Edinburgh Airport Airspace Change Programme 2022

Stage 2 Develop and Assess

Safety Appraisal

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Edinburgh Airport: Airspace Change Programme
Stage 2: Develop and Assess
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Safety Appraisal

Options appraisal – safety

This paragraph describes the safety aspects that have been considered in this airspace change project and how the various options impact upon aviation safety.

The options that have been considered in this airspace change project are all subject to appraisal for their impact on safety. Safety from the perspective of both aviation operations and third-party risks (safeguarding). In general, it should be noted, that most of the options have an equal level of safety. This is required to meet Design Principle 1 and 2 ("The airspace design and its operation must be as safe or safer than it is today" and "Flight paths must be flyable and technically supported by air traffic control and airport technical management systems").

There are other Design Principles that are related to safety in that they are part of the aviation sector that is directly regulated by the UK's Civil Aviation Authority (CAA). For example, Design Principle 3 and 4 ("Flight paths must be designed to allow modern aircraft to use performance-based navigation (PBN) in line with CAA's modernisation strategy" and "Routes to/from Glasgow and Edinburgh airports must be procedurally deconflicted from the ground to a preferred level in coordination with NATS Prestwick") both relate to the safety of flight operations through the design of the instrument procedures and the co-ordination of Edinburgh's traffic with other airports; in this case, primarily, Glasgow.

Initial assumptions

The changes proposed in this airspace change shall all meet the international and national requirements that are applicable. This includes the requirement for ATCOs to be trained on any new procedures. As the procedures are all compliant, airline flight crews will have been trained on these procedures.

The infrastructure associated with air traffic management is subject to approval and oversight by the regulator; in this, the CAA. This airspace change proposes no changes to hardware or software installed at Edinburgh Airport. The use of satellite-based systems is, in principle, already accepted by the CAA. The final procedure design – the path to be followed by the aeroplane when making use of satellite signals – will be approved by the Civil Aviation Authority before it is put into place. EAL will engage an approved instrument flight procedure design bureau to prepare these designs.

It is noted that whilst a rigorous approval and oversight system exists, things do not always go to plan. The civil aviation system in the UK has, since 1976, had a means for reporting incidents and occurrences to the CAA. Airlines, airports and the ASNP all have internal reporting systems for the processing of occurrences. All of these programmes are intended to permit, as required, corrective actions to be taken to prevent recurrence.

Use of controlled airspace

In principle, there are two types of airspace: controlled and uncontrolled. As the names suggest, air traffic in the one is actively controlled by air traffic controllers and the other is not. In controlled airspace, only aeroplanes with permission from Air Traffic Control may operate and then, usually, according to a flight plan submitted by the aeroplane's operator and/or a set of instructions provided by the air traffic controller. In designing the flight procedures for this airspace change, all flights in and out of Edinburgh Airport will operate in controlled airspace up to at least 7000 ft.

Satellite based navigation (RNP)

The application of satellite-based navigation offers a safety benefit in the form of a greater likelihood that approaches will be stable. Stable in this case means, at the right speed and properly aligned with the runway both vertically and laterally. The safety improvement is especially valid when compared to approaches that are made without the use of the ILS. The accuracy with which the autopilots in modern aeroplanes can follow an RNP-departure path is also very high, even when adverse weather conditions – particularly high winds – prevail.

RNP approaches, coupled with modern avionics, are also such that flight crews received continued flight guidance should a missed approach be initiated and a go-around be flown. This raises the situational awareness of the flight crews concerned and is less likely to result in a deviation from the intended flight path during the go-around.

SID design

The routes that aeroplanes will fly from the runway to the point at which they are at or above 7000 ft is known as a Standard Instrument Departure (SID). EAL currently has a set of SIDs that comply with national and international requirements. The revised SIDs that will result from this airspace change project will, equally, all comply with the applicable requirements.

