Fokker 50, G-UKTH, McDonnel-Douglas F15E

AAIB Bulletin No: 6/2002	**Ref: EW/C2001/8/02**	**Category: 1.1**
Aircraft Type and Registration:	(I) Fokker 50, G-UKTH	
	(ii)McDonnel-Douglas F15E	
No & Type of Engines:	Not Relevant	
Year of Manufacture:	Not Relevant	
Date & Time (UTC):	13 August 2001 at 1000 hrs	
Location:	35 nm southeast of Teeside Airport	
Type of Flight:	(i) Public Transport	
	(ii) Military	
Persons on Board:	(i) Crew - 4	Passengers - 37
(ii) Crew 2	Passengers N/A	
Injuries:	Crew - None	Passengers - None
Nature of Damage:	None	
Commander's Licence:	(i) Airline Transport Pilots Licence	
	(ii) N/K	
Commander's Age:	(i) 35 years	
	(ii) N/K	
Commander's Flying Experience:	(i) 5,000 hours (of which 2,500 were on type)	
	Last 90 days 91 hours	
	Last 28 days 34 hours	
	(ii) N/K	
Information Source:	AAIB Field Investigation	

History of flight

Introduction

A Fokker 50 was operating a scheduled flight to Teeside Airport and had departed from Amsterdam Schiphol Airport at 0852 hrs. The planned route was: EHAM - BERGI - B5 - UNIDO - ELDIN - L602 - DOGGA - DCT - EGNV. As is customary on this route the flight left controlled airspace at DOGGA on a track of 305°(M) direct to the Teesside NDB 'TD', the majority of this part of the flight being conducted in Class G (uncontrolled) airspace. However, the aircraft was receiving a Radar Advisory Service (RAS) from Pennine Radar.

At the same time an F15 of the USAF was on a training exercise from RAF Lakenheath and had been operating in a block of airspace from 2,000 feet amsl up to FL 100 whilst receiving a Radar Information Service (RIS) from RAF Leeming.

Fokker 50

At 0940 hrs the commander of the Fokker 50 called Pennine Radar and reported that the aircraft was at FL180 tracking direct to the 'TD' NDB. In response, the Pennine Radar controller allocated the aircraft a Squawk of 6310. At 0956 hrs the controller cleared the aircraft to descend, when ready, to FL100 and this was followed 2 minutes later by a heading change to take the aircraft south of the Fylingdales Radar Site. The controller stated that this was in order to: "KEEP YOU CLEAR OF LEEMING TRAFFIC TO THE NORTH". Having ascertained that the aircraft was in VMC, the controller made the following transmission, at 1000:10 hrs: "OKAY TRAFFIC INFORMATION FOR YOU IN YOUR ONE O'CLOCK RANGE FIVE MILES IT'S FAST MOVING TRAFFIC THAT JUST POPPED UP AND IT'S ACTUALLY CLIMBING THROUGH FLIGHT LEVEL ONE ONE THREE AT THE MOMENT IT'S JUST DECIDED TO TURN RIGHT ONTO A SOUTHERLY HEADING ARE YOU VISUAL WITH THAT TRAFFIC". When the commander replied that he was not, the controller continued: "OKAY IT'S DOING ABOUT FOUR HUNDRED AND SIXTY KNOTS IT'S NOW IN YOUR TWO O'CLOCK RANGE IS TWO MILES HEADING ER CLIMBING THROUGH FLIGHT LEVEL ONE TWO ZERO".

As this exchange was occurring, the commander noticed a contact on the Traffic Alert and Collision Avoidance System (TCAS), which disappeared after a couple of seconds. It then reappeared as a Traffic Advisory (TA) alert with the audio alert "TRAFFIC TRAFFIC". The first officer, who was the handling pilot, followed the Company Standard Operating Procedure for a TA by guarding the controls and selecting an appropriate scale on the map, while the commander scanned the two o'clock position hoping to identify the conflicting aircraft. Almost immediately the TCAS gave a Resolution Advisory (RA) alert with the audio "DESCEND DESCEND DESCEND". As the aircraft was already descending at about 1,000 fpm the first officer increased this to the 1,500 fpm to 1,800 fpm 'green sector' demanded by TCAS. The needle on the TCAS Vertical Speed Instrument (VSI) had only just reached the green sector when the RA demand changed to a climb with the audio alert "CLIMB CLIMB CLIMB". This was followed almost immediately by "INCREASE CLIMB" to which the first officer reacted immediately to establish the 2,500 fpm rate of climb demanded. The commander, however, considered that the conflicting traffic was still a threat and, after he had checked the ASI, intervened to increase the pitch attitude in order to trade airspeed for a rate of climb of around 3,000 fpm. At about 1000:40 hrs the crew of the Fokker 50 transmitted: "WE HAVE TCAS RA CLIMB". ATC replied: "OKAY ARE YOU HAPPY TO

CONTINUE ON THAT I CAN'T REALLY GIVE YOU MUCH AVOIDING ACTION IT'S ABOUT TO PASS UNDERNEATH YOU VERY SHORTLY".

