BOEING 737
OPERATIONS MANUAL

APPROACH PROCEDURE

Flap Extension

Using flaps as speedbrakes is not recommended.

The following procedures and maneuvering speeds are used for extending flaps:

NORMAL MANEUVER AND FLAP EXTENSION SPEEDS		
FLAP POS	NORMAL MANEUVER	SELECT FLAP
0	210	1
1	190	5
5	170	15
*10	160	15
15	150/VREF	25
25	140	30-40

*Used only during one engine inoperative non-precision approaches or one engine inoperative circling approach.

Approach

For a normal approach, the landing configuration (gear down and landing flaps) is established early on final approach.

Stabilize on speed and profile with airplane in trim.

A normal profile of 2.5 to 3 degrees results in a descent of 500 to 800 feet per minute, which is the same as for a standard ILS.

High, low, or offset corrections should be made as early in the approach as possible, in order to be in a stabilized condition through the last 500 feet of the approach.

The pilot should maintain a constant profile and proper rate of descent coordinating pitch attitude with power changes.

Approach Speed

The Boeing recommended approach speed wind correction is 1/2 the steady headwind component plus all of the gust value, based on tower reported winds. The maximum wind correction should not normally exceed 20 knots. In all cases, the gust correction should be maintained to touchdown while the steady wind correction should be bled off as the airplane approaches touchdown.

When the wind is reported calm or light and variable, and no windshear exists, VREF + 5 knots is the recommended airspeed on final, bleeding off the 5 knots as the aircraft approaches touchdown. If this normal 5 knots is being carried above VREF on final approach, do not add any additional speed for a headwind component of up to 10 knots.

Do not apply a wind correction on final approach speed (VREF) for tail winds.

Example

Headwind component = 18 knots, gusting 25 knots. Add 9 knots for headwind component and 7 knots for gust effect, resulting in an approach speed equal to VREF + 16 knots.

APPROACH PROCEDURE (Cont)

Non Precision Approach

When making a VOR or ADF approach, descend to Minimum Descent Altitude (MDA) as soon as practical after passing the final fix inbound. Just prior to starting descent, extend flaps to the final landing flap setting and reduce speed to approach speed. If a circling approach is planned, it is recommended to maintain flaps 15 and flaps 15 maneuvering speed until selecting final flap setting just prior to turning base on final approach.

The pilot should not dive at the runway when breaking clear of clouds at low altitudes from an instrument approach. High rates of descent that develop with this maneuver are not readily apparent on either the Airspeed Indicator or the Vertical Speed Indicator, and may not be noticed until the flare point.

Crosswind

The crab, sideslip, or a combination of both are accepted methods of correcting for a crosswind during approach and landing. Regardless of which method is used, there is sufficient rudder and aileron control available to execute crosswind landings.

Landing

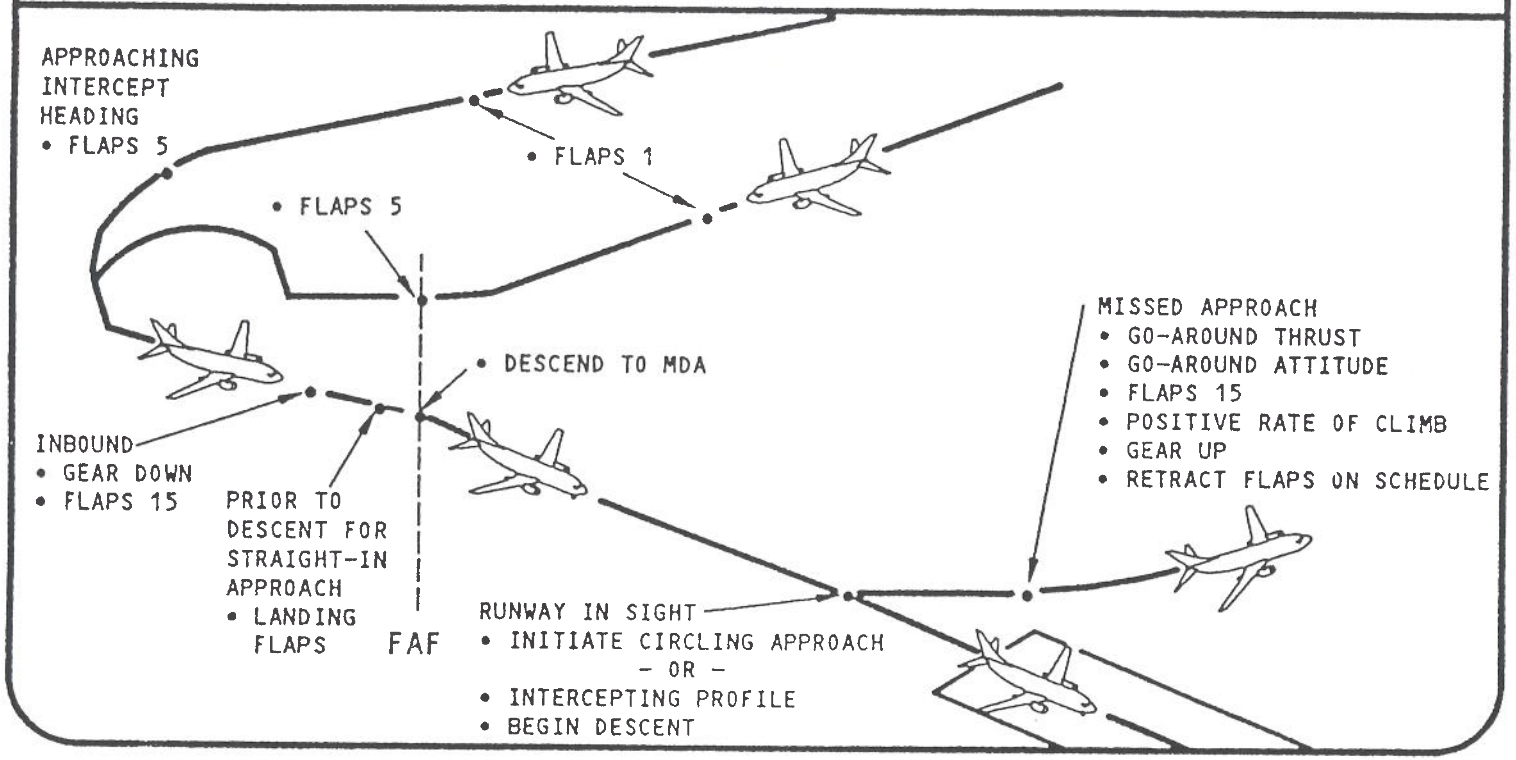
As the airplane approaches the touchdown point, reduce descent rate, smoothly retard thrust to IDLE and maintain the flight profile to touchdown. Use speedbrakes, brakes, and reverse thrust normally after touchdown.

The First Officer should check the speedbrake full up.

In the event of a bounced landing, hold or re-establish normal landing attitude. Add thrust as necessary to control the sink rate. Do not push over, as this may cause a second bounce and possibly damage the nose gear.

Use rudder to hold the airplane on centerline. Displacing the aileron into the wind assists in directional control. Nose wheel steering improves with forward pressure on the control column which increases weight on the nose gear. The aileron and rudder controls are effective down to approximately 50 knots.

NON-PRECISION APPROACH PATTERN



METARs

TIME	SURFACE WIND	VISIBILITY (metres)	WEATHER	CLOUD1 (base in feet agl)	CLOUD2 (base in feet agl)	TEMP °C	QNH (mb)
0650	350/04	800	FOG	OVERCAST 100	-	2	1021
0750	040/04	300	FOG	OVERCAST 100	-	1	1022
0850	CALM	500	FOG	OVERCAST 100	-	2	1023
0950	020/06	1,200	MIST	SCATTERED 700	SCATTERED 1,200	2	1023

RVRs

TIME	RWY 05 (metres)	RWY 23 (metres)
0632	-	1,000
0655	-	800
0734	-	700
0740	-	700
0743	-	600
0750	-	600
0753	550	-
0841	-	450
0844	600	-
0853	800	-
0904	-	900
0916	-	1,000
0925	-	900
0927	900	-
0933	1,200	-
0940	>1,300	-
0945	-	1,100

ROUTINE WEATHER REPORTS AND RUNWAY VISUAL RANGE MEASUREMENTS
COVENTRY AIRPORT - 21 DECEMBER 1994

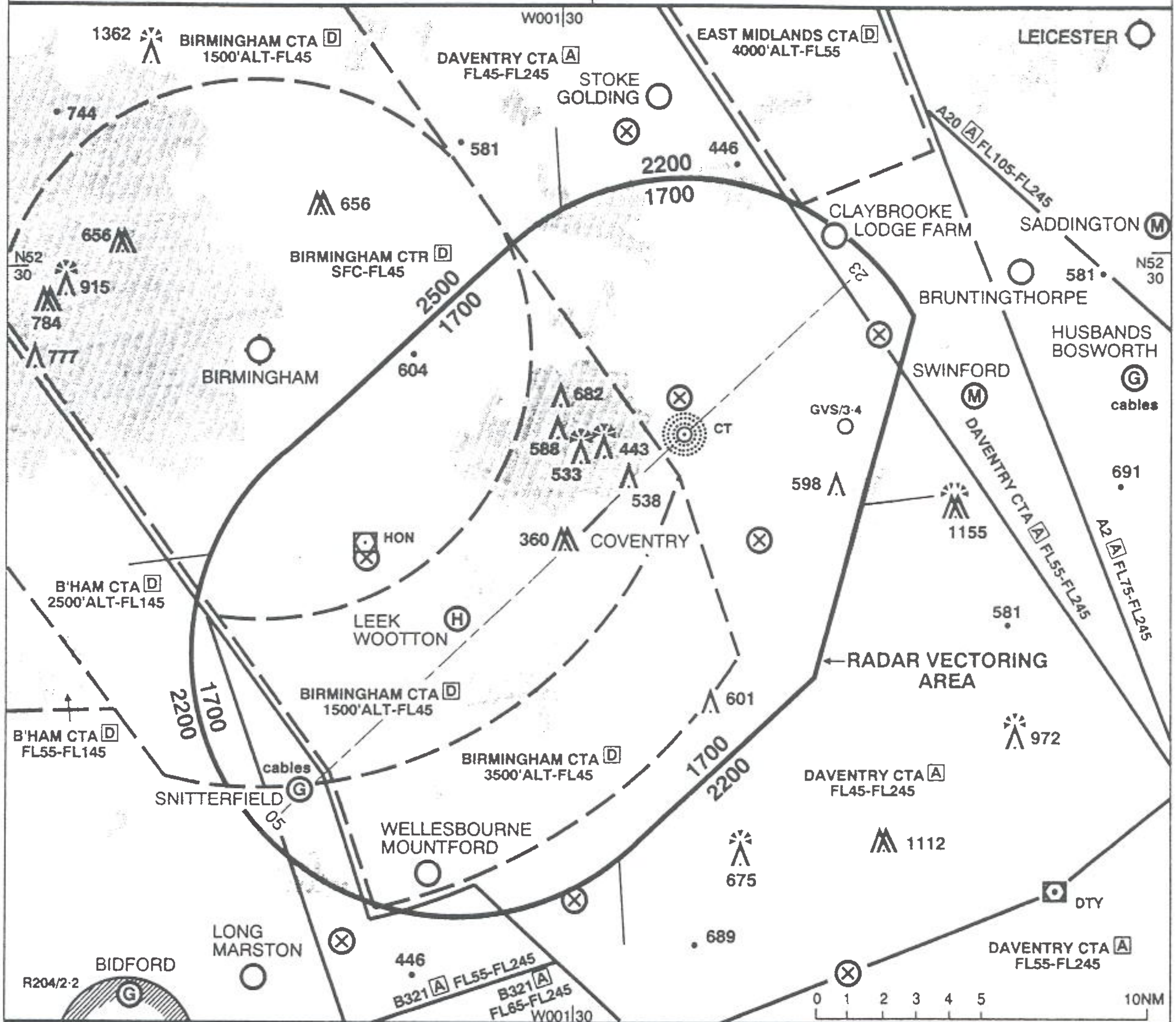
5 AERODROME METEOROLOGICAL REPORTS (SPECIAL)

Specific improvements and deteriorations of any of the items in a routine report are supplied in a special report. They are issued between routine reports and contain only those items which are affected. The criteria for raising special reports are shown in the table below.

Surface Wind	*Criteria agreed locally. (Only issued when there is not a wind indicator in the control tower.)*
Surface Visibility	Increases and decreases to, or through: 800 metres 5000 metres 1500 metres 10 kilometres In addition arrangements can be made at aerodromes where RVR is not available, either permanently or during a temporary unserviceability, to report increases and decreases to, or through: 150 metres 350 metres 600 metres
Weather	At the onset, cessation or change in intensity of: Moderate or heavy: rain, rain and snow mixed, hail, snow pellets or ice pellets Freezing precipitation Thunderstorm Funnel cloud (tornado or waterspout) Squall Low drifting or blowing; snow, dust or sand Dust or sandstorm
Cloud	Base: When the base of the lowest cloud covering more than half the sky increases or decreases to, or through: 2000 feet 500 feet 1500 feet 300 feet 1000 feet 200 feet 700 feet 100 feet At certain aerodromes the upper limit may be higher. Amount: When the amount of the lowest layer at or below 1500 feet changes from half or less to more than half; and vice versa.
Pressure	When the QNH or QFE changes by 1·0 millibar.
Severe icing and/or turbulence	When an aircraft on the approach or on climb out reports severe icing and/or severe turbulence, and it is confirmed by the duty forecaster at the local meteorological forecast office.

RADAR VECTORING AREA — COVENTRY

GENERAL INFORMATION	Elevation 281ft	Transition Alt 3000ft
1. All bearings are magnetic. 2. Levels shown are based on QNH. 3. Only significant obstacles and dominant spot heights are shown. 4. The minimum levels shown within the Radar Vectoring Area ensure terrain clearance in conformity with Rule 29 of the Rules of the Air Regulations in respect of obstacles within the RVA. 5. Minimum Sector Altitudes are based on obstacles and spot heights within 25NM of the Aerodrome Reference Point.	Within the Radar Vectoring Area the minimum initial altitude to be allocated by the radar controller is 1700ft. Descent below 1700ft may be given within the SRA Final Approach Area when on 40° leg or Final Approach.	



LOSS OF COMMUNICATION PROCEDURES

Initial and Intermediate Approach

Continue visually remaining outside Birmingham CTA and CTR or by means of an appropriate final approach aid. If not possible proceed at 2500ft, or last assigned level if higher, (but not above 1500ft untill clear of Birmingham CTA) to CT NDB*.

Within Final Approach Area

Continue visually or by means of an appropriate final approach aid. If not possible follow the Missed Approach Procedure to CT NDB*

* In all cases where the aircraft returns to the holding facility the procedure to be adopted is the basic Radio Failure Procedure detailed at RAC 6.

4·2·94

INSTRUMENT APPROACH CHART - ICAO

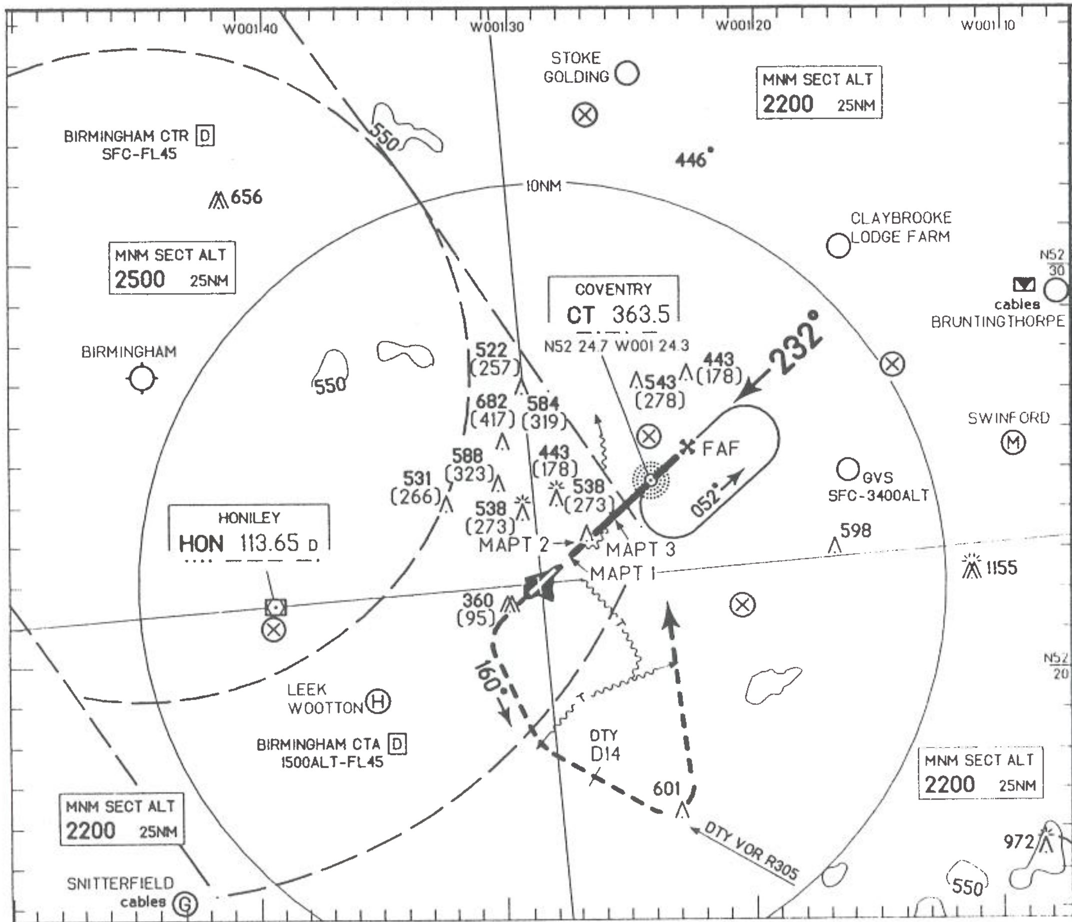
BEARINGS ARE MAGNETIC
ELEVATIONS IN FEET AMSL 682
HEIGHTS IN FEET ABOVE THR ELEV RWY 23 ..... (417)

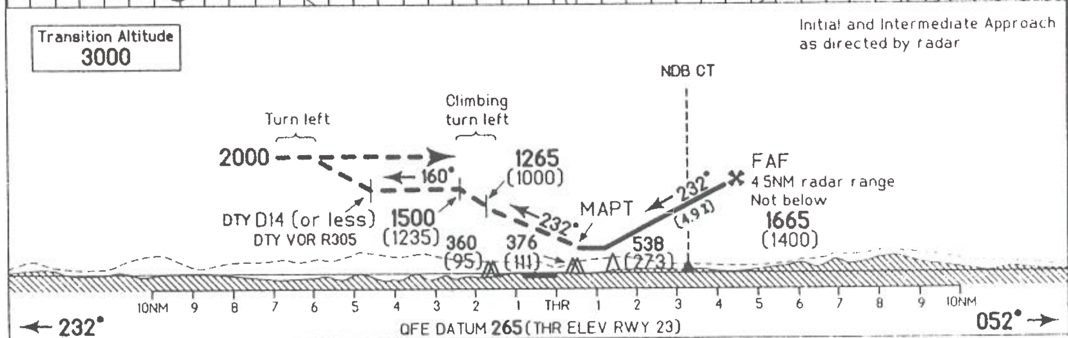
ELEV 281FT
VAR 5°W

N52 22.16
W001 28.69

ACFT CAT A,B,C,D

COVENTRY
SRA RTR 0.5NM/1NM/2NM RWY 23





RADIO		
RAD	122.00	COVENTRY RADAR
VDF	122.00, 119.25, 124.80	COVENTRY APPROACH, TOWER, RADAR (Not en-route)
APP	119.25	COVENTRY APPROACH
TWR	119.25, 124.80, 121.70 (GMC)	COVENTRY TOWER COVENTRY GROUND

LIGHTING	
IBN	Flashing green CT
APP 05 23	426m HI C/L 1 bar. PAPI (3°) LHS. 416m HI C/L 2 bar. PAPI (3°) LHS.
THR 05 23	Elev HI green W bars. HI green with elev HI green W bars.
RWY 05/23	Elev HI bi-d with LI omni-d component. End lights red. Red edge to grass stopway.
TWY	Green C/L from main apron to Hold A. Blue edge from N Airpark to Hold K.

