

Boeing 737-236, G-BKYC, and Ilyushin IL 76, No 78807, 16 July 1997

AAIB Bulletin No: 12/1997

Ref: EW/C97/7/3 Category: 1.1

Aircraft Type and Registration: i) Boeing 737-236, G-BKYC
ii) Ilyushin IL 76, No 78807
(in formation with two Sukhoi SU 30s)

No & Type of Engines: i) 2 JT8D-15A turbofan engines
ii) 4 Aviadvigatel D-30KP turbofan engines

Year of Manufacture: i) 1984
ii) Not known

Date & Time (UTC): 16 July 1997 at 1425 hrs

Location: 3.5 nm north of Reading (10 nm east of Compton VOR)

Type of Flight: i) Public Transport
ii) Military formation

Persons on Board: i) Crew - 5 - Passengers - 110
ii) Crew - 9 - Passengers - 20

Injuries: i) Crew - None - Passengers - None
ii) Crew - None - Passengers - None

Nature of Damage: i) None
ii) None

Commander's Licence: i) Airline Transport Pilot's Licence
ii) Military Rating with Class II instrument rating and Instructor rating

Commander's Age: i) Not known
ii) 46 years

Commander's Flying Experience:

i) Not known

Last 90 days - Not known

Last 28 days - Not known

ii) 5,000 hours (of which 3,500 were on type)

Last 90 days - 80 hours

Last 28 days - 40 hours

Information Source:

AAIB Field Investigation

Synopsis

The Military IL76 tanker aircraft (callsign WS78807), in formation with two SU30 fighters inbound to RAF Fairford for the Royal International Air Tattoo 1997, was routed through controlled airspace as General Air Traffic (GAT), referred to in this report as 'civil traffic'. It had flight planned as Operational Air Traffic (OAT) in accordance with procedures agreed for military traffic inbound to RAF Fairford. The formation was cleared by ATC to descend to FL160 as it transited the London Terminal Manoeuvring Area (LTMA) inbound to the Compton VOR (CPT) from the east. Instead of indicating level at FL160 the ATC controller noticed that the IL76's height readout (Mode 'C') was indicating 200 feet below its assigned level at FL158. The Boeing 737, en-route from Glasgow to London Gatwick was level at FL150, at an Indicated Air Speed (IAS) of 300 kt and approximately 7 nm north-east of the formation as the IL76's height readout reduced further to indicate FL156 (600 feet above that of the Boeing 737). The Boeing 737 was given 'avoiding action' by ATC and instructed to turn left onto a heading of 090°. The Boeing 737 passed 0.5 nm north of the formation in a steeper than normal left turn. Its position at the time was 3.5 nm north of Reading (10 nm east of the Compton (CPT) VOR). The weather at the time was good with light turbulence and unlimited visibility above 8/8ths cloud cover.

History of the Flights

The commander of the IL76 formation had filed a flight plan for his route from Kaliningrad (UMKK) to RAF Fairford (EGVA) in accordance with the instructions and procedures issued in the appropriate Royal International Air Tattoo manual. The instructions concerning arrival procedures stated that 'aircraft not familiar with flight on Airways, or which only have UHF radio fit are required to conduct the UK portion of their flight to RAF Fairford as Operational Air Traffic (OAT)'. This was 'to enable UK Military and Civil ATC agencies to provide an ATC service more suited to military aircraft and enable such aircraft to avoid congested airspace'. The inbound routing to RAF Fairford from the east was via REFSO; Mildenhall (MLD); Brize Norton (BZN) direct to Fairford.

The IL76 was operated by a crew of 9 comprising 2 pilots; 2 navigators; 1 radio operator; 2 engineers and two loadmasters. Radio communications with ATC were carried out by the radio operator whose English was good but limited to routine everyday phraseology. The IL76 commander and the other pilot's understanding of English was limited to routine ATC phrases only.

The pilots of the two SU30s spoke little English. They maintained communications with the IL76 on a discreet air-to-air frequency and hence were not in contact and could not hear the various UK ATC agencies.

