AIRPROX REPORT No 2014051

Date/Time: 1 May 2014 1411Z

Position: 5352N 00140W (1nm S Leeds Bradford airport)

Airspace: Leeds CTR (*Class*: D)

	Aircraft 1	*Aircraft 2*
Type:	B737(1)	B737(2)
Operator:	CAT	CAT
Alt/FL:	FL80	FL86
Conditions:	IMC	IMC
Visibility:	Nil	Nil
Reported Separation:	700ft V/3nm H	NK V/2-3nm H
Recorded Separation:	600ft V/0.8nm H	

PART A: SUMMARY OF INFORMATION REPORTED TO UKAB

THE BOEING B737(1) PILOT reports inbound to Leeds Bradford Airport (LBA) under IFR/IMC: the lighting state was not reported. He was cleared for the hold at the LBA NDB, at FL80, number three in traffic. Whilst on the inbound leg, the crew noticed an aircraft on the TCAS display on a closing track 700ft above their aircraft and descending. ATC were advised of the traffic and shortly afterwards he received a TCAS Traffic Advisory (TA). A subsequent instruction to the other traffic was issued to turn left immediately. He was also instructed to turn immediately left to heading 065° for avoiding action. During the turn, TCAS issued a Resolution Advisory (RA) to 'monitor vertical speed' (instructing him to maintain his level and not climb). The RA was followed. 'Clear of conflict' sounded roughly 30 seconds later; ATC were kept informed throughout. The Air Traffic controller sounded particularly stressed before and after the event. It was thought that the other aircraft was cleared to the same level as his aircraft, although this could not be confirmed.

He perceived the severity of the incident as 'Moderate'.

THE BOEING B737(2) PILOT reports inbound to LBA under IFR/IMC: all normal external lighting was operating. He was descending to FL80 at approximately 500fpm, speed about 200kt, to take up the hold at LBA with 4 other aircraft in the hold. He commented that the ATC workload appeared 'huge', with a number of aircraft requiring an Estimated Approach Time (EAT). Passing FL85 the TCAS reported 'Traffic' and, more or less immediately, 'Monitor Vertical Speed'. The pilot of B737(1) reported a TCAS RA before he did. Both he and the other pilot reported 'clear of conflict' before ATC issued avoiding action instructions to both pilots [but see UKAB note below].

[UKAB Note: Avoiding action was issued to B737(2) at 1410:35 and to B737(1) at 1410:43. B737(2)'s pilot reported 'clear of traffic' at 1411:14; B737(1)'s pilot reported 'clear of conflict' at 1411:25.]

He assessed the risk of collision as 'Severe'.

THE LBA APPROACH RADAR CONTROLLER reports that at 1410 he received a telephone call from the Scottish Control radar controller informing him that the Mode S indication on B737(2) showed that it was descending to FL80, 5nm south of the LBA, in confliction with B737(1), which was in the LBA hold at FL80 awaiting weather improvement. He immediately gave avoiding action and Traffic Information to resolve the confliction.

Factual Background

The minimum horizontal separation based on ATS surveillance system information at LBA was approved by the CAA as 3nm. The Manual of Air Traffic Services (MATS) Part 1[1], states: 'Horizontal separation based on ATS surveillance system information shall not be used between aircraft holding over the same holding point'. At the time of the Airprox only B737(1) had entered the holding pattern, the pilot of B737(2) had been given an avoiding action turn just before reaching the NDB. Consequently the minimum separation required was 3nm horizontally and/or 1000ft vertically.

The LBA METARs for the period from 1220-1450 were:

METAR EGNM 011220Z 05009KT 020V090 1200 R32/P1500 –RA BR SCT001 BKN002 08/08 Q1011=
METAR EGNM 011250Z 05010KT 020V090 0600 R32/1400 –RA FG BKN 001 08/08 Q1012=
METAR EGNM 011320Z 05008KT 010V100 0500 R32/1400 –RA FG FEW000 BKN001 07/07 Q1012=
METAR EGNM 011350Z 04009KT 360V100 0400 R32/0750 –RA FG VV/// 07/07 Q1013=
METAR EGNM 011420Z 04011KT 360V090 0300 R32/1000 –RA FG VV/// 07/07 Q1013=
METAR EGNM 011450Z 05012KT 020V090 0500 R32/1100 –RA FG BKN 001 07/07 Q1013=

