
IFR aircraft shall be cleared via routes and altitudes as available on the Preferred Routes page of the website.

Where possible, preferred routes shall be assigned to all capable aircraft. If aircraft request an alternate route, or are unable to comply with a preferred route, confirm the requested route with the applicable overlying radar controller prior to assigning the clearance.

Where no preferred route has been established, a combination of FAA Preferred Routes, FlightAware, SkyVector, and judgement shall be used in assigning and/or approving routes.

\footnote{FAAO JO 7110.65, Para 4-5-2, Flight Direction}
While finding routes, you may see Tower Enroute Control (TEC) routes. These routes have been established to keep aircraft travelling over relatively short distances inside the TRACON environment. Within ZBW, TEC routes restrict operations at or below 10,000’.

When issuing a full route clearance, use the following phraseology:

\[ JBU717, \text{full route clearance, advise ready to copy.} \]

\[ (\text{Then,}) \ JBU717, \text{cleared to the Kennedy Airport via the SSOXS# departure, SSOXS: Sierra Sierra Oscar Xray Sierra, direct BUZRD: Bravo Uniform Zulu, Romeo, Delta, direct Sandy Point: Sierra, Echo, Yankee, then the PARCH1 arrival. Climb via SID...} \]

Note that each of the waypoints and VORs along the route are spelled phonetically.

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

\[ UAL31, \text{cleared to the Syracuse Airport via the HYLND# departure, HYLND, direct Manchester: Mike Hotel Tango, then as filed...} \]

At the controller’s discretion, a re-route may be issued textually using the .route alias as described above. This method may be used even for airports that are not authorized to use CPDLC. First, use the .route alias to assign the pilot the new route. Then, if the pilot is able to accept the new route, issue the clearance verbally using the following phraseology:

\[ DAL311, \text{cleared to the Kennedy airport via the BGR# departure, radar vectors Kennebunk, then as amended. Maintain one zero thousand...} \]

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

\[ N556, \text{clearance amendment, advise ready to copy.} \]

\[ (\text{Then,}) \ N556, \text{cleared to the Bradley airport via the LOGAN# departure, radar vectors MHT, then direct. The rest of the clearance remains unchanged.} \]

Controller-Pilot Datalink (CPDLC) Clearances

In addition to voice clearances, clearance may also be issued by CPDLC at specific facilities. Reference the General SOP, Chapter 2 and facility documentation for more information.
VFR Traffic

General

VFR aircraft are not required to file flight plans. Those who have may file specific waypoints but can leave the plan as vague as a direction of flight. Even VFR aircraft that have not filed a flight plan do require a flight strip (so you will have to create the flight strip for VFR aircraft that do not file a flight plan).

If a VFR departure calls you without a flight plan, issue any instructions you can first (i.e., taxi instruction), create the flight strip, and then issue additional instructions (squawk code and, if required, Class B airspace clearance). At minimum, ensure the correct aircraft type, direction of flight, and flight following (if requested) are included in the flight strip.

VFR Cruise Altitudes

Acceptable VFR cruise altitudes follow the same rules as IFR aircraft, except 500’ is added to the altitude. For example, VFR aircraft traveling westbound should cruise at the “even thousands” plus 500’ (such as 4500’, 12500’, 16500’, etc.) VFR aircraft are not permitted to fly in Class A airspace (at or above FL180), so the highest legal VFR altitude is 17500’.

VFR Departure Instructions

VFR departures are handled by DEL or GND in different ways based on the airspace class of the airport the controller is working. Always check the relevant facility SOP for specific VFR departure instructions and for an initial altitude to assign for VFR aircraft, if required.

Class D Airports

Class D airspace is generally a four nautical mile ring around a towered airport that extends to 2,500’ AGL (above ground level). TWR is responsible providing Class D services within that airspace.

An aircraft departing VFR from a Class D airport that does not want flight following is not required to contact a departure controller or any other radar facility. Therefore, a VFR aircraft in this scenario is not given any type of clearance and receives taxi instructions only. A transponder code is only necessary if an aircraft explicitly requests flight following.
Initially, issue the aircraft taxi instructions:

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

Review or create the flight plan as appropriate to ensure aircraft type, departure airport, arrival airport (or direction of flight), and altitude is included. If required, issue the squawk code:

*N4BC, squawk 5501.*

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.

Shown to the left is the sectional chart which depicts the Windsor Locks Class C surface area. The inner ring extends from the surface to 4,200’ MSL; the outer from 2,100’ MSL to 4,200’ MSL.

The Class C airspace is split between the Tower and TRACON controllers in the facility-specific SOP.
If DEL is online, that controller creates or amends the flight plan and issues the squawk code, altitude to maintain, and appropriate departure frequency. When GND is operating both positions, attempt to issue the initial departure instructions and taxi instructions with minimal delay.

\[ N134BC, Bradley Ground, Maintain V-F-R at or below two thousand five hundred until advised, departure frequency one two three point niner five, squawk seven three zero five. \]

(Then,) Runway 24 at Kilo, taxi via Echo, Charlie.

**Class B Airports**

Class B airspace is relatively similar to Class Charlie airspace in that it is covered by both a tower controller and an approach controller; however, there is one major difference.

Aircraft departing VFR within Class B airspace require a specific clearance, which is given by DEL. This is usually followed by a specific altitude restriction within the Bravo airspace, a departure frequency, and a squawk code.

\[ Cleared out of the Boston Class Bravo airspace at or below 2,000. Departure frequency 133.00, squawk 1302. \]

A portion of the Boston Class Bravo airspace (from the Boston TAC chart) is shown to the left. The Tower controller is responsible for providing Class B services to aircraft within the inner ring (BOS 8 NM) from the surface to 2,000’. The overlying radar controllers own the rest of the Class B airspace.
Chapter 3: Ground Control

Position Responsibilities

Ground Control (GND) is responsible for aircraft and vehicles operating on movement areas other than active runways (i.e., taxiways and inactive runways). GND also helps manage non-movement areas such as terminal ramps when no ramp controller is online. GND has no authority over starting or shutting down aircraft engines.

General

Coordination with Tower

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 the method of contact (“contact” or “monitor”).

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 shall be the terminal side of the closest active runway.

Prioritization

Naturally, aircraft that are moving (or on movement areas like taxiways and runways) should be given more attention than those who are clear of movement areas or are parked awaiting a clearance. Especially during busy scenarios, it may become more important to provide an instruction to a moving aircraft (for example, to get that aircraft clear of a runway or to preclude a conflict) than to read a clearance immediately to a parked aircraft. When it is operationally feasible to do so, inbound aircraft are prioritized over departures.

“Cleared”

The word “cleared” is not used for taxi, pushback, or runway crossing instructions. Except for IFR or VFR clearances, the word “cleared” is not used by GND.

Aircraft Movement

Pushback Instructions

In general, ATC has no jurisdiction over areas other than runways and taxiways.

When an aircraft is parked in a location where pushback instructions are not required, following a correct readback, instruct the aircraft to advise ready to taxi:
Readback correct. (Optional: Pushback your discretion.) Advise ready to taxi with Information Alpha. (When more than one runway is in use: runway assignment.)

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

AAL33, pushback your discretion. Advise ready to taxi with Information Alpha.

When aircraft is parked in such a way that pushback onto a taxiway will be necessary, instruct the aircraft to advise ready to push:

Readback correct. Advise ready to push with Information Alpha. (When more than one runway is in use: runway assignment.)

When the aircraft requests to push, use the phraseology “push approved” to indicate that the aircraft will be moving onto a movement area:

DAL1621, push approved. (Optional: taxiway, direction.)

Taxi Instructions

Standard Taxi Instructions
When authorizing an aircraft or vehicle to proceed on the movement area, specify the taxi instructions:

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

If it is the intent to hold the aircraft or vehicle short of a runway, issue the route up to the runway hold short point only:

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

When issuing a subsequent runway crossing, include specific instructions on where to cross the runway:

Cross Runway One Zero at Alpha, turn left on Charlie.

If it is the intent to hold the aircraft or vehicle 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.
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.

When authorizing an aircraft to taxi to an assigned takeoff runway, state the departure runway followed by the specific taxi route.

Aircraft/vehicles must receive a runway crossing clearance for each runway that their taxi route crosses. An aircraft/vehicle must have crossed a previous runway before another runway crossing clearance may be issued:

*Cross Runway Two Two Right at November, hold short of Runway Two Two Left.*

At those airports where the taxi distance between runway centerlines is less than 1,300 feet, multiple runway crossings may be issued with a single clearance.

If the pilot does not report having the airport’s ATIS or weather information, the ground controller must at least include the current altimeter at the end of the taxi instructions.

*Runway Six, taxi via Charlie, Echo. Verify you have Information Delta.*

The same general concept applies to inbound aircraft taxiing to parking:

*Taxi to the ramp via Charlie, Alpha. Cross Runway Three Three Left.*

The phrase “taxi to” is only to be used for aircraft taxiing to the ramp. Specific runway crossing instructions are still required for each runway encountered on the inbound taxi route.

**ILS Critical Areas**

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 the area when arriving aircraft is inside the ILS OM or the fix used in lieu of the OM.

*Hold short of Runway 22R ILS Critical Area.*

**Back-Taxi**

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.

*JBU203, back-taxi runway 22R, foxtrot, alpha to the ramp.*
**Sequencing**
Sequence aircraft in a logical order considering route of flight, aircraft type, and overall efficiency of the airport.

For example, if a B738 (large, turbojet) and B190 (small, multi, non-jet) both request taxi, instruct the B738 to taxi behind the B190 to the departure runway. Taxiing the B190 to the runway first will greatly minimize the wake turbulence delays that would be induced by taxiing and departing the B738 first.

Another consideration is destination airport. For example, if there are two aircraft outbound for KJFK, consider putting an airport bound for a different airport (and/or departure gate) between them to build in-trail separation and ease the workload for DEP.

Common instructions used when taxiing aircraft include:

“Hold short of” – Instructs an aircraft to hold short of a runway, taxiway, or other movement area.

“Follow” or “Behind” – Instructs an aircraft to follow another aircraft or vehicle. (Note: any applicable hold short or runway crossing instructions must also be issued.)

“Give way” – Instructs an aircraft to give way to another aircraft or vehicle.

“Hold position” – Instructs an aircraft to stop all movement. Permission to “continue taxi” shall be issued when the aircraft may begin taxiing again.

“Continue” – Resume taxiing.

**Progressive Taxi Instructions**
Progressive taxi instructions may be requested by newer pilots or those who are unfamiliar with the taxiway and runway layout at their airport. A ground controller shall always accommodate these requests except in abnormal situations.

Progressive taxi phraseology may be more informal than a normal taxi instruction to ensure clear communication. A controller shall issue simple instructions and if necessary, issue taxi instructions with cardinal directions to aid a pilot to the departure runway, or destination on the airport. 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.*

**Intersection Departures**
Many times, smaller aircraft do not require the full length of a runway for takeoff. If this is the case, intersection departures are often used to reduce an aircraft’s taxi time.
Intersection departures may be initiated by the controller or pilot. If available, issue the measured distance from the intersection to the runway end, round “down” to the nearest 50 feet, to any pilot who requests and to all military aircraft.

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.

If you are unsure of the aircraft type or performance characteristics, allow the pilot to decide whether or not to assign an intersection departure.

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

If an intersection departure will be used, GND must coordinate with the controller providing TWR services to authorize the intersection.

GND: Request Runway Two Three at Mike for Cair 322.

TWR: Runway Two Three at Mike approved, A-B.

GND: C-D.

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

When issuing taxi instructions to the pilot, specify the runway and departure point:

Runway Two Niner at Charlie, Taxi via Alpha, Charlie

Runway Crossings

Instructions to cross or operate on closed/inactive runways may be issued by GND:

Cross Runway Two Niner.

Unless otherwise coordinated, a taxiing aircraft must contact the appropriate TWR to cross an active runway. With coordination, 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:
Ground: *Cross Runway 33 at Echo with one.*

Ground: *Cross Runway 24 at Charlie with two vehicles.*

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

Tower: *Cross Runway 33 at Echo with one, A-B.*

Ground: *C-D.*

The Ground controller must advise the local controller when the coordinated runway operation is complete, at which point the runway may be re-used by the Tower controller.