At 1401 hrs the IL76 formation, using the callsign 'WS78807', approached UK airspace and contacted the Clacton (CLN) West Sector Controller (SC) who instructed it to maintain FL350. At 1405 hrs, just after it passed REFSO, the formation turned right in accordance with its flight planned routing to MLD. The SC asked for confirmation that the aircraft was routing to Lambourne (LAM), spelling out the designator, when the IL76 radio operator apparently had difficulty in understanding the request. Throughout the formation's progress, the controller had considerable difficulty in communicating with the IL76 formation, having to repeat many of the instructions. The SC was asked by the IL76 to 'stand by', but as the aircraft's track would have taken it into conflict with eastbound traffic routes the formation was instructed to turn left on to a heading of 255°. At this point the IL76 formation requested a routing direct to Mildenhall. The SC turned it right on to 265° and asked it to confirm its destination. When the IL76 formation confirmed it as Fairford the SC asked for confirmation of the request to route direct to Mildenhall. Receiving no reply, the IL76 formation was asked to confirm what its previous request had been. Again no reply was received and the aircraft continued on its assigned heading in the CLN sector controlled airspace, eventually being given a routing via Lambourne VOR (LAM); Woodley (WOD); Compton VOR (CPT) to MIMBI (18 nm west of Compton (CPT)), to leave controlled airspace for Fairford. At 1409 hrs, the formation was instructed to descend to FL260 and at 1413 hrs, whilst in the descent on a heading of 270°, it was transferred to the London Middle Sector (LMS) on frequency 132.60 MHz.

At 1414:20 hrs the IL76 made its initial call to the LMS SC. Communication was difficult at first, with the IL76 repeating that it was only receiving the controller with difficulty, but at 1417 hrs adequate two way communications were established. The LMS SC continued to pass instructions as appropriate to the IL76 formation. At 1426 hrs, with the formation at FL180 on a heading of 285°, he instructed the formation to descend to FL160, the lowest level available to LMS in that portion of airspace, and the level at which it had been coordinated into the Bristol (BRS) sector.

For the majority of its flight the IL76 formation had adhered to its cleared level, but in the 3 minutes prior to the incident, although it had reported level at FL180, its Mode 'C', height readout, showed FL178 or FL177. The LMS Chief Sector Controller (CSC) had noticed the poor level keeping and had considered suggesting to the LMS SC that it might be prudent only to descend the IL76 formation to FL170 until it was clear of the track which Gatwick inbound aircraft would follow at FL150. Before he could do so the SC cleared the IL76 formation to FL160, but the suggestion was offered anyway. The CSC also thought it wise to advise the Terminal Control South West (TC SW) sector of the IL76 formation. At 1427 hrs he telephoned the SW coordinator and advised him to watch the IL76 formation against a Boeing B737 (callsign 'BAW33A') an inbound flight to Gatwick from the north at FL150.

At the time this conversation commenced the IL76 formation was 5 nm west of Burnham (BUR) passing FL168, with the B737 in its 1 o'clock at a range of 18 nm. By 1427:30 hrs the IL76 formation had apparently descended through its cleared level; its Mode 'C' indicating a level of FL158. The conversation between the LMS CSC and the SW co-ordinator was still in progress and recordings show that they noticed the height excursion immediately it occurred. The TC coordinator made the OCKHAM (OCK) SC aware of the IL76 formation and he called the B737. Unfortunately it was not on the TC SW frequency at the time, but the SC continued to call it anyway while the co-ordinator ran to the COWLY sector to ask them to transfer the aircraft to the OCKHAM Sector frequency. When he returned to his station he overheard the SC giving the B737 an avoiding action

turn on to a heading of 090° followed by traffic information. By this time (1428:10 hrs) the B737 was 7nm north-east of the IL76 formation which was indicating FL156. The B737 commander reported visual contact and subsequently informed the OCK SC that he wished to take reporting action.

