APPROACH TRAFFIC MANAGEMENT

1. Introduction

The APP controllers have the responsibility of ensuring Air Traffic Control (ATC) Services within a large area named terminal area (TMA).

Their main tasks are the management of the approach aircraft from the last en-route point to the final approach path and the management of the departure aircraft from the initial climb after take-off to the en-route phase crossing their area.

In IVAO, the APP controller shall handle both arrivals and departures when he is connected alone with no DEP controller. In some of large airports where a departure frequency is published, a DEP controller can open the position in order to take in charge of all departures. This will let the APP handle all the arrivals and transit aircraft.

2. Arrivals management

The first task of the **APP** controller is the management of traffic trajectories and descent path in order to include the aircraft into the final approach sequence.

The arrival management has 2 main phases:

- The arrival management from the last en route fix to the initial approach fix (IAF)
- The approach management from the initial approach fix to the final approach path

2.1. Arrival IFR traffic transfer

The flight is usually transferred at least 2 minutes before entering the TMA by the adjacent controller when descending to an altitude coordinated among the controllers or corresponding to the TMA ceiling.

If there is no controller in one or several of the adjacent controlled areas, the APP controller will send a “FORCE ACT” message where the pilot is located in those areas 2 minutes before the TMA border line.

The adjacent controller can be the en-route traffic controller or an adjacent approach controller.

The clearance to follow the appropriate arrival procedure will normally be issued by ACC without prior coordination with the approach unit.

Prior coordination of clearances should be required only in the event that a variation to the standard clearance or the standardized transfer of control procedures is necessary or desirable for operational reasons.
The APP controller should be kept informed of the sequence of aircraft following the same arrival procedure.

2.2. Arrival procedure

An arrival procedure is the route to fly by the aircraft between its last en-route point and one initial approach fix (IAF).

- For the majority of large airports, **Standard Arrival** procedures (**STAR**) for IFR flights are available and published on arrival charts. These STAR procedures are connecting predefined arrival fixes located on airways to one or several IAF fixes via published routes.
- For some smaller airports, the pilot can fly published **omnidirectional arrival** or omnidirectional arrival issued by air traffic controllers where no procedure is published.

The arrival procedures to be followed by any IFR aircraft shall be provided in the **IFR clearance or instruction** given by the controller who is in charge of the regulation of the en-route area near the entry point given by the arrival procedure.

The controller can eventually extend or shorten the routes of all aircraft under his control according to the traffic situation.

2.2.1. STAR

The Standard Terminal Arrival Route (STAR) is a published procedure between the last point of the route in the flight plan and the first point of the initial approach named IAF (Initial Approach Fix).

At aerodromes where standard instrument arrivals (STAR) have been established, arriving aircraft should normally be cleared to follow the appropriate STAR. The aircraft shall be informed of the type of approach to expect and the runway-in-use as early as possible by the APP controller.

The STAR arrival given by the controller to the aircraft should normally follow its flight plan. Sometimes, the STAR can be different due to specific airfield rules or traffic congestion. The APP controller is responsible to deliver the instruction(s) to permit the arriving aircraft to join the final approach path or one initial approach fix.

If no STAR procedure is published or the pilot asks not to follow a published one, the controller shall issue an omnidirectional arrival clearance toward one initial approach fix.

2.2.2. Omnidirectional arrival

The **content of an omnidirectional arrival clearance is determined by the en-route or APP controller** considering the environmental constraints, the minimum sector altitudes (MSA, MRVA or MVA), the sector radio navigation aids, the airspace structure and the traffic density.

The en-route (**CTR**) controller will perform coordination tasks with the **APP** controller in order to inform them about his decision on each omnidirectional clearance.

The APP controller should know the exact omnidirectional clearance given in order to perform his task.

Examples of simple omnidirectional arrival:

- From present position to initial approach fix (IAF)
- From a specific fix to initial approach fix (IAF)
- From present position direct to a specific beacon or intermediate fix on arrival or approach path

It is possible for the controller to ask for a more detailed procedure involving more complex manoeuvres:

- Minimum descent rate in ft/min or %
- Interception of a VOR radial or NDB track
- Fly a DME arc
- Fly a track until a given DME distance

2.3. Controller task during arrival track until the initial approach fix

From his first contact with the pilot, the **APP** controller shall know if the pilot has already received a **STAR** (**standard arrival procedure**) clearance, an **omnidirectional arrival** procedure clearance (it depends on the coordination with the adjacent controller when present), a direct to an intermediate point or a vectoring.

When an arriving aircraft on a STAR is cleared to descent to a level lower than the level(s) specified in the STAR, the aircraft shall follow the published vertical profile of a STAR, unless such restrictions are explicitly cancelled by ATC. Published minimums levels based on terrain clearance shall always be applied.

The aircraft shall be informed by the APP controller of the type of approach to expect and the runway-in-use as early as possible.

Any arriving aircraft shall be informed without delay about any instrument approach procedure change including another runway or not.

A flight crew may request an alternative procedure and, if circumstances permit, should be cleared accordingly.

If a pilot reports or it is clearly apparent to the ATC unit that the pilot is not familiar with an instrument approach procedure, the description of the procedure needs to be specified (initial approach level, procedural turn, final approach track, necessary frequency in use).

2.3.1. Arrival scenario

If the pilot has been already cleared via an arrival route by the previous controller, the controller may:

- Let aircraft continue this route. Nevertheless, the controller must issue all descent clearances during the arrival procedure since the pilot is not allowed to change his own altitude if not authorized.
- Give aircraft a direct route clearance to an IAF to shorten its route
- Give aircraft an IFR approach clearance that authorizes aircraft to continue beyond IAF
- Give aircraft a direct to a specific fix of the approach procedure to shorten its route
- Provide aircraft radar vectoring (if radar vectoring is possible) to shorten its route or for regulation
- Give aircraft a holding pattern on a fix or navigation aid for regulation purposes

If the pilot has not been cleared via an arrival route (non-controlled area), the controller may

- Give aircraft an arrival route clearance with altitude restriction
- Give aircraft a direct route clearance to an IAF
- Give aircraft an IFR approach clearance that authorizes aircraft to continue beyond IAF
- Give aircraft a direct to a specific fix of the approach procedure to shorten its route
- Provide aircraft radar vectoring (if radar vectoring is possible) to shorten its route or for regulation purposes
- Give aircraft a holding pattern on a fix or navigation aid for regulation purpose

If the pilot has been already under radar-vectoring clearance or a direct route outside any published route by the previous controller, the controller may:

- Continue aircraft radar vectoring (if radar vectoring is possible)
- Give aircraft a direct route clearance to an IAF in order to connect to an approach procedure
- Give aircraft a holding pattern on a fix or navigation aid for regulation purposes

If the pilot is off track or lost, the controller may:

- Give aircraft a direct to an IAF, or specific fix of the approach procedure to shorten his route
- Provide aircraft radar vectoring (if radar vectoring is possible) to shorten his route or for regulation purposes
- Give aircraft a holding pattern on a fix or navigation aid for regulation purposes

2.3.2. Safety

The **APP controller is responsible of the aircraft safety** during arrival. ATC shall respect the minimum applicable altitudes in his sector where these are applicable (MRVA, MSA).

An IFR flight shall <u>never be cleared for initial approach below the appropriate minimum altitude</u> nor to descend below that altitude unless:

- The aircraft is conducting a visual approach or,
- Pilot reports that the aerodrome is and can be maintained in sight or,
- The controller has determined that the aircraft position is compatible by the use of a lower minimum altitude specified for the use of a radar system.

2.4. Controller task during IFR approach procedure until the final approach track

The **APP** controller must give the pilot the final approach clearance together with the landing runway. This information shall be issued as soon as possible always before the IAF, except during vectoring where the approach procedure shall be issued as soon as possible and at maximum 2 min before the final approach path.

