Point Merge implementation

A quick guide

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Foreword

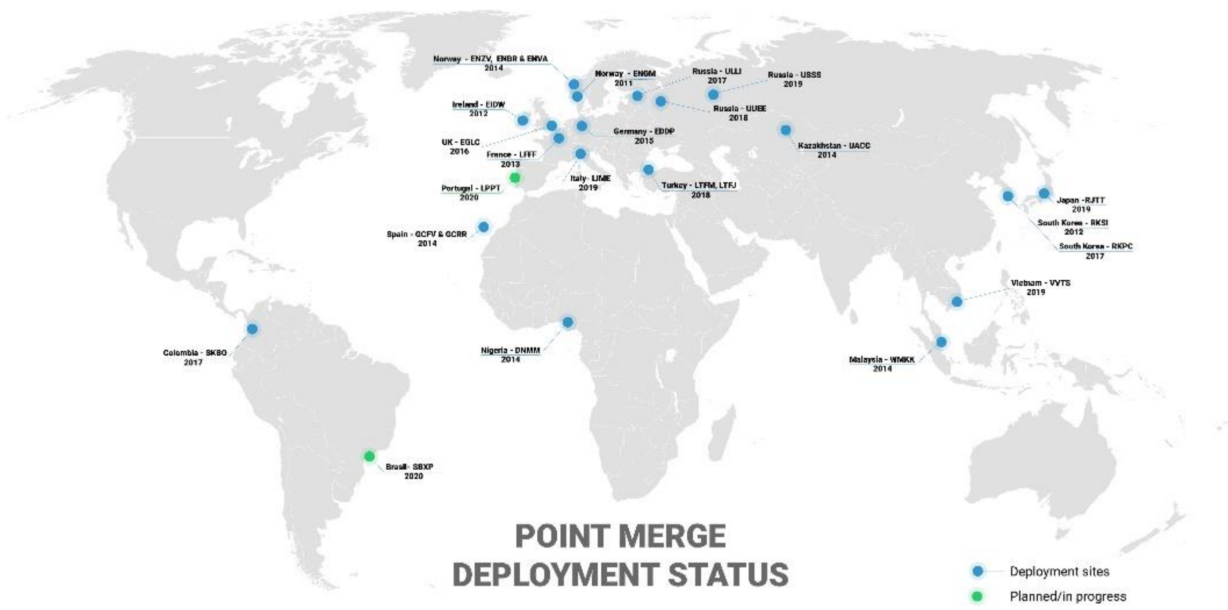
The present document is intended as an introduction to Point Merge, providing an overview of the technique, its main principles, benefits/constraints and important implementation guidelines. It does however not replace EUROCONTROL's Point Merge OSED document [1], which the reader is referred to for more details.

What is Point Merge?

From the 1990s, Performance Based Navigation (PBN) procedures have been gradually introduced in terminal areas to replace vectors prior to final approach. In medium to high-density airspace, where path stretching is required during peaks for sequencing arrivals[1], the designs generally mimicked traditional vectoring patterns – typically trombone-shaped routes including a series of tactical waypoints. This approach was aiming at providing high capacity and acceptability for controllers. However, experience has shown that when traffic rises, controllers tend to revert to tactical vectoring to join the final due to lack of flexibility and accuracy. PBN arrival routes in terminal areas have therefore not brought in the past the full range of expected benefits especially in terms of predictability, flight efficiency and environmental impact.

In 2006, the EUROCONTROL Experimental Centre developed Point Merge, a systemised method relying on a specific PBN design, and allowing controllers to sequence and merge arrivals without vectoring. Unlike previous PBN procedures in the terminal area, Point Merge has been conceived from a 'blank sheet'. The aim was to offer an easy and intuitive operating method for controllers, while providing a balanced trade-off between capacity, flight efficiency and environmental impact. Notably, Point Merge was also designed to ensure that adherence to the procedure is guaranteed, and benefits maintained, even during peaks of traffic.

