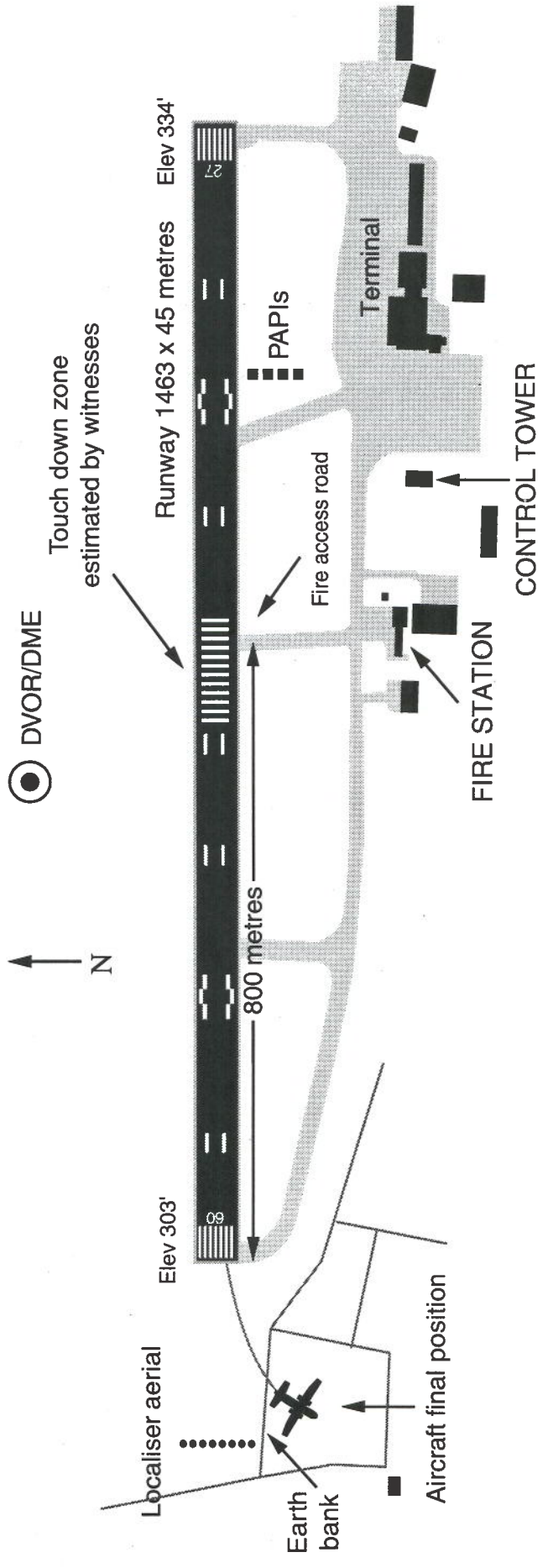
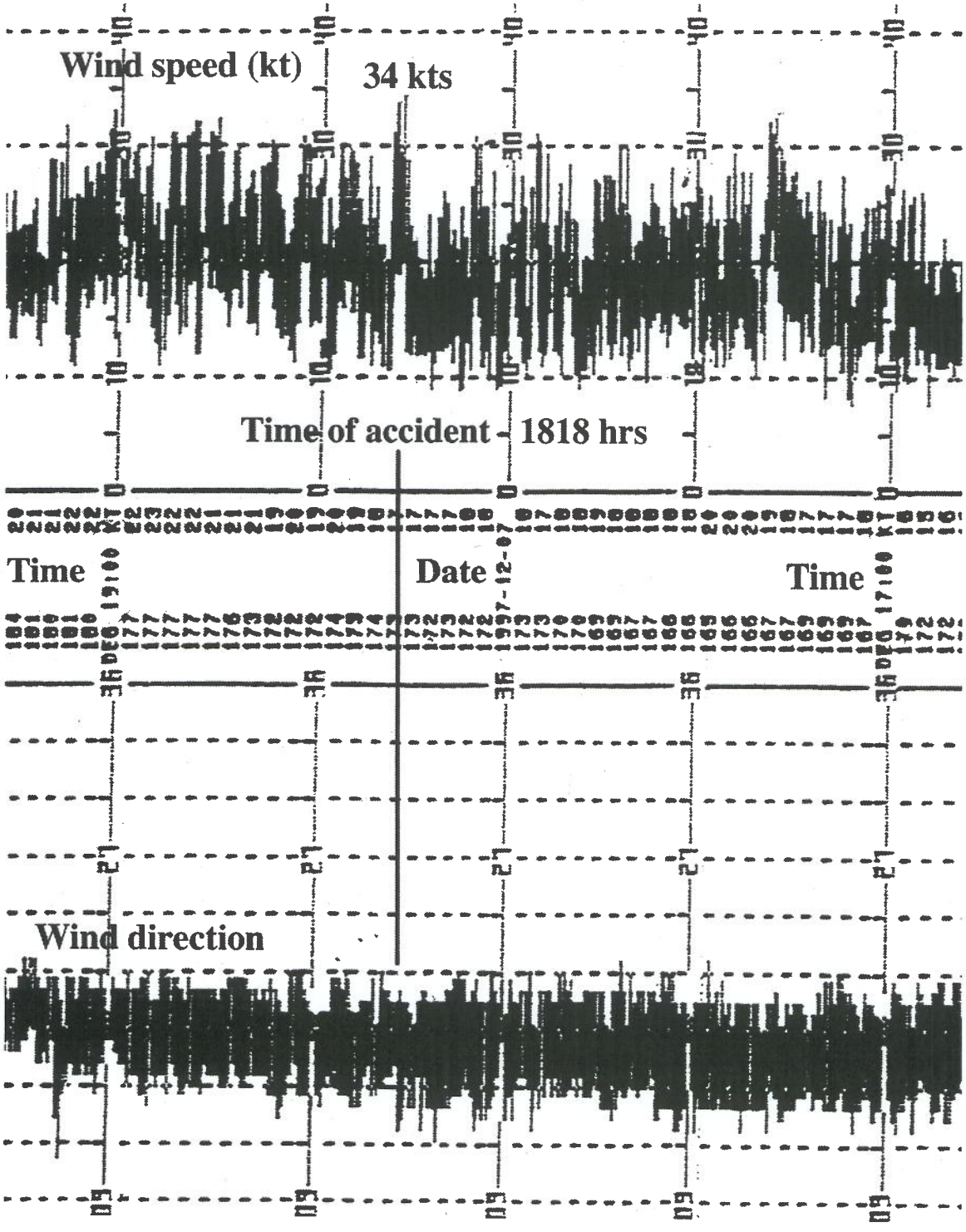
GUERNSEY AIRPORT **APPENDIX 1**

(not to scale)



Wind speed and direction recording for Guernsey Airport on 7 December 1997



APPENDIX 3

Runway Friction Trials Guernsey Airport Runway 09/27 following the accident to Fokker F27 G-BNCY

Friction Classification

A runway friction classification of runway 09/27 at Guernsey Airport was performed according to CAA guidance material on 12th February 1998. The weather was fine and the runway surface remained dry throughout the trial.