Simultaneously the LMS SC had observed that the IL76 formation had apparently descended below its cleared level, so at 1427:45hrs he asked it to confirm that it was maintaining FL160 and gave it traffic information regarding the B737, which by then was 12nm away. The IL76 formation reported that it was maintaining FL160. However its Mode 'C' continued to decrease until by 1428:10hrs it was showing FL156 and lateral separation had reduced to 7 nm. Again the SC asked the IL76 formation to confirm that it was maintaining FL160, and again he received an affirmative answer, although the Mode C was then showing FL157. By this time the distance between the aircraft had diminished to approximately 0.5 nm as the B737 passed north of the IL76 formation in a steeper than normal left turn. As a result of the avoiding turn lateral separation was quickly restored and at 1429 hrs, as the aircraft diverged, the IL76 formation was transferred to the BRISTOL (BRS) sector.

As a result of the incident the commander of the Boeing 737, who had sighted the formation, filed an 'AIRPROX P' report stating that he estimated the 'miss distance' as being of the order of 400 feet vertically and 800 metres horizontally. The crew of the IL76 saw the conflicting Boeing 737 in their '2 o'clock range 5 nm' and assessed that there was no risk of collision and did not alter course. They were only aware that an Airprox 'P' had been filed some time after landing uneventfully at Fairford.

The Separation Monitoring Function (SMF) equipment at the London Air Traffic Control Centre (LATCC) records reductions in vertical separation at 600 feet or less when the horizontal separation between aircraft is less than 2 nm within the TC area. The equipment was not activated on this occasion indicating that the vertical separation was more than 600 feet.

The IL76

At the time of the incident the IL76 was being operated with the autopilot engaged in the height mode with its height keeping performance of the order of ± 20 metres. The assigned flight level was being maintained using indications from the main Metric Altimeter fitted with a millimetre sub scale. The sub scale was set to 760 mm (standard setting) and the indicated height was 4,900 metres, equivalent to 16,076 feet. The aircraft's Standby Altimeter, which was not as accurate and was only used as a gross error check, was calibrated in feet with the sub scale set to 1013 mb.

The two SU30 aircraft were in very close formation at the time of the incident positioned under the left and right wing respectively of the IL76, stepped down by 20 metres.

The Boeing 737

The Boeing 737 was fitted with a flight data recorder that recorded numerous parameters including height, heading, IAS, bank angle and normal acceleration. The readout showed that prior to the avoidance manoeuvre the aircraft was at a height of 15,000 feet, on a heading of 162°M and at an IAS of 300 kt. During the avoiding turn the aircraft achieved a 34° banked turn to the left and the normal acceleration increased to two peaks of 1.27g and 1.32g. The aircraft returned to a 'wings level' attitude on a heading of 130°M before resuming its original track.

The aircraft was not fitted and was not required to be fitted with a Traffic Alert and Collision Avoidance (TCAS) System.

ATC administrative procedures

The flight was operating in accordance with the procedures that had been agreed between LATCC and the organisers of the event, which stipulated that, as there had in previous years been problems with participants from the ex-Soviet bloc countries routing as civil traffic, all such aircraft should flight plan to fly as military traffic in UK airspace. Consequently, although the IL76 formation flight planned as GAT up to the UK Upper Information Region (UIR) boundary, it planned to route thereafter as military traffic via Mildenhall (MLD) and Brize Norton (BZN). This flight plan was received at LATCC at 0735 hrs on 16 July and input at 0756 hrs. The route was input as UR126.CLN.FIR. EGVA, with further details in the remarks field to show the requested routing viz. FPL RFS MLD BZN.

There was some confusion about the type of aircraft, which was shown on the flight plan as 'ZZZZ'; normal practice when there is no ICAO recognised type designator for the aircraft concerned. In this case, however, as IL76 is an ICAO approved designator, it may have been done because the flight was in fact a formation of 3 aircraft. There was no statement on the flight plan however that this was the case, only an entry in the supplementary information field of "TYP/3333" and in the remarks data field the entry 'TIP/ NL76 2 SU 30'. Not surprisingly, the Flight Plan Reception Suite (FPRS) staff did not appreciate that this was intended to show the types of aircraft in a formation, and therefore in the remarks field prefaced the route information with TYP/3333 to indicate the aircraft type.

