

Wake turbulence separation

Wake turbulence: yet another abstract new term. This video explains what wake vortices are and how they arise.

And what do air traffic controllers have to do with it? We have to make sure that accidents like the one shown in the video in New York don't happen again. There are minimum separation values for this depending on the maximum take-off mass of the aircraft and we as controllers need to make sure these separation distances are maintained at all times.

When must wake turbulence separation be applied?

Wake turbulence separation is used in areas where wake turbulence is expected.

Between aircraft with **obligatory radar separation** (see radar separation), if:

- an aircraft is directly behind a preceding aircraft at the same altitude or less than 1000ft below
- an aircraft crosses directly behind another aircraft - at its 6 o'clock position - at the same altitude or less than 1000ft below

Between aircraft in the **approach or departure phase** of flight when:

- an aircraft is directly behind a preceding aircraft at the same altitude or less than 1000ft below it
- an aircraft crosses directly behind another aircraft - at its 6 o'clock position - at the same altitude or less than 1000ft below it
- both aircraft are using the same runway or parallel runways less than 760m apart
- the aircraft use crossing or parallel runways (distance of 760m or more) and one aircraft flies through the flight path of the preceding aircraft at the same altitude or less than 1000ft below it

Wake turbulence separation does not apply to:

- approaching VFR flights
- approaching IFR flights that are performing a visual approach, have reported the preceding aircraft in sight and have been instructed to follow it and maintain their own separation

In these cases, a **wake turbulence warning (CAUTION WAKE TURBULENCE)** must be issued.

Departure phase

A VFR flight is in the departure phase from take-off until

- reaching 1000ft above aerodrome level or
- reaching level flight or
- entering (right) downwind

Approach phase

A VFR flight is in the approach phase when it is at or below 1000ft above aerodrome level and

- has entered the traffic pattern or part of it or
- has begun the final descent within a control zone

until landing.

A **touch-and-go** is considered an approaching aircraft until touchdown, from then on it is handled as a departing aircraft. A **low-approach** is considered to be an approaching aircraft until it crosses the runway threshold, after which it is considered to be a departing aircraft.

Wake turbulence categories

For this purpose, aircraft are divided into four wake turbulence categories (WTC) according to their maximum take-off mass (MTOM).

WTC	MTOM
Light (L)	$MTOM \leq 7t$
Medium (M)	$7t < MTOM < 136t$
Heavy (H)	$MTOM \geq 136t$
Super (J)	A388; A225

Of course, you don't need to know how heavy each aircraft is. In addition to the aircraft type, the corresponding WTC can always be found in the flight plan.

The Boeing 757 counts as heavy in Germany despite an MTOM of less than 136 tons.

Aircraft in the “Super” category are treated as “Heavy” above flight level 100.

Minimum separation values

Wake turbulence separation can either be distance-based or time-based. As a standard procedure, distance-based wake turbulence separation is used. However, there are also constellations in which this is not possible and in these cases time-based wake turbulence separation is used.

Distance-based

Preceeding	Suceeding	Separation value
M	L	5 NM
H	L	6 NM
	M	5 NM
	H	4 NM
J	L	8 NM
	M	7 NM
	H	6 NM

Time-based

With time-based wake turbulence separation, a distinction is made between the separation values of departing and approaching aircraft.

We also differentiate between a take-off from an intersection or the full runway length. Usually the values of the take-off on an intersection apply to a take-off on a crossing runway. In each case, the separation value is increased by one minute.

In contrast to distance-based wake turbulence separation there is no separation value between heavy-heavy aircraft in time-based wake turbulence separation.

Departing aircraft

Preceeding	Suceeding	Separation value	Separation value (intersection)
M	L	2 min	3 min
H	L	2 min	3 min
	M	2 min	3 min

J	L	3 min	4 min
	M	3 min	4 min
	H	2 min	3 min

Approaching aircraft

Preceeding	Suceeding	Separation value
M	L	3min
H	L	3min
	M	2min
J	L	4min
	M	3min
	H	2min

Examples for separation values

- 1. IFR departure B744 (H) behind IFR departure B744 (H) --> 4 NM
- 2. IFR departure C172 (L) behind IFR departure A388 (J) --> 8 NM
- 3. IFR approach A320 (M) behind IFR approach B753 --> 5 NM (B753 is considered H)
- 4. IFR approach B752 behind IFR approach B773 (H) --> 4 NM (B752 is considered H)
- 5. IFR approach A320 (M) behind IFR approach A320 (M) --> no wake separation needed (no value in the table for this scenario)
- 6. VFR approach C172 (L) behind IFR Anflug A320 (M) --> Wake turbulence warning required (for 2 minutes)
- 7. VFR departure C172 (L) behind IFR departure A332 (H) --> 6 NM (see table; separation required as this is a VFR departure)
- 8. VFR touch and go C172 (L) behind IFR departure A320 (M) --> 5 NM as soon as the C172 enters the area where wake turbulence is expected after the touch and go

Further information on wake turbulence separation can be found [here](#).