Point Merge is referenced by ICAO both as part of an aviation system block upgrade[2] and as a technique supporting Continuous Descent Operations [10]. After the first implementations in Oslo (2011) and Dublin (2012), the new method spread not only within the ECAC area, but also far beyond its borders. **As of end 2019, the procedure has been deployed in terminal areas around 25 airports across four continents**, including for instance: Seoul, London City, Kuala Lumpur, Istanbul, Bogota, and Tokyo Haneda.



[1] See [2]

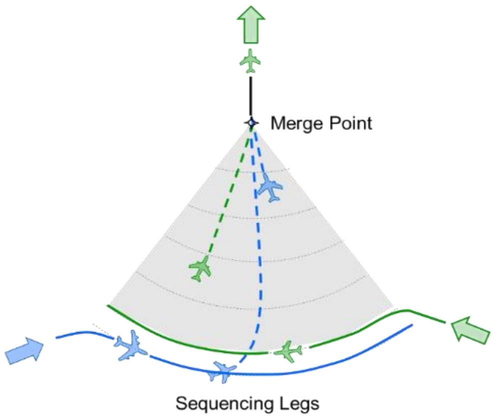
[2] ASBU module B0-RSEQ: Improved traffic flow through runway sequencing [3]

How does it work?

The specific design merges arrivals to a single point, instead of an axis, as would be the case with vectoring or trombone routes. From that merge point, aircraft join the final approach via a fixed path. Before merging, a portion of the procedure (sequencing legs) is devoted to path stretching when necessary. Those legs are designed in the form of “quasi arcs” with equidistance from the merge point. Sequencing is achieved through “direct to” instructions from the legs, issued according to the sequence order and longitudinal spacing requirements. When traffic permits, aircraft are cleared to the merge point without flying along the arcs.

Similarly to trombone routes, the operating method involves a procedure with a built-in route extension that air traffic controllers have to shorten. With the Point Merge specific design however, the determination of the sequence order and the appropriate times to issue the “direct to” instructions are extremely intuitive for controllers. Simple distance markings on their display (e.g. range rings centred on the merge point) are sufficient to support the operating method.

Maintaining spacing between aircraft on course to the merge point is equally straightforward, and relies on a limited number of speed adjustments.



Design example with two parallel, vertically separated sequencing legs of opposite directions.

Operating method

A typical Point Merge operating method consists of the following steps:

- **Check entry conditions:** prior to leg entry, ATC checks speed/level/spacing and issues instructions if/as required.
- **Create spacing:** along sequencing legs, ATC maintains in-trail spacing, and decides sequence order. When the required spacing is achieved behind the preceding aircraft in the sequence (already on course to the merge point), ATC issues a direct-to instruction to the merge point.
- **Clear descent:** when clear of other traffic and when appropriate according to altitude/level windows e.g. at merge point, ATC issues the descent clearance, in the form of a continuous descent.
- **Maintain/refine spacing:** on course to, and after the merge point, ATC uses speed control to deliver the aircraft at an optimised spacing and at an appropriate speed for the exit of the Point Merge procedure.

Pilots fly the procedure with lateral navigation engaged at all times in nominal conditions - complying with published speed/altitude restrictions - and execute ATC instructions. Once on course to the merge point, the distance to go is known by on-board systems, enabling continuous descents.

What are the enablers?

Point Merge relies on existing technology on-board aircraft such as RNAV1 navigation specification. More stringent navigation specifications may be required depending on local/specific requirements (e.g. airspace complexity, terrain, runway spacing in case of independent parallel approaches, etc...).

No new specific ground tool or system is required. Visual markings on the controllers display (e.g. range rings centred on the merge point) adequately support the operating method.

Applicability

Point Merge was initially thought as a sequencing and merging arrival procedure in approach sectors, feeding a single runway. Since its inception, studies and implementation experience have expanded its usage to a broad variety of environments in and around terminal areas with medium-to-high density/complexity:

- terminal area, sequencing and merging arrivals towards a single runway in segregated or mixed mode operations [4] [5] [6];
- terminal area, sequencing and merging arrivals towards parallel runways [7] [8];
- terminal sectors in an area control centre, pre-sequencing of arrivals towards TMA entry points supported by an arrival manager (AMAN) [9].

