DH112 Venom FB50, G-VIDI, 7 July 1996

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Aircraft Type and Registration:	DH112 Venom FB50, G-VIDI
No & Type of Engines:	1 DH Ghost 48 Mk 1 turbine engine
Year of Manufacture:	1955
Date & Time (UTC):	7 July 1996 at 1436 hrs
Location:	Hawarden Airfield, Broughton, Chester
Type of Flight:	Aerial Work (Flying Display)
Persons on Board:	Crew - 1 - Passengers - None
Injuries:	Crew - Minor - Passengers - N/A
Nature of Damage:	Extensive
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	51 years
Commander's Flying Experience:	13,233 hours (of which 9 were on type)
	Last 90 days - 187 hours
	Last 28 days - 69 hours
Information Source:	AAIB Field Investigation

The event was an Open Day and flying display at an aircraft manufacturingfacility, organised by the airfield operator and approved by theCAA in accordance with the requirements laid down in CAA publicationCAP 403. The pilot also held the required Display Authorisationfrom the CAA.

The aircraft had been refuelled before the display flight. Therefuelling was supervised by the aircraft operator's Chief Engineerwho confirmed that the fuel load had been symmetrically loaded.A total of 364 gallons was on board, being distributed as 90 gallonsin the centre tank, 59 gallons in each main wing tank and 78 gallonsin each wing tip tank.

The aircraft was taking off from Runway 23 as the number fourof a four aircraft formation comprising two Vampires followedby two Venoms. The departures were as two pairs, each in echelonstarboard formation, about 15 seconds apart. The surface windwas from 310° at 14 kt, with

gusts reported to 20 kt. Therunway width is 45 metres and the span of each aircraft is 12.7metres. For each pair take off, the lead aircraft was positionedon the downwind half of the runway width.

The pilot noted that his lead aircraft's nosewheel had left theground at the time of the 80 kt airspeed indicator check and hestated that both aircraft maintained a nose up attitude untillift off occurred. The pilot stated that after lift off, G-VIDIsuffered a rapid right wing drop which required a large oppositeaileron input to correct. The aircraft then rolled rapidly leftto a bank angle which the pilot estimated was 60°. Full rightaileron and some right rudder application was necessary in orderto stop the roll and reverse the direction. The pilot assessedthat the roll oscillation was becoming divergent and elected toland the aircraft back on the runway. However, the aircraft toucheddown to the left of the runway centreline, initially on the rightwing tip fuel tank, which ruptured. The aircraft yawed to theright but touched down with the left main gear on the grass andthe right main gear on the runway. The aircraft left the runwayto the left and continued on the grass, striking a displaced thresholdmarker light. The pilot applied the brakes and attempted to recoverthe aircraft towards the runway centreline, but the aircraft wentonto the runway and departed off the end, causing damage to theILS Localiser transmitter facility. When the pilot assessed thatan over-run was likely, he attempted to raise the landing gear,but could not operate the emergency retract system because ofthe violent ride.

The aircraft's right wing finally struck a grass mound formingpart of the airfield fuel installation. This caused a yaw to theright and the aircraft came to rest against the wire mesh perimeterfence just short of a public road running along the outside ofthe airfield boundary. The final position of the aircraft wassome 100 metres to the right of the runway centreline.

The pilot shut down the engine and switched off the electrics.He opened the canopy, released his harness and made safe the seatpan ejection seat handle. The airfield fire service arrived atthe scene quickly and made safe the ejection seat top handle beforeremoving the pilot to a waiting ambulance. Despite the ruptureof the right wing tip fuel tank with consequent fuel spillageand impact with the airfield fuel storage installation, therewas no fire.

Video Analysis

Several spectators provided video tapes showing the sequence ofevents. These indicated that the nose landing gear of G-VIDI liftedoff early and that the aircraft became airborne about three secondsbefore the lead aircraft's nosewheel left the runway. From thispoint, G-VIDI appeared to fall back from the leader. Shortly afterlift-off, the aircraft rolled slightly to the left and moved overthe runway centreline. This was corrected, apparently with oppositeaileron and some rudder input. There was then a significant yawand roll to the right to about 20° bank, which took the aircraftover the right hand edge of the runway, almost touching the groundwith the right wing tip fuel tank. This was then followed by aroll and yaw to the left, achieving a bank angle of about 60°.During this reversal, the aircraft began to cross towards theleft side of the runway and nose up elevator input was still apparent.The lead aircraft by this time was airborne, had moved over tothe left hand edge and was pulling away from G-VIDI.

