

**Independent Toronto Airspace Noise Review
Helios Report and Recommendations
RANGO Review and Suggestions**

Introduction

This review does not deal with aspects or recommendations of the Helios report where our opinion is neutral. We will only consider items where we disagree, strongly agree or feel that potential recommendations were omitted or overlooked.

The Helios report is available in bound mode and in an online version so we will not include large portions of report text, but will refer to it by section or page number using these for headings.

Our Findings

A good starting point would be to refer to the Terms of Reference which started the Review process.

The Review was intended, as indicated by the title, to be an independent air space review which, by definition, would suggest that the majority of recommendations would be directed toward NAV CANADA. However a significant number of Recommendations impact airlines and the GTAA neither of which are party to the report and were not referred to in the Terms of Reference.

One of the three terms of reference for the review speaks to the six existing "Noise Mitigation Initiatives" (p61) being pursued by the GTAA and NAV CANADA. Beyond the fact that these operational procedure items would be expected to be dealt with as a matter of course in this type of study, they are specifically mentioned in the Terms of Reference of the Review. However, there is no critique of the quality or efficacy of any the six initiatives despite three of the six initiatives actually increasing recurrence of overflight at relatively low altitudes. By not providing technical critique of each of the initiatives, the report can only be construed as providing tacit approval of all of them. The only comment on the initiatives was that it is "unfortunate that GTAA and NAV CANADA did not progress the investigation of these six noise mitigation initiatives with a greater priority than appears to have been the case; the delay has added to the communities frustrations and lack of faith in the aviation industry's willingness to do the right thing at the right time." While we agree wholeheartedly with this assessment, the lack of technical critique is unfortunate.

Although Helios identifies the primary factors of the impact of residential noise as generation, attenuation and dispersion (v.v. recurrence) they do not identify the negative impact with

regard to these three principles of Recommendations 1, 2 and 4 which would actually decrease dispersion (increase recurrence) at low altitude over residential areas.

6 Guiding principles

6.8 Looking to the Future

While long-term solutions are obviously the ultimate goal, easy short-term solutions should not be ignored. Many of the short term recommendations of the various residential noise groups have been completely ignored. These include controller managed Constant Descent Operations (CDO), especially during low traffic periods and silent hour operations, as well as the use of the existing published holding procedures.

6.9 The Canadian Border

While there is an international boundary over Lake Ontario a significant area of US airspace has been seconded to the control of Toronto Air Traffic Control (ATC) by the US and could be used to mitigate delays by using point merge or holding.

9.3.1 Tromboning

This is an effective technique to fine tune arrivals. However, Toronto ATC uses it for both fine tuning and moderate delay management. This can result in extended downwind and final approach legs which generally overfly residential communities 20 to 30 miles from the airport. Because Toronto ATC does not use CDO or Controller Managed Descents, this often means that aircraft are operating thousands of feet lower than necessary and at speeds that require the use of flap. Extensive use of tromboning would not be an issue, from a noise perspective, if aircraft were kept higher and faster when a long downwind was required.

A better method of handling moderate delay management, in use at major airports around the world, would be holding. During periods of intensive traffic causing delays, Toronto ATC often uses delaying vectors rather than holding, increasing controller and pilot workload, increasing the number of radio transmissions and reducing the margin of safety. Toronto ATC seems so averse to using holding as a delay technique that it would almost seem that they consider it to be some kind of performance measure.

9.3.2.1 High/low operation and 9.3.2.2 Why the high/low cannot be swapped

Current procedures do not take advantage of high low operations to mitigate noise on the high side. Standard Terminal Arrival Routes (STARs) on both the north- and the south-side downwind legs require aircraft to descend to 3000 ft above sea level (ASL) even though the high side will never be cleared below 4000 ft ASL. This often creates a difficulty for pilots since controllers rarely advise pilots that they will not be cleared to 3000 ft ASL when on the high side. Nevertheless, arrivals are cleared down to 4000 ft ASL on the high side, even when long downwind legs are in use. There is no aerodynamic or operational requirement for any aircraft to be below 5000 ft ASL when turning base leg at Toronto, except in very unusual wind conditions, so high side aircraft should be kept at a minimum of 5000 ft ASL plus 1000 ft higher

for each 2 miles of extra downwind flight. In addition, this would allow the low side to stay higher during extended downwind operations. It is our opinion that the design of these procedures stems from archaic rules in the NAV CANADA ATC Manual of Operations (MANOPS) that were designed for non-radar procedures.