A Point Merge procedure in the initial/intermediate approach can be followed by a precision approach procedure (e.g. ILS), or an RNAV approach. In addition, Point Merge can be considered/combined with other concepts and improvements such as RECAT (wake turbulence re-categorisations), or TBS (time-based separation).

What are the main benefits?

Point Merge brings general PBN improvements thanks to the use of a published procedure and reliance on track-keeping accuracy/repeatability. These benefits are actually increased since adherence to the procedure remains possible, and aircraft are kept under lateral navigation, even during peaks of traffic. In addition, the procedure also brings specific benefits in terms of capacity/throughput, safety, ATCO training/staffing, flight efficiency, and environmental impact.

Workload, capacity and safety

From a **controller's perspective**, the structured method results in an orderly flow of traffic and provides a **clear air traffic picture**. There is also a clear mapping with air traffic control tasks for arrivals, and in particular a dissociation between sequence building, sequence maintenance and intercept of the final approach. Along with its simplicity and intuitiveness for controllers, Point Merge enables a **significant reduction in ATC tactical interventions**, hence in **controller's workload, R/T occupancy and communications task load**. Thanks to standardised and streamlined working methods, Point Merge also addresses controllers staffing and qualification, with a **straightforward initial training**.

From a **pilot's perspective**, Point Merge provides an **improved situational awareness** and **reduced communications** task load.

All of these features globally result in a **safety increase**.

In approach airspace, the procedure allows to maintain the runway throughput during longer periods and with high accuracy – with the potential to match future runway capacity increases. It also maintains, and possibly increases terminal airspace capacity (thanks to the reduction in controller's workload and R/T occupancy). **In en-route terminal sectors, it has the potential to increase capacity**.

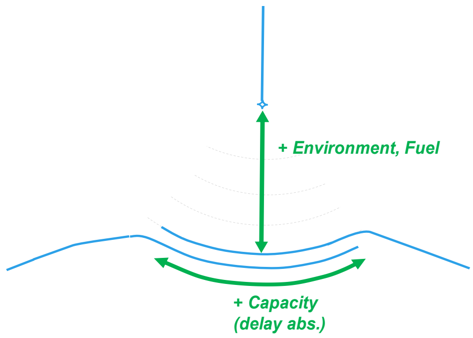
Environmental impact and flight efficiency

Point Merge offers both the path stretching capability required to build the sequence in dense terminal areas, and, once aircraft are directed to the merge point, the necessary predictability to support continuous descent operations [3] [10], with a reduced environmental impact and improved flight efficiency.

In terminal areas, the containment of arrival trajectories allows controlling the 2D footprint and optimising it with respect to noise impact in densely populated areas. It also enables a **better flow segregation** – including departures, which may in turn facilitate Continuous Climb Operations (CCOs), and/or be adapted to complex terminal areas with multiple airports.

Trade-offs

Finally, while a single procedure cannot provide simultaneously maximum benefits in all performance areas, **Point Merge offers a scalable design with a clear trade-off between key performance areas**. For instance, increasing the distance between the sequencing legs and the merge point results in a longer portion of the trajectory flyable as a continuous descent, with environmental and fuel efficiency benefits. On the other hand, this also reduces the flexibility to cope with gaps in the runway sequence and maintain the runway throughput in case of e.g. go-arounds. Increasing the length of the sequencing legs provides a larger capacity (delay absorption) – but to the cost of longer restrictions in the vertical profiles. Design variants (see below) such as parallel legs with overlap or dissociated legs also provide different trade-offs between capacity and environmental impact/fuel efficiency.



What are the main constraints?