During the approach procedure, the controller is responsible for the separation of all aircraft under his control, whether it is along a published route or not (direct or radar-vectored).

2.4.1. Approach scenario

The pilot follows a direct route or a published procedure to the IAF. The controller can make one of the following choices before reaching the IAF:

- Give the aircraft an approach clearance
- Grant a direct route to a fix along the published approach track
- Provide radar vectoring (if possible in function of local regulations and minima)
- Give the aircraft a direct route to an IAF or off-procedure point only for traffic management purpose
- Issue a holding clearance over the IAF (this is the procedure the pilot must follow when he has not received any of the preceding clearances)

The pilot follows a direct route to a point along the published IAP. The controller can make one of the following choices before reaching the point:

- Give the aircraft an approach clearance from that point when the next track leg is a straight segment towards the final approach (dead reckoning segment) or the point belongs to the final approach track
- Grant a direct route to a fix along the published procedure
- Provide radar vectoring (if possible in function of local regulations and minima)
- Give the aircraft a direct route to an IAF or off-procedure point only for traffic management purpose
- Issue a holding clearance over this point or an IAF (if a holding circuit is published or feasible at this point)

The flight is radar-vectored. The controller shall:

- Continue with radar vectoring until the interception of the final approach procedure track
- Give the aircraft an approach clearance normally when the aircraft trajectory and altitude are compatible with a correct interception of the final approach procedure track through a point not farther than 30 seconds from the descent fix (FAF, FAP)
- Issue a holding clearance over an IAF when radar vectoring is no more possible.

The pilot follows a direct route to an off-procedure point. The controller can make one of the following choices before reaching the point:

- Provide radar vectoring (if possible in function of local regulations and minima)
- Issue an approach clearance from that point when the aircraft heading is compatible with a correct interception of the approach procedure track published on that point
- Grant a direct route to another off-procedure point for traffic management purpose

- Issue a holding clearance over an IAF if any of the other choices is not possible

The pilot is deviating by more than 1 NM from the last cleared route. The controller shall:

- Provide radar vectoring (if possible in function of local regulations and minima)
- Negotiate with the pilot another route clearance which he can follow
- Issue a holding clearance over an IAF if any of the other choices is not possible

Once aircraft have left the IAF, the controller should not change the landing runway announced unless in exceptional situations (emergency, separation loss, occupied runway, weather conditions).

At the commencement of final approach, the following information shall be transmitted to aircraft:

- Significant change of mean headwind component of 10KT (19km/h)
- Significant change of mean tailwind component of 2KT (4km/h)
- Significant change of mean crosswind component of 5KT (9km/h)
- Presence of wind shear and/or turbulence in the final approach area
- Change of the current visibility value or RVR value and their trend

During final approach, the following information shall be transmitted to aircraft without delay:

- Sudden occurrence of hazards (on runway, on approach path …)
- Significant variation in the current surface wind
- Significant changes in runway surface conditions (rain, ice)
- Change in the operational status or required visual or non-visual aids (not applicable in IVAO)
- Change in the RVR value or change in the visibility

The exceptional change of the announced landing runway after the IAF must be negotiated with the pilot.

In addition, the APP controller can assign altitudes and speeds different from those published in order to ensure regulation and separation but with respecting the minimum applicable altitudes in his sector where these are applicable (MRVA, MSA).

2.4.2. Visual approach clearance

A visual approach clearance for an IFR flight may be requested by the flight crew or initiated by the controller.

An IFR flight may be cleared to execute a visual approach if the pilot can maintain visual reference to the terrain and:

- The reported ceiling is at or above the level of the beginning of the initial approach segment for the aircraft cleared, or
- The pilot reports at the level of the beginning of the initial approach segment or at any time during the instrument approach procedure that the meteorological conditions are such that with a reasonable assurance a visual approach and landing can be completed.

The controller **shall ensure separation between an aircraft cleared to execute a visual approach and other arriving and departing aircraft**.
For **successive visual approach**, separation shall be maintained by the controller until the pilot of a succeeding aircraft reports having the preceding aircraft in sight.

The aircraft **shall then be instructed to follow and maintain own separation** from the preceding aircraft and the controller will then not assure separation only between these two aircraft.

If the distance between the aircraft is less than the wake turbulence separation minimum during visual approach, the controller shall issue a caution of possible wake turbulence. The pilot-in-command of the aircraft concerned shall be responsible for ensuring that the spacing from the preceding aircraft is acceptable.

The controller shall exercise caution in a visual approach when there is reason to believe that the flight crew concerned is not familiar with the aerodrome and its surrounding terrain.

The controller shall also take into consideration the meteorological conditions when initiating visual approach.

2.4.3. Safety

An IFR flight shall never be cleared for final approach below the published minimum altitude nor to descend below that altitude unless:

- The aircraft is conducting a visual approach or,
- The pilot reports that the aerodrome is and can be maintained in sight or,
- The controller has determined that the aircraft position is compatible by the use of a lower minimum altitude specified for the use of a radar system (MRVA, MVA).

2.5. Holding task

In the event of extended delays, aircraft should be advised of the anticipated delay as early as possible and, when practicable, **be instructed or given the option to reduce speed** in order to absorb delay.

When some delay is expected for landing and it cannot be resolved by regulation, the APP controller is responsible for clearing aircraft to one holding fix and expected approach time or onward clearance time as applicable in such clearance.
Holding procedure and holding pattern entry shall be accomplished first in accordance with procedures established by the regulation and the charts.

If the holding procedures have not been published on the considered fix or if the procedure is not known to a flight crew, **the appropriate air traffic control unit shall specify:**

- The designator of the location or aid to be used,
- The inbound track, radial or bearing,
- The direction of turn in the holding pattern
- The time of the outbound leg or the distances between which to hold.

If an aircraft is unable to comply with the published or cleared holding procedure, alternative instructions shall be issued.

For the purpose of maintaining a safe and orderly flow of traffic, an aircraft may be instructed to orbit at its present or at any other position.

NOTE: After coordination with lower ATC, ATC may clear an arriving aircraft to a visual holding location to hold until further advised by the lower ATC.

2.6. VFR flight managing task

The **APP** controller shall handle VFR flights under his TMA following its airspace class:

- **Class B**: continuous and two-way radio communication is required and the airspace penetration is subject to an ATC clearance (separation is provided to VFR flights with respect to all aircraft)
- **Class C and D**: continuous and two-way radio communication is required and the airspace penetration is subject to an ATC clearance (no separation is provided to VFR flights). VFR flights are limited to 250kt IAS below 1000ft AMSL. Flight Information Service (FIS) is provided to VFR (traffic avoidance on request)
- **Class E**: radio communication is optional and the airspace penetration is not subject to an ATC clearance (separation is provided to VFR flights from IFR only in class C). VFR flights are limited to 250kt IAS below 1000ft AMSL. Flight Information Service is provided as far as practical

On IVAO, the **APP** controller **may provide FIS** (flight information service) in the traffic information sector attached to his platform.

The **traffic information sector** includes the airspace below and around the TMA as published on the platform charts. This class G airspace outside the TMA is a sector where **radio communication is optional** for VFR flights. Only FIS can be provided (no separation for VFR). Speed restrictions for VFR are the same for class C, D and E airspaces.

Inside a class G airspace, all IFR flights must obtain an ATC clearance whenever they want to penetrate a controlled airspace. The clearance shall be issued by the controller responsible for that airspace either on the ground or airborne before entering the airspace.

