OSL – UTVALGET

NOTAT TIL PKT. 5

OPPDRAG 3. MAI 2023

Rammebetingelser for luftrom og trafikkstyring

Pkt. 5

Oversikt over (og om ønskelig kommentere) det viktigste regelverket (evt også standarder og prosedyrer) som utgjør rammene for mht å utnytte rullebanekapasiteten optimalt i luftrom- og lufttrafikkstyringen for Avinor/Avinor flysikring

AVINOR

Regelverk som regulerer rullebaneutnyttelse i dag:

Det europeiske byrå for flysikkerhet (EASA) sitt standardiserte regelverk for utøvelse av lufttrafikktjeneste ble gjort gjeldende i Norge fra 01.11.2022, gjennom *Forskrift om krav til lufttrafikktjenester og ytere av lufttrafikkstyrings- og flysikringstjenester (ATM/ANS) m.m* (BSL G 1-3).

Regelverket er regulert gjennom EU forordning 2017/373 - Parts ATS og BSL G 1-3, kapittel 4, samt EU 923/2012 og BSL F 1-1.

Under er det hentet ut utsnitt fra forordningen som beskriver rammefaktorene per i dag for rullebaneatskillelse (minste avstand mellom fly på samme rullebane), redusert rullebaneatskillelse (regelverk som regulerer forutsetningene for å redusere atskillelse), radaratskillelse (regelverk som regulerer minste horisontale avstander mellom fly i luften), parallelle innflyginger (regelverk som regulerer muligheter for operasjon på parallelle rullebaner) og krav til wake turbulence atskillelse (minste horisontale avstand for å sikre operasjoner bak vingevirvelturbulence hos større fly).

I vedlegg 1 til dette notatet er det samlet regelverket for radar- og rullebaneadskillelse.

I vedlegg 2 til dette notatet er det samlet regelverk for parallelle operasjoner

Rullebaneatskillelse

AMC7 (c)(2)(i) RUNWAY SEPARATION MINIMA BETWEEN DEPARTING AIRCRAFT AND OTHER AIRCRAFT USING THE SAME RUNWAY

Except as provided in AMC9 ATS.TR.210(c)(2)(i) as regards reduced runway separation minima between aircraft using the same runway, and in ATS.TR.220 as regards time-based wake turbulence separation minima, the aerodrome control tower should not permit a departing aircraft to commence take-off until:

(a) the preceding departing aircraft has crossed the end of the runway-in-use; or

(b) the preceding departing aircraft has started a turn; or

(c) all preceding landing aircraft are clear of the runway-in-use (see Figure 33).

Position limits to be reached by a landed aircraft (A) or a departing aircraft (B or C) before an arriving aircraft may be cleared to cross the threshold of the runway-in-use or a departing aircraft may be cleared to take off, unless otherwise prescribed.

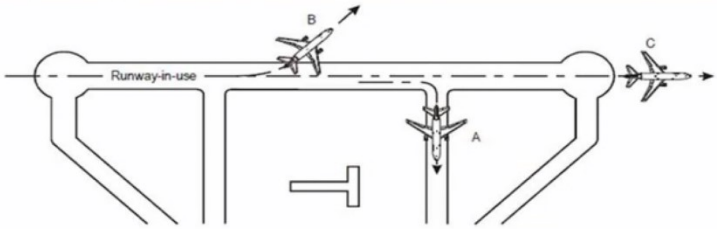

Figure 33: Separation between departing and arriving aircraft

AMC8 (c)(2)(i) RUNWAY SEPARATION OF LANDING AIRCRAFT AND PRECEDING LANDING AND DEPARTING AIRCRAFT USING THE SAME RUNWAY

Except as provided AMC9 ATS.TR.210(c)(2)(i) as regards reduced runway separation minima between aircraft using the same runway, and in ATS.TR.220 as regards time-based wake turbulence separation minima, the aerodrome control tower should not permit a landing aircraft to cross the runway threshold on its final approach until:

(a) the preceding departing aircraft has crossed the end of the runway-in-use; or

(b) the preceding departing aircraft has started a turn; or

(c) all preceding landing aircraft are clear of the runway-in-use (see Figure 33).