The report suggests that high/low cannot be swapped, however, this could easily be done during periods when the three runway operation was not in use, particularly on weekends and in low traffic periods during the day. This would meet the concept of respite.

9.4.1.2 Arrivals descent profile

The report identifies that some (sic) Toronto Pearson arrivals operate with extended low level segments. We feel that "some" is an understatement of the actual case and that the use of "many" would have been more reflective of actual conditions.

9.4.2 Visual approaches

Pilots are not aware of the benefit to ATC and to quieter operations, of them advising ATC that they are able to conduct a visual approach. This underlines another missing item in the report... education of both pilots and controllers.

9.5.3.2 Departures

Toronto ATC uses very simple initial departure routings for aircraft. Essentially, they include a slight turn away from the other parallel runway and, once the aircraft reaches 3600 ft above sea level (ASL) the aircraft is turned toward the initial Standard Instrument Departure (SID) waypoint. Clearly, these simple departure procedures have been designed only to meet the requirements to diverge departing aircraft from close parallel runways, and give only a semblance of concern for noise by employing the feeblest standard of noise management suggested by ICAO. One of the six noise mitigation initiatives recommends increasing this turn altitude to 7000 ft during night operations. From some runways, by coincidence only, this would avoid overflight of *some* residential areas at low levels. It would also increase recurrence for those under the departure path who reside in the area between 36000 ft and 7000 ft and increase track miles by at least 12 miles (360 kg of GHGs) for some departures. Departure routings that are designed to avoid residential areas and not rely solely on altitude would have the greatest impact on reducing residential noise.

There are many major airports in the world where departure routings have been designed to avoid flying over communities rather than a heading to an altitude designed to meet simple separation and noise abatement rules. These are achieved in both Area Navigation (RNAV) and non-RNAV environments. The integration between aircraft using RNAV and non-RNAV departures is easier than the integration of RNAV/ Required Navigation Performance (RNP) arrivals.

The other aspect of departures that requires attention is the 7000 ft restriction on departure. As is stated in the report, departures are restricted against further climb because, in the current

arrival procedures which involve a dog-leg, there is insufficient distance for the departing traffic to climb above the 8000 ft arrivals.

However, if arrivals were routed direct to the base legs and the dog-leg eliminated, as recommended as a regular STAR routing in 10.4.8, this would provide an additional 5 miles of space, enabling departing traffic to climb clear of the arrival traffic which would be at a lower altitude.

The International Civil Aviation Organization (ICAO) climb gradient, used for departure crossing restrictions, is 400 ft per nautical mile. A departure from runway 24R, climbing to 3600 ft, then proceeding to SAVUR and following the eastbound SID would travel over 27 nautical miles meaning that, even using the very conservative ICAO climb gradient, the flight would be at 10,500 ft when crossing this inbound track. In fact, it is observed that flights which are cleared direct to altitude are often above 13,000 ft at the crossing point. Inbound flights would be descending and be at 6,000 ft. So, instead of aircraft on converging tracks in active, converging climb and descent to within the minimum safe separation of 1000 ft of each other, they would be as much as 4500 ft apart, and diverging in altitude. As can be seen from Figure 16 on page P76 of the report, a continuous climb avoids as much as three minutes of level flight at what can be uncomfortable altitudes in warm seasons. So passenger comfort is also improved.

These procedure changes would save 2 minutes on every arrival, 2 minutes on every departure, save 70 kg of fuel on every arrival, 120 kg of fuel on every departure, thus saving airlines in the range of \$40 million per year and avoid the production of approximately 120 million kg of greenhouse gases every year.

Finally, residents on the lakeshore who are currently subject to aircraft initiating climb from level flight at 7,000 ft would no longer receive that noise, residents on the existing downwind inside the connection point would have fewer overflights and any homes under the direct approach track would have minimal impact because of the relatively high altitude of the arriving aircraft, in descent, with power off.

