

# ZSE Radar Cheat Sheet

V1.2

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## 1. Terminal Radar Separation (5-5-4)

Class	Rules (x1000lbs)	Laterally	Vertically	Sep.
B	IFR > IFR	3 Miles	1000ft.	Visual
	Any > VFR (>19)	1.5 Miles	500ft.	Visual
	Any > VFR(<19)	Visual	500ft.	Targ. Res.
C	IFR > IFR	3 Miles	1000ft.	Visual
	IFR > VFR	Visual	500ft.	Targ. Res.
	VFR > VFR	Traffic Advisories and Safety Alerts		
D	IFR > IFR	3 Miles	1000ft.	Visual
	IFR > VFR	Traffic Advisories and Safety Alerts		
E	Same as Class Delta airspace.			

**Target Resolution:** the targets on the radar can not touch.

## 2. Enroute Radar Separation (5-5-4 d)

- Below FL600:** 5 nm
- At or above FL600:** 10 nm

## 3. One In / One Out Rule

- There can only be one IFR aircraft operating at an uncontrolled field at once.
- IFR aircraft departing will be given a departure release, only one aircraft may be released for departure at once.
  - Departure Release Phraseology: (4-3-4)**
    - Hold for Release Phraseology:** "(callsign), hold for release, advise number one for departure, frequency change approved."
    - Zulu Time Phraseology:** "(callsign), released for departure, clearance void if not off by (zulu time), advise (facility) not later than (zulu time) of intentions, time (current zulu time)."
- IFR Cancellation must be requested by the pilot, and the pilot may cancel IFR anytime they are not required to be under IFR.

- d. **Change to advisory phraseology:** “(callsign), no traffic is observed between you and the field, report cancellation of IFR or missed approach this frequency, radar service terminated, frequency change approved.”
- e. Applies from issuance of approach clearance to an arriving aircraft to cancellation of IFR or missed approach - **OR** - departure release given to departure to when the departure is radar contacted.

#### 4. Minimum Altitude Definitions

- a. Minimum Vectoring Altitude (MVA): the lowest altitude a radar controller may issue aircraft altitude changes, vectoring, or direct-to issuance unless otherwise authorized by DVAs
- b. Minimum Safe Altitude (MSA): the lowest safe altitude that is at least 1000 feet above any obstacle or terrain.
- c. Minimum Instrument Altitude (MIA): an altitude that is 1,000 feet above the highest obstacle within 4 nm of the course flown in non-mountainous areas, or 2,000 feet above in [mountainous areas](#).

#### 4. Radar Identification (5-3-2)

Form	Phraseology/Explanation
IDENT	<i>“(callsign), ident.”</i>
Change Squawk	<i>“(callsign), reset transponder, squawk (code).”</i>
Squawk STBY/C	<i>“(callsign), squawk mode (standby/normal) for radar identification.”</i>
30-Degree Turn	<i>“(callsign), turn (at least) 30 degrees [left/right] for radar identification.”</i>
Position Report	Aircraft's reported position allows for radar identification.
Departure	Observing a departing aircraft target within 1 mile of the departure end at airports with an operating control tower, so long as a verbal/nonverbal rolling/boundary notification is issued for each departure
Radar Ct. Lost	<i>“(callsign), radar contact lost.”</i>
Radar Term.	<i>“(callsign), radar service terminated, frequency change approved.”</i>

## 5. Wake Turbulence: (5-5-4 f)

- a. Apply wake turbulence criteria when an aircraft is directly behind or within 2,500ft vertically of the lead aircraft.
- b. **Phraseology:** “(callsign), caution wake turbulence from [heavy/super] (aircraft).”
  - i. Ex: “N123A caution wake turbulence from heavy 767”

Following Aircraft	Lead Aircraft	Separation (nm)
Small	757	4
Small/Large	Heavy	5
Heavy	Heavy	4
Small	Super	8
Large	Super	7
Heavy	Super	6

## 6. Merging Targets: (5-1-4)

- a. A set of radar identified targets who will pass over/under each other and are separated by the minimum vertical separation.
- b. Apply To:
  - i. All aircraft at/above 10,000ft.
  - ii. Turbojet aircraft at any altitude.
  - iii. Presidential aircraft at any altitude.
- b. Requires:
  - i. Traffic point-out, and any cautionary wake turbulence advisories.
  - ii. Upon request, vectors around the aircraft.

## 7. Safety Alerts: (2-1-6)

- a. Traffic Alerts:
  - i. Should be issued if two targets are on converging courses, including a course of action followed by the word “immediately”.
  - ii. **Phraseology:** “Traffic alert, (callsign), (traffic advisory), advise you [turn/climb/descend], immediately.”
- b. Terrain/Obstruction Alerts:
  - i. Should be issued if an aircraft is in unsafe proximity to a terrain or obstruction.
  - ii. **Phraseology:** “Low altitude alert, (callsign), check your altitude immediately, the [MEA/MVA/MOCA/MIA/MDA/DH] is (altitude).”