Redusert rullebaneatskillelse

ATS.TR.210 – Operation of air traffic control service

(a) The air traffic services provider may prescribe lower minima than those established in AMC7 ATS.TR.210(c)(2)(i) concerning separation of departing aircraft, and in AMC8 ATS.TR.210(c)(2)(i) concerning separation of landing aircraft and preceding landing and departing aircraft using the same runway, after consultation with the operators. The safety assessment to be performed in support of the application of reduced separation minima should be carried out for each runway for which the reduced minima are intended, taking into account factors such as:

(1) runway length;

(2) aerodrome layout; and

(3) types/categories of aircraft involved.

(b) Reduced runway separation minima should only be applied during the hours of daylight from 30 minutes after local sunrise to 30 minutes before local sunset.

(c) For the purpose of reduced runway separation, aircraft should be classified as follows:

(1) Category 1 aircraft: single-engine propeller aircraft with a maximum certificated take-off mass (MCTOM) of 2 000 kg or less;

(2) Category 2 aircraft: single-engine propeller aircraft with a maximum certificated take-off mass of more than 2 000 kg but less than 7 000 kg; and twin-engine propeller aircraft with a maximum certificated take-off mass of less than 7 000 kg; and

(3) Category 3 aircraft: all other aircraft.

(d) Reduced runway separation minima should not apply between a departing aircraft and a preceding landing aircraft.

(e) Reduced runway separation minima should be subject to the following conditions:

(1) wake turbulence separation minima should be applied;

(2) visibility should be at least 5 km and ceiling shall not be lower than 300 m (1 000 ft);

(3) tailwind component should not exceed 5 kt;

(4) there should be available means, such as suitable landmarks, to assist the air traffic controller in assessing the distances between aircraft. A surface movement ATS surveillance system that provides the air traffic controller with position information on aircraft may be utilised, provided that approval for operational use of such equipment includes a safety assessment to ensure that all requisite operational and performance requirements are met;

(5) minimum separation continues to exist between two departing aircraft immediately after take-off of the second aircraft;

(6) traffic information should be provided to the flight crew of the succeeding aircraft concerned; and

(7) the braking action should not be adversely affected by runway contaminants such as ice, slush, snow and water.

(f) Reduced runway separation minima which may be applied at an aerodrome should be determined for each separate runway. The separation to be applied should in no case be less than the following minima:

(1) landing aircraft:

(i) a succeeding landing Category 1 aircraft may cross the runway threshold when the preceding aircraft is a Category 1 or 2 aircraft which either:

(A) has landed and has passed a point at least 600 m from the threshold of the runway, is in motion and will vacate the runway without backtracking; or

(B) is airborne and has passed a point at least 600 m from the threshold of the runway;

(ii) a succeeding landing Category 2 aircraft may cross the runway threshold when the preceding aircraft is a Category 1 or 2 aircraft which either:

(A) has landed and has passed a point at least 1500 m from the threshold of the runway, is in motion and will vacate the runway without backtracking; or

(B) is airborne and has passed a point at least 1 500 m from the threshold of the runway;

(iii) a succeeding landing aircraft may cross the runway threshold when a preceding Category 3 aircraft:

(A) has landed and has passed a point at least 2 400 m from the threshold of the runway, is in motion and will vacate the runway without backtracking; or

(B) is airborne and has passed a point at least 2 400 m from the threshold of the runway;

(2) departing aircraft:

(i) a Category 1 aircraft may be cleared for take-off when the preceding departing aircraft is a Category 1 or 2 aircraft which is airborne and has passed a point at least 600 m from the position of the succeeding aircraft;

(ii) a Category 2 aircraft may be cleared for take-off when the preceding departing aircraft is a Category 1 or 2 aircraft which is airborne and has passed a point at least 1 500 m from the position of the succeeding aircraft; and

(iii) an aircraft may be cleared for take-off when a preceding departing Category 3 aircraft is airborne and has passed a point at least 2 400 m from the position of the succeeding aircraft.

