

2015



IFR Manual for S2 - TWR

English version

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Table of Content

1. General	3
1.1 Purpose	3
1.2 Credits	3
1.3 Feedback and contact information	3
2. Introduction	4
2.1 Aerodrome information	4
2.2 Aircraft information	4
2.2.1 IFR departure aircraft	4
2.2.2 IFR arrival aircraft	4
3. IFR Departures	5
3.1 General	5
3.2 IFR Clearance	5
Standard IFR clearance	6
Re-clearance	6
Non P-RNAV clearance	6
Visual climb out clearance	8
3.3 Pushback and start-up	9
Section I: Pushback clearance	9
Section II: Start-up clearance	9
Section III: Pushback and start-up clearance	9
3.4 Taxi	10
3.5 Takeoff	10
Takeoff criteria	10
Mitigation of wake turbulence hazard	11
Line-up clearance	12
Takeoff clearance	12
When airborne	13
4. IFR arrivals	14
4.1 General	14
4.2 On approach	15
4.2.1 ILS approach	15
4.2.2 Visual approach	16
4.3 Missed approach	16

Chapter 1. General

1.1 Purpose

The main purpose of the ATC Training Manual Norway FIR is to provide standardized local and general procedures for controllers in Norway FIR. This document is made in respect of the S2 students who struggle understanding local and general procedures. This document provides standardized procedures for most airports within Norway FIR (except special procedures). We hope that this document can help you improve your aviation knowledge. Our goal is to make you understand the basics behind a controller unit who is controlling within Europe (more specifically: Norway FIR).

On behalf of the crew in VATSIM Scandinavia and the creator of this document, Sebastian Rekdal (Chief of Training Norway), we wish you good luck with your air traffic control (ATC) training on VATSIM, and welcome to VATSIM Scandinavia!

1.2 Credits

The *ATC Training Manual Norway FIR* was created by VATSIM Scandinavia. Original appendices published October 10, 2014 was made by Sebastian Rekdal (Chief of Training Norway). Thanks to:

- Sebastian Rekdal | Chief of Training Norway (accsca23@vatsim-scandinavia.org)
- Joachim Buerskog | Mentor in Norway FIR (buerskog@hotmail.com)

Thanks to VATSIM Scandinavia member Joseph Donat Bolton (joseph.bolton1@gmail.com) for helping out translation of this manual.

1.3 Feedback and contact information

If you have any questions, comments, suggestions or complains regarding this manual, please do not hesitate to contact us. Please let us know about your concern...

- **Chief of Training Norway** (Sebastian Rekdal): accsca23@vatsim-scandinavia.org
- **Director of Norway FIR** (Daniel Klepp): accsca4@vatsim-scandinavia.org
- **Discussion forum** (need forum-account): <http://www.forum.vatsim-scandinavia.org/>

If you find any errors, outdated procedures or typos in this manual, please do not hesitate to E-mail us: accsca23@vatsim-scandinavia.org. Help us keep the documents clean, realistic and updated!

Chapter 2. Introduction

2.1 Aerodrome information

The airport used in this document is Bergen airport Flemland [ENBR]. Bergen airport, Flemland is an international airport located at Flemland in Berge, Norway. The airport opened in 1955 and is the second-busiest airport in Norway, with over 6.2 million passengers in 2013. 19 scheduled airlines operate to 19 different domestic destinations, and 34 different international destinations; ten more are provided through regular charter service during summer and spring time.

Scandinavian Airlines (SAS), Norwegian Air Shuttle (NAX) and Widerøe (WIF) are the largest airlines operating at Flemland. The route from Bergen Flemland to Oslo Gardermoen is among the busiest routes in Europe with over 350 schedules flights each week!

Flemland operates with only one runway (17/35). This runway is used for both departures and arrivals twenty-four-seven. However, helicopters (such as CHC, Bristow etc.) may lift-off or touch-down/land on a specific taxiway.

2.2 Use of aircraft and callsign

2.2.1 IFR Departure aircraft - Chapter 3:

FLIGHT PLAN			
3 MESSAGE	7 AIRCRAFT IDENTIFICATION	8 FLIGHT RULES	
≡≡ (FPL	N A X 6 3 1	I	≡≡
	TYPE OF AIRCRAFT	WAKE TURBULANCE CAT.	≡≡
	B 7 3 8	/ M	
13 DEPARTURE AERODROME	TIME		
E N B R	1 8 3 5	≡≡	
15 CRUISING SPEED	LEVEL	ROUTE	
4 4 8	2 9 0 0 0	GOKAB L24 ADOPI	
			≡≡
16 DESTINATION	ALTN AERODROME	2ND ALTN AERODROME	
E N G M	E N R Y		≡≡
18 OTHER INFORMATION			