MISSED APPROACH POINT

MISSED APPROACH POINT 1	SRA RTR 0.5NM	RTR 0.5NM
MISSED APPROACH POINT 2	SRA RTR 1NM	RTR 1NM
MISSED APPROACH POINT 3	SRA RTR 2NM	RTR 2NM

MISSED APPROACH PROCEDURE

At or before the Missed Approach Point climb straight ahead to **1266**(1000) then climbing turn left onto 160°M to **1500**(1234). Turn to intercept and track inbound the VOR DTY R305 (VOR HON R125). When at DTY DME 14 or less (HON DME 9 or more) continue climb to **2000**ALT then turn left to return to NDB CT or as directed by ATC.

OBSTACLE CLEARANCE ALTITUDE/HEIGHT

AIRCRAFT CATEGORY	A	B	C	D
SRA RTR 0.5NM	636(370)	636(370)	636(370)	636(370)
SRA RTR 1NM	636(370)	636(370)	636(370)	636(370)
SRA RTR 2NM	916(650)	916(650)	916(650)	916(650)
VISUAL MANOEUVRING	881(600)†	931(650)†	1131(850)†	1131(850)†

† Heights in feet AAL

LOWEST ALTITUDE 2000 for holding

MAXIMUM IAS HOLD 170KT

NOTE When using VOR DTY some receivers may show abnormal characteristics.

RADAR APPROACH PROCEDURE (Nominal approach slope 3°)

RANGE FROM TOUCHDOWN	NM	4.5	4.0	3.5	3.0	2.5	2.0	1.5	1.0
ADVISORY HEIGHT	FT	1400	1250	1100	950	800	650	500	350

CHANGE NEW RTR 1NM/2NM PROCEDURES

AERO INFO DATE 31 Mar 94

PUBLISHED BY THE CIVIL AVIATION AUTHORITY

SHEET 275D

Runway Primary Aids FAT °MAG	Procedures	Aircraft Categories OCH (ft)	Missed Approach Procedure
Coventry Runway 23 † SRA - RTR 0.5 nm **232°**	**Nominal Glidepath 3°** Initial and intermediate approach as directed by radar. From FAF (4.5 nm radar range) not below **1665** (1400) ft, follow nominal glidepath advisory heights to MDH. Nominal Final Approach Gradient 4.9%, 300 ft/nm.	A/B/C/D 370	At or before MAPt (RTR 0.5 nm), climb straight ahead to **1265** (1000) ft, then climbing turn left onto track 160° MAG to **1500** (1235) ft. Turn to intercept and track inbound the VOR DTY 305 radial (VOR HON 125 radial). When at 14 DME DTY or less (9 DME HON or more), continue climb to **2000** ft, then turn left to return to NDB(L) CT, or as directed by ATC.
Coventry Runway 23 † SRA - RTR 1 nm 232°	**Nominal Glidepath 3°** Initial and intermediate approach as directed by radar. From FAF (5 nm radar range) not below **1815** (1550) ft, follow nominal glidepath advisory heights to MDH. Nominal Final Approach Gradient 4.9%, 300 ft/nm.	A/B/C/D 370	At or before MAPt (RTR 1 nm), climb straight ahead to **1265** (1000) ft, then climbing turn left onto track 160° MAG to **1500** (1235) ft. Turn to intercept and track inbound the VOR DTY 305 radial (VOR HON 125 radial). When at 14 DME DTY or less (9 DME HON or more), continue climb to **2000** ft, then turn left to return to NDB(L) CT, or as directed by ATC.
Coventry Runway 23 † SRA - RTR 2 nm 232°	**Nominal Glidepath 3°** Initial and intermediate approach as directed by radar. From FAF (5 nm radar range) not below **1815** (1550) ft, follow nominal glidepath advisory heights to MDH. Nominal Final Approach Gradient 4.9%, 300 ft/nm.	A/B/C/D 650	At or before MAPt (RTR 2 nm), climb straight ahead to **1265** (1000) ft, then climbing turn left onto track 160° MAG to **1500** (1235) ft. Turn to intercept and track inbound the VOR DTY 305 radial (VOR HON 125 radial). When at 14 DME DTY or less (9 DME HON or more), continue climb to **2000** ft, then turn left to return to NDB(L) CT, or as directed by ATC.
Coventry Runway 23 † VDF 225°	**Aircraft Categories A and B only:** Arrival not below MSA **(Note)**; Shuttle as required. Overhead VDF (IAF) not below **1700** ft, fly outbound on QDR 063° (QDM 243°) for 2.5 minutes descending to **1565** (1300) ft. Base turn left onto FAT. When established descend to MDH. **Shuttle Procedure:** Overhead VDF, fly outbound on QDR 205° (QDM 025°) for 1-minute, turning right onto QDM 063° to return to the facility. **Note:** Minimum altitude within 10 nm of VDF facility **1700** ft. FAT is off-set by 7° from Runway centre-line and nominal intercept occurs 1.2 nm before threshold.	A/B 570	At MAPt (VDF overhead), climb straight ahead to **1265** (1000) ft, then climbing turn left onto track 160° MAG to **1500** (1235) ft, then continue as directed by ATC.

APPENDIX E

THE TRAINING OF AIR TRAFFIC SERVICES PERSONNEL IN THE PREPARATION OF AERODROME WEATHER REPORTS

CAA Aeronautical Information Circular number 62/1994 (White 184) gives details of the Training of Air Traffic Services Personnel in the Preparation of Aerodrome Weather Reports. The relevant extracts are:

1. Aerodrome weather reports made by ATS personnel at UK aerodromes and provided to aircraft will not be accepted by the CAA as METAR for dissemination beyond the aerodrome on the AFTN, OPMET or VOLMET unless the reports are compiled by a qualified meteorological observer. Furthermore, only reports from qualified observers will be used as the basis for the production of TAF by the parent Met Office. It is therefore essential that the ATS personnel concerned have received appropriate training to become accredited observers.

2. The Meteorological Office, on behalf of the CAA, arranges the necessary courses of training in meteorological observation and reporting for ATS personnel. A copy of the syllabus is shown at Annex A circular 62/1994.

3. The courses consist of five days spent residentially at the Meteorological Office College, followed by a further week of practical training (including night time observations) at a Meteorological Office unit. Examinations are set at the end of each week of the course and candidates who successfully complete the two week course will receive a certificate to that effect. Holders of a certificate become accredited observers for the purposes of the MATS Part 1, Section 7, Chapter 1, paragraph 3(f).

4. On completion of the formal Met Office training, the responsibility for ensuring that certificated observers fulfil their weather reporting duties satisfactorily is that of the aerodrome management, usually the Air Traffic Control Manager/SATCO. Although two weeks of professional training is the minimum required for the award of a certificate, no newly certificated observer can be considered competent or fully qualified without a period of further 'on the job' training at his/her home aerodrome under the supervision of more experienced colleagues/observers and in a variety of weather situations.

TIME GMT	TIME TO END	RTF COMMUNICATION FROM	TO		FLIGHT DECK COMMUNICATION ORIGIN		REMARKS
9:36				**EXTRACT BEGINS**			
	16:25	EAST MID TWR	702P	SEVEN ZERO TWO PAPA - ER - AFTER DEPARTURE YOU'RE CLEARED TO LEAVE THE ZONE CLIMBING STRAIGHT AHEAD TO FLIGHT LEVEL FOUR ZERO THE SQUAWK SEVEN THREE SIX FIVE		**NOTE: BRACKETS DENOTE UNCERTAIN WORDS ITALICS DENOTE TRANSLATION FROM FRENCH OR ARABIC**	
		702P	EAST MID TWR	STRAIGHT AHEAD CLIMBING FLIGHT LEVEL FOUR ZERO SQUAWKING SEVEN THREE SIX FIVE			
		EAST MID TWR	702P	PAPA THAT'S CORRECT IT WILL BE STRAIGHT AHEAD AND AFTER THE LANDING D C NINE LINE UP TWO SEVEN			
		702P	EAST MID TWR	AFTER THE LANDING AIRCRAFT WE LINE UP SEVEN ZERO TWO PAPA			
				EXTRACT ENDS			

TIME GMT	TIME TO END	RTF COMMUNICATION FROM	TO		FLIGHT DECK COMMUNICATION ORIGIN		REMARKS
9:37				**EXTRACT BEGINS**			
	15:40	EAST MID TWR	702P	SEVEN ZERO TWO PAPA LINE UP TWO SEVEN			
		702P	EAST MID TWR	LINE UP SEVEN ZERO TWO PAPA			
				EXTRACT ENDS			
				EXTRACT BEGINS			
					P1	CLEAR TAKE OFF LIGHTS - TRANSPONDER ON	
					P2	?	
	15:07	EAST MID TWR	702P	SEVEN ZERO TWO PAPA CLIMBING STRAIGHT AHEAD CLEARED TAKE OFF WIND NORTHERLY THREE			
		702P	EMT	CLEAR TAKE OFF CLIMBING STRAIGHT AHEAD SEVEN ZERO TWO PAPA			

TIME GMT	TIME TO END	RTF COMMUNICATION FROM	TO		FLIGHT DECK COMMUNICATION ORIGIN		REMARKS
9:38					P1	(LEFT)	
					P2	(POWER)	SOUND OF ENGINE RUN-UP FOR TAKE-OFF N1=90% (POWER LEVELS HAVE BEEN DERIVED FROM AREA MICROPHONE DUE TO TAPE SPEED VARIATIONS ACCURACY ±5%)
					P1	SPEED'S RISING	
					P1	ENGINE DATA GREEN	
					P1	EIGHTY KNOTS	
	14:29				P1	V ONE VR	
					P1	POSITIVE RATE	
					P2	CHECK GEAR UP	
				EXTRACT ENDS			
	14:00			**EXTRACT BEGINS**			
					P2	CLIMB THRUST	
	13:58	EAST MID TWR	702P	SEVEN ZERO TWO PAPA YOU CAN TURN LEFT NOW ON COURSE CHARLIE TANGO			
		702P	EAST MID TWR	TURN LEFT ON COURSE TO CHARLIE - CHARLIE TANGO			
					P2	(SET CHARLIE TANGO)	
					P1	*HEADING ONE EIGHT ZERO*	

TIME GMT	TIME TO END	RTF COMMUNICATION FROM	TO		FLIGHT DECK COMMUNICATION ORIGIN		REMARKS
9:39	13:38	EAST MID TWR	702P	SEVEN ZERO TWO PAPA CONTACT EAST MIDLANDS APPROACH ONE ONE NINE DECIMAL SIX FIVE			
	13:23	702P	EAST MID TWR	ONE ONE NINER SIX FIVE FOR SEVEN O TWO PAPA			ALT ALERT
					P2	FLAPS ONE	NOISE OF LEVER MOVEMENT
		702P	EAST MID APP	MIDLAND - EAST MIDLAND SEVEN ZERO TWO PAPA GOOD MORNING			
		EAST MID APP	702P	SEVEN ZERO TWO PAPA GOOD MORNING SQUAWK SEVEN THREE SIX FIVE IDENT MAINTAIN FLIGHT LEVEL FOUR ZERO ON REACHING			
		702P	EAST MID APP	ROGER (TWO) THREE SIX FIVE IDENTING AND WE ARE MAINTAINING FOUR ZERO			
		EAST MID APP	702P	ROGER			
					P1	*IT'S DONE*	
					P1	AFTER TAKE OFF	
					P2	FLAPS UP	NOISE OF LEVER MOVEMENT
					P1	AFTER TAKE OFF AIR CONDITIONING AND PRESS SET START SWITCHES LOW ALTIMETERS AND INSTRUMENTS SET	

TIME GMT	TIME TO END	RTF COMMUNICATION FROM	TO		FLIGHT DECK COMMUNICATION ORIGIN		REMARKS
					P1	LANDING GEAR UP AND OFF	
					P1	FLAPS UP NO LIGHTS LANDING LIGHTS OFF COMPLETE	
9:40					P1	DESCENT AND APPROACH CHECK-LIST	
					P1	LOOSE OBJECTS SECURED	
					P1	APPROACH BRIEFING REVIEWED	
					P1	ANT-ICE ON	
					P1	AIR-CONDITIONING AND PRESS SET	
					P1	START SWITCHES LOW	
					P1	ALTIMETERS AND INSTRUMENTS	
	12:21	EAST MID APP	702P	SEVEN ZERO TWO PAPA CONTACT BIRMINGHAM ONE ONE EIGHT DECIMAL ZERO FIVE			
		702P	EAST MID APP	ONE ONE EIGHT ZERO FIVE BIRMINGHAM SEVEN ZERO TWO PAPA GOODBYE			
		EAST MID APP	702P	BYE			
		702P	BIRM	BIRMINGHAM GOOD MORNING SEVEN ZERO TWO PAPA FLIGHT LEVEL FOUR ZERO			
		BIRM	702P	ACE CARGO SEVEN ZERO TWO PAPA BIRMINGHAM SQUAWK FOUR SEVEN TWO THREE			
		702P	BIRM	FOUR SEVEN TWO THREE IS COMING			

TIME GMT	TIME TO END	RTF COMMUNICATION FROM	TO		FLIGHT DECK COMMUNICATION ORIGIN		REMARKS
9:41				OTHER ATC TRANSMISSIONS			
						?	
						?	
	11:09	BIRM	702P	ACE CARGO SEVEN ZERO TWO IS IDENTIFIED RADAR VECTORS RUNWAY TWO THREE AT COVENTRY			
		702P	BIRM	SEVEN ZERO TWO PAPA			
		BIRM	702P	SEVEN ZERO TWO PAPA CONTINUE TOWARDS THE CHARLIE TANGO AT FLIGHT LEVEL FOUR ZERO			
		702P	BIRM	ROGER WE ARE MAINTAINING FOUR ZERO SEVEN ZERO TWO PAPA			
				OTHER ATC TRANSMISSIONS			
						?	
					P1	*SET TWO THREE TWO*	
9:42				OTHER ATC TRANSMISSIONS			

TIME GMT	TIME TO END	RTF COMMUNICATION FROM	TO		FLIGHT DECK COMMUNICATION ORIGIN		REMARKS
					P2	*(? ONE THOUSAND)*	
					P1	*THE MET CONDITIONS ARE VERY BAD*	
					P1	*ASK FOR DESCENT*	
					P2	*GO AHEAD*	
	9:45	702P	BIRM	SEVEN ZERO TWO PAPA REQUESTING DESCENT			
9:43							
				OTHER ATC TRANSMISSIONS			
	9:31	BIRM	702P	ACE SEVEN ZERO TWO PAPA TURN LEFT HEADING ONE ONE ZERO			
		702P	BIRM	SEVEN ZERO TWO PAPA TURN LEFT HEADING ONE ONE ZERO			
		BIRM	702P	ACE SEVEN ZERO TWO PAPA DESCEND TO ALTITUDE TWO THOUSAND FIVE HUNDRED FEET BIRMINGHAM QNH ONE ZERO TWO TWO			
		702P	BIRM	SEVEN ZERO TWO PAPA DESCEND DOWN TWO THOUSAND FIVE HUNDRED FEET ON QNH ONE ZERO TWO TWO			
				OTHER ATC TRANSMISSIONS	P2	*(TWO)*	

TIME GMT	TIME TO END	RTF COMMUNICATION FROM	TO		FLIGHT DECK COMMUNICATION ORIGIN		REMARKS
				OTHER ATC TRANSMISSIONS			
					P2	?	
	8:55	BIRM	702P	SEVEN ZERO TWO PAPA CONTACT COVENTRY ONE TWO TWO DECIMAL ZERO			
				OTHER ATC TRANSMISSIONS			
	8:44				P2	SET ONE TWO TWO ZERC	ALTITUDE ALERT (3500FT)
9:44				OTHER ATC TRANSMISSIONS			
	8:29	702P	COV	CONTROL-ER ACE CARGO SEVEN ZERO TWO PAPA GOOD MORNING			
		COV	702P	SEVEN ZERO TWO PAPA GOOD MORNING IDENTIFIED ON HANDOVER FROM BIRMINGHAM RADAR WHAT'S YOUR PRESENT HEADING			(VOLUME ON SPEAKER INCREASED)
		702P	COV	NOW WE HAVE HEADING ER ONE ONE ZERO CROSSING THREE THOUSAND FEET DOWN TWENTY FIVE HUNDRED FEET QNH			
		COV	702P	ROGER THANK YOU VERY MUCH CONTINUE PRESENT HEADING FOR THE MOMENT IT WILL BE RADAR VECTORING FOR THE ILS APPROACH RUNWAY TWO THREE IDENTIFIED ON HANDOVER FROM BIRMINGHAM RADAR			

TIME GMT	TIME TO END	RTF COMMUNICATION FROM	TO		FLIGHT DECK COMMUNICATION ORIGIN		REMARKS
		702P	COV	THANK YOU			
					P2	*WE CAN GO THROUGH*	
					P1	*WE GO*	
					P2	*(THIRTY HUNDRED)*	
					P1	*WATCH THE SPEED*	
	7:51	COV	702P	ACE SEVEN ZERO TWO PAPA TURN LEFT NOW ONTO RADAR HEADING ZERO NINER ZERO			
		702P	COV	SEVEN ZERO TWO PAPA TURN LEFT HEADING ZERO NINER ZERO			
					P1	(FLAPS)	
	7:29				P1	*TAKE TWO HUNDRED AND TEN KNOTS*	
9:45					P2	*TWO HUNDRED AND TEN*	
	7:16	COV	702P	ACE CARGO SEVEN ZERO TWO PAPA SET QFE ONE ZERO ONE THREE DESCEND TO MAINTAIN HEIGHT ONE THOUSAND FIVE HUNDRED FEET AND TURN LEFT HEADING ZERO THREE ZERO			
		702P	COV	ACE CARGO SEVEN ZERO TWO PAPA WE TURN LEFT HEADING ZERO EIGHT ZERO AND WE DESCEND DOWN ONE FIVE ZERO ZERO FEET HEIGHT FOX ECHO ONE ZERO ONE THREE			
		COV	702P	ROGER THAT WAS -ER - ONTO RADAR HEADING NOW OF ZERO ONE ZERO PLEASE			