## 8. Traffic Advisories (2-1-21)

- a. Unless in Class A, issue traffic advisories to all aircraft on your frequency as required.
- b. To radar identified aircraft:
  - i. Azimuth in terms of the 12-hour clock
  - ii. Distance
  - iii. Direction
  - iv. If known, type of aircraft and altitude
  - v. **Example:** "N123A, traffic, eleven o'clock, one zero miles, southbound, Boeing Seven-Twenty-Seven, one seven thousand."
  - vi. If the pilot doesn't report traffic in sight, inform them when:
    - 1. The traffic is no factor
- c. To aircraft that are not radar identified:
  - i. Distance and direction from fix
  - ii. Direction
  - iii. If known, type of aircraft and altitude
  - iv. **Example:** "N123A, traffic five miles west of McMinnville Airport, eastbound, altitude unknown appears to be entering the pattern."
- d. For aircraft displaying Mode C, not radar identified, issue indicated altitude.
  - i. **Example:** "N123A, traffic, one o'clock, six miles, eastbound, altitude indicates six thousand five hundred."

## 9. Vectoring: (5-6-2)

- a. Any initial vector requires a reason.
  - i. Example: "N123A, turn left heading 150, vectors for the ILS RWY 36 approach."

## 10. Handoffs: (5-4)

- a. Handoffs must be completed by the transfer of control point, and only when the aircraft is clear of conflict.

## 11. Flight Following: (7-6-1)

- a. Get Aircraft Type.
- b. Squawk Code.
- c. In air: radar contact, maintain VFR.
- d. **Cancellation:** radar service terminated, squawk and maintain VFR, etc.

## 12. Pop-Up IFR (4-2-8)

- a. **IFR Request Phraseology:** "(callsign), (radio), go ahead with your IFR request."
  - i. Squawk code, radar identify, give clearance.
  - ii. Make sure aircraft are above the MVA:
    - 1. Climb the aircraft above the MVA.
    - 2. *OR* approval of PIC:
      - a. "(callsign), can you maintain your own terrain and obstruction clearance to (MVA/MIA/MEA)?"
- b. "(callsign), cleared to (airport) via present position, [radar vectors/direct] [fix], [climb and maintain/maintain] (altitude)."

## 13. VFR-On-Top (7-3-1)

- a. **Phraseology:** "(callsign), climb to and report reaching VFR-on-top, [tops reported at (altitude)/no tops reported], if not on top at (altitude) maintain (altitude) and advise."

## 14. Speed Restrictions (5-7-2)

- a. "(callsign), say airspeed."
- b. "(callsign), say mach number."
- c. "(callsign), maintain present speed."
- d. "(callsign), maintain (speed) knots"
- e. "(callsign), maintain (speed) knots or greater."
- f. "(callsign), do not exceed (speed) knots."
- g. "(callsign), maintain maximum forward speed."
- h. "(callsign), maintain slowest practical speed."
- i. "(callsign), increase/reduce speed to (speed)."
- j. **Off STAR/SID:** "(callsign), resume normal speed."
- k. **On STAR/SID:** "(callsign), delete speed restrictions."

*Note: Above phraseologies may be used with mach or speed. transition between IAS/Mach occurs between FL270-280*

## 15. Approach Clearances (4-8-1)

- a. **ILS:** follow PTAC phraseology.
- b. **LOC/BC:** follow PTAC phraseology.
- c. **Visual:** can be issued after visual contact of the airfield or an aircraft to follow.
  - i. **Controlled Field Phraseology:** "(callsign), cleared visual approach runway (number)."
  - ii. **Uncontrolled Field Phraseology:** "(callsign), cleared visual approach into (airport name)."

- d. **RNAV/VOR/NDB:** "(callsign), cleared direct (fix), cross (fix) at (altitude), cleared (full approach name)."
- e. **ARC:** "(callsign), [fly heading/cleared direct], join the (number) DME ARC (direction) bound, maintain (altitude) until established on the ARC, cleared (full approach name)."
- f. **ARC to VOR:** "(callsign), cleared direct (navaid), outbound (number) radial to (fix), maintain (altitude) until (fix), cleared (full approach name)"

*If the aircraft is going into a satellite field, add full airport name to the end of the clearance*

## 16. PTAC (4-8-1)

- a. **ILS:** "(callsign), (distance) miles from (IAF/FAF), turn [left/right] (degrees), descend/maintain (altitude) until established on the localizer, cleared ILS runway (number) approach."
- b. **Localizer Only:** "(callsign), (distance) miles from (initial/final), turn [left/right] (degrees), cleared localizer runway (number) approach."
- c. **RNAV/VOR/NDB:** "(callsign), (distance) miles from (IAF/FAF), turn [left/right] (degrees), descend/maintain (altitude) until established on the final approach course, cleared RNAV/VOR/NDB runway (number) approach."