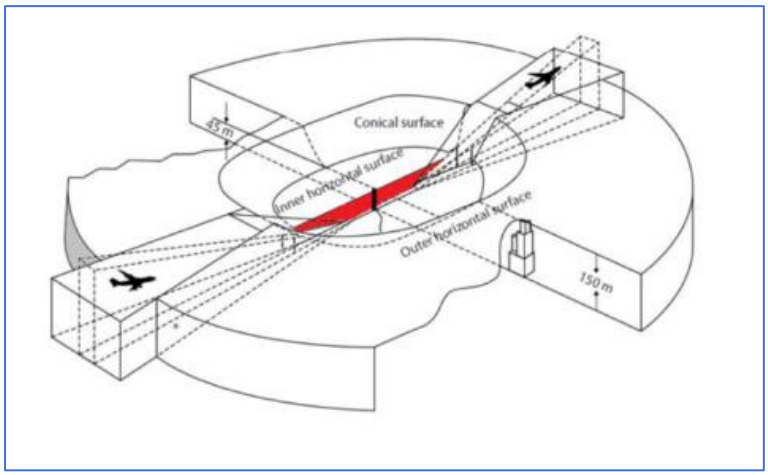
There are currently three SIDs in place at Edinburgh Airport; TALLA, GOSAM and GRICE. One of the scenarios that is proposed by Edinburgh Airport is the addition of a new waypoint over the North Sea at the mouth of the Firth of Forth; point "East". This is intended to relieve traffic heading to northern and north-western Europe from the TALLA route. As its path routes mainly over water, this proposal alleviates noise for populations below TALLA, when used.

The exact routes are not yet established as only swathes of airspace are being consulted upon. However, analysis of the current situation shows that the curved route of GRICE can be straightened to reduce track miles. This, however, will require a small amount of new controlled airspace in the area around Dollar, Clackmannanshire and Knockhill, Fife.

The safety of the SID design will be confirmed by the design procedure. At present, the focus of the work is seeking routes that meet the design principle criteria of capacity, noise and emissions. The compliant and safe design of the whole airspace change design is of fundamental importance and the design procedure evaluation includes safety for each of the options proposed.

Obstacles

It is a basic principle of airspace design that physical obstacles do not obstruct the safe passage of aeroplanes to and from the runway. International requirements have been established that define a set of imaginary slopes, known as Obstacle Limitation Surfaces, around the runway through which obstacles may not penetrate.



Obstacle Limitation Surfaces (Source Civil Aviation Authority)

As the airspace change does not affect the length of the runway or its position there will be no change the surfaces that are associated obstacle limitations.

Separation

Air Traffic Control can separate aeroplanes by means of a combination of three factors; time, vertical separation and lateral separation. National and international requirements will be applied to both the instrument procedures that are designed and to the procedures in use by air traffic controllers & flight crews. This will ensure that there will always be a safe distance, vertically and laterally, between aeroplanes. This is

equally applicable to departing and arriving traffic at Edinburgh where a minimum of 1000 ft vertical separation is applied as it is for the traffic that is merged from Edinburgh and Glasgow's airports. Lateral separation minima are also applied to ensure that aeroplanes never operate too close to each other.

Both commercial aeroplanes and Air Traffic Control systems have a final mitigation in the event that two aeroplanes do, inadvertently, operate at a distance that is less than that prescribed. Aeroplanes use a warning system called Airborne Collision Avoidance Systems (ACAS) to provide instructions to the flight crew so that a potential conflict can be avoided.

Short-term conflict alert (STCA) is a "safety net" within the Air Traffic Control system. Whilst controllers themselves are primarily responsible for detecting possible losses of separation, this tool provides a warning of potential losses of separation shortly before it actually occurs.

Minimum separation times for departing aircraft

The first point of separation between two aeroplanes is created when one aeroplane takes-off behind another. There are national and international requirements to ensure that the gap behind two departing aeroplanes or one departing and one landing are always safe. Safe in this context is a combination of two factors;

- A time-based separation intended to keep traffic at least 3NM apart at all times, and
- A time-based separation that is applied between different classes of aeroplane so that a smaller aeroplane cannot be upset by the wake turbulence of a larger one ahead of it.

Aircraft in the hold

One feature of an airport's airspace design is the "holding pattern" or "hold". This is an imaginary set of oval tracks, stacked one above the over at vertical intervals of 1000 ft, around which aircraft fly. It is normal to designate areas of medium level airspace near an airport for holding). During busy periods, air traffic control may introduce a delaying tactic whereby aeroplanes when they cannot, for whatever reason, continue their approach to an airport. By design they are link between the airspace used for cruise flight and the final approach to a runway. Edinburgh Airport currently has holds at points STIRA and TARTN. STIRA hold is located above Tullibody, Clackmannanshire (position 56°08'02.1"N 3°50'01.0"W) and TARTN is above a point between Penicuik and Peebles, Borders (position 55°43'01.9"N 3°08'18.7"W). Their use and control will not alter in this airspace change. In general, the holds are not used regularly.