VFR flights are generally transferred:

- 2 minutes before entering the CTR (tower control zone)
- 2 minutes before entering an adjacent TMA
- Abeam of the VFR reporting points (VRP) previously coordinated
- Following any other procedure coordinated among controllers for safety or traffic management purposes
- Before joining the traffic circuit for a controlled aerodrome

2.7. Transferring on final approach path

The approaching flights must be transferred to the **TWR** controller once established on the final approach axis.

The point or the time of transfer of aircraft shall be done by the controller where information on local traffic, clearance to land or other instructions can be issued to the aircraft in a timely manner.

It is generally admitted that a flight shall be transferred:

- Once the aircraft is established on the localizer axis for an ILS, LOC/DME, ILS/VPT approach
- Once the aircraft is established on the VOR radial for a VOR, VOR/DME, VOR/VPT approach
- Once the aircraft is established on the NDB track for a NDB, NDB/DME or NDB/VPT approach
- Once the pilot has the runway in sight for a circling approach (visual manoeuvring without prescribed track)

In the case of visual manoeuvring using prescribed tracks or circling procedures, the flight will be transferred once established on the localizer axis, the VOR radial or the inbound NDB track of the first IFR approach flown.

In this case the transfer shall be done well before the pilot starts the visual approach in order to help the tower with the traffic management.

3. Regulation for approach sequence

The approach sequence shall be established in a manner **which will facilitate arrival of the maximum number of aircraft with the least average delay**.
In establishing the approach sequence, the need for increased longitudinal spacing between arriving aircraft due to wake turbulence shall be taken into account.

If a pilot of an aircraft in an approach sequence has indicated an intention to hold for weather improvement, or for other reasons, such action (holding) shall be approved.

3.1. Priority

Priority shall be given to (by priority):

1. An aircraft which wants to land because of factors affecting the safe operation of the aircraft (distress, emergency, or pan like engine failure, shortage of fuel …)
2. Hospital aircraft or aircraft carrying any person requiring urgent medical attention
3. Aircraft engaged in search and rescue operation
4. Other aircraft determined by the country's regulations

Note that there are not rules saying that IFR aircraft have priority over VFR aircraft.
The controller will ease IFR flight first, but without lowering his service quality toward the VFR flight.

3.2. Succeeding aircraft

Succeeding aircraft shall be cleared for approach:

- when the preceding aircraft has reported that it is able to complete its approach without encountering Instrument Meteorological Conditions (IMC), or
- when the preceding aircraft is in communication with the aerodrome tower controller and a reasonable assurance exists that a normal landing can be accomplished
- when timed approaches (procedural control) are used, the preceding aircraft has passed the defined point inbound (regulation reference point), and a reasonable assurance exists that a normal landing can be accomplished
- when the use of radar surveillance system confirms that the required longitudinal spacing between succeeding aircraft has been established

3.3. Sequencing and spacing of instrument approaches (procedural control)

Following procedures should be utilized as necessary for timed approach procedure (procedural control) to expedite the approaches of a number of arriving aircraft:

- A suitable point on the approach path which shall be capable of being accurately determined by the pilot, shall be specified to serve as a check point (regulation reference point) in <u>timing successive approaches</u>
- Aircraft shall be given a time at which to pass the specified point inbound (EAT – Expected Approach Time) in order to achieve the desired interval between successive landings

The time at which aircraft should pass the specified point outbound shall be determined by the APP controller and notified sufficiently in advance to permit the pilot to arrange the flight path accordingly.

Each aircraft in the approach sequence shall be cleared to pass the specified point inbound at the notified time only after the preceding aircraft has reported passing the point inbound

The time interval between successive aircraft shall take into account the following parameters:

- The relative speed of aircraft
- The distance from the specified point to the runway-in-use
- The need to apply wake turbulence separations
- The runway occupancy times
- The meteorological conditions (LVP)
- The go around procedure track

Coordination task shall be made to ensure that the aerodrome control tower is kept informed of the sequence in which aircraft will be established on final for landing.

4. Separation minima during approach

4.1. Separation definition and concerned traffic

Two aircraft controlled under traffic separation conditions are considered clear of conflict if they are separated horizontally or vertically by a distance in accordance with the separation minima (whether they are handled or not by the same ATC).

As established by ICAO regulation, traffic separation must be provided:

- for all flights in class A and B airspaces
- for IFR and SVFR from each other and from VFR in class C airspace
- for all IFR and SVFR from other IFR/SVFR in class D and E airspaces

Flights under VFR conditions in class C, D, E and F airspaces are not separated from IFR traffic and are required to ensure their separation by the "see and avoid" rule.

4.2. Radar separation minima for IFR

The minimal **vertical** separation within the terminal control area is:

- **1000ft** over the whole approach procedure

The minimal **horizontal** separation within the terminal control area is:

- **5NM**
- **3NM** when reduced approach separation is applicable to the TMA area.
- **2.5NM** when reduced approach separation is applicable on final approach track for this airfield

A minimum horizontal radar separation of 3NM (or even 2.5NM on the final approach axis) may be kept over the whole approach or departure procedure according to national or division rules. Consult the available documentation about minimum radar separation in order to have more information.

A separation higher than the general minimum is mandatory for some aircraft depending on their wake turbulence category.
The separation minima applicable for a controller using radar (IvAc) are:

Succeeding Aircraft	behind	preceding aircraft	Separation minima
Heavy	behind	Heavy	4 NM
Medium	behind	Heavy	5 NM
Light	behind	Heavy	6 NM
Light	behind	Medium	5 NM
Heavy	behind	A380	6 NM
Medium	behind	A380	7 NM
Light	behind	A380	8 NM

If the controller provides procedural approach control only without considering that IvAc software is a radar system where the radar vectoring is possible, the controller shall apply wake turbulence timed base separation presented below. (Consult available document about wake turbulence separation)

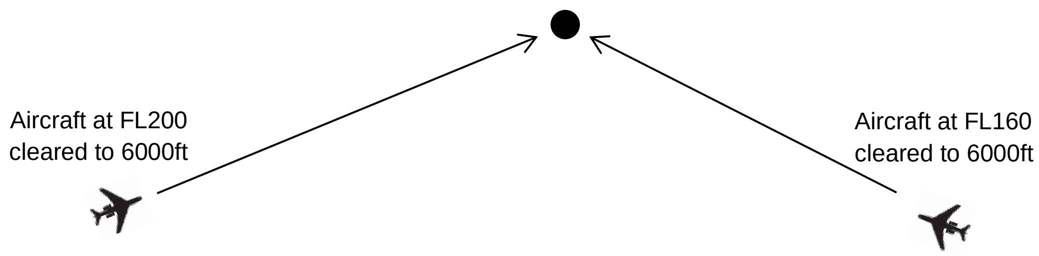
Succeeding aircraft	**behind**	**preceding aircraft**	**Separation minima**
Medium	behind	Heavy	2 minutes
Light	behind	Heavy	3 minutes
Light	behind	Medium	3 minutes
Medium	behind	A380	3 minutes
Light	behind	A380	4 minutes

4.3. Loss of separation

A conflict is an **event in which two or more aircraft experience a loss of minimum separation**.
However, the separation minima are set for risk mitigation and therefore it is essential to a controller's job to prevent this situation from occurring.

The controller shall not issue any clearance implying a separation reduction below separation minima.
A clearance presenting a potential risk of separation loss is considered as an ATC fault.

Example of clearance presenting a potential risk of separation loss:



The controller is responsible for the separation between all aircraft under his control with all other aircraft, whether they are under his control or not.

5. Use of Radar

During increased traffic at the airport, radar vectoring becomes the standard procedure in most of the large airports to arrange aircraft in sequence to ensure air traffic flow management for the most efficient use of airspace (in replacement of procedural control).