Acceptability, change management and training

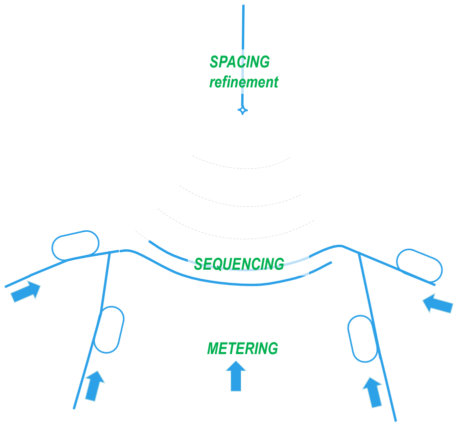
From a controller's perspective, the most important constraint lies in the risk of loss of controller's vectoring skills, which shall then be mitigated through recurrent training. The risk of a decrease in air traffic controllers' vigilance shall also be highlighted during training.

From a pilots' perspective, Point Merge is using standard FMS functions (Direct To) and does not induce a need for significant change management processes, nor specific training/briefing requirements other than the standard ones applicable to the deployment of PBN procedures[3].

[3] E.g. [20] – note however that no worldwide standardization exists on PBN pilots training (see https://www.skybrary.aero/index.php/Performance_Based_Navigation_(PBN))

Traffic presentation

As for any closed PBN procedure in terminal areas, an adequate metering is assumed to take place prior to the Point Merge entry points, relying as a minimum on holding stacks, or on arrival management supported by an adequate tool (AMAN).



This metering shall account for the overall capacity of the procedure and ensure that under nominal conditions, traffic does not reach the end of the sequencing legs prior to being directed towards the merge point. Care shall also be taken that traffic is properly streamed into the sequencing legs at their entry points, including appropriate de-confliction where a same sequencing leg can be fed by two or more arrival flows.

Fuel planning

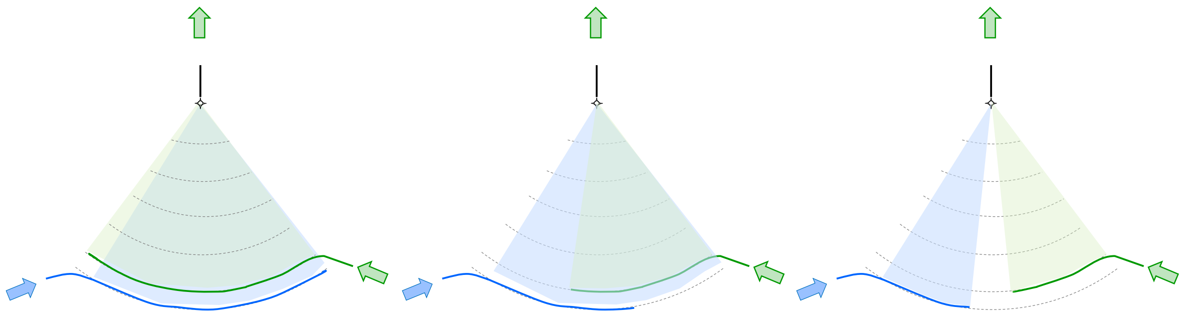
For safety reasons, the on-board flight plan shall include the full procedure including the sequencing leg. Nevertheless, planning for the fuel required to fly the full length of the procedure as trip fuel, even outside peak hours, would generally result in unnecessary extra fuel on board and extra fuel consumption to carry it, compromising the benefits expected from CDOs. Early Point Merge implementations have considered different ways to address this issue: allow for a short route to be used for fuel planning purposes, and/or rely on statistics on the expected arrival delays depending on the time of the day, either published by the air navigation service provider or consolidated by airlines. Pending the outcomes of clarification work at ICAO and regional instances, national authorities shall address such fuel planning and management aspects. Some states have already provided explicit guidance at the national level for Point Merge fuel planning [12]. These are based on similar mitigations as above, considering ICAO Doc 9976 [13], and allowing aircraft operators to account for linear hold as part of contingency/extra fuel, rather than as part of trip fuel.