TIME GMT	TIME TO END	RTF COMMUNICATION FROM	TO		FLIGHT DECK COMMUNICATION ORIGIN		REMARKS
		702P	COV	ROGER TURN RIGHT TO ZERO ONE ZERO			
	6:44	COV	702P	SEVEN ZERO TWO PAPA WE'LL BE TAKING YOU THROUGH THE FINAL APPROACH TRACK FOR SPACING	P1	FLAPS	
					P2	ONE	SOUND OF LEVER BUZZER
9:46		COV	702P	SEVEN ZERO TWO PAPA ARE YOU ABLE TO TAKE UP THE ILS AT COVENTRY NOW OR WOULD YOU LIKE AN SRA			
		702P	COV	AH SORRY CONFIRM YOUR MESSAGE PLEASE			
	6:30	COV	702P	ROGER COULD YOU TURN LEFT IMMEDIATELY NOW ONTO A HEADING OF ZERO ONE ZERO INITIALLY PLEASE			
		702P	COV	WE HAVE PRESENTLY HEADING ZERO ONE ZERO			
		COV	702P	ROGER AT THE MOMENT YOU'RE TRACKING ONE ZERO ZERO CAN YOU TURN LEFT ZERO ONE ZERO PLEASE			

TIME GMT	TIME TO END	RTF COMMUNICATION FROM	TO		FLIGHT DECK COMMUNICATION ORIGIN		REMARKS
					P2	ZERO ONE ZERO	
		702P	COV	ROGER			
	6:15				P2	FLAPS FIVE	PITCH TRIM
					P1	*ZERO TEN THE HEADING*	
					P1	*HEADING TWO HUNDRED THIRTY*	
	5:54				P1	*IF WE CONCENTRATE WE CAN GET IT*	NOISE OF ENGINE POWER INCREASE TO 70%
					P1	*THE PROBLEM IS NO ILS*	
				EXTRACT ENDS			
	5:45			**EXTRACT BEGINS**	P2	FLAPS TEN	
	5:32	COV	702P	ACE CARGO SEVEN ZERO TWO PAPA CONTINUE THE LEFT TURN NOW ONTO RADAR HEADING OF TWO SIX ZERO			
9:47		702P	COV	ROGER WE TURN LEFT HEADING TWO SIX ZERO SEVEN ZERO TWO PAPA			
					P1	*IF WE CAN'T GET IT GO AROUND AND WE TRY AGAIN IF WE GIVE ATTENTION TO THE FUEL*	POWER REDUCED FROM 63% TO 53%
							POWER INCREASE TO 65%

TIME GMT	TIME TO END	RTF COMMUNICATION FROM	TO		FLIGHT DECK COMMUNICATION ORIGIN		REMARKS
9:48	4:40	COV	702P	AND SEVEN ZERO TWO PAPA APPROXIMATELY TWELVE NAUTICAL MILES NOW TO RUN FOR SURVEILLANCE RADAR APPROACH RUNWAY TWO THREE THAT APPROACH TERMINATES AT TWO NAUTICAL MILES FROM TOUCHDOWN CHECK YOUR MINIMA AND MISSED APPROACH POINT			
		702P	COV	ER - ROGER MADAM ER COULD YOU GIVE AAH COOPERATION WITH AH S R E -ER- APPROACH			
		COV	702P	ROGER A SURVEILLANCE RADAR APPROACH FOR RUNWAY TWO THREE			POWER REDUCTION 65% to 60%
		702P	COV	ROGER THANK YOU BECAUSE WE ARE NOT READING THE ILS			
	4:02	COV	702P	THAT'S ALL COPIED THANK YOU VERY MUCH YOU'RE TEN MILES FROM TOUCHDOWN NOW AT YOUR CONVENIENCE CHECK YOUR WHEELS YOU'RE CLOSING THE FINAL APPROACH TRACK VERY GENTLY FROM THE LEFT			
							INCREASED BACKGROUND NOISE

TIME GMT	TIME TO END	RTF COMMUNICATION FROM	TO		FLIGHT DECK COMMUNICATION ORIGIN		REMARKS
	3:53	702P	COV	OKAY WE ARE GEAR DOWN			
	3:50	COV	702P	THANK YOU			
					P2	FLAPS FIFTEEN	
							SOUND OF LEVER MOVEMENT INCREASED POWER TO 70 %
					P2	CHECK - THREE GREENS	
	3:55	702P	COV	DISTANCE TO FOR TOUCHDOWN AH - SEVEN ZERO TWO PAPA			
9:49	3:31	COV	702P	ROGER MILES FROM TOUCHDOWN NOW NINE TRACK MILES NINER TRACK MILES FROM TOUCHDOWN			
		702P	COV	ROGER			
		COV	702P	YOU CAN EXPECT FURTHER DESCENT TO MAINTAIN A THREE DEGREE GLIDEPATH AT FOUR AND A HALF MILES FROM TOUCHDOWN I'LL KEEP YOU ADVISED			
		702P	COV	OKAY THANK YOU VERY MUCH			

TIME GMT	TIME TO END	RTF COMMUNICATION FROM	TO		FLIGHT DECK COMMUNICATION ORIGIN		REMARKS
	3:11				P2	*WE CAN SEE THE GROUND*	
					P1	*EH*	
					P2	*WE CAN SEE THE GROUND*	
					P1	*FROM TIME TO TIME* *IT'S NOT ALWAYS THE CASE*	
					P2	IN PATCHES	
					P2	*IT'S IN PATCHES*	
					P1	*OTHERWISE WE COME HERE AND TRY TO GET BELOW CLOUD*	
	2:57	COV	702P	SEVEN ZERO TWO PAPA IS VERY SLIGHTLY LEFT OF TRACK CLOSING VERY GENTLY			
		702P	COV	ER - WOULD YOU WANT WE TURN RIGHT HEADING TWO SEVEN ZERO			
		COV	702P	NEGATIVE IF YOU CONTINUE ON THAT HEADING YOU WILL BE ON THE FINAL APPROACH TRACK BY SIX MILES			
		702P	COV	ROGER			
					P1	*LOOK AT ADF ONE*	

TIME GMT	TIME TO END	RTF COMMUNICATION FROM	TO		FLIGHT DECK COMMUNICATION ORIGIN		REMARKS
	2:34	COV	702P	SEVEN ZERO TWO PAPA TURN LEFT NOW TWO FOUR ZERO THE RADAR HEADING FINAL APPROACH TRACK			
9:50		702P	COV	ROGER SEVEN ZERO TWO PAPA TURN LEFT ON TWO FOUR ZERO			
				EXTRACT ENDS			ENGINE 62%-64% PITCH TRIM
				EXTRACT BEGINS	P1	*TURN TURN TURN TWO HUNDRED AND FORTY*	
	2:11	COV	702P	TURN FURTHER LEFT NOW TWO THREE ZERO THE HEADING TWO THREE ZERO			
		702P	COV	TURN LEFT TWO THREE ZERO			
					P1	*QUICKLY*	
					P1	*ONE HUNDRED AND FIFTY*	SOUND OF POWER INCREASE TO 74%
	1:55				P1	*PUT ON FIVE DEGREES MORE TO THE LEFT*	
	1:52	COV	702P	AND YOU'RE SIX MILES FROM TOUCHDOWN NOW QFE CHECK ONE ZERO ONE THREE NICELY ON THE FINAL APPROACH TRACK THE HEADING GOOD			

TIME GMT	TIME TO END	RTF COMMUNICATION FROM	TO		FLIGHT DECK COMMUNICATION ORIGIN		REMARKS
		702P	COV	ROGER			CLICKING PITCH TRIM
		COV	702P	FIVE AND A HALF MILES FROM TOUCHDOWN TWO THREE ZERO THE HEADING ON TRACK			POWER REDUCTION 72% - 67%
	1:44	COV	702P	TURN RIGHT FIVE DEGREES TWO THREE FIVE FIVE FROM TOUCHDOWN TWO THREE FIVE IS THE HEADING COMMENCE DESCENT NOW TO MAINTAIN A THREE DEGREE GLIDEPATH, YOU			
	1:28			SHOULD BE LEAVING HEIGHT ONE THOUSAND FIVE HUNDRED FEET			
9:51				TWO THREE FIVE IS THE RADAR HEADING ON TRACK FOUR AND A HALF MILES FROM TOUCHDOWN HEIGHT ONE FOUR ZERO ZERO FEET			
	1:21			TWO THREE FIVE THE RADAR HEADING TURN FURTHER RIGHT RADAR HEADING TWO FOUR ZERO FOUR MILES FROM TOUCHDOWN YOUR HEIGHT SHOULD BE ONE TWO FIVE ZERO FEET TWO FOUR			(POSSIBLE MOVEMENT OF FLAP)
	1:09			ZERO THE HEADING THREE AND A HALF MILES FROM TOUCHDOWN			MULTIPLE CLICKING
	1:01			YOUR HEIGHT SHOULD BE ONE THOUSAND ONE HUNDRED FEET TWO FOUR ZERO THE RADAR HEADING VERY VERY SLIGHTLY LEFT OF TRACK AND CLOSING GENTLY TWO FOUR ZERO THE HEADING			

TIME GMT	TIME TO END	FROM	TO	RTF COMMUNICATION	ORIGIN	FLIGHT DECK COMMUNICATION	REMARKS
	0:48	COV	702P	THREE MILES FROM TOUCHDOWN YOUR HEIGHT			
				SHOULD BE NINE FIVE ZERO FEET			PITCH TRIM
				ON TRACK TURN LEFT HEADING TWO THREE			
				EIGHT TWO THREE EIGHT THE			
				HEADING TWO AND A HALF MILES FROM			POWER INCREASE
				TOUCHDOWN YOUR HEIGHT SHOULD BE EIGHT			
				ZERO ZERO FEET			
	0:26			TWO THREE EIGHT YOU'RE CLEARED TO LAND			
				RUNWAY TWO THREE THE SURFACE WIND			PITCH TRIM
9:52				VARIABLE LESS THAN FIVE KNOTS			
	0:23			TWO MILES FROM TOUCHDOWN YOUR HEIGHT			
				SHOULD BE SIX FIVE ZERO FEET CHECK MINIMUM			
				DESCENT HEIGHT ON TRACK THE HEADING			
				GOOD TWO THREE EIGHT THE RADAR HEADING			
				YOU ARE CLEAR TO LAND			
				TURN FURTHER RIGHT TWO FOUR ZERO			
				DRIFTING VERY SLIGHTLY LEFT OF TRACK			
				TWO FOUR ZERO TWO FOUR ZERO IS THE RADAR			
				HEADING NICELY ON TRACK NOW			
				THE HEADING IS GOOD			
	0:01 0					EXCLAMATION	END OF RECORDING

AN ANALYSIS OF THE IMPACT BETWEEN THE AIRCRAFT AND THE TOWER, AND SUBSEQUENT FLIGHT PATH

Tower construction

The electricity tower comprised a lattice girder structure 26.4 metres high supporting six 132 kV high tension phase conductor cables arranged in two sets of three, one set on each side of the tower, together with a single earth cable carried at the apex of the tower, see Figure 1. Each cable was suspended from its support arm by a stack of interlocking ceramic insulators approximately 2 metres in length. Vibration dampers, each comprising a pair of weights attached to arms, were clamped to each conductor cable a short distance from their attachment to the insulators.

The high tension cables each comprised a multi-stranded steel core of approximately 8 mm diameter overlaid with a multi-stranded outer layer of aluminium wire, increasing the outer diameter to 20 mm. The multi-strand earth cable was of steel only, and was 13 mm in diameter.

The tower impact

The aircraft struck the tower at a position approximately level with the mid set of support arms, severing the tower structure at this level and causing the upper section of tower to topple to the ground. The lower pair of support arms and their attached cables were intact and essentially undamaged. The mid set of support arms and the intervening tower structure was totally disrupted by the aircraft impact but the mid set of cables survived relatively intact, evidently because they had become unhooked during the impact process, and were hanging down on each side of the tower suspended between the two adjoining towers. The aluminium outer strands of the mid-conductor cable on the aircraft down-track side of the tower had been torn and dragged along the length of the cable as a result of attachment clamps being dragged along the cable during the impact process, but no evidence of contact with the aircraft was apparent on either of the mid-cables.

Both of the top conductor cables and the earth cable were broken, and were found on the ground having recoiled out to either side of the tower. (These cables had been cut and partially removed from site by the electricity company in the immediate aftermath of the accident, prior to AAIB arrival on site.) Of these two cables, that on the aircraft's approach side had failed at a position approximately 10.5 metres to the right of the suspension point (viewed from the aircraft's approach direction) due to tension overload of the steel core. The aluminium outer strands of this cable were extensively bunched, due to the outer strands being forced along the inner core, away from the tower, during the impact process. The corresponding cable on the down-track side of the tower had failed in a similar manner at a point approximately 7 metres from the tower.

The earth line had failed in tension overload at a position similar to that of the two upper conductor cables.

It was not possible to identify positively any evidence of splash caused by arcing contact between a conductor and the aircraft structure.

Wreckage distribution

Debris from both the tower and aircraft was distributed on the ground along the aircraft's flight path between the initial impact with the electricity tower and the final ground impact in the woods bordering the southern edge of the housing estate. Figure 2 is a sketch plan showing the general distribution of wreckage, together with relevant ground features.

The greater part of this debris was found in the fields immediately forward of the pylon impact, and comprised:

- the upper part of the tower structure, with upper conductor support arms still attached (though deformed)
- the twisted remains of the mid-conductor support arms
- numerous miscellaneous lengths of heavily deformed angle iron from the tower structure
- lengths of phase conductor and earth cable
- fragments of, and clusters of intact, ceramic insulator blocks
- small pieces of leading edge flap and wing leading structure from the mid region of the left wing
- the whole of the left wing trailing edge mid-section fore flap, in four pieces
- sections of left engine fan cowling
- the left engine slipper fairing (between the fan cowl and leading edge)
- left wing boat (flap track) fairings
- both nose landing gear doors, complete
- large quantities of unidentified wing leading edge, miscellaneous fibreglass and honeycomb fragments, and general structural debris

Wreckage was less densely distributed in the areas beyond the field, the principal items comprising:

- the left wingtip and outermost 2 metres of left wing, which was lodged in a tree in the garden of No 16 Fieldmarch; adjacent to the end of wall of the house, which was damaged
- miscellaneous sections of heavily deformed angle iron from the tower structure, including one piece with brick dust adhering, found in the road adjacent to No 17 Fieldmarch (the chimney of which was damaged), and at the final impact site

- pieces of left aileron and left outboard leading edge flap, also found in the road adjacent to No 17 Fieldmarch

- miscellaneous metal, fibreglass, and honeycomb fragments

The remaining aircraft wreckage was contained within the main ground impact zone, which began at a point just beyond the edge of the road bounding the southeast corner of the housing estate.

Evidence from initial impact with tower

The wreckage from both the tower structure and the aircraft were examined in detail for evidence associated with the initial stages of the tower impact, with a view to facilitating subsequent correlation between the aircraft and tower damage patterns aimed at establishing the aircraft's attitude and flight path at the instant of tower contact.

The following evidence was noted on the tower wreckage (see Figure 3):

- A red paint smear on the outer surface of the main (corner) upright of the tower, on the approach side of the tower and on the right side (viewed along track). The smear extended over a distance of approximately 200 mm and was centred approximately 1 metre below the mid-conductor support arm.

- Severe buckling and associated localised heavy indentations of the angle iron components forming the outer end of the lower spanwise member of the mid-support arm on the approach side of the tower. This localised damage comprised regularly spaced notches in the free (outer) edge of the horizontal flange of this member over a 550 mm spanwise length of the arm beginning at a position approximately 1 metre from the end of the arm; sooting of the vertical flange was also apparent over this same spanwise region.

- Two distinct contact bruises were also evident on the vertical flange of this member at positions approximately 335 mm and 425 mm (toward the tower) from the region of indentation-damage and sooting. These two bruises were approximately parallel to one another, and were inclined slightly from the vertical.

- A small fragment of fibreglass honeycomb sandwich structure was embedded between plates at the free end of the mid-conductor support arm on the down-track side of the tower.

- A second small fragment of similar honeycomb material was embedded in the joint plate at the junction between the bottom rail of the mid-conductor support arm on the approach side of the tower and the left side main upright (viewed along the approach).

The following evidence was noted on the left engine wreckage (see Figure 4):

- A series of deep chordwise cuts into the left engine compressor stator blades was found. These cuts were all in the same plane and had evidently been produced simultaneously. The cuts displayed highly serrated fracture faces consistent with high speed tearing, such as would occur if stator had been driven into the free edge of one of the flanges of the angle-iron tower elements. The orientation of the plane of these cuts, in terms of both longitudinal (pitch) and lateral (roll) angles in relation to the engine axes is illustrated in Figure 4 (the blue coloured blade is at engine bottom centre).

- Several broader regions of leading edge bruising were also apparent on several of the stator blades at locations just above the cuts. Each bruise was of similar form and width (typically 65 mm), and had evidently been caused by contact with the flat side of one or more of the angle-iron elements of the tower structure. The thick magenta lines in Figure 4 indicate the positions of these bruises.

The following evidence was noted on the aircraft wreckage:

- Front-to-rear crush damage to the left outboard side engine fan cowl, caused by a heavy grazing impact, in the vicinity of a red painted line which runs circumferentially around the cowl. A comparative chemical analysis of the red smear film from the tower and a sample of the red paint from the engine cowl produced excellent correlation between the samples, indicating beyond reasonable doubt that the paint smear on the tower was caused by contact with the left engine cowl.

- A longitudinal cable-cut into the left-hand nose gear door, running aft into the door from its forward edge a distance of 690 mm. The plane of the cable-cut was approximately at right angles to the plane of the door, and the cut-line was angled downwards slightly in relation to the bottom edge of the door (door at gear extended position), approximately parallel with the fuselage belly-profile. The (conductor) cable was firmly embedded in the door structure at the end of the cut, and the outer strands of the cable had been bunched up in a manner consistent with the door having slid along the steel core of the cable from left to right (relative to aircraft track) as the cable had sliced back into the door.

- No corresponding cable-cut was present on the right-hand nose gear door; instead, a light chamfer had been ground onto the upper top edge over the forward part of the door, consistent with a cable having slid along the in the gap between the door and the belly of aircraft. The hinges of this door were broken in a manner consistent with this scenario.

A survey of the honeycomb materials used on the engine cowl and wing structure suggested that each of the two fragments of honeycomb material found embedded in the joint plates of the tower, described earlier, originated from the flap track boat-fairings.