5.1. Condition of radar vectoring use

In some airfield procedures, radar vectoring is a mandatory procedure to guide aircraft on the final approach track.
Radar vectoring procedure shall be used by air traffic controller only for identified aircraft on radar system.

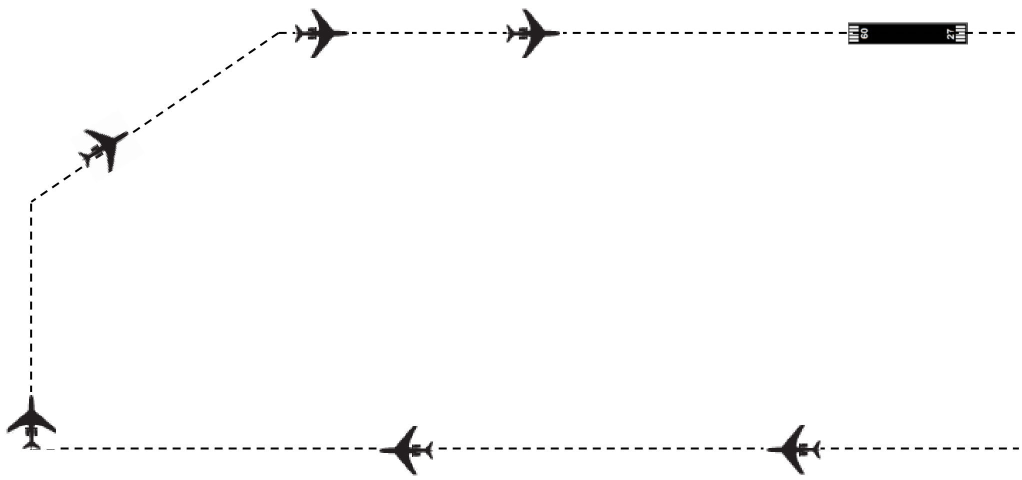
In smaller airports or airports in mountainous areas, the APP controller might provide only procedural control (published procedures).

Radar vectoring is mainly used by the ATC as a tool in order to ensure and enhance:

- The **air traffic flow management in arrival and/or approach phase** of instrument approach procedure.
- The **aircraft arrangement in sequence in arrival and/or approach phase** of instrument approach procedure.
- The **horizontal and vertical separation** between all departing and/or approaching aircraft

Typical regulation distance between vectored aircraft depends on the runway capabilities, the navigation equipment used during the approach procedure, the weather and/or the airport configuration.

Example of optimal approach sequence using radar vectoring:



Note: consult radar vectoring documentation in order to have more information.

5.2. Other goals of radar vectoring

Radar vectoring can be used by the ATC as a complementary tool in order to enhance:

- The **optimisation of departing aircraft** climb inside or outside an arrival flow
- The en-route traffic regulation in complex situations when classical management is failing
- **The assistance to pilots in emergency or pan**
- The assistance **to lost pilots or deviating pilots from their cleared track**
- Other cases where the situation needs it like specific pilot request, pilot off-track…

5.3. Safety during radar vectoring

When providing radar vectoring, the APP controller shall at all times:

- **ensure safety for each aircraft with respect to aircraft performance and <u>minimum separation between all aircraft at all times</u>** (whether they are totally or partially under his control)
- **<u>Not give any altitude clearance below minimum safety altitudes</u>** i.e. MRVA for Minimum Radar Vectoring Altitude or MSA minimum sector altitude where they are applicable to prevent any potential terrain collision
- Prevent any potential terrain collision

5.4. Side effect of radar vectoring

The procedures based on vectoring onto the IFR final approach path <u>in high workload</u> leads to traffic dispersion at low altitude and stepped descent (level-offs), resulting in fuel inefficiencies and noise pollution for local communities.

The new sequencing techniques like the point merge system (see below) aim primarily at improving the final part, in particular securing the ILS interception and reducing noise nuisances even under high traffic conditions, as well as optimising descents, reducing workload and communications.

In some cases, this may also lead to ILS interception in non-standard conditions and even to separation minima infringements in case of parallel approaches.

6. Approach sequence methodology

As explained in the previous chapters, the main goal of approach management is to organize a sequence of aircraft providing a continuous flow towards the final approach path.

The approach management can be done using:

- Procedural control: APP controller will use only the IFR procedure and holding combined with direct to intermediate fix, altitude change and speed instruction in order to maintain and create separation
- Radar vectoring: APP controller will use the radar to guide the aircraft outside the published tracks in order to optimize the distance between aircraft in order to increase the arrival of the maximum number of aircraft with the least average delay

Radar vectoring is today one of the main methods to achieve efficient sequencing.
Point merge operation where they are published are now the new optimisation procedure in development in Europe.

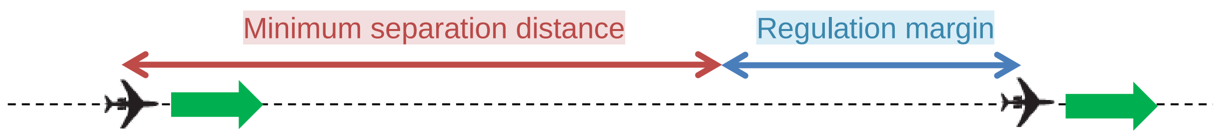
Whenever a controller starts radar vectoring, he has to take responsibility of all flight navigation parameters: heading, altitude and speed (descent rate if applicable) until interception of the IFR final approach track

6.1. Minimum regulation distance

ATS shall apply a margin for regulation distance between aircraft in order to handle unexpected changes in flying conditions and sequence situations like:

- Pilot error (track change, level change, speed change)
- Wind condition change (Aircraft ground speed change)
- Radar delay (or IVAO network latency)
- Human factors related to ATC (workload and stress, Emergency handling by ATC, fatigue)
- Human factors related to ATC (Emergency/pan stress, fatigue, distraction)
- IVAO related issues (Simulator crash, pause mode …)
- Aircraft going into emergency/pan condition (possible change of track, level and/or speed)

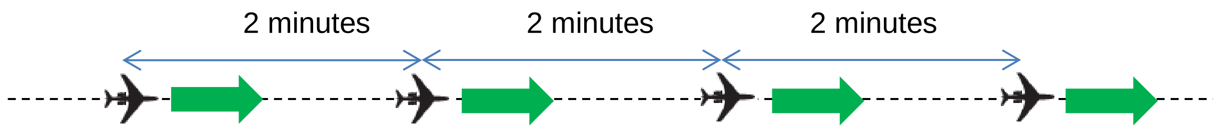
ATC should never regulate his traffic just at the minimum separation distance. (no margin)



There are no specific rules and no predefined procedures to define the regulation margin distance.
It should be a typical value of 2NM minimum which corresponds with about 30 sec flight time at 220kt.

6.2. Regulation target

A **typical 5NM separation on the final approach path** is one of the most used methods to manage **the traffic flow**.
This target of 5NM on final approach will create the need of a 2 minutes spacing sequence of aircraft.



Today, the timed based separation is the method applied in the modern air traffic control systems.

The table below will give you the separation time to monitor by using speed vector on IvAc calculated in function of the final separation distance wanted:

Final separation wanted (on final approach path)	Mean approach speed (during final approach path)	Separation time (speed vector)
8NM	150KT	3,2 min
7NM	150KT	2,8 min
6NM	150KT	2,4 min
5NM	150KT	2 min
4NM	150KT	1,6 min
3NM	150KT	1,2 min
2.5NM	150KT	1 min

If you handle light aircraft, the separation time should be increased during final approach as light aircraft use lower mean approach speed during final approach.