Table 1 below shows the recommended GripTester (GT) readings for runway surfaces as defined in NOTAL 2/94.

Equipment	Design Objective	Maint. Planning Level	Min. Friction Level	Test Water Depth mm (tolerance)	Test Speed km/h (tolerance)	Tyre Pressure psi (tolerance)	Tyre
GripTester	Above 0.80	0.63	0.52	0.25 (±0.01)	65(±5)	20(±1)	Type A 10 x 3.6 - 5

Table 1 CAA recommended GT readings

This trial was performed using GripTester serial no. 001 fitted with Macreary 'A' series tyre no. A-14-80. The machine was towed by a Ford Mondeo estate car fitted with a 250 litre water bag tank and pump to supply the GT self-wetting system. Measuring runs were made with the GT over the full width of the runway at 3m spacing, starting 1.5m each side of the centreline out to 19.5m from the centreline. Each run started with the GT positioned 10m from the end of the runway, with the 65km/h test speed being maintained for as long as possible before braking. Additional runs were made over a 500m length of the runway situated in an uncontaminated area 6m left of the 27 centreline at speeds of 30, 65, 95 and 130km/h (each with a self-wetting water depth of 0.25mm) to enable speed/friction curves for the surface to be constructed.

For reference purposes photographs were taken of each threshold, together with close-ups of the surface and other points of interest.

Results

Runway 09/27 is 1463m long and 45m wide. The runway is surfaced with Porous Friction Course (PFC) with 50m of brushed concrete at each threshold. The surface was laid approximately 20 years ago and is showing signs of breaking up in some areas. The binder holding the aggregate has disappeared and is allowing individual chippings to loosen and lie on the surface, particularly near the runway edges. Significant areas show a rough textured surface caused through this loss of chippings. Trial conditions are shown in the standard pro-formas of Table 2 and Table 3.

Table 3 shows the results obtained on runway 09/27. The average self-wetting GT reading for the full length of the runway is 0.62. This value is just above the maintenance planning level (see Table 1). Inspection of sample traces (Figure 1, Run 3, 09 direction, 1.5m right of centreline and Figure 2, Run 4, 27 direction, 1.5m right of centreline) shows that the surface has fairly even friction properties, with the trace varying only slightly about the mean value. This is typical for all the runs made on the surface, excepting runs 9 and 12 which passed through the painted touchdown markings. Figure 3 (Run 9, 09 direction, 10.5m left of centreline) shows the effect of these markings on the friction readings, with excursions up to approximately 0.9 GT reading in two places. This is a rather unusual situation, as painted markings normally cause the friction values to decrease. The markings on this runway are in need of renewal, however. It is likely that the paint remaining has weathered to a rough texture, causing a local increase in friction. Readings in Table 4 show the average for the centre strip of the runway, (up to 7.5m each side of the centreline), and the outer strips (from 10.5m to 19.5m from the centreline). Rubber deposits were subjectively assessed as light at both thresholds.

The speed friction/curve for runway 09/27 is presented in Figure 4. A single 500m run 6m from the centreline was made at each of the speeds 30, 65, 95, and 130km/h. The curve remains essentially flat, but at a fairly low level. This indicates that the surface is providing good water clearance beneath the GT measuring tyre, but that the aggregate is polished and has a low microtexture.

Figure 5 is a graph showing the variation in average 65km/h full-length self-wetting GT reading with distance from the runway centreline. It can be seen that the readings show a marked variation across the width of the runway, with a rise at the untrafficked edges of the runway, where the aggregate is less polished.

Friction Monitoring

In order to gain some knowledge of the friction properties of the runway surface during wet weather, instructions were left with Guernsey Airport staff for friction trials to be performed during natural rainfall using the airport GT. The procedure followed is defined as Friction Monitoring in Annex A of NOTAL 2/94, and is included as Annex A to this report. Runs were performed at 1.5m and 10.5m from the centreline and approximately 1.5m from the runway edge. The vehicle speed was 65km/h throughout. The dry or self-wetting check runs required in NOTAL 2/94 were not performed for this exercise; as they are intended to highlight any changes in the runway surface to aid the comparison of historical data only.

Results

Table 5 shows the average readings on the runway during rainfall. Typical traces of the runs performed in rainfall are shown at Figure 6 to Figure 8. The same general variability about the mean found in the classification trial is evident in these traces. There are no rapid reductions in friction of the type which would be caused by areas of standing water, except for a very short duration excursion at the 09 threshold in run 8 (Figure 8) approximately 1.5m from the edge of the runway and thus not in a trafficked area. The shape of the graph of friction reading against distance from the centreline, Figure 9, mirrors that obtained during the classification trial, Figure 5. The increase in friction toward the runway edges is more marked.

Conclusions

The average Friction Classification readings for this runway are just above the maintenance planning requirements of the NOTAL 2/94 guidance material (Table 1). The Friction Monitoring runs give no indication of significant low friction areas caused by standing water. It is unlikely therefore that the surface friction was a significant contributory factor in this accident. However, this trial has shown that the runway surface would benefit from some attention to improve the surface friction and prevent the loss of further aggregate. Action to improve the visibility of the painted markings whilst retaining their friction value should also be considered.

RUNWAY FRICTION CLASSIFICATION SURVEY
GENERAL SURVEY INFORMATION

Airport	**Guernsey Airport**
Runway	**09/27**
Date	**12.2.98**

1	**Survey type**	Classification
2	**CFME type**	GripTester
3	**CFME Serial No.**	GT001
4	**Operator/s**	IB/RJN
5	**Tyre Serial No.**	A-14-80
6	**Self wetting water depth (mm)**	0.25
7	**Air Temperature (°C)**	10-12
8	**Weather**	Clear, sunny
9	**Rubber Deposits**	Light
10	**Offset distance from the threshold at the lower runway end QDM designator (End 1) (m)**	6
11	**Offset distance from the threshold at the higher runway end QDM designator (End 2) (m)**	6
12	**Remarks**	