So, this suggestion reduces noise on the ground, saves time, improves airline on-time performance, reduces fuel burn, reduces greenhouse gas emissions, improves safety and improves passenger comfort.

10.2 Reducing noise at source

While engine and aircraft design has resulted in reducing noise generation, the next section, 10.2.1 regarding the Airbus A320 whine, underlines that simply meeting a theoretical noise standard does not necessarily mean that generated noise does not have a negative community impact. In addition, noise standards are designed for engines in the takeoff phase, not low flying aircraft tens of miles from the airport in high drag, high noise configurations. As a result, dependence on quieter aircraft in the future is not a valid solution.

10.2.1 Airbus A320

The Airbus A320 noise problem has been known for many years, yet the GTAA has not made any effort to address this issue, despite the fact that many airports in Europe have already banned these aircraft, after having given 2 to 3 years of notice to airlines. While we agree that Recommendation 1 be implemented, we find it disappointing that the first recommendation in the report does not even apply to NAV CANADA, to whom the report is addressed.

10.4.1 Descent management

This section underlines the need for Controller Managed Descents. When one looks at the various arrival and departure procedures in the Toronto area, it is clear that absolutely no consideration has been given towards tailoring procedures for their impact on communities. Departures simply meet the 3000 ft (AGL) requirement, whilst controllers clear aircraft on approach to lower altitudes many miles before the aircraft need to be at those altitudes. Existing STARs force aircraft down to lower altitudes at anchor points even as they fly farther from the airport. Controllers should be clearing aircraft to lower altitudes when needed, with the objective of keeping aircraft as high and clean as possible for as long as possible.

10.4.1.1 Pilot and air traffic controller collaboration

We agree with improving the quality of communication between pilots and controllers. While an Industry Noise Management Board is a lofty goal, we feel that the recommendation should go further to underline the importance of improving both pilot and controller knowledge of noise issues and methodologies to safely reduce community noise.

10.4.1.2 Low Power – Low Drag and Continuous Descent Operations

We strongly feel that Low Power – Low Drag (LPLD)/Continuous Descent Operations (CDO) operations are the basic building block of reducing noise in the arrival phase. We also feel that, below 7000 ft, Controller Managed Descents provide the shortest implementation timeline for the low level CDO solution. Controllers already give clearances for descents, Controller Managed CDO would simply be requiring that they provide these clearances at the appropriate time/location rather than simply clearing aircraft down to 3000 ft on initial contact, which is often the case. This may also require minimal pilot education to understand that, with the new methodology, a clearance to descend should be followed forthwith. This could be handled with a Notice to Airmen (NOTAM).

Many airlines operate with minimum safe flap configurations for fuel savings so we feel that Recommendation 2D is redundant.

As the report indicates, continuous descent operations should be easy and quick to implement.

10.4.2 Performance Based Navigation

RNP approaches, despite being touted as a solution, have the potential to be the most negatively impacting procedure being proposed, making life miserable for thousands of residents who currently do not currently have ANY aircraft over their homes.

One of the issues surrounding current noise complaints is the impact that modern navigation systems result in very accurate recurrence. In today's environment the accuracy of flights on the downwind leg is the source of many of the complaints from those living below them. RNP

AR will both lower the downwind and base leg altitude and provide perfect recurrence over exactly the same areas on the base leg. Tromboning, often referred to in the report, has the effect of reducing recurrence on the base leg simply by the fact that the base leg is initiated by the controller. This randomness will all but disappear with RNP and impact entirely new areas when introduced.

RNP approaches are one of the major causes for noise complaints at virtually every airport at which they have been introduced. This includes Chicago, Charlotte, Seattle and notably, Phoenix, whose city administration recently won a lawsuit against the FAA which forced the FAA to withdraw these procedures.

While the report touches on this issue, it failed to make any detailed recommendation to introduce randomness into RNP approaches by providing variable base leg locations, only that NAV CANADA "will need to consider" the concentrated flight path that RNP creates. History has shown that such consideration is rare.

10.4.2.2 New RNAV approach route

As stated in the report, this too will increase recurrence on base leg.