## 17. Practice Approaches (4-8-11)

- a. State intentions after approach (missed/full-stop/etc.) and then holding, etc.
- b. Can fly any type of approach.
- c. **Class B/C Phraseology:** "(normal approach clearance), maintain VFR."
- d. **Class D/E Phraseology:** "N123A, practice approach approved, no separation services provided, maintain VFR"

## 18. Transfer to Tower

- a. Radar Tower (KSEA): keep the track.
- b. Non-Radar Tower: keep the track, or drop.
- c. Verbal Handoff

## 19. Holds (4-6-1 / 4-6-4)

- a. **Non-Published Hold:** "(callsign), cleared to (navaid), hold (direction) on the [radial], (number) [mile/time] legs\*, [left/right] turns\*, expect further clearance at (zulu time)."  
  - i. \*: optional items
- b. **Published Hold:** "(callsign), cleared to (navaid), hold (direction) as published, expect further clearance at (zulu time)."

- c. **Cancel:** “(callsign), cleared to (destination) via [route/radar vectors/last routing cleared].”

## 20. Course Deviation (2-6-4 h)

- a. **Approved Phraseology:** “(callsign), deviation approved ...”
- b. May state the following alongside the phraseology mentioned above:
  - i. “... when able proceed direct (fix)”
  - ii. “... when able, fly heading (degrees), vectors to join (airway) and advise.”
  - iii. **For Previous Crossing Restriction:** “... maintain (altitude), expect to resume (procedure) at (fix).”
  - iv. “... advise clear of weather.”
- c. **Unable Phraseology:** “(callsign), unable request deviation ...”
- d. May state the following alongside the phraseology mentioned above:
  - i. “... fly heading (degrees), advise clear of weather.”
  - ii. “... turn (number of degrees) degrees, vector for traffic, advise clear of weather.”

## 21. In-Air Refueling (9-2-13)

- a. **Phraseology:** “(callsign), cleared to conduct refueling [along \_\_ track/from \_\_ to \_\_], maintain (optional: refueling level) (altitude).”
- b. Information:
  - i. ARIP: Air Refueling Initiation Point
  - ii. ARCP: Air Refueling Control Point
  - iii. Egress Fix: the departure fix to prepare to resume on course from departing a track.
- c. Aircraft can be departed to a navigational reference point (fix) or the egress fix. Aircraft can be told to report these fixes or ARIP/ARCP.
- d. Receiving aircraft will squawk standby per military procedures, and no formation flight procedures will be applied. MARSA is automatically applied.

## 22. Formation Flights (2-1-13)

- a. Upon aircraft requesting a join with aircraft ensure the following is acquired:
  - i. The callsigns of all aircraft participating.
  - ii. Confirmation of visual of the lead aircraft.
  - iii. The lead aircraft of the formation flight for which all communications will occur with.
  - iv. Wingmen Squawk Standby



## 23. Precipitation Advisories (2-6-4)

- a. Categories:
  - i. Light
  - ii. Moderate
  - iii. Heavy
  - iv. Extreme
- b. **Phraseology:** "(callsign), area of (intensity) precipitation between (number) o'clock and (number) o'clock, (distance) miles, moving (direction) at (speed) knots, tops (altitude). Area is (number) miles in diameter."

*If intensity is unknown; at the end of the say: "intensity unknown."*

## 24. Weather/Chaff Advisories (2-6-4)

- a. **Azimuth Phraseology:** "(callsign), [weather/chaff] area between (number) o'clock and (number) o'clock, (distance) miles."
- b. **Fix Phraseology:** "(callsign), (distance) mile band of [weather/chaff] from (fix) to (fix)."
- c. For the "fix phraseology" the "fix" value may be interchangeable with a distance (in miles) and direction from the fix.

## 25. Hazardous Inflight Weather Advisory Service (2-6-6)

- a. **Phraseology:** "ATTENTION ALL AIRCRAFT. HAZARDOUS WEATHER INFORMATION (SIGMET, Convective SIGMET, AIRMET, Urgent Pilot Weather Report (UUA), or Center Weather Advisory (CWA), Number or Numbers) FOR (specific weather phenomenon) WITHIN (geographical area), AVAILABLE ON UPON REQUEST THIS FREQUENCY."

## 26. Block Altitude (4-5-7 g)

- a. **Phraseology:** "(callsign), maintain block (altitude) through (altitude)."