Analysis

Impact parameters

The weight, bulk, and highly deformed nature of the tower wreckage precluded a physical reconstruction of the aircraft and tower wreckage, in the conventional manner, to facilitate correlation of impact witness marks. Instead, three-dimensional computer models were constructed of the upper part of the tower and the aircraft, the latter comprising the external form of the aircraft overall with more detailed modelling of the landing gear door and engine stator assembly. The correlation between damage marks on both tower and aircraft components, caused during the initial stages of the tower collision and detailed in the preceding section, was then explored by adjusting the relative position of the computer model of the aircraft in relation to that of the tower until a reasonable match was achieved.

A similar approach was adopted in relation to the wingtip collision with the house at No 16 Fieldmarch, and the passage of the aircraft through the lighting pole and trees during the initial stages of the ground impact.

Tower impact parameters

Figure 5 shows the best fit achieved between the aircraft/engine and the tower computer models. With the aircraft positioned in this attitude, the position of the left engine stator damage matches almost exactly with the region of heavy localised damage and sooting on the mid-conductor support arm on the approach side of the tower. Furthermore:

- the orientation of the plane of the stator blade-cuts matches the orientation of the horizontal flange of the arm's lower member,
- the flatter bruises on the blades are broadly consistent with the positions of the vertical flanges of the spanwise and bracing elements of the arm, and
- the two bruises on the vertical flange of the arm member coincide almost exactly with the position of the outboard sector of the intake casing.

With the engine in this position, the red paint smear on the tower matches the position of the red paint line on the engine cowl. The lateral positions of the two fragments of fibreglass honeycomb material also match reasonably well with the two flap track fairings from which this material almost certainly originated, the slight lateral mis-match as-drawn being reduced in practice by rotation of the tower due to the initial impact of the engine into the support arm. The slight vertical mis-match implies that the aircraft was on a slightly climbing trajectory (bearing in mind that the relevant parts of the aircraft as-drawn still have some distance to travel before they meet their respective contact points on the tower structure).

Figures 6 and 7 illustrate the complete aircraft and tower interaction at the stage in the impact process when the red paint line on the cowl was contacting the tower upright. It can be seen that the upper phase conductor cable on the approach side of the tower would have passed just below the nose and run down under the belly of the aircraft until it met the landing gear doors.

At this point, due to the slight bank angle to the left, it would have entered the gap between the left nose gear door and the fuselage skin, and on the right side cut into the leading edge of the right-hand nose gear door. Thereafter, it would have sliced rearwards through the right-hand door, following the belly curvature of the aircraft and broken through the hinges of the left-hand door until it came up against the landing gear proper, at which point it would have broken due to tension overload.

Flight path following the tower impact

Figure 10 shows the estimated trajectory and aircraft attitudes following the tower impact. The aircraft height and attitude shown at the instant of the tower impact is that derived in the above analysis. The attitude and position of the aircraft at the instant of contact with the house at No 16 Fieldmarch was derived from matching of scrape and impact damage features on the left wingtip and on the gable end of the house. The attitude immediately prior to ground impact was determined from a study of aircraft geometry in relation to the heights at which trees and the lighting pole were severed. It should be noted that the ground rises slightly between the tower and the houses, before falling way again slightly toward the final impact site. The intermediate aircraft positions are estimates only.

Figure 10 shows that the aircraft evidently followed a slightly lofting flight path following impact with the tower, rolling violently to left but with the nose well above the horizon until after the impact with the house. The corresponding plan-view diagram in Figure 9 shows that the aircraft followed a curving flight path to the left of track.

The rapid roll to the left following the impact with the tower was undoubtedly caused by loss of left from the left wing following impact disruption of the leading and trailing edge flaps.

Figure 11 is a perspective view of those shown in Figures 9 and 10, showing the aircraft in relation to the housing estate over which it passed.

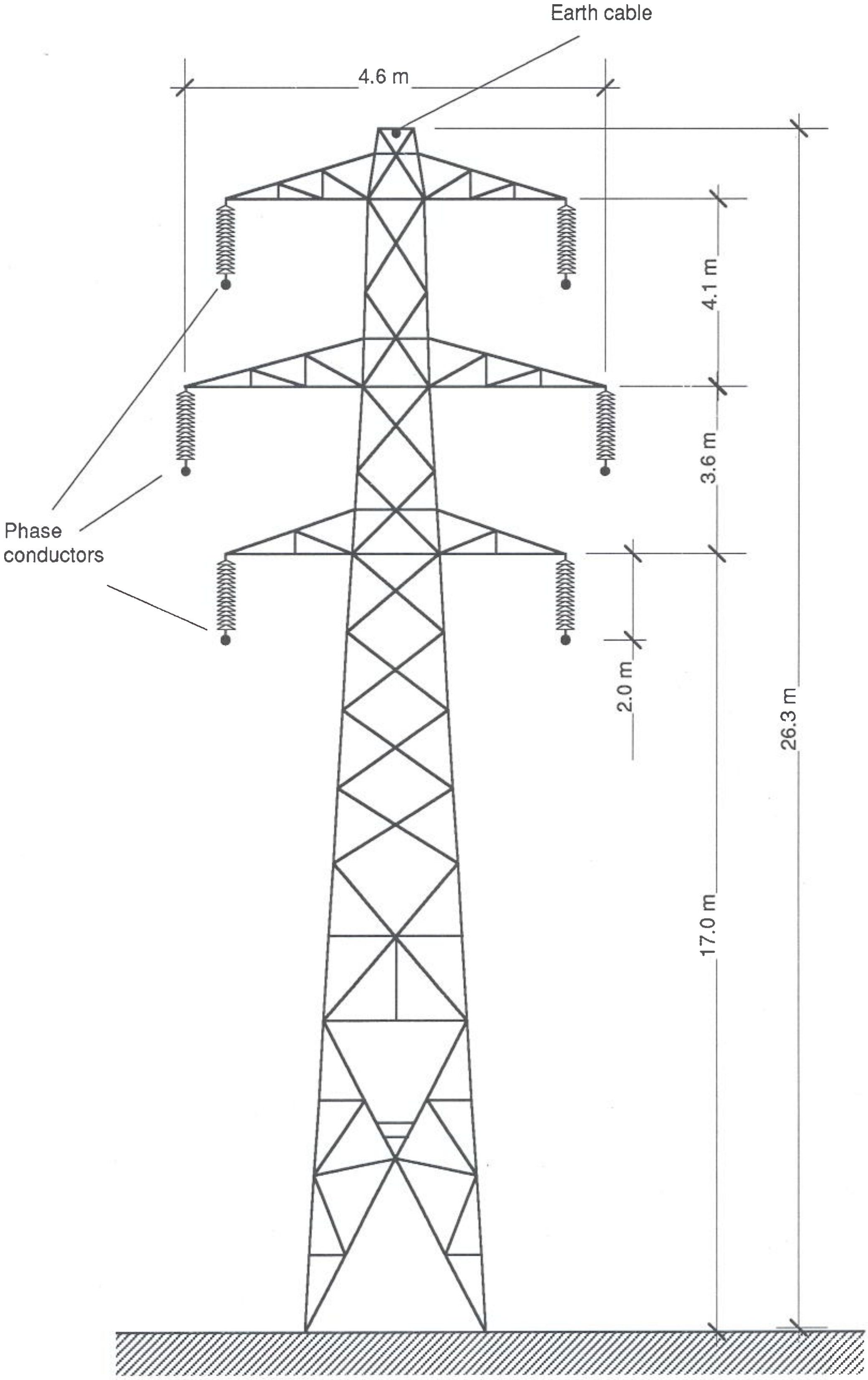
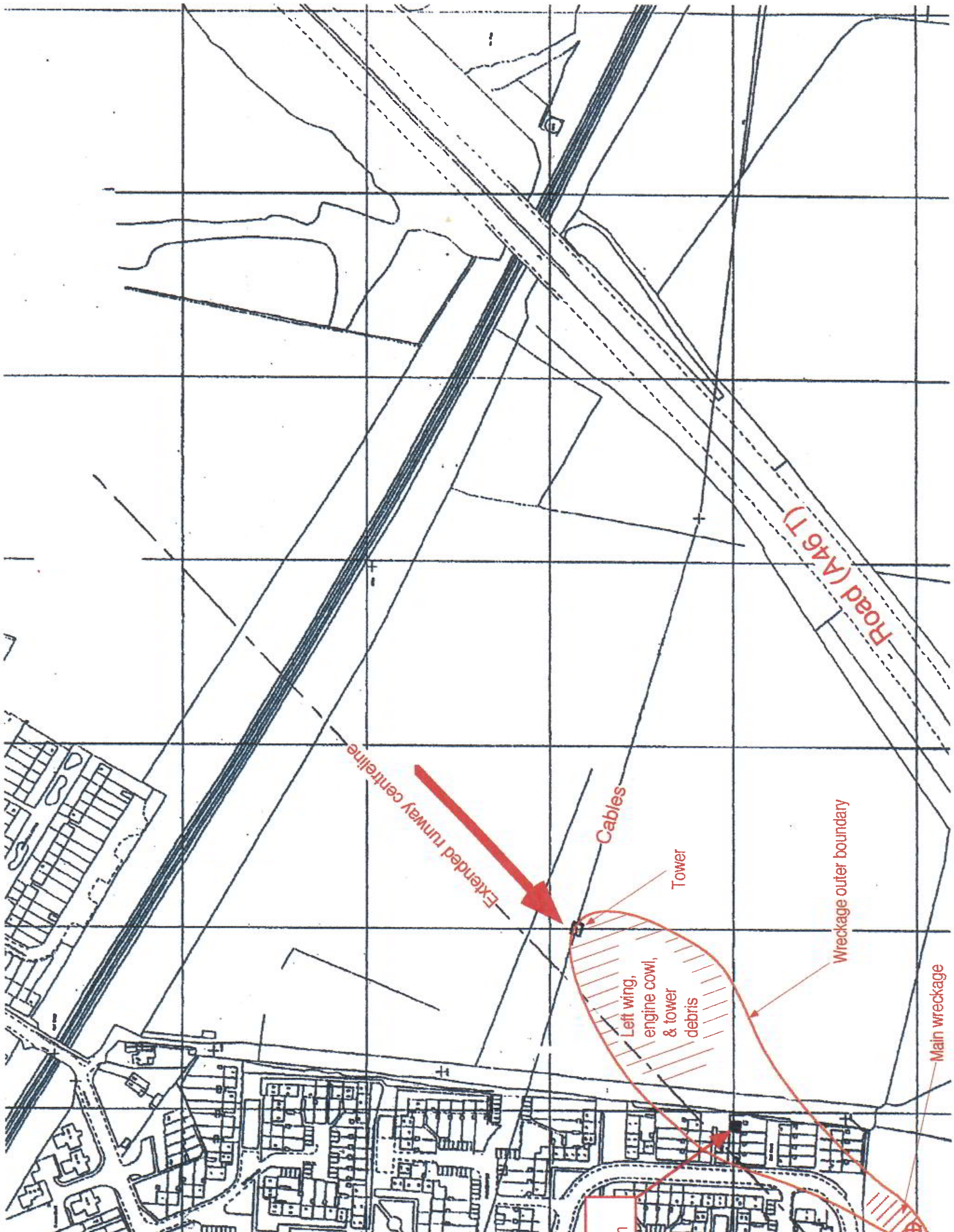


Figure 1



Road (A46 T)
Extended runway centreline
Cables
Tower
Wreckage outer boundary
Left wing, engine cowl, & tower debris
Main wreckage
No 16 Fieldmarch

Figure 2

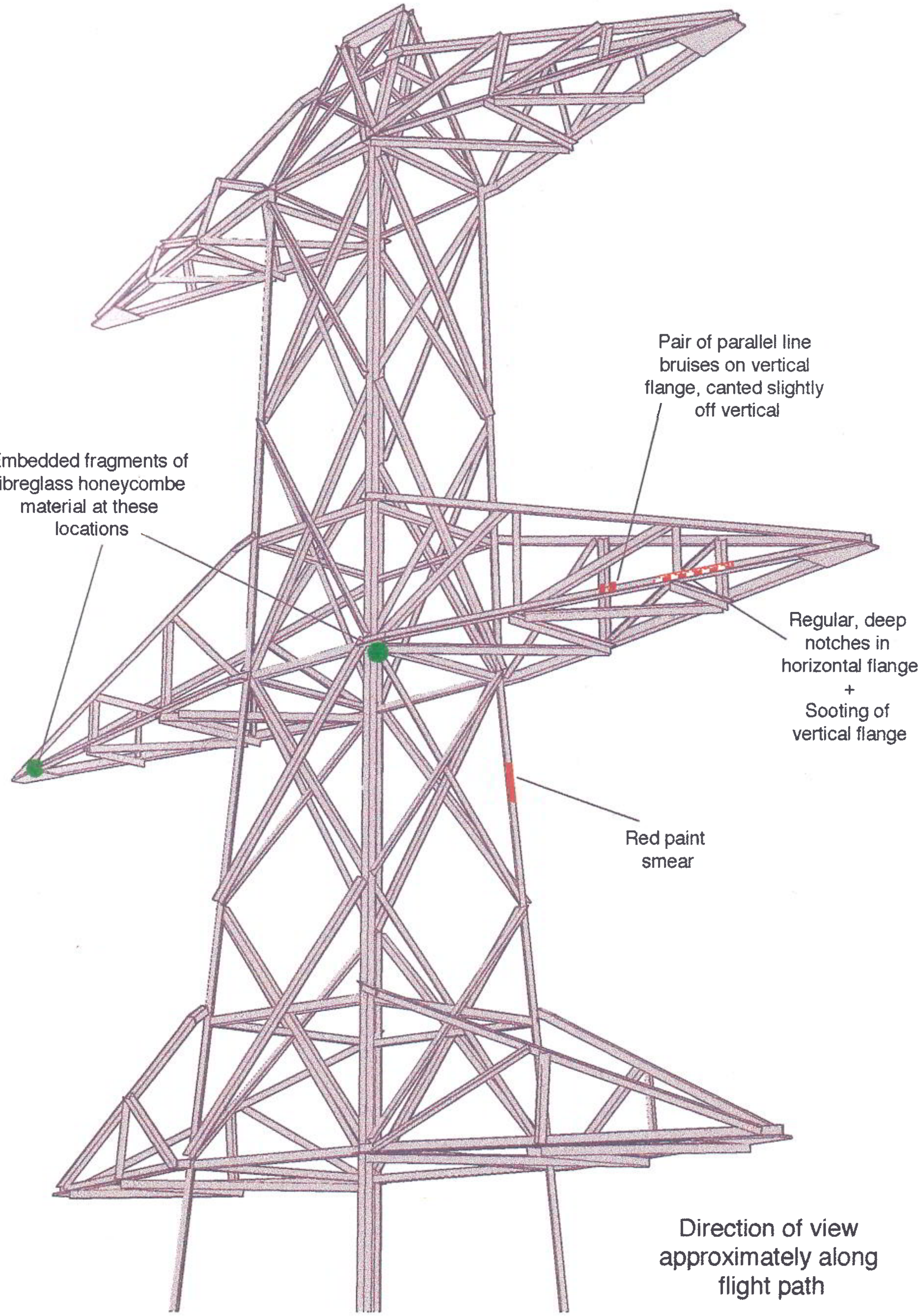
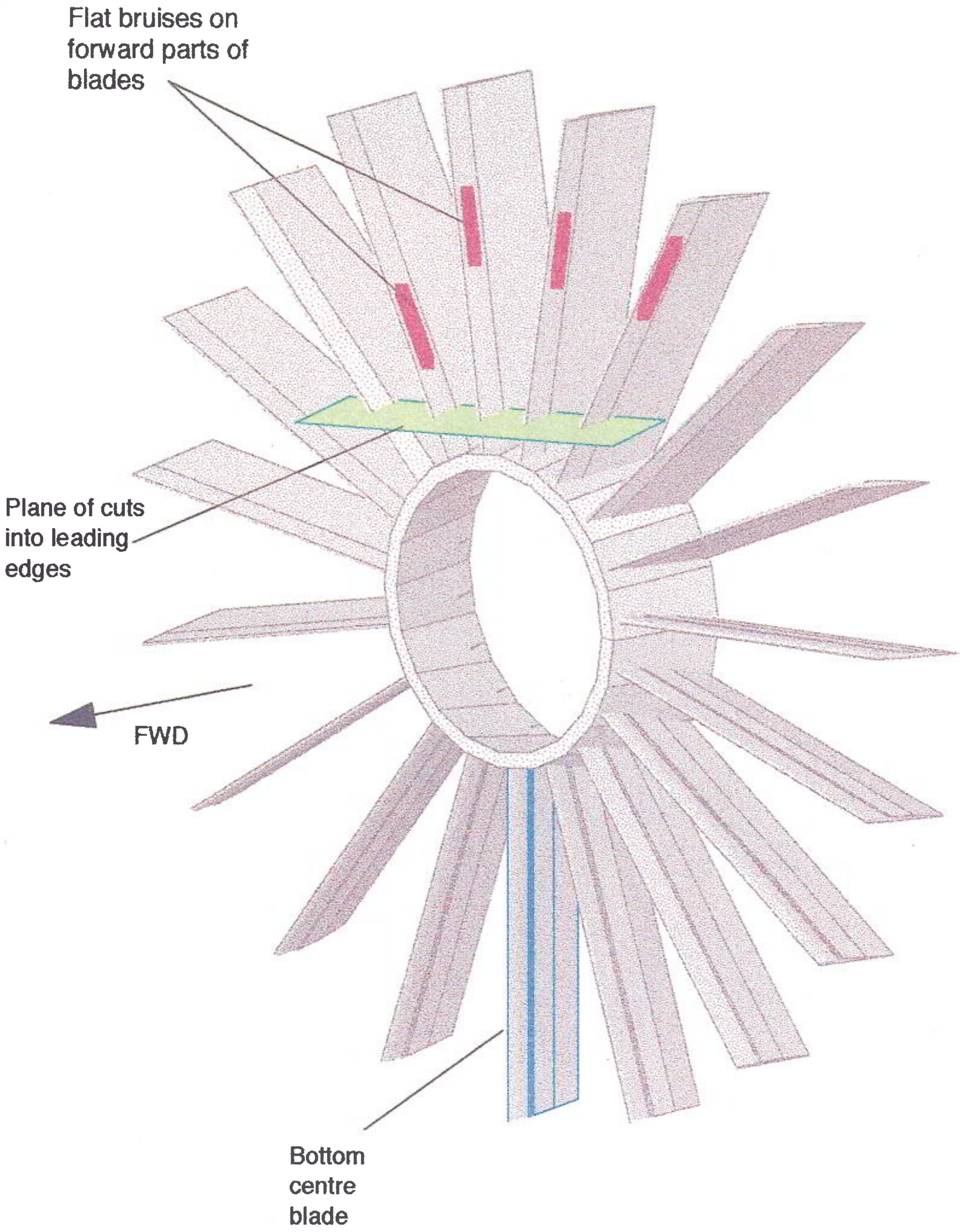

Pair of parallel line bruises on vertical flange, canted slightly off vertical
Embedded fragments of fibreglass honeycombe material at these locations
Regular, deep notches in horizontal flange + Sooting of vertical flange
Red paint smear
Direction of view approximately along flight path