Note: EASA has published in 2016 a Notice for Proposed Amendment [11] introducing a notion of fuel schemes, and among others addressing the issue of fuel planning with Point Merge and trombones[4]. This NPA suggests that "*'Point Merge' is a form of holding over destination which, in essence, is not different from other forms of holding like racetracks holding patterns or linear holding (e.g. trombone pattern). The condition for using contingency fuel for such calculations is the availability of relevant data, related to the average part of the Point Merge to be flown, and obtained either from internal or external sources (operator and/or ATS unit)*". Although the amendment process was expected to enable a decision by end 2018, as of end 2019 the EASA NPA review group RMT.073 was still active, indicating the process is not closed yet.

[4] Indeed this issue actually affects any closed PBN arrival procedure allowing tactical shortcuts, including for instance trombone routes.

Variants and options

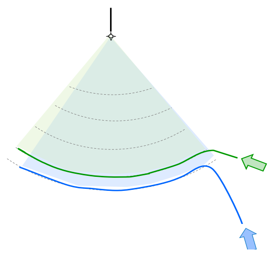
Relative positioning of sequencing legs: subject to capacity requirements and/or specific constraints, sequencing legs may be parallel (fully overlapping), fully dissociated or with a partial overlap. Fully or partially overlapping legs require level-off segments to be vertically separated. Dissociated sequencing legs typically either use more airspace horizontally or provide less path stretching capacity, but allow for less vertical constraints hence improved vertical profiles.



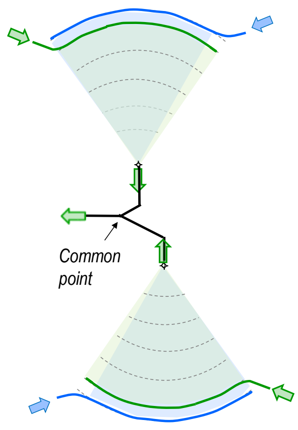
Open or closed procedure: A Point Merge procedure could theoretically be published as an open procedure. However in complex airspaces and/or in the case of parallel approaches where there is a need to contain arrival trajectories a closed procedure is generally more appropriate.

Shape of sequencing legs: ideally designed as a succession of segments forming quasi-arcs and providing equidistance to the merge point during path stretching, sequencing legs may also take the form of straight segments. This results in a less accurate sequencing and possibly lower controller acceptability, that can however be partly mitigated by specific geometrical properties – such as designing the sequencing legs with a 90° angle between a downwind and a base procedure, and ensuring similar values and variation law of the direct distance to merge point along the legs [14].

Sequencing legs may be of opposite or same direction subject to airspace geometry - especially the respective locations of TMA entry points.



Finally, with more than two main inbound flows, a Point Merge procedure may need to incorporate **multiple sequencing legs**. However, this could induce too large level/altitude differences or lateral distance between parallel sequencing legs. It is advised to avoid using more than three parallel sequencing legs in a Point Merge design. Another option, where airspace constraints permit, is to **split the Point Merge procedure into two parts** with a common point after their respective merge points, and ensure an equidistance property from the sequencing legs of each system to this common point. In such configurations feeding a single runway however, cross winds may affect differently the two parts of the procedure in particular once traffic is directed to the merge points.



General design guidelines

Standard/general PBN design requirements obviously apply to any Point Merge design such as minimum procedure segments' length, turn angles/maximum track angle changes especially at the merge point [15], [16], [17], [18], [19]. Equally important, the design process shall involve all relevant stakeholders as early as possible [19]. In addition, some specific guidelines applicable to Point Merge are summarised here below.

When **dimensioning a Point Merge procedure**, especially the length of sequencing legs, and the distance between sequencing legs and merge point, in addition to the availability of airspace volumes, the main driver shall be the required airspace capacity to absorb arrival management delays according to the forecast arrival traffic demand, and traffic presentation (level of metering/smoothing) at TMA entry. In approach sectors, the total track distance from the sequencing legs to the runway shall obviously also be sufficient to accommodate the descent profiles. On the other hand it should be kept small enough to avoid difficulties in maintaining in-trail spacing over large distances, and allowing for more reactivity in case of sequence change (e.g. due to a go-around).