The last TCAS indication the commander recalled was the conflicting traffic's RA data tag showing -300 feet (300 feet below the Fokker 50's level) as it moved to the 8 o'clock position. When the TCAS display returned to normal, the audio "CLEAR OF CONFLICT" sounded and the first officer gently levelled the aircraft at FL145. The commander looked out to his left and saw a fast moving aircraft moving away which he identified as an F15. The commander then told the controller that he would be filing an Airprox report. The controller then cleared the aircraft to descend to FL 70.

After the incident the commander briefed the No 1 cabin attendant and ascertained no-one had been injured (the 'fasten seat belt' sign had been on at the time of the incident) and he then made a PA announcement to brief the passengers. The flight arrived at Teesside Airport at 1020 hrs without further incident.

F15

On completion of a low level exercise, the F15 left the area to the south-east of Teeside and climbed on a southerly heading in order to return to RAF Lakenheath. At 0959:30 hrs, the crew informed the RAF Leeming controller that they were changing frequency to London Military and were instructed by him to Squawk 7000. The crew were not aware that they were the subject of an Airprox report until they were informed some days later.

The aircraft was equipped with an onboard video recorder and this had been functioning throughout the flight. Replay of this video recording identified the incident. For the flight back to their base, the crew had elected to continue VFR and the rear seat crew member had selected the new Squawk of 7000. At 1000:52 hrs, the Head Up Display indicated that the aircraft was climbing at 360 kt through 13,600 feet, with a rate of climb of about 4,000 fpm, when the rear seat crew member said that he could see an aircraft to the left; he estimated that it was about 400 ft above and would pass behind their own aircraft. The front seat crew member had not seen the aircraft.

Air Traffic Control

At about 0957 hrs, the Pennine Radar controller asked RAF Leeming for information on "0402 TRAFFIC" (the F15) and was told that it was operating between 2,000 feet on the regional QNH and FL100. When he asked if the traffic was staying "THAT SIDE OF FYLINGDALES" (ie to the north), the RAF Leeming controller replied to the effect that he hoped so. The Pennine controller then asked him if he could see "6310 BY FLAMBOROUGH HEAD" (the F50). By the time this traffic had been identified and confirmed, it was to the south of the RAF Leeming controller's normal area and so the Pennine Radar controller said that he would "BRING HIM THE OTHER SIDE OF FYLINGDALES" (ie to the south). Shortly after this there was a change of Pennine Radar controller and it was the incoming controller who noticed the fast moving contact in potential conflict with the Fokker 50. It is possible that he referred to the contact as a "POP UP", because the Sqawk had just changed to 7000 and he hadn't associated it with the F15's previous Squawk of 0402. The Short Term Conflict Alert was active when he informed the Fokker 50 about the confliction. Normally under a RAS the controller would be expected to give the action necessary to resolve the confliction either before the information, if urgent, or after, if not. In this incident, the controller assessed that any action he could give the Fokker 50 may have aggravated rather than resolved the conflict.

The Incident Investigation Report compiled by the Safety and Quality Section of Manchester ATCC and Airport found that the Pennine Sector was operating in accordance with unit instructions and was correctly manned. Having observed the radar replay, they also considered that any instructions given to the F50 would have resulted in it turning into the F15 or placing it directly in front with the F15 catching up rapidly. The CAA investigation concurred with these findings.

When, at 0959:30 hrs, the F15 crew told Leeming that they were changing frequency to London Military, they were more than 15 nm north-west of the Fokker 50, tracking south and climbing through FL100. The Leeming controller had no reason to suspect that there would be a confliction and the onus for maintaining separation from other traffic had been transferred to the F15 crew.