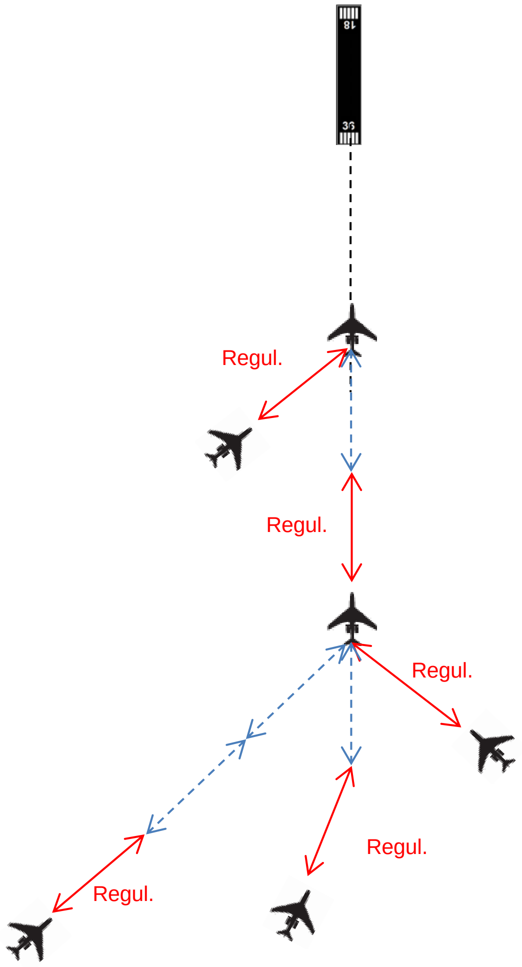
Final separation wanted (on final approach path)	Mean approach speed (during final approach path)	Separation time (speed vector)
8NM	120KT	4 min
6NM	120KT	3 min
5NM	120KT	2.5 min
3NM	120KT	1.5 min

6.3. Baseline regulation

The basic of regulation is to use the final approach path as a baseline.

This basic method is used combined with radar vectoring.

Each aircraft should be vectored by taking into account the preceding aircraft and the need of separation between all traffic.



6.1. Regulation via one point

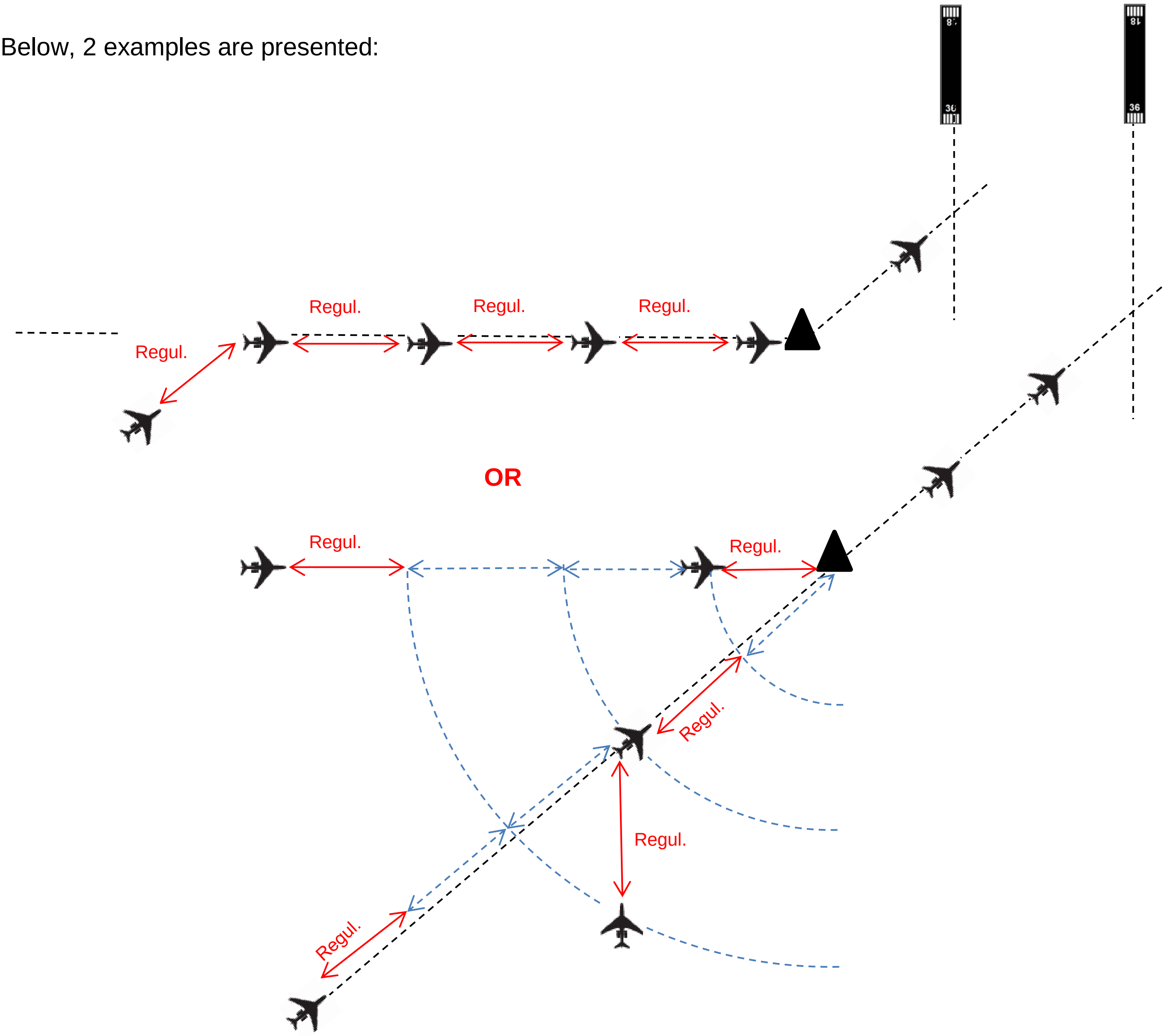
The APP controller should create the sequence via one point which is not on the final approach path.

A minimum vertical separation of 1000 ft between 2 successive aircraft should be used during the regulation separation establishment before obtaining the effective and stable regulation separation.

With this method, we secure the regulation in the final approach path before the interception. All aircraft are performing the same final path interception that improves the pilot awareness of the situation.

On IvAc, you can use the range rings with radar centred on the regulation point.

Below, 2 examples are presented:



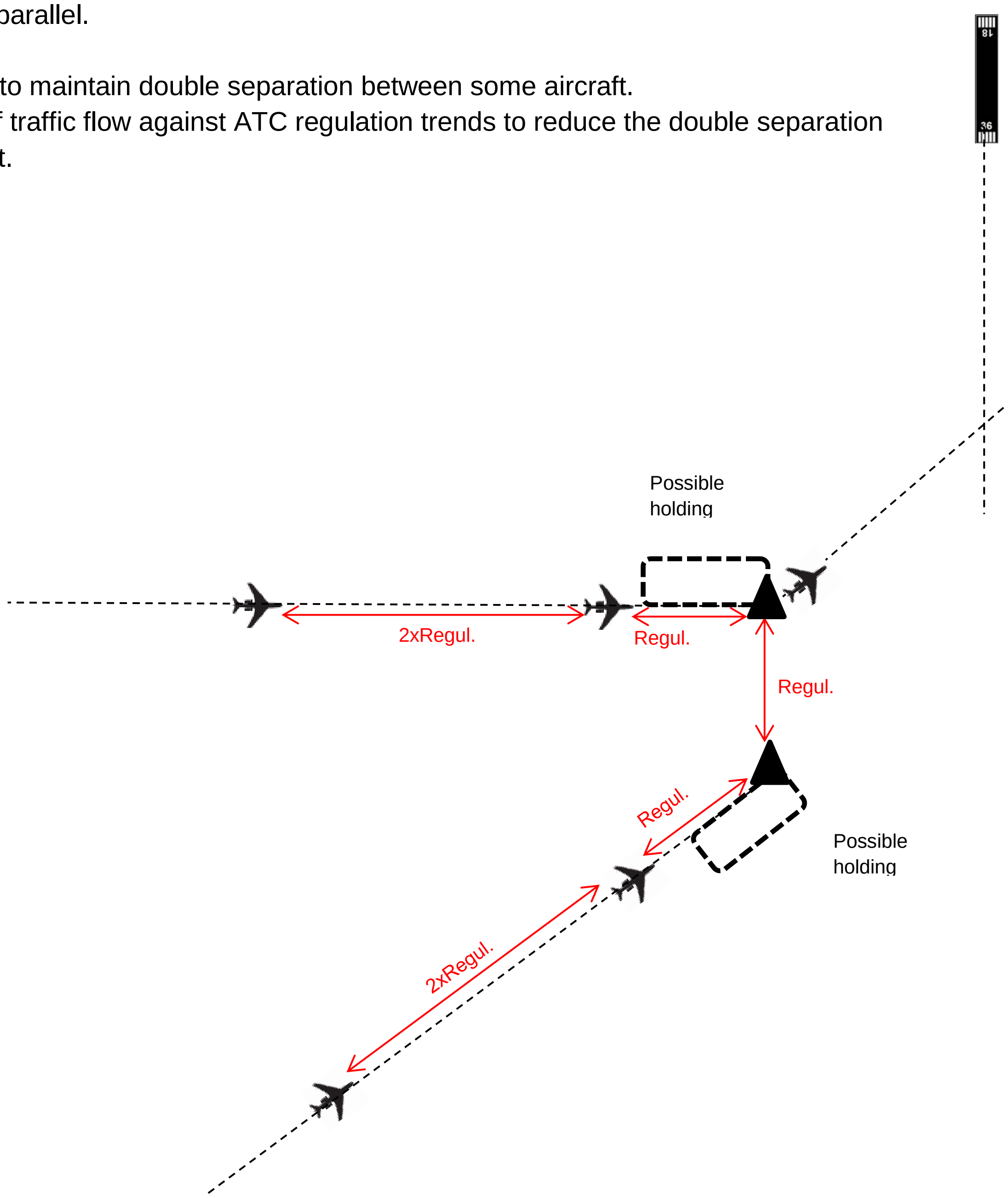
6.2. Regulation via two points from the same side

The APP controller can use vectoring or regulation via two points from one side.

A minimum vertical separation of 1000 ft between 2 successive aircraft should be used during the regulation separation establishment before obtaining the effective and stable regulation separation.

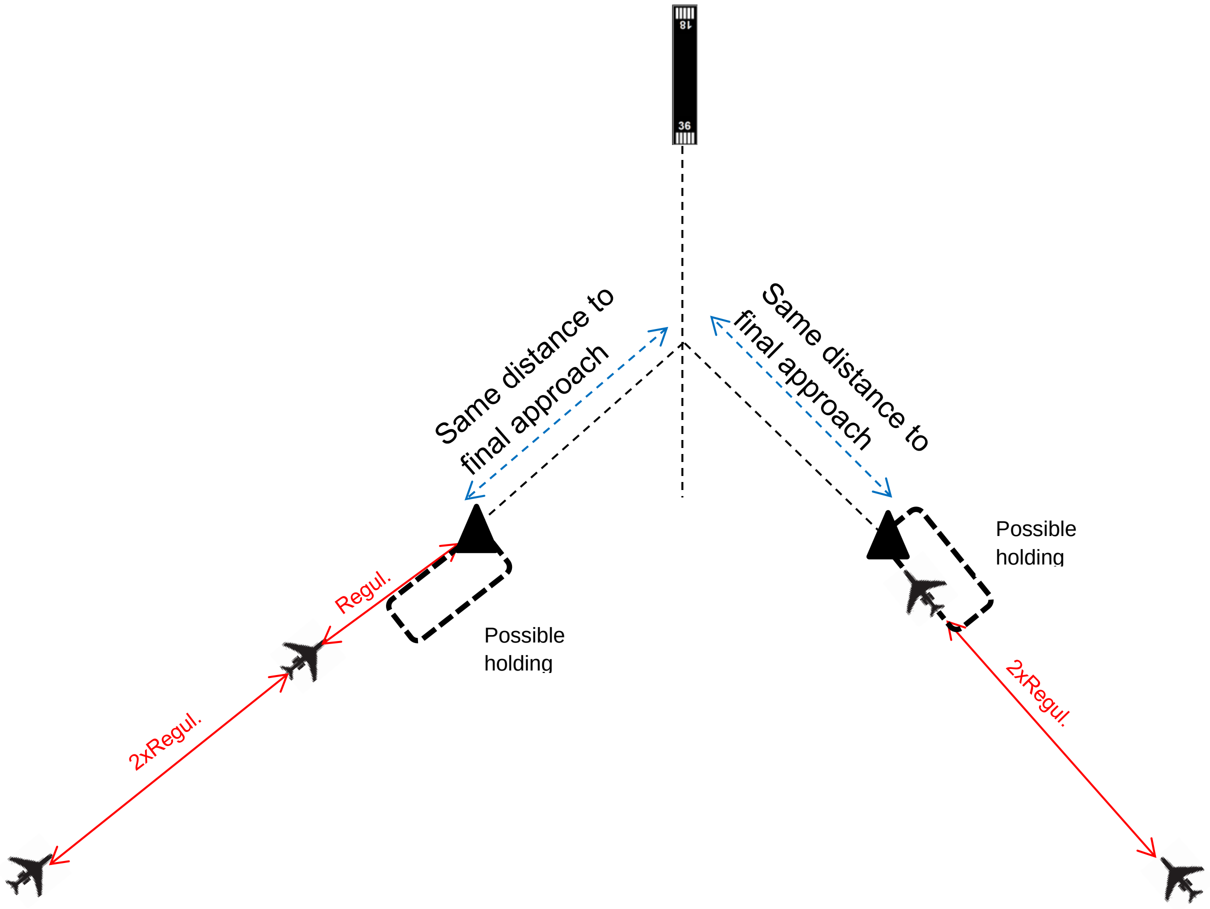
The disadvantage of regulation via two points from the same side is that the APP controller may have problems with maintaining all aircraft on specified routes and create lateral separation issues when the 2 paths are near parallel.

The difficulty is to maintain double separation between some aircraft.
The pressure of traffic flow against ATC regulation trends to reduce the double separation between aircraft.



6.3. Regulation via two points from two sides

Radar vectoring via two points from two sides is used in enlarged traffic from more directions especially at airports with parallel runways.
The two regulation points shall share the same distance to the final axis approach in order to ease the regulation separation on the final axis and reduce the possibility of instructing a holding procedure.

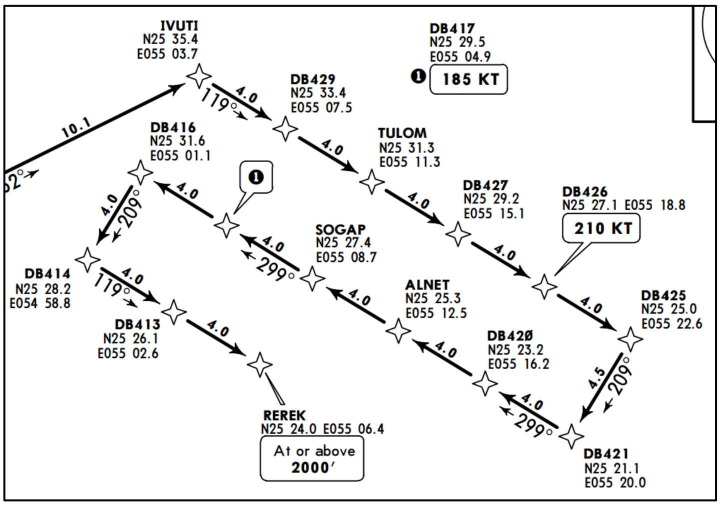


6.4. Regulation using mixed solution

In complex situations where arrivals are coming from several areas of controller airspace, the APP controller may use a combination of the solutions given above.
He can change the strategy in function of the traffic flow.