Later on, at 0956 hrs, FPRS staff amended the remarks field to show the composition of the flight by replacing TYP/3333 with "IL76 and 2/SU30". It was not possible to discover what prompted this amendment. As only 26 characters of any remark can be printed on a flight progress strip the message eventually shown was 'IL76 and 2/SU30. FPL RFS M*'; the asterisk showing that there was more information available which could be accessed through a flight readout. No readout was requested by the CLN sector.

The flight was activated at 1349 hrs with a REFSO estimate of 1404 hrs. Two minutes later an amendment was input from the CLN wings (a working area adjacent to the controllers station) altering the aircraft's routing to 'UR1.UB29.UG1.MIMBI.FIR EGVA'. It could not be determined why this change was instigated. It was this routing via MIMBI, however, which was shown on the strips and, as it was apparently done without reference to the SC, the SC had no knowledge of the aircraft's flight planned routing. Furthermore, it was evident that no one on the CLN sector had any knowledge of the promulgated routings for Fairford traffic.

LATCC ATC Procedure Safety Analysis (LAPSA)

A LATCC ATC Procedure Safety Analysis (LAPSA) was carried out prior to the Fairford Tattoo which correctly identified one of the hazards associated with the event as 'assistants and controllers not being familiar with the relevant procedures, with a consequence that traffic might not be routed correctly'. The resolution of this hazard was to publish a Temporary Operating Instruction (TOI), provide a dedicated copy to the Bristol (BRS) suite and make complete briefing material available on the Supervisor's desk. Another hazard was identified as being East European/Russian participants arriving as civil traffic and having language difficulties. In this connection it was noted that there have been problems in the past with such aircraft causing disruption to LATCC sectors.

The resolution of this hazard was to ensure that all such aircraft should arrange to arrive as military traffic at London UIR/FIR boundaries.

LATCC Temporary Operating Instructions (TOIs)

LATCC TOI 30197 (AC) was published on 30 June 1997, specifying that military aircraft inbound to RAF Fairford, especially formations, would transit as military traffic from the UIR/FIR boundary. It included specific procedures for handling traffic which operated as civil traffic to the boundary, as did the IL76 formation. However, it was incorrectly published as being relevant to the Bristol (BRS) suite only, and hence was posted only on the South Sectors board in the 'Area Control Room' briefing room, and was available on the electronic briefing system only to BRS controllers. It was not possible to ascertain the reason for the limited distribution of TOI 30197.

No-one on the CLN sector would have known of the arrangements made with the 'Tattoo' participants, and the CLN SC had no cause to question the routing of the IL76 formation via airways which was shown on the flight progress strips. CLN sector staff were not aware of the procedure for military aircraft to route as military traffic because they never saw the appropriate TOI.

The SC had attempted to obtain confirmation of the routing to Mildenhall which the pilot requested but when the attempts failed the SC had adhered to the routing shown on the strip.

However, even if the contents of the TOI were unknown to them, further information on the routing of the aircraft was available to the CLN sector staff in the remarks field of the flight progress strip. Messages in this field often contain vital information and when they are truncated (indicated by a '*' at the end of the text) sector support staff are able to make a flight readout to ascertain what is hidden.

Furthermore the layout of the TOI was not ideal. The agreement for military aircraft, especially formations, to route as military traffic was an important part of the instruction, yet it was buried in a note to the section which specifies the hours of operation of the Fairford restricted airspace. The Procedures section of the TOI included a paragraph on military traffic arrivals but did not mention the agreement.

Follow-up actions

Procedures have now been put in place at LATCC to ensure that all TOIs (and also all Supplementary Instructions (SIs)) include, in their title, the sectors or functions to which the instruction is applicable. The originators of these instructions have been reminded that the 'sector addressees' should be checked in both the safety analysis and proof reading stages.

Suggestions have also been made to see if it may be appropriate to review instructions relating to the 'TRUNCATED REMARKS FIELD' of the flight progress strips to consider if there is any way of increasing the number of displayed characters in this field. The message, which at present occupies two thirds of the bottom two lines of a box in the flight progress strip, could possibly be increased by up to another 18 characters if the whole of these lines were used.