Ground: *Crossing complete, C-D.*

Tower: *A-B.*

When an aircraft is required to hold short of the runway, the Tower controller will specify the requirement to “hold short”, which must then be read back by the Ground controller.

Tower: *Hold Short Runway 33, A-B.*

Ground: *Hold Short Runway 33, C-D.*

**Handoff to Tower**

All aircraft must be given a verbal handoff to the tower controller (either a “monitor” or “contact” instruction as coordinated) before they reach the hold short line for their departure runway. Optimally, you should issue the verbal handoff early enough so that the aircraft can be issued a takeoff clearance before it is required to hold short of the runway.

At Class C and D airports, 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.

**Instructions Requiring Expeditious Compliance**

Use the phrase “no delay” when immediate action is required:

*Cross Runway 22L at Echo, no delay, traffic short final.*
Helicopter Operations

A few key differences exist between handling helicopters and fixed wing aircraft ground operations (clearance delivery is exactly the same).

There are two methods of taxiing that a helicopter may use: hover taxi and air taxi. (Wheeled helicopters can also receive normal taxi instructions.) Often times, however, a helicopter may request to depart from the ramp or other non-movement area. Since this does not require any taxi instructions, the helicopter is simply told to contact TWR.

Hover taxi is defined by movement just above the airport surface at speeds less than 20 knots. Phraseology for hover taxi is very similar to standard taxi instructions:

*Runway Two Niner, hover taxi via Alpha.*

*Hover taxi to the ramp via Bravo.*

Air taxi is defined by movement above the surface below 100 feet AGL which allows for speeds greater than 20 knots. The helicopter does not necessarily have to follow any taxiways, and may simply proceed directly to its assigned location or via an assigned route.

Phraseology is as follows:

*Air taxi to the helipad.*

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

Regardless of which taxi method is used, standard runway crossing and hold short procedures apply. For more information on helicopter operations, see FAAO JO 7110.65, para 3-11-1, Helicopter Operations.

Aircraft Repositioning Requests

Very rarely you may have an aircraft request to reposition from one location to another. This is a lower-priority request but should be fulfilled in a timely manner.

*Delta maintenance seven sixty seven, reposition via Kilo, Alpha to the company hangar.*

To this point in the document, phraseology examples spelled out the correct enunciation of each phraseology element. From this point, for simplicity, some elements are depicted in numerical format. The correct enunciation should be substituted for UAL35 (“United Thirty Five”), for 11,000 (“one, one thousand”), etc.
Chapter 4: Local Control

Position Responsibilities

Local Control (TWR) is responsible for setting the active runways, clearing planes for takeoff and landing, maintaining or delegating the ATIS, and separating departures and arrivals (where applicable). Close coordination with ground, departure and approach is a must in order to maintain a smooth flow of traffic in and out of the airport.

General

Duty Priority

TWR is primarily responsible for sequencing and, where required, separation of airborne aircraft. This is the first priority for TWR.

In general, prioritize aircraft/operations as follows:

1. Sequencing (and, where required, separation) of airborne aircraft
2. Aircraft on the runway
3. Aircraft moving on the airport surface
4. All other requests

Active Runway Selection

Runways are selected based on wind direction, with the idea being that active runways should generally allow traffic to depart and land into the 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, but is actually blowing south. So, choosing active runways is as easy as selecting runways whose headings close to the reported wind direction.

Using KPWM as an example, Runway 29 should be in use if KPWM wind is 280 at 14.

Factors such as runway length, preferred runway configurations, and noise abatement should also be considered when selecting active runways.

When considering or implementing a runway configuration change, coordinate the change with all controllers. Ensure to give overlying radar controllers enough time to plan the change given inbound or outbound traffic. Coordination should include the specific callsign of the last planned departure and arrival aircraft from the old and new configurations.
Wind

When giving an aircraft the wind, the direction is always given first, followed by the magnitude. Round the direction to the nearest multiple of ten, and apply magnetic variation to issue magnetic wind directions to pilots.

Wind two two zero at one four.

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.

Notice how every digit of each number is spoken individually. The phrase “wind two-twenty at fourteen” is incorrect.

When the wind is less than three knots, it is reported as calm.

Automated Terminal Information Service (ATIS)

TWR is responsible for maintaining (or delegating the maintenance of) an ATIS. The ATIS shall be updated:

- When any new official weather is received
- When runway braking action reports are received indicating runway braking is worse than that which is included in the current ATIS broadcast
- When there is a change in any other pertinent data, such as a runway change, instrument approach in use, etc.

A digital ATIS may be used at any airport for which a VATIS profile is available (i.e., any airport where a real-world digital ATIS is available). At all other airports, a voice ATIS shall be recorded through VRC.

Components of an ATIS

Introduction
First, the airport facility name is given, followed by the current information code. It does not matter which letter of the alphabet is chosen initially, but all subsequent ATIS reports are given the next letter in sequence. If you are relieving another controller who was using an ATIS, you should continue lettering any future reports where the previous controller left off.
**Time**
The time in the ATIS always matches the time associated with the official weather. If the weather is released in between the routine weather observations, the word “special” is added after the time.

The time the ATIS was generated/recorded is not included in the broadcast.

**Weather**
Next, read the weather from the METAR. Keep the following in mind when creating the weather:

- Pronounce the word “wind” (not “winds”), omit any leading zeros in the wind speed, and do not say the word “knots”
- When the wind is gusting, use the word “gusts” followed by the gust speed
- 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
- In cases of low visibility, the runway visibility range (RVR) may also be present; this information should not be included in the ATIS
- In the case of an indefinite ceiling (denoted by a “VV” followed by the height in hundreds of feet), include this after issuing the visibility
- The conditions BKN and OVC represent a ceiling, and the word “ceiling” must preface the altitude of the layer
- Anything after the “RMK” section can be ignored in the ATIS

**Airport Configuration**
If any instrument approaches are in use, they should be stated first before any visual approaches are mentioned.

If applicable, state any LAHSOs (Land And Hold Short Operations) in use. State the affected runways, followed by the available landing distance so that a pilot can determine whether or not it can be accepted.

The landing and departing runways are given next. If all runways in use are used for both departures and arrivals, you may combine the two.

**NOTAMs**
Any applicable NOTAMs come next. These are specific to the airport you are currently working, and are prefaced by the phrase “notices to airmen”.

**Conclusion**
At the end of the broadcast, add any concluding remarks and state the ATIS letter once again.
Once finished speaking, leave a three to five second pause before stopping the recording to mark the clear ending of the ATIS before it repeats itself from the beginning.

**Examples**

KHYA 241756Z 01008KT 10SM CLR 25/13 A2989 RMK AO2 SLP123 T02500128 10250 20206 58000

“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; landing and departing Runways Six and Three Three; all aircraft read back all hold short instructions and assigned altitudes; advise controller 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; landing and departing Runway One Five; notice to airmen: Runway Three Three localizer out of service; read back all hold short instructions and runway assignments; advise controller on initial contact you have information TANGO”

KLWM 201955Z 04015G23 1/2SM R05/2600V3600FT +RA VV003 18/16 A2974 RMK SLP013 T01760158 10412

“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; landing and departing Runway Five; all aircraft read back all hold short instructions and runway assignments; advise controller on initial contact you have information Kilo.”

This guide is by no means a complete resource for decoding a METAR and recording an ATIS, but does provide the basic fundamentals for doing so that are most applicable to BVA.

For more information reference FAAO JO 7110.65, Chapter 2, Section 9 and a [guide to decoding METARS](https://example.com).
Separation

There are many requirements that must be met for separating landing and departing traffic. Multiple criteria must be considered before clearing an aircraft to takeoff or land.

Same Runway Separation

The following requirements determine whether or not a runway is “clear”, or available for a takeoff/landing. These requirements are based on aircraft categories, which are as follows:

- CATEGORY I - small aircraft weighing 12,500 lbs. or less, with a single propeller driven engine, and all helicopters.
- CATEGORY II - small aircraft weighing 12,500 lbs. or less, with propeller driven twin-engines.
- CATEGORY III - all other aircraft.

Separate one departing aircraft from another by ensuring that the first aircraft has passed the end of the runway (or has turned to avoid a conflict) before the second aircraft begins its takeoff roll. Separate two arriving aircraft by ensuring that the first aircraft has cleared the runway before the second aircraft crosses the threshold.

If you can determine the following distances using landmarks or other means, the following separation minima can be applied for both departures and arrivals:

- When only Category I aircraft are involved: 3,000 feet
- When a Category I aircraft is preceded by a Category II aircraft: 3,000 feet
- When either the succeeding or both are Category II aircraft: 4,500 feet.
- When either is a Category III aircraft: 6,000 feet.
- When the succeeding aircraft is a helicopter, visual separation may be applied in lieu of using distance minima

Note that in addition to same runway separation, the standard requirements for VFR/IFR separation in addition to any wake turbulence considerations (discussed in the next section) must also be followed.
**Simultaneous Same Direction Operation**

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.

<table>
<thead>
<tr>
<th>Aircraft Category</th>
<th>Minimum Distance (feet) between parallel...</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Runway centerlines</td>
</tr>
<tr>
<td>Category I or II</td>
<td>300</td>
</tr>
<tr>
<td>If either aircraft is a Category III</td>
<td>500</td>
</tr>
<tr>
<td>If either aircraft is a Heavy</td>
<td>700</td>
</tr>
</tbody>
</table>

**Wake Turbulence**

**Definitions**

Generally, wake turbulence should be applied whenever a smaller aircraft will fly through the airborne path of a larger aircraft. It applies to the same runway, and normally also to parallel runways separated by less than 2,500’ as well as runways with crossing flight paths.

For wake turbulence purposes, aircraft are classified into four categories:

<table>
<thead>
<tr>
<th>Category</th>
<th>Maximum Takeoff Weight</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>41,000 lbs</td>
<td>Most general aviation aircraft (e.g., C172, BE58, PA31, etc.)</td>
</tr>
<tr>
<td>Large</td>
<td>300,000 lbs</td>
<td>Most airliners (e.g., B737, A321)</td>
</tr>
<tr>
<td>Heavy</td>
<td>300,000 lbs or greater</td>
<td>Aircraft larger than a Boeing 757 (e.g., B747, B787, etc.)</td>
</tr>
<tr>
<td>Super</td>
<td>The A380 and AN225</td>
<td></td>
</tr>
</tbody>
</table>

Small aircraft with a maximum takeoff weight of 12,500 lbs or greater are referred to as “Small Plus”, or “S+”.

**Full-Length Departures**

Separate aircraft taking off from the same runway or from a parallel runway separated by less than 2,500’ as follows:

- Heavy, large, or small behind super: 3 minutes
- Heavy, large, or small behind heavy: 2 minutes

Separate a small aircraft behind a Boeing 757 by two minutes when the small aircraft is departing from the same runway, or from a parallel runway separated by less than 700’.

The timer starts when the lead aircraft begins the takeoff roll.
Small aircraft require no timed separation from previously departed large aircraft.

Pilots are not permitted to waive any of the above wake turbulence intervals.

In lieu of using timed separation, the following distance minima (nm) can be applied instead. For departures, ensure the appropriate radar separation exists at or prior to the time an aircraft becomes airborne. The minima in parentheses represent required distances for landing when the lead aircraft is over the landing threshold.

<table>
<thead>
<tr>
<th>Lead Aircraft</th>
<th>Small</th>
<th>Small Plus</th>
<th>Large</th>
<th>B757</th>
<th>Heavy</th>
<th>A380/Super</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>3</td>
<td>3</td>
<td>3 (4)</td>
<td>4</td>
<td>5 (6)</td>
<td>8</td>
</tr>
<tr>
<td>Small Plus</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Large</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>B757</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Heavy</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>A380/Super</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

**Intersection Departures**

For the purposes of wake turbulence, touch and go or stop and go operations are considered intersection departures.