Table 2 Guernsey Airport Runway 09/27 General Survey Information

RUNWAY FRICTION CLASSIFICATION SURVEY
SUMMARY OF RUNS

Airport	Guernsey	Runway	09/27	Date	12.2.98

Run No.	Rwy Dirn	Time	Dist from c/l (m)	Side[2] of c/l	Speed (km/h)	Run length (m)	Self-Wet On/Off	Surface condition	Average Friction value	Remarks
1	09	1210	19[1]	L or R	65	1460	On or Off	Dry	0.74	Water on. R of c/l
2	27	1217	6.0	L	30	500	On	Dry	0.58	
3	09	1223	1.5	R	65	1460	On	Dry	0.56	
4	27	1226	1.5	R	65	1460	On	Dry	0.55	
5	09	1230	4.5	L	65	1460	On	Dry	0.53	
6	27	1243	4.5	L	65	1460	On	Dry	0.56	
7	09	1246	7.5	R	65	1460	On	Dry	0.60	
8	27	1248	7.5	R	65	1460	On	Dry	0.58	
9	09	1252	10.5	L	65	1460	On	Dry	0.64	
10	27	1313	6.0	L	65	500	On	Dry	0.57	
11	09	1316	19[1]	L or R	65	1460	On or Off	Dry	0.73	Water on. R of c/l
12	27	1317	10.5	L	65	1460	On	Dry	0.66	
13	09	1319	13.5	R	65	1460	On	Dry	0.70	
14	27	1322	13.5	R	65	1460	On	Dry	0.71	
15	09	1325	16.5	L	65	1460	On	Dry	0.72	
16	27	1327	16.5	L	65	1460	On	Dry	0.72	
17	09	1329	1.5	R	65	1460	On	Dry	0.56	
18	27	1339	6.0	L	95	500	On	Dry	0.58	
19	09	1342	19[1]	L or R	65	1460	On or Off	Dry	0.72	Water on. R of c/l
20	27	1402	6.0	L	130	500	On	Dry	0.58	
Maximum absolute difference between any two Check Runs 1,11 and 19										0.02
Maximum absolute difference between Check Runs 3 and 17										0
Survey valid				YES						
Remarks				Runs at 19.5m from c/l not performed due to loose aggregate on surface.						

Notes: 1. These runs performed at approx19m from c/l due to loose aggregate at runway edges
2. Side refers to direction of travel of CFME

Table 3 Guernsey Airport Runway 09/27 Summary of Runs

RUNWAY FRICTION CLASSIFICATION SURVEY
SUMMARY OF RESULTS

Airport	Guernsey	Runway	09/27	Date	29.1.98

Description	Applicable Runs	Friction Level
Friction Level for Central Portion	3-8	0.56
Friction Level for Outer Portion (Left)	9,14,15,18	0.69
Friction Level for Outer Portion (Right)	12,13,16,17	0.69
Overall Friction Level	3-9, 12-18	0.62
Classified Runway Friction Level		
Remarks		
Loose aggregate chippings on surface near runway edges		

Table 4 Guernsey Airport Runway 09/27 Summary of Results

Run No.	Dist fr c/l	GT Reading
1	1.5m N	0.63
2	1.5m S	0.60
3	10.5m S	0.65
4	10.5m N	0.61
7	19.5m N	0.93
8	19.5m S	0.88

NB Runs 5 & 6 aborted, repeated as Runs 7 & 8.