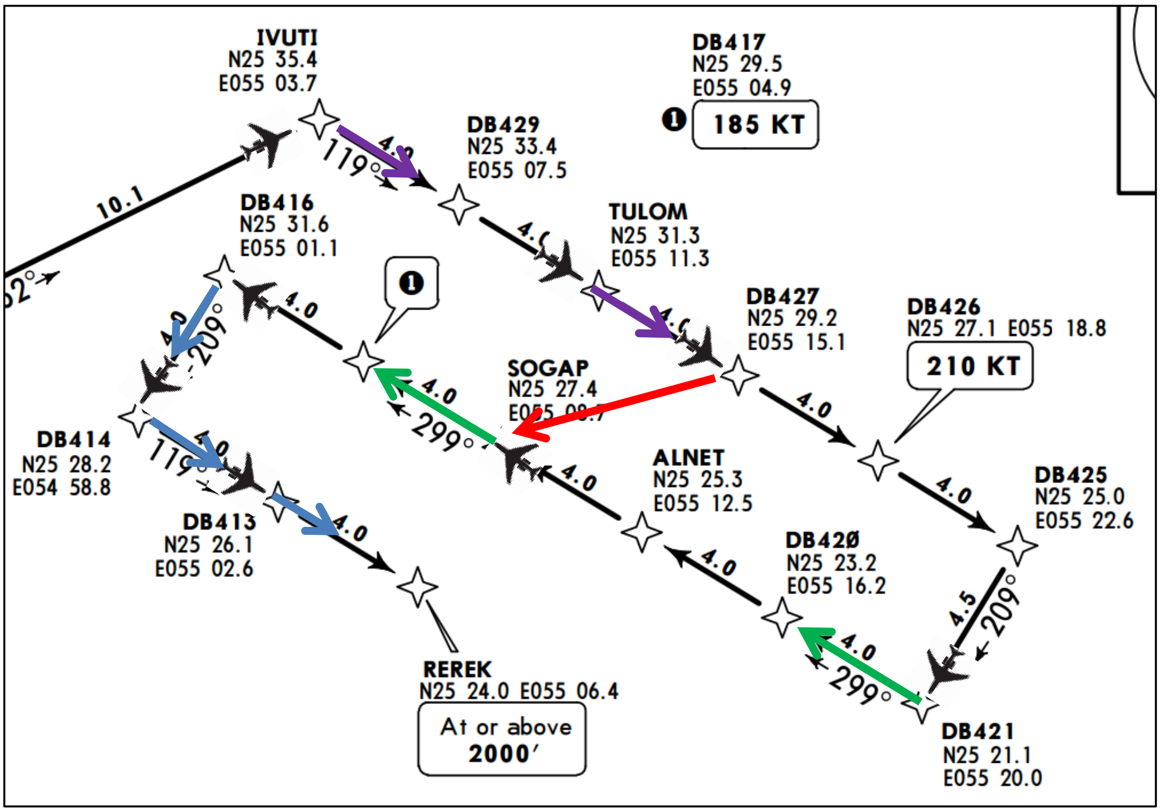
6.5. Regulation using flight path procedure

The flight path procedure is a procedural arrival procedure to sequence traffic in long waiting lanes.



OMDB flight path sequence

The ATC will shorten the flight track of aircraft if needed by the optimal regulation target.



On the sequence above the red arrow shows how to optimize the traffic regulation flow by inserting an aircraft between two others with a sufficient available space (between aircraft at SOGAP and aircraft at DB421).

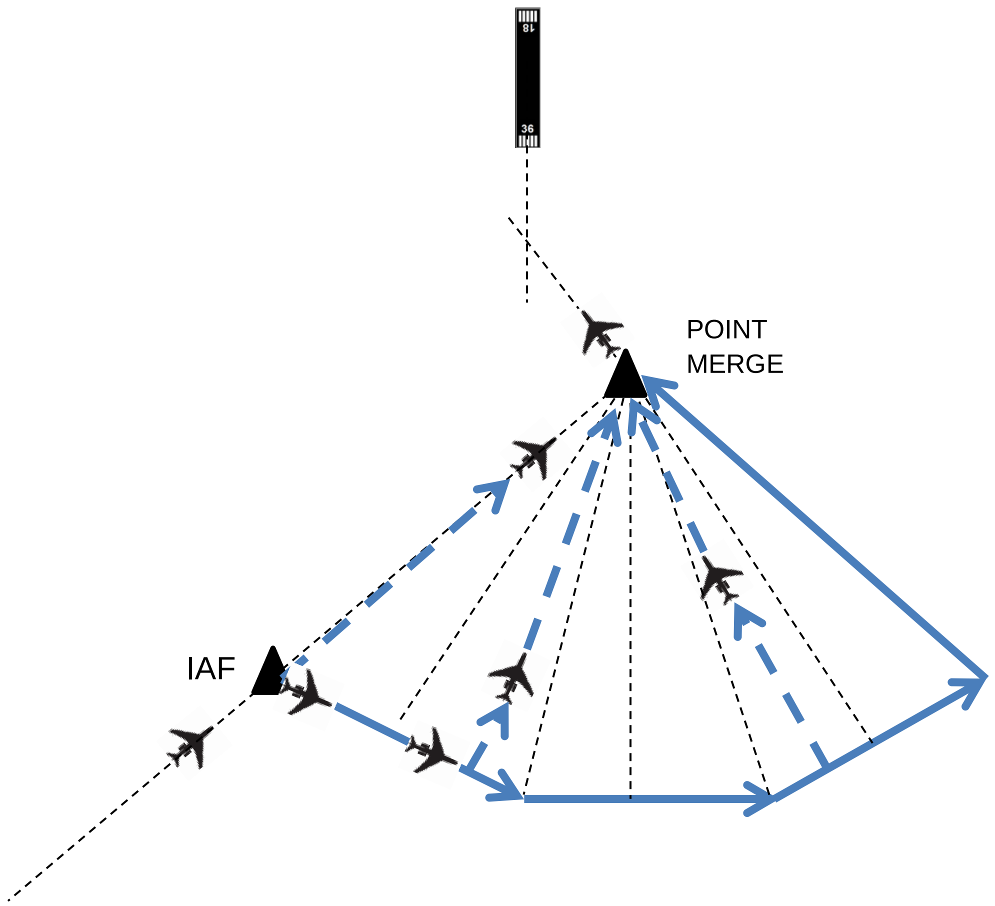
6.6. Regulation using point merge

The point merge procedure is a new regulation procedure initiated by Eurocontrol (SESAR program).
It should provide benefits in terms of safety, environment and capacity, even with high traffic loads.

The new sequencing techniques aim primarily at improving the final part, in particular securing the ILS interception and reducing noise nuisances even under high traffic conditions, as well as optimising descents, reducing workload and communications.

Point Merge is designed to work in high traffic loads without radar vectoring.
In some airfields point merge operation has been combined with radar vectoring.

Point Merge is based on a specific RNAV route structure (precision 1NM), consisting of a point (the merge point) and pre-defined legs (the sequencing legs) equidistant from this point.