2.2.2 IFR Arrival aircraft - Chapter 4:

FLIGHT PLAN			
3 MESSAGE	7 AIRCRAFT IDENTIFICATION	8 FLIGHT RULES	
≡≡ (FPL	N A X 6 2 4	I	≡≡
	TYPE OF AIRCRAFT	WAKE TURBULANCE CAT.	≡≡
	B 7 3 8	/ M	
13 DEPARTURE AERODROME	TIME		
E N G M	1 9 5 5	≡≡	
15 CRUISING SPEED	LEVEL	ROUTE	
4 4 8	3 0 0 0 0	ATLAP N623 PESUR	
			≡≡
16 DESTINATION	ALTN AERODROME	2ND ALTN AERODROME	
E N B R	E N Z V		≡≡
18 OTHER INFORMATION			

Chapter 3. IFR Departures

3.1 General

In this chapter, you will learn about IFR departures. IFR aircraft departing an aerodrome needs to go through several units in order to actually takeoff. An IFR (or VFR) clearance is usually the first request made by the pilot. After receiving IFR clearance the pilots may request push and start from the parking area. When the pilots are ready for taxi, they will contact the appropriate controller unit for taxi clearance. After the pilot has received the taxi clearance and reached their assigned holding point will be handed off to the next controller, a tower controller, who will issue a line-up and takeoff clearance. After the aircraft is airborne, the tower controller will then transfer the aircraft over to area control.

In this chapter, you will learn how to handle IFR aircraft departing an aerodrome:

- 3.1 General (pg. 5)
- 3.2 IFR Clearance (pg. 5)
- 3.3 Pushback and start-up (pg. 9)
- 3.4 Taxi (pg. 10)
- 3.5 Takeoff (pg. 10)

The learning objectives for this chapter are as followed:

- Understand how to issue an IFR clearance
- Understand how to clear an aircraft pushback and start-up
- Issue correct and appropriate taxi clearance
- issue line-up and takeoff clearances
- Issue correct takeoff clearance
- Use correct phraseology when controlling IFR aircraft as aerodrome control

3.2 IFR Clearance

An IFR clearance is the first request a pilot will make. This clearance is usually taken place on stand, parking or cargo area (depending on aerodrome structure). This clearance might be issued in the maneuvering area (e.g. a taxiway) if absolutely necessary. This is only applied during special circumstances. An IFR clearance is usually issued by a delivery controller who is located in the control tower along with the ground and tower controllers. However, some airports do not operate a delivery controller. In such situation, the ground (or tower) controller will issue the clearance and take the delivery responsibilities.

IFR Departure aircraft - Chapter 3:

FLIGHT PLAN			
3 MESSAGE ◀◀ (FPL	7 AIRCRAFT IDENTIFICATION N A X 6 3 1	8 FLIGHT RULES I	▶▶▶
	TYPE OF AIRCRAFT B 7 3 8	WAKE TURBULANCE CAT. / M	▶▶▶
13 DEPARTURE AERODROME E N B R	TIME 1 8 3 5		▶▶▶
15 CRUISING SPEED 4 4 8	LEVEL 2 9 0 0 0	ROUTE GOKAB L24 ADOPI	
			▶▶▶
16 DESTINATION E N G M	ALTN AERODROME E N R Y	2ND ALTN AERODROME	▶▶▶
18 OTHER INFORMATION			

Note: The controller unit in the upcoming examples will be named “Flesland Tower” at all times, instead of “delivery” and “ground” when it should be. This is because it is fairly normal, on VATSIM, to control tower top down.

STANDARD IFR CLEARANCE

PILOT: *Flesland Tower, NAX631 with information alpha, QNH1013, request clearance to Oslo Gardermoen.*

ATC: *NAX631, Flesland Tower. Cleared to Oslo Gardermoen via GOKAB 1D, runway 35 and squawk 4350.*

PILOT: *Cleared to Oslo Gardermoen via GOKAB 1D, runway 35 and squawk 4350, NAX631.*

ATC: *NAX631, read-back is correct.*

Please note that if the pilot does not have the correct ATIS information and/or QNH, please specify so before an eventual clearance is issued. See example below:

PILOT: *Flesland Tower, NAX631 with information Bravo, QNH 993, request clearance to Oslo Gardermoen.*

ATC: *NAX631, information Alpha valid, QNH 1013, cleared to Oslo Gardermoen, GOKAB 1D runway 35, squawk 4350*

RE-CLEARANCE

In case of a potential re-clearance, be sure to specify to the aircraft exactly the changes such as the example shown below:

ATC: *NAX631, your flight plan is invalid; your clearance must be reissued. Report when ready.*

PILOT: *Ready, NAX631.*

ATC: *NAX 631 re-cleared Oslo Gardermoen [CHANGE OF ROUTE], (rest of route unchanged).*

PILOT: *Re-cleared to Oslo Gardermoen [CHANGE OF ROUTE], (rest of route unchanged), NAX631.*

NON P-RNAV CLEARANCE

Aircraft with outdated AIRAC versions, basic or non precision area navigation (Non P-RNAV) may not be cleared via a standard instrument departure. This is simply because such aircraft are not capable of doing so. For more information regarding non- and precision area navigation, see Skybrary.aero.