Takeoff clearance to the following aircraft should not be issued until the time interval has passed after the preceding aircraft has taken off:

- From the same runway:
  - Small less than 12,500 lbs. behind small plus: 3 minutes
  - Small behind large: 3 minutes
- From the same runway, or a parallel runway separated by less than 700’:
  - Small behind B757: 3 minutes
- From the same runway, or a parallel runway separated by less than 2,500’:
  - Heavy, large, or small behind super: 4 minutes
  - Heavy, large, or small behind heavy: 3 minutes

The timer starts when the lead aircraft is airborne.
This separation is not required if:

- The pilot requests to waive wake turbulence, and the preceding departure is a small plus or large (except B757)
- The intersection is 500’ or less from the departure point of the preceding aircraft and the take off is in the same direction
- Except if the lead aircraft is an A380, successive touch and go or stop and go operations are taking place, and the aircraft in the pattern has been issued “caution wake turbulence” and the position of the larger aircraft ahead

In these three cases, do not restrict the aircraft in such a way that it will be unable to avoid wake turbulence. Do not specify an immediate takeoff or restrict the aircraft to touch-and-go only. Allow the aircraft to extend downwind or deviate from course 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. [Base turn at your discretion].*

*N236PB, caution wake turbulence, departing E170, Runway 24, cleared for the option.*

**Crossing Flight Paths**
When flight paths cross, wake turbulence also applies, even if the runways do not intersect. These intervals cannot be waived.

- Heavy, large, or small behind super: 3 minutes
- Heavy, large, or small behind heavy: 2 minutes
- Small behind B757: 2 minutes

**General**
Do not issue “line up and wait” to apply wake turbulence separation when a small aircraft will follow a previously-departed super or heavy aircraft.

Wake turbulence advisories should be issued to all aircraft following a heavy, and to all small aircraft behind large aircraft. 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.*

*COM922, Runway 22L, cleared to land, caution wake turbulence, heavy Boeing 767 departing the parallel runway.*
A 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, expect a two-minute delay for wake turbulence following a departing Boeing 757.*

**IFR Departure Separation**

The standard IFR departure separation is 3nm of anticipated separation. Takeoff clearance must be issued so that the second aircraft will have 3nm or more of increasing separation at the time both aircraft are airborne.

With consideration for the wake turbulence and same runway separation provisions above, separation between successive departures from the same runway may be reduced to 1nm if their courses diverge by at least 15 degrees.

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.

**IFR Arrival Separation**

IFR arrivals sent to you from a radar controller will already be properly spaced. When the tower controller is responsible for sequencing arrivals (such as VFR arrivals or aircraft in the pattern), apply “Same Runway Separation” and “Wake Turbulence” as described above.

**Line Up and Wait Instructions**

Line up and wait (LUAW) instructions should only be used when there are circumstances that prevent that aircraft from departing immediately. Do not tell an aircraft to “line up and wait” when there is no reason why it cannot be cleared for takeoff. Issue a reason for LUAW, along with any pertinent traffic:

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

A reason for LUAW need not be provided if the traffic is obvious (e.g., behind an immediate departure or while waiting for a just-landed aircraft to clear the runway).

LUAW may not be issued when an aircraft is “cleared to land” on the runway. Additionally, at night, LUAW may not be issued for an intersection departure.
**Takeoff Clearances**

State the runway number followed by the takeoff clearance:

*Runway 29, cleared for takeoff.*

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.

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 270, Runway 24, cleared for takeoff.*

The wind should be given as part of the takeoff clearance, and is always included before the takeoff clearance:

*Wind 270 at 8, Runway 29, cleared for takeoff.*

*Fly heading 270, wind 290 at 8, Runway 24, cleared for takeoff.*

When conducting simultaneous parallel runway departures utilizing RNAV SIDs, advise aircraft of the initial fix/waypoint on the RNAV route\(^5\). The pilot is expected to acknowledge the advisory as any other ATC communication.

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

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.

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

*Runway 24, cleared for immediate takeoff, traffic Boeing 737 on a four mile final.*

\(^5\) There are currently no airports within ZBW with a configuration requiring the “RNAV to” phraseology.
Intersection departures are common for smaller aircraft that do not need the full length of the runway for takeoff, and are phrased as follows:

*Runway 24 at Alpha, cleared for takeoff.*

Always state the intersection from which the aircraft will depart to avoid confusion with traffic holding at the end of the runway.

**Radar Release of Departing IFR Aircraft**

A release is required for all departing IFR aircraft.

At all Class B or C airports, departures are automatically released (i.e., silent releases) for aircraft on coordinated departure runways. Rolling calls may be requested by the overlying radar controller, which can be fulfilled verbally or via pushing the flight strip to the radar controller.

*TWR: DAL142 Boeing 737 off of Runway 22R.*

At Class D airports, a verbal release is required from the overlying radar controller unless otherwise coordinated. TWR shall request the release:

*TWR: K90, Nantucket Tower, request release for JBU2092, E190 (Optional: runway number if departing multiple runways).*

The overlying radar controller can instruct TWR to hold the aircraft, can release the aircraft immediately, or provide a time for the release:

*DEP: Hold for release, C-D.*

*DEP: Released, C-D.*

*DEP: Heading 190, maintain 3,000, released, C-D.*

*DEP: Released at 2103Z, C-D.*

If an immediate release is given, the release is valid as long as the aircraft becomes airborne within 3 minutes. If a timed release is given, the aircraft can be airborne 2 minutes prior, and up to 1 minute after, the coordinated release time.

Use caution if using line up and wait while requesting an aircraft’s IFR release.

*N2CH, hold short Runway 16, awaiting IFR release.*

*N332, Runway 16, line up and wait, awaiting IFR release. Traffic, Cessna 172, eight mile final.*
Once the release is valid, push the aircraft’s flight strip to the radar controller.

**Handoffs to Departure**

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.*

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

*Turn left heading 140, contact Boston Departure.*

**Landing Clearances**

The format of a landing clearance is very similar to the takeoff clearance. State the runway number, followed by the landing clearance.

*Runway 24, cleared to land.*

When wind information is given, issue the wind prior to the landing clearance:

*Wind 070 at 7, Runway 4L, cleared to land.*

At busier airports, it will be very common for traffic to land and depart in front of another aircraft on final approach. When clearing an aircraft to land, always report any traffic that will either land or depart before them so that the aircraft is aware of its position in the sequence. The following are a few examples:

*Wind 220 at 5, Runway 24, cleared to land. Traffic, Boeing 737 on a two mile final.*

*Wind calm, Runway 24, cleared to land. Traffic holding in position on the crossing runway.*

*Wind 060 at 8, Runway 6, cleared to land. Traffic will land and depart the crossing runway.*

As the above examples indicate, a landing clearance may be given even though the runway is not clear at that particular time. A landing clearance just guarantees that the runway will be clear at the time of the aircraft’s arrival. However, a landing clearance may not be issued if an aircraft has been instructed to line up and wait or is already holding in position on the same runway. Phraseology for this scenario is as follows:

*Runway 29, continue. Traffic is holding in position.*
Once the traffic holding in position has been given a takeoff clearance and has started its roll, a landing clearance may then be issued as usual. If an aircraft requests a touch and go, stop and go, or low approach, simply insert that in the clearance. For example:

*Wind two seven zero at eight, runway 27, cleared touch and go.*

The phrase “cleared for the option” may also be used, which gives the aircraft a choice of a full stop, touch and go, stop and go, or low approach. This is useful when an aircraft is performing multiple approaches, but must be used with caution. A stop and go requires significantly more time on the runway than any of the other options; therefore, clearing an aircraft for the option with another aircraft right behind it is not a good idea.

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.*

**Land and Hold Short Operations (LAHSO)**

Land and Hold Short Operations (LAHSO) can be applied at airports where a LAHSO marking is indicated on the airport diagram. For example, consider the airport diagram for KACK, which allows for aircraft landing on Runway 33 to hold short Runway 24.

To eliminate the need for intersecting runway separation, aircraft may be instructed to land and hold short of a crossing runway. The hold short instruction must be clearly included (and read back by the pilot) for both the approach and landing clearances. As a result, close coordination is required between controllers during LAHSO.

Simultaneous takeoff and landing operations shall only be conducted in VFR conditions.

*KAP211, Nantucket Tower, Runway 33, cleared to land, hold short of Runway 24, traffic, Boeing 737, landing Runway 24.*

*N332, Runway 33, cleared to land, hold short of Runway 24, traffic, CRJ700 departing Runway 24.*

*EGF3321, traffic, Cessna 172, landing Runway 33 will hold short of the intersection, Runway 24, cleared for takeoff.*

Missed Approaches and Go-arounds

A missed approach is a published procedure for an instrument approach, and ends in a hold over a certain fix. Clearance for a missed approach is automatically included with an instrument approach clearance.

By comparison, a go-around can be initiated by a pilot or controller for reasons such as a poor approach, traffic, etc.

In either case, the aircraft shall be assigned runway heading, and a climb to 3,000, except if otherwise coordinated or as required by local conditions. Smaller aircraft can be offered the opportunity to remain with TWR if weather conditions permit.

VRD1655, go around. Fly runway heading, climb and maintain 3,000.

N3BC, would you like to remain this frequency to join right traffic for Runway 24?

If an IFR aircraft specifically requests to fly a missed approach, the missed approach procedure may be flown instead of the standard runway heading and 3,000 assignment.

UAL3105, fly the Runway 22L published missed approach procedure.

If the IFR aircraft will return to the radar facility, TWR must verbally coordinate with the radar controller:

TWR: Departure, Tower, VRD1655 go-around.

DEP: Runway heading, 3000, over to me. C-D.

TWR: A-B.

After a missed approach or go-around, all departure releases, including at Class B and C airports, are automatically cancelled. The radar controller must advise when departures may be released.

DEP: Departures released, C-D.

TWR: A-B.
PIREP & Weather Information

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

- Ceilings at or below 5,000’ – PIREPs must include cloud base reports when 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, and then pass the pertinent information to other controllers and aircraft in a timely manner.

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

*Cactus Seventy-six, a D-C Niner previously reported wind shear, gain of twenty-five knots between niner hundred and six hundred feet, followed by a loss of five zero knots between five hundred feet and the surface.*

For hazardous weather information, controllers shall advise pilots of the availability of hazardous weather information:

*Attention all aircraft, hazardous weather information (SIGMET, AIRMET, UUA, Center Weather Advisory, Number or Numbers) for (geographical area) available on HIWAS or Flight Service Station frequencies.*

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.

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 him/her to categorize braking action in these terms.

Runway Visual Range (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](http://rvr.fly.faa.gov/cgi-bin/rvr-status.pl), while RVR information for other airports can be found in the airport’s METAR. 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 6,000 feet.
Runway 22L RVR two thousand, rollout one thousand eight hundred.

Wind 030 at 8, touchdown RVR 6000, midpoint 4500, rollout 3000, Runway 4R, cleared to land.

Controllers are encouraged to reference the NOAA ZBW Weather Briefing.

Runway Crossings

Aircraft may not cross any runway, active or inactive, without an explicit ATC instruction. ATC may not authorize and aircraft to cross multiple runways in a single instruction unless the taxi distance between runway centerlines is less than 1,300’.

TWR is responsible for all movement on or across all active runways. If GND is online, all aircraft needing to cross an active runway will be handed off to TWR except where specifically coordinated otherwise and when operationally advantageous. Proper phraseology for a runway crossing is as follows:

*Cross Runway 15 at Charlie.*

The runway crossing shall include the taxiway the aircraft will cross on.

If runways are separated by less than 1,300’:

*Cross Runways 1L and 1R at Kilo.*

Since the ground controller cannot authorize traffic to cross an active runway, all inbound aircraft should be sent to the ground controller only after they have crossed all remaining active runways. For example, if traffic has landed on Runway 22L at Boston (KBOS) and Runway 22R is active, the following instructions should be given:

*Exit right onto Taxiway Echo, cross Runway 22R, then contact ground point niner.*

When runway crossings are coordinated controller-to-controller, the authorizing controller shall use appropriate phraseology when authorizing the crossing request and shall terminate the transmission with his or her initials:

*Cross Runway 22R at Charlie with One, A-B.*

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

- A departing aircraft is observed to be in a turn to avoid the crossing point
• A departing aircraft has passed the point where the crossing will occur, regardless of the departing aircraft’s altitude
• An arriving aircraft is far enough back that the crossing can be completed before the arrival reaches the runway threshold
• An arriving aircraft has landed and the pilot has verbally confirmed that the aircraft will exit the runway prior to the crossing point
• An arriving aircraft has exited the runway prior to the point at which the crossing is intended, or has passed the crossing point

**Traffic Advisories**

Traffic advisories are given to both IFR and VFR aircraft as a useful tool for separating aircraft. There are four elements involved in issuing a radar traffic advisory:

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

If an aircraft is not radar identified, report the displayed altitude as “altitude indicates”, and do not specify a type.

