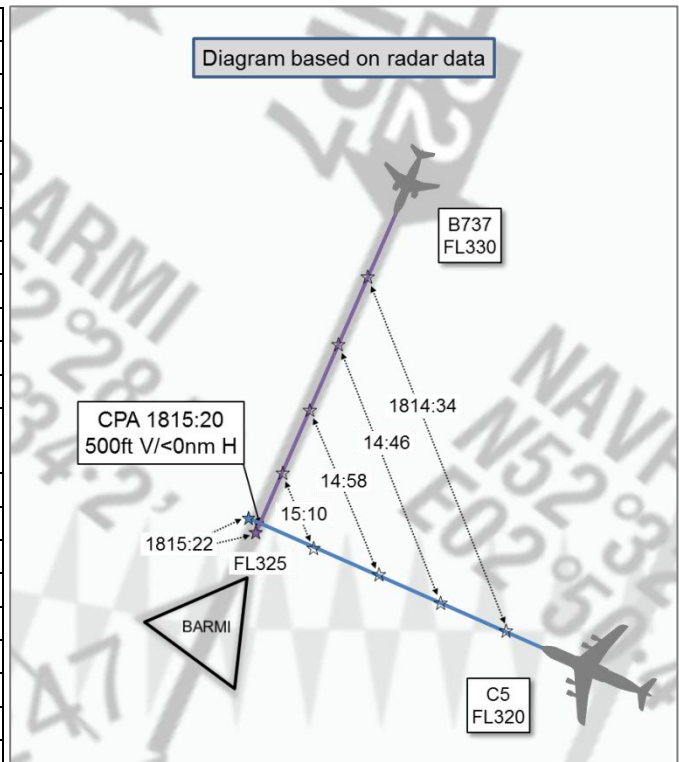


AIRPROX REPORT No 2015111

Date: 14 Jul 2015 Time: 1815Z Position: 5230N 00236E Location: BARMI

PART A: SUMMARY OF INFORMATION REPORTED TO UKAB

Recorded	Aircraft 1	Aircraft 2
Aircraft	B737	C5
Operator	CAT	Foreign Mil
Airspace	UAR	UAR
Class	C	C
Rules	IFR	IFR
Service	Radar Control	Radar Control
Provider	Swanwick	Swanwick
Altitude/FL	FL325	FL320
Transponder	A/C/S	A/C/S
Reported		
Colours	White/blue	Grey
Lighting	NK	Strobes, nav, leading edge and fuselage
Conditions	NK	VMC
Visibility	NK	>20nm
Altitude/FL	NK	FL320
Heading	NK	NK
Speed	NK	NK
ACAS/TAS	TCAS II	TCAS II
Alert	RA	RA
Separation		
Reported	600ft V/NK H	500ft V/0m H
Recorded	500ft V/<0.1nm H	



THE BOEING 737 PILOT reports that whilst at FL340, and well before waypoint BARMI, he received a clearance to be level at FL300 at BARMI. A short while afterwards, he was then issued with an instruction to leave FL340 for FL330. As the First Officer entered the flight deck after a short visit to the restroom, he realized that they were close to BARMI and that he was high on the profile to meet the previous clearance to be level at FL300 at BARMI. He increased the rate of descent and, just below FL330; they received a TCAS TA and then an RA. He responded manually and adjusted pitch to follow the RA instructions; at that moment he gained visual contact with the conflicting traffic, observing it passing behind them. After a short communication with ATC he realized that his cleared level was FL330.

He did not make an assessment of the risk of collision.

THE LOCKHEED C5 GALAXY PILOT reports that both pilots at the controls of the C5 were following the B737 via TCAS and picked it up visually on their right-hand side, 1000ft above and slowly converging; visual contact was made initially at approximately 15nm. As the B737 approached overhead it initiated a rapid descent. With approximately 800ft of vertical separation, the First Pilot at the primary controls in the right seat disengaged the autopilot and also began a descent. The Instructor Pilot, in the left seat, followed on the controls and immediately notified Swanwick Mil [he thought] of their deviation while following the RA. Because the B737 was directly overhead, visual contact was not maintained during the response to the RA. They descended to approximately FL314 before the RA cleared. Indications in their cockpit placed the B737 within 500ft of their aircraft, and its pilot appeared to have descended near, or to, their cleared FL (FL320). No traffic calls were given by Swanwick prior to the response to the RA. Due to the other aircraft's pilot communicating on a different frequency [he recollected] they were unaware of any clearances he had been given.