The sequencing is achieved with a "direct-to" instruction to the merge point at the appropriate time.

The legs are only used to delay aircraft when necessary ("path stretching"); the length of the legs reflects the required delay absorption capacity.

Aircraft using point merge operation shall have the RNAV capacity precision 1NM. The APP controller shall not use procedural point merge operation on non-RNAV aircraft.

Point merge principles can be used as a method for vectoring radar as well

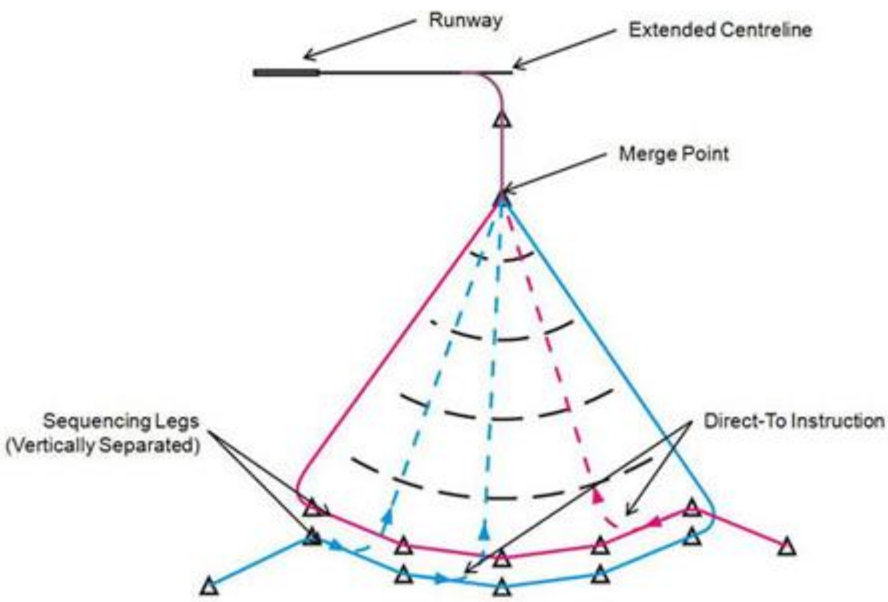
According to Eurocontrol, Point Merge promises a significant increase of trajectory predictability and reduced track dispersion, which would enable more efficient sequencing of the approaching aircraft.

Depending on the operational and environmental constraints, and on the design choice made, these are the expected benefits:

- simplification of controller tasks
- reduction of communications and workload
- better pilot situational awareness (if procedural control)
- a better view of arrival sequences
- improved containment of flown
- better trajectory prediction
- better airspace management.
- standardisation of operations

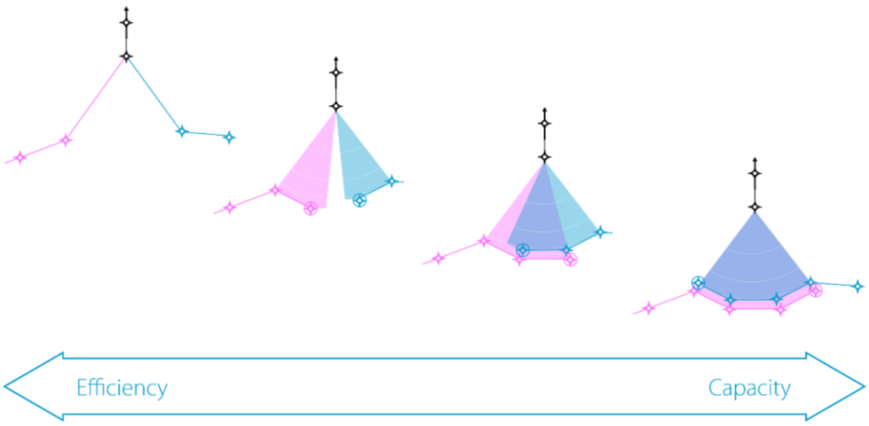
6.7. Regulation using point merge from two arrival sides

In some larger airfields, you can find a point merge with 2 IAF from two arrival sides.



The altitude between the 2 arrival sequencing legs shall be different and vertically separated.

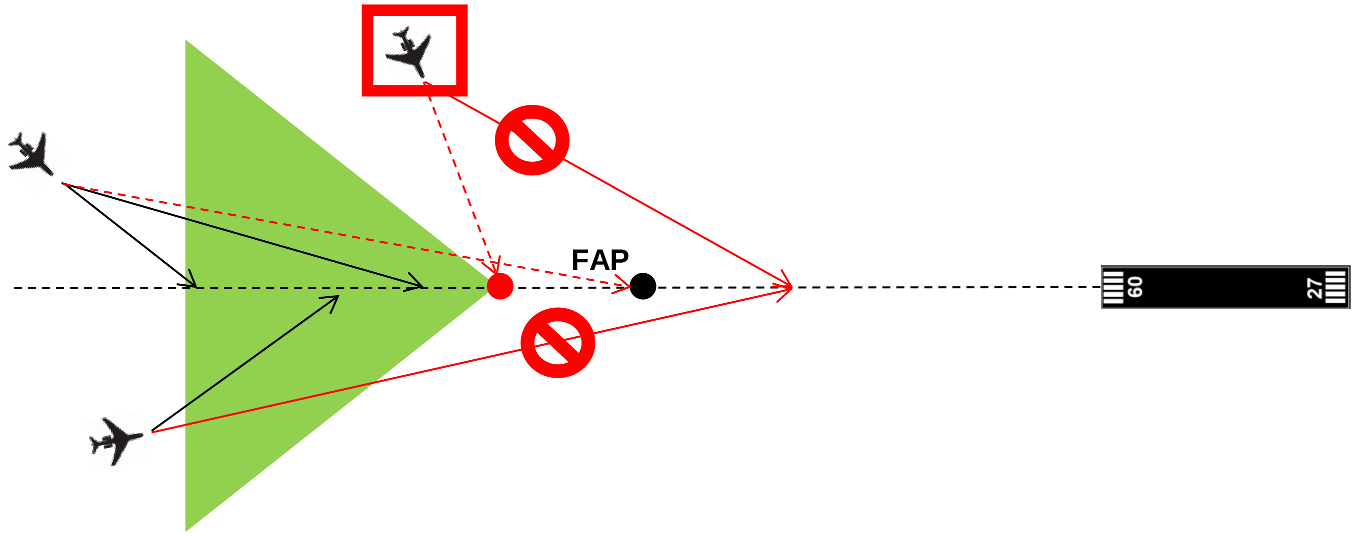
The same final altitude shall be reached when reaching the point merge after regulation horizontal separation is applied and maintained.



7. Final approach track interception rule

To ensure a convenient interception of the final approach axis (LOC track, VOR radial or NDB track) the APP controller shall use the approach gate (mandatory):

- Provide at least a 30 seconds long straight track over the final approach track before joining the FAF or the FAP
- Indicate an interception heading (whenever the aircraft has not an already compatible heading) which is ideally 30° with respect to the approach track or in any case higher than 10° and lower than 45°)
- Give the published interception altitude for the procedure given (whenever the aircraft is not already established at that altitude)
- Issue the final IFR approach clearance following the standard phraseology
- Not let the pilot intercept the final approach axis with a speed higher than 220kt IAS (the average interception speed of a Medium aircraft is between 180 and 200kt IAS)



Legend:

- black arrow = good track for interception;
- dotted red arrow = possible tracks but needs pilot's approval;
- red arrow = forbidden track (except aircraft performing his own visual approach)
- Green area (triangle) = Approach gate valid area

The interception of the descent glide slope is realized at level flight once established on the final approach track and undercrossing the descent slope, the localizer shall be established before the glide.