Slightly Steeper Approaches trial
Community Noise Forum 08 July 15
The London TMA and London CTR are some of the most congested and complex airspace volumes in the world. The airspace has not radically changed since the 1960s whereas aircraft equipage and technology has significantly developed providing opportunity for improvement.
Introduction

- Heathrow is planning to carry out a trial to undertake 3.2° RNAV approaches for aircraft arriving into Heathrow Airport. The current 3.0° approach used by Heathrow Airport is the industry standard angle for aircraft arriving into the vast majority of airports around the world.
- 3.0° approaches have been industry standard since the mid 1970’s, before this 2.75° was the standard approach angle.
- There are some exceptions to this rule, with steeper approaches being permitted due to obstacles. Currently in the UK steeper approaches cannot be carried out for noise abatement reasons.
- Slightly steeper approaches of up to 3.2 degrees versus a standard 3.0 degree approach may offer scope for noise reduction of up to 1dBA SEL.
- A study completed by British Airways and Airbus in 2010 proved the fly-ability of this approach angle for A320 aircraft although there remain operational, safety and infrastructure considerations to be overcome before this practice could be adopted for noise mitigation reasons in the UK.
Purpose

• To understand the impact of any changes we may wish to introduce……this trial has been developed in order to better understand how an increased glideslope will impact Heathrow operationally.

• In addition we will endeavor to provide data on the environmental impact under the 27L approach.

• Crucially we needed CAA approval to proceed – this has been granted.

• This is only ground breaking as there are no obstacles necessitating the 3.2
Success Criteria

A safe trial which enables sufficient data gathering, with no adverse impact on the daily operation
Objectives

- Support SESAR, FAS, LAMP and Heathrow Noise Blueprint
- Gain ATC and aircraft operator experience of RNAV 3.2° approach operations – specifically to better understand the impact on:
  - TBS
  - CDA
  - RoT/Go-arounds
  - Speed control
- If possible to better understand the potential environmental benefits of a 3.2 approach

And also

- In response to the Airports Commission: Interim Report, Appendix 1: Assessment of Short and Medium-term Options, December 2013, Recommendation 22
- In response to the 2013 DfT Night Noise Consultation
Why 3.2°?

- CAA terminology defines that any approaches operating up to 3.25° should be termed as slightly steeper approaches.
- Previously CAA policy stated that any approaches above 3.0° had to be for obstacle clearance or operational reasons, with noise abatement not being a valid reason to operate above 3.2°.
- The CAA have allowed Heathrow to trial a slightly steeper approach at 3.2° and infer they will use the data to review whether this policy can be changed.
- The main reason for operating up to 3.2° is due to the aircraft needing no additional modifications and the pilots requiring no further training to allow the trial to be operated.
- No aircraft yet certified for CAT III autoland above 3.25°
- The same is also the case for the Air Traffic Controllers at Swanwick and at Heathrow.
- Heathrow is carrying out the trial in order to analyse and observe if operating a 3.2° approach doesn’t have an adverse impact on Heathrow Airports operation, while providing a noise benefit to the communities under the approach paths.
Design

• Designed by NATS based on the Baro-VNAV procedure design criteria and to facilitate promulgated approach angles of 3.2
• They are designed in accordance with ICAO Doc 8168 PANS-OPS – Volume II – 6th Edition – except where UK policy differs from the ICAO criteria. In line with existing Approach with Vertical Guidance (APV) procedures in use at Heathrow, the trial procedures are based on GNSS and are defined by lateral navigational accuracy of ±0.3nm.
• The approaches are annotated as RNAV (GNSS) Y RWY 27/09L/R
• The FAF has moved near to the threshold by 0.5nms in all cases.
• There is no change to the ILS, MLS or Missed Approach procedures in relation to this trial.
• There is no change to the PAPI alignment – a note stating the PAPI alignment is included in the charts.
Planning Timeline

We have been working on this for some time……

- 22 Aug 2014 DAP 1916 was submitted
- 29 Sep 2014 – PDG detailed design delivery date 24 Nov 14
- 25 Nov to 28 Jan 2015 – Fly-ability simulations - BA
- 29 Jan 2015 – 26 Feb 2015 PDG finalizing design for CAA Validation
- 27 Feb 2015 - Submission for CAA Validation with DAP 1917
- 1 May 2015 - Amend/edit following CAA comments
- 29 May 2015 – AIRAC Submission Date
- 9 Jul 2015 – Supplement published (allows for 56 days) and textual change for the 3.0 RNAV charts to facilitate this trial published (effective date 20 Aug 15)
- 17 Sept 2015 – AIRAC Publication Date and Trial start
- 16 Mar 2016 – Trial ends 2359 local
RNAV Uptake

RNAV Approaches by airline 16 Feb - 16 Mar 2015

AFR: 1
AMC: 2
BA: 148
DAL: 1
EIN: 3
FIN: 1
QTR: 1
UAE: 2
VIR: 17
RNAV Approaches by aircraft type 16 Feb - 16 Mar 2015
RNAV Approaches by runway 16 Feb - 16 Mar 2015
Operational Planning

• First briefing to CAA 20 Aug 2014
  • Regular briefings thereafter with Case Officer
  • Briefed CAA Safety Manager 9 Jun 2015
  • As advised by CAA, the DfT have been briefed at routine update meetings.