*Traffic one o’clock, seven miles, southbound Cessna Citation level at niner thousand.*

*Traffic ten o’clock, eight miles, passing left to right, Boeing 737 descending through seven thousand.*

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

**VFR Traffic**

Handling VFR traffic varies based on the airspace classification of the airport. Please keep in mind that handling of VFR aircraft tends to differ with airspace and airport and therefore more verbal coordination may be needed for VFR operations than for IFR aircraft.

**Sequencing and Separation**

There are different service level requirements for VFR aircraft that vary based on the airport’s airspace category. Sequencing is a set of instructions that inform aircraft of their order for a given runway or airspace area. These instructions are normally traffic advisories and “follow” instructions. Separation is a stronger requirement that involves maintaining a prescribed amount
of space between two aircraft. The phrase “maintain visual separation” is used only when separation is required; it is not to be used when sequencing is the only requirement.

The requirements for sequencing and separation at different airports is further discussed in the “VFR Departures” section below.

**Methods**

The following techniques can be used to help sequence VFR and IFR aircraft:

- **“Make a right 360”** – make a 360 degree turn
- **“Make a left 270”** – make a 270 degree turn, and end up on the next pattern leg
- **“Make short approach”** – turn base and final closer than normal to the runway
- **“Turn direct the threshold”** – turn directly to the runway threshold
- **“Extend (leg)”** – extend the leg of the traffic pattern being flown

In general, IFR aircraft should be prioritized over VFR aircraft. However, consideration must be given for the most efficient flow of the airport as a whole.

**Altitudes**

**Assigning Altitudes & Restrictions**

It may be necessary to assign specific altitudes to VFR aircraft for separation purposes. Altitudes may be assigned to VFR aircraft in a VFR clearance, in a takeoff clearance, or while the aircraft is in flight. Here are some examples of the different forms of altitude assignments that can be given to VFR aircraft:

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

*Runway two four, make left closed traffic at or below two thousand two hundred, cleared for takeoff.*

*Maintain VFR at or above three thousand.*

*Maintain 5,500 while in Bravo airspace.*

**Removing Altitudes & Restrictions**

If the altitude assigned to a VFR aircraft does not meet the requirements for a VFR cruising altitude, instruct the aircraft to resume an appropriate VFR altitude for the direction of flight once the restriction is no longer needed:

*Resume appropriate VFR altitudes.*
VFR Closed Traffic

Aircraft requesting VFR closed traffic are given traffic pattern instructions in the takeoff clearance:

*Left closed traffic approved, Runway 24, cleared for takeoff.*

The tower controller can use numerous methods to sequence VFR traffic in the pattern. When traffic is light, aircraft in the pattern are not given any specific instructions on when to turn, and are simply given a landing clearance when appropriate. When other traffic is a factor, instructions such as “extend downwind”, “turn base now”, etc. are commonly used. Here are a few examples:

*Extend downwind, tower will call base turn. Traffic Cessna 182 turning onto a three mile final.*

*Left base approved. Wind two five zero at one zero, Runway 24, cleared for the option.*

Maneuvers such as a left or right 360 degree turn, a left or right 270 degree turn or “S-turns” can also be useful to space inbound traffic. For example, if you have a number of fast-moving aircraft for a runway and need to sequence in a slow-moving piston aircraft, you might consider holding the piston aircraft by the end of the runway to wait for a gap.

VFR Departures

**Class D Airspace**

The Tower controller is the only controller covering Class D airspace. In this airspace, the Tower controller provides:

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

Because VFR aircraft will not depart into airspace where radar separation is required, they are seldom assigned specific headings, but are instead given departure instructions corresponding to the legs of the traffic pattern. The following are examples of common VFR departure instructions:

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

*Right crosswind departure approved, Runway 36, cleared for takeoff.*

*Northbound departure approved, Runway 24, 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. At that point, issue a frequency change.

*N3KR, frequency change approved.*

For a departing VFR with flight following, keep the aircraft on your frequency as long as necessary to ensure you can provide the appropriate sequencing and services to the pilot within the Class D surface area. At or before the edge of the Class D surface area, manually handoff the aircraft.

For more information on Class D airspace operations and separation, see FAAO JO 7110.65, Chapter 7, Section 6.

**Class C Airspace**

The responsibilities for VFR aircraft increase in Class C airspace and are now shared between the Tower and radar controller(s). Class C services include:

- Sequencing of all aircraft to the primary airport;
- Standard IFR services to IFR aircraft;
- Separation (visual separation, 500’ vertical separation, or target resolution), traffic advisories, and safety alerts between IFR and VFR aircraft; and,
- Mandatory traffic advisories and safety alerts between VFR aircraft.

Because of this increased responsibility (and because it is a shared responsibility with more than one position having jurisdiction over the airspace), coordination is imperative.

Unless otherwise coordinated, all VFR departures shall be assigned runway heading and are included in silent releases like any other IFR aircraft.

For more information on Class C airspace operations and separation, see FAAO JO 7110.65, Chapter 7, Section 8.

**Class B Airspace**

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

Class B services include:

- Standard IFR services to IFR aircraft;
- VFR aircraft must be separated from VFR/IFR aircraft that weigh more than 19,000 lbs. and turbojets by no less than 1 ½ miles separation, 500’ vertical separation, or visual separation;
• VFR aircraft must be separated from VFR/IFR aircraft which weigh 19,000 lbs. or less by a minimum of target resolution, 500’ vertical separation, or visual separation;
• Mandatory traffic advisories and safety alerts between all aircraft; and,
• VFR helicopters need not be separated from VFR or IFR helicopters; traffic advisories and safety alerts shall be issued as appropriate.

Because of the increased separation requirement in Class B airspace, VFR departures are issued an altitude restriction when given clearance to enter Class B airspace.

For more information on Class B airspace operations and separation, see FAAO JO 7110.65, Chapter 7, Section 9.

**VFR Arrivals**

**Class D Airspace**
VFR arrivals receiving Flight Following will be instructed to contact TWR. Alternatively, aircraft may make the initial contact with TWR directly.

Ensure the arrival has at least the local altimeter setting, as well as any pertinent weather information. This can be accomplished by confirming that the pilot has obtained the current ATIS, if applicable.

All aircraft should be made aware of any other traffic in the pattern as well as their place in the sequence.

*Altimeter three zero two four, enter right base Runway 24.*

*Enter left downwind Runway 29. Traffic to follow Cessna 172 on a three mile final, report the traffic in sight.*

*Make straight in Runway 24.*

If required, create or amend the flight plan for the aircraft to reflect its type and arrival.

**Class C Airspace**
In Class C airspace, all arriving aircraft shall be radar identified by the overlying radar controller, and given sequencing instructions to the airport. Unless otherwise coordinated, TWR can expect all inbound VFR aircraft to be sequenced for the active runway by the overlying radar facility. TWR will then issue the landing clearance or alternative instructions.

Class C airspace requires pilots to establish two-way radio communications before entering. If the controller responds to a radio call with the aircraft’s callsign, radio communications have been established and the pilot can enter the airspace. If workload or traffic conditions prevent
immediate provision of the appropriate level of service, inform the pilot to remain outside the airspace until conditions permit the services to be provided.

*N99N, remain outside Class Charlie airspace and standby.*

### Class B Airspace
Inbound VFR aircraft handed off from an overlying radar controller will have been radar identified and cleared into the Class B airspace. As with Class C airspace, the radar controller is required to provide sequencing to the active runway. Generally, aircraft will be handed off to TWR established on final for the primary landing runway.

VFR arrivals may choose to remain below the outer shelves of the Class B airspace, in which case they will contact TWR directly. These aircraft must be cleared into the Class B airspace by TWR. This is accomplished as follows:

- Issue discrete squawk code, ATIS, and current altimeter;
- Verify altitude, radar identify the aircraft, and pick up track;
- Issue clearance into Class B airspace at or below the lower boundary of the overlying radar controller’s airspace (if necessary); and,
- Provide pattern entry instructions and a landing clearance.


*(Then,) N16B, radar contact 15 miles south of the Boston Airport at 1,500’, cleared into the Boston Class Bravo via right downwind Runway 22R, maintain VFR at or below 2,000.*

### Special VFR
Special VFR (SVFR) is a VFR flight cleared by air traffic control to operate within Class B, C, D, and E surface areas in metrological conditions below VMC (conditions below 3 miles visibility and a ceiling of 1,000’ MSL). SVFR operations are permitted for fixed-wing aircraft with a reported visibility of 1 mile or greater. There is no visibility restriction for helicopter SVFR operations.

SVFR operations are authorized provided no specific exclusion exists, within the lateral boundaries of Class B, C, D, and E surface areas, below 10,000’ MSL, and when requested by the pilot. SVFR is prohibited at some Class B airports (see sectional chart notes or A/FD); with coordination among active controllers, SVFR may be authorized at these airports despite published restrictions.

*N220CH, cleared through the Nantucket Class D surface area, maintain special V-F-R conditions.*
Additional directional or altitude restrictions may be applied in the SVFR clearance if it is operationally advantageous:

...cleared through the Nantucket Class D surface area west of the Nantucket airport...

...maintain special V-F-R conditions at or below 2000’.

SVFR departures in Class B and C airspace must be verbally coordinated with and released by the departure radar controller. SVFR arrivals must be verbally coordinated with the tower (Local) controller.

Apply altitude or visual separation between two SVFR aircraft or between SVFR aircraft and IFR aircraft. When applying vertical separation, do not assign a fixed altitude but clear the SVFR aircraft at or below an altitude which is at least 500’ below any conflicting IFR traffic.

For more information on Special VFR, see FAAO JO 7110.65, Chapter 7, Section 5.

Special Operations

Circling Instructions

If an instrument approach in use requires circling instructions, they are assigned by the tower controller on initial contact with an inbound aircraft. Depending on the approach in use and the active runway, various types of circling instructions may be given which are very similar to instructions given to VFR aircraft. These aircraft are given a cardinal direction in which to circle with respect to the airport, and can also be assigned pattern entry instructions.

Circle east, Runway 22R, cleared to land.

Circle northwest of the field, enter left base Runway 33.

The landing clearance is given when appropriate.

Formation Flights

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 shall be issued to standard formation aircraft.

MUSKET01 flight, Runway 24, taxi via Alpha, November, cross Runway 15.

Aircraft, especially formation flights, may request overhead maneuvers. You can use the following phraseology to instruct an aircraft that will conduct an overhead maneuver:
ATC: Air Force Three Six Eight, Runway 6, wind 070 at 8, pattern altitude 2,000, report initial.


ATC: Air Force Three Six Eight, break at midfield, report break. [This request should only be made if required for traffic or other reasons; specify the point of “break” only if nonstandard]

Pilot: Air Force Three Six Eight, right break.

ATC: Air Force Three Six Eight, cleared to land.

Overhead Maneuver

Initial Approach

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USA/USAF/USN aircraft should be reminded to check wheels down on each approach unless the pilot has previously reported wheels down for that approach. Tower (or the controller covering that position) shall issue the wheels down check in the landing clearance or at an appropriate point in the pattern.

Check wheels down.

For more information on military operations, see FAAO JO 7110.65, para 2-1-12, Military Procedures and 2-1-13, Formation Flights.
Opposite Direction Operations (ODO)

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.

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

Coordination

Coordination to initiate an ODO must include the phrase “opposite direction”, along with callsign, type, and runway. Radar must input "ODO" in the scratchpad of the arrival's datablock. Radar must, when required, issue an initial heading to Local for the departure that avoids conflict.

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.

Separation

The use of visual separation is not authorized. Each Tower facility SOP prescribes distance-based "cutoff points" that represent minimum lateral separation. ODO is not authorized inside the cutoff point unless an emergency exists. Radar must not allow an arrival to reach the cutoff point until the opposite direction operation is complete. If the integrity of the cutoff point has been or is about to be compromised, Radar must ensure recovery actions are taken.

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.

