

# Runway separation

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# Runway separation

Runway management is the main task of every tower controller. Without a runway, an airport obviously makes no sense. Not only do we have to use our runway as efficiently as possible in order to fully utilize the airport's capacity, but we also have to protect it accordingly, as the critical flight phases of take-off and landing take place there. Runway separation was introduced for this purpose. But what actually is runway separation? It's actually quite simple:

**The runway may only ever be occupied by one user at a time.**

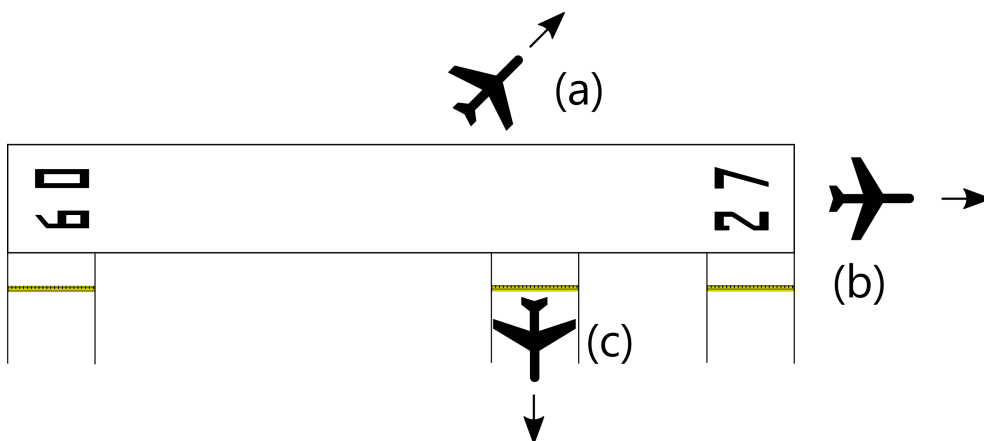
Now we just have to deal with a few more questions to clearly define the concept.

Who is considered a runway user?

- Landing aircraft (i.e. aircraft with active landing clearance)
- Aircraft taking off (i.e. aircraft with active take-off clearance)
- Vehicles on the runway e.g. inspecting the runway (not implemented on Vatsim)

How long is a user considered to be an active user of a runway and when is the runway free again for the next user?

- For aircraft taking off: The runway can be used again as soon as the departing aircraft has either
  - overflowed the end of the runway (image b) or
  - vacated the runway to the side (picture a)
- For landing aircraft: The runway can be used again as soon as the aircraft has vacated the runway (image c). The runway is considered abandoned as soon as all parts of the aircraft have rolled over the stop bar of the CAT1 holding point.



An aircraft that is cleared for line-up (i.e. taxiing onto the runway, but without take-off clearance) does not count as a runway user. A line-up clearance can therefore be given in the following cases, even though the runway is still occupied according to the above criteria:

- After a landing aircraft has passed the point at which the waiting aircraft will taxi onto the runway
- After a departing aircraft has passed the point at which the waiting aircraft will taxi onto the runway

The procedure described on this page is also called “**full**” runway separation. Does this mean that there is a “half” runway separation, too? Not quite, but almost. There is also “**reduced**” runway separation (RRS), which is taught in the specific tower textbooks. A brief teaser: with reduced runway separation, under certain conditions the runway may be used more efficiently.

# Intersecting runways

Many airports have intersecting runways either to compensate for prevailing weather conditions or to increase efficiency due to a lack of space. In Germany, Hamburg and Cologne are particularly well known for their intersecting runways.

As always, there are rules and regulations that must be observed when using the two runways simultaneously.