Figure 3



Flat bruises on forward parts of blades
Plane of cuts into leading edges
FWD
Bottom centre blade

Figure 4

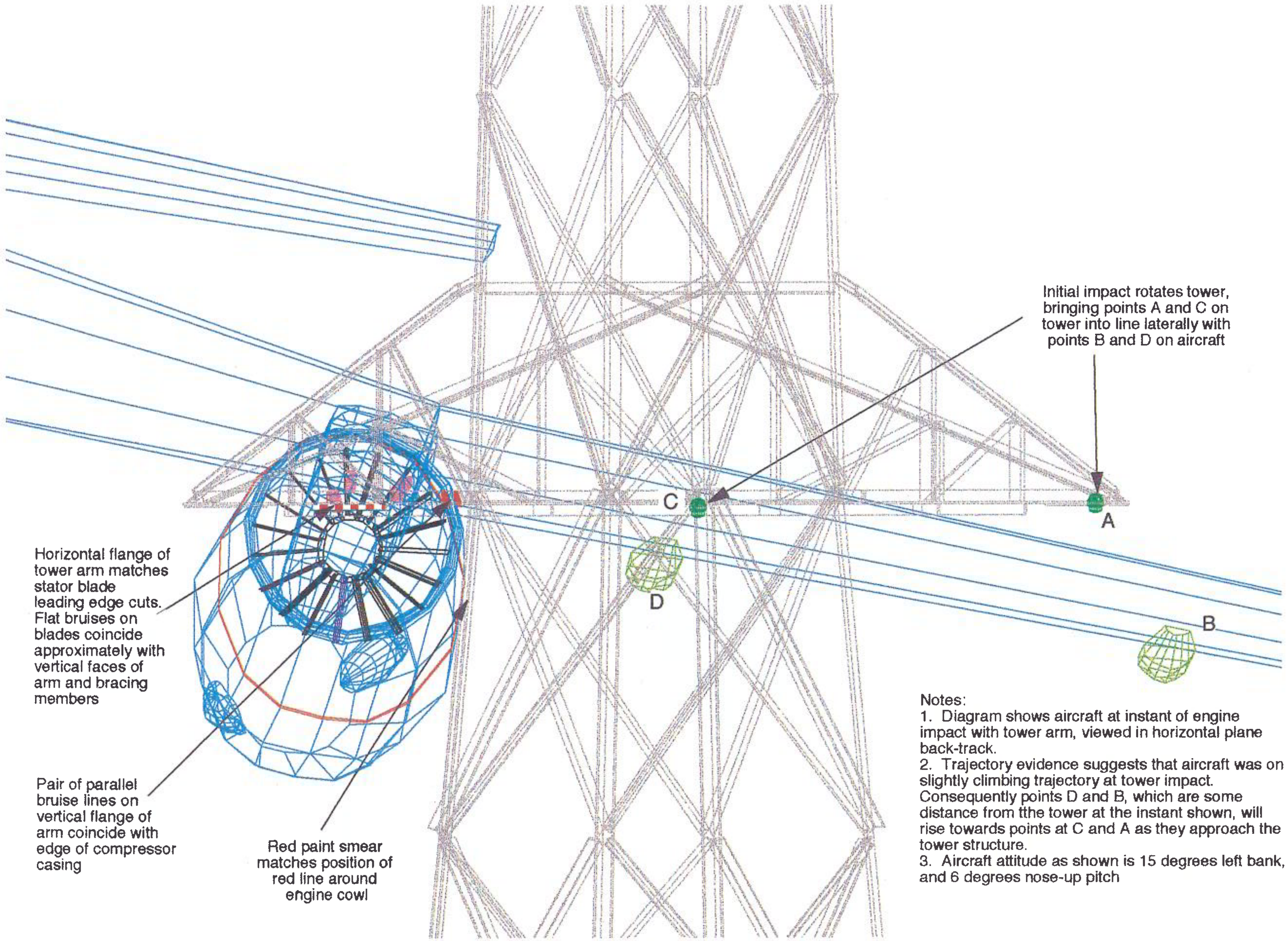

Initial impact rotates tower, bringing points A and C on tower into line laterally with points B and D on aircraft
A
B
C
D
Horizontal flange of tower arm matches stator blade leading edge cuts. Flat bruises on blades coincide approximately with vertical faces of arm and bracing members
Pair of parallel bruise lines on vertical flange of arm coincide with edge of compressor casing
Red paint smear matches position of red line around engine cowl
Notes:
1. Diagram shows aircraft at instant of engine impact with tower arm, viewed in horizontal plane back-track.
2. Trajectory evidence suggests that aircraft was on slightly climbing trajectory at tower impact. Consequently points D and B, which are some distance from tthe tower at the instant shown, will rise towards points at C and A as they approach the tower structure.
3. Aircraft attitude as shown is 15 degrees left bank, and 6 degrees nose-up pitch

Figure 5

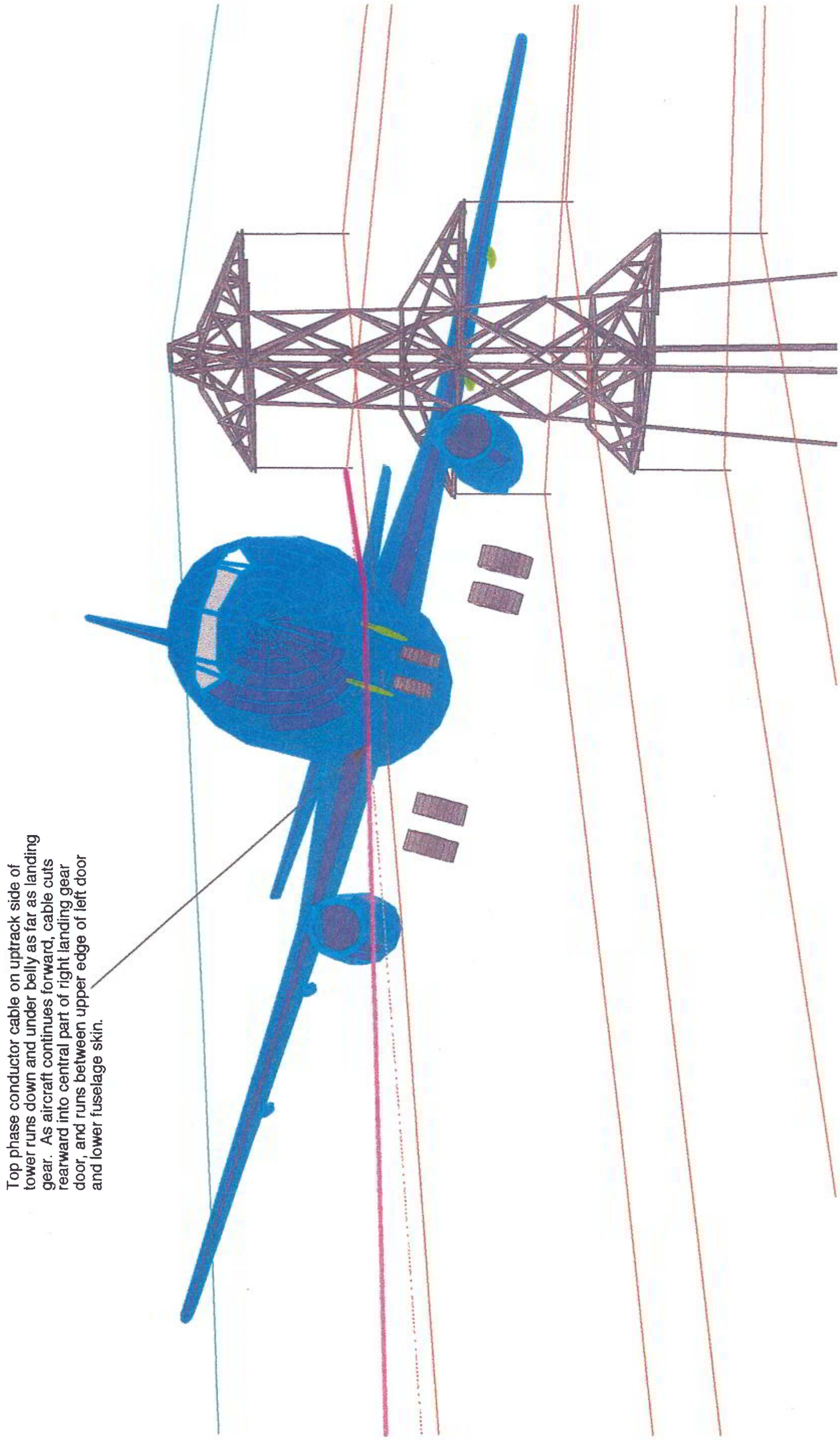

Top phase conductor cable on uptrack side of tower runs down and under belly as far as landing gear. As aircraft continues forward, cable cuts rearward into central part of right landing gear door, and runs between upper edge of left door and lower fuselage skin.

Figure 6

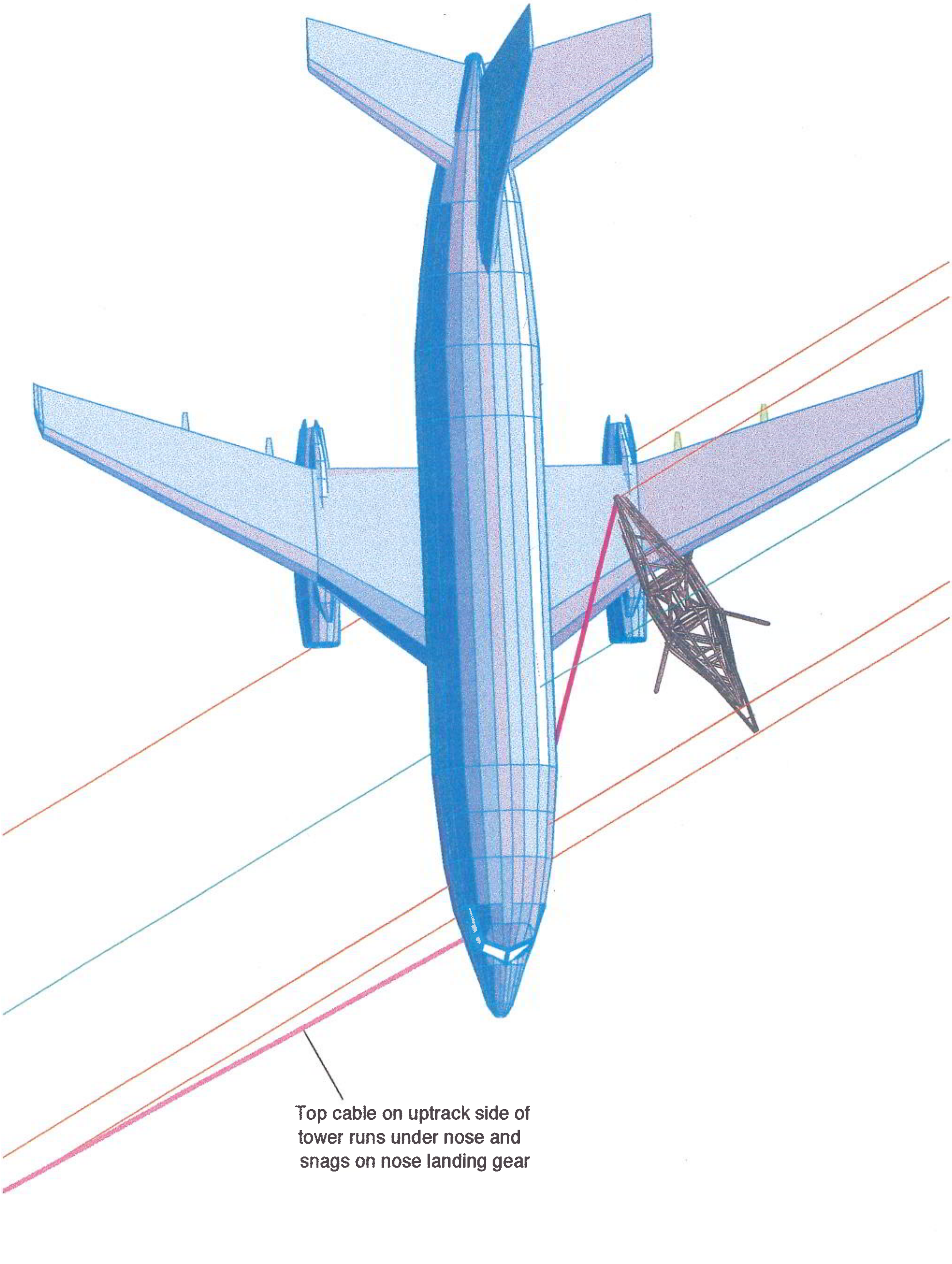

Top cable on uptrack side of
tower runs under nose and
snags on nose landing gear

Figure 7

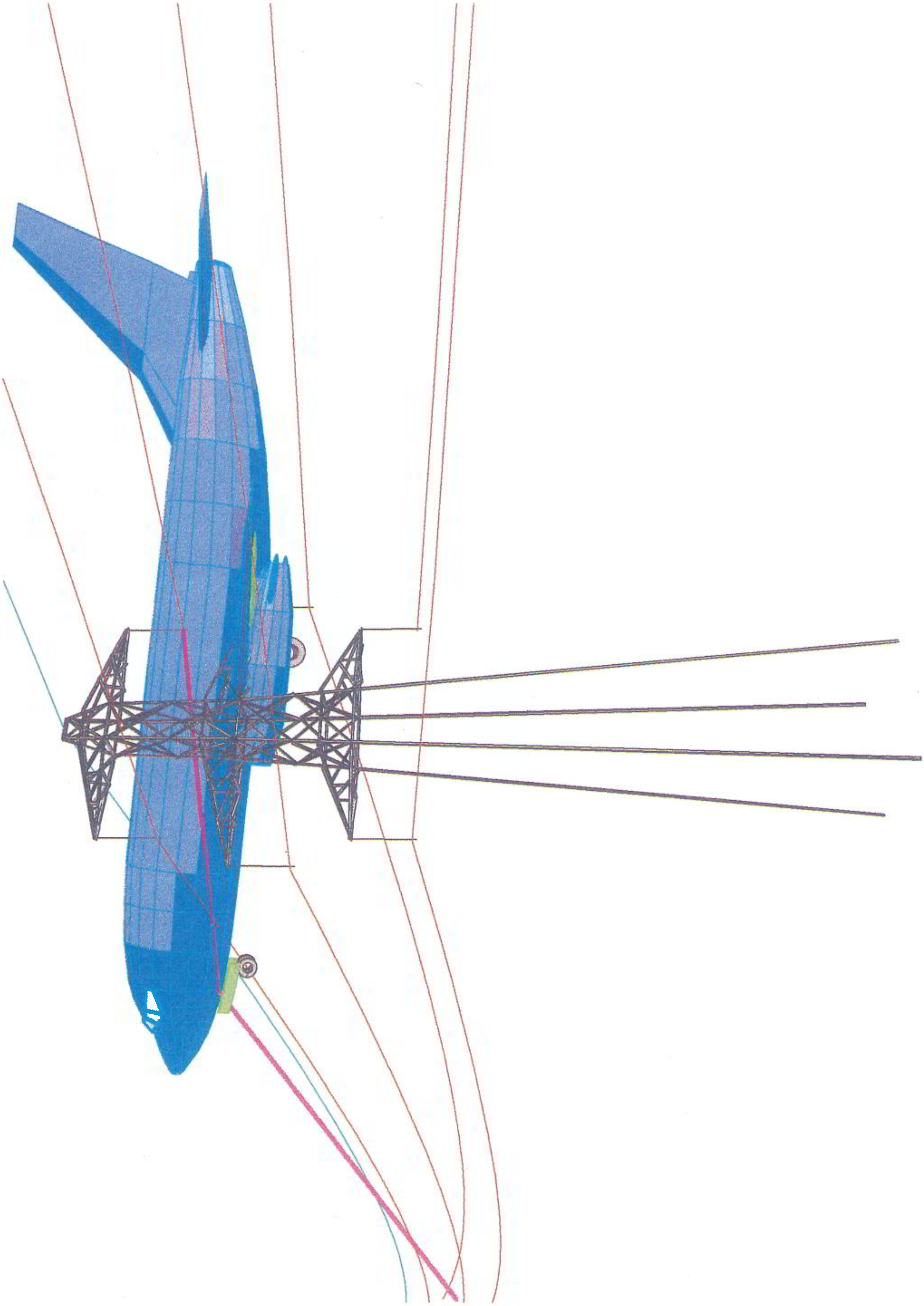


Figure 8

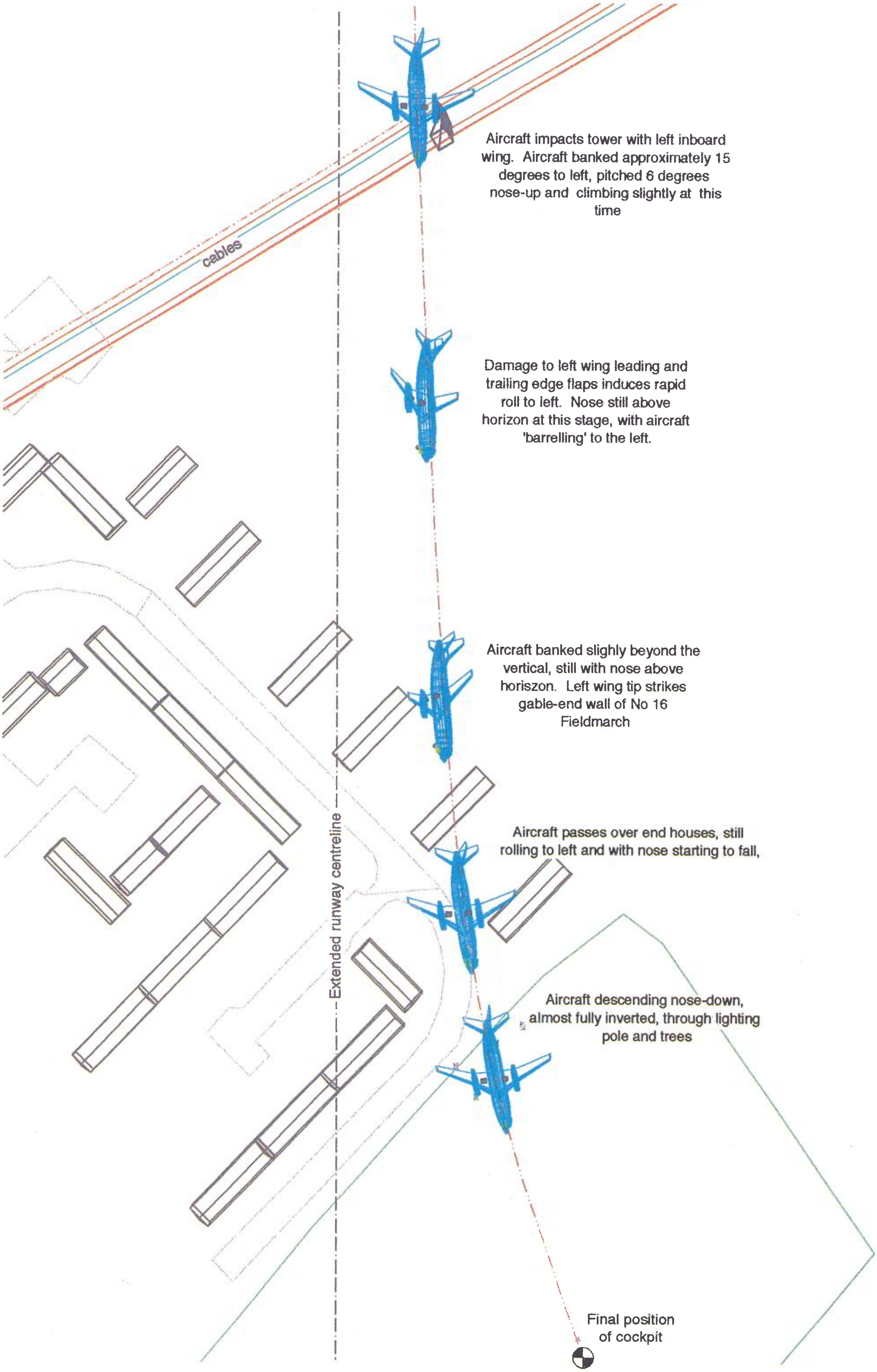

Aircraft impacts tower with left inboard wing. Aircraft banked approximately 15 degrees to left, pitched 6 degrees nose-up and climbing slightly at this time
cables
Damage to left wing leading and trailing edge flaps induces rapid roll to left. Nose still above horizon at this stage, with aircraft 'barrelling' to the left.
Aircraft banked slighly beyond the vertical, still with nose above horiszon. Left wing tip strikes gable-end wall of No 16 Fieldmarch
Extended runway centreline
Aircraft passes over end houses, still rolling to left and with nose starting to fall,
Aircraft descending nose-down, almost fully inverted, through lighting pole and trees
Final position of cockpit

