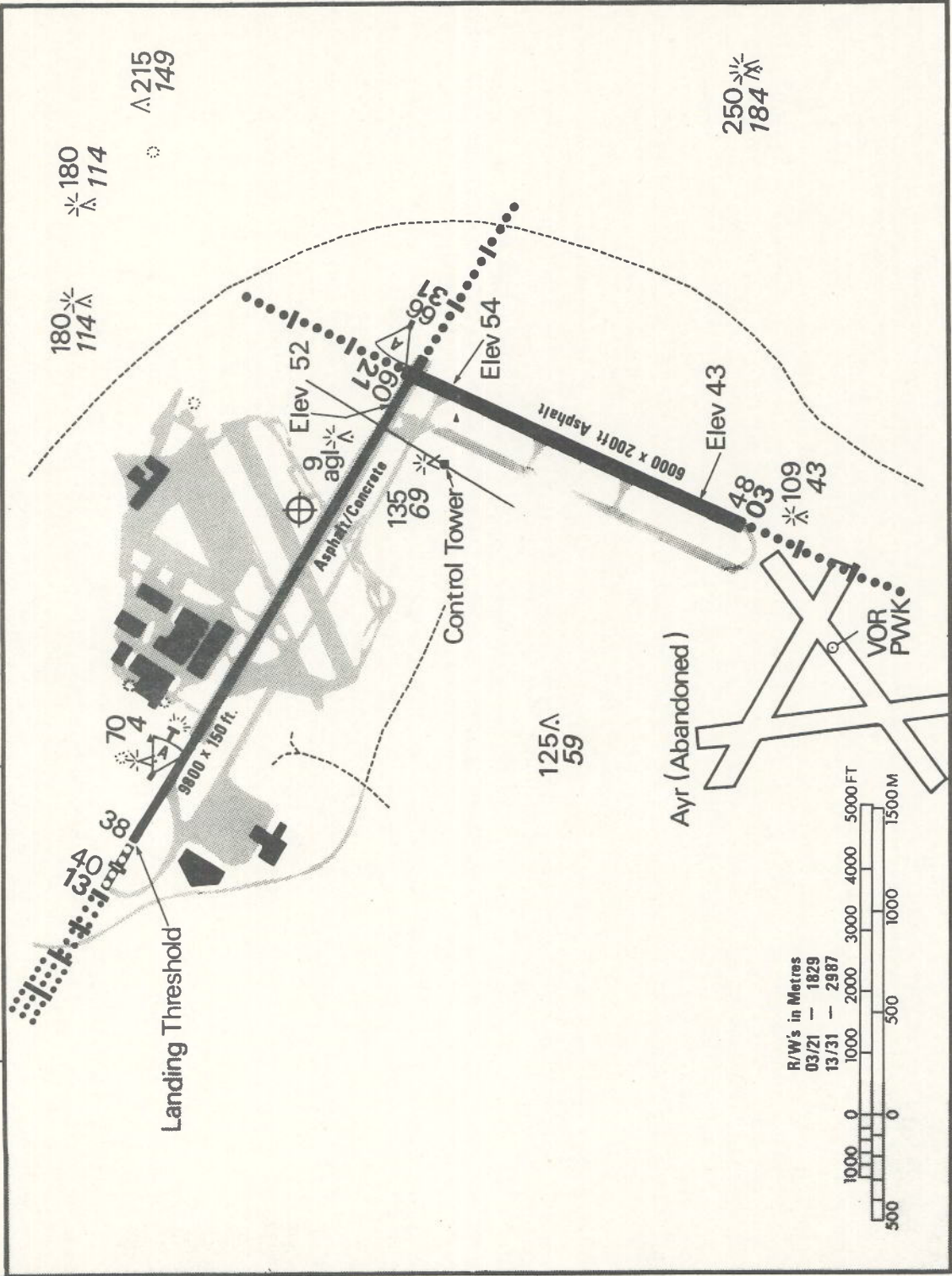
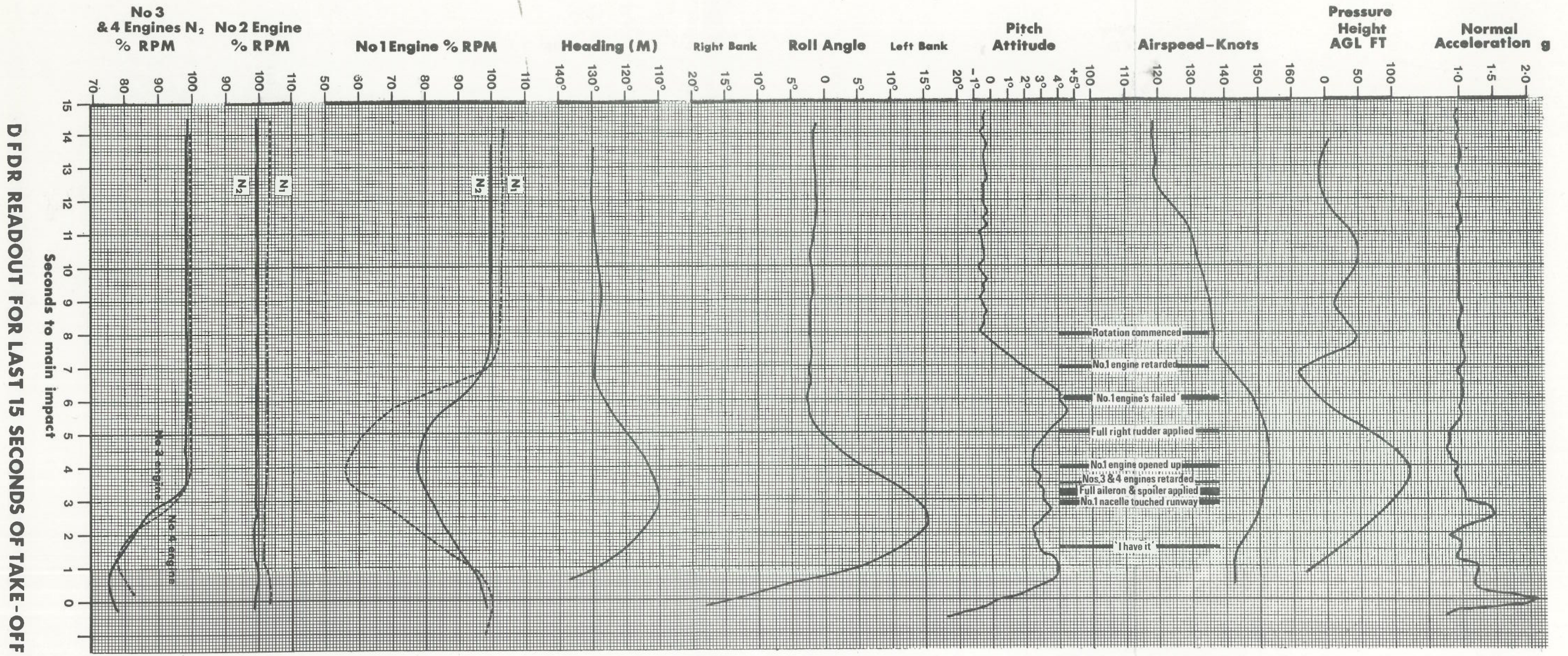