In such situation, where one or several aircraft are equipped with basic or non P-RNAV, coordination between controller units should be applied. This is usually an approach controller unit, and should be informed before any clearances are issued. The controllers should coordinate the aircraft route, direction of flight upon departure and altitude. When this has been agreed between the controller units, a clearance may be applicable. The most common Non P-RNAV departures used in Norway FIR are:

- *Vectoring departure:*
 - The vectoring departure is a type of Omni-directional departure that implies for a pilot to follow vectors given by and air traffic controller unit. The pilot shall respect the standard procedure gradient and altitude. In same fashion as Omni-directional departures, Vectoring departures may be used as an alternative when no track guidance is provided in the design of a departure procedure. Nevertheless, an Omni-directional and vectoring departure are rather the same. Both are based on Non P-RNAV and require initial heading, altitude and speed.
 - A detailed departure procedure shall be given step by step by the controller issuing the clearance on the ground. This is also a non-published Omni-directional departure.

Omni-directional departures are departures specified in either a LOP, SOP or the AIP (e.g. AIP Norway). These may and may not be published in charts. Vectoring departures on the other hand, are usually not published and is prior to coordination with relevant approach sector. If a specific heading and altitude (e.g. runway track to altitude 4000 feet) is agreed in advance, there is no need to coordinate unless another heading and/or altitude is relevant than agreed. The process of a non-published Omni-directional or vectoring departure:

- Confirm the aircraft equipments before issuing clearance
- Ensure if it is a Standard Instrument Departure or *not*.
- Coordinate with relevant approach sector if necessary.
- Issue Non-published IFR Clearance (when aircraft is ready to copy!)

OMNI-DIRECTIONAL DEPARTURE

**BERGEN/Flesland
RWY 35**

RADIO COMMUNICATION FAILURE: Squawk A7600. Climb on track 350° to 4000 FT, then proceed in the most direct manner possible to join the CPL route, climbing to CPL cruising LVL.
ACFT under vectoring shall, after set transponder to A7600, proceed the most direct route to join the CPL route, climbing to the CPL cruising LVL.

VECTORING/DIRECT ROUTING: When being vectored or cleared for DCT routing, the climb gradient(s) stated in Omni-directional departure "RESTRICTIONS"-table apply.

DESIGNATOR	ROUTE	RESTRICTIONS	CLIMB TO	CONTACT
OMNI 2D (OMNI-DIRECTIONAL TWO DELTA DEPARTURE)	Climb on track 350° to 4000 FT. Start turn according to ATC clearance.	MNM climb gradient 6.0% (365 FT/NM) to 4000 FT. If unable to comply, inform ATC.	4000 FT.	When airborne, contact FLESLAND APPROACH 121.000 MHZ

Look at the picture above. This picture is taken from the published Omni-directional departure "OMNI 1D" for runway 35 at Flesland. The first example shows us how to clear an aircraft with a published Omni-directional departure from Flesland. The text written in (...) is text you may, but do not have to include in the clearance:

PILOT: *Flesland Tower, NAX631 with information alpha, QNH1013, request clearance to Oslo Gardermoen. Be advice, we are negative P-RNAV equipped.*

ATC: *NAX631, Flesland Tower. Cleared to Oslo Gardermoen, OMNI 1D departure 35, (climb to 4000 feet on track 351°), squawk 4350.*

PILOT: *Cleared to Oslo Gardermoen, OMNI 1D departure 35, (climb to 4000 feet on track 351°), squawk 4350, NAX631.*

ATC: *NAX631, read-back is correct.*

The next example will include a full detailed non-published Omni-directional departure. Please note that the headings may not be relevant in all non-published Omni-directional departures.

PILOT: *Flesland Tower, NAX631 with information alpha, QNH1013, request clearance to Oslo Gardermoen. Be advice, we are negative P-RNAV equipped.*

ATC: *NAX631, Flesland Tower. Cleared to Oslo Gardermoen, climb on runway track to 4000 feet, when passing 2000 feet, turn left heading 080 degrees, squawk 4350*