Analysis and Investigation

CAA ATSI

CAA ATSI had access to LBA RTF and area radar recordings, the written reports from the LBA Radar controller and ATSU, together with the written reports from the pilots of B737(1) and B737(2). CAA ATSI interviewed the controller involved, with access to Flight Progress Strip (FPS) data and Unit Competency Training records. NATS provided a TCAS Performance Assessment report (Appendix A). The Factual History details events leading up to the Airprox in order to reflect the controller's increasing workload. The radar prints below are taken from the area radar recordings (Figures 3-5). These show Mode S Selected Flight Level (SFL) data. LBA Radar does not have access to Mode S SFL data.

The Airprox occurred overhead the LBA NDB at 1410:35 between two Boeing B737s, when both aircraft were cleared to descend to FL80 whilst in receipt of a Radar Control Service within the Class D controlled airspace (CAS) of the LBA Control Zone (CTR).

LBA was operating on RW32 in fog conditions with Low Visibility Procedures (LVP)/CAT 3 safe-guarding operations and a mixture of CAT1 and CAT3 equipped aircraft. The Radar controller normally monitors the Tower frequency at low volume to be aware of the position of departing traffic. Optimised IFR Procedures were in operation (introduced 30 May 2013) which divide the LBA airspace into arrival and departure boxes allowing departing aircraft to achieve continuous climb to FL70 and direct transfer to the designated en-route frequency. Inbounds are released at FL80 or above. For RW32 operations, inbound aircraft are provided with descent when south of a line drawn through Pole Hill (POL)–LBA NDB as shown in Figure 1, which is taken from Prestwick Centre (PC) Supplementary Instruction (SI 052/13). Figure 2 is an extract taken from the UK AIP page AD 2-EGNM-8-7 (18 Oct 12).

[1] Section 1, Chapter 3, Paragraph 3.67

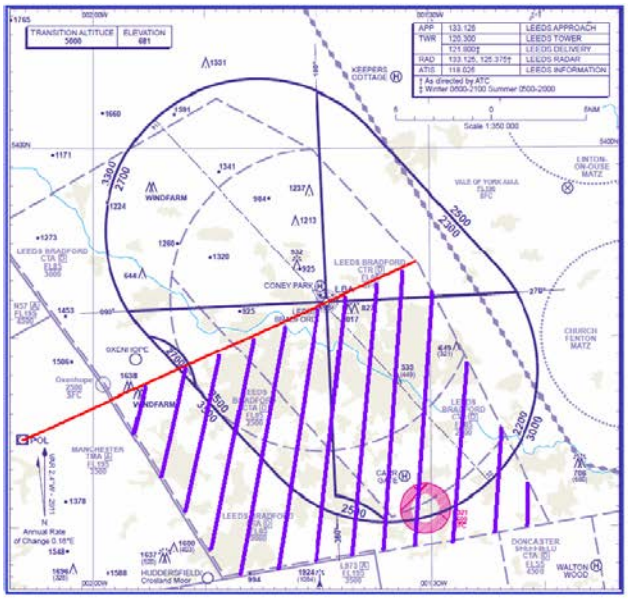

Figure 1 – Leeds Controlled Airspace

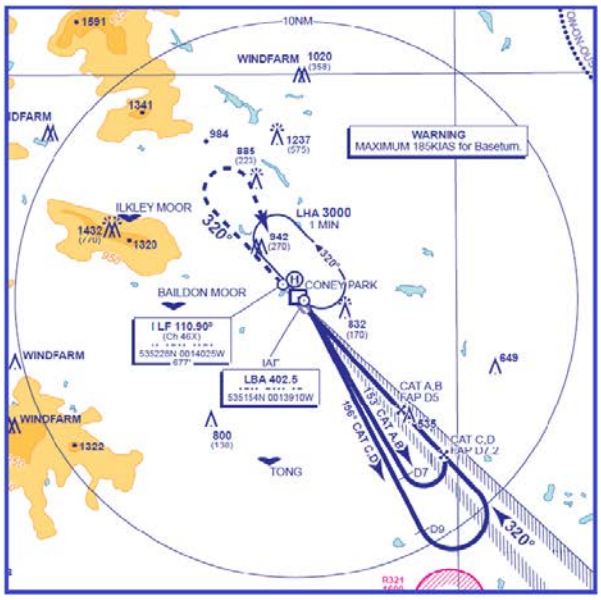

Figure 2 – Leeds Hold & ILS RWY32

At interview, the controller reported that when he had taken over the Radar position at 1345 traffic levels and workload had been light. .