The final roll reversal produced a bank angle of about 45°to the right. The right wing tip fuel tank struck the runway surfaceabout 15 metres from the left hand edge. The tank ruptured andreleased its fuel load. The bank angle reduced rapidly and theaircraft's nose yawed to the right as a result of the impact,but its overall ground track was still towards the left edge ofthe runway. The main wheels touched down straddling the left edge,with the aircraft yawed some 20° to the right. The left wingagain lifted as the crab angle increased, the aircraft then runningalong scuffing its right main

wheel only. The final full touchdownoccurred on the grass area to the left of the runway with about40° of crab angle. The aircraft then ran onto the hard surfaceonce again, in the undershoot area of the Runway 05 displacedthreshold, crossing the area at an angle and departing off theend diagonally onto the grass overrun area. In this area, a collisionoccurred with the ILS Localiser hut and the right wing struckthe earth mound protecting the fuel installation. The aircraftfinally came to rest up against the wire mesh fence at the airfieldboundary.

Analysis of the video coverage of the lift off point of G-VIDIindicated that the aircraft became airborne at a speed between99 kt and 106 kt. The stalling speed of the aircraft in this take-offconfiguration was estimated by the operator to be about 90 kt.The Aircraft Flight Manual handling notes, Take-off section, notesthat *'Care must be taken not to raise the nose too high duringthe take-off run as the aircraft may fail to accelerate'* and*'The aircraft should be flown off at about 110 kt at normalload and at about 120 kt at maximum load. Because of the possibilityof a wing drop, the aircraft should not be pulled off the groundbelow the recommended speeds.'*

The pilot stated that at no time during the sequence of eventsdid the stall warning system operate (warning horn and light).The operator commented that, when the aircraft was inspected afterthe accident, the switch controlling the operation of the systemwas in the off position. It could not be determined if the switchhad been on for the take off.

It was noted during the analysis of the video recordings thatseveral other aircraft were experiencing the effects of turbulenceand crosswind.

Airfield Facilities

Runway 23 at Hawarden is the main instrument approach runway.The Take-off Run Available is 2,034 metres and the Take-off DistanceAvailable is 2,184 metres. The LDA after a displaced landing threshold,is 1,738 metres. This accident highlighted certain physical featuresin the over-run area of Runway 23.

The airfield fuel storage installation is believed to date fromaround the time of the second world war. It currently comprisestwo 10,000 gallon tanks used to store Jet A-1 turbine fuel. Thesetanks are contained within concrete bunkers covered with earthmounds. These are positioned some 30 metres from the runway extendedcentreline and are 190 metres beyond the end of the paved surface.It was fortunate in this case that no damage was caused to theinstallation by the aircraft.

The airfield boundary fence comprises wire mesh netting supportedby concrete posts which are not intended to be frangible in theevent of an impact by an aircraft. The boundary fence crossesthe extended centreline of Runway 23, within 250 metres beyondthe end of the paved surface. Adjacent to and outside the boundaryfence runs a public road (the B5125). It was fortunate in thiscase that the aircraft came to rest within the airfield boundaryand did not cross the boundary onto the road, from where somemembers of the public were observing the flying activities.

Safety Recommendation 97-12

British Aerospace Airbus Ltd. should carry out a safety reviewof the over-run area of Runway 23 at Hawarden with a view to theremoval of the fuel storage installation to an area more remotefrom the runway. The review should consider the replacement ofthe boundary fence crossing the extended centreline with a suitablyfrangible fence. In view of the proximity of the public road,consideration

should also be given to the provision of greaterprotection for the public for example, by the use of a soft bedarrester system in the over-run area and/or the installation oftraffic lights on the road.