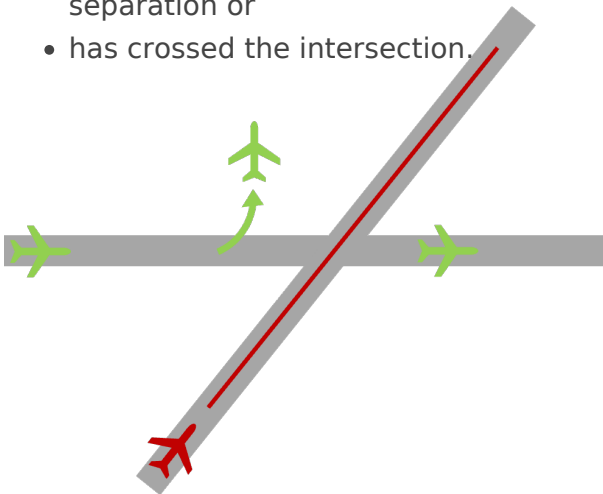
In this chapter, we will consider all possible combinations for using the runways.

## Departure - Departure

In the case of two departures on intersecting runways, the second aircraft may only begin the take-off run if one of the following conditions is met:

The other aircraft is taking off and

- has taken off and has initiated a turn that excludes the possibility of undercutting the separation or
- has crossed the intersection.

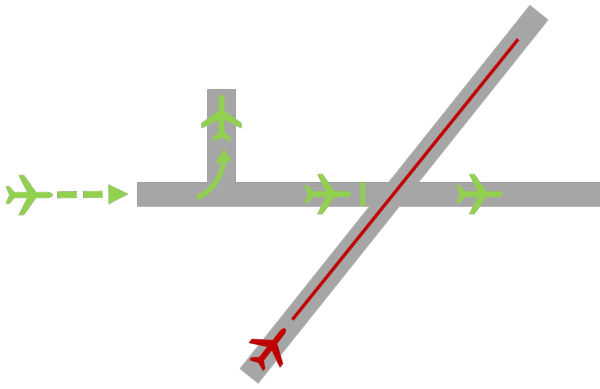


## Arrival - Departure

The situation is different if we have a preceding inbound, in which case the second aircraft on the intersecting runway may only begin the take-off run if one of the following conditions is met:

The other aircraft lands and

- has left the runway or
- has been instructed to stop before the intersection and has completed the landing roll or
- has crossed the intersection.

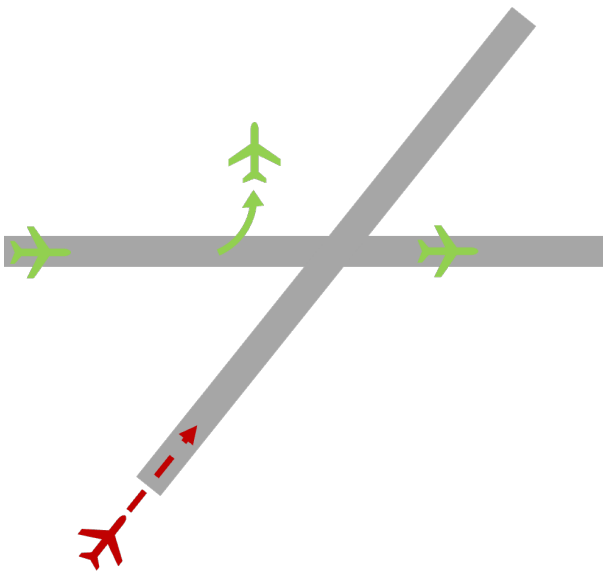


## Abflug - Anflug

Bei einem abfliegenden Luftfahrzeug gefolgt von einem anfliegenden Luftfahrzeug auf der kreuzenden Piste, darf das folgende Luftfahrzeug den Anfang der Piste erst überfliegen, wenn eine der folgenden Bedingungen gegeben ist::

Das andere Luftfahrzeug startet und

- hat abgehoben und eine Kurve eingeleitet, die eine Staffelungsunterschreitung ausschließt  
oder
- hat die Kreuzung überquert.