The procedures by which military formation flights, especially those of foreign air forces, are allowed to operate as civil traffic within controlled airspace are also under review. Under the terms of MATS Pt 1 133 requests by formations of military aircraft to operate in controlled airspace

may be approved subject to certain conditions, provided that such clearances would in no way adversely affect normal civil flying operations. The responsibility rests with the controller to ensure that the leader of the formation is aware of the conditions of the clearance. Given the difficulty in communicating with the IL76 formation this would have been impossible, and it is doubtful if the onus should be laid at all on a controller actively engaged in controlling traffic. Consideration is being given to amending the procedure by which formation flights are approved in order to place this responsibility elsewhere. It is also being considered if there should be an explicit requirement that all aircraft in a formation must be capable of clear communication with the controlling authority and if there are any areas of airspace where formation flights should not be allowed.

AAIB Conclusions

The commander of the Russian formation had received and understood the procedures and routings for traffic inbound to the UK for the Royal International Air Tattoo at Fairford. He and his crew understood little English but were capable of operating safely within the UK UIR/FIR so long as their planned flight was conducted in accordance with their expectations. The pilots of the two SU30 aircraft, who spoke little English, were fully reliant on the actions of their formation leader in order for them to arrive safely at their destination. They were not in two way communication with the civil ATC agencies.

The unexpected re-routing of the formation as it approached the eastern coast of the UK was unexpected and unsettling to the crew. The CLACTON SC was aware of the difficulties in communicating with the formation and that the mention of unexpected and unfamiliar reporting points led to confusion. He was not aware that the formation intended to route as military traffic outside controlled airspace under the control of military agencies. The formation however eventually complied with ATC instructions as it was routed towards the London Terminal Manoeuvring Area. The LMS CSC had noticed the apparent poor level keeping of the formation and had considered suggesting to the LMS SC that it might be prudent only to descend the IL76 formation to FL170 until it was clear of the track which Gatwick inbound aircraft would follow at FL150. However before his suggestion was adopted the formation was cleared to FL160.

The pilots of the two SU30s were able to maintain a close formation with their 'tanker' (the IL76). Had either one experienced an in-flight emergency necessitating a break in formation and an emergency diversion the subsequent control of that aircraft would have been difficult to say the least. The pilot would have taken a finite time to change frequency to that of the current controlling sector and would not have been able to understand the subsequent ATC instructions.

No doubt the CLACTON SCs would have been aware that the military ATC agencies would have been better suited to provide a service to this military formation. However, given the communication difficulties which the sector controller was experiencing with the IL76 formation, it is possible that they concluded that attempting to divert the pilot from what they thought was his intended route would have created more problems than it would have resolved. Even if the TOI had been available to the relevant sector controllers it did not include any specific mention of the problems that can be associated with formations, especially within congested controlled airspace. The controllers, however, were instantly aware that the formation was apparently not adhering to its assigned level and instigated the appropriate avoiding actions.

Safety recommendations

The following recommendation is made to the Civil Aviation Authority(CAA):

Recommendation 97-45

The Air Traffic Services Standards Department (ATSSD) of the CAA Safety Regulation Group (SRG) should conduct a review of the Manual of Air Traffic (MATS) Part 1 provisions for the conduct of military formation flights as GAT (civil traffic) in controlled airspace.

The following recommendations are made to The National Air Traffic Services Limited (NATS):

Recommendation 97-46

NATS should review the process for composing TOIs and Supplementary Instructions (SIs) to ensure that the resolution of identified hazards in any associated safety assessment process be given appropriate prominence in the subsequent instruction.

Recommendation 97-47

NATS should ensure that the maximum possible amount of any supplementary flight plan information is shown in the remarks field of the flight progress strip or any other flight plan display media.

Recommendation 97-48

NATS should ensure that where flight progress strips or any other flight plan display media show a truncated message, staff are reminded that they should always ascertain the full content of the message.