Table 5 Guernsey Airport Runway 09/27 Monitor runs10.4.98

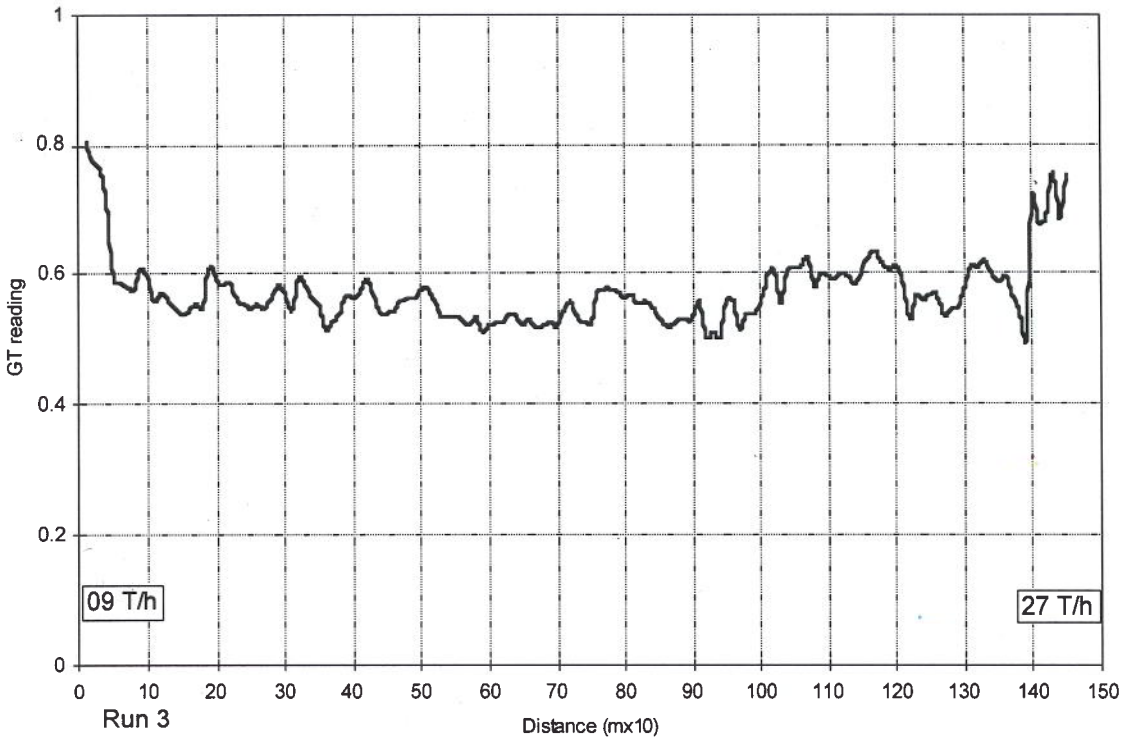


Figure 1 Run 3, 09 direction, 1.5m right of centreline

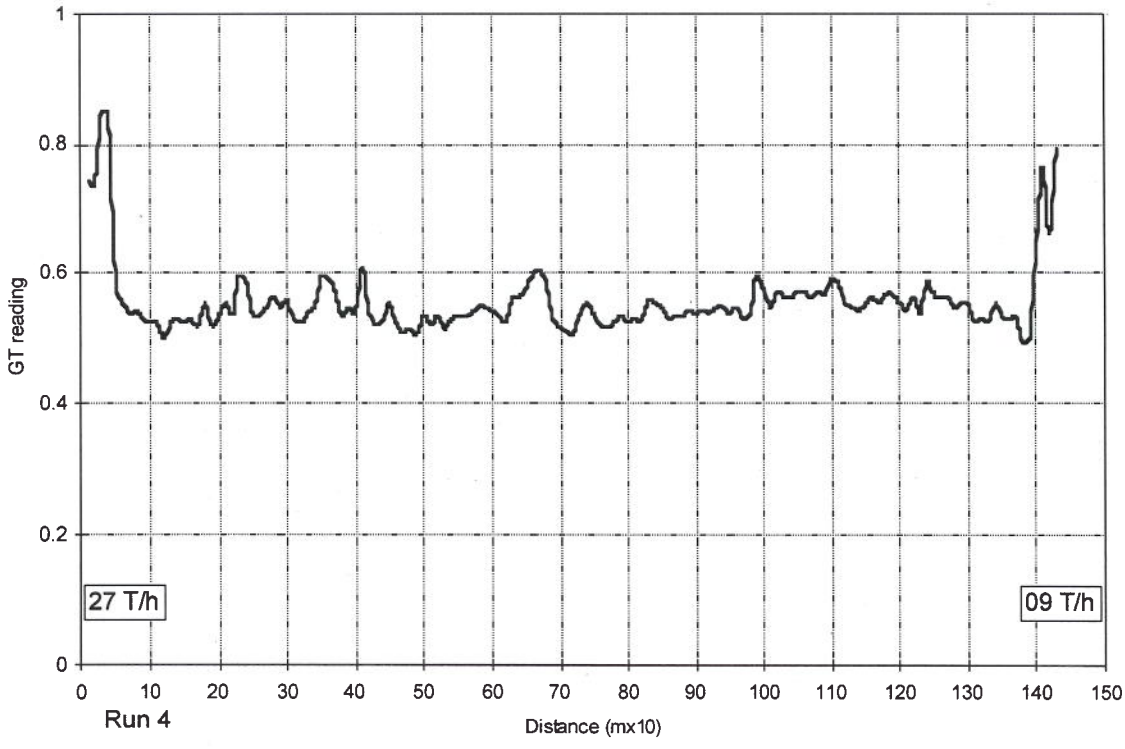


Figure 2 Run 4, 27direction, 1.5m right of centreline

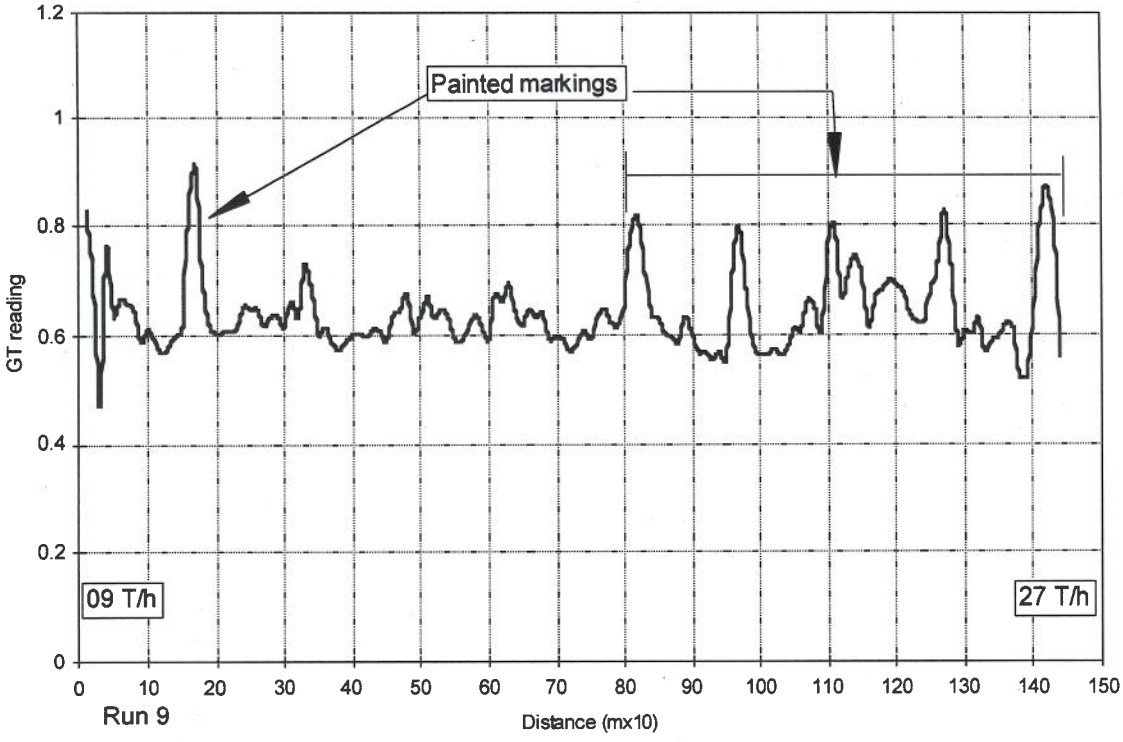


Figure 3 Run 9, 09 direction, 10.5m left of centreline

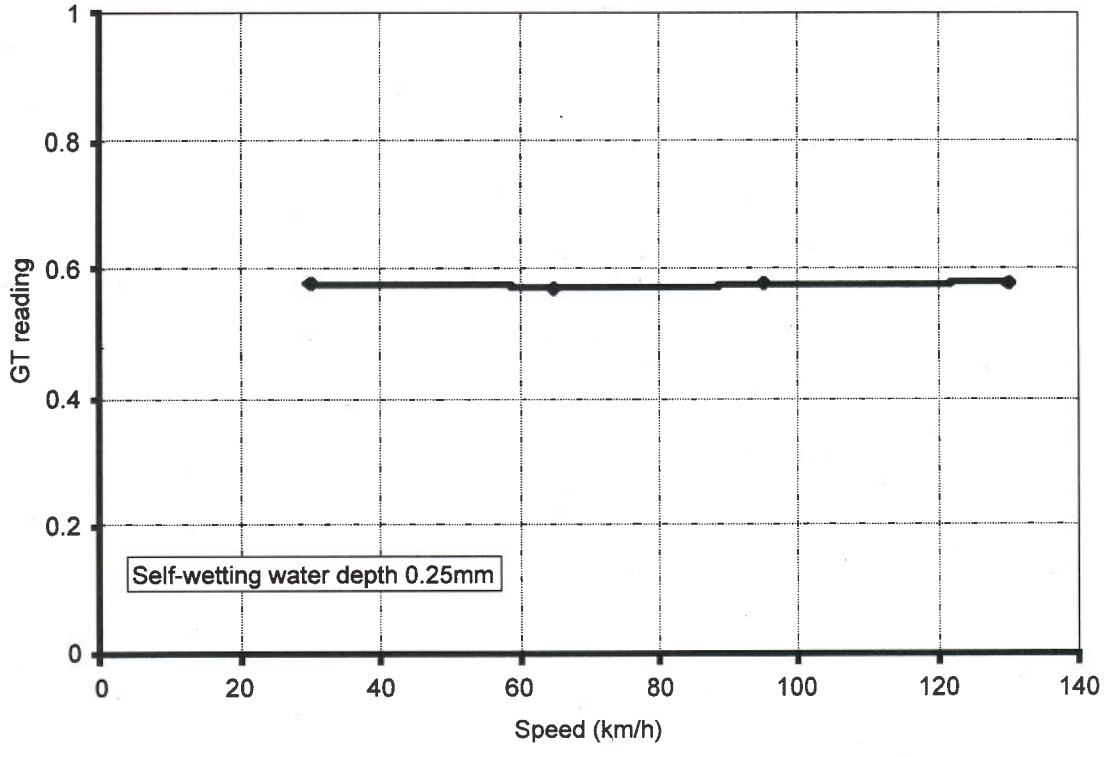


Figure 4 Speed/friction curve runway 09/27

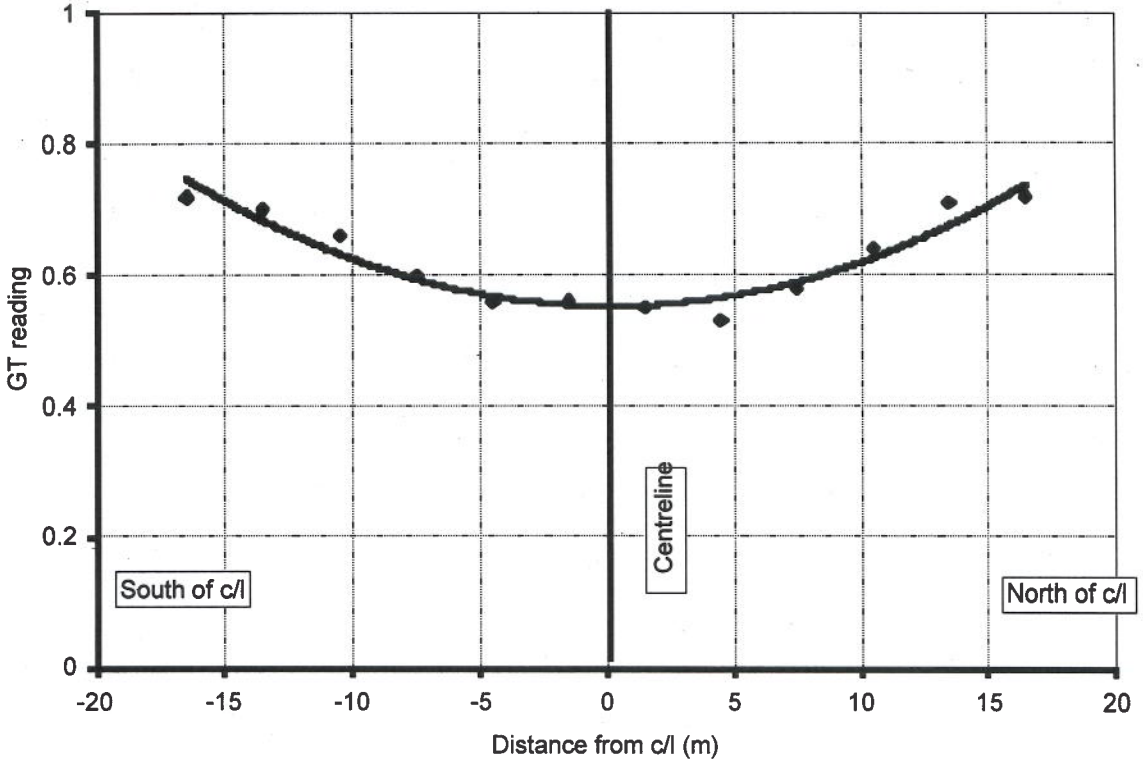


Figure 5 GT reading v Distance from centreline runway 09/27