Figure 9

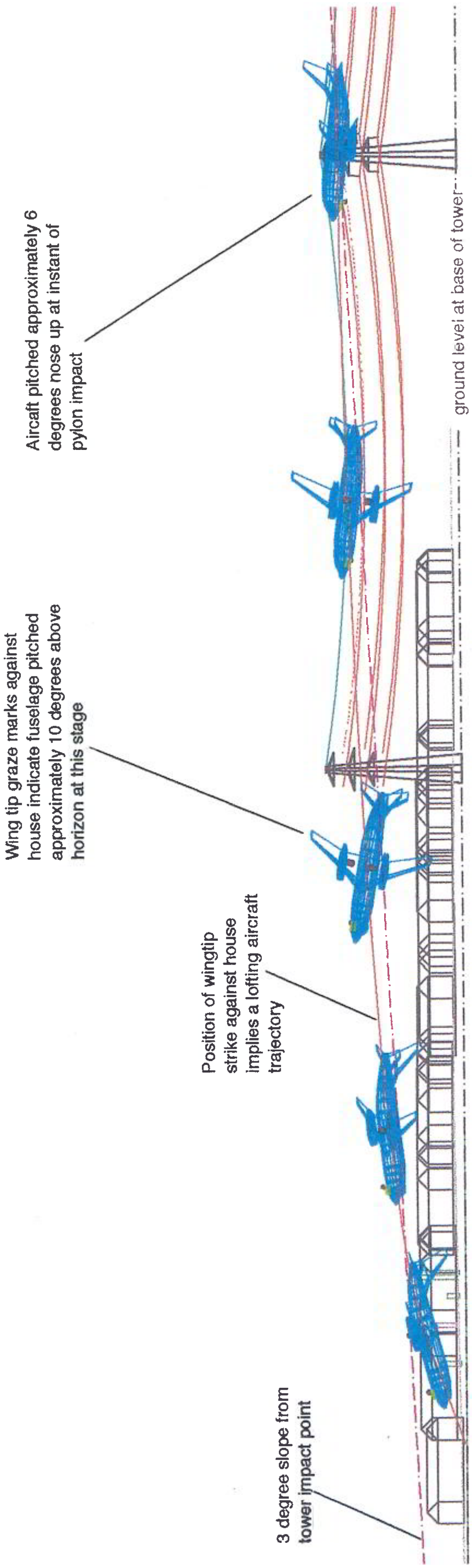

Aircaft pitched approximately 6 degrees nose up at instant of pylon impact
ground level at base of tower
Wing tip graze marks against house indicate fuselage pitched approximately 10 degrees above horizon at this stage
Position of wingtip strike against house implies a lofting aircraft trajectory
3 degree slope from tower impact point

Figure 10

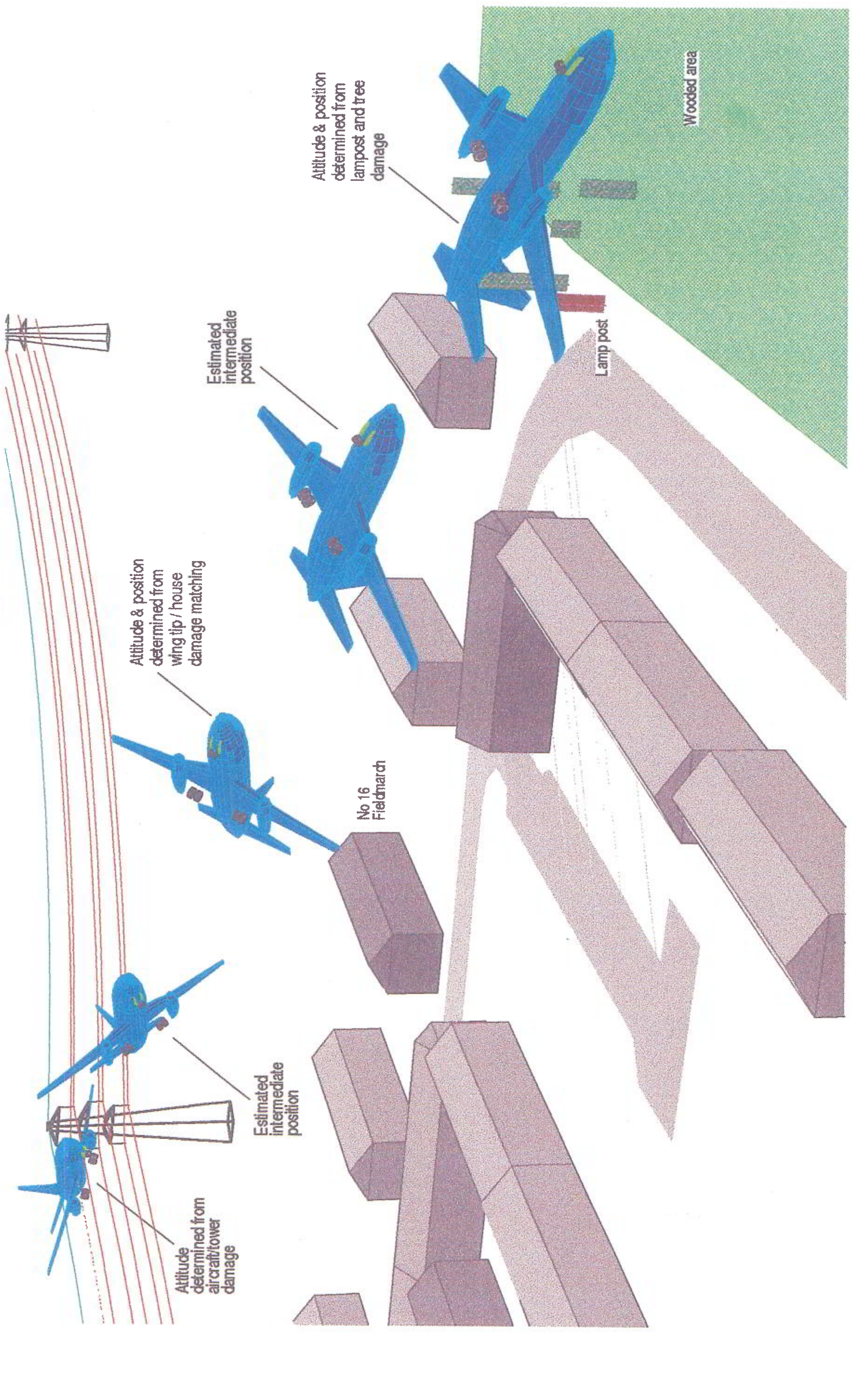

Attitude determined from aircraft/tower damage
Estimated intermediate position
No 16 Fieldmarch
Attitude & position determined from wing tip / house damage matching
Estimated intermediate position
Lamp post
Attitude & position determined from lampost and tree damage
Wooded area

Figure 11

Coventry Runway 23 Approach - Range approx. 2 miles

VIEW OF APPROACH AREA FROM NORMAL GLIDEPATH

VIEW OF APPROACH AREA FROM LOW GLIDEPATH

7T-VEE FLIGHT OPERATIONS

OPERATIONS FROM/TO BOURNEMOUTH AIRPORT

DATE	DAY	DEP TIME	DEPART TO/ARRIVE FROM	ARR TIME
20-Oct	Thu	=	DAAG	1125
20-Oct	Thu	1641	EHAM	2111
21-Oct	Fri	1624	EHAM	2059
25-Oct	Tue	1552	EHAM	1938
26-Oct	Wed	0930	EHAM	1303
26-Oct	Wed	1451	EHAM	1803
26-Oct	Wed	1942	EHAM	2233
27-Oct	Thu	1331	EHAM	1619
27-Oct	Thu	1804	EHAM	2052
28-Oct	Fri	1305	EHAM	1537
29-Oct	Sat	0719	EGPK/LIMC	1714
29-Oct	Sat	1901	EHAM	2201
30-Oct	Sun	0741	DAAG	=
31-Oct	Mon	=	DAAG	0904
1-Nov	Tue	1250	EHAM	1548
1-Nov	Tue	1726	EHAM	2015
2-Nov	Wed	0805	EHAM	1128
2-Nov	Wed	1900	EHAM	=

OPERATIONS FROM/TO COVENTRY AIRPORT

DATE	DAY	DEP TIME	DEPART TO/ARRIVE FROM	ARR TIME
2-Nov	Wed	=	EHAM	2232
5-Nov	Sat	1044	EHAM	1332
5-Nov	Sat	1543	EHAM	1810
5-Nov	Sat	1955	EHAM	=
6-Nov	Sun	=	EHAM	0944
10-Nov	Thu	0519	EGLL	=
14-Nov	Mon	=	DAAG	1700
14-Nov	Mon	1756	LFRN/LFRU	2126
15-Nov	Tue	0930	EHAM	1219
15-Nov	Tue	1357	EHAM	1637
16-Nov	Wed	0950	LFRS	1347
16-Nov	Wed	1614	LFRS	2022
17-Nov	Thu	0730	LFRS	1048
17-Nov	Thu	1251	LFRS	1610
17-Nov	Thu	1837	LFRN	2123
18-Nov	Fri	0741	LFRN	1226
18-Nov	Fri	1359	LFRS	1723
18-Nov	Fri	1930	LFRN	2221
19-Nov	Sat	0500	EHAM	0748
19-Nov	Sat	0938	LFRN	1241
21-Nov	Mon	1038	LFRS	1337
21-Nov	Mon	1634	EHAM	1926
22-Nov	Tue	1022	LFRS	1316
22-Nov	Tue	1342	LFRS/LFRN	1842
23-Nov	Wed	1119	LFRN	1505
23-Nov	Wed	1644	LFRN	1957
23-Nov	Wed	2121	LFRN	=
24-Nov	Thu	=	LFRN	0036
24-Nov	Thu	0747	LFRN	1046
24-Nov	Thu	1101	LFRN	1438
24-Nov	Thu	1634	LFRN	1926
24-Nov	Thu	2103	LFRN	=
25-Nov	Fri	=	LFRN	0001

7T-VEE FLIGHT OPERATIONS

DATE	DAY	DEP TIME	DEPART TO/ARRIVE FROM	ARR TIME
25-Nov	Fri	0647	EHAM	0942
25-Nov	Fri	1024	LFRN	1413
25-Nov	Fri	1456	LFRN	1846
25-Nov	Fri	2009	LFRN	2325
26-Nov	Sat	0032	LFRN	0322
26-Nov	Sat	0439	EHAM	0658
26-Nov	Sat	0819	LFRN	1101
26-Nov	Sat	1341	EGLL	=
28-Nov	Mon	=	DAAG	0934
30-Nov	Wed	0807	EHAM	1143
30-Nov	Wed	1315	EHAM	1623
30-Nov	Wed	1829	LFRN	2142
1-Dec	Thu	0847	LFPO/LFRS	1727
1-Dec	Thu	1828	EHAM	2114
2-Dec	Fri	0031	EHAM	1212
2-Dec	Fri	1318	EHAM	1557
2-Dec	Fri	1724	EHAM	2043
3-Dec	Sat	0501	LFRN	0806
3-Dec	Sat	0953	EHAM	1305
3-Dec	Sat	1350	EGLL	=
4-Dec	Sun	=	DAAG	1859
5-Dec	Mon	0837	LFRN	1116
5-Dec	Mon	1238	LFRN	1528
5-Dec	Mon	1719	EHAM	2014
5-Dec	Mon	2119	LFRN	=
6-Dec	Tue	=	LFRN	0002
6-Dec	Tue	0511	LFRN	0813
6-Dec	Tue	0931	LFRN	1210
6-Dec	Tue	1332	EHAM	1642
6-Dec	Tue	1743	EHAM	2111
7-Dec	Wed	0250	LFRN	0438
7-Dec	Wed	0911	LFRN	1224
7-Dec	Wed	1417	EHAM	1722
7-Dec	Wed	1903	EHAM	2311
8-Dec	Thu	0104	EHAM	0359
8-Dec	Thu	0817	EHAM	1147
8-Dec	Thu	1522	LFRN	1827
8-Dec	Thu	2011	LFRN	=
9-Dec	Fri	=	LFRN	0010
9-Dec	Fri	0127	EHAM	0429
9-Dec	Fri	0548	LFRN	0938
9-Dec	Fri	1051	LFRN	1349
9-Dec	Fri	1511	LFRN	1734
9-Dec	Fri	1830	LFRN	2119
10-Dec	Sat	0303	EHAM	0546
10-Dec	Sat	0702	EHAM	0954
10-Dec	Sat	1206	EHAM	1456
10-Dec	Sat	1552	LFRN	1833
10-Dec	Sat	1941	EHAM	=
12-Dec	Mon	=	EHAM	0730
12-Dec	Mon	0928	LFRN	1219
12-Dec	Mon	1354	LFRN	1651
12-Dec	Mon	1751	EHAM	2043
13-Dec	Tue	0032	EHAM	0435
13-Dec	Tue	0555	EHAM	0853
13-Dec	Tue	0936	LFRN	1229
13-Dec	Tue	1328	LFRN	1611
13-Dec	Tue	1724	LFRN	2020

7T-VEE FLIGHT OPERATIONS

DATE	DAY	DEP TIME	DEPART TO/ARRIVE FROM	ARR TIME
14-Dec	Wed	0215	EHAM	0513
14-Dec	Wed	0627	EHAM	0954
14-Dec	Wed	1026	EHAM	1312
14-Dec	Wed	1412	LFRN	1645
14-Dec	Wed	1809	EHAM	2056
15-Dec	Thu	0137	EHAM	0415
15-Dec	Thu	0546	EHAM	0846
15-Dec	Thu	0952	LFRN	1258
15-Dec	Thu	1422	EHAM	1807
15-Dec	Thu	1926	LFRN	2231
16-Dec	Fri	0119	EHAM	0428
16-Dec	Fri	0622	LFRN	0857
16-Dec	Fri	0953	LFRN	1224
16-Dec	Fri	1329	LFRN	1618
16-Dec	Fri	1805	EHAM	2038
16-Dec	Fri	2205	EHAM	=
17-Dec	Sat	=	EHAM	0029
17-Dec	Sat	0207	EHAM	0448
17-Dec	Sat	0606	EHAM	0837
17-Dec	Sat	0956	LFRN	1225
17-Dec	Sat	1357	LFRN	1619
17-Dec	Sat	1730	EHAM	=
18-Dec	Sun	=	EHAM	1009
18-Dec	Sun	1328	DAAG	=
19-Dec	Mon	=	DAAG	1218
19-Dec	Mon	1325	LFRN	1602
19-Dec	Mon	1729	LFRN	1958
20-Dec	Tue	0116	EHAM	0355
20-Dec	Tue	0517	EHAM	0833
20-Dec	Tue	0930	EHAM	1206
20-Dec	Tue	1323	EHAM	1559
20-Dec	Tue	1727	LFRN	2014
21-Dec	Wed	0059	EHAM	0342
21-Dec	Wed	0452	EHAM	0735

KEY

CODE	AIRPORT
DAAG	ALGIERS
EHAM	AMSTERDAM
EGLL	LONDON HEATHROW
EGPK	PRESTWICK
LIMC	MILAN
LFRN	RENNES
LFRS	NANTES
LFPO	PARIS - ORLY
LFRU	MORLAIX

Public Safety Zones

Public Safety Zones (PSZs) were first introduced in 1958. They are established by the Department of Transport (DOT) at specified major airports in order to prevent any build-up of population in areas where there is a greater risk of an aircraft accident. The CAA acting on behalf of the DOT generally advises against the grant of planning permission for developments which are likely to increase significantly the numbers of persons residing, working or congregating in these zones. The advice given is formulated in accordance with policy directions from the DOT. Zones are included in the uncoloured areas in official safeguarding maps for aerodromes where PSZs are established. Aerodrome owners concerned and appropriate local authorities have been notified by the DOT of the grid reference co-ordinates defining each PSZ, which broadly coincides with the shape of the instrument approach funnel, and extends for a distance of 1,000 metres, or 1,372 metres, from the end of the runway or planned extension, depending upon the level of movements at the aerodrome concerned. As originally conceived, a PSZ was 1,372 metres long, but such PSZs are now only established at the ends of major runways of busy aerodromes having an annual total of 45,000 or more specified movements. In January 1982 the DOT introduced a Standard PSZ 1,000 metres long. This reduction in length reflected the improved accident safety record experienced, and is applied at less busy aerodromes which have reached a minimum of 1,500 and have a potential for 2,500 specified movements a month. For PSZ purposes, a specified movement is taken to include all commercial and military movements, other than by light training types, but to exclude local pleasure, private, aero club and official flights as detailed in CAA Monthly Statistics. PSZ requirements bear no relation to the normal CAA aerodrome licensing process.