The airspace changes proposed here may result in one or both of these holds being moved laterally by up to several miles. The move may be required to align Edinburgh Airport's plans with those of NATS, who manage the airspace above 7000 ft.. The holds will be designed for use above 7000ft and will therefore not be considered for noise but the tracks descending from them will be.

Edinburgh Airport plans to design a hold at [add location] that is to be used only in exceptional circumstances, e.g., the airport is unavailable to an aircraft blocking the runway. This low-level hold permits aircraft to reposition themselves close to the airport whilst decisions about where they will have to go are made.

In addition to the above, one scenario that is proposed by Edinburgh Airport is the addition of a new waypoint over the North Sea at the mouth of the Firth of Forth: point "East". If this scenario is adopted, a hold will also be constructed. Its location is likely to off the Fife coast, again at an altitude no lower than 7000 ft.

Links to airspace above 7000 ft

Whilst the use of the holds is not regular, NATS and Edinburgh Airport's ANSP have directed aircraft to the point at which the final approach commences by means of radar vectoring. This results is a spread of traffic, particularly at higher altitudes, across the airspace. This airspace change intends to introduce more systemisation and reduce the amount of vectoring that is used. This will result is fixed routes, with a net reduction in miles flown on the descent but an increase in concentration of traffic. Most of the new concentrations of traffic will occur above 7000 ft. Radar vectoring remains as a tool to be used by ATCOs when high capacity or restrictions such as poor weather justify its use.

Safety of the options proposed

The safety of the options that have been proposed will be transformed into safe designs by use of an Instrument Flight Procedure Designer. The designer, working for a company approved for the task by the CAA, will apply international and national requirements to ensure that the routes created are at least as safe as the current situation. The designer will follow the UK's requirements that are based on the principles contained in two ICAO documents; ICAO Doc 8168 (PANS-OPS) and Doc 4444 (PANS-ATM).
PANS-OPS provides criteria for the design of instrument approach, holding and departure procedures. PANS-OPS provisions also cover en-route procedures where obstacle clearance is a consideration. PANS-ATM provides procedures for air navigation services, whose basic tenets form the basis of airspace design.

In addition, a document produced by EUROCONTROL, the Manual for Airspace Planning, provides important guidance material for flight procedure design.
The requirements and guidance address issues such as how to avoid traffic crossing paths or, where this occurs, mitigating the associated risks. Routes will avoid prohibited, danger and restricted areas. Climb and descent profiles will ensure that the terrain surrounding the aerodrome is safely passed over. The design will be easily integrated into adjacent airspace run by NATS or other air navigation service providers. Lastl, but by no means least, the requirements ensure that the design will take environmental considerations into account (e.g. noise abatement procedures).

Once designed, the proposed routes will be subject to second opinion by another designer and will be tested in air traffic simulators before they are approved.

Management of change
Once approved a management of change process is applied to bring the procedures into use. Well in advance of their implementation, EAL will work with the air navigation service provider and airlines to ensure that the new routes are understood.

The air navigation service provider will draft new procedures for the use of the routes. They will also train controllers within the existing recurrent training programmes and will amend initial training, for new, future, controllers, to reflect the new practices. We anticipate that there will be no need for new hardware & software, meaning that the training is related to procedural changes. This limits the burden to the air navigation service provider.

In aviation it is normal to reissue aeronautical information every 28 days; the so-called AIP cycle. EAL will, together with the air navigation service provider, submit material so that the instructions to flight crews is published in advance of its implementation. This will permit the charts used by pilots to be amended and the information to be transformed into digital information for the aircraft's flight management system. Edinburgh Airport is not a complex airport. This means that we anticipate that airlines will easily be able to adapt to the new routes. As an extra mitigation, EAL will create safety promotion information about the new routes and procedures that will be shared with airlines that regularly operate at Edinburgh Airport.