He assessed the risk of collision as 'High'.

THE SWANWICK SECTOR 10/11 TACTICAL CONTROLLER reports that the B737 pilot, at FL340 inbound to Heathrow, was cleared to FL300 at 1808 to meet the Standard Agreement at BARMI. At 1812 the B737 pilot was then instructed to stop at FL330 against the C5 (on a military code and crossing south of NAVPI) at FL320. The B737 pilot was still maintaining FL340 when the revision to his clearance was made. At 1813:12, the B737 reached FL330 and maintained the level. At 1813:40 the Short Term Conflict Alert (STCA) activated against both aircraft but was cleared down because they were both maintaining their levels. At 1813:50, the controller reiterated the clearance to the B737 pilot to maintain FL330, which he responded 'to maintain'. The C5 pilot checked in, he was identified, and his code changed. At 1815:03, just as the B737 was passing directly overhead the C5, the B737's Selected Flight Level (SFL) changed to FL300 and the aircraft started to descend. The C5 pilot reported an RA and that he was descending. The B737 was passing through FL326 when the controller instructed him to level off at FL325 to which he responded he had received a TCAS RA and that he was climbing back to FL330.

THE SWANWICK SECTOR 10/11 PLANNER reports that she accepted a C5 via NAVPI directly from Maastricht (MAAS) on track to DOLAS at FL320. This aircraft was seen with the MAAS squawk when 15nm east of the FIR boundary, and the B737 pilot was instructed to stop his previously given descent (to FL300) at FL330 due to the C5. At the time, he had not yet commenced his descent from FL340. The C5 pilot called on frequency and, on passing the boundary, the London squawk (2023) was assigned. Shortly after this, the B737 pilot started to descend with an SFL of FL330 as cleared. The B737 pilot levelled at FL330 for a while then, when almost directly on top of the C5, he started to descend again. At this time her labels had merged, and she was alerted to the loss of separation by the C5 pilot declaring a TCAS RA descent coincident with the STCA activating 'red'. The B737 pilot also declared a TCAS RA and climbed.

Factual Background

Reduced Vertical Separation Minima (RVSM) are 5nm horizontally/1000ft vertically. The Swanwick Sector 10/11 Tactical Controller RT transcript is reproduced below:

From	To	Speech Transcription
B737	Swanwick	London er good evening [B737 C/S], flight level four hundred, inbound????? (1802:00) point er mach point seven four
Swanwick	B737	[B737 C/S] roger
Swanwick	B737	[B737 C/S] descend now flight level three four zero, good rate through flight level three (1804:20) five zero please
B737	Swanwick	Descend flight level er three four zero at a good rate, out of three five [B737 C/S]
Swanwick	B737	(1808:20) [B737 C/S] descend when ready flight level three hundred, level by BARMI
Swanwick	B737	[B737 C/S] descend when ready flight level three hundred, level by BARMI
B737	Swanwick	Okay er level three hundred by BARMI when ready (1808:40) [B737 C/S]
Swanwick	B737	[B737 C/S] er stop your initial (1812:20) descent flight level three three zero please
B737	Swanwick	Level three three zero [B737 C/S]
Other/ C5	Swanwick	(1813:00) [Other C/S] maintaining????? ?????? ?????? ?????? ?????? [part C5 C/S] is with you flight level three two zero {part simultaneous transmissions}
Swanwick	C5	[C5 C/S] hello to you squawk ident
C5	Swanwick	[C5 C/S] with the flash and we are direct (1813:20) DOLAS at this time sir
Swanwick	C5	Roger
Swanwick	B737	[B737 C/S] maintain flight level three three zero on reaching
B737	Swanwick	Okay maintain three three zero????? [B737 C/S] (1814:30)
Swanwick	C5	(1814:40) [C5 C/S] squawk two zero two three
C5	Swanwick	Two zero two three for [C5 C/S]
C5	Swanwick	(1815:00) And [C5 C/S] is responding to an R A, in the descent
Swanwick	B737	(1815:20) [B737 C/S] er maintain flight level three two five
B737	Swanwick	[B737 C/S] just had a TCAS R A and we're clear of conflict now, levelling off er three three zero