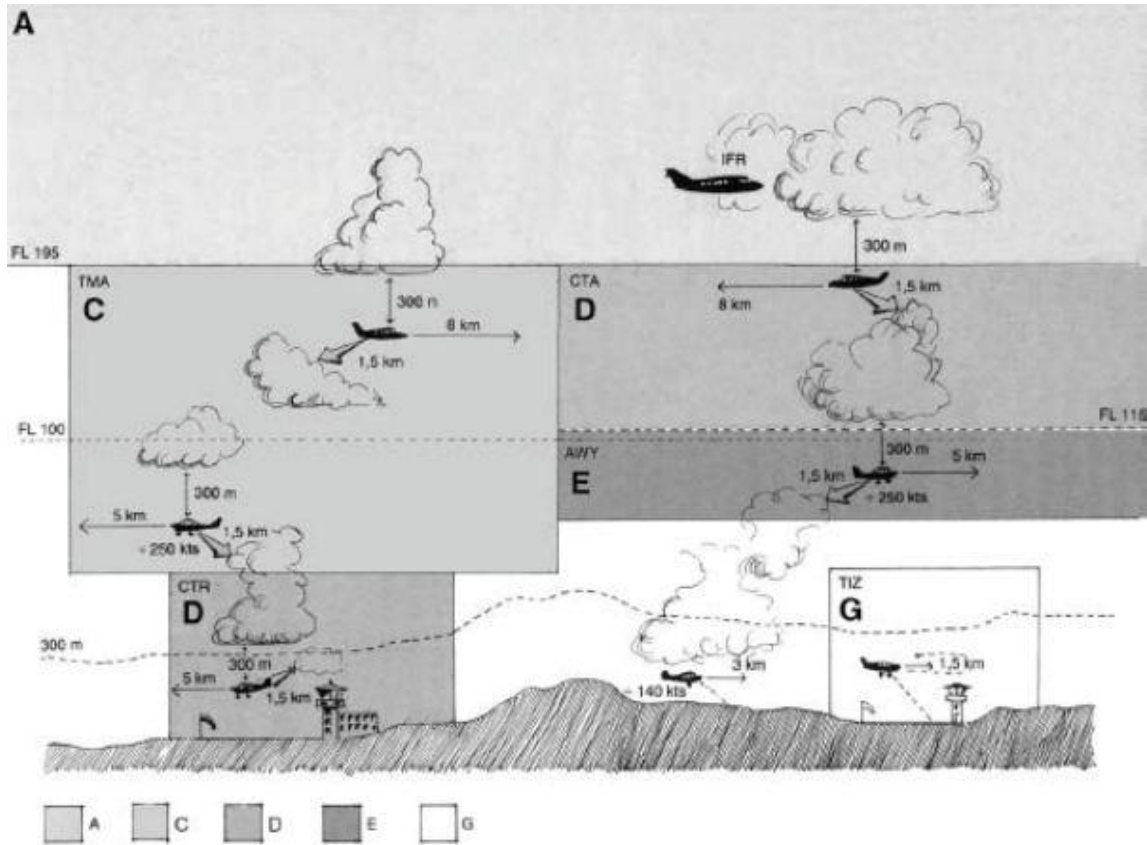
PILOT: *Cleared to Oslo Gardermoen, climb on runway track to 4000 feet, when passing 2000 feet, turn left heading 080 degrees, squawk 4350, NAX631.*

ATC: *NAX631, read-back is correct.*

Note: *this clearance is subject to prior coordination with relevant approach sector.*

VISUAL CLIMB OUT CLEARANCE

A *visual climb out*, or (VCO) is a departure option in which the pilot gets cleared direct a specific waypoint (usually first waypoint in flight plan). Visual Climb outs are available on pilots' request towards either side (left/right). A VCO departure is only permitted in good weather, but exactly what defines *good weather*? A visual climb out is only permitted when VFR aircraft are, which is in VMC (Visual Meteorological Conditions). Restrictions for VMC in Norway FIR are defined in the picture below:



It is important not to be too eager with VCO. It is not that often used, not even in real-life. As stated above, it is only obtained on pilots' request. Visual climb outs are specified in the IFR clearance. Look at NAX631's clearance below:

PILOT: *Flesland Tower, NAX631 with information alpha, QNH1013, request clearance to Oslo Gardermoen. Request visual direct GOKAB.*

Before the controller unit can issue the clearance, coordination between relevant sectors is required. Sometimes, both tower and approach must know. This is because tower issues a *special* takeoff clearance in which the VCO is included.

Note: *the coordination with both tower and approach may not be relevant and necessary at all airports.*

ATC: *NAX631, Flesland Tower. Cleared to Oslo Gardermoen, climb to 4000ft, when ready left visual direct GOKAB, squawk 4350*

PILOT: *Cleared to Oslo Gardermoen, climb to 4000ft, when ready left visual direct GOKAB, squawk 4350, squawk 4350, NAX631*

ATC: *NAX631, read-back is correct.*

3.3 Pushback and start-up

Once an IFR clearance is obtained, the pilot may request something called *pushback*. Pushback is an airport procedure, done by the ground crew in real-life, which an aircraft is pushed backwards away from its stand or parking spot by external power. Start-up, on the other hand, is the moment where the aircraft will start its engine or power. Start-up clearances shall not be given before clearance is obtained (see VFR manual for specific exceptions). The following examples will be divided into three sections:

SECTION I: PUSHBACK CLEARANCE

Aircraft requesting pushback only are rare. However, it might happen. In such case, please use the phraseology example below:

PILOT: *Flesland Tower, NAX631 request pushback.*

ATC: *NAX631, Flesland Tower. Pushback approved, QNH 1013.*

PILOT: *Pushback approved, QNH 1013, NAX631.*

Note: *whenever an aircraft have confirmed correct ATIS information and/or QNH upon requesting IFR clearance, QNH confirmation is not necessarily unless QNH and/or ATIS information have changed. See example below:*

ATC: *NAX 631, pushback approved, information Bravo now valid, QNH 1014, no significant changes.*

SECTION II: START-UP CLEARANCE

Aircraft requesting start-up only is used very often by propeller aircraft such as Dash-8 Q400, 300, 100 etc. The start-up clearance shall be stated as followed:

PILOT: *Flesland Tower, NAX631 request start-up.*

ATC: *NAX631, Flesland Tower. Pushback approved, QNH 1013.*

PILOT: *Start-up approved, QNH 1013, NAX631.*

Note: *whenever an aircraft have confirmed correct ATIS information and/or QNH upon requesting IFR clearance, QNH confirmation is not necessarily unless QNH and/or ATIS information have changed. See example below:*