Wake Turbulence

When using ODO, the following wake turbulence separation applies:

- Small, Large, or Heavy behind Super: 4 minutes
- Heavy, Large, or Small behind Heavy: 3 minutes
- Small behind B757: 3 minutes
- Small behind Large (except B757): 3 minutes, unless waived by the pilot
Helicopter Operations

The local controller handles helicopters in different ways based on the location on the field they are operating (movement or non-movement areas).

Operations from a movement area such as a runway, taxiway or helipad are simply given any specific departure/arrival instructions followed by a takeoff/landing clearance:

*Remain west of Runway 4L at all times, Runway 15R, cleared for takeoff.*

Operations from a non-movement area such as a ramp are not given an explicit takeoff clearance since non-movement areas are not controlled by ATC. The same is true for requests for takeoff/landing at an airport location that is not visible to the controller or off the primary airport (but within Class B, C, or D airspace). In this scenario, inform the pilot that the operation will be at his/her own risk:

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

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

Issue additional instructions for approaching helicopters as required:

*Make right circling approach to Helipad 1, Cleared to Land.*

*Pass east of the Tower, Taxiway C, at A, Cleared to Land.*

*Remain west of the Runway 4L departure path, make straight-in approach, landing at the Signature Ramp will be at your own risk.*

For more information on helicopter operations, see FAAO JO 7110.65, Chapter 3, Section 11, Helicopter Operations.
Chapter 5: Approach Control

Position Responsibilities

The approach controller deals primarily with the separation and control of airborne IFR aircraft. In the United States, this position is often referred to as a TRACON (Terminal Radar Approach Control) facility.

TRACON is responsible for ensuring separation while sequencing IFR arrivals to the final approach course, climbing IFR departures and turning them on course before handing them off to the en-route controller, and providing services to VFR aircraft on a workload-permitting basis.

In addition to serving the primary airport, TRACON provides ATC services to all other airports within the position’s defined airspace that are not serviced by another controller. 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, which is accomplished by means of a handoff.

Coordination

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 radio communications will not be transferred.

You utilize a point-out anytime one of your aircraft, will or may, enter another controller’s airspace. If you think that you may need to issue a point out, then you probably should. It is always better to err on the side of caution.

The following information is required:

- 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 datablock
- Your intentions

K90: Cape Approach, Providence Approach.

PVD_APP: Go ahead.

K90: Point-out, 10nm west of SEY, N31398, 11,000’, request direct ENE and keep him with me.
The receiving controller can use one of the following phrases once the aircraft has been identified:

- **Point-out approved** – aircraft may enter the airspace and you can retain control
- **Radar contact** – you must transfer control and communications to the controller
- **Unable** – the aircraft may not enter the adjacent airspace at all

**ZBW:** *Boston Approach, Boston Center, point-out.*

**APP:** *Go ahead.*

**ZBW:** *Point out, 10 miles west of CON, DAL311, 11,000’, direct ENE and then over to Portland Approach.*

**APP:** *Point-out approved, E-F.*

**ZBW:** *C-D.*

The receiving controller may also issue “traffic”, indicating that you must separate your point out aircraft from the aircraft specified. Use the phrase “traffic observed” to indicate that you see the aircraft and will keep your aircraft clear of the traffic.

**APP:** *Traffic six south of CON, westbound Cessna 182 at 10,000’*

**ZBW:** *Traffic observed, E-F.*

**APP:** *C-D.*

**Radar**

In order for an aircraft to be radar identified and receive radar services, it is usually first assigned a squawk code. The squawk code is typically assigned in an IFR aircraft’s clearance while it is on the ground, but must be given by the radar controller for a “pop up” aircraft (one that requests radar services after it is already airborne).

**Identification**

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.
Radar identification may be established by:

- Observing a departing aircraft target within 1 mile of the takeoff runway end at airports with an operating control tower
- When the aircraft is already squawking a discrete code, requesting the aircraft to activate the “IDENT” feature of the transponder
- 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
- Observing a target make an identifying turn or turns of 30 degrees or more
- Requesting the aircraft to change to a specific code and observing the change
- Requesting the aircraft to change the transponder to “standby” and then, after you see the target change, back to normal operation

For Center controllers, an aircraft may be considered identified when the full data block is automatically associated with the beacon target symbol of an aircraft that is squawking a discrete code assigned by another facility. The phrase “radar contact” is still used, but no further beacon identification method is required.

If radar identification is established by observing a departing aircraft target within 1 mile of the takeoff end, as long as the aircraft altitude is verbally confirmed, use “radar contact”. When radar identification takes place by any other means, use “radar contact” and state the aircraft’s location with respect to a fix/navaid as well. For example:

*Radar contact one zero miles northwest of the Providence VOR.*

In all cases, radar identification also include a verification of the aircraft’s altitude.

When radar services are no longer required (VFR departure without flight following leaves Class B, C, or D airspace) or requested (aircraft cancels IFR or flight following), the phrase “radar service terminated” is given. If an aircraft cancels IFR or terminates flight following, it should be told to squawk VFR (1200).
Vertical Separation

The minimum vertical separation between IFR aircraft in an approach controller’s airspace that are not laterally separated is 1000’. Altitudes that are assigned to aircraft must ensure separation from other aircraft as well as terrain.

The Minimum Vectoring Altitude, or MVA, is the lowest MSL altitude at which an IFR aircraft may be vectored by the radar controller to guarantee terrain separation. The MVA is available for controllers under “Diagrams” in our sector files.

When not being vectored, aircraft are responsible for terrain avoidance. Aircraft do so by using the following elements published on terminal procedures (available at www.airnav.com) and low en-route charts (available at www.skyvector.com):

- MEA: Minimum En-route Altitude. When an aircraft is flying on a published STAR or Victor airway, the MEA is displayed along each segment of the route, which is the minimum altitude the aircraft may fly at along that portion to guarantee terrain clearance and radio reception.

- MOCA: The minimum altitude an aircraft may fly on a route segment to guarantee terrain clearance (not that radio reception is not guaranteed at this altitude).
• GPS Minimum Altitude: The MEA for aircraft navigating using a GPS rather than conventional navigation.

• MSA: Minimum Safe Altitude. These are depicted on all instrument approach procedures (IAPs) and display an altitude that is 1000’ higher than the highest obstacle within a 25 nautical mile radius from a navaid that is on the chart.

Before turning an aircraft off of the Tower-assigned or SID-assigned heading, or before vectoring an aircraft off of a published MEA/MOCA, the controller must ensure a radar identified aircraft is at or above the MVA.
Lateral Separation

The following are the minimum lateral separation standards between two aircraft that are not vertically separated as mentioned above.

For non-heavy aircraft of the same weight class, the separation minima is 3 miles. When aircraft of different weight classes are involved, separate aircraft operating directly behind (within 1,000’ below) or following an aircraft conducting an instrument approach as follows:

- Heavy behind heavy: 4 miles
- Small behind B757: 4 miles
- Small/large behind heavy: 5 miles

In addition to the above, separate aircraft landing behind another aircraft on the same runway by ensuring the following minima exist at the time the preceding aircraft is over the landing threshold:

- Small behind large or B757: 4 miles
- Small behind heavy: 6 miles

Consider parallel runways separated by less than 2,500’ as a single runway for these purposes.

Visual Separation and Traffic Advisories

An alternative to providing radar separation is visual separation, which relieves the controller of the responsibility of keeping two aircraft separated. In order to apply visual separation, an aircraft is first asked to report another aircraft in sight after a traffic advisory is given. Once the traffic is reported in sight, the phrase “maintain visual separation from that traffic” is applied. If the two aircraft are on a converging course, the other aircraft should be told that “traffic has you in sight and will maintain visual separation”. Visual separation may not be assigned in Class A airspace (at or above FL180).

Reference the ‘Traffic Advisories’ section under Chapter 5 for more information and proper phraseology for giving traffic information to aircraft.
Managing Aircraft In-Flight

Vectoring

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

- 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 specific direction:

  * Turn twenty degrees right.*  
  
  Notice that the number of degrees is spoken in group form.

- Fly its present heading:

  * Fly present heading.*

- Depart a fix/navaid on a specific heading:

  * Depart PROVI heading zero one zero.*

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.

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

- Proceed direct to a fix. The aircraft will turn in the shortest direction. For example: “proceed direct Providence”, “cleared direct Manchester”.

- 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. For example: “turn right heading one niner zero,
when able, proceed direct LUCOS”, “fly heading two seven zero, when able, proceed direct GLYDE.”

- Fly a particular heading, followed by instructions to join a specific radial, airway or final approach course. For example: “fly heading zero one zero, join the LaGuardia two two five radial inbound”, “turn left heading three four zero, join Victor one forty one, resume own navigation”, “turn right heading two four zero, join the runway two seven localizer”.

For more information on vectoring, see FAAO JO 7110.65, Chapter 5, Section 6.

Altitude Assignment

All IFR aircraft may only be assigned an altitude that is at or above the MVA.

Instruct an aircraft to:

- 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 NABBO at or above three thousand”, “cross Hartford at or below six thousand”.
- Cross a fix at an altitude: “cross Lawrence at three thousand”. Note that if the aircraft is at a different altitude than what has been assigned, the climb or descent is at the pilot’s discretion. Such an instruction is usually followed by further altitude instructions or an approach clearance. For example: “cross Providence at one one thousand, then descend and maintain seven thousand”. The aircraft in the previous example is required to cross the Providence VOR at 11000’, and then descend and maintain 7000’.
- Cross a fix at an altitude and then maintain that altitude: “cross Pease at and maintain niner thousand”.

Speed Adjustments

Instruct an aircraft to:

- Maintain its present speed or an assigned speed: “maintain present speed”, “maintain two five zero knots”.
- Maintain greater or less than a specified speed. Note the difference between the following two examples: “maintain two one zero knots or greater”, “do not exceed two zero zero knots”, “maintain present speed or greater”.
- Maintain either its highest or lowest practical speed: “maintain maximum forward speed”, “maintain slowest practical speed”.
- Increase or reduce speed a specified number of knots. Note that the amount is spoken in group form: “increase speed twenty knots”, “reduce speed thirty knots”.
• Increase or reduce to a specific speed. Note that that the word “knots” is not included in these instructions: “increase speed to two one zero”, “reduce speed to one eight zero”.

• Resume its normal speed. This instruction is given when an aircraft no longer requires a speed restriction: “resume normal speed”.

It is important to understand that all speed adjustments below FL240 are given in knots indicated airspeed (KIAS). The speed displayed on a controller’s radar screen is groundspeed, which is usually 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 KIAS. Because of this discrepancy, it may be useful to ask an aircraft to report its current indicated airspeed in order to accurately assign another speed, by instructing it to “say airspeed”. The following is a list of other essential notes regarding an aircraft’s speed.

• An approach clearance cancels any speed restriction. If a speed restriction is still necessary, it must be restated in the approach clearance. Once an aircraft crosses the final approach fix (FAF), any current speed restriction is cancelled and may not be reassigned.

• An aircraft that is assigned a speed higher than 250 knots above 10000’ MSL will automatically reduce its speed to at or below 250 knots once descending through 10000’ MSL.

• When issuing a speed restriction in conjunction with a descent, specify which instruction the pilot should accomplish first. For example: “descend and maintain seven thousand, then reduce speed to two one zero”, or “reduce speed twenty knots, then descend and maintain four thousand”.

• Unless an operational advantage will be realized, do not assign a speed restriction below the following recommended minima:
  - No speed restrictions slower than 250 knots until the aircraft is below 10,000’
  - For arrivals more than 20 flying miles from the runway threshold, do not assign a speed restriction below:
    ▪ For turbojet aircraft: 210 knots
    ▪ For reciprocating engine and turboprop aircraft: 200 knots
  - For arrivals less than 20 flying miles from the runway threshold, do not assign a speed restriction below:
    ▪ For turbojet aircraft: 170 knots
    ▪ For reciprocating engine and turboprop aircraft: 150 knots
  - For departures, do not assign a speed restriction below:
    ▪ Turbojet aircraft: 230
    ▪ Reciprocating engine and turboprop aircraft: 150 knots
    ▪ Helicopters: 60 knots
In general, speed restrictions take time to build separation (whereas a turn or altitude can typically achieve it more immediately). When issuing speed restrictions, be aware that different simulators and weather engines may mean that two aircraft assigned the same indicated speed restriction may have vastly different groundspeeds.