At 1353:00 the Radar controller received coordination on two inbounds from the south, a B737 [not one of the subject aircraft] descending to FL90, and B737(1) descending to FL100, both CAT3 equipped.

At 1354:00 the Radar and Aerodrome controllers discussed the departure order and agreed free-flow measures, allowing departures without a release to climb to FL70, with holding traffic not below FL80.

At 1402:02 the Radar controller coordinated with Prestwick Centre (North) (PC(N)) for B737(1) to descend to FL90 (the other non-incident B737 had vacated this level) and another inbound from the south (B737(2)) to descend to FL100.

At 1403:43 the pilot of B737(1) called inbound from the southwest, descending to FL90 towards the LBA NDB. The Radar controller reported RW32 in use, QNH 1012hPa, RVR 900m and advised he was number 3 in traffic. He was instructed to report taking up the hold at FL90.

At 1404:45 the B737(1) pilot reported being able to make only one hold.

At interview, the controller reported that the workload had increased to moderate/heavy and that he had been focussed on vectoring two aircraft in the holding pattern, paying particular attention to ensuring that a B757 did not infringe the boundary of Manchester's CAS (Figure 3), as well as being conscious of an imminent A319 departure climbing to FL70, and an AS65 wishing to join from the east. The controller had planned to route B737(1) to the LBA hold at FL80 and B737(2) to the LBA hold at FL90.

At 1406:56 the following RTF exchange occurred:

B737(1) *"ER [B737(1) C/S] TAKING UP (1407-) THE HOLD AT THE LBA"*
RADAR *"[B737(1) C/S] ROGER DESCEND FLIGHT LEVEL **EIGHT ZERO**"*
B737(1) *"FLIGHT LEVEL EIGHT ZERO [B737(1) C/S]"*
B737(2) *"APPROACH GOOD AFTERNOON [B737(2) C/S] DESCENDING ONE (1407:10) HUNDRED TOWARDS THE LBA SEVEN THREE EIGHT WE'VE GOT UNIFORM ONE ZERO ONE TWO"*
RADAR *"[B737(2) C/S] LEEDS RADAR GOOD AFTERNOON TAKE UP THE HOLD AT THE L B A DESCENDING FLIGHT LEVEL **EIGHT ZERO** YOU'RE (1407+20-) NUMBER FOUR"*
B737(2) "*DESCENDING EIGHT ZERO ER TOWARDS THE L B A [B737(2) C/S]".*

The Radar controller did not annotate FL80 on B737(2)'s FPS. At this point [1407:26], B737(1) entered the hold and was passing FL90 whilst B737(2) was 15nm south of the LBA NDB passing FL112 (Figure 3)