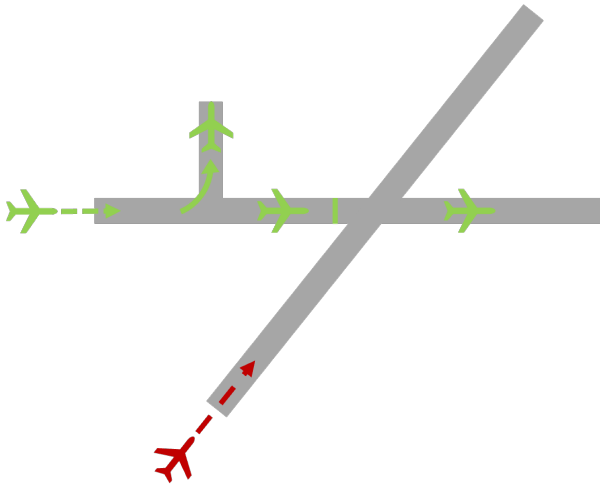
## Arrival - Arrival

The last possibility is a landing aircraft followed by another landing aircraft on the intersecting runway. The following aircraft may only fly over the runway threshold if one of the following conditions is met:

The other aircraft is landing and

- has left the runway or
- has been instructed to stop before the intersection and has completed the landing roll or

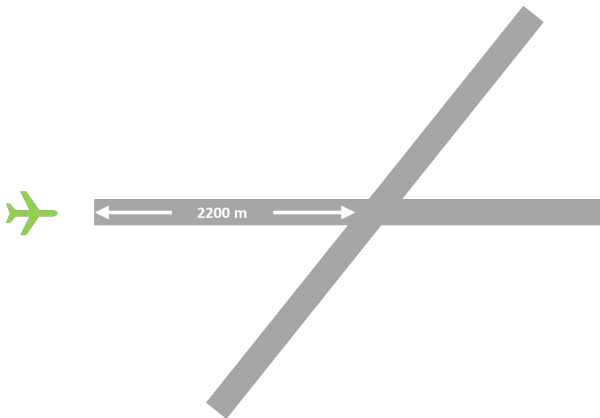
- has crossed the intersection.



## Simultaneous use of intersecting runways

The simultaneous use of intersecting runways may only be authorized for two landing aircraft under the following conditions:

- One of the intersecting runways has an available distance between threshold and intersection of at least 2200 meters.
- An aircraft with a maximum take-off weight of up to 2000 kg lands on this runway.



All of the following conditions must additionally be met:

- VMC
- The braking action is not negatively affected.
- Both aircraft have been informed of the simultaneous landings.
- The aircraft landing on the 2200m runway has been instructed to stop before the intersection.

# Reduced runway separation (RRS)

Reduced runway separation is not a mandatory part of S1 training.

## Requirements

ATCOs can only use Reduced Runway Separation if the following aspects are fulfilled:




- The tailwind component on the ground must not exceed 5 knots
- Ground visibility must be equal to or greater than 5 kilometers
- The main cloud base must be at 1000ft AGL or higher
- Wake turbulence separation must be maintained at all times
- The braking effect on the runway must not be significantly impaired by precipitation
  - On Vatsim, the braking effect is considered to be significantly impaired by precipitation: snow (SN), snow grains (SG), ice grains (PL), hail (GR) and rime (GS) - in other words, all precipitation except rain (RA) and drizzle (DZ)
- The following aircraft in the RRS sequence must receive traffic information about the preceding traffic

## Aircraft categories

For the Reduced Runway Separation procedure, aircraft have been divided into three categories.