MET OBSERVATION PERIODS, BROADCAST FACILITIES, AIRCRAFT MOVEMENTS AND PSZ STATUS

AIRPORT	MET OBS PERIOD (mins)	MET BROADCAST FACILITIES	1994 AIR TRANSPORT MOVEMENTS	1994 TOTAL MOVEMENTS	CURRENT PSZ STATUS
HEATHROW	30	LM,SC,AT	411608	424557	L
GATWICK	30	LM,LN,AT	181879	191646	L
MANCHESTER	30	LM,LN,AT	145549	169908	L
ABERDEEN	30	SC,AT	79984	103056	L
GLASGOW	30	LM,SC,AT	75986	95482	L
BIRMINGHAM	30	LS,AT	71068	95278	S
EDINBURGH	30	SC,AT	61080	110265	L
STANSTED	30	LM,AT	57670	75261	L
JERSEY	30	LS,AT	49018	81308	-
GUERNSEY	30	AT	39850	61131	-
NEWCASTLE	30	LN,AT	37153	74507	S
EAST MIDLANDS	30	LN,AT	32954	61525	S
BELFAST INTL	30	SC,AT	32877	88325	-
BELFAST CITY	60	-	31938	40197	-
BRISTOL	30	LS,AT	26141	51598	S (NEW)
SUMBURGH	30	SC,AT	23326	27966	-
SOUTHAMPTON	30	LS,AT	23314	57876	S
LEEDS/BRADFORD	30	LN,AT	23002	49737	S (NEW)
LIVERPOOL	30	LN	20676	80223	S
ISLE OF MAN	30	LN	17516	39991	-
LUTON	30	LS,AT	17161	41588	S
LONDON CITY	30	-	16970	17341	VS
CARDIFF	30	LS,AT	16203	55742	S (NEW)
TEES-SIDE	30	LN	14489	55311	-
HUMBERSIDE	60	AT	12018	35633	-
ISLES OF SCILLY	60	-	10304	11425	-
EXETER	30	-	10198	51745	-
KIRKWALL	30	-	9198	11825	-
ALDERNEY	30	-	8559	13554	-
BOURNEMOUTH	30	LS,AT	8467	90025	S
NORWICH	30	LS	8128	34008	-
INVERNESS	30	SC	6988	23923	-
COVENTRY	60	-	6949	56683	-
BLACKPOOL	30	LN	6241	45877	-
PLYMOUTH	60	-	5453	26399	-
UNST	60	-	4782	6225	-
STORNOWAY	30	SC	3945	7072	-
WICK	30	-	3661	6007	-
CAMBRIDGE	60	-	3357	48290	-
SOUTHEND	30	LS,AT	3138	51223	S

KEY		PSZ
LM - LONDON VOLMET MAIN	SC - SCOTTISH VOLMET	L - 1372 m
LN - LONDON VOLMET NORTH	AT - ATIS	S - 1000 m
LS - LONDON VOLMET SOUTH		VS - 600 m

Permits to operate flights

With regard to the requirements to be met before an aircraft registered outside the United Kingdom (or, more recently, any member state of the European Union) can be used for cargo operations from an airport within the UK, the Air Navigation Order 1989, as amended, Article 88 paragraph 1 states:

"An aircraft registered in a Contracting State other than the United Kingdom, or in a foreign country, shall not take on board or discharge any passengers or cargo in the United Kingdom where valuable consideration is given or promised in respect of the carriage of such persons or cargo, except with the permission of the Secretary of State granted under this article to the operator or the charterer of the aircraft or to the Government of the country in which the aircraft is registered, and in accordance with any conditions to which such permission may be subject."

The procedure for applying for such a permit, to operate non-scheduled flights for commercial purposes, is outlined in the FAL section of the UK AIP, which section (paragraph 2.1.5.1.3) details the following information which is required to be submitted by the applicant for a Permit, normally giving five full working days notice for a series of two or more flights:

(a) Name of operating company and address to which permit should be sent;
(b) type of aircraft and nationality or registration marks;
(c) date and estimated times of arrival at, and departure from, UK aerodromes;
(d) place of embarkation or disembarkation abroad of freight;
(e) nature of flight, eg freight;
(f) name, address and business of charterer and the nature and amount of freight to be taken.

A note indicates that in considering applications, the DOT has regard to the conditions of such flights which are applicable to similar flights by UK operators.

The following documentary evidence requirements are also listed therein in respect of non-scheduled commercial operations:

(Para. 2.1.1.1.1) The Department of Transport will require evidence that the operating company is considered by the national authority of the State of registry of the aircraft to be operationally competent to undertake the type of flight concerned.
(ie holds a Certificate of Competency - referred to as an Air Operator's Certificate)

(Para. 2.1.1.2) The Department of Transport will require evidence that the aircraft to be operated is considered by the national authority of the State of registry of the aircraft to be airworthy.
(ie holds a current Certificate of Airworthiness)

(Para. 2.1.1.3) The Department of Transport will require evidence that the operating company of the aircraft has entered into adequate insurance arrangements in respect of the aircraft to be operated.
(ie holds a valid Certificate of Insurance)

Aerodrome Operating Minima - Notification Requirements

The following technical requirement is specified in the AIP, FAL section, detailing the procedures for applications to conduct Non-Scheduled Commercial Flights:

Para. 2.1.2.1 Application for permits for non-scheduled flights should include details of Aerodrome Operating Minima (see para. 1.13) for aircraft and aerodromes concerned where this information has not been previously notified to the CAA Flight Operations Inspectorate.

The following information is presented earlier in the FAL section regarding Aerodrome Operating Minima:

Para. 1.13.1 Articles 32 and 32A of the Air Navigation Order 1989 as amended, state that neither public nor non-public transport aircraft registered in a country other than the United Kingdom shall commence or continue an approach to landing at an aerodrome in the United Kingdom if the runway visual range for the relevant runway and approach aid at that aerodrome is less than the operator's specified minimum, unless:

(a) The aircraft is below decision height; and
(b) the specified visual reference has been established at decision height and is maintained.

Para 1.13.1.1 A copy of this prohibition, which must be included in instructions to crews, must be submitted to the Civil Aviation Authority with aerodrome operating minima.

Para 1.13.2 Each operator is asked to ensure that details of specific minima for Category 1 operations will reach the CAA at least 7 working days before the date(s) of the proposed flight(s) so that the operator can be advised of any amendments necessary to meet United Kingdom safety requirements.

Details of these minima are thus required to be forwarded to the Flight Operations Department of the CAA at Gatwick Airport in advance of the proposed flights.

The "specified visual reference" referred to above is intended to mean that reference as defined in the particular operator's Operations Manuals. This definition is included in the text of the relevant article in the Air Navigation Order, but is not reproduced in the AIP, FAL section.

COVENTRY, UK EGBE (11-1) JEPPESEN

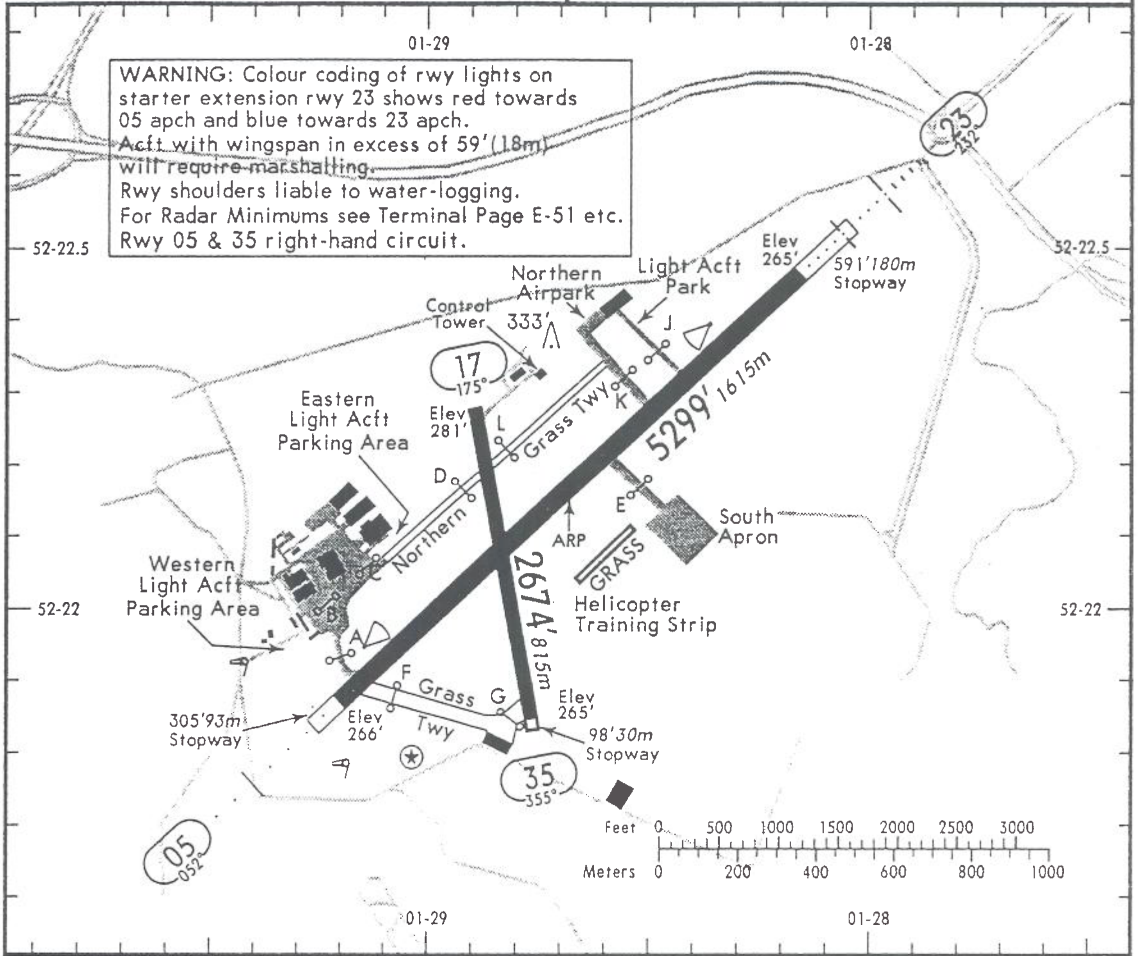
COVENTRY

N52 22.2 W001 28.7 088.5°/6.8 From HON 113.65

Elev **281'** *Var* 05°W

*COVENTRY Ground **121.7** (Instructed by ATC)

*Tower **124.8 119.25**



ADDITIONAL RUNWAY INFORMATION

RWY		USABLE LENGTHS — LANDING BEYOND Threshold	Glide Slope	TAKE-OFF	WIDTH
05 / 23	HIRL HIALS PAPI-L (angle 3.0°) RVR		4396' *1340m*	❶	151' *46m*
17 / 35					98' *30m*

❶ Additional 689'(210m) are available for take-off if using starter extension. Total take-off length: 5988'(1825m). Starter extension not available to acft with under-slung engines.

■ TAKE-OFF

	AIR CARRIER Rwy 05/23 HIRL	Rwy 17/35
A	RVR *250m*	*400m*
B	RVR *300m*	*400m*
C	RVR *300m*	NOT APPLICABLE
D	RVR *400m*	NOT APPLICABLE

■ UK auth: refer to TERMINAL page UNITED KINGDOM-1 etc.

CHANGES: Noise abatement proc transferred to 10-3.

RADAR LANDING MINIMUMS (cont'd)

LOCATION (Airport)	PROCEDURE TYPE, RWY	OCL/OCA (H) QNH (QFE)	LOWEST STRAIGHT-IN LANDING MINIMUMS	
			DA (H) MDA (H)	VISIBILITIES
UNITED KINGDOM (cont'd)				
CONINGSBY	PAR 08(2.5°)	#A: 222'(200')	222'(200')	1200m
		#B: 222'(200')	232'(210')	1200m
		#C: 222'(200')	242'(220')	1200m
		#D: 222'(200')	252'(230')	1200m
	PAR 08(3.0°)	#A: 222'(200')	252'(230')	1200m
		#B: 222'(200')	262'(240')	1200m
		#C: 222'(200')	272'(250')	1200m
		#D: 222'(200')	282'(260')	1200m
	PAR 26(2.5°)	#A: 225'(200')	225'(200')	R 720m V 800m
		#B: 225'(200')	235'(210')	R 720m V 800m
		#C: 225'(200')	245'(220')	R 720m V 800m
		#D: 225'(200')	255'(230')	R 720m V 800m
	PAR 26(3.0°)	#A: 225'(200')	255'(230')	R 720m V 800m
		#B: 225'(200')	265'(240')	R 720m V 800m
		#C: 225'(200')	275'(250')	R 720m V 800m
		#D: 225'(200')	285'(260')	R 720m V 800m
	PAR 08 Tmn 1 Azimuth only	#312'(290')	320'(298')	ABC: 1200m D: R 1500m V 1600m
	PAR 26 Tmn 0.5 Azimuth only	#345'(320')	350'(325')	ABC: 800m D: R 1500m V 1600m
	ASR 08 Tmn 1	#342'(320')	350'(328')	ABC: 1200m D: R 1500m V 1600m
	ASR 26 Tmn 1	#345'(320')	350'(325')	ABC: 800m D: R 1500m V 1600m
CAUTION: PAR 08 Azimuth only & ASR 08 include stepdown fix at 3.0 NM. Do not descend below 410'(388') until advised by ATC. PAR 26 Azimuth only & ASR 26 include stepdown fix at 3.0 NM. Do not descend below 420'(395') until advised by ATC.				
# RAF DH/MDA				
COVENTRY*	SRA 05 Tmn 0.5	616'(350')	620'(354')	ABC: 1200m D: R 1500m V 1600m
	SRA 05 Tmn 1	616'(350')	620'(354')	ABC: 1200m D: R 1500m V 1600m
	SRA 05 Tmn 2	916'(650')	920'(654')	ABC: 1500m D: R 1500m V 1600m
	SRA 23 Tmn 0.5	635'(370')	640'(375')	ABCD: R 1500m V 1600m
	SRA 23 Tmn 1	635'(370')	640'(375')	ABCD: R 1500m V 1600m
	SRA 23 Tmn 2	915'(650')	920'(655')	ABCD: R 1500m V 1600m
SRA 05 Tmn 0.5: Pass FAF 4.5 NM at 1670'(1404') or above.				
SRA 05 Tmn 1: Pass FAF 5.0 NM at 1820'(1554') or above.				
SRA 05 Tmn 2: Pass FAF 5.0 NM at 1820'(1554') or above.				
SRA 23 Tmn 0.5: Pass FAF 4.5 NM at 1670'(1405') or above.				
SRA 23 Tmn 1: Pass FAF 5.0 NM at 1820'(1555') or above.				
SRA 23 Tmn 2: Pass FAF 5.0 NM at 1820'(1555') or above.				
All SRA: Descent Gradient 4.9%.				

Aerodrome Operating Minima (AOM) requirements

The AOM for the conduct of an instrument approach to landing consists of three distinct parts, namely:

(a) a minimum height down to which the aircraft may be flown without visual reference to the landing runway or approach lighting;
(b) the precise visual reference required for landing, which must be attained by the end of the published approach procedure, and;
(c) a minimum visibility required to exist before commencing the approach procedure.

For a Precision Approach (eg ILS, MLS, PAR etc which have electronic glidepath guidance), the Decision Height (DH) is the height at which a missed approach must be initiated if the required visual reference to continue the approach has not been established.

For a non-precision approach (eg VOR, NDB, SRA etc where there is no electronic glidepath guidance), the Minimum Descent Height (MDH) is the height below which descent may not be made without the required visual reference.

The visual reference is defined in the AIP as "a view of the section of the runway and/or the approach area and/or their visual aids, which the pilot must see in sufficient time to assess whether or not a safe landing can be made from the type of approach being conducted."

The final element of AOM is the RVR. On reaching the DH/MDH after an instrument approach, the pilot must have a reasonable chance of being able to complete the approach to a manual landing by visual reference to ground features. The visibility required to achieve a landing will increase with a higher value of DH/MDH. An improved chance of landing will be obtained if high intensity lights are in use at the aerodrome. Therefore, for each DH/MDH, there is a corresponding RVR depending upon the type of approach and runway lighting in use. If the weather at the aerodrome includes an RVR worse than this minimum there is not a reasonable prospect of achieving a landing and consequently the pilot shall not commence or continue the approach to landing.

The Jeppesen Airway Manual defines the "Required Visual Reference" as follows: "When conducting an instrument approach procedure, the pilot shall not operate an aircraft below the prescribed MDH or continue an approach below the DH, unless the aircraft is in a position from which a normal approach to the runway of intended landing can be made and at least one of the following visual references is clearly visible to the pilot:

(a) Runway, runway markings, or runway lights.
(b) Approach lights.
(c) Threshold, threshold markings, or threshold lights.
(d) Touchdown zone, touchdown zone markings, or touchdown zone lights.
(e) Visual glide path indicator (such as VASI, PAPI).
(f) Any other feature which clearly identifies the landing surface."