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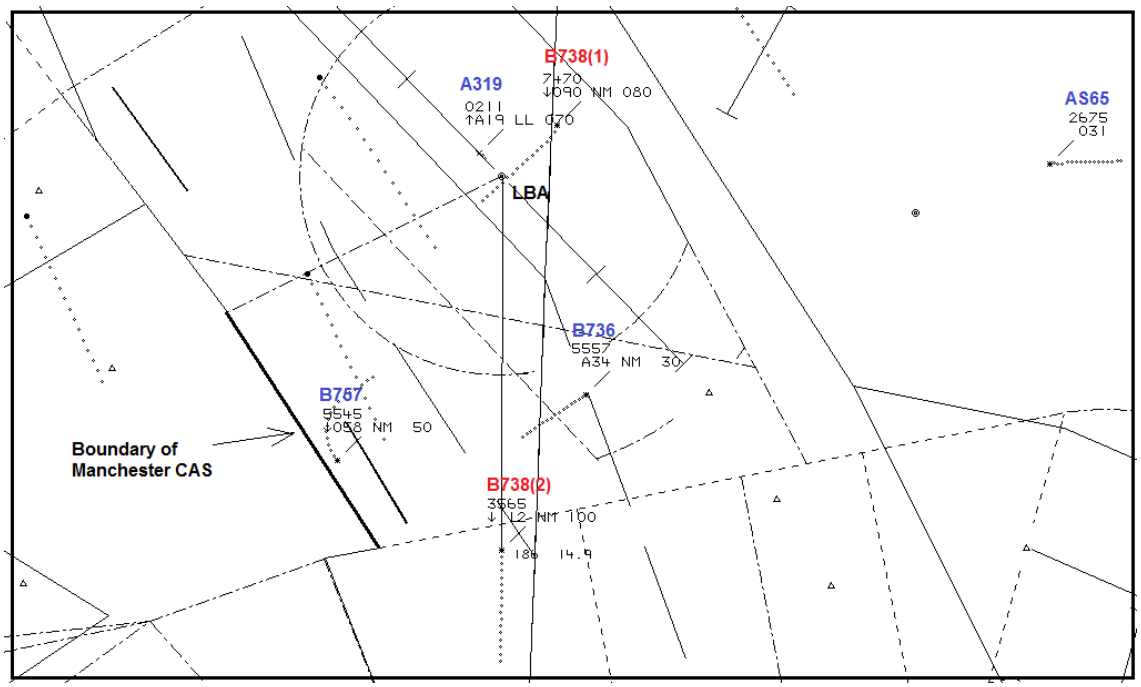

Figure 3 – Prestwick MRT at 1407:26

The pilot of B737(1) subsequently requested an EAT and was advised to expect one hold. RVR was reported as touch-down 1200m and mid-point 700m.

The pilot of B737(2) also asked for an EAT and was instructed to standby [1408:26]. B737(1) reached FL80 as B737(2) was 10.4nm south of LBA NDB, passing FL100, descending to FL80.

At 1409:53 the pilot of B737(1) was turning inbound in the hold at FL80 and B737(2) was passing FL90 for FL80. The two aircraft were on reciprocal tracks and the horizontal distance between the two aircraft was 9.1nm (Figure 4).