Radar

The Pennine Radar Controller display was recorded. A replay of the recording gave the following flight levels of the two aircraft and their separation:

Time	Fokker 50	F15	Separation
0959:51 hrs	FL 150	FL 101	11.9 nm
1000:10 hrs	FL 145	FL 110	7.6 nm
1000.30 hrs	FL142	FL 116	4.7 nm
1000:41 hrs	FL140	FL128	1.9 nm
1000:49 hrs	FL142	FL 135	0.6 nm
1000:57 hrs	FL 147	Not recorded	0.8 nm
1001:05 hrs	FL 148	FL 148	4.7 nm

A plot of the flight trajectories of both aircraft from this data is shown in Figure 1 *(JPG 102kb)*. The data indicates that the minimum lateral separation of the two aircraft was in the order of 800 metres, and the vertical separation some 1500 feet. The F15 did not change its course or rate of climb when approaching the Fokker 50, which is consistent with its crew being unaware of its presence.

The United Kingdom Airprox Board (UKAB), who have also conducted an investigation into this serious incident, analysed data from two radar heads and a plan view plot of this is shown in Figure 3 *(JPG 61kb)*. This suggests that the vertical separation of the two aircraft tracks (assuming constant velocities) would have been in the order of 600 feet.

Flight recorders

The 30 minute duration CVR recording from the F50 was overwritten and provided no information on the incident. The DFDR from the Fokker 50, however, did contain data covering the incident and a time history of relevant data is shown in Fig 2. At the time of the incident, the data shows that the aircraft initially pitched nose down and then suddenly pitched nose up to an attitude of +8°. During this manoeuvre the vertical acceleration increased to almost 2g, the indicated airspeed

reduced by 40 kt and the aircraft climbed some 1,000 feet. TCAS data was not recorded on the DFDR, and it was not possible to decode the messages generated within the TCAS computer. With the exception of the video record of the flight, there was no onboard recorded data available from the F15.

Meteorology

An aftercast was obtained from the Met Office at Bracknell as follows:

> The synoptic situation at 1000 hrs showed a moderate, unstable, westerly airflow covering northern England with generally well-broken cloud following the passage of a frontal system overnight.

Weather	Nil
Surface visibility	15 to 25 Km
Cloud	FEW/SCT strato-cumulus at 2,000 to 2,500 ft
	FEW thin alto-cumulus between 7,500 ft and 11,000 ft
	BKN cirrus at 22,000 ft
QNH	1006 mb

Radar Service Outside Controlled Airspace

The UK AIP defines two radar services available to pilots outside controlled airspace; a Radar Advisory Service (RAS) and a Radar Information Service (RIS). The main difference between these two services is that a controller providing a RAS gives information on the relative range and bearing of any conflicting traffic, and the action necessary to resolve the confliction, whereas, the controller providing a RIS provides information only and it is the responsibility of the pilot to take any action necessary to resolve the conflict.

Previous Incident

AAIB Bulletin 2/2001 contained a report (EW/G2000/03/07) into a similar incident in the same airspace on 20 March 2000. It involved a Shorts SD-360 bound for Newcastle, and a RAF Tornado F3. A synopsis of that report is as follows:

> A Shorts SD-360 aircraft, G-OLAH, was operating a scheduled service from Aberdeen to Newcastle. The direct track between the two aerodrome control zones followed by the aircraft lay within Class G airspace. At the same time a formation of three RAF Tornado F3 aircraft were engaged in a Tactical Training Leadership medium scale night exercise planned by the Air Warfare Centre and notified to civilian operators by NOTAM. As the SD-360 descended to FL50 into Newcastle, under a Radar Advisory Service, one of the Tornados was manoeuvring at high speed and passed closely in front of the SD-360 at the same level. The Newcastle

radar controller, who observed the military traffic on his radar, provided the SD-360 pilot with avoiding headings, which were followed. Despite this, and because the Tornado was manoeuvring, both aircraft conflicted, with the closest point of approach estimated to be some 300 feet horizontally and 100 feet vertically. The Tornado navigator detected the confliction on his radar moments before and warned his pilot of the danger. Neither he nor the pilot saw the aircraft until it had passed behind them and too late to take any avoiding action. The pilot of the SD-360 did not see the Tornado until it passed in front of his aircraft.

That report made 2 safety recommendations:

Safety recommendation 2000-57

The CAA, in conjunction with the Director of Airspace Policy, should, by means of risk assessment, quantify the risk of mid-air collisions occurring between scheduled public transport services, which operate wholly or partly outside controlled airspace, and other users of Class G and F airspace.