Through Clearances

You may clear an aircraft through intermediate stops:

*Cleared through (airport) to (fix/airport).*

Cruise Clearances

A cruise clearance authorizes an aircraft to descend at the pilot’s discretion to the minimum IFR altitude, and (when issued in conjunction with an airport clearance limit), to fly to the airport and complete any published instrument approach. When no approach is published, the aircraft can conduct a visual approach.

*N3911K, cruise FL190.*

When issuing a cruise clearance, the aircraft is assigned a block of airspace from the minimum IFR altitude up to and including the assigned cruising altitude. Climb/descent within the block is at pilot’s discretion. When the pilot verbally reports leaving an altitude in descent, he/she may not return to that altitude.

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.

Holding

Putting an aircraft in a holding pattern is sometimes necessary due to traffic density, weather or other factors. There are five components included in detailed holding instructions:

- Clearance limit to holding fix and cardinal direction. The aircraft’s clearance limit is changed to the holding fix, and the direction of holding is given.
- Holding course: This is usually a radial of a VOR or an airway.
- Leg length: Given in miles or minutes (if necessary).
- Direction of turns: If no turn direction is given, the hold is to be flown with right hand turns.
• Expect further clearance time: When the aircraft can expect to resume its filed route.

*Cleared to Manchester. Hold north on the Manchester three six zero radial, ten mile legs, left turns. Expect further clearance at zero two four zero Zulu, time now zero two two zero Zulu.*

If a holding pattern is depicted on a published chart, all that is needed is:

• Clearance limit to fix and cardinal direction
• The phrase “as published”
• An “expect further clearance” time

For example, if an aircraft flying the Norwich (ORW#) arrival into Boston is to hold at the Providence VOR, its holding instructions would be:

*Cleared to Providence. Hold south as published, expect further clearance at zero three two five Zulu, time now zero one zero zero Zulu.*

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. Continuing with the previous scenario, the following are two examples of acceptable clearances beyond a holding fix.

*Cleared to the Boston airport via last routing cleared.*

*Cleared to the Boston airport via the Norwich # arrival.*
**IFR Departures**

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

- Radar identification.
- A climb to the ceiling of the departure controller’s airspace or the aircraft’s cruise altitude, whichever is lower.
- Vectors to join the aircraft’s assigned route (if required), once the aircraft is above the applicable MVA.
- Handoff to the en-route controller or adjacent approach controller, whichever is appropriate.

**IFR Arrivals**

All IFR arrivals must be given weather information at the destination airport unless the aircraft indicate the current ATIS on initial contact. At the bare minimum, arriving aircraft must be given the following:

- Altimeter setting at the destination airport
- Approach to expect

If time and workload permit, give arriving aircraft a full weather report. For arrivals into a satellite or uncontrolled airport, ask the aircraft if it has a particular approach request after reading the weather. For example:

> Hartford airport reporting wind zero five zero at eight, visibility one zero. Few clouds at one thousand five hundred, ceiling three thousand broken. Temperature two four, dewpoint one three, altimeter two niner niner four. When able, say approach request.

**Standard Terminal Arrival Route (STAR)**

STAR procedures may have mandatory speeds and/or crossing altitudes published. Other STARs may have planning information depicted to inform pilots what clearances or restrictions to “expect”. These “expect” altitudes/speeds are not considered crossing restrictions unless verbally issued by ATC.

The STELA# arrival into KBDL is a good example of a STAR with “expect” instructions. The crossing altitudes of 15,000’ at ALB and 11,000’ at STELA are only valid when issued by ATC. By contrast, the ZELKA# arrival at KBED includes charted restrictions that become mandatory when a pilot is issued a “descend via” instruction.
The two images below depict the differences between the two types of crossing restrictions.

The image below shows mandatory speed and crossing altitudes for arrivals on the QUABN RNAV arrival.

The image to the right shows the “expect” instruction for arrivals on the GDM arrival.

The following are examples of different clearances for arrivals:

**Lateral/Routing Clearance Only**

*Cleared Hadly One arrival.*

**Routing With Assigned Altitude**

*Cleared Hadly One arrival, descend and maintain FL240.*

*Cleared Hadly One arrival, descend at pilot’s discretion, maintain FL240.*

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 or speed restrictions on an arrival does not alone authorize the pilot to comply with those restrictions; the pilot must receive a specific instruction.

To clear aircraft to comply with published restrictions, authorize aircraft to “descend via” the arrival procedure. This authorizes pilots to vertically and laterally navigate on the STAR. ATC remains responsible for obstacle clearance when issuing a “descend via” instruction to the pilot. Minimum enroute altitudes (MEAs) are not considered restrictions; however, pilots are expected to remain above MEAs.
Note: pilots are expected to descend to FL 240 as directed, and maintain FL 240 until cleared for further vertical navigation with a newly assigned altitude or a “descend via” clearance.

**Lateral/Routing and Vertical Navigation Clearance.**

*Descend via the Civit One arrival.*

*Descend via the Civit One arrival, except cross ARNES at or above 11,000.”*

**Lateral/routing and vertical navigation clearance when assigning altitude not published on procedure.**

*Descend via the Haris One arrival, except after BRUNO, maintain 11,000.*

*Descend via the Haris One arrival, except cross BRUNO at 13,000, then maintain 10,000.*

Note: the aircraft should track laterally and vertically on the Haris One arrival and should descend so as to comply with all speed and altitude restrictions until reaching Bruno and then maintain 10,000. Upon reaching 10,000, aircraft should maintain 10,000 until cleared by ATC to continue to descend.

**Direct routing to intercept a STAR/RNAV STAR/FMSP and vertical navigation clearance.**

*Proceed direct Mahem, descend via Mahem One arrival.*

*Proceed direct LUXOR, cross LUXOR at or above FL200, then descend via the KSINO One Arrival.*

Any other descent instruction, including “descend pilot’s discretion” or “cross (waypoint) at (altitude)” removes the responsibility to comply with published crossing restrictions. Note that the terms “descend pilot’s discretion” and “cross (waypoint) at (altitude)” have two meanings and should not be combined in the same transmission.

Pilots cleared for vertical navigation using the phase “descend via” are expected to inform ATC upon initial contact with a new frequency.

*DAL121 leaving FL240, descending via the Civit One arrival.*

Some arrivals terminate at a waypoint that serves as an initial approach fix on the instrument approach the arrival will fly (such as the JFUND, ROBUC, and OOSHN at KBOS for runways with transitions). These approaches work the same as any other of the full approaches discussed in previous sections. Aircraft can be vectored off the arrival onto the appropriate final approach course or, more commonly, are given an approach clearance with the unnecessary elements of PTAC left out.
Instrument Approach Clearances

Definitions

For all instrument approaches, aircraft can be vectored to final or cleared via any of an Initial Approach Fix (IAF), Intermediate Fix (IF), and/or Feeder Route:

<table>
<thead>
<tr>
<th>Fix/Route</th>
<th>Initial Approach Fix</th>
<th>Intermediate Fix</th>
<th>Feeder Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition</td>
<td>The fix(es) depicted on instrument approach procedure charts that identify the beginning of the initial approach segment(s).</td>
<td>The fix that identifies the beginning of the intermediate approach segment of the procedure. (Not always identified on approach charts.)</td>
<td>Route segments leading to an Initial Approach Fix. Always includes a minimum enroute altitude, heading/radial, and distance.</td>
</tr>
<tr>
<td>Example</td>
<td><img src="image1" alt="IAF" /></td>
<td><img src="image2" alt="IF" /></td>
<td><img src="image3" alt="Con" /></td>
</tr>
</tbody>
</table>

Additionally, there are several means by which an aircraft may be required to “turn around” as part of an approach clearance from an IAF, IF, or Feeder Route:

<table>
<thead>
<tr>
<th>Fix/Route</th>
<th>Procedure Turn</th>
<th>Hold-in-Lieu of Procedure Turn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition</td>
<td>The maneuver prescribed when it is necessary to reverse direction to establish an aircraft on the intermediate approach segment or final approach course. 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.</td>
<td>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. A hold after entry requires authorization.</td>
</tr>
<tr>
<td>Example</td>
<td><img src="image4" alt="R-095" /></td>
<td><img src="image5" alt="H-050" /></td>
</tr>
</tbody>
</table>
PTAC

A simple way to remember all that is needed in an instrument approach clearance is to memorize the acronym “PTAC” (pronounced P-TAC). Regardless of the type or instrument approach (ILS, VOR, NDB, LOC, RNAV) the PTAC method is used for the approach clearance. Quite often, however, some components of PTAC are not needed, in which case they are omitted.

The four components of PTAC are:

- **Position**: This is the aircraft’s distance in miles from a fix published on the approach chart.
- **Turn**: A final vector to the approach course.
- **Altitude**: An altitude assignment until established on the approach course.
- **Clearance**: The actual clearance for the approach.

**Position**

Position information is included in the approach clearance only when the aircraft is being vectored to the final approach course. If the aircraft is navigating to an initial approach fix (IAF) or an intermediate fix (IF) via its assigned route, a feeder route, or has been previously cleared direct to a fix on the approach course, the position is not given in the approach clearance because the aircraft is already capable of determining the distance to the fix.

**Turn**

An aircraft is issued a turn (vector) in the approach clearance only when it is being vectored to the final approach course. If the aircraft is already on a heading that allows it to intercept the final approach course, a turn is not necessary and is therefore not included.

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

- 20 degrees, when the aircraft will intercept inside of three miles from the final approach fix (FAF) or outer marker (OM). The aircraft may not be vectored to intercept the approach course less one mile outside of the FAF.
- 30 degrees (45 degrees for a helicopter), when the aircraft will intercept three miles or greater from the FAF.

A minimum of 1,000’ of 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.

**Altitude**

An altitude to maintain is always included in the approach clearance when the aircraft is being vectored to final. If the aircraft is already navigating to a feeder route or IAF via a published STAR
or Victor airway that contains published altitude information such as an MEA, an altitude to maintain is not given in the approach clearance.

**Clearance**
To authorize a pilot to fly any published instrument approach, the phrase “cleared approach” is given. If an aircraft is required to fly a particular instrument approach (which is almost always the case), state the name of the approach in the clearance. For example: “cleared ILS runway two seven approach”. If there is only one approach of a particular type available at the airport, the runway number may be omitted in the clearance. For example: “cleared NDB approach”.

If an instrument approach into a towered airport does not have a runway number associated with it or if a runway other than what is specified is active, circling instructions are included at the end of the approach clearance. For example: “cleared VOR Alpha approach, circle to runway two four.” Circling instructions are not given in an approach clearance into an un-towerded airport.