These three categories are:

CAT 1	CAT 2	CAT 3
Single-engine propeller-driven aircraft with a maximum take-off weight of up to 2 tons.	Single-engine propeller-driven aircraft with a maximum take-off weight greater than 2 tons but less than 7 tons.  Twin-engine propeller-driven aircraft with a maximum take-off weight of less than 7 tons.	All other aircraft

		
<p>The following registrations apply in Germany:</p> <ul style="list-style-type: none"> <li>• D-<b>E</b></li> <li>• D-<b>K</b></li> <li>• D-<b>M</b></li> </ul>	<p>The following registrations apply in Germany:</p> <ul style="list-style-type: none"> <li>• D-<b>C</b> (up to 7 tons)</li> <li>• D-<b>F</b></li> <li>• D-<b>G</b></li> <li>• D-<b>I</b></li> </ul>	<p>The following registrations apply in Germany:</p> <ul style="list-style-type: none"> <li>• D-<b>C</b> (over 7 tons)</li> <li>• D-<b>B</b></li> <li>• D-<b>A</b></li> </ul>
Examples: C152, C172, P28A, A210, DA40, DR40, DV20, SR22	Examples: DA62, PA34, TBM9, BE58, B350	Examples: AT75, DH8D, C25C, CRJ9, B738, A359

## Possible constellations

There are four different possible constellations of these categories on a runway. We will now look at these step by step with a focus on Reduced Runway Separation.

### Departure behind departure

- The following departure receives traffic information about the leading departure.
- If all other criteria are met, the second departure may be cleared for take-off as soon as the first departure has taken off and is a defined distance away from the second departure. The distance is specified by the LFZ-KATs (aircraft categories):

Preceding	Succeeding	Requirement
CAT 1 / CAT 2	CAT 1	airborne and at a distance of 600m
CAT 1 / CAT 2	CAT 2	airborne and at a distance of 1500m
CAT 3	all	airborne and at a distance of 2400m

- As soon as the second departure has taken off, any applicable separation must exist.
- Example of application: First departure is a DV20 IFR, second departure a BE58 VFR. No separation must be established between the two aircraft in D(CTR), only wake turbulence separation, as the VFR is a departure. However, since light behind light does not require wake turbulence separation, I only have to consider the runway separation. Without Reduced Runway Separation, I would have to hold back the take-off clearance until the DV20 has flown over the end of the runway. Using RRS, I can now clear the following take-



off as soon as the DV20 has taken off and is 1500 m away from the BE58. This means I can use the runway more effectively and have more capacity.

## Arrival behind arrival

- The second approach receives traffic information about the approach ahead.
- If all other criteria are met, the second approach may be cleared for landing as soon as the first approach has landed and is a defined distance away from the threshold. Additionally, the first approach must continue moving and leave the runway without backtracking. Because the landing clearance is explicitly clearance to overfly the runway threshold, it must of course be issued before the threshold is crossed. If the criteria are not (yet) fulfilled, a missed approach must be instructed. The distance is specified by the LFZ-KATs (aircraft categories):

Preceding	Succeeding	Clearance before	Requirement
CAT 1 / CAT 2	CAT 1	aircraft crosses runway threshold	vacating runway and at least 600m from threshold
CAT 1 / CAT 2	CAT 2		vacating runway and at least 150m from threshold
CAT 3	all		vacating runway and at least 240m from threshold

This situation may seem somewhat strange, as a landing clearance is issued even though there is another pilot still on the runway. However, if the distances are maintained, this is actually legal and is practiced in reality.

## Arrival behind departure

- The approach receives traffic information about departure.
- If all other criteria are met, the approach may receive landing clearance as soon as the departure has taken off and is a defined distance away from the threshold. Because the landing clearance is explicitly clearance to overfly the runway threshold, it must of course be issued before the threshold is crossed. If the criteria are not (yet) fulfilled, a missed approach must be instructed. The distance is specified by the LFZ-KATs (aircraft categories):

Preceding	Succeeding	Clearance before	Requirement
CAT 1 / CAT 2	CAT 1	aircraft crosses runway threshold	airborne and at least 600m from threshold

CAT 1 / CAT 2	CAT 2	airborne and at least 1500m from threshold
CAT 3	all	airborne and at least 2400m from threshold

## Departure behind arrival

Reduced runway separation **may not be used** in this constellation.