APPENDIX 1  
**PRESTWICK**  
 N55 30.5  
 W004 35.1  
 ELEV 66 FT

PRESTWICK Approach 120.55 257.8	PRESTWICK Tower 118.15 121.5 257.8 243.0
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## The accident sequence – interpretation of data.

An interpretation of evidence from the DFDR correlated with that from the accident site, is as follows:

- (i) The take-off ground roll proceeded normally; at – 8 seconds (ie 8 seconds before the main impact) and at a recorded airspeed of 137 knots ( $V_R$  135 knots), rotation commenced, and continued through the following 2.3 seconds, with the pitch attitude changing from – 0.6° (nose-down) to 4.6° nose-up.
- (ii) At – 7 seconds (1 second after commencement of rotation) No. 1 engine rpm started to reduce and continued to do so over a period of approximately 3 seconds. The roll attitude, which had been at 2° right bank for several seconds prior to rotation, increased to 2½° right bank with the airspeed increasing through 149 knots. Almost coincidentally with the commencement of the engine run-down, the aircraft started to yaw quickly to the left. This was followed one second later by a rapid left roll, reaching 15.4° left bank at – 2½ seconds.
- (iii) During this left roll the airspeed increased to a peak of about 153 knots and then commenced to decrease. The aircraft, which had been heading 129° prior to rotation, yawed slightly to the right and then rapidly to the left to 110° by – 3 seconds.
- (iv) An impact ‘g’ spike of 1.44g coincided with the maximum left bank angle; this was caused by the No. 1 engine nacelle striking the ground.
- (v) Immediately following the strike a rapid yaw and roll to the right started, the aircraft passing through the wings level position just after – 1 second and reaching 17.6° right bank coincident with a second ‘g’ spike of 2.15g. The last recorded value of heading was 137° and of airspeed about 142 knots.  
  