In any wake turbulence situation, particularly when an aircraft will follow a Heavy/B757, 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 on the approach.
```

**Methods**

**Vectors to Final: Full PTAC**
Refer to the ILS or LOC RWY 29 approach at KPWM for the following examples.

If an aircraft is being vectored to intercept the final approach course at or behind the SAPPE intersection, a correct approach clearance using the “PTAC” acronym is:

```
Seven miles from SAPPE, turn left heading three two zero, cross SAPPE at or above three thousand, cleared ILS Runway 29 approach.
```

If the aircraft will join the localizer behind the PEATT intersection (remember that it must be at least one mile behind PEATT, the FAF), a sample approach clearance would be:

```
Eight miles from PEATT, fly heading two seven zero, descend and maintain two thousand five hundred until established on the localizer, cleared ILS Runway 29 approach.
```

Notice that any of the previously mentioned methods of vectoring and assigning altitudes to aircraft may be applied in approach clearances. If an aircraft requests the localizer approach instead of the ILS and is already on an appropriate intercept heading, the approach clearance would sound like:
Four miles from SAPPE, cross SAPPE at three thousand, cleared localizer Runway 29 approach.

**Abbreviated PTAC**

If an aircraft is currently proceeding direct to the Kennebunk (ENE) VOR and is to fly the full approach from the ENE Initial Approach Fix (IAF), the approach clearance no longer requires a position to be given:

*Cross Kennebunk at or above three thousand, cleared ILS Runway 29 approach.*

For the next series of examples, refer to the VOR RWY 6 approach into KHYA. Again, if an aircraft is being vectored to the final approach course, a sample approach clearance would be:

*Six miles from ASKEW, turn left heading zero niner zero, cross ASKEW at two thousand, cleared VOR Approach.*

Notice that since there is only one VOR approach into KHYA, the runway name is not required in the approach clearance.

If the aircraft has the Martha’s Vineyard (MVY) VOR in its flight plan and is proceeding direct to MVY:

*CROSS Martha’s Vineyard at two thousand, cleared VOR approach.*

If the aircraft is traveling south-eastbound on V146 toward MVY, the approach clearance would be:

*After Martha’s Vineyard, cleared VOR approach.*

The altitude is not required because the MEA on V146 is 2,000’.

**Circling Approaches**

Now assume that runway 33 is active at KHYA and the weather is below VFR minimums.

Aircraft inbound on V146 could fly the VOR RWY 6 approach from MVY, and then circle to runway 33 once the airport is in sight. Assuming that the airport either has an active tower controller or the approach controller is providing tower services, an approach clearance would then sound like this:

*After Martha’s Vineyard, cleared VOR approach, circle to Runway 33.*

The acting tower controller provides more detailed circling instructions, which in this scenario, may sound like:
Circle west of the field, Runway 33, cleared to land.

A landing clearance is then given when appropriate.

If the airport is treated as uncontrolled, circling instructions are not given, and the aircraft is given a frequency change and may land on whichever runway it chooses.

**Direct to Fix**

Refer to the ILS or LOC RWY 11 approach at KPWM for the examples below.

Where adequate radar coverage exists, radar facilities may clear an aircraft to any fix 3 NM or more prior to the FAF along the final approach course provided the intercept angle does not exceed 30 degrees (in accordance with the rules maximum intercept angle rules listed above).

*Proceed direct AIMME.*

(Then, provided the aircraft will intercept final approach course with an angle not exceeding 30 degrees,) *Six miles from AIMME, maintain three thousand until established on the localizer, cleared ILS Runway 11 approach.*

Controllers may also clear an aircraft direct to an IAF or IF (on both conventional and RNAV approaches) and issue the approach clearance from that fix. If the intercept angle is less than 90 degrees and no procedure turn, hold-in-lieu of procedure turn pattern, or arrival holding is depicted:

*Cleared direct PARSO, maintain at or above 5,000 until PARSO, cleared ILS Runway 11 Approach.*

When a procedure turn, a hold-in-lieu of procedure turn pattern, or arrival holding is depicted and the intercept angle is less than 90 degrees, aircraft must be instructed to conduct a straight-in approach if ATC does not want the pilot to execute a procedure turn or hold-in-lieu of procedure turn.

(Refer to the ILS or LOC RWY 29 approach at KPWM. If an aircraft has been instructed to “proceed direct SAPPE” and will intercept the final approach course at less than 90 degrees:)

*Cross SAPPE at or above three thousand, cleared straight-in ILS Runway 29 approach.*

When a procedure turn, hold-in-lieu of procedure turn pattern, or arrival holding is depicted and the intercept angle is greater than 90 degrees, the pilot cannot be instructed to fly a “straight in” approach and is expected to execute the procedure turn or hold-in-lieu of procedure turn if cleared direct to that IAF.
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.

Refer to the RNAV (GPS) Y Runway 19 Approach at KALB. Aircraft can be:

- Vectored to final (1 mile or further from the FAF).
- Cleared for the approach while flying direct to any of CAM, EYMEY, PAYGE, QIFET, or XIPAQ (provided the aircraft will intercept its course at an intercept angle of 90 degrees or less; “straight-in” clearance is not required as no procedure turns or holds-in-lieu of procedure turns are depicted).

For more information on instrument approach clearances, see FAAO JO 7110.65, Chapter 4, Section 8, Paragraphs 1-10, Approach Clearance Procedures and FAAO JO 7110.65, Chapter 5, Section 9, Radar Arrivals.

**Visual Approach Clearances**

Visual approaches are useful tools for reducing a controller’s workload. An aircraft may be given a visual approach if the weather is VFR (visibility 3 statute miles or greater) and the reported ceiling is at least 500’ above the MVA. In order to clear an aircraft for a visual approach, it must report one of the following in sight:

- The airport or runway.
- A preceding aircraft.

To have an aircraft report the airport in sight, give the direction and distance of the airport from the aircraft’s present position using phraseology similar to that used to issue a traffic advisory:

*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:

*Cleared visual approach Runway 22L.*

If an aircraft is to follow another aircraft already on approach, simply give a traffic advisory as discussed above 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:

*Follow that traffic, cleared visual approach Runway 22L.*

Because the term “follow” implies it, there is no need to state “maintain visual separation”.
All aircraft following a Heavy/B757 must be informed of the airplane manufacturer and/or model:

*Cessna 34J, following a Boeing 757, 12 o’clock, six miles.*

At an uncontrolled 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.*

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.*

Visual approaches are beneficial for the approach controller for the following reasons:

- A visual approach clearance relieves ATC of the responsibility of terrain separation.
- When an aircraft has reported another aircraft on the visual approach in sight, the controller is no longer required to ensure radar separation between the two aircraft.
- For this reason, multiple aircraft may be “strung” together on a visual approach, which increases efficiency.

**Charted Visual Flight Procedures (CVFPs)**

CVFPs are published to provide additional 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, depending on the procedure, may be vectored onto a navaid).

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 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.*
Contact Approaches

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.

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’.

IFR Operations at Non-Towered Airports

An IFR aircraft arriving or departing a Non-Towered (i.e., Class E or G field) is handled differently than it would be at a Towered airport.

Since no tower services are provided at these airports, the only way to ensure separation between two IFR aircraft is to only allow one IFR aircraft into or out of the airport at any given time. This is known as the “one-in/one-out” rule. For instance, if a departing aircraft has been issued a departure release, any arriving IFR aircraft must be held until the first aircraft has departed and is radar identified by the controller.

If an aircraft departs IFR from a Non-Towered Airport, the overlying radar controller will give the aircraft its clearance, followed by the departure release. Clearances to these aircraft generally follow the same “CRAFT” method as discussed in the clearance delivery SOP, but a few points must be considered.

If a departure procedure is to be given, ensure that the departure contains explicit instructions for the pilot to follow upon departure. For instance, if the departure reads “climb on assigned heading”, the departure is not valid when the airport is uncontrolled since there is no tower controller to give a takeoff clearance with an assigned heading in it. In lieu of a departure procedure, an initial heading may be assigned followed by radar vectors to the first waypoint, but the assigned heading must provide acceptable terrain and obstacle clearance which is difficult to verify. In general, try to avoid assigning departure procedures or headings to aircraft departing an airport that is uncontrolled unless it provides a significant operational advantage (e.g., RNAV departures).

Note that Departure Procedures or Obstacle Departure Procedures are published in a different place than a Standard Instrument Departure. These procedures may be assigned to aircraft at controlled or uncontrolled airports, and may be valuable for use in top-down controlling:
Cleared to the Boston Airport via the Syracuse Departure Procedure, radar vectors Albany, then as filed. Climb and maintain 3,000, expect...

If no departure procedures or headings are assigned, an aircraft’s clearance does not provide course guidance to the first waypoint in the flight plan. In other words, once the aircraft is airborne, the pilot is responsible for navigating on course while maintaining separation from terrain. Clearances of this nature do not include the phrase “radar vectors [first fix]” since radar vectors imply course guidance. The following are two ways to give an aircraft a clearance in this scenario:

- The aircraft may be cleared to the destination airport “as filed” if the filed route is acceptable.
- The aircraft may be cleared to the destination airport via “[first fix], then as filed”. If the aircraft’s filed route requires an amendment, simply issue the first assigned waypoint in the clearance followed by the rest of the route.

N123RX, cleared to the Boston Airport via enter controlled airspace heading 290, radar vectors Marconi, direct...

After the clearance is read, the aircraft is either told to “hold for release”, or is “released for departure” as appropriate. A departure release consists of the following elements:

- The phrase “released for departure”
- The current time
- Clearance void time (if necessary)
- A location, altitude, or phase of flight to report at (e.g., “report airborne this frequency”, “report passing through 3,400”)

For example, assume that an aircraft has filed an IFR flight plan from Provincetown (KPVC) to Hartford (KHFD) via PVD V167 HFD. Since Provincetown is an uncontrolled airport, the aircraft may be cleared to the Hartford airport “as filed”, or “via Providence, then as filed.” Note that the departure frequency is not needed, as the aircraft will be told to report airborne on the current frequency in the release. After the clearance is read back, a departure release may be issued.

Released for departure at zero two zero four Zulu. Clearance void if not off by zero five zero four Zulu. Report airborne this frequency.

It is important to choose the clearance void time wisely, because the approach controller must protect a significant amount of airspace around that airport once the departure release has been given to ensure separation from other IFR traffic in the area.
IFR arrivals into Non-Towered Airports should advise ATC of their requested approach. Vectors to final may be provided if a final approach course is depicted on the radar screen. Otherwise, a full approach clearance must be issued.

Once established on the final approach course, arrivals shall be given a frequency change so they can announce intentions to nearby traffic on the UNICOM frequency. However, this does not imply that the aircraft’s IFR separation requirement has been removed. Controllers must protect the airspace surrounding the airport both for the approach itself as well as the area where the published missed approach procedure is flown in case the aircraft has to fly it.

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.

Per 7110.65 5-1-13(b), the phrase “radar service terminated” is not required.

Once the aircraft is on the ground and contacts the controller to cancel IFR, the cancellation is acknowledged.

IFR cancellation received.

VFR Aircraft

Managing VFR Traffic

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 Class C or Class B airspace.

The following are the separation standards involving VFR traffic in Class C airspace:

- Between two VFR aircraft: separation is not required
- Between a VFR aircraft and an IFR aircraft: radar targets may not touch unless separated 500’ vertically

The following are the separation standards involving VFR traffic in Class B airspace:

- Between a VFR aircraft and another VFR or IFR aircraft weighing 19,000 pounds or less: radar targets may not touch unless separated 500’ vertically
- Between a VFR aircraft and another VFR or IFR aircraft weighing more than 19,000 pounds: 1.5 miles, unless separated 500’ vertically
Remember that the standard separation between IFR aircraft described in the above sections applies no matter what airspace classification an aircraft is operating in.

Flight following to VFR aircraft shall be provided on a workload permitting basis. Once the aircraft is radar identified, radar services and traffic advisories are given until the aircraft exits the controller’s airspace, cancels flight following, or the controller is no longer able to provide flight following services.

VFR Practice Approaches

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.

Where separation services are required (i.e., in Class C or B airspace), VFR aircraft should be “cleared for the approach”, and be provided standard IFR separation (once cleared for the approach).

If IFR separation is being provided:

- Instruct the aircraft to “maintain VFR” on initial contact.
- Vector the aircraft for the approach as usual.
- Issue a normal clearance for the approach.
- IFR separation is now required, except that vertical separation reduces to 500’ other than when operating below Heavy/B757 aircraft.

V311CB, five miles from UFTAC, turn right heading 040, maintain 3,000 until established on the localizer, cleared ILS Runway 6 Approach. Maintain VFR.

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.

If IFR separation is not being provided:

- Instruct the aircraft to “maintain VFR” on initial contact.
- Issue headings and altitudes only as required or on request.
- If an altitude is assigned, it must meet MVA, MSA, or minimum IFR altitude criteria.
- Use the phrase “maintain VFR, practice approach approved, no separation services” to authorize the practice approach.
• IFR separation is not required.