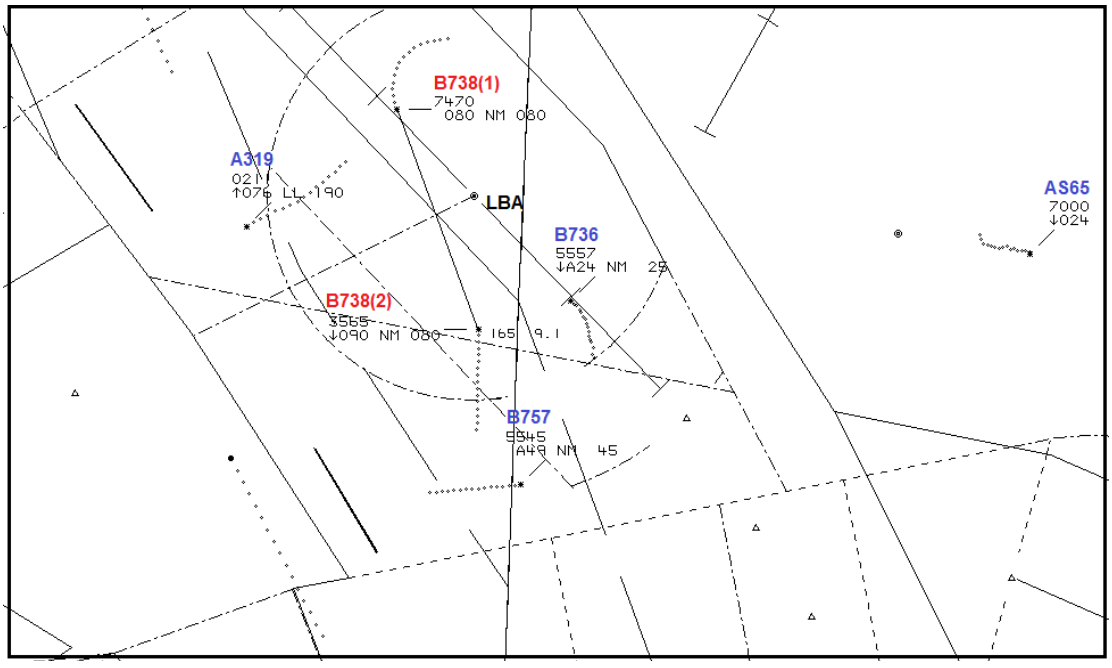

Figure 4 – Prestwick MRT at 1409:53

At 1409:58 the Prestwick Centre Short Term Conflict Alert (STCA) activated. The range between the two aircraft was 8.2nm. The PC(N) controller, alerted to the situation, observed B737(2) passing FL88 with FL80 selected on Mode S (SFL). The distance between the aircraft was 5.2nm when, at 1410:23, the PC(N) controller initiated a call to LBA Radar and the following sequence of events occurred:

1410:23

PC(N) [PHONE] *"HI LEEDS YOUR [B737(2) C/S] IS DESCENDING TO EIGHT ON TOP OF YOUR [B737(1) C/S] THEY'RE HEAD ON"*

1410:26

[Note: Both B737s received a TCAS TA at the same time]
[Note: B737(2) was descending at 384ft/min]

Leeds [PHONE] *"SAY AGAIN"*
PC(N) [PHONE] *"YOUR [B737(2) C/S] AT THE LBA IS DROPPING TO EIGHT AND HE'S GOT EIGHT SELECTED AGAINST THE [B737(1) C/S] IN THE HOLD AT EIGHT AS WELL"*
Leeds [PHONE] *"OK"*

1410:26

B737(1) *"ER ER LEEDS ER [B737(1) C/S] HAVE YOU GOT TRAFFIC ER AT SEVEN HUNDRED FEET ABOVE US"*

1410:35

Leeds *"[B737(2) C/S] TURN LEFT IMMEDIATELY HEADING TWO SEVEN ZERO DEGREES AVOIDING ACTION"*
B737(2) *"LEFT TWO SEVEN ZERO [B737(2) C/S]"*

1410:43

Leeds *"[B737(1) C/S] TURN LEFT HEADING ZERO SIX FIVE TURN LEFT IMMEDIATELY AVOIDING ACTION"*
B737(1) *"IMMEDIATE IMMEDIATE LEFT HEADING ZERO SIX FIVE [B737(1) C/S]"*

[Note: B737(2) was maintaining FL86.]

1410:51

Leeds *"[B737(2) C/S] ER TRAFFIC IS A SEVEN THREE SEVEN IN YOUR TWELVE O'CLOCK RANGE ONE MILE DESCENDING FLIGHT LEVEL EIGHT ZERO"*

1410:53

[Note: TCAS RA MVS's downlinked at 1410:53 - B737(1): 'DCL' (Don't Climb) and B737(2) 'DDE' (Don't descend)]

1410:58

[Note: B737(1) crossed the LBA and the pilot of B737(2) commenced the left turn. The distance between the two aircraft was 1.2nm horizontally and 600ft vertically]

1411:02

B737(1) "[B737(1) C/S] TCAS RA" [Figure 5]