Analysis and Investigation

CAA ATSI

ATSI had access to reports from the Swanwick Tactical and Planner controllers, both pilots, area radar recordings, RTF and transcript of the unit position frequency and the ATS Unit investigation report. Screenshots produced in the report are provided using area radar recordings. Levels indicated are flight levels.

The B737 pilot had reported on frequency at 1802:00, maintaining FL400. At 1804:20, the B737 pilot was given descent to FL340 and asked for a “good rate through FL350.” At 1808:20, the controller gave further descent clearance to the B737 pilot, “when ready to FL300, level by BARMI” which was read back correctly. The B737 SFL remained selected at FL340.

Between the times 1808 and 1812, the Planner accepted the C5 direct from Maastricht.

At 1812:01, the B737 (transponding 2206) was on a south-westerly track maintaining FL340 and the C5 (transponding 0636) 30nm to the SSE of the B737, was on a north-westerly track maintaining FL320 (Figure 1).

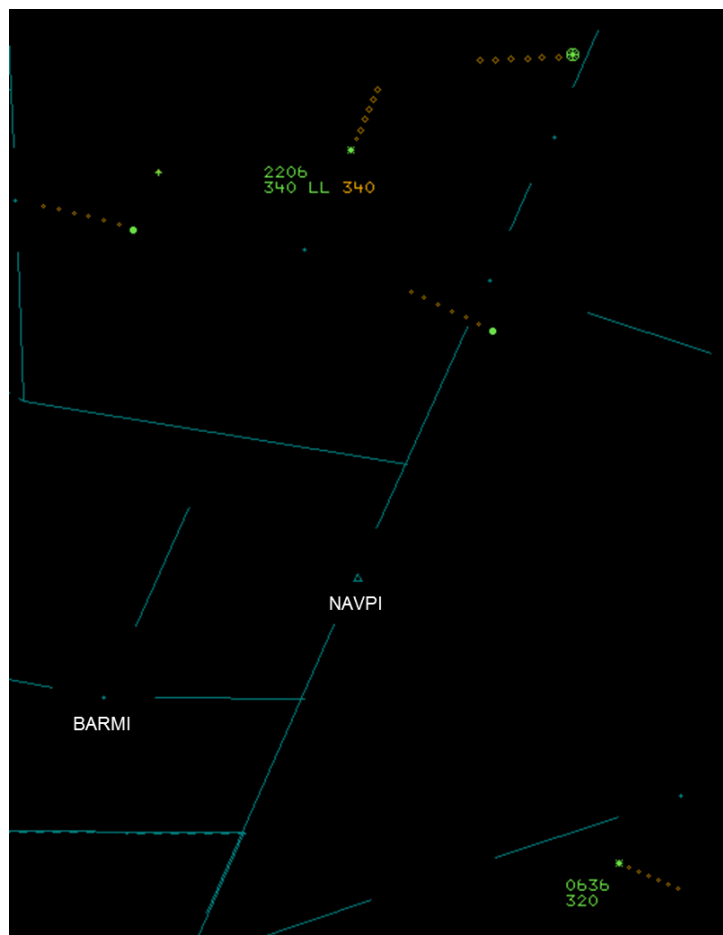


Figure 1 – 1812:01

At 1812:20, the controller instructed the B737 pilot to stop descent at FL330 which was read-back correctly and confirmed in the SFL at 1812:38.

At 1812:43 the B737 pilot commenced descent to FL330. The C5 was still maintaining FL320, now 24nm southeast of the B737 (Figure 2).