N602TL, cross Nantucket at or above 2,500, VFR practice VOR Runway 24 Approach approved, no separation services provided.

N789PF, six miles from WAIVS, turn left heading 220, maintain 2,000 until established on the localizer, VFR practice ILS Runway 24 Approach approved, no separation services provided.

For all VFR practice approaches, coordinate the following when transferring communications to another controller:

• If separation is being provided
• Authorization, if given, for the missed approach
• Any other special instructions, including alternate missed approach instructions, traffic information, etc.

VFR-on-top

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 the clearance. 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 other aircraft.

Standard IFR separation is not applied but controllers must continue to provide traffic advisories and safety alerts, and applying merging target procedures to aircraft operating VFR-on-top.

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.

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 those conditions do the separation requirements change).

N1153, climb to and report reaching VFR-on-top. [Tops reported (altitude) or No tops reports]. If not on top at (altitude), maintain (altitude) and advise.
(Once pilot reports reaching VFR-on-top:) Maintain VFR-on-top.

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.

**N1153, descend and maintain eight thousand.**

For more information about VFR-on-top procedures, see FAAO JO 7110.65, Chapter 7, Section 3. 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.

**Pop-up IFR Clearances**

Occasionally, VFR aircraft request to open an IFR flight plan once airborne, in which case a “pop up” IFR clearance is given. The following are the steps to issue a pop up IFR clearance:

- Assign a squawk code and radar identify the aircraft if the aircraft is not already radar identified.
- Issue a clearance limit. This is usually the intended destination airport, unless the aircraft intends to operate IFR only until able to maintain VFR again, in which case a clearance to a particular fix that is clear of the bad weather is given.
- Assign the route to the aircraft’s destination. The route is prefaced by the phrase “present position”, assuming that IFR separation is present at the time the clearance is given. Usually, a flight plan is not filed in these scenarios, and a route is just assigned to the pilot by the controller.
- Issue an altitude to maintain.

For example, assume that a VFR aircraft 20 miles south of the PVD VOR requests an IFR clearance to KBOS. The following is how a clearance would sound, assuming that the aircraft has already been radar identified:

*Cleared to the Boston airport via present position, direct Providence, direct. Maintain niner thousand.*

As with any IFR clearance, a readback from the pilot (as well as the “readback correct” confirmation) is required.
Chapter 6: Center

Position Responsibilities

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, shall provide services to VFR aircraft within its lateral and vertical boundaries. CTR controller 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.

CTR shall be comfortable and competent with all procedures for coordination with the adjacent ARTCCs/FIRs, including knowledge of, and proficiency with, the Letters of Agreement (LOA) in place with adjacent facilities.

CTR may publish one ATIS as necessary. If an ATIS is published, it shall be for KBOS, unless an operational advantage is obtained by posting the ATIS elsewhere.

Airspace

All controlled airspace (i.e., up to FL600) within the ARTCC that is not being provided services by another controller is controlled by the overlying Center sector.

Separation Requirements

When operating Center, the following separation requirements apply in the enroute environment in addition to basic IFR separation.

Lateral Separation

- 5nm
- 2.5nm or greater from an airspace boundary
- In-trail handoffs from DEP: 3nm increasing to 5nm if aircraft are on diverging courses, or the lead aircraft is faster
- In-trail handoffs to APP: 10nm unless otherwise coordinated

Vertical Separation

- At or below FL410: 1,000’
- Above FL410: 2,000’ (note that the directionality rules for altitude no longer apply)

When operating top-down, reduced separation standards shall be adopted for subordinate airspace, to the separation standard utilized by that subordinate airspace (i.e., when controlling Approach, provide Approach separation standards).
### Speed Adjustments

Above FL240, speed restrictions may be issued using Mach numbers. Because the range of indicated airspeeds diminish at altitude, almost all speed restrictions given above FL290 will be expressed in Mach number. Speeds may be issued in increments of Mach 0.01.

*Delta 291, maintain Mach point 78.*

Most aircraft will transition between indicated airspeeds and Mach numbers between about 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.

As aircraft maintaining a Mach speed restriction initiate descent, issue a speed restriction referencing indicated airspeed:

*Delta 291, transition to 280 knots.*

*JetBlue 317, when you transition, maintain 250 knots.*

Speed adjustments may not be issued to aircraft above FL390 without pilot consent. The phrase “if unable, advise” may be used after the speed restriction to obtain pilot concurrence.

When assigning speeds to achieve spacing between aircraft at different altitudes, consider that ground speed may vary with altitude. Further speed adjustment may be necessary to attain the desired spacing.

On a standard day, the Mach numbers equivalent to 250 knots are:

- FL240: 0.6
- FL250: 0.61
- FL260: 0.62
- FL270: 0.64
- FL280: 0.65
- FL290: 0.66

### Controller Coordination

#### Speed & Altitude Assignments

If traffic is light, and there is no immediate concern for safety or separation, speed restrictions may be waived with prior coordination between Center and TRACON controllers. Though this is normally done on a “blanket” basis, it may also be done on a per-aircraft basis, as required by the affected TRACON controller.
Certain situations may call for the use of temporary altitudes, including step climbs, keeping track of altitude assignments for aircraft descending for an arrival procedure or an approach, or conducting a handoff with other than standard altitudes. If temporary altitudes are used, the enroute controller shall clear them when the altitude information is no longer valid or required for coordination or organization purposes.

**Shortcuts**

Without coordination, route amendments or “direct to” shortcuts can be issued to aircraft if the “direct to” point is within your airspace.

Any shortcuts that amend a portion of the route outside of your sector require coordination with the adjacent sector(s).

**Transfer of Control**

Should the neighboring ARTCC be offline, it may be necessary to send a “contact me” request to pilots entering your sector. Send the “contact me” if necessary no more than 20nm prior to airspace entry, and no later than 30nm after entering the airspace.

CTR shall transfer control and communications of an aircraft to the appropriate controller staffing an adjacent facility prior to that aircraft entering the lateral and vertical boundaries of the adjacent controller’s airspace.

Transfer of radar identification is normally accomplished via an automated handoff. Unless otherwise specified in a letter of agreement, the Boston Center controller shall ensure that the aircraft is at a 1x simulation rate, clear of any conflict, is at an appropriate altitude, and is on course.

In addition, when not otherwise specified by a letter of agreement, CTR shall initiate transfer of radar identification:

<table>
<thead>
<tr>
<th>Transferring To...</th>
<th>No sooner than...</th>
<th>No later than...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Another Center</td>
<td>50nm from border</td>
<td>10nm from border</td>
</tr>
<tr>
<td>Internal Sector</td>
<td>50nm from border</td>
<td>5nm from border</td>
</tr>
<tr>
<td>TRACON</td>
<td>30nm from border</td>
<td>10nm from border</td>
</tr>
<tr>
<td>Tower</td>
<td>8nm from airspace</td>
<td>2nm from airspace</td>
</tr>
</tbody>
</table>

Transfer communication once the handoff is completed and no further traffic information needs to be given to the aircraft.
Issuing Hazardous Weather Information to Pilots

AIRMET/SIGMET

An AIRMET is issued to amend the area forecast concerning certain weather phenomena which could potentially hazardous to aircraft that have limited equipment, instruments, or pilot qualifications.

There are three types of AIRMET:

- Sierra: Mountain obscuration or IFR
- Tango: Turbulence
- Zulu: Icing or freezing levels

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

Controllers may pass information about AIRMET and SIGMET updates to pilots.

PIREP

Pilot Reports, or PIREPs, may be given by pilots during any phase of flight. Controllers shall record information from the pilot, and then pass the information other aircraft as required.

Precipitation

Areas of precipitation are shown on real-world ATC radar screens. For our purposes, precipitation areas can be cross-referenced from SkyVector or other sources.

Issue advisories about areas of precipitation to pilots by defining the area of coverage 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, moving eastward at 20 knots, tops reported at FL240 by a Boeing 737.

Pilots may request to deviate around areas of precipitation. Approve requests to deviate whenever possible, or issue alternative instructions if the requested deviation is not possible.
Boston Center, AAL469, request to deviate 10 degrees right for weather.

When approving the deviation, state the word “approved”, and issue instructions allowing the pilot to return on course once clear of the area.

AAL469, deviation 10 degrees right approved, when able, proceed direct MHT.

AAL469, deviation approved, advise when able to resume own navigation.

AAL469, unable deviation, turn thirty degrees right, vector for traffic, advise clear of weather.

Traffic Management

Traffic management initiatives are rarely required, and will usually be implemented by the Controller in Charge or Events Coordinator during major events.

Traffic management initiatives include, but are not limited to, ground stops, miles in trail, and minutes in trail. To meet these restrictions, controllers may use enroute holding, vectors, reroutes, speed adjustment, and other approved techniques.

These are normally communicated by a Controller in Charge or Event Coordinator, but in the absence of those positions being filled, may come directly from the facility implementing traffic management procedures.

When operationally advantageous, implement traffic management initiatives with neighboring facilities. Controllers shall comply with traffic management restrictions imposed by neighboring facilities.

When restrictions are no longer required in the sector(s) that you are controlling, inform the Controller in Charge.
Special Flight Operations

Fuel Dumping

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.

If an aircraft is dumping fuel in IFR conditions, assign an altitude at least 2,000 feet above the highest obstacle within 5 miles of the route or pattern being flown.

Separate known aircraft from aircraft dumping fuel as follows:

- **IFR aircraft:**
  - 1,000’ above
  - 2,000’ below
  - 5 miles laterally
- **Radar identified VFR aircraft by 5 miles**

If you are in contact with an aircraft when it starts dumping fuel, advise adjacent controllers.

Controllers aware of fuel dumping shall 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.*

Broadcast an advisory when the fuel dumping operation is complete:

*Attention all aircraft, fuel dumping 10 miles east of Provincetown Airport terminated.*

Formation Flights

Formation flights can take place between any group of pilots, and are not restricted to military aircraft (although those are the most common).

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, followed by the word “flight”.

Support formation flight join-up when all of the following occur:

1. The participating pilot (or the flight lead) requests it
2. All participating pilots (or the flight lead) concur
3. 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.

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.

Formation flights will often check in individually on a new frequency to confirm all pilots are present. The lead will request a “flight check”, and each pilot will check in. Controllers should not reply to the “flight check”, and are cautioned not to mistake this request for a radio check.

Lead: “MACE 21 Flight Check”

Other Pilots: “2”, “3”, etc.

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 “BAMA23, squawk 4702” (then) “BAMA23, radar contact, (position if required). Cleared to MHT via Direct. Descend and maintain FL190”

Initial Approaches & Overhead Maneuvers

Formation flights may request to conduct overhead maneuvers by requesting an “initial”.

When an “initial” or “overhead” approach is requested by the pilot, vector the aircraft to the appropriate point or direct to the airport, and ask the aircraft to report the airport in sight. Once the airport has been reported in sight, use the following phraseology to authorize the initial/overhead maneuver:
MACE21 flight, cleared 10 mile initial, report initial with Bradley Tower on 120.30, frequency change approved.

Any overhead maneuver is VFR; the IFR flight plan is automatically cancelled when the aircraft reaches the “initial point” of the initial approach.

When working top down, instruct the aircraft to “report initial” on your own frequency, and then issue appropriate “break” instructions as described in the earlier sections of this document.

Aerial Refueling

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 ALB and BOS along Q935. Maintain FL230.

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.

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.

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.

Military Operating Areas (MOAs)

A Military Operations Area or MOA is airspace of defined vertical and lateral limits used for military flight training. These large areas of the country are shown on VFR and low en-route sectionals as enclosed by a line of magenta hash marks with a sharp outer edge.

An MOA is considered “hot” when a military aircraft has been issued a clearance into the airspace. However, there is no requirement to keep aircraft clear of the airspace. IFR traffic can be cleared through MOAs provided that standard IFR traffic separation criteria can be met. VFR traffic can pass through an MOA at any time, but VFR aircraft receiving Flight Following shall be advised of active MOAs.
NOBLE12, cleared into the CONDOR 1 MOA between 9,000 and 17,000.

If an aircraft operating in the MOA requests to change frequencies, approve the request, and instruct the aircraft to contact you prior to exiting the MOA:

Switch to discrete frequency approved, contact me on 134.70 at (altitude) prior to exiting the MOA.

Military Training Routes (MTRs)

Military Training Routes (MTR) are mutually developed for use by the military for the purpose of conducting low-altitude, high-speed training. Generally, MTRs are established below 10,000 feet MSL for operations at speeds in excess of 250 knots. However, route segments may be defined at higher altitudes for purposes of route continuity.

MTRs are depicted on sectional as well as IFR enroute charts.

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 3,000’ AGL.

Four number characters (e.g., IR1206, VR1207, etc.) shall identify MTRs with no segment above 1,500 feet AGL. MTRs that include one or more segments above 1,500 AGL shall be identified by three number characters (e.g. IR206, VR207, etc.). VFR Sectional charts depict all IRs and VRs.