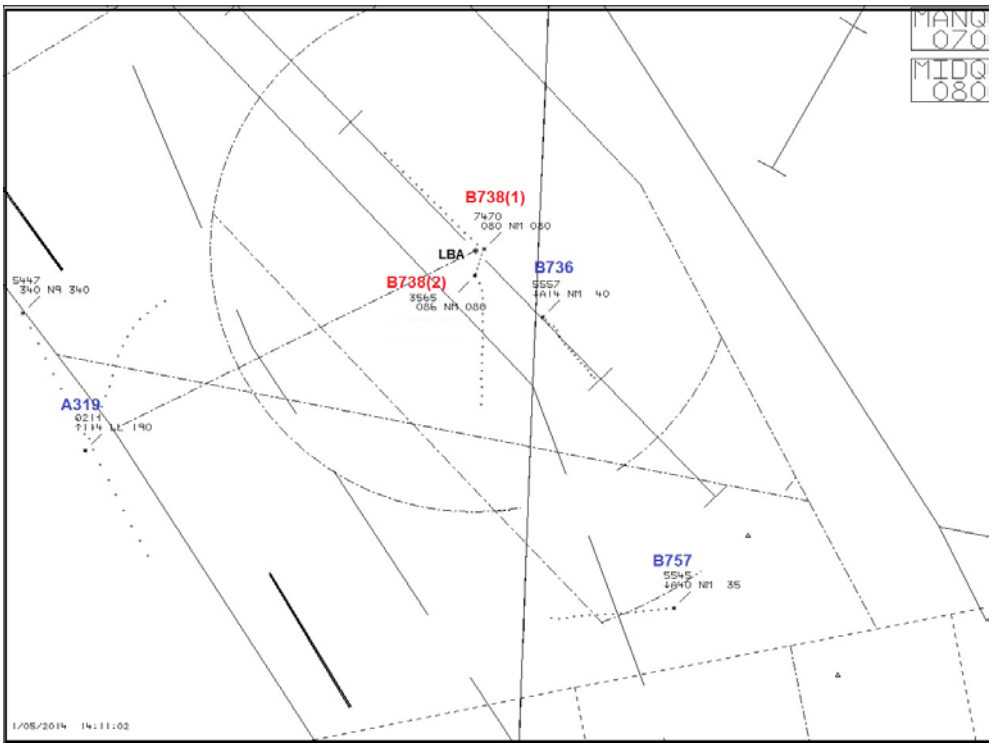

Figure 5 – Prestwick MRT at 1411:02

[Note: CPA as both aircraft start a left turn. Distance 0.8nm horizontally and 600ft vertically]

1411:14

B737(2) "[B737(2) C/S] CLEAR OF TRAFFIC"
Leeds "[B737(2) C/S] SAY AGAIN"
B737(2) "[B737(2) C/S] WE'RE CLEAR OF TRAFFIC"
Leeds "ROGER"

1411:25

B737(1) "[B737(1) C/S] CLEAR OF CONFLICT".

At 1411:40 the Radar controller requested the attendance of another Radar controller to provide an immediate relief. The pilot of B737(1) was turned onto a radar heading of 240° before being instructed to descend to FL70. B737(2) was heading west at FL84 and its pilot was instructed to maintain FL80 and make a right turn, own navigation to the LBA. B737(1)'s pilot was then given a left turn heading 180° degrees at which point the Radar controller handed over to the oncoming controller. The pilots of the subject aircraft were then vectored for an ILS approach without further incident.

At interview, the Radar controller reported it being a normal working day and prior to work he felt rested with no issues likely to affect performance or competency and had not recently been on leave or suffered any illness. The Radar controller was an experienced controller, an On the Job Training Instructor (OJTI) and an examiner. The controller was operating on a day shift, being the fourth day of the working cycle, having previously worked two early shifts and one late shift. The Radar controller attended work at 0800 and spent the morning sampling random radar and RTF recordings as part of the Unit Competence Scheme before taking a lunch break. There had been fog earlier in the day followed by a gradual improvement. The Radar controller was surprised to see visibility start to reduce again at 1250 with the introduction of LVP operations. The afternoon watch was due to commence at 1300 with two controllers arriving and a third controller arriving at 1430. The Radar controller decided that he would take over the radar position from 1345 to 1430 in order to provide a relief break prior to the third controller's arrival.

Upon assuming control duties, the Radar controller had considered traffic levels light, but he explained that, because of the restrictions when operating in LVP safeguarding conditions without a Surface Movement Radar (SMR), procedures dictated an increased spacing requirements for arrivals and increased coordination with the Aerodrome controller to allow only one ground movement or backtrack prior to a departure. He stated that when operating Optimised Procedures together with LVP restrictions, this has the effect of increasing the spacing and extending track miles required to lose height within the constraints of the arrivals box and workload increases substantially.

The Radar controller gave his recollection of events. When the pilot of B737(2) called, his plan was to descend it to FL90 and he believed that he had given FL90. However, the controller expressed some concern that he had mistakenly given FL80. Examining B737(2)'s FPS it showed B737(2**)** was descending to FL100 and this had not been updated to show FL80 until the oncoming controller took over. A desk-top strip management simulation was completed to show which instructions had been annotated on the FPS. This showed that after the pilot of B737(1) had been cleared to FL80, the updating of strip marking stopped.

The Radar controller reasoned that a contributory cause of his error was that he had become fully focussed on the busy airspace south of the LBA NDB There were added pressures due to the limited holding time of the B737(1) and consideration for planning a potential diversion. He also commented that his FPS marking was not as it should have been.