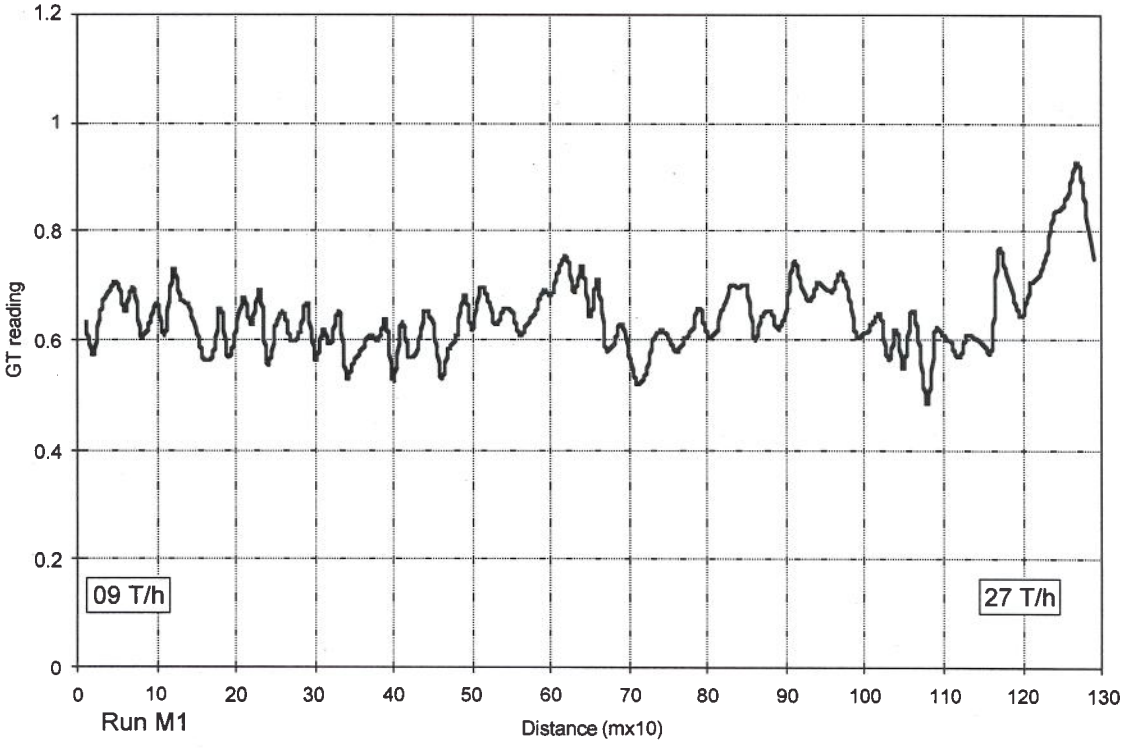


Figure 6 Natural rain. Run 1, 09 direction ,1.5m l of centreline

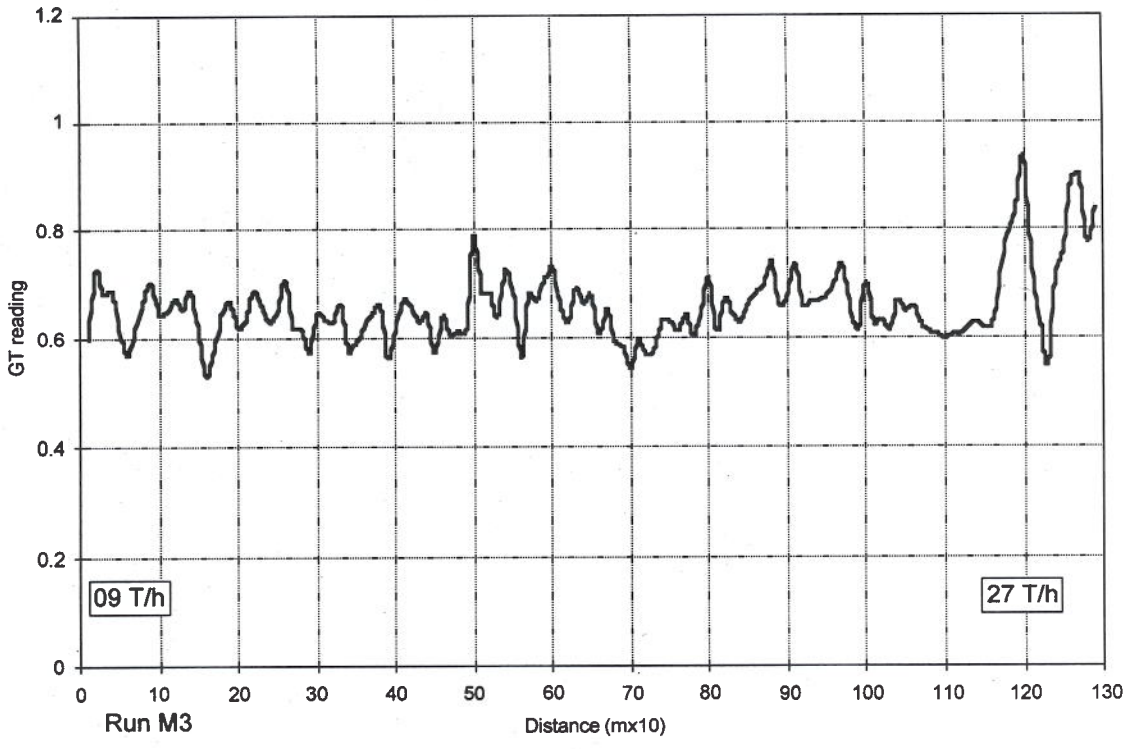


Figure 7 Natural rain. Run 3, 09 direction ,10.5m l of centreline

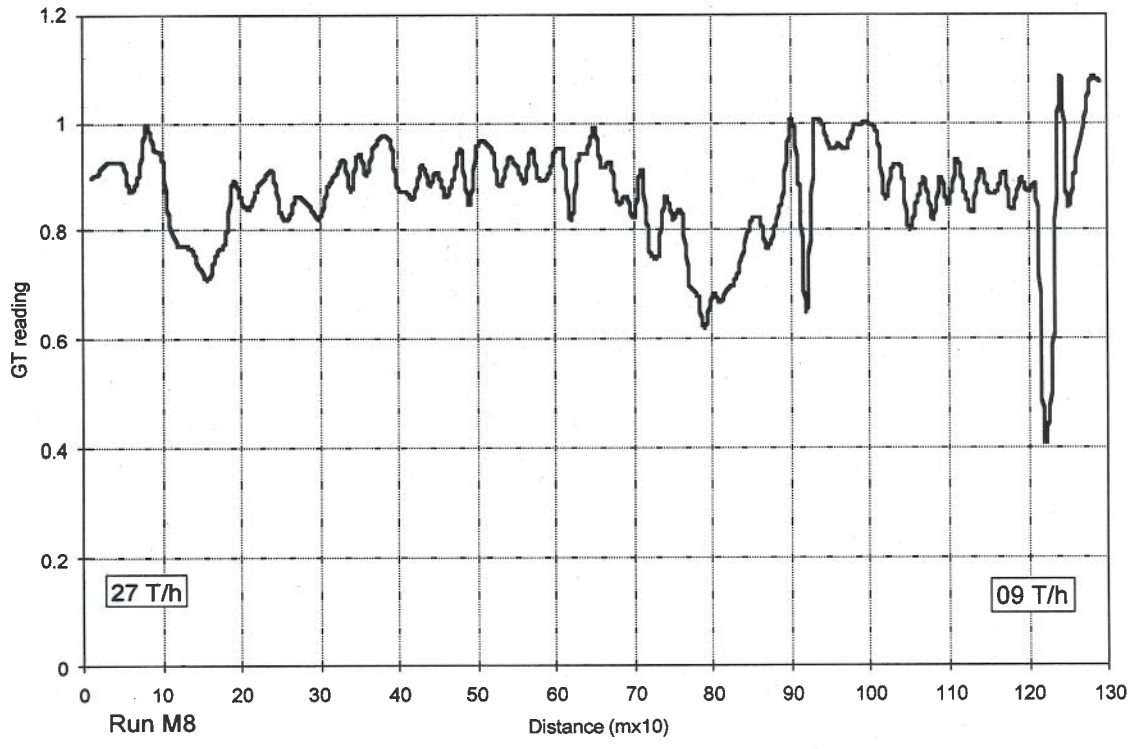


Figure 8 Natural rain. Run 8, 27 direction ,1.5m from rh edge

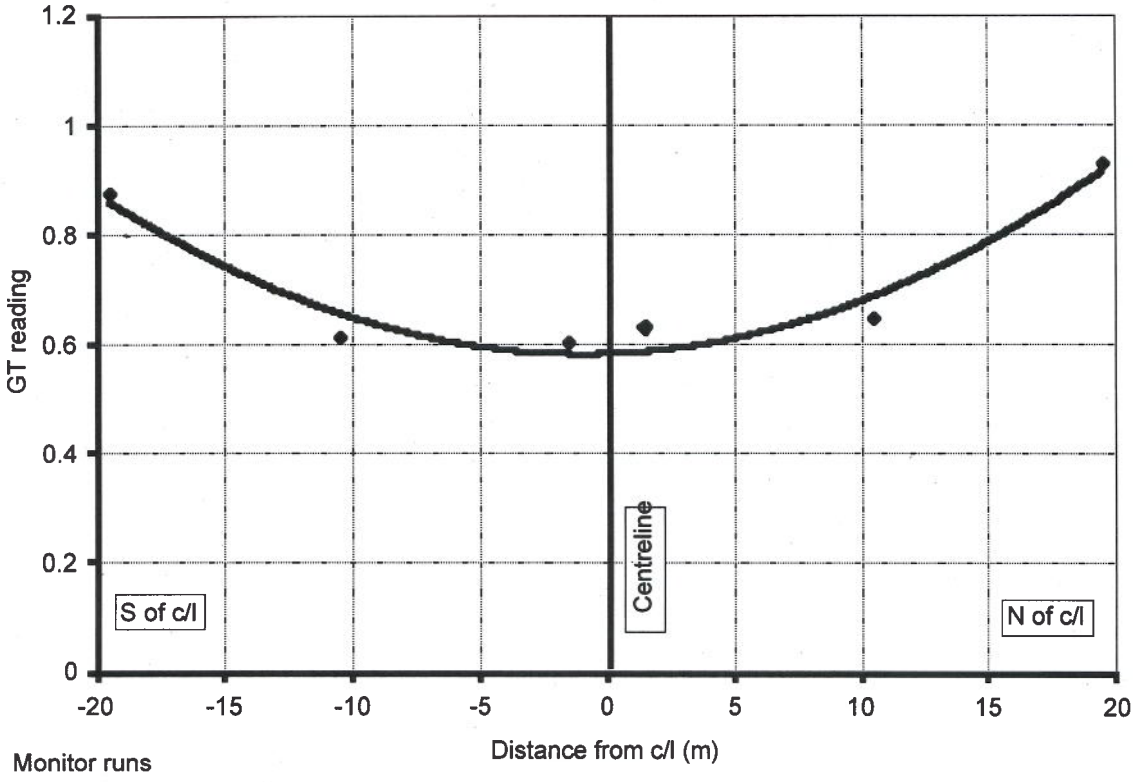


Figure 9 Natural rain. GT reading v Distance from centreline runway 09/27

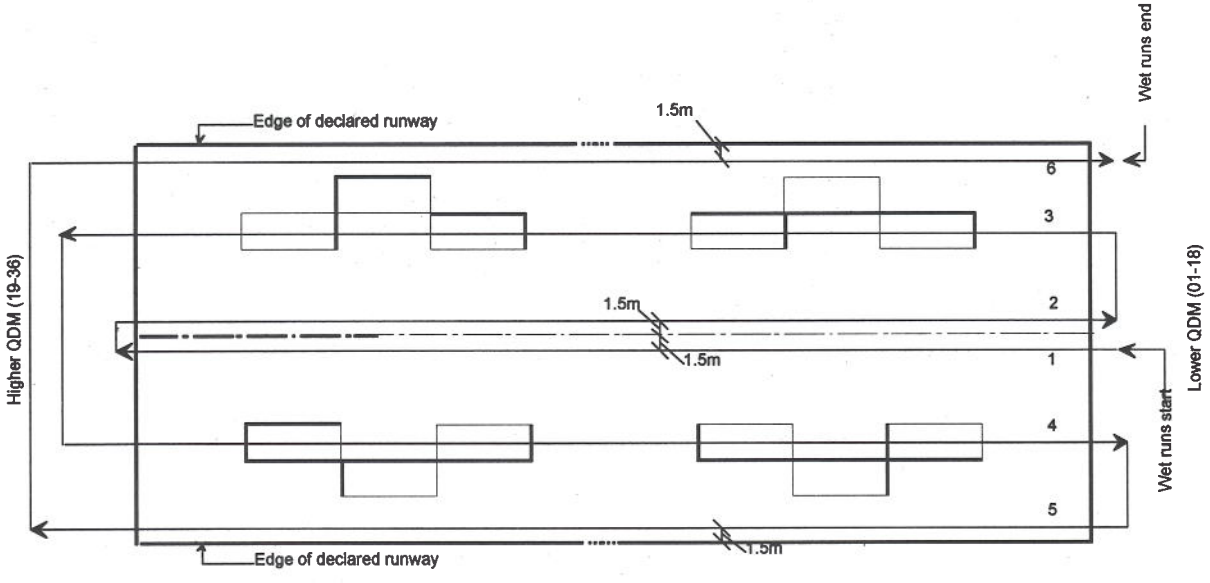
CAA NOTAL 2/94 ANNEX A RUNWAY FRICTION MONITORING SURVEY

1. CAP 168 Appendix 3F at para 3 explains the requirement for periodic monitoring tests to be carried out by aerodrome authorities, now known as Runway Friction Monitoring Surveys, and recommends that heavily used runways should be monitored every four months and other runways every six months. Tests should also be made when deemed necessary by airport management and in particular when unexpectedly poor braking in wet conditions is experienced. The additional tests should indicate those areas of the runway where friction is being reduced either through rubber build-up, ponding or runway markings.

2. The Runway Friction Monitoring Survey test should follow a standard format as shown in the attached diagram so that each series of tests can be correlated and areas of reduced friction more readily monitored. Tests should be made using either a Mu-Meter or GripTester towed at 40mph (See Note 1). Friction values below the Maintenance Planning Level on stretches of runway in excess of 100 metres in length will be a cause for concern and the reason for such areas of reduced friction should be investigated.