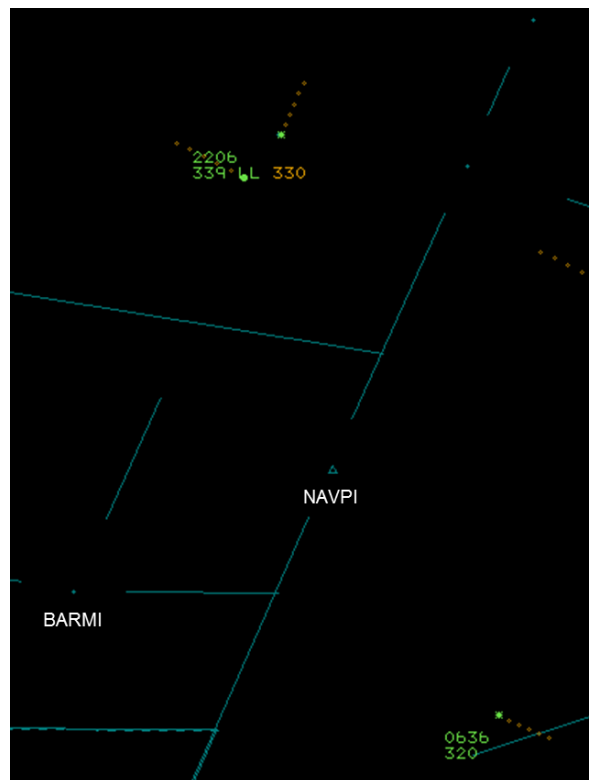


Figure 2 – 1812:43

At 1813:20, the C5 pilot reported on frequency, maintaining FL320. The controller asked the C5 pilot to “Squawk Ident,” which was acknowledged. The ATSU investigation report confirmed that a low-level STCA activated at 1813:32. The controller then went back to the B737 pilot, confirming the instruction to the pilot to maintain FL330 on reaching which was acknowledged by the pilot at 1813:40.

At 1815:02, the B737, still maintaining FL330, selected a lower FL in the SFL (FL313 at this point). (The C5 squawk had changed to 2023) (Figure 3).



Figure 3 – 1815:02

At 1815:14, with FL300 now set in the SFL, the B737 was observed commencing descent, passing FL328. The aircraft were separated by 0.9nm horizontally and 800ft vertically (Figure 4).

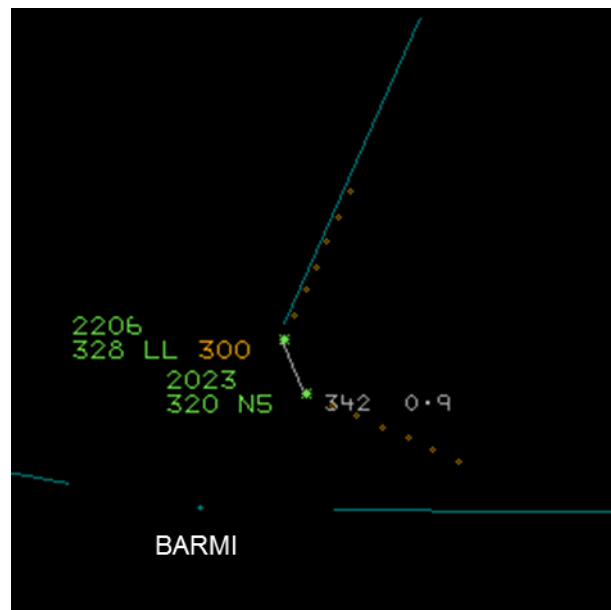


Figure 4 - 1815:14

At 1815:18 the aircraft were separated by 0.3nm horizontally and 600ft vertically (Figure 5). The pilot of the C5 reported “responding to an RA, in the descent.” The ATSU investigation report confirmed that both a high-level STCA and a Cleared Flight Level (CFL) deviation alert were displayed to the controller at 1815:20.