The Radar controller indicated that when PC(N) warned him about the loss of separation, he was initially confused, believing that he had cleared the pilot of B737(2) to FL90. He asked the PC(N) to say again whilst assessing the radar picture and then gave avoiding action to both pilots, albeit that he had emphasised the heading first ahead of the term avoiding action.

The controller was asked about the provision in the Leeds Manual of Air Traffic Services Part 2[2], allowing the radar position to be split. The Radar controller reported that this option was rarely used unless unusually high levels of traffic were planned.

The Radar controller was asked what might be done to prevent a re-occurrence. In discussion he considered that his updating of FPS marking was an issue caused by the increased workload. He considered that Short Term Conflict Alert (STCA) would have alerted him to the loss of separation and also indicated that after a quiet winter period he had not expected the high workload. The controller believed that the Optimised Procedures worked well but considered, in the circumstances, the combination of holding traffic and LVP operations had increased his workload. In discussion, he considered that holding inbounds at 5000ft and climbing departures to 4000ft was an option, but was something that would need to be considered and planned for in advance. When asked about splitting the radar position he indicated that this was not normally an option without advance planning for situations when traffic levels were expected to be high and was subject to the availability of staff. The controller agreed that following the standard FPS management process would have acted as a safety barrier and would have highlighted that FL80 was occupied by B737(1**)**.

As a result of this Airprox the ATSU has made recommendations to:

- Review the 'pros and cons' of using Optimised Procedures compared with the previous practise of using lower levels.
- Issue a notice to staff regarding the quality of FPS marking.
- Prioritise the introduction of a conflict alert into the Radar Data Processing.
- Examine the requirements to have only two controllers on duty.

[2] Page 128, Paragraph 1.2.6

CAA ATSI are content with the recommendations proposed by Leeds ATSU. It is recommended that the CAA SRG Principal Inspector (Stirling Regional Office) in consultation with LBA ATSU ensure that the ATSU undertake the following:

- An assessment of controller workload when operating Optimised Procedures in combination with LVP/CAT3 operations in order to identify and mitigate against any areas of concern.

- The scenario of this Airprox and 'lessons learned' be included in controller TRUCE training.

Assessment of TCAS Performance (Extract from NATS report- Appendix A))

Eurocontrol's Automatic Safety Monitoring Tool (ASMT) recorded two RAs relating to the encounter; two 'Monitor Vertical Speed' RAs (MVS), each recorded at 1410:53. These were down-linked from both B737(1) and B737(2). Of the two recorded RAs, it was possible to reproduce both in an InCAS simulation.

The simulation suggests that both B737(1) and B737(2) received a TA at 1410:26. At the time of the recorded TAs, B737(1) was level at FL80 and B737(2) was descending at a rate of 384ft/min, about 700ft above B737(1).

The simulation suggests that B737(1) received a 'DCL' (Don't Climb) RA at 1410:42, slightly before B737(2) received a 'DDE' (Don't Descend) RA at 1410:43. DDE and DCL RAs are a sub-type of MVS used in InCAS to distinguish between different senses of MVS. These simulated RAs are 11secs ('DCL' RA) and 10secs ('DDE' RA) before the down-linked MVS alerts.

At the time of the simulated RA's (1410:42/1410:43), B737(1) was level at FL80 and B737(2) was descending at about 240ft/min, 615ft above B737(1). The distance at the InCAS simulated closest point of approach (CPA) was 0.9nm horizontally and 557ft vertically, at 1411:01.

The InCAS simulated 'Clear of Conflict' (CoC) message was issued at 1411:05, just after CPA.

Summary

The Airprox occurred when the LBA Radar controller instructed the pilot of B737(2) to descend to FL80, a level already occupied by B737(1). The controller was distracted by the high workload associated with coordination and tactical planning during LVP/CAT3 safeguarding operations and did not update or check his FPS marking presentation before giving B737(2)'s pilot descent clearance to FL80. Avoiding action instructions were issued after the PC(N) controller warned the LBA controller that both aircraft were descending to the same level. Both pilots received and complied with TCAS RA MVS commands. The CPA was recorded as 0.8nm horizontally and 600ft vertically.