Radaratskillelse

AMC1 to (c)(2) HORIZONTAL SEPARATION MINIMA BASED ON ATS SURVEILLANCE SYSTEM

(a) Unless otherwise prescribed in accordance with point (b), or AMC6 ATS.TR.220, or point (d) of AMC7 ATS.TR.220, or ATS.TR.255, the horizontal separation minimum based on radar and/or ADS-Band/or MLAT systems should be 9.3 km (5.0 NM).

(b) If so established by the air traffic services provider and approved by the competent authority, the separation minimum in point (a) may be reduced but not below:

(1) 5.6 km (3.0 NM) when radar and/or ADS-Band/or MLAT systems' capabilities at a given location so permit; and

(2) 4.6 km (2.5 NM) between succeeding aircraft which are established on the same final approach track within 18.5 km (10 NM) of the runway threshold. A reduced separation minimum of 4.6 km (2.5 NM) may be applied, provided:

(i) the average runway occupancy time of landing aircraft is proven, by means such as data collection and statistical analysis and methods based on a theoretical model, not to exceed 50 seconds;

(ii) braking action is reported as good and runway occupancy times are not adversely affected by runway contaminants such as slush, snow or ice;

(iii) an ATS surveillance system with appropriate azimuth and range resolution and an update rate of 5 seconds or less is used in combination with suitable displays;

(iv) the aerodrome air traffic controller is able to observe, visually or by means of surface movement radar (SMR), MLAT system or a surface movement guidance and control system (SMGCS), the runway-in-use and associated exit and entry taxiways;

(v) wake turbulence separation minima in AMC6 ATS.TR.220 or in point (d) of AMC7 ATS.TR.220, or as may be prescribed by the air traffic services provider and approved by the competent authority (e.g. for specific aircraft types), do not apply;

(vi) aircraft approach speeds are closely monitored by the air traffic controller and when necessary adjusted so as to ensure that separation is not reduced below the minimum;

(vii) aircraft operators and pilots have been made fully aware of the need to exit the runway in an expeditious manner whenever the reduced separation minimum on final approach is applied; and

(viii) procedures concerning the application of the reduced minimum are published in AIPs.

Parallelle innflyginger

ATS.TR.255 Operations on parallel or near-parallel runways

ATS.TR.255 Operations on parallel or near-parallel runways

When independent or dependent operations on instrument approach to or departure from parallel or near-parallel runways are conducted, procedures shall be established by the air traffic services provider and approved by the competent authority.

AMC1 REQUIREMENTS AND PROCEDURES FOR INDEPENDENT PARALLEL DEPARTURES

(a) Parallel runways may be used for independent instrument departures as follows:

(b) both runways are used exclusively for departures (independent departures); or

(1) one runway is used exclusively for departures while the other runway is used for a mixture of arrivals and departures (semi-mixed operation); or

(2) both runways are used for mixed arrivals and departures (mixed operation).

(c) Independent IFR departures should only be conducted from parallel runways when the conditions listed below are met:

(1) the runway centre lines are spaced by a minimum distance of 760 m (2 500 ft) (as also specified in CS ADR-DSN.B.055 'Minimum distance between parallel instrument runways' in EASA ED Decision 2014/013/R 'Certification Specifications and Guidance Material For Aerodromes Design', as amended);

(2) the nominal departure tracks diverge by at least:

(i) 15 degrees immediately after take-off; or

(ii) 10 degrees where:

(A) both aircraft are flying an RNAV or RNP instrument departure; and

(B) the turn commences no more than 3.7 km (2.0 NM) from the departure end of the runway;

(3) a suitable ATS surveillance system capable of identification of the aircraft within 1.9 km (1.0 NM) from the end of the runway is available; and

(4) ATS operational procedures ensure that the required track divergence is achieved.

