

# Radar Separation

Radar separation defines the **minimum horizontal and vertical distance** that must be maintained between two aircraft in flight.

Since **safety is the top priority in aviation**, controllers must ensure separation is maintained at all times. **Radar separation is considered maintained when either horizontal or vertical separation (or both) exist between aircraft.**

When aircraft **lose both horizontal and vertical separation**, it is classified as a **Loss of Separation (LoS)**. If a controller is responsible for a **LoS**, it will result in an automatic failure during an exam.

Radar separation applies wherever **air traffic control (ATC) has radar equipment** available. In **Approach and Center sectors**, radar is always used to verify separation. **Tower controllers at international airports also use radar screens**, so radar separation must be ensured in the **tower environment** for **departures and approaches**.

A separate guide is available detailing **radar separation procedures for tower controllers**.

## When is Separation Required?

The requirement for **radar separation** depends on the **airspace** and the applicable **flight rules**.

# Radar Separation Requirements

Radar separation is **mandatory** between:

- **All flights in airspace A and B** (not applicable in some countries).
- **IFR to IFR** in airspace **C, D, and E**.
- **IFR to VFR** in airspace **C**.
- **Special VFR to IFR** within a **Control Zone (CTR)**.

## Vertical Separation

The following **minimum vertical separation** applies between aircraft requiring separation:

Flight Level Range	Vertical Separation	Remarks
FL410 - UNL	2000 FT	
FL290 - FL410	2000 FT	<b>CVSM</b> (Conventional Vertical Separation Minimum, exception)

1000 FT	<b>RVSM</b> (Reduced Vertical Separation Minimum, standard)	
GND - FL245	1000 FT	

Vertical separation applies at both **altitudes (AMSL)** and **flight levels (FLs)**.  
Vertical separation **is not used on final approach**, where **only horizontal separation** is applied.

## Horizontal Separation

The following **minimum horizontal separation** applies between aircraft requiring separation:

Flight Level Range	Horizontal Separation
FL245 - UNL	5 NM
GND - FL245	3 NM
Final approach (within 10 NM)	2.5 NM

Horizontal separation is **always measured as a direct line** between the **centers of aircraft radar targets**.

## Formation Flight Considerations

- **Formation flights must be separated from other traffic by 1 NM more than the required minimum distance.**
- **Two formation flights must be separated from each other by 2 NM more than the required minimum distance.**

## Wake Turbulence Considerations

If **wake turbulence separation** requirements **exceed** the above values, the **higher separation value always applies** to ensure safety.