PART B: SUMMARY OF THE BOARD'S DISCUSSIONS

Information available included reports from the pilots of both aircraft, transcripts of the relevant RTF frequency, radar recordings, report from the controller concerned and reports from the appropriate ATC and operating authorities.

From the information available, the Board quickly decided that the cause of the Airprox had been that the LBA controller had instructed the pilot of B737(2) to descend to the level of B737(1). There then ensued a prolonged debate as to why such an experienced controller might have done so.

The Board noted that it would have been easy to simply blame the controller for what had happened but that, in their opinion, there were extenuating circumstances that needed to be explored further. Because of the adverse weather conditions, workload had increased significantly from the time the controller concerned had taken over the Approach Radar position. A Civil controller member with LBA experience explained that the vectoring space around the airport was very restricted. He further commented that because of the new 'Optimised IFR Procedures' (where inbound aircraft descend to

only FL80 and outbounds are released without clearance to FL70) there is limited airspace for aircraft to lose height when subsequently descending from FL80. Not only does the controller have to ensure that inbounds are kept clear of the outbound path, but also that they remain outside Manchester's airspace. This often means that aircraft have to be orbited to remain within the required airspace. Previously, before May 2013 when the new procedures were introduced, it was normal for inbounds to descend to 5000ft and outbounds to climb to only 4000ft after release by the Approach Radar controller. This had allowed for easier vectoring of inbound aircraft to final approach given that they had less height to lose. It was surmised that the change of level for the outbound traffic under the new procedure was to assist aircraft in obtaining continuous climb after contacting Prestwick Centre. An ATC advisor commented that in better weather conditions there were probably no problems with the new procedures, but that it was only in LVP conditions, where a 15nm spacing between inbound aircraft was required, that the workload increased substantially. He commented that although it was possible to revert to the 'old' system, on this occasion, the workload increased too quickly to do so. The only other possibility had been to temporarily stop outbound flights; this did not occur. The Board opined that the combination of LVPs, busy traffic conditions, and the new procedures had placed the controller in a highly complex situation that had required considerable mental agility and the maintenance of a high degree of situational awareness. As such, the Board wondered whether it would have been appropriate for the Approach Radar position to be split due to the high workload. It was not known if there was a controller available to split the position at the time, but an ATC advisor explained that splitting the position was not normally an option unless there was a planned high traffic situation and staff could be appropriately rostered in advance.

The Board also noted that neither Short Term Conflict Alert (STCA) nor Selected Flight Level (SFL) were provided on the surveillance equipment displays at LBA and so no automated warning systems were available to the controller. The first person to identify the conflict had been the PC(N) controller who had received a STCA between the subject aircraft and had noted that the SFL of B737(2) was the same level that B737(1) was maintaining. The Board commended the PC(N) controller's actions in telephoning the LBA controller straight away to warn him of the conflict and noted that, after initially being unsure of the situation because he had not been able to keep the Flight Progress Display up to date due to the high workload, the LBA controller had soon assimilated the situation and issued avoiding action turns to both pilots (although no level change instructions were passed). Almost coincidentally, the pilots received TCAS RAs to 'Monitor Vertical Speed', which caused the pilot of B737(2) to level at FL86, 600ft above B737(2). Horizontal separation as the aircraft passed each other was 0.8nm. Therefore, the Board considered that, although there had been no risk of an actual collision mainly due to the TCAS warnings, safety margins had been much reduced below the normal, especially as the aircraft were on reciprocal tracks, in CAS, and had been cleared to the same level under IMC; consequently they categorised the risk as 'B'.

The Board noted the ATSI recommendations regarding this incident and strongly endorsed them; they reasoned that if a highly experienced controller could be affected by the circumstances of this Airprox then the probability existed that any other controller could be similarly affected and this strongly indicated a need to reassess controller workload when operating Optimised Procedures in combination with LVP/CAT3 operations at LBA.

PART C: ASSESSMENT OF CAUSE AND RISK

Cause: The LBA controller cleared the B737(2) pilot to the same level as the B737(1).

Degree of Risk: B.

ERC Score[3]: 50.

[3] Although the Event Risk Classification (ERC) trial had been formally terminated for future development at the time of the Board, for data continuity and consistency purposes, Director UKAB and the UKAB Secretariat provided a shadow assessment of ERC.