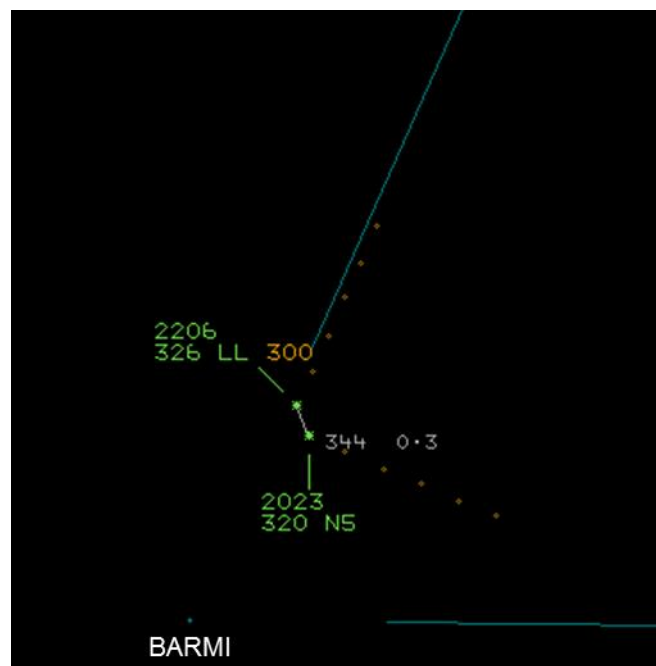


Figure 5 - 1815:18

By 1815:23 both aircraft had passed each other, 0.3nm horizontally and 500ft vertically apart and were diverging (Figure 6).

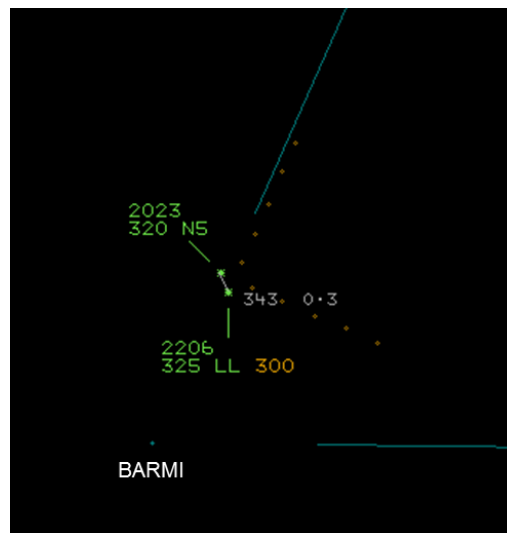


Figure 6. 1815:23

Due to the relative speeds of both aircraft and the radar replay refresh rate, CPA was assessed to have taken place between 1815:18 and 1815:21, with the aircraft separated at the end of this period by 0.3nm horizontally and 500ft vertically.

The conflict with the C5 was not predicted by the controller's interim Future Area Control Tool System (iFACTS) because the aircraft was transponding a military code and remained unpaired by the system, but was spotted by the controller before the C5 entered his sector. Separation was applied by stopping the descent of the B737 whilst the aircraft were still separated horizontally by 23nm and 2000ft vertically with both aircraft still apparently in level flight.

The unauthorised descent by the B737 pilot to FL300 was initiated just before the aircraft passed overhead the C5, triggering TCAS RAs on both aircraft. The B737 pilot report indicated that he had also increased his rate of descent, believing that the aircraft was now high on its profile, based on the original clearance of having to be level at FL300 by reporting point BARM. This indicated that the crew had forgotten the revised clearance to stop their descent at FL330. The B737 pilot's late descent left little time for ATC to resolve the conflict.

UKAB Secretariat

Both pilots shared an equal responsibility for collision avoidance and not to operate in such proximity to other aircraft as to create a collision hazard¹.

Comments

USAFE

Given the evidence, there would appear to have been a serious lapse in CRM within the B737 cockpit.