ATC: *NAX 631, start-up approved, information Bravo now valid, QNH 1014, no significant changes.*

SECTION III: PUSHBACK AND START-UP CLEARANCE

Aircraft requesting pushback and start-up clearance are the most common request. Usually taken place on the apron, terminal or cargo area at an aerodrome. The clearance will be issued by a ground controller (or tower if no ground) and should be as followed:

PILOT: *Flesland Tower, NAX631 request pushback and start-up.*

ATC: *NAX631, Pushback and start-up approved, QNH 1013.*

PILOT: *Pushback and start-up approved, QNH 1013, NAX631.*

Note: *If the aircraft, for example NAX631, includes that they have obtained the correct ATIS information, there is no need to include QNH when issuing pushback and start-up clearance. In same fashion if the pilot include correct QNH in the request.*

3.4 Taxi

When an aircraft has completed pushback and start-up, it will contact the same controller unit for taxi clearance to the active runway. The controller unit shall then instruct the aircraft to the runway according to his cleared flight plan (which is runway 35). The active runway is designated by a tower controller (also referred to as aerodrome controller) and is depending on the current wind direction.

Note: We recommend you read “ATC Training Manual: Norway FIR - Weather information” in order to learn and understand how to choose an active runway.

In the following examples, runway 35 at Bergen airport Flesland [ENBR] will be the active runway as stated in section 2.2. NAX631, located on terminal 1 (main pier) at stand 29 will also be relevant. A taxi clearance from the apron (terminal) to the active runway is given by the ground controller, and the phraseology should be as followed:

ATC: NAX631, taxi to holdingpoint runway 35 via Whiskey, Charlie and Yankee.

PILOT: Holdingpoint runway 35 via Whiskey, Charlie and Yankee, NAX631

The example above shows us a *standardized* taxi clearance given by a ground controller. However, these taxi clearances may be issued in several methods and different phraseology. See examples below:

- **ATC:** NAX631, taxi to holdingpoint Alpha-two runway 35.
- **ATC:** NAX 631 taxi via Whiskey, Delta and Yankee to holdingpoint runway 35.
- **ATC:** NAX 631 taxi via Whiskey, Delta and Yankee to holdingpoint Alpha-two runway 35.

3.5 Takeoff

Takeoff is the last part given by the aerodrome controller on the ground. This is where the aircraft will roll down the runway and pitch the nose upwards so that it will start climb. A successful takeoff is not successful before gear is up and the pilot has confirmed positive climb. A takeoff procedure used on a regular basis in Norway FIR consists of mainly three parts as described in section 3.4.

- Taxi clearance
- Line-up clearance
- Takeoff clearance

Often used as in an oral content as: **TLT (Taxi, Line-up, Takeoff)**

This *unofficial* procedure does indeed have a story. This was partly determined in Norway after a misunderstanding between a tower controller and an Aeroflot A319 pilot at Oslo airport, Gardermoen [ENGM] February 25, 2010, where the Aeroflot pilot took off from taxiway *Mike* instead of runway 01L. Similar misunderstandings has been experienced in other countries, it is therefore recommended to use the TLT whenever controlling on VATSIM.

TAKEOFF CRITERIAS

When the aircraft approaches the runway holdingpoint, you may give him line-up clearance. When aircraft is lined-up and ready for departure, the tower controller may give the aircraft takeoff clearance if:

- No aircraft is on the runway
- No aircraft is crossing the runway
- No aircraft in the vicinity will receive or have received landing clearance before takeoff clearance is issued.

MITIGATION OF WAKE TURBELENCE HAZARD

Minimum Distance Separation

Minimum distances apply whenever:

- an aircraft directly follows another at the same altitude or less than 1,000 ft below it, or
- if both aircraft are using the same runway or parallel runways separated by less than 760 m, or
- An aircraft is crossing behind another aircraft, at the same altitude or less than 300 m (1 000 ft) below.

Proceeding Aircraft	Following aircraft	Minimum Separation
HEAVY	HEAVY	4.0 NM (1.0 MIN)
HEAVY	MEDIUM	5.0 NM (1.5 MIN)
HEAVY	LIGHT	6.0 NM (2.0 MIN)
MEDIUM	LIGH	5.0 NM (1.5 MIN)

- **Examples of *HEAVY* aircraft**

Boeing 747
Boeing 757
Boeing 767
Boeing 777
Boeing 787
Airbus A340
Airbus A350

- **Examples of *MEDIUM* aircraft**

Boeing 737
Airbus A319
Airbus A321

- **Examples of *LIGHT* aircraft**

C172
BE20
BE58

Minimum Time Separation: Intermediate Take Off After a Full Length Take Off

Minimum time separation for departing aircraft which are using:

- an intermediate part of the same runway; or
- an intermediate part of a parallel runway separated by less than 760 m (2 500 ft).
- is 3 minutes between a LIGHT or MEDIUM aircraft when taking off behind a HEAVY aircraft and a LIGHT aircraft when taking off behind a MEDIUM aircraft