• A successful HAZID was held on 13 Jan 2015. The experts in the room were from:
  • HAL
  • CAA
  • NATS (Twr and TC)
  • BA
  • Virgin
  • Lufthansa.
Operational Planning

- Broad engagement has also taken place with the following airlines with positive results:
  - Air France
  - American Airlines
  - Delta
  - Swiss
  - United

- SARG have accepted that there is no change to the Wake Vortex requirements and NATS have stated that there is no impact on the TBS function.

- A safety assessment has been undertaken by NATS to ensure that this trial is acceptably safe to introduce into the operation and there is no change to the way that ATC will vector the aircraft.

- This trial does not necessitate any additional pilot training, modifications to airframes or changes to flight plans.
Availability – all explained in the Supp…..

- **Voluntary** – other approaches are available
  
  - ILS and MLS

- **BUT 3.0 X unavailable** to encourage uptake and facilitate recording

- Cat 1 conditions only

- Targeted engagement
Noise Monitors

- Noise monitor sites being sourced – all difficult and none exactly where our environmental analysis highlighted
  - Mogden Sewage works - deployed
  - Mid Surrey Golf Course - deployed
  - Hounslow Heath permanent monitor
  - Still looking for a site nearer London …. Any offers?
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<th>Distance from touchdown zone (ANOMS marker) in nautical miles</th>
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<td>1.7</td>
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<tr>
<td>Mogdens Sewage Works</td>
<td>4.3</td>
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</tr>
<tr>
<td>Mid Surrey Golf Course</td>
<td>5.4</td>
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Approach Heights Comparison

- 43 ft difference at 2 NM
- 85 ft difference at 4 NM
- 128 ft difference at 6 NM
- 170 ft difference at 8 NM

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Expected Differences Between 3.0° and 3.2°

Pilots:
• No difference recorded for pilots who have flown the 3.2° approach in the simulator.
• Pilots who have not flown the approach are expecting significant changes to the approach speed and the ability carry out a continuous descent and low power/low drag approach. This is a common response to change.
• Pilot engagement is therefore crucial to avoid any miss-communication or confusion

ATC:
• No expected change except for familiarisation with the process

On The Ground:
• Evidence from Frankfurt is that visually the aircraft may appear slightly higher and quieter (1-2Db on average).

Operationally For Heathrow:
• No expected impact to the operation.
Data gathering

For the duration of the trial HAL will be monitoring the following parameters:

- Total number of 3.2 flights
- Numbers of 3.2 flights on each runway
- Compliance with CDA
- Compliance with Joining Point
- Number of Go-arounds
- Numbers of enquiries from community to Heathrow related to this trial – this is subject to error due to complainant knowledge
- Impact on aRoT
- Monitoring of speed compliance
- Unintended consequences
Any questions?
European Examples – ~ 30 Airports in Europe with approach angles between 3-4°

- London City Airport has a 5.5° ILS approach due to tall buildings in close proximity.
- Flying this approach requires specially modified aircraft below Code C size, specific pilot training and approval from the CAA.

- Frankfurt operate a 3.2° ILS approach on their new runway, highlighted in orange.
- This is for noise abatement reasons and formed part of the approval for the runway.
- The approach is only offered in CAT I conditions as 3.2° has yet to be approved in CAT III conditions.
Beyond – Two segment approaches

- No aircraft yet certificated for CAT III autoland above 3.25 degrees, some aircraft limited to 3.15 degrees
- Stabilised approach at 1,000ft is a key safety requirement
- A steeper intermediate segment, say 4-5 degrees with a standard 3 degree final segment ensures retention of autoland capability
- Transition above 1,000ft to ensure stabilised, no benefits close-in
- Requirement not to intercept glide path from above - intended in part to avoid false-glide path capture
- Alternative navigation technologies may address this issue e.g GBAS

2–segment approach

- Replicates “intercept from above” procedure.
- Profile tested in Frankfurt by several airlines in 2013.
- Boeing tested profile using BA aircraft in July at Moses Lake, USA (5 approaches).

British Airways proving flights
- BA 777 2 segmented approach
- BA A380 3.2 FLS approach
- BA A380 2 segmented approach
Two segment approaches: Challenges

Energy management

• Speed and height would need to be more carefully managed at entry to a steeper intermediate segment
• Could be controlled using RNAV procedure design – but would give less operational flexibility
• Compatibility with next generation of more aerodynamically efficient aircraft?

ATC Operations

• Intermediate phase based around radar vectoring
• Steeper segment would preclude this, so aircraft would need to be sequenced much earlier in the approach phase than currently so
• Different ATC tools/techniques and/or more airspace required?
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