Positioning the merge point and joining final approach: in approach sectors, close to the runway and especially after the merge point, the procedure design may be subject to strong environmental constraints. In particular, the merge point shall be positioned at a sufficiently high FL/altitude due to noise considerations (in general at, or higher than, 7000ft above ground level). For this purpose, a vertical restriction may be published at the merge point e.g. in the form of an FL/altitude window. The vertical/horizontal merge point location will in turn influence the lengths of the segment(s) joining the final approach. Combined with the need to avoid overflights of densely populated areas, this may also impact the design of the procedure segment joining the final, down to the location of the intersection point with the final approach, and any ILS glideslope intercept altitude. In case of independent parallel approach operations, additional design constraints arise e.g. for a precision approach the need for a high and a low ILS and a 3NM/1000ft radar separation between aircraft prior to being established on final [7].

Sequencing legs altitude: while this design parameter is, among others, a function of the dimensioning of the procedure through the distance to final and the need to enable continuous descents, additional local considerations may need to be factored in, like the transition altitude.

Accounting for other flows: the need for procedural segregation from other flows (departures, and in the case of complex airspace, arrivals/departures from other close airports) will influence the 3D positioning, and dimensions, of the various procedure segments.

Holding patterns: Point Merge provides a form of linear holding, but does not remove the need for holding patterns, which shall continue to be used as a minimum as contingency, should unpredictable events reduce the capacity of the runway or of the terminal airspace. Such patterns should be defined at a sufficient distance from the sequencing legs entry points to ensure a seamless flow of traffic is entering each leg, and minimise nuisance TCAS RAs (see also below).

Waypoint types: in a Point Merge design, waypoints should generally be defined with turn anticipation (flyby). This is intended to guarantee trajectory containment and facilitate in-trail spacing management. There may nevertheless be exceptions, requiring that a particular point is overflown (e.g. the last point of the sequencing leg in a closed Point Merge procedure where the design does not require containment for separation from other flows or areas).

Waypoint naming: tactical waypoints, and in particular the merge point, shall bear a five letters pronounceable name since it is used on a systematic basis.

End of sequencing leg: even though appropriate metering is expected to be put in place upstream of the Point Merge procedure, there will remain circumstances in which, due to an unexpected runway or airspace capacity limitation, aircraft that are already flying the procedure may reach the end of a sequencing leg. In order to provide procedural containment/separation from other flows, it is recommended that the procedure be published in the form of a closed procedure, with a route segment joining the merge point at the end of each sequencing leg. If/as necessary a holding capability may be provided (e.g. at the merge point) so as to absorb a temporary under-capacity/over-demand situation.

Missed approach / communications failure / emergency: the definition of these parts of the procedure should obviously account for any local/specific constraints. A missed approach procedure may either re-join a sequencing leg – or, in case this would involve unnecessary long trajectories, provide a means to re-join the merge point or a common point, including a holding pattern as necessary to be re-inserted in the sequence. Communications failure procedures may be based on a short route, involving for instance a direct track to the merge point from the sequencing legs entry points.

DO’s and DON’Ts

Publication

As any terminal airspace procedure, Point Merge procedures are expected to be published in the form of a PBN STAR or transition, and detailed in an official aeronautical publication (AIP) or a supporting information circular (AIC) by the concerned air navigation service provider. It is recommended to include among others an **explicit mention that pilots shall expect to be directed to the merge point at any time while flying along a sequencing leg.**

Sequencing legs design

In environments where airspace availability would allow for it, it may be tempting to envisage a Point Merge design of large horizontal dimensions and large path stretching capability. However, **it is recommended to avoid too long sequencing legs**, as they may generate large track angle change differences at the merge point or heterogeneous wind effect. Long sequencing legs also result in a large angular spread of tracks converging towards the merge point, which over 90° may induce face to face convergence cases.

Again, the driver shall be the required delay absorption capacity accounting for the expected traffic demand and traffic presentation at entry points. An adequate metering prior to the Point Merge procedure, and de-confliction capacities towards sequencing legs entry points provide a means to keep the length of sequencing legs within reasonable limits.

Similarly, **too large an altitude difference between sequencing legs may lead to difficulties** due to e.g. heterogeneous speeds or wind effect between different legs.