Minimum Time Separation: Mixed Arrival/Departure Use with Displaced Threshold

Additional minimum time separations apply if the runway involved has a displaced landing threshold. In this case, separation minimum for runways with successive arriving-departing or departing-arriving traffic is a minimum 2 minutes between a LIGHT or MEDIUM aircraft and a HEAVY aircraft and between a LIGHT aircraft and a MEDIUM aircraft if:

- an arriving LIGHT or MEDIUM aircraft follows a departing HEAVY aircraft or an arriving LIGHT aircraft follows a departing MEDIUM aircraft or
- a departing LIGHT or MEDIUM aircraft follows an arriving HEAVY aircraft or a departing LIGHT aircraft follows an arriving MEDIUM aircraft and
- if the projected flight paths are expected to cross

Minimum Time Separation: Opposite Direction Use by Successive Aircraft

A separation minimum of 2 minutes is required between a LIGHT or MEDIUM aircraft and a HEAVY aircraft and between a LIGHT aircraft and a MEDIUM aircraft when the heavier aircraft is making a low or missed approach and the lighter aircraft is:

- using an opposite-direction runway for take-off or
- landing on the same runway in the opposite direction or

Prior Awareness of Aircraft Wake Turbulence Category

To improve awareness of the applicable aircraft wake turbulence category, particularly if it is 'Heavy' the following related requirements are also included in ICAO air traffic procedures.

- The wake turbulence category of an aircraft should be included in the aircraft flight plan.
- For aircraft in the HEAVY wake turbulence category, the word "Heavy" is to be included immediately after the aircraft R/T call sign in the initial communication between such aircraft and ATS units.

LINE-UP CLEARANCE

At a point where the aircraft is approaching the runway holdingpoint, the tower controller may issue a *line-up* clearance. A line-up clearance gives the aircraft permission to enter the runway, but not takeoff. Look at the phraseology example below:

PILOT: *Approaching holdingpoint alpha-two, NAX631*

ATC: *NAX631, line-up runway 35, and wait.*

PILOT: *Line-up runway 35 and wait, NAX631.*

If there is any other relevant traffic, such as a Boeing 737-800 for instance, the phraseology might look like:

PILOT: *Approaching holdingpoint alpha-two, NAX631*

ATC: *NAX631, behind arriving Boeing 737-800, line-up runway 35 and wait, behind*

PILOT: *Roger, behind arriving Boeing 737-800, line-up runway 35 and wait, behind, NAX631.*

When the Boeing 737-800 has vacated the runway, the tower controller may give NAX631 takeoff clearance. This takeoff clearance should be in accordance with the examples below (under the TAKEOFF CLEARANCE section)

TAKEOFF CLEARANCE

If the runway is clear of aircraft and no aircraft are in the vicinity relevant to the departing aircraft, it may get takeoff clearance right away. Remember TLT.

ATC: *NAX631 wind 340 degrees 5 knots, runway 35, cleared for takeoff.*

PILOT: *Cleared for take-off runway 35, NAX631.*

Note: *All numbers, such as 350 degrees 5 knots shall be spoken as "Three Five Zero degrees Five knots" and not "three hundred and fifty"*

In case of an immediate departure needs to be issued due traffic on approach, or other relevant reasons, the phraseology should be more or less the same, just include "immediate" before "takeoff".

ATC: *NAX631 wind 340 degrees 5 knots, runway 35, cleared immediate takeoff.*

PILOT: *Cleared immediate take-off runway 35, NAX631.*

These are the most common outcome when issuing a takeoff clearance. However, you may experience a scenario in which you need to either reject or cancel a takeoff clearance. This happens very rarely, but when it happens, it is good to know what to say. The examples below show us how to instruct an aircraft to abort, or reject a takeoff clearance:

ATC: *NAX631 abort takeoff, I say again, abort takeoff.*

PILOT: *Aborting takeoff, NAX631.*

You may also say:

ATC: *NAX631 cancel takeoff clearance, I say again, cancel takeoff clearance*

PILOT: *canceling takeoff, NAX631.*

WHEN AIRBORNE

When the aircraft has taken off from the runway, it is defined as airborne. When an aircraft is airborne it will handed over, or transferred to the next controller unit. The next controller will then handle the aircraft further to a specific point or altitude before handing it over to another sector. This is how it goes from the time it takes off, till the time it lands.

Note: *If no controller unit is covering the airspace above, the aircraft shall be sent to UNICOM frequency, which is 122.800MHz.*

After takeoff, the tower controller should use the following phraseology to hand an aircraft over to the next receiving controller unit:

ATC: *NAX631 contact Flesland radar 121.00.*

PILOT: *Contacting Flesland radar 121.00 good bye.*

If the aircraft took off with wrong SSR (secondary surveillance radar), or squawk code, the tower controller is responsible of fixing this before transferring the aircraft. However, this shall be cross check before issuing takeoff clearance.