The DFDR was powered by the No. 3 engine bus bar. Therefore the second ‘g’ spike was probably caused by impact of the No. 4 engine, and this was followed immediately by the impact of No. 3 engine and its separation from the aircraft, causing the termination of the record.
- (vi) During the roll manoeuvres the pitch attitude fluctuated between 4.6° nose-up at the end of rotation and between 2.5° and 4° nose-up just prior to the main impact. It then started decreasing rapidly, reaching a minimum value of 2.8° nose-down.
- (vii) No. 1 engine rpm started to increase from a minimum  $N_1$  of 57%,  $N_2$  of 77.5% at – 4 seconds, (1½ seconds after the commencement of the left roll), to reach 100%  $N_1$ , 98%  $N_2$  by the time of the main impact. Nos 3 and 4 engines  $N_2$  rpm decreased from their original settings of 99% and 100% respectively at – 3½ seconds, to 76% and 78% at – 1 second. One second later data points were recorded of 76% and 83% respectively. However, as these coincided with the time of the main impact, their validity is questionable. The No. 2 engine  $N_1$  and  $N_2$  rpm remained at their original settings of 103% and 100% throughout the recording apart from a slight decrease at – 2 seconds which was probably caused by disturbance of the intake airflow due to the rapid yaw to the right. The examination of previous flight recordings showed no anomaly in the operation of the No. 3 engine, and during the taxi out to the runway at the start of the accident flight the readout showed that the engine was responding normally to thrust lever movements.

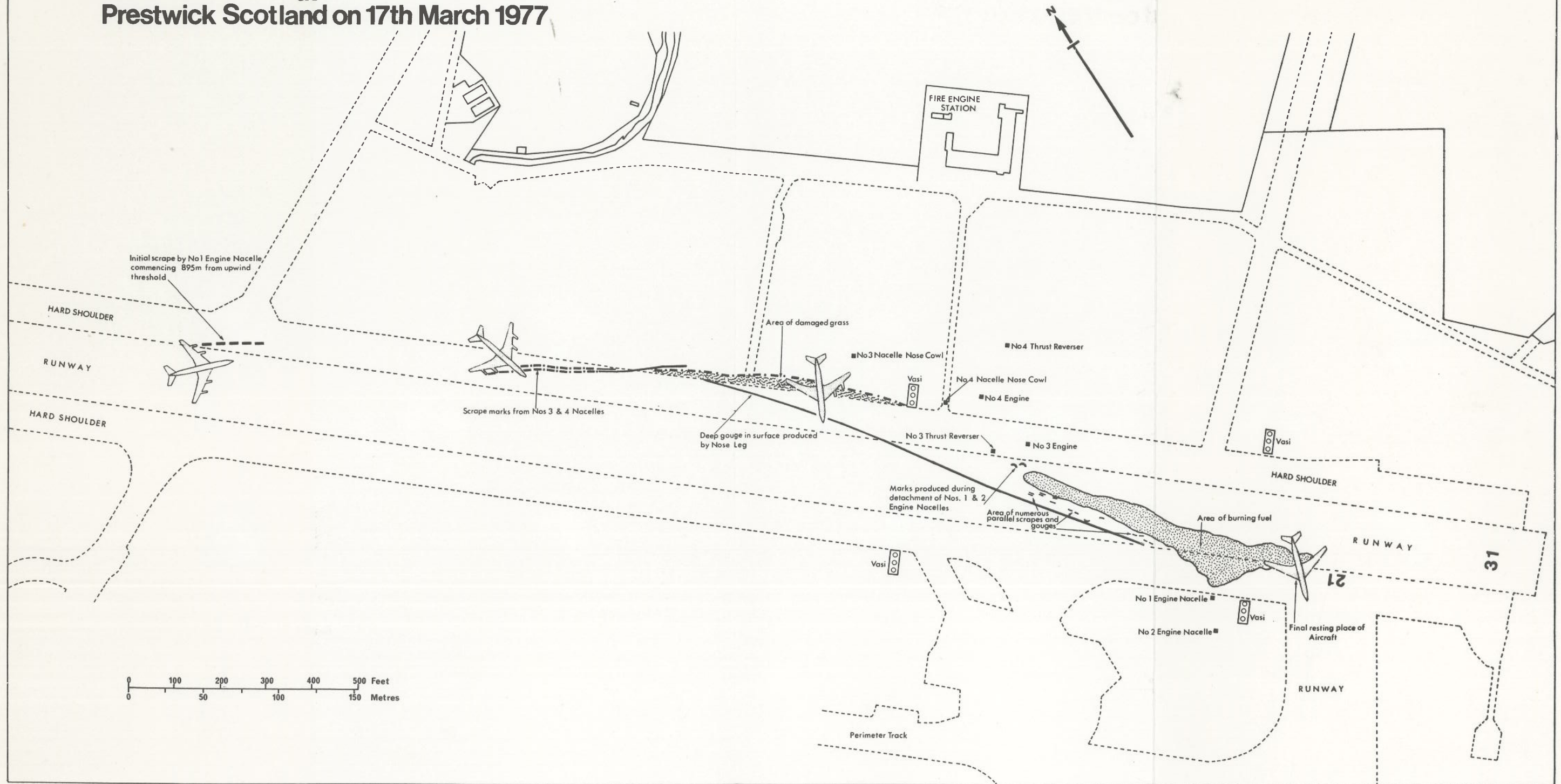
Note: The fluctuations in the height trace are considered to be mainly due to variations in the position error of the static vents due to the yaw which developed; at the point around - 3 seconds, when the No. 1 engine nacelle first touched the runway, the true height can have been only about 10 feet. The recorded airspeed will also have been effected by this static error variation.