One area of particular disappointment is that the report did not identify the opportunity to use a different downwind track when single-runway operations are in use. While preferential runway operations or runway alternation would provide some respite for people on final approach, runway alternation does not provide respite for people on downwind. For example, in today's environment, traffic arriving from the south during the silent hours and using Runway 05 or 23 still uses the same downwind leg that they would use if landing on Runway 06 or 24. By using a parallel downwind leg, that meets the same ICAO offset standard that caused the downwind change in 2012, the downwind for 05 would be 1.5 miles north of the populated area of north Oakville and provide respite for those on the 24 L/R downwind in the Mount Pleasant area when runway 05 or 23 is in use. This would also assist in efficient vectoring as it would place aircraft at the same offset from final approach as in all other operations.

A side note to the discussions about new RNAV and RNP routes brings the new RNP approaches in Winnipeg into the discussion. In the design of these approaches, NAV CANADA either showed complete ignorance of the current worldwide uprising against this type of approach or have simply continued their historical attitude of ignoring the impact of their designs on communities surrounding airports.

As a matter of coincidence in the Winnipeg situation, the runway configuration and the poor design of the approaches cause the RNP base leg for both runway 31 and runway 36 to occur

over the exact same neighbourhood regardless as to which runway is in use. This introduces aircraft at low altitude, in landing configuration, anytime the wind is out of the north or northwest over the exact same locations WHERE AIRCRAFT HAVE NEVER FLOWN BEFORE.

Simply moving the base leg 1/2 mile farther from the airport would have placed it out over farmland, but this option was obviously not considered by NAV CANADA.

If new RNAV approach routings can be developed, it is quite conceivable that different base legs could be developed for traffic arriving from the north or from the south allowing appropriate lateral and vertical separation for traffic on base leg as they approach their respective final approach courses.

10.4.3 Slightly steeper glide path

We disagree that a 3.2 degree glide path should be considered. While it does provide slight increases in altitude, increasing the glide path to 3.2 degrees would require the use of a higher drag configuration to meet the required 3.2 degrees, negating any benefit that might be attributable to the higher altitude and probably increasing noise reaching the ground.

10.4.8 Reduced downwind usage

We disagree with the suggestion of the report that using the diagonal to the downwind leg would unacceptably increase noise in communities under this path. If controller managed descents were used, the depicted areas would be overflown at altitudes and in configurations that would have little noise impact. The areas identified in Figure 32 would have aircraft at 5000 to 6000 ft. In addition, it would reduce noise impact for significant areas of communities in every quadrant of the airport on the current downwind.

In fact, this is used on an ad hoc basis today but without the benefit of CDO. With a properly designed CDO procedure, aircraft overflying these areas would be higher than they are in the current ad hoc environment, actually reducing the noise impact. In addition, in the current environment arriving aircraft are at the appropriate altitude for the published 7 mile longer routing. This means that they must use flaps or speed brakes to recover from the ad hoc direct routing which, it is fair to say, ATC *never* advises in advance, further increasing generated noise. A published and well designed CDO arrival would have aircraft higher and in quieter configurations than today. The biggest problem with the ad hoc procedure is that controllers still clear flights to 3000 ft while on the diagonal when they should not be descending below

5000 ft until crossing the current downwind. Having aircraft at altitudes above 5000 ft over or near Billy Bishop airport would have no impact on operations there.

In addition, these same communities would benefit because departing aircraft would have the opportunity to climb directly to altitude without having to level at 7000 ft which is currently in use today. Departing aircraft would be in the range of 10 to 12 thousand feet in these areas instead of the current 7000ft. This routing and continuous climb operation would also have the

effect of saving airlines in the range of 40 million dollars per year and reducing greenhouse gas emissions by up to 120 million kg per year.

10.4.9.1 Holding stacks

We disagree with the Helios position that holding stacks are not a viable alternative. It is ironic that just three pages prior, on page 108, Helios refers to the fact that Hong Kong airport uses the arrival manager (AMAN) arrival management product, recommended for CYYZ in 10.4.9.3, but also uses holding stacks to manage arrival traffic in addition to the use of this product.