AMC2 REQUIREMENTS AND PROCEDURES FOR INDEPENDENT PARALLEL APPROACHES

Independent parallel approaches should only be conducted to parallel runways when the following conditions are met:

(a) separate air traffic controllers are responsible for the sequencing and spacing of arriving aircraft to each runway;

(b) as early as practicable after an aircraft has established communication, the approach control unit advises the aircraft that independent parallel approaches are in force;

(c) the following ATS surveillance criteria are met:

(1) for runway centreline spacing less than 1 310 m (4 300 ft) but not less than 1 035 m (3 400 ft), an ATS surveillance system with:

(i) a minimum accuracy as follows:

(A) for SSR, an azimuth accuracy of 0.06 degrees (one sigma); or

(B) for MLAT or ADS-B, an accuracy of 30 m (100 ft);

(ii) an update of 2.5 seconds or less; and

(iii) a high-resolution display providing position prediction and deviation alert;

(2) for runway centreline spacing less than 1 525 m (5 000 ft) but not less than 1 310 m (4 300 ft), provided that it is determined that the safety of aircraft operations is not adversely affected, an ATS surveillance system:

(i) with performance specifications equal to or better than:

(A) for SSR, a demonstrated minimum accuracy of 0.3 degrees (one sigma); or

(B) for MLAT or ADS-B, a demonstrated performance capability equivalent to or better than the SSR requirement;

(ii) with an update of 5 seconds or less;

(3) for runway centreline spacing of 1 525 m (5 000 ft) or more, a surveillance system with:

(i) a minimum SSR azimuth accuracy of 0.3 degrees (one sigma), or for MLAT or ADS- B, a demonstrated performance capability equivalent to or better than the SSR requirement; and

(ii) an update of 5 seconds or less;

(d) the instrument approach procedure that aligns the aircraft with the extended runway centre line is one of the following:

(1) a precision approach procedure;

(2) an approach with vertical guidance (APV) designed using the RNP AR APCH specification where:

(i) the RNP value for B, and the RNP value for C, if that segment of the approach is within the horizontal separation minimum of a parallel approach, does not exceed one quarter of the distance between runway centre lines (A) (see Figure 51); and

(ii) the RNP value for B, and the RNP value for C, if that part of the approach is within the horizontal separation minimum of a parallel approach, does not exceed (A-D)/2 (see Figure 51);

Wake turbulence/Time based separation

AMC6 DISTANCE-BASED WAKE TURBULENCE SEPARATION MINIMA BASED ON ATS SURVEILLANCE SYSTEM

The following distance-based wake turbulence separation minima should be applied to aircraft being provided with an ATS surveillance service in the approach and departure phases:

PRECEDING AIRCRAFT	SUCCEEDING AIRCRAFT	WAKE TURBULENCE RADAR SEPARATION MINIMA
SUPER or HEAVY	SUPER	Not required. In this case, separation reverts to radar separation minima as established by the air traffic services provider and approved by the competent authority.
SUPER	HEAVY	11.1 km (6.0 NM)
SUPER	MEDIUM	13.0 km (7.0 NM)
SUPER	LIGHT	14.8 km (8.0 NM)
HEAVY	HEAVY	7.4 km (4.0 NM)
HEAVY	MEDIUM	9.3 km (5.0 NM)
HEAVY	LIGHT	11.1 km (6.0 NM)
MEDIUM	LIGHT	9.3 km (5 NM)