## Explanation of method of evaluation of flight recorder data

The basic method used to determine the course of events was to match the known roll and heading history of the flight against the changes in roll and heading which would result from the aerodynamic characteristics of the aircraft in combination with different control inputs and the recorded thrust changes. From the known initial conditions and with the control positions required to give straight flight in the cross wind on all engines, the changes in roll and heading which would follow the simulated engine failure were computed. These changes corresponded very closely for some time with those actually recorded, and then diverged. This divergence was assumed to be due to the initial applications of control, and the amounts of control movement required to produce the divergence were then investigated. It was found that the actual flight history corresponded initially to rudder movement alone. Any significant lateral control input at that time would have produced a different roll history almost immediately, and a different heading trace subsequently. Further investigation showed that while full rudder was applied there was no appreciable roll control movement until, at earliest, about - 3 seconds, just before the first contact with the ground. Full lateral control was being used during the period of flight after the first impact, so that it could have been applied as late as about - 2 seconds.

# Accident to British Airtours Boeing 707 GAPFK at Prestwick Scotland on 17th March 1977

Appendix 3

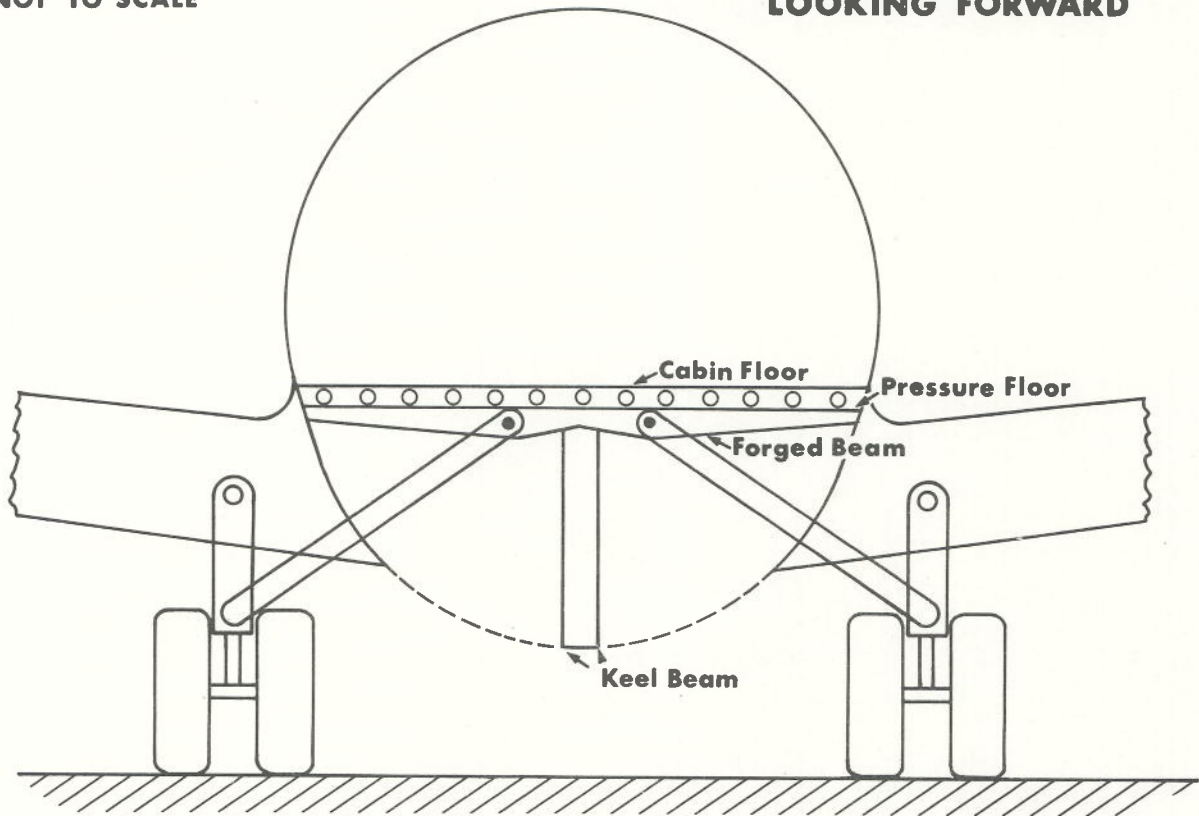


**BOEING 707 G-APFK, PRESTWICK 17 MARCH 1977**

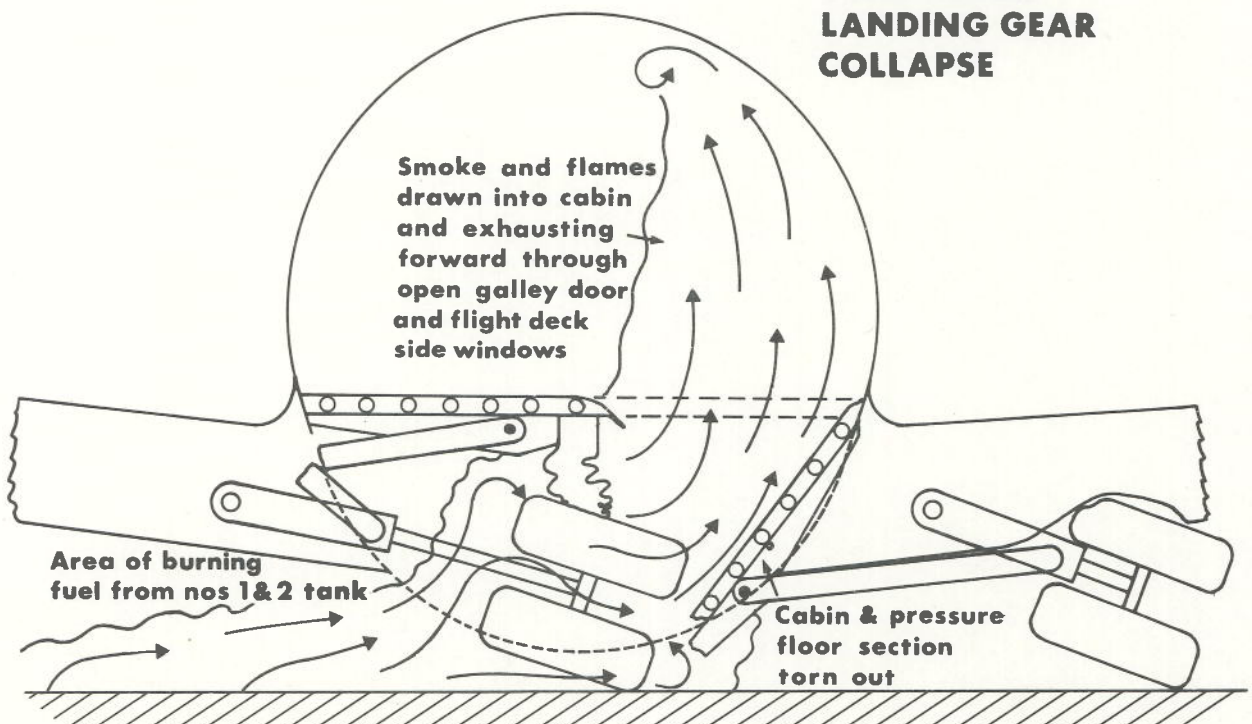
**Schematic View of Fire Spreading to Cabin via Mainwheel Bays and Ruptured Pressure Floor**

NOT TO SCALE

**SECTIONAL VIEW  
LOOKING FORWARD**



**VIEW AFTER  
LANDING GEAR  
COLLAPSE**



### Effect of Bank Angle on VMCA B707-436 Reduced to ISA Sea Level Conditions