We disagree that adding holding stacks to the Toronto air space would require redesign as there are multiple holding points on every STAR for Toronto. We disagree that holding stacks increase track mileage, any additional track mileage that may occur while either transitioning to or from the holding stacks simply reduces the number of track miles required on the trombone downwind leg over residential areas.

Ultimately, holds, tromboning, point merge or delay vectoring are in place to kill TIME. Because aircraft are moving, this translates into track mileage.

It is our opinion that holding clearances could be simpler than is required under current rules in Canada. Hold clearances require the controller to provide a number of parameters to the pilot, which the pilot must read back verbatim. These procedures, and many in use in Canada, were designed in the 1950s when radar coverage was rare and radio failures were common. Clearances at London Heathrow are as simple as "Hold at Ockham, expect 10 minutes". In Canada, the same clearance would be "You are cleared to hold at Ockham, as published, maintain 7000 ft, expect further clearance at 1024". In the Heathrow case there are 7 syllables, in the Canadian case there are 28.

We therefore disagree with the drawbacks identified in Table 13. Benefits and draw-backs of holding stacks:

track miles (i.e. time) are exactly what vectors and tromboning, the only current alternatives, are designed to create;

sequencing will happen in any approach, this should not have been identified as a drawback: and

there is no need to re-design the Toronto Terminal Control Area as EVERY STAR to Toronto has multiple published holds.

10.4.9.2 Point merge

We agree that point merge is a viable technology to allow sequencing of aircraft while reducing recurrence and low-altitude flight over residential areas and reducing controller workload. The

report only recommends point merge for straight in approaches to runways at Toronto however we feel that this could be used as a viable alternative to incorporate arrivals from the

north and the south as well, when runways 24 and 06 are in use. The negative aspect of this is the medium to long term implementation due to the need for controller training.

10.4.9.3 Arrival Manager and Time Based Operation

While an arrival manager and time base operations would be beneficial to reduce the amount of downwind travel, the overall benefit on arrival times would be limited and as indicated in the Hong Kong example, holding stacks, or extended downwind operations, would still be required in many cases. In addition it would be very difficult to coordinate arrival management from US airspace from whence a substantial amount of Toronto traffic arrives. Cruise speed windows at altitude can often be only 10 to 15 knots. Over 500 mile distances, this translates to 10 to 15 miles or a 2 to 4 minute change to the arrival time. With aircraft sometimes 25 miles downwind (a total of 50 flying miles out and back), 10 to 15 miles difference would save some residents from noise, but issues remain for those still on the downwind leg because of other noise factors (altitude, speed).

Current processes in use in Toronto do not even allow the enroute controller to advise pilots of ATC's desired speed in descent before descent commences, causing pilots to waste fuel by planning their descent point for normal operating speeds, then having to use speed brakes to slow and descend steeply to regain the shallower descent profile necessary for lower speed.

Annex F Lateral and vertical dispersal of aircraft on the South downwind

These graphics seem to give the impression that there is little difference between 2010 and 2016 profiles on the downwind. However, it does not indicate the physical location where the data was collected. The altitudes indicated (approximately 5000 ft) in the data point to the probability that the location is upwind of the earliest turn-in point (MAROD or DARPU) which is not an area where we feel a major problem exists. A more appropriate location to underline that aircraft are lower than in 2010 would be further along the downwind leg. Multiple collection points would be necessary to determine the difference in altitudes of aircraft on the downwind leg.

Conclusions

We feel that the report lacks the appropriate critique of NAV CANADA's procedures, both those in current practice and in terms of the Six Noise Mitigation Initiatives. While the report does offer some medium to long term solutions, it overlooks some simple and effective short term options.

We dispute the report's suggestion that holding is not a viable solution to reducing the extended use of downwind legs for delay absorption through tromboning.

We feel that not enough research has been done to determine the viability and benefits of diagonals to the downwind leg from the north and south, which would allow space for continuous climb for departing traffic.

We feel that the opportunity to use the appropriate offset of downwind legs during single preferential runway operations has been overlooked.

RANGO has no opinion on runway alternation or preferential runway use. Our goal is to drive change to reduce residential noise while improving efficiency and safety of flights using Toronto Pearson.

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