B737 Operating Company Investigation

The flight cruised at FL340 and had entered London airspace when the FO informed the CDR he needed to visit the toilet. That was accepted by the CDR and the FO left the flight deck. Shortly after, at 18:08:21, ATC called and cleared the flight to; "*descend when ready FL300 to be level by BARM*". A correct read-back by the CDR was given and the transmission is verified in flight data, VHF1 keyed. The CDR entered FL300 as a hard level at point BARM in the FMS. A Top-of-Descent point was calculated and displayed on the MAP.

¹ SERA.3205 Proximity.

At 18:12:18 ATC called the flight and revised the clearance by instructing; "... *stop your descent FL330 please*". The CDR responded; "Stopping level 330, ..." Flight data verifies the transmission on VHF1 and seconds later FL330 was selected on the MCP and the descent was initiated. At 18:13:23 ATC called and reminded the flight to stop the descent at FL330. The CDR replied correctly and at 18:13:50 the flight maintained FL330.

The FO returned to flight deck and, during re-seating, he observed the hard level at BARMI [FL300] and he realized it would not be possible to reach FL300 with such a short distance remaining. Simultaneously, the CDR started to scroll down the vertical speed wheel on the MCP. The aircraft did not leave FL330 since that level was selected on the MCP. The CDR then selected FL300 on the MCP and initiated the vertical speed mode by rotating down the vertical speed wheel. At 18:15:02 the flight started the descent. Seconds later a TCAS TA "Climb" was activated followed directly by the TCAS RA "Climb" and "Climb now". At 18:15:14 separation to the conflicting traffic was lost and at 18:15:22 the minimum separation of 0.3 nm/500 feet was reached. The CDR disconnected the autopilot and initiated a climb in accordance to TCAS instructions. He could see the conflicting traffic on the left side. Approximately 18:15:30 the TCAS announced "Clear of conflict". The FO then took control of communication and reported the TCAS climb to FL330 to ATC.

The investigation concluded that all clearances were correctly replied by the CDR however without any confirmation by the FO. When approaching point BARMI the CDR was triggered to descent to FL300 forgetting that the flight had been re-cleared FL330. Safety recommendations addressed hazards related to single pilot communicating and to strengthen the procedure in connection with pilot absence from flight deck.

Summary

The Airprox occurred in Class C airspace within UAR UP7; both pilots were in receipt of a Radar Control Service from Swanwick Sector 10/11. The B737 pilot was cleared to descend initially to be level at BARMI at FL300. He was subsequently instructed to stop descent at FL330 to achieve separation from the C5, which had been accepted at FL320. This clearance was acknowledged by the pilot. However, as the two aircraft approached each other, the B737 pilot started to descend to comply with his previous clearance to FL300. Both pilots received TCAS RAs. Minimum separation was 500ft vertically and <0.1nm horizontally.

PART B: SUMMARY OF THE BOARD'S DISCUSSIONS

Information available included reports from both pilots, the airline company, the controllers concerned, area radar and RTF recordings and reports from the appropriate ATC and operating authorities.

The Board were grateful for the report supplied to UKAB by the B737 operating company which had helped them to understand the sequence of events in the flight-deck that had led up to the Airprox. Using this information the Board noted that the B737 was maintaining FL340 when the FO requested permission to leave the flight-deck and departed. The B737 PF was subsequently cleared to descend to FL300 to be level at BARMI, which he read back correctly. He then entered FL300 in the FMS as the level to be reached at BARMI. Approximately 4 minutes later ATC instructed the PF to stop his descent at FL330 (due to the C5 being accepted from Maastricht at FL320). The PF read back the revised clearance. Shortly afterwards, the controller reminded the PF to level at FL330, which he also read back. By the time the B737 had levelled at FL330 the FO had then returned to the flight-deck and had taken over RT communication again. After a short time, the PF noticed that the aircraft was approaching the descent point relative to the initial clearance of FL300 at BARMI, as displayed due to the FMS setting of FL300 at BARMI, and, presumably overlooking his revised clearance to only FL330, he reset the Mode Control Panel to FL300 and started to descend. Realising that he was slightly high on the flight profile he then increased his rate of descent, received a TCAS TA, followed by an RA to 'Climb' and then 'Climb now'.