- i) Tower checking Mode-C on departing aircraft:

ATC: *NAX631 confirm (squawk) mode-C(?)*

- ii) Tower checking SSR-code:

ATC: *NAX631, recycle your transponder - 4350.*

Note: *Aircraft shall not be handed over to next controller unit before aircraft identifies himself with Mode-C or recycled his transponder to the correct SSR-code.*

Chapter 4. IFR Arrivals

4.1 General

In this chapter, you will learn about IFR arrivals. An IFR aircraft arriving an aerodrome must, similarly to an IFR departure, go through several controller units in order to receive a landing clearance. This chapter will deal with mainly one aircraft, NAX624 from Oslo airport Gardermoen [ENGM] with destination Bergen airport Flesland [ENBR]. We will also go through several outcomes that may be relevant for a tower controller when dealing with such traffic.

Note: VFR aircraft and separation between IFR/VFR will not be described in the following chapter. Please see the VFR Manual for S2 - TWR.

In this chapter, you will learn how to handle an IFR arrival aerodrome:

- 3.1 General (pg. 14)
- 3.2 On Approach (pg. 15)
 - 3.2.1 ILS Approach (pg. 15)
 - 3.2.2 Visual Approach (pg. 16)
- 3.3 Misses Approach (pg. 16)

IFR Arrival aircraft - Chapter 4:

FLIGHT PLAN			
3 MESSAGE ◀≡ (FPL	7 AIRCRAFT IDENTIFICATION N A X 6 2 4	8 FLIGHT RULES — I	▶≡
	TYPE OF AIRCRAFT B 7 3 8	WAKE TURBULANCE CAT. / M	▶≡
13 DEPARTURE AERODROME — E N G M	TIME 1 9 5 5 ▶≡		
15 CRUISING SPEED — 4 4 8	LEVEL 3 0 0 0 0 →	ROUTE ATLAP N623 PESUR	
▶≡			
16 DESTINATION — E N B R	ALTN AERODROME → E N Z V	2ND ALTN AERODROME →	▶≡
18 OTHER INFORMATION			

The learning objectives for this chapter are as followed:

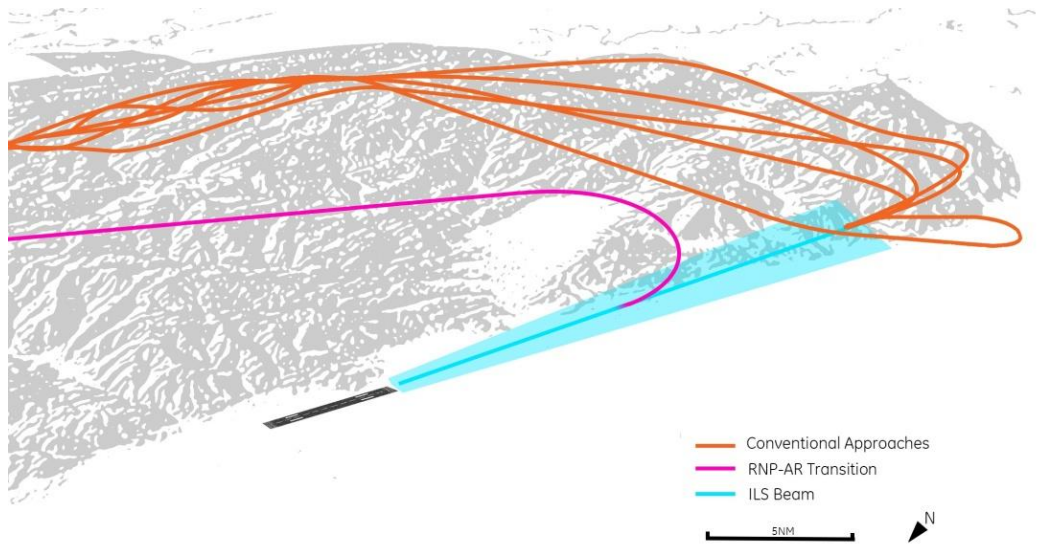
- Issue correct landing clearance
- Provide traffic information between IFR aircraft
- Ensuring separation
- Issue go around instructions when necessary
- Issue correct and appropriate taxi clearance
- Use correct phraseology when controlling IFR aircraft as aerodrome control

4.2 On approach

An aircraft is defined as being on approach when it is descending into a specific waypoint towards its destination.

4.2.1 ILS Approach

An ILS (Instrument landing system) is an instrument that guides the pilot laterally and vertically towards the runway on final approach. An ILS is the combination of a G/S (Glide Slope) and LLZ (Localizer). When the aircraft is established on the LLZ and it is descending with the glide slope, the approach controller shall transfer the aircraft to the next receiving controller unit - the tower controller for landing clearance. When the aircraft contacts the tower controller, it should state its current position, speed and other relevant information if instructed by previous controller unit.



When an aircraft is established on the LLZ and is descending with the G/S, it will contact the tower controller for landing clearance. Please note that not only landing clearances are available: touch and go and low approaches are also used on a regular basis. However, these options are rarely executed by commercial IFR aircraft.