AFTER TAKE-OFF

Air Cond & Press	SET
Start Switches	OFF
Gravel Protec Switch	OFF
Landing Gear	UP & OFF
Flaps	UP & OFF
Altimeters	1013,2
Inboard Landing Lights (5000 FT)	OFF

DESCENT - APPROACH

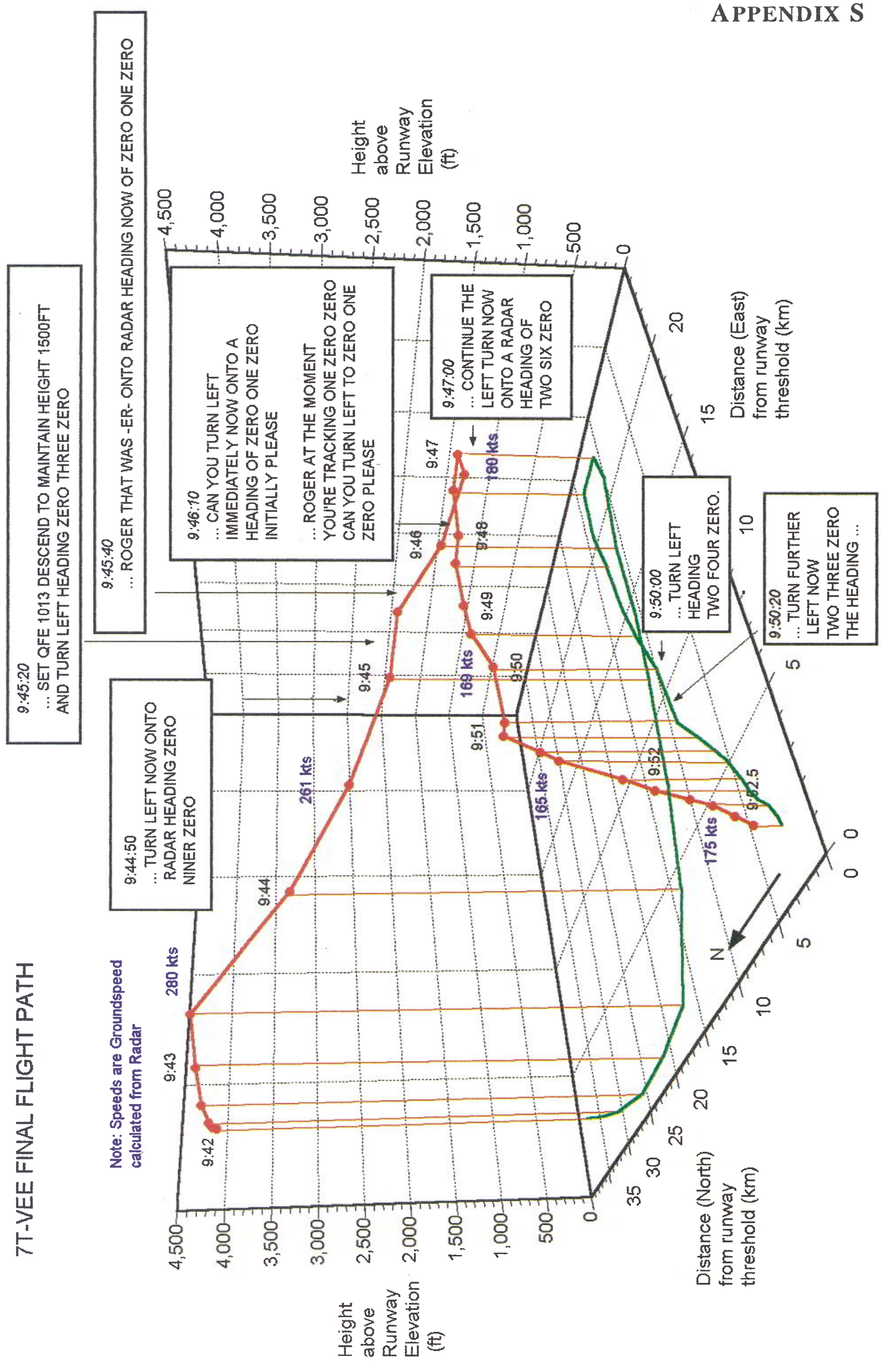
Loose Objets	SECURE
Approoch Briefing	REVIEWED
Anti-Ice	CLOSED/OPEN
Air Cond & Press	SET
Star Switches	LOW IGN
Gravel Proted Switch	AS REQUIRED
Altimeters & Instruments	SET & CHECKED
EPR & IAS Bugs	CHECKED & SET
Inboard Landing Lights (5000 FT)	ON

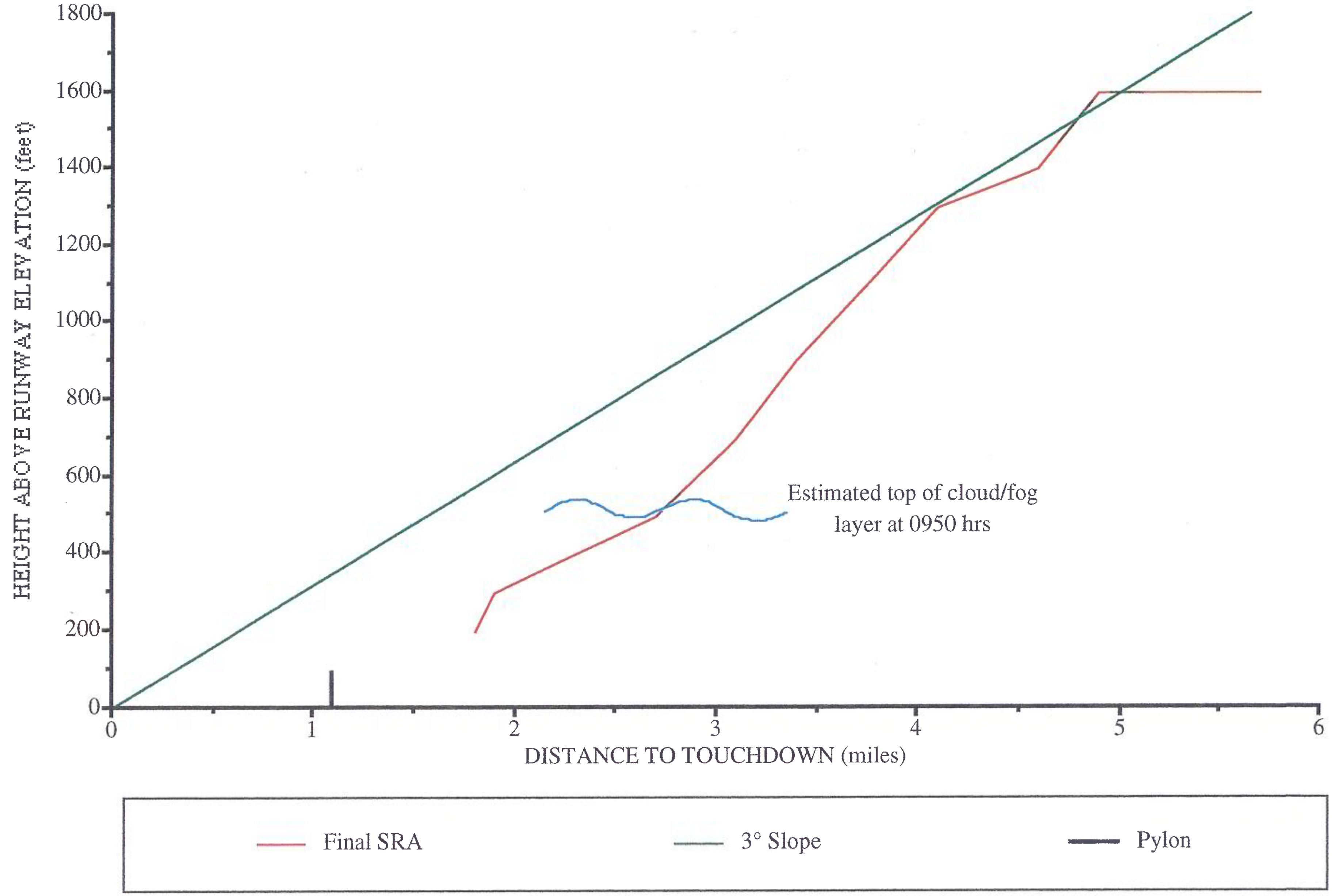
LANDING

Recall	CHECKED
Speed Brake	ARMED, GREEN LIGHT
Landing Gear	DOWN 3 GREEN
Flaps	GREEN LIGHT
Altimeters	CHECKED

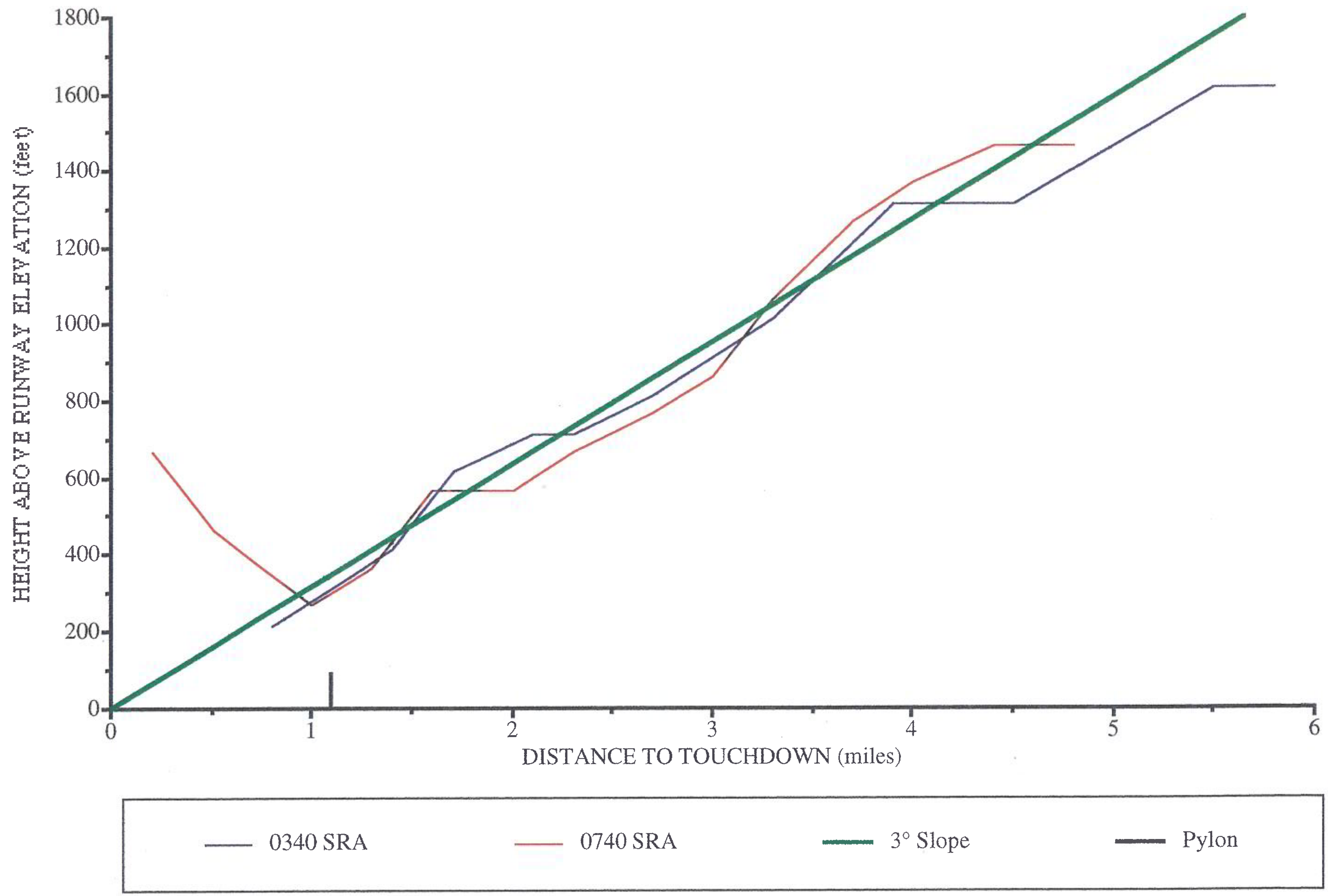
FLIGHT PHASE/CONDITION:	NON-HANDLING PILOT CALLS:
CLIMB AND DESCENT:	
1,000 feet above/below assigned altitude	"1,000 feet to level off"
DESCENT:	
5,000 feet MSL	"5,000 feet, landing lights on"
1,000 feet above initial approach altitude	"1,000 feet above initial
FINAL APPROACH:	
Final fix inbound (altimeter, instrument and flag crosscheck)	"At beacon, VOR, etc ____ feet," "altimeters and instruments crosschecked"
500 feet above field elevation (altimeter, instruments and flag crosscheck)	"500 feet above field," "altimeters and instruments crosschecked"
After 500 feet above field elevation	(Call out significant deviations from programmed airspeed, descent and instrument indications)
100 feet above minimums	"100 feet above minimums"
Minimum altitude (DH or MDH)	"Minimums, runway in sight" (or "no runway in sight")

AIR ALGERIE STANDARD ALTIMETER CHECKING PROCEDURES

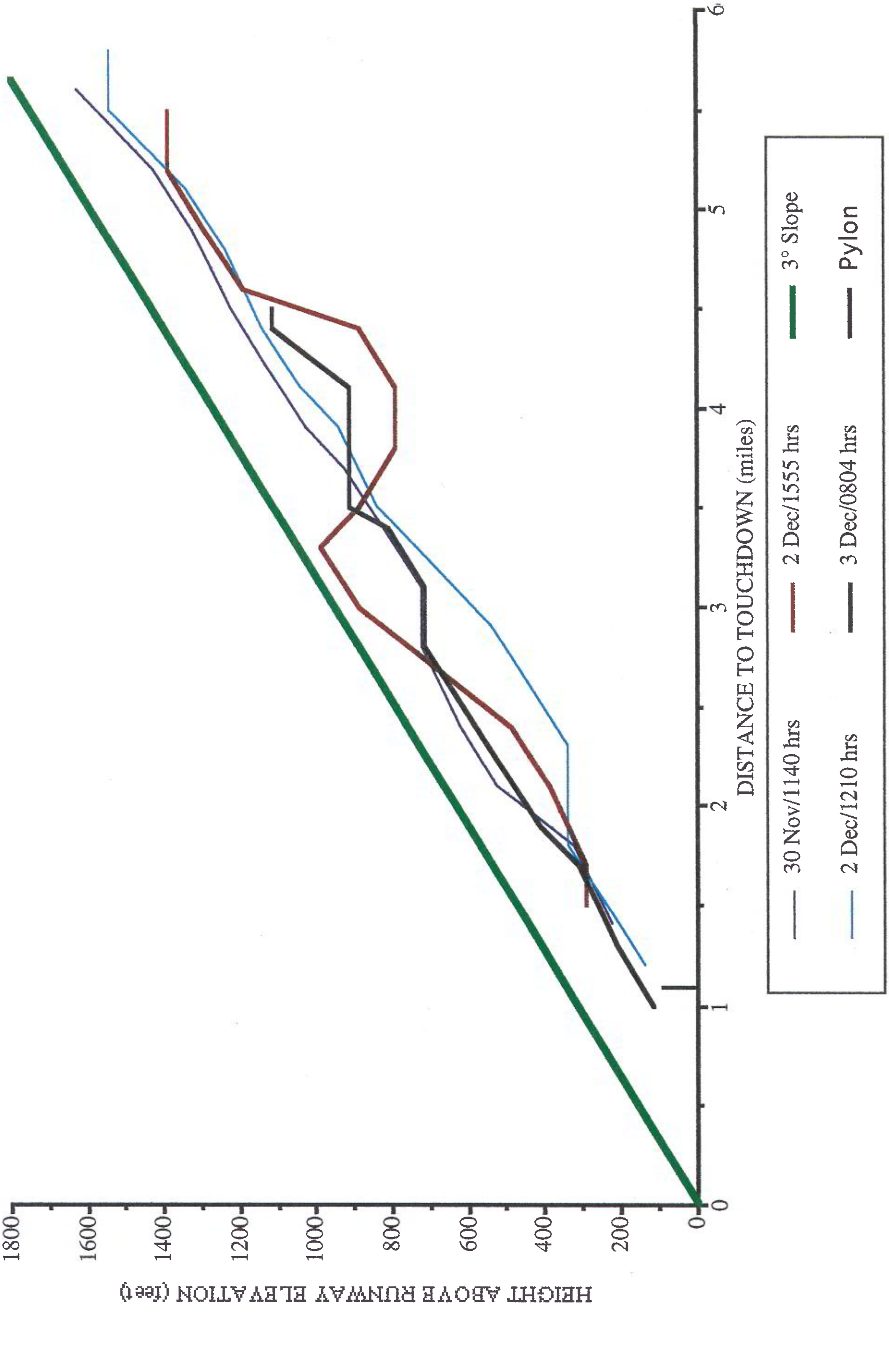

7T-VEE FINAL FLIGHT PATH
Note: Speeds are Groundspeed calculated from Radar
9:45:20 ... SET QFE 1013 DESCEND TO MAINTAIN HEIGHT 1500FT AND TURN LEFT HEADING ZERO THREE ZERO
9:45:40 ... ROGER THAT WAS -ER- ONTO RADAR HEADING NOW OF ZERO ONE ZERO
9:44:50 ... TURN LEFT NOW ONTO RADAR HEADING ZERO NINER ZERO
9:46:10 ... CAN YOU TURN LEFT IMMEDIATELY NOW ONTO A HEADING OF ZERO ONE ZERO INITIALLY PLEASE
... ROGER AT THE MOMENT YOU'RE TRACKING ONE ZERO ZERO CAN YOU TURN LEFT TO ZERO ONE ZERO PLEASE
9:47:00 ... CONTINUE THE LEFT TURN NOW ONTO A RADAR HEADING OF TWO SIX ZERO
9:50:00 ... TURN LEFT HEADING TWO FOUR ZERO.
9:50:20 ... TURN FURTHER LEFT NOW TWO THREE ZERO THE HEADING ...
280 kts
261 kts
180 kts
169 kts
165 kts
175 kts
9:42
9:43
9:44
9:45
9:46
9:47
9:48
9:49
9:50
9:51
9:52
9:52.5
Height above Runway Elevation (ft)
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Distance (North) from runway threshold (km)
35
30
25
20
15
10
5
0
Distance (East) from runway threshold (km)
20
15
10
5
0
N



7T-VEE FINAL SRA - 21 DECEMBER 1994



7T-VEE EARLIER APPROACHES - 21 DECEMBER 1994



PREVIOUS APPROACHES MADE BY 7T-VEE

Attachment to Appendix E

	Phraseology
	Reply not received. If you read (ATSU callsign) turn left/right heading (three digits), I say again turn left/right heading (three digits). If you read (ATSU callsign) Squawk (code). Turn observed. I will continue to pass instructions. Squawk observed, I will continue to pass instructions.
Secondary Radar	Squawk (code). Confirm squawk (code). Recycle (mode) (code). Squawk Ident. Squawk Mayday. Squawk Standby. Squawk Charlie. Check altimeter setting and confirm level. Stop squawk Charlie. Wrong indication. Stop squawk Charlie. Stop squawk Alpha. Stop squawk. Verify your level. Confirm you are squawking assigned code (code assigned to the aircraft by air traffic control). *To verify that 7500 has been set intentionally.*
Radar Approaches	Vectoring for a surveillance radar approach; runway (designation). Vectoring for an ILS approach; runway (designation). Vectoring for a localiser only approach; runway (designation). This is a left/right hand circuit for runway (designation). Position (distance) miles (direction)* of (aerodrome). On left/right base leg (distance) miles (direction)* of (aerodrome). **Direction is to be expressed as a cardinal or intermediate point of the compass.* Closing final approach track from the left/right (distance) miles from touchdown. This turn will take you through (aid) (reason). Taking you through (aid) (reason). If you lose radio contact on this approach (instructions) and contact (ATSU callsign) on (frequency). This approach may be affected by clutter, advise you check the approach with ILS. This approach may be affected by clutter. Missed approach instructions will be passed in good time if necessary. (Type) approach not available due to (reason).

Attachment to Appendix E

	Phraseology
ILS Approaches	Turn left/right heading (three digits), report established on the localiser. Closing the localiser from the left/right; report established. Descend on the ILS, QFE (pressure) millibars. Descend on the ILS, QNH (pressure) millibars, elevation (number) feet. (Distance) miles from touchdown. Height should be (number) feet. Report runway/approach lights in sight. Number (number) contact Tower (frequency). Contact (ATCU callsign) on (frequency) for final approach. After landing contact (ATCU callsign) on (frequency).
SURVEILLANCE RADAR APPROACHES	This will be a surveillance radar approach, terminating at (distance) mile from touchdown. Check your minima, step down fixes and missed approach point. Check wheels.
Azimuth information	Turn left/right (number) degrees, heading (three digits). Closing (final approach) track from the left/right. Heading of (three digits) is good. On track. Slightly left/right of track.
Descent information	Approaching (distance) miles from touchdown – commence descent now to maintain a (number) degree glidepath. (Distance) miles from touchdown – height should be (number) feet Do not reply to further instructions. Check minimum descent height.
Completion	Approach completed, out. Continue visually or go around (missed approach or further instructions).
Breaking off	Turn left/right (number) degrees, heading (three digits) climb to (number) feet (further instructions), acknowledge. Climb immediately, I say again climb immediately on heading (three digits) to altitude (number) feet (further instructions), acknowledge.

Printed in the United Kingdom for HMSO
Dd 301863 C5 1/96 341069 50/34275