## Phraseology examples

German	English
G: VERKEHR C172 FLIEGT *VON PISTE 25* AB	G: TRAFFIC C172 DEPARTING *ON RUNWAY 25*
G: VERKEHR A320 IST *AUF PISTE 25* GELANDET	G: TRAFFIC A320 LANDED *ON RUNWAY 25*
G: VERKEHR PA34 LANDET *AUF PISTE 25*	G: TRAFFIC PA34 LANDING *ON RUNWAY 25*

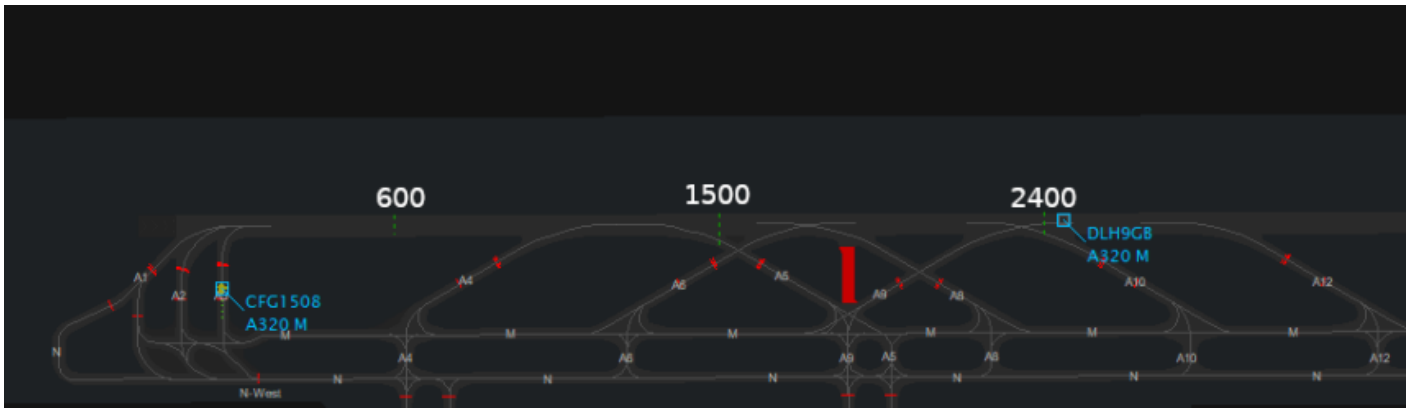
## Miscellaneous and example

### Example of the procedure

We issue a take-off clearance, the next approach is on a 3NM final. In this situation full runway separation is not so likely, so we give traffic information to the landing traffic about the departing traffic. As soon as this is done and the meteorological conditions are suitable, we can apply RRS. The traffic info can read: "DLH414, TRAFFIC A320 DEPARTING RUNWAY 26R". Theoretically, the traffic information can also be given when the aircraft is cleared to land. However, as RRS is quite tight, it is advisable to give the traffic information as early as possible so you only have the landing clearance left to give and can keep it brief and concise later. As soon as the departing traffic has taken off and passed the prescribed distance from the runway threshold, the landing clearance can be given: "DLH414 WIND 170 DEGREES 6 KNOTS RUNWAY 26R CLEARED TO LAND".

### Marker in the sector file

Of course, you do not have to estimate the distances in meters. Depending on the runway direction selected in Euroscope, you will find green markers on the runway (design may vary depending on the FIR). These describe the distances for the various combinations of aircraft CATs from the start of the runway. The first marker is at 600m and the following ones at 1500m and 2400m. The picture shows an example of these markings for runway 08L in Munich. The representation may differ depending on the FIR.



## Article about Reduced Runway Separation

Anyone interested in the topic of RRS beyond the content mentioned above will find an interesting article on the subject in an issue of “Flugleiter”, the magazine of the air traffic controllers’ union. It can be found from page 48 onwards.

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