The CAA response to this recommendation was as follows:

The CAA partially accepts this recommendation.

It is not possible to gather the statistical data required to conduct the quantitative risk assessment called for in this Recommendation. Therefore, the Directorate of Airspace Policy conducted an immediate safety assessment of operations by scheduled public transport services in Class F and G airspace throughout the UK. The study confirmed that there had been a concentration of incidents in the vicinity of Newcastle Airport and that provided a Radar Advisory Service or Radar Information Service is used, the target levels of safety are met. However, this and a number of other incidents indicate that not all military traffic is availing itself of such air traffic services. Consequently, the CAA is continuing to work closely, as a matter of urgency, with the MOD and Newcastle Airport, on a wide range of initiatives aimed at reducing conflicts of this nature in the future. This work is expected to be complete by October 2001, after which the subject will continue to be reviewed as part of the ongoing safety assurance process.

CAA Action following this recommendation is as follows:

A variety of initiatives aimed at reducing conflicts between scheduled public transport services and military aircraft have been introduced between May 2001 and October 2001. Use of a serviceable transponder is now mandatory for military flights within the United Kingdom Low Flying System (UKLFS), and military pilots engaged in low-flying activities have been directed to make an information call to Newcastle Airport when operating close to the Newcastle CTR boundary and when transiting the Hexham gap. During large-scale military exercises in the area, an airspace buffer is put in place around the Newcastle CTR for UKLFS participants. A Military Liaison Officer is deployed to Newcastle Airport ATC during such exercise periods. The Liaison Officer has full details of exercise activities and acts as a point of contact for any unusual occurrences or incidents. The situation in the Newcastle area remains under constant review, with Newcastle Airport providing the CAA and

MOD with monthly reports on any issues of concern. MOD subsequently investigates any suspected breaches of airspace, military regulations or UKLFS procedures arising from these reports and takes appropriate remedial action. The MOD and Newcastle Airport, in conjunction with the CAA, continue to meet at 6 monthly intervals to provide the safe and efficient use of airspace in the region.

Safety recommendation 2000-58

The CAA, in conjunction with the Director of Airspace Policy (DAP), should assess whether there is adequate provision of regulated airspace for scheduled air transport operations to and from regional airports that are not directly linked by airways or advisory routes.

The CAA response to this recommendation was as follows:

The CAA partially accepts this recommendation

The safety assessment referred to in the response to Recommendation 2000-57 indicates that target levels of safety are met where Radar Advisory and Radar Information Services are utilised. However, a further consideration of the adequacy of the airspace in the Newcastle area will be conducted following discussions with MOD. It is expected that this further work will be concluded by April 2002.

CAA action following this recommendation is as follows:

Following discussions with the MOD, the CAA has recently reviewed the adequacy of the airspace in the Newcastle area. The CAA noted the steps that had been taken by MOD to address the issues surrounding airspace in the vicinity of Newcastle Airport and supported Joint Future Airspace Design Team proposals for additional Controlled Airspace in the area. The CAA concluded that, whilst there was clearly still a level of risk associated with the current airspace arrangements, all reasonable steps had been taken to mitigate the risk of encounters between civil air transport aircraft and military aircraft to an acceptable level in the short and medium term. Notwithstanding this, the situation needs to be carefully monitored. Additionally, commencing with data from 2001, the CAA will undertake an annual review of all AAIB/UKAB reports for incidents involving commercial aircraft operating in Class G airspace within the UK FIR. The 2001 review should be completed by 30 June 2002.

Subsequent incident

Since the incident with the Fokker 50 and the F 15, another similar incident has occurred (on 22 April 2002) in the same area. This involved a Norwegian registered DHC-8 aircraft and one of two Sea Harriers of the Royal Navy. The minimum vertical separation in this event is reported to have been of the order of 400 feet. This incident will be reported upon in an AAIB Bulletin in the near future.

Conclusion

During this confliction, neither the crew of the F50 or the F15 saw the other aircraft. However, as a result of the action of the Fokker 50 crew in response to the TCAS alert, the minimum lateral separation between the aircraft was estimated to have been some 800 metres and the vertical separation about 1,500 feet at their closest point. It was also estimated that the vertical separation of the two aircraft tracks was some 600 feet and that the F15 passed the track crossing point marginally ahead of the Fokker 50. If avoiding action had not been taken, it was considered that the lateral separation would have been less than 500 metres and the vertical separation some amount less than 100 feet (less than the resolution of the SSR height encoding equipment).