In so far as possible, **it is advisable to design Point Merge structures so that their main symmetry axis is aligned with predominant wind directions / runway orientation**, i.e. sequencing legs perpendicular to that direction, in order to minimise the occurrence of adverse effects of strong wind along sequencing legs.

Vertically separated sequencing legs

The case of parallel, vertically separated sequencing legs generally imposes levelling off along the legs. It also generates specific safety requirements in terms of design, operating method and controllers training. These include in particular:

- published vertical restrictions upstream of sequencing legs entry points,
- specific monitoring of adherence to vertical clearances,
- inner leg designed higher than outer leg (to enable earlier descents from the higher leg and reduce the risk of loss of separation with aircraft on the lower leg),
- provision for a spare level if/as necessary,
- systematic dissociation of direct to and descent clearances,
- a minimum lateral distance between parallel legs to avoid cluttering the radar display and mitigate the risks in case of vertical deviation.

Longitudinal restrictions

Speed constraints should be published at appropriate waypoints along the procedure e.g. at sequencing legs entry and at the merge point, to ensure homogeneous speeds and reduce the occurrence of catch up situations.

Horizontal efficiency

Since the procedure is providing path stretching and delaying aircraft "by default", it may create the impression that track miles are increased. This is not the case: **all other things being equal, it is not expected that Point Merge would result in longer distances or larger time flown than with current procedures.**

However, it is key to ensure that any procedure design in approach airspace not only provides a sufficient path-stretching capacity to absorb peaks of traffic, but also the same reduced track miles outside peak hours - as vectoring would achieve. With Point Merge, an adequate short route shall be made available, which may be a direct route from the first point of the sequencing leg, or even earlier shortcuts/directs when practicable, using specific tactical points if needed. As an example, the Dublin design for Point Merge (runway 28) incorporates a tactical waypoint aligned with the runway axis to enable early shortcuts from the downwind segments, with acceptable track angle changes.

Along similar lines, **the particular geometry of Point Merge may give the false impression that a large horizontal area is required** to accommodate the procedure. In reality the required amount of available airspace is not larger than with any other procedure providing the same path extension capacity. The driving factor here is actually **the shape of available airspace in the horizontal dimension to accommodate the design, rather than a larger amount of available airspace**.

Combined Point Merge procedures

When **combining Point Merge procedures**, either ending up on a common point feeding a single runway, or leading to parallel approaches with geographical runway allocation, care should be taken to introduce a **lateral offset** between the segments leading to the common point (respectively the runways extended centrelines) to avoid face to face situations of a systematic nature close to final.

Training/briefing specifics

Although the operating method is simple and highly intuitive, implementing Point Merge in terminal areas where vectoring to final has been the norm for decades is a significant change. Its impact from the controller's standpoint should be acknowledged. Traffic patterns induced by the procedure may differ significantly from vectoring patterns previously in place. It may also initially seem uncommon for controllers to delay/path stretch aircraft "by default", or to use parallel segments of opposite directions (even though these are vertically separated). **Familiarisation/information sessions and early involvement of a core panel of controllers in the project ahead of large-scale training are key to a broad adoption and seamless implementation.**

Moreover, maintaining in-trail spacing for aircraft on course towards the merge point, and after the merge point, solely based on speed control may appear as a loss of flexibility for controllers. The operating method shall include, and the training shall highlight, the notion of a buffer in inter-aircraft spacing when issuing the 'Direct To' instruction to the merge point, in order to anticipate on this loss of flexibility and on the compression effect due to gradual speed decrease.

Finally, **controllers' training should also highlight the fact that Point Merge supports a form of CDO, along with an explicit phraseology** (e.g. 'descend when ready').

Training/briefing requirements for pilots are mainly driven by standard PBN implementation considerations. However, a few specific aspects may need to be addressed in certain cases. For instance, when a PBN arrival procedure followed by a precision approach (typically ILS) is interrupted with ATC vectors, pilots used to a vectoring environment may tend to remove the remaining points in the procedure until the runway threshold from the active flight plan in their Flight Management System. This may be done routinely in order to prepare for ILS capture and/or clean the flight plan should a missed approach need to be initiated. However, such waypoint deletion shall be avoided if the intent is to resume the PBN procedure. This may also have further safety implications in case of parallel approaches. Pilot's briefing and/or procedure publication shall highlight this constraint.