The phraseology below shows us how to clear an IFR aircraft to land on an active runway while executing an ILS approach:

PILOT: *Flesland Tower, NAX624 established ILS runway 35.*

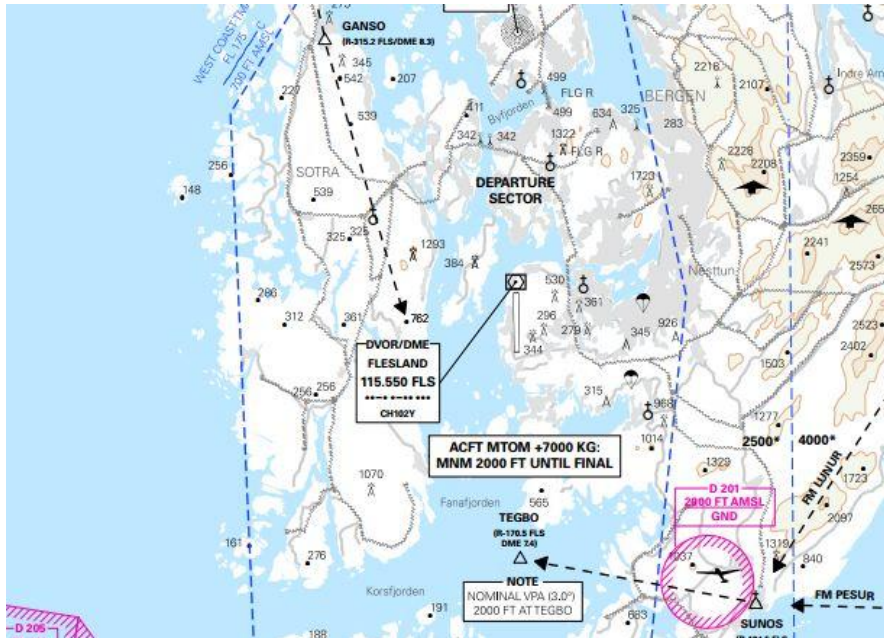
ATC: *NAX624, Flesland tower. Wind 340 degrees 5 knots, runway 35, cleared to land.*

PILOT: *Runway 35, cleared to land, NAX624.*

A touch and go or low approach clearance is issued in the same way as a landing clearance although the *cleared to land* part shall be exchanged with *cleared touch and go* or *Low approach*.

4.2.2 Visual Approach

A visual approach is an approach to a runway at an airport conducted under IFR, but where the pilot proceeds by visual reference to the runway. The visual approach allows a pilot to fly to the runway without having to perform an instrument approach. The visual approach is an invaluable tool to the controller for maximizing traffic flow. This can greatly reduce pilot and controller workload; however, some airports do not allow this procedure.



The phraseology below shows us how to clear an IFR aircraft to land on an active runway while executing a visual approach:

PILOT: *Flesland Tower, NAX624 with you, visual runway 35*

ATC: *NAX624, Flesland tower. Cleared unrestricted descend to final. Wind 340 degrees 5 knots, runway 35, cleared to land.*

PILOT: *Cleared unrestricted descend to final, runway 35, cleared to land, NAX624.*

A touch and go or low approach clearance is issued in the same way as a landing clearance although the *cleared to land* part shall be exchanged with *cleared touch and go* or *Low approach*.

4.3 Missed approach

A missed approach is a procedure followed by a pilot when an approach cannot be completed to a full-stop landing. The tower controller may assign the instructions for a missed approach before executing landing clearance, or after a pilot has executed a missed approach. This is, on the other hand, not relevant on all airports. Some airports are operating with a specific missed approach procedure (MAP) located in the AIP or aerodrome charts. A missed approach can, theoretically, be executed in all kinds of weather an approach type, however there may not be a published procedure for all. The following phraseology is used when a pilot declares a missed approach:

PILOT: *Flesland Tower, NAX624 going around.*

ATC: *NAX624, roger. Climb to 4000 feet and continue missed approach procedure.*

PILOT: *Climb 4000 feet and continuing missed approach procedure, NAX624*

ATC: *NAX624, contact Flesland radar 121.00.*

PILOT: *Contacting Flesland Radar 121.00, NAX624.*

If the pilot is unable to comply with the missed approach procedure, or the approach does not state any missed approach procedure for that particular approach or runway, another phraseology shall be used. This is subject to prior coordination with the relevant approach sector:

PILOT: *Flesland Tower, NAX624 going around.*

ATC: *NAX624, roger. Continue runway track to 4000 feet.*

PILOT: *roger. Continue runway track to 4000 feet, NAX624*

... if coordinated, Flesland Tower may issue vectors before handoff to approach.

ATC: *NAX624, contact Flesland radar 121.00.*

PILOT: *Contacting Flesland Radar 121.00, NAX624.*

Last but not least, the scenario in which the controller unit enforce the pilot to execute a go around:

ATC: *NAX624, Cancel landing clearance. Go around, I say again, go around.*

PILOT: *Going around, NAX624*

ATC: *Climb 4000 feet continue missed approach procedures*

PILOT: *Climbing 4000 feet and continuing missed approach procedure, NAX624*

ATC: *NAX624, contact Flesland radar 121.00.*

PILOT: *Contacting Flesland Radar 121.00, NAX624*