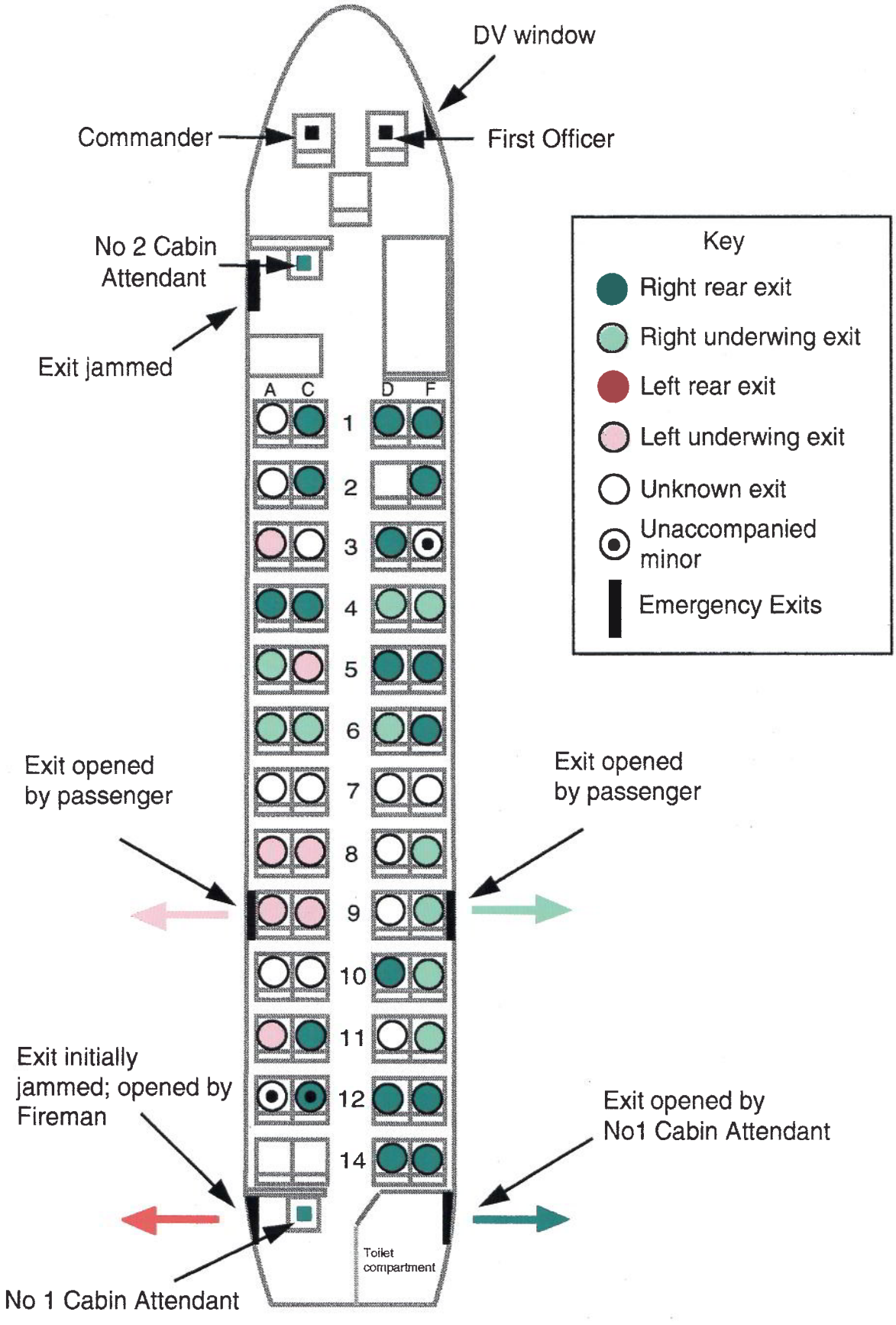
3. Test records obtained at 4 or 6 monthly intervals as appropriate for both the dry tracks and the natural rain tracks should be retained and made available to the aerodrome inspector for incorporation into the Runway Friction Data Base.

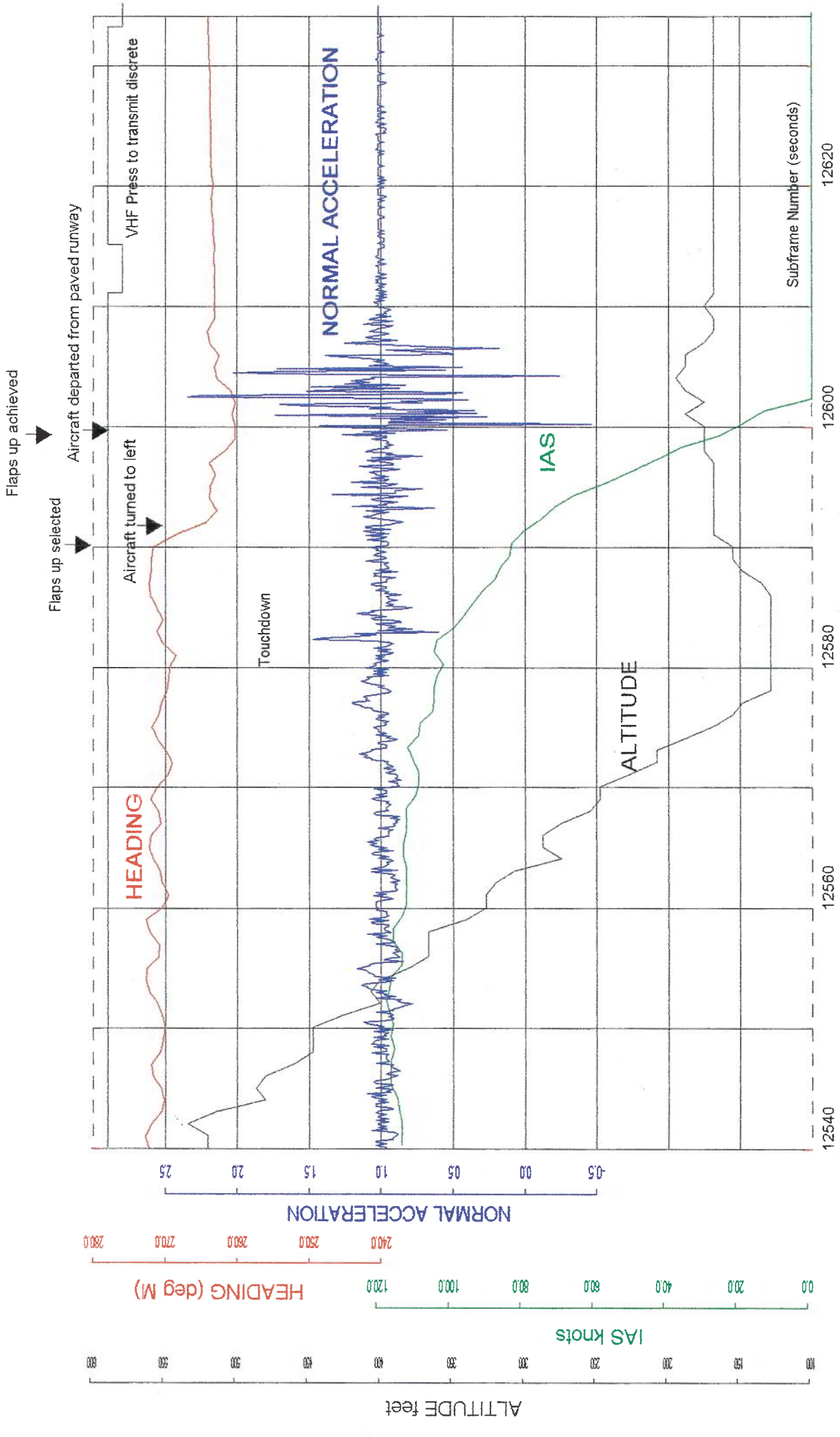
Note 1. Mu-Meters should be calibrated to a reading of 0.77 on the friction board except that when the MK1 or MK3 Mu-Meter is fitted with Dico tyres the calibration reading should be 0.89.



Natural Rain Tracks	1 to 6
Dry Tracks	1 & 2

G-BNCY - Emergency Exits used by Passengers and Crew




Flaps up achieved
Flaps up selected
Aircraft departed from paved runway
Aircraft turned to left
VHF Press to transmit discrete
Touchdown
NORMAL ACCELERATION
IAS
ALTITUDE
HEADING
Subframe Number (seconds)
12540
12560
12580
12600
12620
NORMAL ACCELERATION
HEADING (deg M)
IAS knots
ALTITUDE feet