ATS.TR.220 – Application of wake turbulence separation

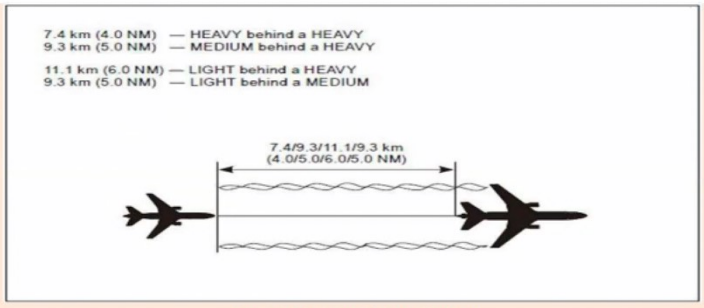

Figure 48: Operating directly behind

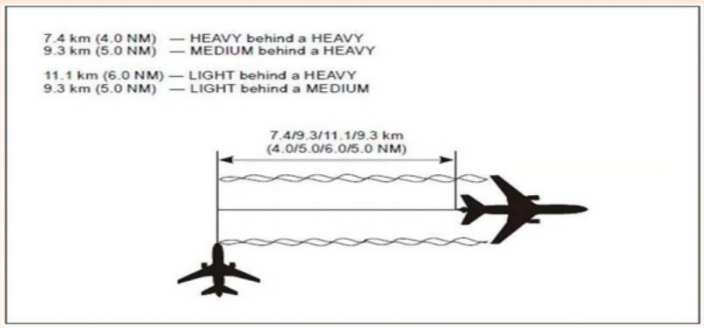

Figure 49: Crossing behind

80

ATS.TR.220 Application of wake turbulence separation

(a) Air traffic control units shall apply wake turbulence separation minima to aircraft in the approach and departure phases of flight in either of the following circumstances:

(1) an aircraft is operating directly behind another aircraft at the same altitude or less than300 m (1 000 ft) below it;

(2) both aircraft are using the same runway, or parallel runways separated by less than 760 m(2 500 ft);

(3) an aircraft is crossing behind another aircraft, at the same altitude or less than 300 m (1 000 ft) below it.

(b) Paragraph (a) shall not apply to arriving VFR flights and to arriving IFR flights executing visual approach when the aircraft has reported the preceding aircraft in sight and has been instructed to follow and maintain own separation from that aircraft. In those cases, the air traffic control unit shall issue caution for wake turbulence.

AMC1 CATEGORISATION OF AIRCRAFT FOR THE PURPOSES OF WAKE TURBULENCE SEPARATION MINIMA APPLICATION

Wake turbulence separation minima should be based on a grouping of aircraft types into four categories according to the maximum certificated take-off mass as follows:

(a) SUPER (S) if so identified by the competent authority;

(b) HEAVY (H) - all aircraft types of 136 000 kg or more;

(c) MEDIUM (M) - aircraft types less than 136 000 kg but more than 7 000 kg; and

(d) LIGHT (L) - aircraft types of 7 000 kg or less.

GM1 to AMC1

For the Airbus A380-800 aircraft, with a maximum take-off mass in the order of 560 000 kg, it is recommended to apply an increase of the wake turbulence separation minima associated with the HEAVY category.

AMC 2 TIME-BASED WAKE TURBULENCE LONGITUDINAL SEPARATION MINIMA - ARRIVING AIRCRAFT

Except for arriving VFR flights, and for arriving IFR flights executing visual approach, the following separation minima should be applied to aircraft landing behind a SUPER, a HEAVY or a MEDIUM aircraft:

(a) MEDIUM aircraft behind SUPER aircraft: 3 minutes;

(b) MEDIUM aircraft behind HEAVY aircraft: 2 minutes;

(c) LIGHT aircraft behind SUPER aircraft: 4 minutes; and

(d) LIGHT aircraft behind a HEAVY or MEDIUM aircraft: 3 minutes.

ATS.TR.220 – Application of wake turbulence separation

RECAT-EU scheme		Super Heavy	Upper Heavy	Lower Heavy	Upper Medium	Lower Medium	Light
Leader / Follower		A	B	C	D	E	F
"Super Heavy"	A		100s	120s	140s	160s	180s
"Upper Heavy"	B				100s	120s	140s
"Lower Heavy"	C				80s	100s	120s
"Upper Medium"	D						120s
"Lower Medium"	E						100s
"Light"	F						80s

(f) Wake turbulence time-based separation minima between departing aircraft should be applied by determining airborne times between successive aircraft.