Environmental/noise impact

While **dispersion of trajectories at low altitudes** is generally considered an issue, a debate has emerged in some places as to whether **concentrating approach trajectories** close to the runway axis would not also raise significant, albeit different, noise exposure concerns. As for any PBN implementation in terminal areas, care should be taken to account for such trade-offs when designing the low altitude portions of the procedure. For Point Merge in approach sectors, this affects in particular the common portion of the procedure after the merge point, and may influence the location of the point where the procedure intercepts the final approach, and the intercept altitude as mentioned above.

Change in runway configuration

The horizontal dimensions of a Point Merge procedure, and in general the distance (track miles) from the sequencing legs to the runway may influence the response times to a change in runway in use. Smaller distances result in a potentially smaller number of aircraft flying on course to the merge point, or along the subsequent transition to final, when such a change is occurring.

'Invariant' Point Merge designs (i.e. a same set of sequencing legs and merge point including, after the merge point, possible transitions towards either ends of the concerned runway), when they can be considered, may support smooth runway changes with smaller response times, but on the other hand may result in increased track miles.

Weather resilience

Weather may affect Point Merge, as any PBN procedure in a terminal area, in various ways:

- strong winds, inducing heterogeneous aircraft behaviour on sequencing legs or during merging,
- weather phenomena (typically thunderstorms) limiting, or preventing the use of the procedure.

In the case of Point Merge, strong wind conditions may result in heterogeneous ground speeds between aircraft flying on different sequencing legs. Studies and implementation experience have shown that controllers are able to adapt to a strong wind condition, as they do with e.g. vectors, also supported by FMS turn anticipation with PBN. The differential effect of strong wind conditions should nevertheless be highlighted during training.

In terminal areas that are subject to frequent and/or difficult-to-predict weather phenomena, design and procedures shall generally include provisions to enable prompt reactions to weather impact, and when needed co-ordinated capacity reductions.

Non-nominal conditions

More generally **non-nominal conditions should be addressed by a reversion to vectors for one or more aircraft**, and if needed, a temporary, coordinated decrease in airspace capacity. In circumstances when the merge point can continue to be used, a specific constraint of compatibility with normal Point Merge operations can be considered, e.g. by vectoring aircraft to mimic sequencing legs.

Minimising nuisance ACAS/TCAS RAs

Any terminal airspace design shall avoid creating TCAS "hotspots". Regarding Point Merge, especially in the case of parallel, vertically separated sequencing legs, nuisance TCAS RAs may occur due to configurations involving 1000ft level-offs, around the first and/or last points of sequencing legs, in the case when aircraft would be stable too late at the leg's defined FL/altitude. Consequently, **vertical restrictions may have to be defined at a sufficient distance upstream of sequencing legs entry points**.

Terrain/obstacle clearance

While pilots are responsible to ensure that any clearances are safe in respect to terrain clearance, ATC shall ensure assigned levels/altitudes are at or above established minimum flight altitudes. **In the case when an IFR flight following a PBN procedure is vectored off its route (be it through a Direct To instruction), the responsibility for**

terrain/obstacle clearance remains primarily on ATC. This should be highlighted during controller's training, especially in environments where, within the lateral envelope of possible paths for a Point Merge procedure, terrain altitude is higher than the altitude of the merge point. Vertical clearance(s) should then be issued to (an) intermediate level(s)/altitude(s).

Descent performance in specific environments

In terminal areas subject to low temperatures, the prevalence of **icing conditions** may influence the descent performance and needs to be accounted for in the design of a Point Merge procedure.

Traffic mix

In environments where the mix of traffic involves a significant **heterogeneity in performances** (including purely aerodynamic aspects and/or navigation/equipment), specific/separate procedures for low performance aircraft may need to be established.

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