A Civil Airline Pilot member commented that a number of European airline SOPs require a member of the cabin crew to be present on the flight-deck if one of the flight-crew leaves. He wondered if the pilot had been distracted by the presence of a cabin crew member, and if this had affected his actions. The operating company report confirmed that it is normally the airline's requirement for a cabin member to enter the flight-deck in those circumstances but, on this occasion, the pilot, realising that the cabin crew were busy and the FO would only be gone for a short period, decided not to ask for any attendance. The Board then considered the quality of the Crew Resource Management (CRM) between the two pilots. Civil Airline Pilot members commented that they would have expected the pilot to have briefed the FO when he returned to the flight-deck about any ATC clearances that he had received in his absence. It would appear that, surprisingly, this had not occurred. As a result, the FO did not have the knowledge to query the pilot's descent from the cleared level of FL330. Civil Airline members found it difficult to explain the pilot's actions, and opined that there must have been Human Factor issues which had affected his performance. Supporting this comment the pilot had remarked during the airline investigation that *"long and frequent working days do influence the levels of awareness and alertness negatively"*.

The Board then discussed the actions of the C5 crew. The Board noted that they had initially seen the B737 on TCAS, then visually 1000ft above slightly converging but had lost sight of it as it had passed overhead when it had started to descend. The USAFE member confirmed that as soon as the crew received an RA to descend they had reacted quickly to the descent instruction. The Board noted that the recordings showed that the C5 had yet to leave FL320 at CPA, presumably because of latency in the radar display and the fact that the RA activation had been almost coincident with CPA due to the timing of the B737's descent.

The Board then turned their attention to the Swanwick controllers. It was noted that the B737 pilot had been cleared to descend to FL300 before the C5 had been accepted at FL320 from Maastricht on a converging track. The Board agreed that there had been sufficient time to instruct the B737 pilot to stop his descent at FL330 to ensure that standard separation was maintained, and they commended the actions of the Swanwick Tactical controller who had subsequently reminded the B737 pilot to maintain FL330 and had received a further read back of the revised clearance. When the C5 crew subsequently transmitted that they were responding to a TCAS RA descent, the Board noted that the controller, seeing that the B737 was descending through FL326 had also been quick to instruct the B737 pilot to maintain FL325 - albeit the pilot then responded that he was reacting to a TCAS RA climb.

The Board quickly agreed that the cause of the Airprox was that the B737 pilot had descended into conflict with the C5. The Board opined that if, on his return to the flight-deck, the FO had been briefed on the ATC clearances received in his absence he would likely have queried the pilot's actions in descending from FL330, and the pilot himself might also have been prompted to recall the revised clearance. Consequently, a breakdown in CRM in the B737 cockpit was considered to be a contributory factor, although members could not comment on the presumed Human Factors reasons behind this, given that there was no relevant information available to the members.

Turning to the risk, the Board noted that the confliction had, in the end, been resolved by both pilots receiving and complying with TCAS RAs. However, the proximity and aspect of the two aircraft when the B737 pilot had started to descend towards the C5's level, together with the B737's increased rate of descent, meant that there had only been a very short time for both pilots to react. A Civil Airline Pilot member commented that, after the B737 pilot had received the TCAS RA climb, he would first have had to stop his descent before then climbing; he opined that this would also have affected separation margins. He added that it is very unusual to receive a TCAS RA 'climb now' instruction, and that this illustrated that the two aircraft were in close proximity. The Board agreed that safety margins had been much reduced below the norm due to the dynamics of the situation and the fact that the two aircraft had passed each other, whilst reacting, by a distance estimated between radar plots to be in the region of 500ft vertically as they diverged post-CPA; this was half the required vertical separation of 1000ft. The Board therefore agreed that the Airprox should be categorised as risk Category B.

PART C: ASSESSMENT OF CAUSE AND RISK

Cause: The B737 pilot descended into conflict with the C5.

Contributory Factor: A breakdown in CRM in the B737 cockpit.

Degree of Risk: B.