(g) An additional 60 seconds should be applied to all the wake turbulence time-based separation minima above when taking off from:

(1) an intermediate part of the same runway; or

(2) an intermediate part of a parallel runway separated by less than 760 m (2 500 ft).

GM1 to AMC7 APPLICATION OF RECAT-EU WAKE TURBULENCE SEPARATION SCHEME

(a) The implementation of RECAT-EU or parts thereof is considered to be a change to the air traffic services provider functional system and, as such, is supported by a safety assessment, in accordance with ATS.OR.205. Any such implementation should provide clear operational benefits.

(b) While the ICAO flight plan remains unchanged, the RECAT-EU wake vortex aircraft grouping should be displayed to air traffic controllers using the associated aircraft type information available in the flight data processing system.

(c) A list of aircraft types for each RECAT-EU aircraft grouping, in particular with respect to new aircraft types, is maintained by EASA and is available at https://www.easa.europa.eu/easa-and- you/air-traffic-management#group-easa-downloads.

GM1 WAKE TURBULENCE EFFECTS INDUCED BY HELICOPTERS

(a) Helicopters should be kept well clear of light aircraft when hovering or while air-taxiing.

(b) Helicopters produce vortices when in flight and there is some evidence that, per kilogramme of gross mass, their vortices are more intense than those of fixed-wing aircraft. When hovering inground effect or air taxiing, helicopters generate downwash producing high-velocity outwash vortices to a distance approximately three times the diameter of the rotor.

ATS.TR.220 – Application of wake turbulence separation

AMC7 RECAT-EU WAKE TURBULENCE SEPARATION MINIMA

(a) As an alternative to the wake turbulence separation minima prescribed in AMC1 to AMC6 ATS.TR.220, an air traffic services provider may decide to implement RECAT-EU or parts thereof, subject to the approval of the competent authority.

(b) The following wake vortex aircraft groupings, based on the allocation of aircraft types to six categories according to both maximum certificated take-off mass and wingspan, and associated separation minima should be used when applying RECAT-EU:

(1) 'SUPER HEAVY' - all aircraft types of 100 000 kg or more, and a wingspan between 72 m and 80 m;

(2) 'UPPER HEAVY' - all aircraft types of 100 000 kg or more, and a wingspan between 60 m and 72 m;

(3) 'LOWER HEAVY' - all aircraft types of 100 000 kg or more, and a wingspan below 52 m;

(4) 'UPPER MEDIUM' - aircraft types less than 100 000 kg but more than 15 000 kg, and a wingspan above 32 m;

(5) 'LOWER MEDIUM' - aircraft types less than 100 000 kg but more than 15 000 kg, and a wingspan below 32 m;

(6) 'LIGHT' - all aircraft types of 15 000 kg or less (without wingspan criterion).

(c) Aircraft types with maximum certificated take-off mass of 100 000 kg or more, and wingspan between 52 m and 60 m are included in one of the above categories on the basis of specific analyses.

(d) RECAT-EU wake turbulence distance-based separation minima for arriving and departing aircraft when ATS surveillance service is provided should be:

ATS.TR.220 – Application of wake turbulence separation

RECAT-EU Scheme Leader	Follower					
	Super Heavy	Upper Heavy	Lower Heavy	Upper Medium	Lower Medium	Light
Super Heavy	3 NM	4 NM	5 NM	5 NM	6 NM	8 NM
Upper Heavy	(*)	3 NM	4 NM	4 NM	5 NM	7 NM
Lower Heavy	(*)	(*)	3 NM	3 NM	4 NM	6 NM
Upper Medium	(*)	(*)	(*)	(*)	(*)	5 NM
Lower Medium	(*)	(*)	(*)	(*)	(*)	4 NM
Light	(*)	(*)	(*)	(*)	(*)	3 NM

(*) means that the separation minimum to be applied is the horizontal separation minimum based on an ATS surveillance system (established in accordance with AMC1 ATS.TR.210(c)(2)), and should remain compatible with runway capacity.

(e) RECAT-EU wake turbulence time-based separation minima between departing aircraft should be: