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CAA PAPER 98002

FRICTION CHARACTERISTICS OF HELIDECKS ON OFFSHORE FIXED-MANNED INSTALLATIONS

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Foreword

A review of the marking of prohibited landing headings on helidecks, conducted by the RAF Institute of Aviation Medicine (IAM Report No. 711, dated January 1992) on behalf of the Authority in response to Recommendation 4.5 of AAIB Aircraft Accident Report 2/91 (accident to Sikorsky S61 G-BEWL at Brent Spar, East Shetland Basin on 25 July 1990), highlighted the problem of the obscuration of helideck markings by the landing net. The net normally extends over a significant proportion of the markings and the mesh size (200 mm max) and rope diameter (20 mm min) are such that little of the markings under the net are visible to the pilot at normal glide path angles. This problem is exacerbated when the sun is low in the sky, and at night in the presence of low level flood lighting, when the shadows cast by the net may further mask the markings. The prohibited landing heading marking has been redesigned to compensate for the presence of the landing net following the above-mentioned AAIB Recommendation.

In addition to the concern within the Authority on this issue, the costs of maintenance, difficulties of helideck cleaning, and the general inconvenience of landing nets has motivated the offshore installation operators to work towards their removal. A joint CAA/Industry research programme, aimed at demonstrating the performance and durability of non-slip surfaces and establishing appropriate in-service monitoring requirements, was therefore instigated with the objective of facilitating helideck net removal. The results of the work are reported in this Paper.

As the research progressed, the Industry began to remove landing nets by taking credit for existing friction surfaces and by applying new ones. Pilot reports subsequently received, however, drew the Authority's attention to the problems caused by the loss of visual cues; the extent and importance of the visual cues that had been provided by the landing net had not been fully appreciated until they were removed. Research aimed at replacing the visual cues provided by the net has been progressed but, to date, no effective alternative has been identified.

It is the Authority's belief that the textural properties of the landing net provide the visual cueing, in respect of rate of closure and lateral movement, essential for pilots in what can otherwise be a poor cueing environment. Serious consideration must be given to this aspect before a landing net is removed. The helicopter operator must be consulted before existing landing nets are removed (where permitted by the criteria established in this Paper), and installation operators must replace landing nets if so advised by the helicopter operator in the event that visual cueing difficulties exist. For the above reasons, it is also recommended that new installations include the provision of landing net fittings regardless of the helideck surface. The relevant section of CAP 437 (Offshore Helicopter Landing Areas: A Guide to Criteria, Recommended Minimum Standards and Best Practice) will be amended in the revised edition scheduled for publication in 1998.

Summary

This report is an overview of the experience of measuring friction on helidecks without landing nets since 1988. Particular reference is made to the installation and long term measurement of a high friction surface on the Shell Expro North Cormorant platform. A method of extending the periodicity of measurement out to a three year maximum, using the trend of past readings to predict likely future decay in friction readings is recommended. Annexes to this report show an evaluation of the retro-reflective deck markings incorporated in the North Cormorant surface; a summary of the experience of applying the high friction surface in the field; and a brief survey of helideck icing and the nett safety benefits of helideck landing nets.

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1 INTRODUCTION

1.1 General

1.1.1 In order that the landing nets may be removed from offshore helidecks the surface friction is required to meet a minimum standard. The assessment of surface friction on the helidecks of offshore installations against this standard has been practised since 1988. Many helidecks have been tested on an annual basis and various research projects, supported by the CAA and by industry, have been conducted since 1988. This report draws together all the work associated with maintaining good frictional contact between the helideck surface and the helicopter tyres.

1.1.2 Landing nets on helidecks are '...provided to aid the landing of helicopters, particularly those with wheeled undercarriages in adverse weather conditions. They will considerably assist in the stability of the helicopter on the deck in conditions of high winds, wet snow and ice'[1]. However, some installation operators would like the landing net removed, seeing it as a potential hazard and a restriction on operations around helicopters. As a separate exercise CAA asked Cranfield University (CU) to investigate the nett safety benefit of landing nets on helidecks and this is reported in Appendix A.

1.1.3 A friction measuring machine, the GripTester (GT), was specifically designed and developed for the task of helideck friction assessment and, based on GT readings, the CAA established the standards for removal of the net (see Table 1).

1.1.4 Other matters which impinge on helicopter operations on a helideck, such as snow and ice accumulation and retro-reflective markings, are included in Appendices B and C.

1.2 Friction Surface Contamination

Any contamination on a helideck, including sea-bird guano, has the potential to adversely affect or eliminate the friction properties of the surface. It is therefore essential that the surface should be kept free of contamination for helicopter operations. The recommendations of this report are only valid for uncontaminated surfaces.

1.3 Friction Measuring Device Development

1.3.1 The specification for a friction device to measure helideck friction called for a continuous measuring machine which could survey the complete area of the deck in a reasonable time. The data output should be dealt with in real time with a storage capability to allow post test analysis and reporting.

1.3.2 In the planning stages it was decided that the friction values should be measured and displayed on a 1m by 1m matrix across the deck surface and that the software would be capable of identifying various areas of the deck whose average friction could then be separated out from the overall average of the deck. The areas chosen were:

- Outside the aiming circle
- Inside and including the aiming circle*
- On the painted markings.

*Where Chinook bi-directional landing bars are present, they are to be treated as part of the aiming circle for the purposes of the friction survey.

1.3.3 It should be noted that the painted aiming circle and 'H' were included in the aiming circle average due to their proximity to the area of helicopter operations. However, the painted areas are also tested independently to obtain the painted markings average which also needs to meet the minimum friction value. The painted deck name is not included in this average.

1.3.4 The machine would measure wet dynamic friction with a revolving tyre slipping on the surface at a slip value of approximately 15% with measured drag being divided by measured load to produce a friction value. Water would be deposited in front of the test tyre in order to simulate wet friction. The amount of water would be metered so that all helidecks could be compared under the same controlled conditions. The deck must therefore be dry prior to the survey.

1.3.5 Non-continuous measuring devices were considered, but rejected on a number of counts, principally their inability to easily measure the whole area of the deck. Other reasons for rejection included the inability to meter the amount of water beneath the measuring patch, and the problem associated with confusing mechanical interlocking of the test pad on high textured surfaces with sliding friction.

1.3.6 The GripTester (Figure 1) was designed and developed in response to the specification. The machine is a relatively small (80kg) three wheeled trolley whose measuring wheel travels at 85% of the forward speed with the consequent drag measured and related to the friction measurement. It is described in greater detail in para 2.5 of this report. The GT was conceived to be air transportable, but required the removal of passenger seats from the helicopter. Subsequent increases in seat costs and changes in operating procedures have meant that the GT is now shipped to platforms in a container, which can result in long delays. The current level of testing (approximately 17 decks in 1995) is approaching the maximum for a single GT when delays due to weather and transport are considered.

1.4 Criteria for Landing Net Removal

1.4.1 Friction trials at Cranfield in 1987 using a test vehicle fitted with a braked helicopter equivalent test tyre on different surfaces, established the correlation between a braked slipping tyre and the GT output. On the basis of this information the CAA indicated that a helideck needs initially to achieve an average friction value of 0.65 in order for the landing net to be removed[1], but this value may to fall to 0.60 before the net need be refitted. The GT values and their associated actions in the removal of landing nets are shown in Table 1.

Table 1 Standards for Friction Values on Helidecks

Average GripTester Reading	*Verbal Description of Deck Friction*	*Remarks*
0.7 and above	Good	No helideck net required. Friction to be retested in 1 year.
0.65 or above	Medium	Criteria for initial removal of net. Friction to be retested in 1 year.
0.61 to 0.69	Medium	No helideck net required. Friction to be retested in 6 months.
0.6 and below	Poor	Helideck net to be fitted / retained

1.5 Periodicity of Testing

1.5.1 When the process of landing net removal was started in 1988, it was intended to reassess the periodicity of test described in Table 1 when sufficient data was available to make a valued judgement. It was anticipated that it would take at least five years to acquire sufficient helideck friction calibrations to determine a trend. In parallel with this data logging exercise the CAA decided to assess the long term stability of a new epoxy type surface manufactured by Safeway Traffic Products Ltd, selected after an evaluation of contemporary products by CU. The experiment also involved Shell Expro who offered one of their installation helidecks as the test platform, and CU who would measure the friction of the surface on a regular basis.

1.5.2 The platform offered by Shell Expro was the North Cormorant and the new surface was installed in July 1992. Friction monitoring commenced immediately with the post installation survey, then at 6-monthly intervals for 2 years extending to yearly intervals up to December 1996. A more detailed description of the trial is given in the North Cormorant Research Project section (Section 2) of this report.

1.6 Scope of Report

This report draws together all the information collected and assesses its impact on offshore helicopter operations. The report comprises the following three parts:

- North Cormorant Research Project
- Extension of the Required Test Period
- Minor Research Projects, attached as Appendices A, B and C.

2 NORTH CORMORANT RESEARCH PROJECT

2.1 Introduction

2.1.1 With the introduction of the option for operators to remove their landing net, emphasis has now been concentrated on improving the condition and frictional qualities of the deck itself. To this end a new surface was designed by Safeway Traffic Products Ltd. which not only offered a high friction surface, but also incorporated retro-reflective beads in the material of the deck markings. After considerable development of the new surface in the laboratory and evaluation of its friction performance against other friction surfaces in the hangar at Cranfield, it was decided to carry out full scale platform trials for which Shell Expro (UK) Ltd offered their North Cormorant platform. The Civil Aviation Authority as controllers of the exercise contracted Cranfield University (CU) to perform the long term monitoring of the surface friction.

2.1.2 The Civil Aviation Authority's Directorate of Research has established a minimum level of friction below which an untethered and unchocked aircraft could slide in severe wind conditions on a deck without netting. Deck movement has not been considered because net removal is currently restricted to fixed installations. Table 1 illustrates the friction qualities required as measured by a Findlay, Irvine Ltd, GripTester (Figure 1).

2.1.3 In 1992 the new experimental surface was installed on the North Cormorant helideck. Because of adverse weather conditions the task extended considerably beyond the time allowed for its completion and some concern was expressed that the finished quality was not as it would have been had it been laid in ideal conditions. The report by Safeway on the laying process (reproduced in Appendix C) pointed out some of the mistakes which should be avoided in future applications. In the event the surface friction proved to be good.

2.1.4 Since 1992 the surface friction of the North Cormorant helideck has been measured on a regular basis by the Aircraft Ground Operations Group (AGOG) of CU. Initially (up to October 1994) the assessment was made at 6-monthly intervals, but since then it was extended to yearly intervals.

2.1.5 Each assessment of the helideck friction has been reported separately[2-8]; this report summarises the complete trial.

2.2 Objectives

The objectives of the CAA sponsored trial were twofold: 1) to investigate the long term stability of an epoxy type surface, including its frictional properties, its adhesion and its resistance to damage; 2) to investigate the feasibility and effectiveness of incorporating retro-reflective beads into the surface of the markings to enhance their visibility without degrading their friction qualities. Item 2) is referred to in Appendix B, a CAA internal report issued by the Safety Regulation Group.

2.3 Description of Deck

2.3.1 The North Cormorant helideck is rectangular (27 metres x 29 metres) with a 14 metre diameter aiming circle and yellow 'Chinook bars' centred 11 metres from the outboard edge of the landing platform.

2.3.2 The experimental epoxy surfaces were manufactured and laid by Safeway Traffic Products Ltd. The overall surface finish on the helideck was 'Sealcoat Green' (Figure 2) whilst the markings were also of the same epoxy finish, but with an added pigment to give 'Safeflor Yellow' (Figure 3) on the aiming circle and 'Safeflor White' on the 'H' and the platform name. The yellow and white pigmented areas contain retro-reflective materials for improved visibility at night.

2.3.3 Since the installation of the new surface some damage has been caused by helicopters fitted with skid-type undercarriages (Figure 4). The damage consisted of worn patches on the tops of the deck weld seams which had permitted corrosion to occur, together with areas where the friction material had been badly scuffed. This was caused by high pressure contact with the skids of the in-field shuttle helicopter, which sits on the helideck with the engine running and rotor blades turning for considerable periods of time while personnel and freight are being loaded and unloaded. The resulting vibration had worn the surface coating in scattered areas (all within the aiming circle).

2.3.4 In the early stages some dark staining of the deck occurred in the north-west corner (Figure 5) which was thought to be caused by pollution.

2.3.5 In the later stages the surface material attained a white 'bloom' (Figure 6) which was believed to be caused by the adverse weather conditions during the installation. In the summer of 1994 the deck was overlaid with a thin layer of polyurethane resin which succeeded in restoring the original green colour of the surface at the cost of a short-term slight reduction in the friction value, (Figure7).

2.4 Friction Surface Installation

Appendix C comprises a report written by Shell Expro staff, based on a report from Safeway Traffic Products Ltd personnel. It describes the surface installation procedures and highlights the difficulties encountered due to operational constraints and adverse weather.

2.5 Equipment

2.5.1 The GripTester is a multipurpose continuously recording friction measuring device weighing 80 kg originally developed by Findlay, Irvine Ltd. specifically for use on helidecks, but now also used on roads and runways. It can be pushed by one person and lifted into a helicopter by two. In its other rôles it can be towed at up to 80 mph (130 km/hr).

2.5.2 The principle of operation of the machine is the simultaneous measurement of load and drag on the single test wheel which slips at approximately 15% of the forward speed.

2.5.3 When used on helidecks the GT is pushed at approximately 5 km/hr with the measuring tyre being self-wetted at an average flow of 4.5 litres/min. This is achieved by means of a watering system supplied from two 18 litre tanks carried on the GT and filled with fresh water.

2.5.4 GT data is collected and stored by a small hand-held Microscribe microcomputer which displays the average friction value at the end of each run. Post calibration analysis is performed back onshore on a PC which produces the information shown at Figure 9.

2.5.5 For helideck work, the GT is calibrated by the 'screw-jack' technique which stresses the measuring axle by defined amounts in load and drag. The resulting strains have to fall within precise limits, which relate to the original calibration at Cranfield when the tester was correlated with a locked aircraft wheel on the Heavy Load Friction Vehicle[9].

2.6 Survey Procedure

2.6.1 The GT is calibrated as described in para 2.5.5 above.

2.6.2 For assessment purposes the CAA require friction readings from three areas of the helideck: a) outside the aiming circle, b) inside and including the aiming circle and 'H', and c) the paint areas comprising the aiming circle and 'H'.

2.6.3 Runs are made parallel to the edge of the deck nearest the platform (the northern edge) in an east – west direction, spaced at intervals of 1 metre (Figure 9). Friction readings are sampled automatically twenty-five times per metre. The datum around which all the data is plotted is the north – south centre-line of the helideck, which is identified on each run by pushing an event button on the computer. After each run the computer displays the average friction reading for that run.

2.6.4 Following the full east/west survey of the deck, two runs are made at right angles to the set, spaced at 0.5 metre each side of the centreline in order to check whether there is a difference between the readings in the chosen direction and at right angles.

2.6.5 Short runs are also made on the paint marks of the 'H' and at an angle across the aiming circle.

2.6.6 All the survey information is recorded on a Test Data Sheet a sample of which can be seen at Table 3.

2.7 Tests

2.7.1 Since the objective was to make comparisons of friction levels over a period of time then the least number of variables involved the better. Throughout the trials the same GT and measuring tyre were used, the same pattern of runs was made and even the GT self watering tanks were filled at the same point in the measuring sequence. Initially the same GT operator was used, but a change was necessary for the last two tests. The weather was difficult to anticipate and ambient temperature variations were inevitable. A dry surface was stipulated in order that the amount of water beneath the measuring tyre was constant, but on one occasion (October 1994) pressure of time dictated that the test was performed on a damp surface.

2.7.2 The October 1994[6] trial was an additional test necessitated by work carried out on the surface to rectify staining and colour fading problems which occurred after the surface had been exposed to the elements for some time (Figure 5 & Figure 6). To correct these problems, the surface was coated with an additional thin layer of polyurethane resin, which the tests showed had the effect of reducing the average available friction from 1.02 (February 1994) to 0.97, still well above the 0.70 requirement for 1 year operation without a net.

2.8 Results and Discussion

2.8.1 The data acquired on the hand held mini-computer is downloaded to a desktop PC, processed and printed as shown in Figure 9. The friction values are displayed on a 1 metre grid covering the whole of the deck. Because of the constraints on space available for printing the decimal point is omitted from the friction readings so, for example, a figure of 107 means 1.07.

2.8.2 Table 2 is a summary of the friction values since the beginning of the project.

2.8.3 The friction values on this helideck have remained high throughout its life to date, but the overall trend in friction readings is downward (Figure 7). Extended trendlines in Figure 8 will cross the 0.7µ level at the end of 2005. It should be noted that the test in October 1994 was the only one performed on a wet deck.

2.8.4 There is more variability inside than outside the aiming circle which can be attributed to two factors; a) contamination from fuel and oil spillage which, although cleaned off regularly, still marks the surface; b) surface damage caused by helicopters with skids. The contamination can be kept under control by regular cleaning. The latter problem will soon be eliminated with the withdrawal of skid-fitted helicopters from North Sea operations.

2.8.5 As explained in para 2.3.2. the markings are of the same epoxy material as the general deck surface with an added pigment to provide the colour. Friction values on the markings show the same variability as on the overall deck but, because of the retro-reflective glass beads in the surface, are slightly lower.

2.8.6 The friction values on the transverse runs are consistently lower than on the overall deck. This is attributable to the surface nap which can be caused during roller application of the material while still in its plastic state, producing a 'carpet pile' effect which is smoother in one direction than another.

2.8.7 When compared with the figures in Table 1 it can be seen that the friction values on all the areas of the North Cormorant helideck comfortably meet the required standards.

2.9 Conclusions

2.9.1 The average friction values in each of the three defined areas of the deck have remained well above the 'good' value of 0.70.

2.9.2 The friction values have changed very little from the high values obtained on the first visit in July 1992. A slight reduction was experienced in October 1994 after the surface was re-coated with a thin application of polyurethane resin and the test was performed with the surface already wet.

2.9.3 The surface has stood up well to the regular impact of the skid fitted inter-platform shuttle helicopters. Scuff marks have been repaired by the resident helideck team.

2.9.4 Initial dark staining of the deck, thought to be caused by pollution, has worn off and not reappeared. A white bloom, thought to be caused by moisture ingress during the initial installation, was overlaid and successfully eliminated with a thin layer of polyurethane resin.

2.9.5 Weather and operational difficulties experienced during the application of the surface to the platform helideck indicate that the surface may be easier to apply using tiles coated under factory controlled conditions.

Table 2 North Cormorant Helideck Friction History July 1992 to December 1996

	Dec. 1996	Nov. 1995[a]	Oct. 1994[b]	Feb. 1994	Jul. 1993[c]	Jul. 1993[d]	Jan. 1993	Jul. 1992
Average reading outside the outer aiming circle	0.96	1.04	0.92	1.07	1.10	1.09	1.07	1.09
Average reading inside the outer aiming circle	0.91	1.00	0.94	1.02	1.06	1.05	1.01	1.04
Average reading on paint of aiming circle & 'H'	0.93	0.98	0.97	1.02	–	1.05	1.04	1.03
Average readings for runs at right angles	0.90	0.98	0.87	1.06	–	1.03	1.02	1.01

Notes:-

a Nov 1995 – Repainted inside circle

b Oct 1994 – After recoating, deck wet due to rain

c July 1993 – After cleaning

d July 1993 – Before cleaning.

Table 3 Sample Data Sheet

Offshore Helideck Friction Assessment Test Record Sheet

No. 073 **Date : 06.11.95**

A	**General Details**		
	1. Platform Name:		NORTH CORMORANT
	2. Position:		N61°14.42'/E01°08.97'
	3. Operator:		Shell UK Ltd
	4. Surface Type:		Safeway 'Sealcoat Green'
	5. Manufacturer:		Safeway Traffic Products Ltd
	6. Aiming Circle Diameter		14m
	7. Contract No:		CAA Contract 7D/S/939/1
	8. Contact Personnel:		OIS Andy Clark
B	**GripTester Details**		
	1. GT Number: 001		
	2. Tyre No:		McCreary F-3-22
	3. Calibration:	Load	OK
		Drag	OK
	4. Method of carriage:		GT shipped out by sea in waterproof container
C	**Test Details**		
	1. Start Time:		17.20hrs
	2. OAT:		8°C
	3. Windspeed:		18 Knots
	4. Precipitation:		Nil
	5. Deck Contamination:		Nil
	6. Deck Condition:		Dry
D	**Data Files**		
	1. Raw Data:		SHCTA06B.01D SHCTA06B.01H SHCTA06B.01T
	2. Processed data:		SHCTA06B.CSV SHCTA06B.XLS

Figure 1 Grip Tester

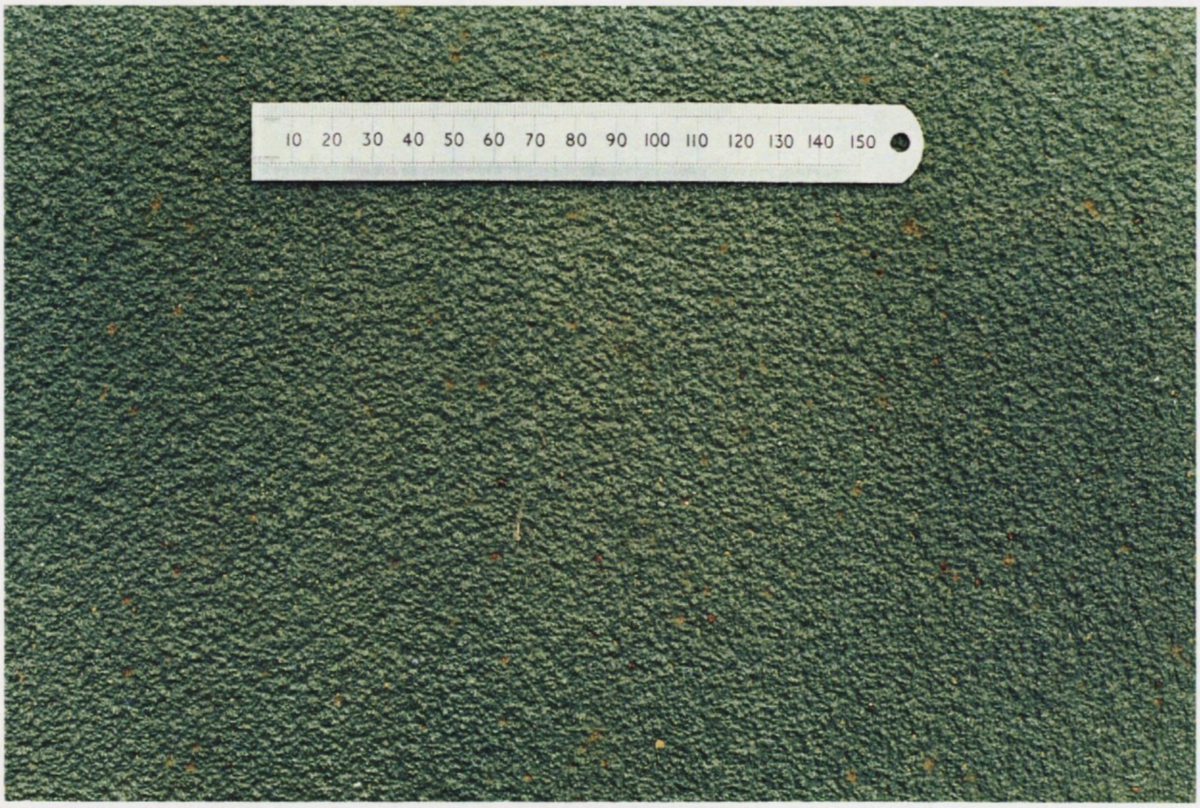


Figure 2 Sealcoat Green Deck Surface

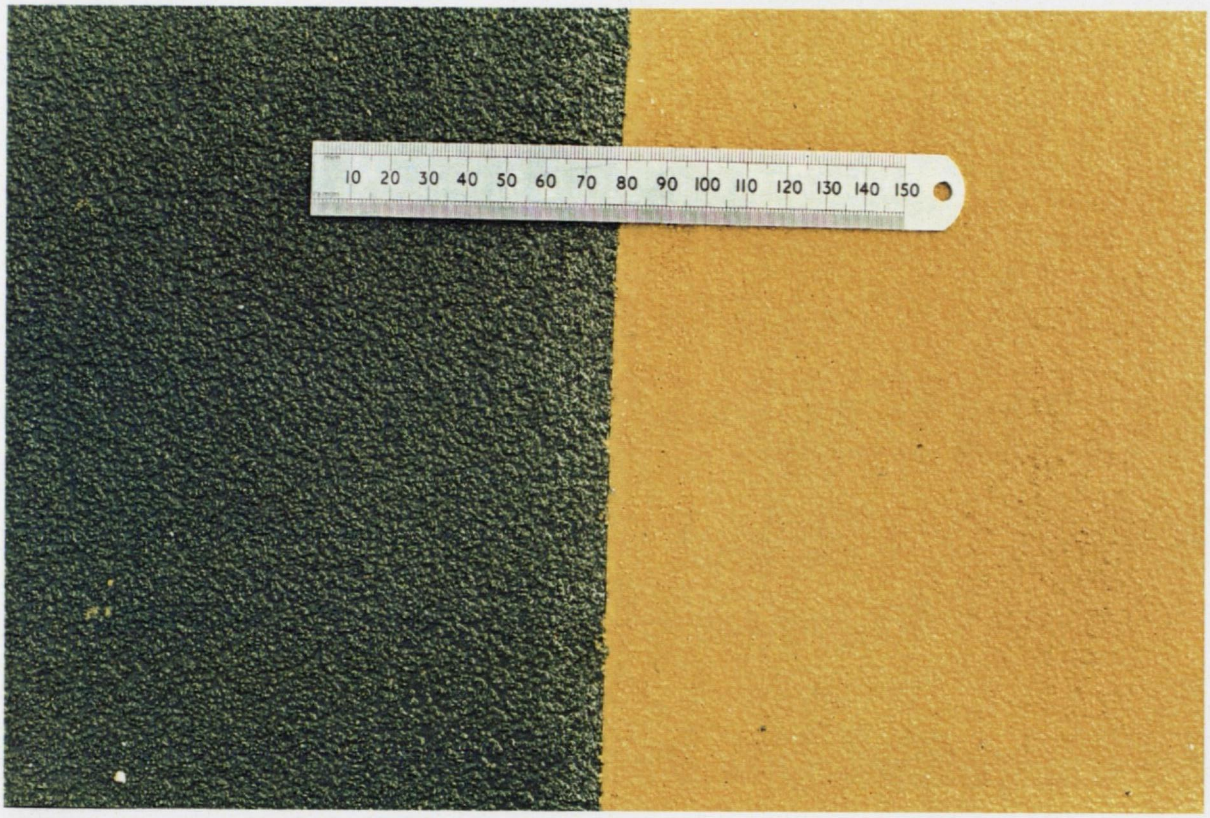


Figure 3 Sealcoat Green and Safeflor Yellow Finishes

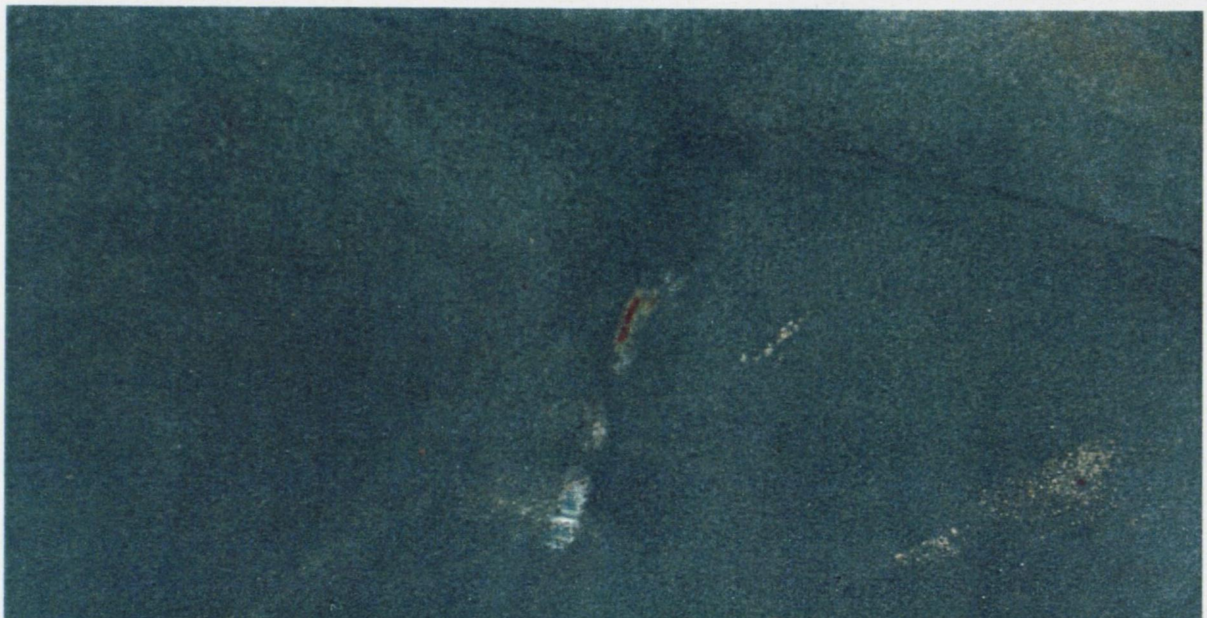


Figure 4 Damage to Weld Seam by Helicopter Skids

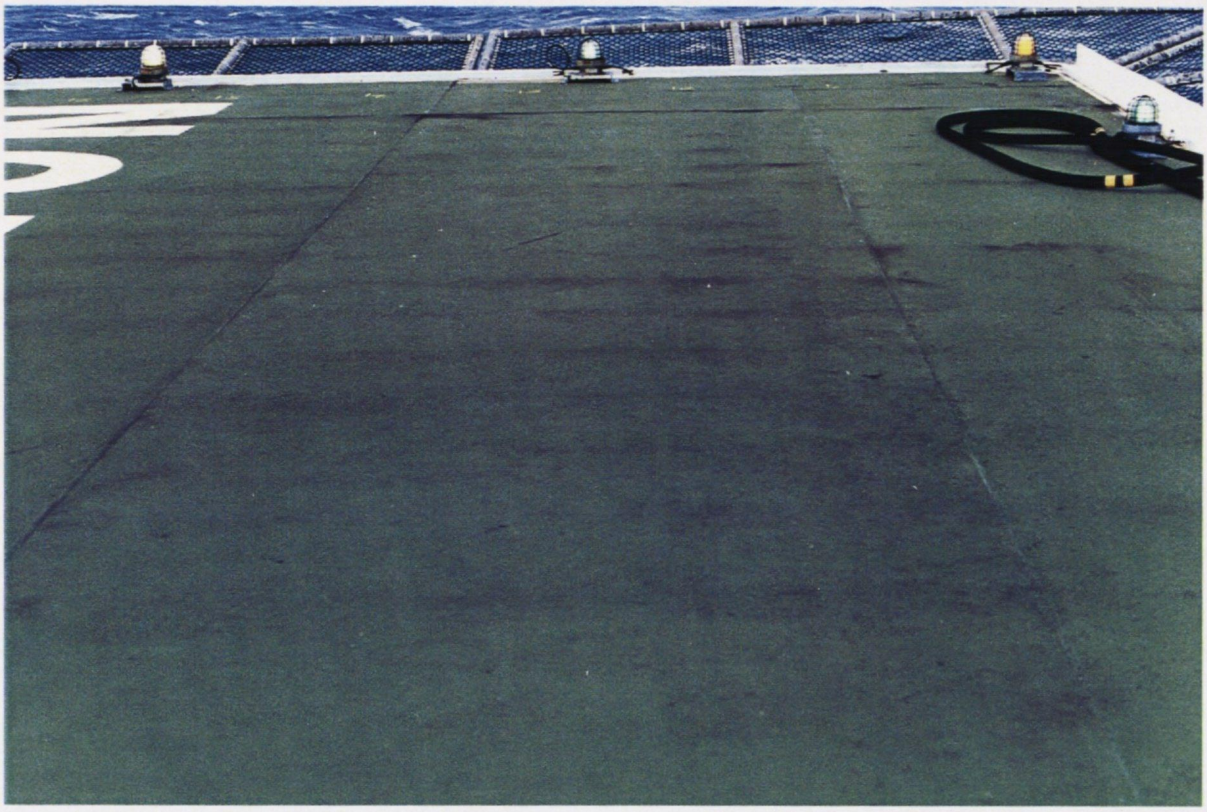


Figure 5 Pollution Deposits

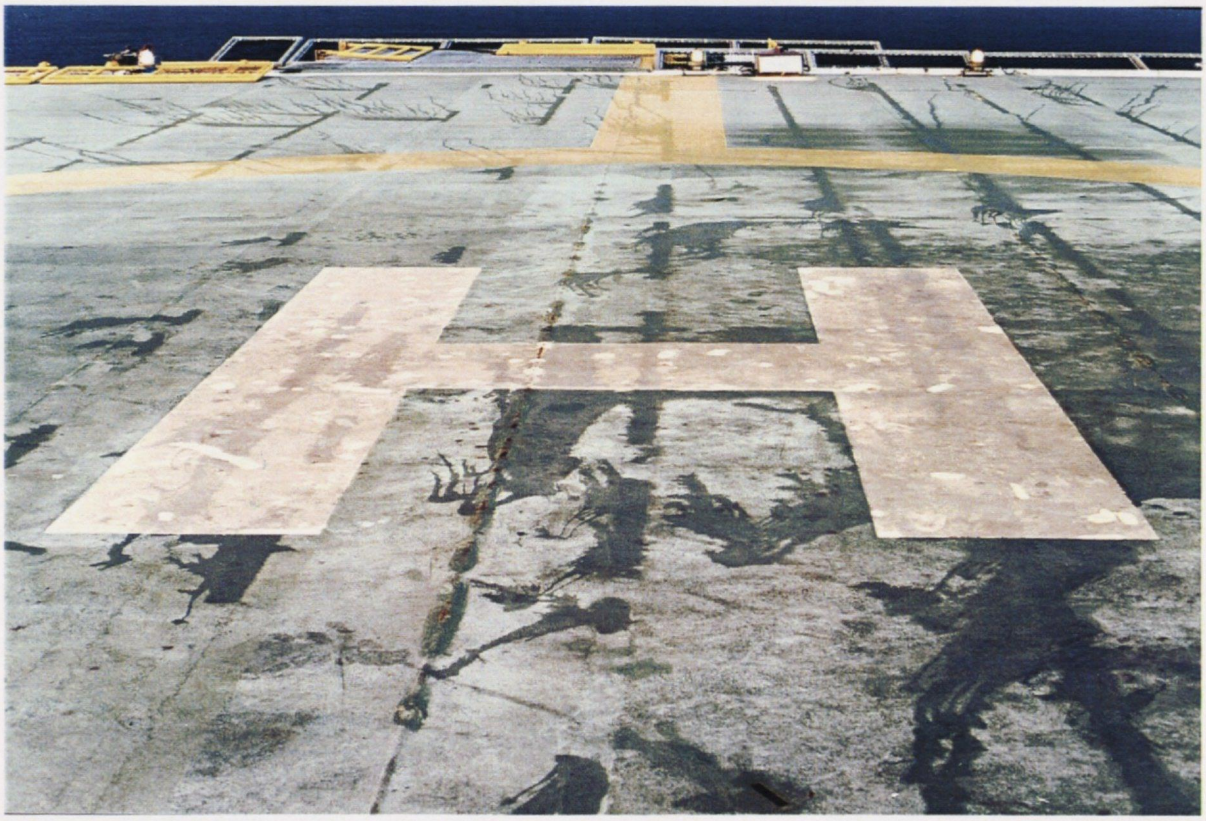


Figure 6 White Bloom

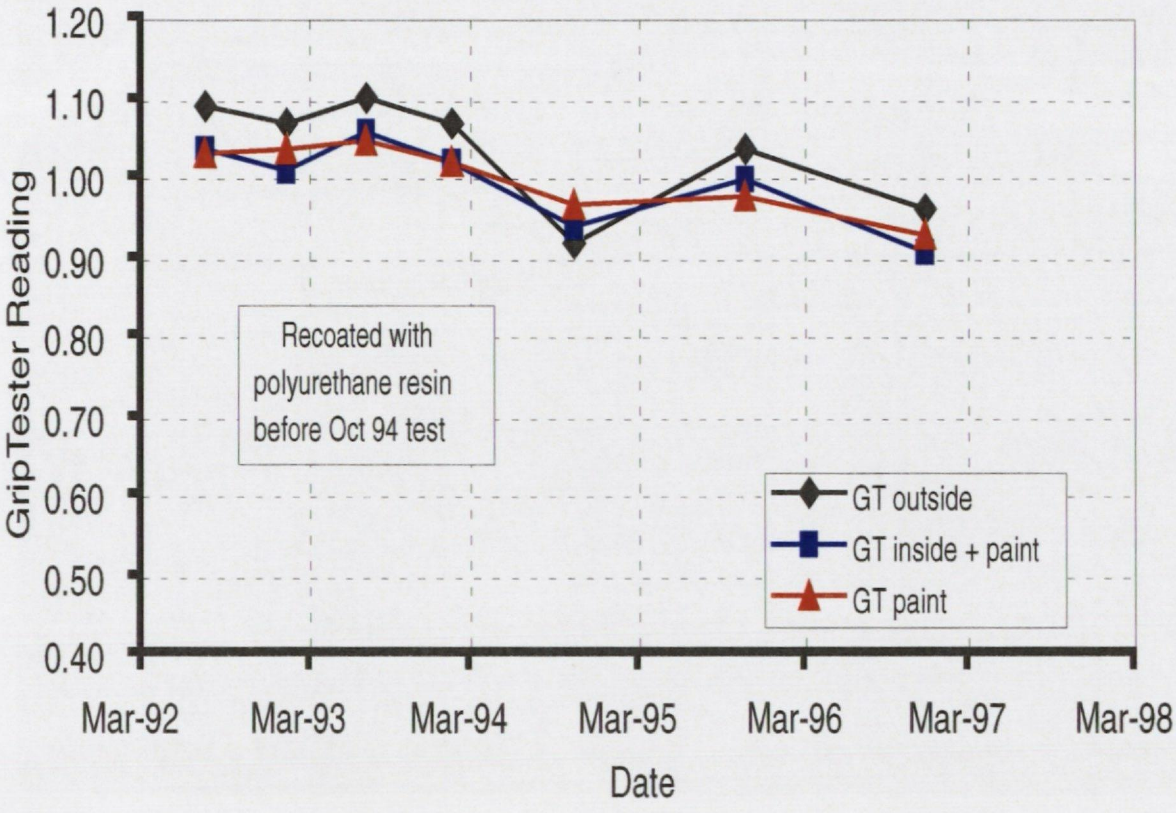


Figure 7 North Cormorant Friction History

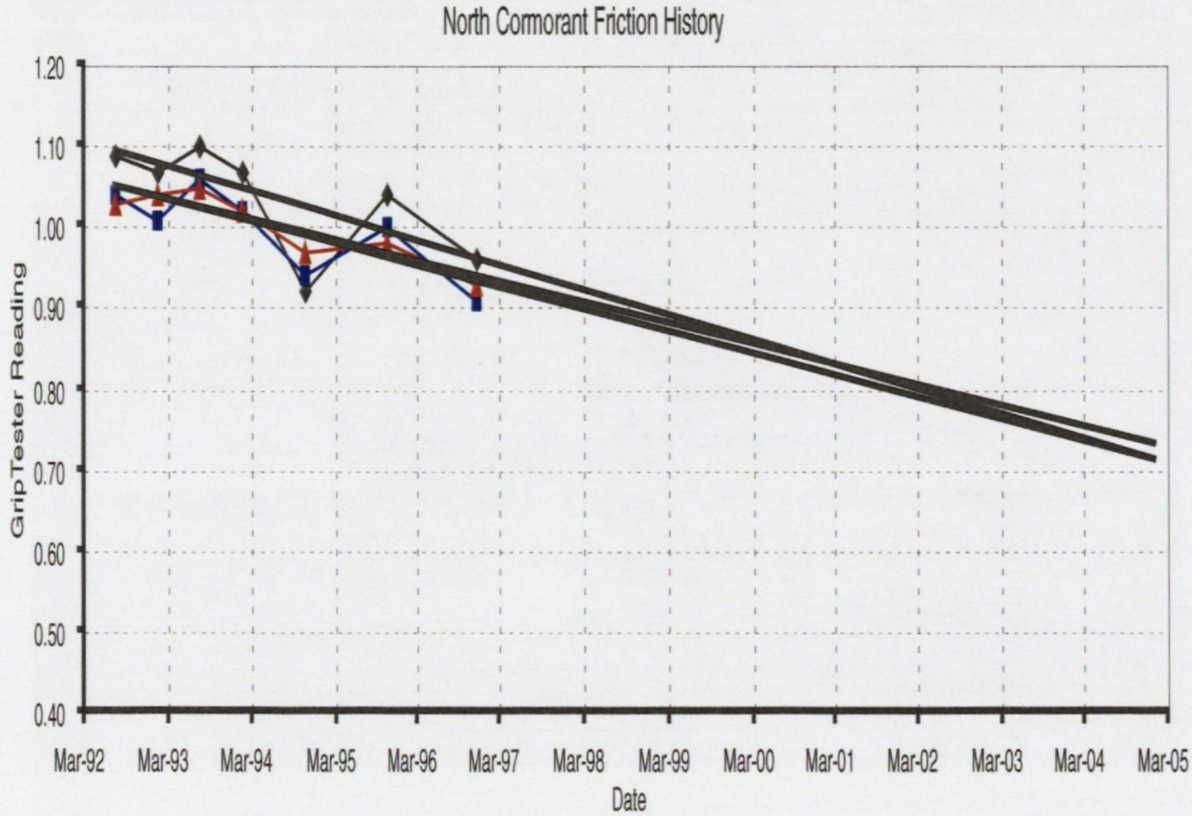
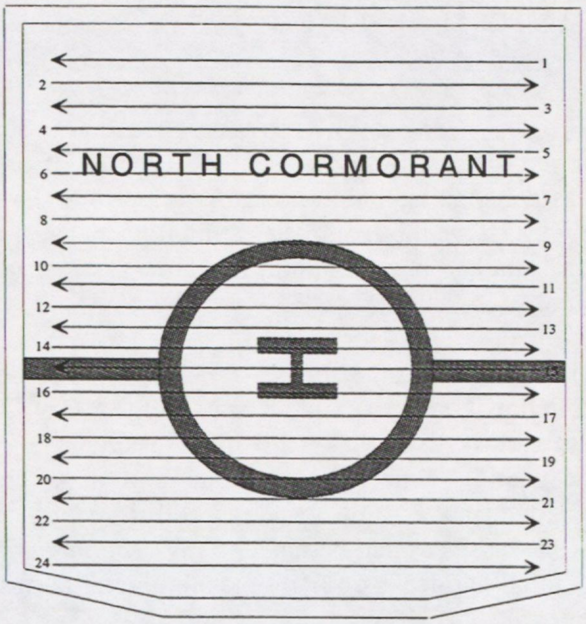


Figure 8 North Cormorant Friction History Showing Extended Trendlines



c/l

1		107	107	109	107	102	110	105	109	107	106	106	100	103	94	106	103	102	106	106	105	104	100	105	103	110	101		1
2		110	113	110	111	100	99	107	104	108	107	100	101	97	96	89	97	97	105	104	102	104	104	101	105	106	104		2
3		107	108	111	112	109	107	105	108	104	105	103	100	103	100	102	100	94	96	103	106	106	106	102	103	103	104		3
4			108	110	109	109	106	104	93	100	103	102	102	98	101	102	96	101	106	107	107	104	105	104	105	104	96		4
5		96	98	98	103	103	111	96	104	90	94	91	98	94	100	95	95	99	100	106	104	101	100	100	98	95	103		5
6			93	99	94	100	98	97	88	93	99	103	104	101	99	100	99	101	95	95	97	98	83	90	97	88	92		6
7			102	111	111	109	111	107	108	101	103	101	100	102	100	102	98	99	101	102	104	105	108	107	100	100	98		7
8			107	112	108	109	110	107	101	104	105	102	103	104	101	103	102	96	106	105	107	103	107	108	110	108	104		8
9		106	108	112	105	107	107	106	97	103	104	107	107	106	106	120	108	106	112	104	111	108	107	106	106	106			9
10			108	110	110	111	109	109	99	106	102	97	97	93	97	102	98	99	108	107	105	103	106	103	100	98	97		10
11		106	108	109	109	108	113	106	103	102	96	98	96	96	95	96	103	94	104	107	102	103	103	108	108	105			11
12		110	111	112	112	111	110	110	102	103	100	96	95	91	95	96	100	96	106	108	109	105	107	105	106	104	102		12
13		104	110	110	107	106	107	108	102	102	100	93	95	102	99	90	90	96	96	97	106	101	108	105	106	110	105		13
14		104	107	104	105	104	102	104	88	91	89	82	85	77	88	87	96	97	99	104	107	110	111	111	111	111	97		14
15	c/l	99	103	106	105	105	104	112	99	90	90	91	93	89	86	86	78	89	96	104	106	109	110	110	110	106	107	c/l	15
16		109	109	108	110	105	109	105	97	96	94	91	91	86	88	88	94	93	101	99	110	111	106	108	101	104	94		16
17		113	114	113	111	106	111	108	97	99	101	97	105	100	94	95	95	97	104	100	104	106	108	104	110	109			17
18		113	109	109	111	108	111	110	109	106	108	110	102	97	96	100	103	99	107	105	107	107	104	103	98	110	105		18
19		115	125	120	112	111	112	112	110	102	106	98	102	100	97	102	102	103	104	110	108	106	105	101	101	108			19
20			109	107	107	106	107	107	104	110	109	106	108	105	102	106	97	105	108	106	105	107	107	107	107	107	105		20
21		105	107	102	96	102	105	104	103	109	109	109	108	101	93	104	110	110	101	105	105	100	106	104	106	107			21
22		104	103	105	106	100	104	106	102	107	105	98	106	105	100	105	102	100	104	106	107	109	111	108	113	110	107		22
23		99	109	108	104	102	102	101	99	101	97	96	97	98	100	95	99	102	94	101	105	103	104	98	101	103	109		23
24			109	102	105	106	107	107	106	104	104	107	104	96	102	100	106	103	104	106	102	100	101	104	103	96			24

c/l

Friction readings averaged over each square metre

Min	77
Max	125

Average GN outside aiming circle: 1.04	Average GN on paint: 0.98
Average GN inside aiming circle: 1.00	Average GN for transverse runs: 0.98

Figure 9 GripTester Survey Of Shell Platform N CORMORANT on 06.11.95

3 EXTENDING THE TESTING PERIOD

3.1 Introduction

3.1.1 In 1988 a new system of assessing the friction qualities of offshore helidecks on fixed installations was established to enable operators to remove the landing net from the deck if the surface proved to have the required frictional properties. At the time it was agreed that after sufficient data had been acquired then a re-assessment of the periodicity of the task would be made.

3.1.2 Following a Civil Aviation Authority (CAA) funded extended friction survey of the North Cormorant helideck surface, and an approach by Oryx UK Energy Co, Cranfield University (CU) was tasked to make this re-assessment[10]. CU have carried out all offshore helideck friction calibrations to date and as a consequence have a wide background knowledge of the subject and, in addition, hold all the past records upon which an objective assessment can be made. Any recommendations made in this report will be applicable to all helidecks on fixed-manned installations.

3.2 Current Practice

3.2.1 At present the friction characteristics of helidecks are measured using a small three wheeled continuously measuring device called a GripTester (GT) which was specifically designed for the task. The GT is pushed across the deck at walking speed in a pre-determined pattern with a known quantity of water being deposited on the surface in front of the measuring wheel to simulate friction on a wet surface. During helideck friction calibrations the GT generates a continuous friction reading which can be analysed on a desktop PC to give friction values on a 1m x 1m matrix across the deck as shown in Figure 9.

3.2.2 The PC software is arranged to analyse the friction values on three different areas of the helideck and produce an average friction value for each. These areas are:

- Outside the aiming circle
- Inside and including the aiming circle*
- On the painted markings.

3.2.3 It should be noted that the painted aiming circle and 'H' are included in the aiming circle average due to their proximity to the area of helicopter operations. However, the painted areas are also tested independently to obtain the painted markings average which also needs to meet the minimum friction value. The painted deck name is not included in this average.

3.2.4 By calculating the forces which will cause a helicopter equipped with rubber tyres to slide across a fixed helideck surface in the most extreme of North Sea conditions, the CAA has determined the friction values necessary to prevent sliding. These friction values, recorded by the GT, are shown in Table 1 in Section 2 and now represent the standards required to support removal of a landing net on fixed installation helidecks.

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* Where Chinook bi-directional landing bars are present, they are to be treated as part of the aiming circle for the purposes of the friction survey.

3.2.5 The CAA have indicated that a helideck needs initially to achieve a friction value of 0.65 in order for the landing net to be removed[1], but this value may fall to 0.61 before the net need be refitted.

3.2.6 The purpose of this report is to propose methods of extending the time period between friction calibrations without compromising the safety of helicopter operations.

3.3 Recommendations

Definition: A Recognised Friction Surface (RFS) is a helideck surface which has a proven friction record. RFS status is achieved by demonstrating a friction value (as measured by the GripTester) above 0.70 for three years and a trendline which remains above 0.70 for the next 3 years. All three areas of a helideck as defined in para 1.3.2. are required to comply.

3.3.1 Three categories of deck surface have been identified:

(a) Untested deck, non-RFS coating

(b) Untested deck, RFS coating

(c) Previously tested deck, non RFS coating

3.3.2 *(a) Untested deck, Non-RFS coating*

3.3.2.1 A flow diagram for the following process is shown in Figure 10. If all three areas of a helideck have demonstrated a friction value of 0.70 or more over the previous three annual friction measurements it is proposed that the period between tests can be increased to 2 years provided that an extension of the 3 point trendline* does not indicate a transgression below 0.70μ-value within these two years (Figure 11). If the trendline falls below 0.70μ-value before the two year period expires (as shown in Figure 12) then testing must remain at a one year or 6 month interval as appropriate.

*Note: The trendline is a linear regression line using the equation: $y = mx + c$

3.3.2.2 Following the retest after two years if the value is still above 0.70μ-value and the trendline based on all the data does not indicate a drop within the next three years below 0.70μ-value line then the test period can be extended to three years (see Figure 13). At this point the surface will become a Recognised Friction Surface. If the trendline falls below 0.70μ-value before the three year period expires (see Figure 14) then testing must remain at a one or two year interval depending on where the trendline drops below 0.70μ-value. To summarise, the test period must never be extended beyond the point where the trendline falls below 0.70μ-value.

3.3.3 *(b) Untested deck, RFS coating*

3.3.3.1 A flow diagram for the following process is shown in Figure 15. A helideck newly treated with a Recognised Friction Surface will require testing as soon as possible after completion. If this initial friction assessment is 0.85μ-value or more, this is considered sufficiently high to give confidence that the three year trendline would indicate that the friction will remain above 0.70μ-value (based on performance data held at CU for the same surface on other offshore installations). The next friction test may therefore be performed after three years, and the period can remain at three year intervals subject to satisfactory friction readings and as long as the extended trendline for all three deck areas remains above 0.70μ-value.

3.3.3.2 If the Recognised Friction Surface does not achieve a 0.85μ-value on its initial survey then it must be tested again after one year. It is known that some surfaces take time to build up their friction values and therefore if the second test exceeds the 0.85μ-value figure then testing can be extended to a three year period as described in para 3.3.3.1 above. Otherwise the surface must be re-established as a Recognised Friction Surface by the process described in para 3.3.2.1 or 3.3.2.2 Decks on other installations with the same surface which have already achieved Recognised Friction Surface status will not be affected.

3.3.3.3 If the untested surface has been in situ for a year or more and is a Recognised Friction Surface and if the first calibration achieves an initial value equal to or greater than 0.85μ-value, then the subsequent calibration period should be three years subject to meeting the trendline requirements. Calibrations can then be performed on a three year basis.

3.3.4 *(c) Previously tested deck, non-RFS coating*

3.3.4.1 A flow diagram for the following process is shown in Figure 16. If a helideck has demonstrated a friction of 0.70μ-value or more on each of the specified areas over the previous four annual friction measurements it is recommended that the period between tests can be increased to 3 years provided that an extension of the previous 4 point trendline does not indicate a drop below 0.70μ-value within these three years (see Figure 17). At this point the surface will become a Recognised Friction Surface. If the trendline drops below 0.70μ-value before the three year period expires (as shown in Figure 18) then testing must remain at a one or two year interval depending on where the trendline crosses the 0.70μ-value line.

3.3.5 Three years is the maximum allowable period between tests. Provided that the criteria in paras 3.3.2, 3.3.3 and 3.3.4 are met, future tests may continue on a three year basis until the trendline, based on the three previous test points, drops below 0.70μ-value before the next scheduled test. At this point a test will be required before the trendline crosses the 0.70μ-value line. The three year maximum period for tests will be re-assessed when more data becomes available.

3.3.6 These recommendations are summarised in Figures 19 to 22.

3.4 Conditions

3.4.1 Since the accepted standard is the value produced by the GT then all initial friction calibrations of helidecks must be performed with this device with the results being presented on a 1m x 1m matrix across the entire area of the deck. Furthermore, trendlines must always be produced using results generated by the same type of friction measuring machine.

3.4.2 Other friction machines are acceptable provided that they correlate with the GT to the satisfaction of the CAA. If it is the intention to establish a trendline for use in the process described in Section 3.3 above using an alternative machine then it is suggested that during the initial calibration with the GT a parallel calibration is performed using the alternative which, provided satisfactory results are achieved, can then be used in subsequent years.

3.4.3 If friction calibrations are to be carried out using an alternative friction machine then it will be necessary to re-establish the trendlines as described in Section 3.3 with the new machine.

3.4.4 Because of the large time gap between friction tests (up to 3 years) the condition of the deck must be monitored closely by platform personnel and if there is any doubt then a test must be performed before the allotted time span.

3.4.5 It is likely that painted markings will need to be refreshed in between calibrations and it is therefore essential that the friction values are maintained by using manufacturers' recommended materials and procedures for application.

3.5 Database

3.5.1 It is proposed that a database of Recognised Friction Surfaces by trade name, specification and friction performance will be maintained by CU on behalf of the Offshore Oil Industry. Initial entries in the database will be ascertained by inspection of the helideck test records held at CU.

3.5.2 Performance data for inclusion in the data base will be accepted on production of accredited data from recognised testing agencies using an approved friction measuring device.

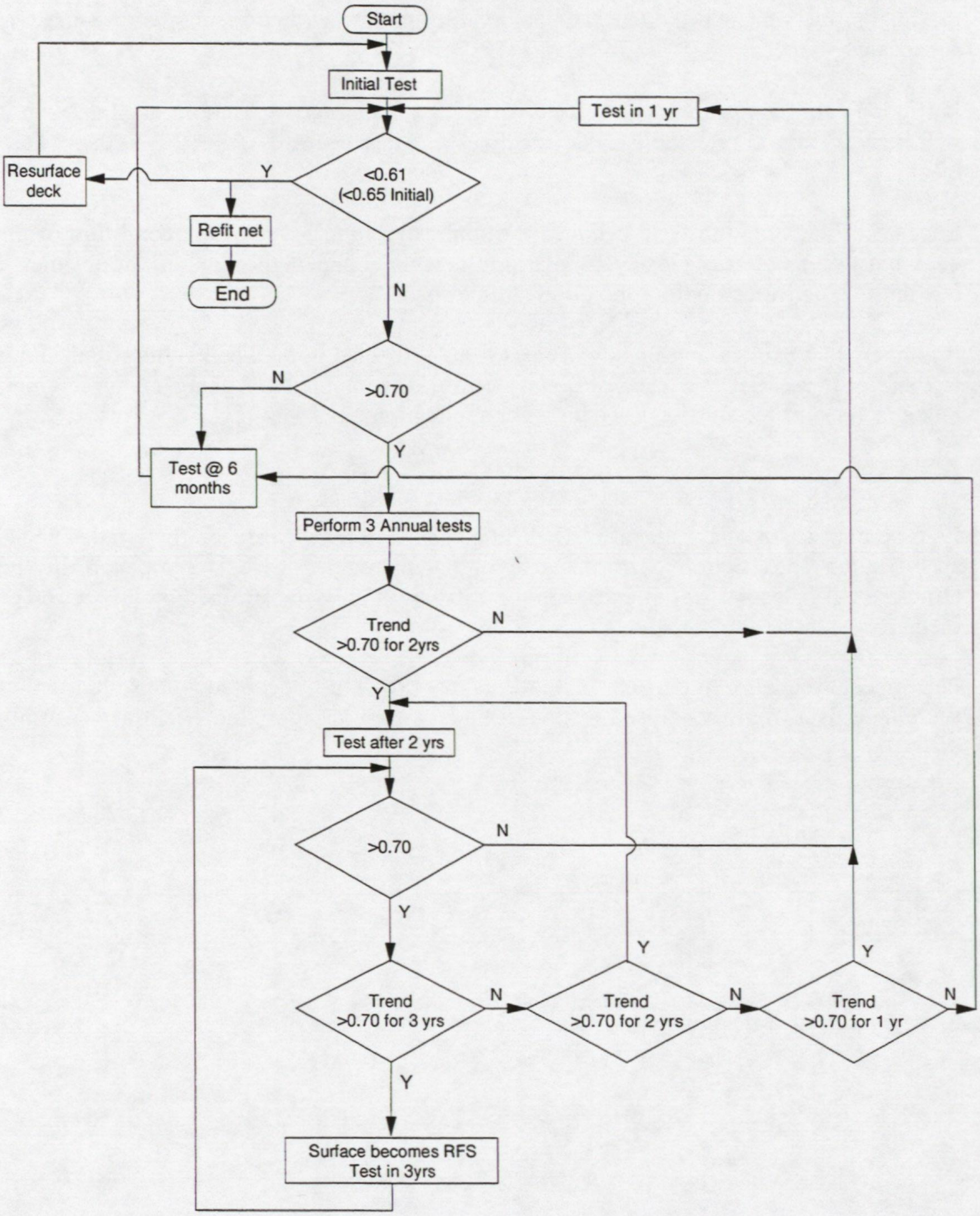

Figure 10 Flow diagram – Untested Non-RFS Decks

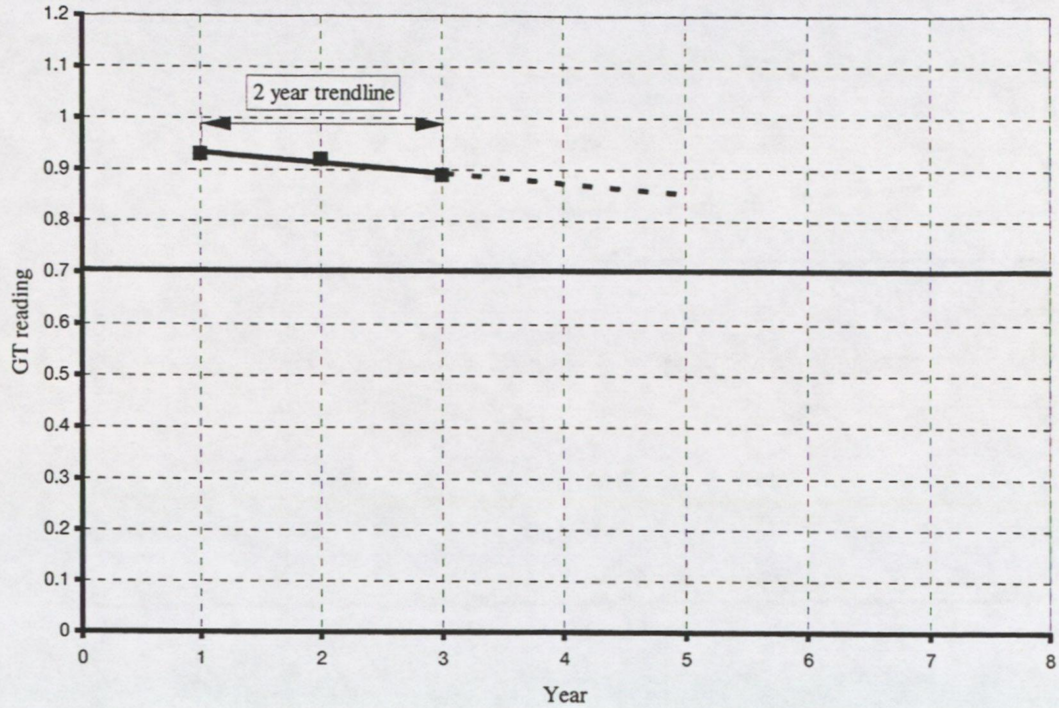

Figure 11 Acceptable 2yr Trendline

The extension of the 2 year (3 point) trendline remains above 0.7 for 2 years.

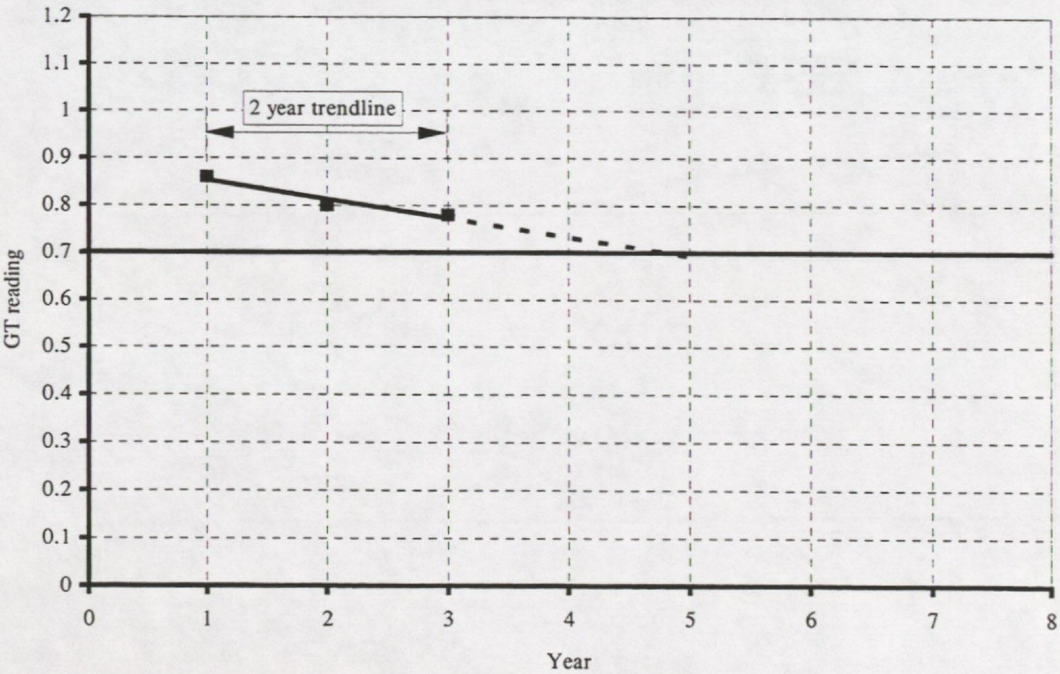

Figure 12 Unacceptable 2yr Trendline

The extension of the 2 year (3 point) trendline falls below 0.7 within 2 years.

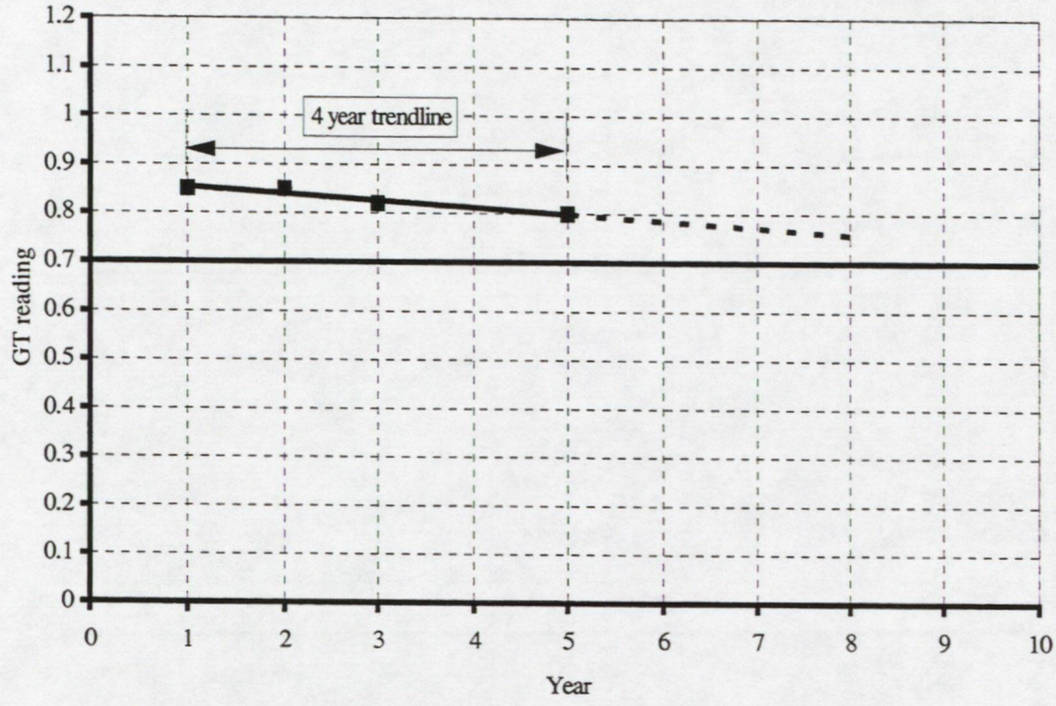

Figure 13 Acceptable 4yr Trendline

The extension of the 4 year (4 point) trendline remains above 0.7 for three years.

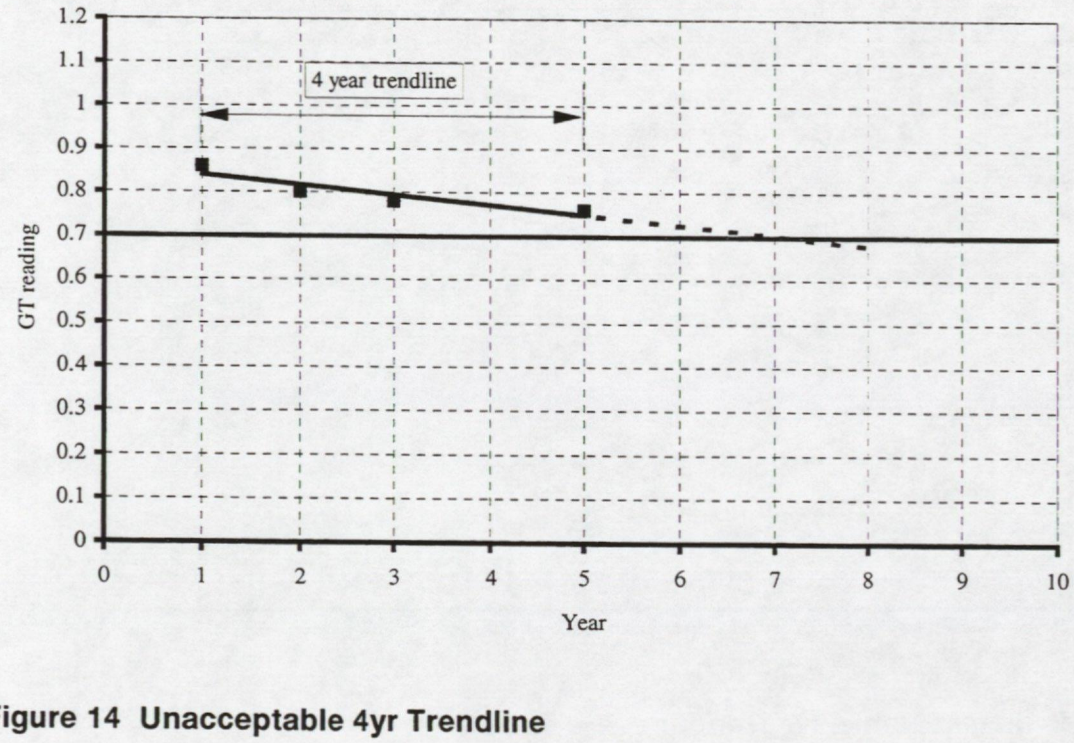

Figure 14 Unacceptable 4yr Trendline

The extension of the 4 year (4 point) trendline falls below 0.7 within three years.

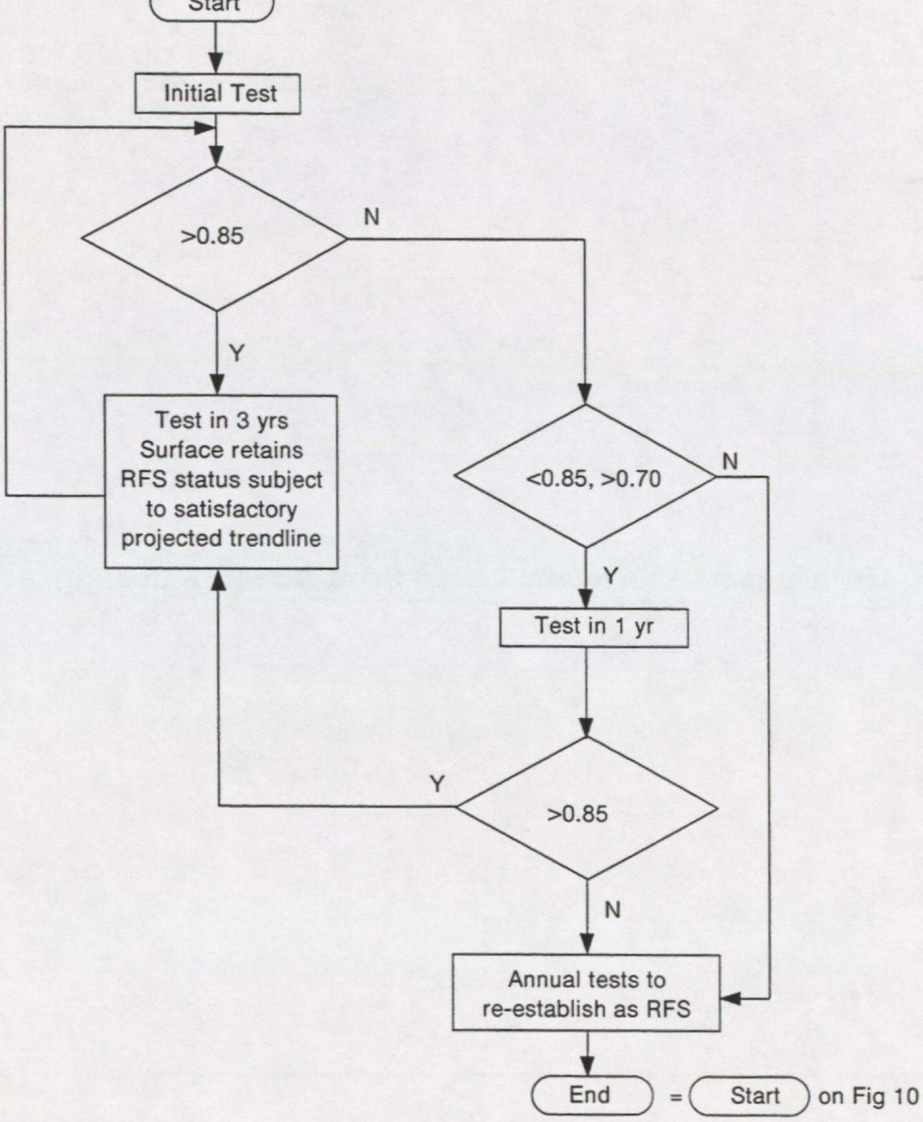

Figure 15 Flow Diagram – Untested Deck, RFS Coating

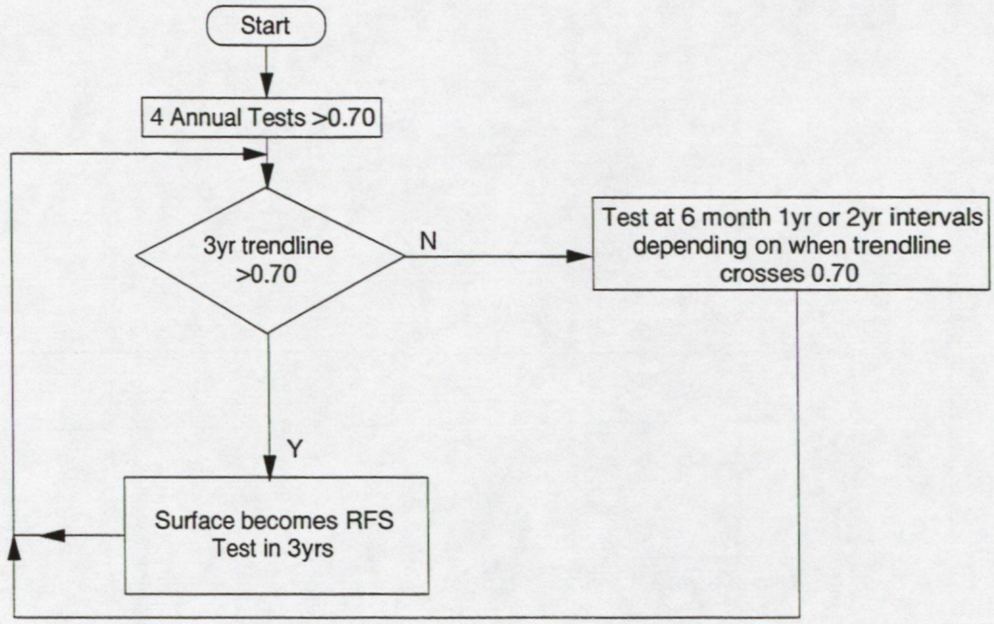

Figure 16 Flow diagram – Previously Tested Deck, Non-RFS Coating

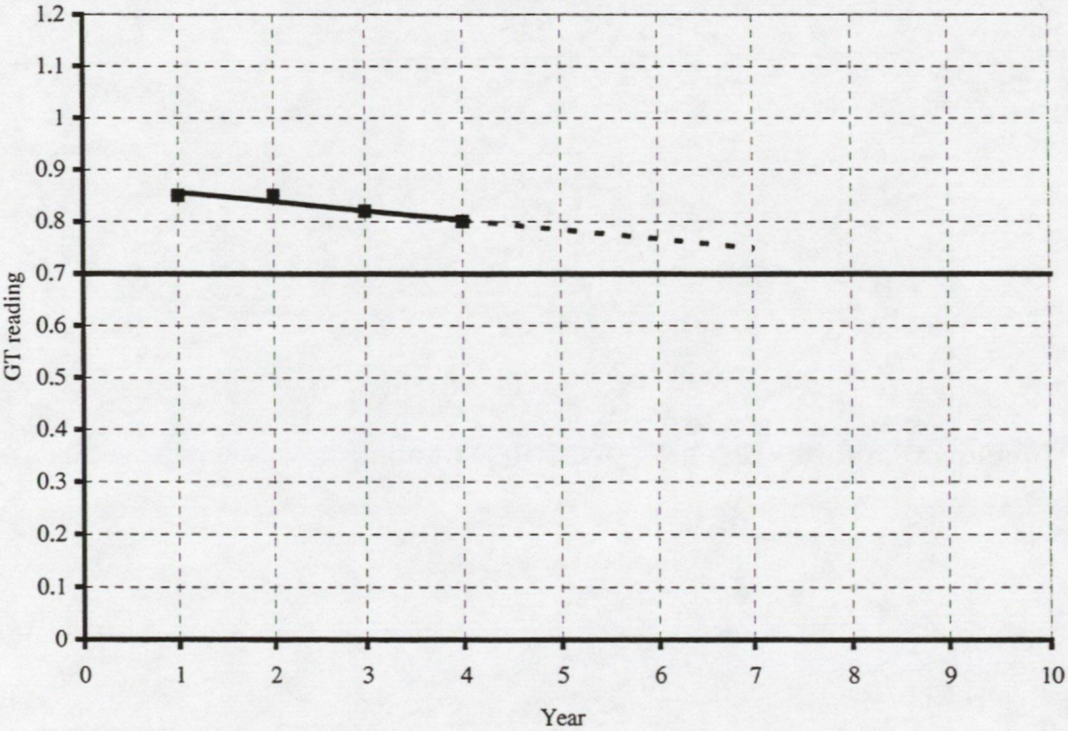

Figure 17 Acceptable 3yr (4 point) Trendline

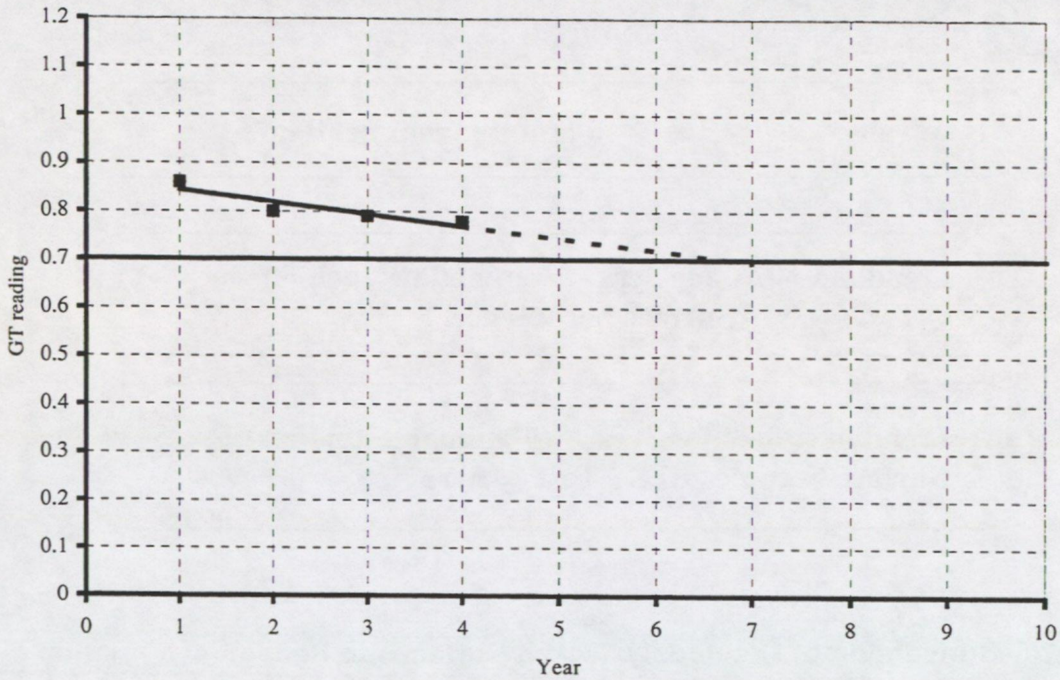

Figure 18 Conditionally Acceptable 3yr (4 point) Trendline

The extension of the 3 year (4 point) trendline crosses 0.7 within 3 years: Retest required in this case after 2 years

Recognised Friction Surface

A surface which has demonstrated average friction values of more than 0.70 for four annual tests and whose trend line remains above 0.70 for the next 3 years.

Figure 19 Conditions for Recognised Friction Surface

A) Untested deck, non-RFS coating

i) μ value <0.70 - Test @ 6 months, refit net if <0.61

ii) Trendline >0.70 for 2yrs - (3 annual test points)
- Test @ 2yrs Surface becomes RFS

iii) Trendline >0.70 for 3yrs - (4 annual test points)
Surface becomes RFS - Test @ 3yrs

Figure 20 Conversion of Previously Tested Surfaces to Recognised Friction Surface (RFS)

B) Untested deck, RFS coating

i) μ value >0.85, - Test @ 3 years

ii) μ value <0.85 - Retest in 1year, then:
>0.85 - Test @ 3 years
<0.85 - go to A

Figure 21 Checking Recognised Friction Surface (RFS) Coating on Other Platforms

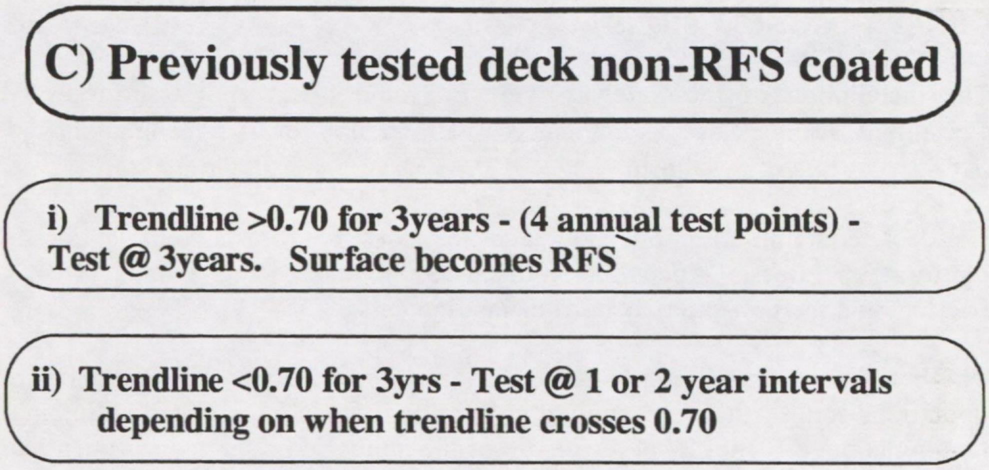

Figure 22 Conversion of Existing Deck Surface to RFS

4 GENERAL CONCLUSIONS

4.1 The installation of the Safeway Traffic Products Ltd epoxy surface on the North Cormorant Helideck has been a success with friction levels remaining above 0.9μ-value over the 5 years of monitoring.

4.2 Helideck contamination by snow and ice does not present any major problems to platform operators. Appendix A discusses helideck icing and its effect on surface friction, and the nett safety benefit of landing nets.

4.3 The benefits of using retro-reflective coatings are likely to be minimal during normal operations unless they are applied to markings which are usually illuminated by the landing lamp, e.g. the 'H' at the centre of the helideck, as shown in Appendix B.

4.4 Some problems were encountered with the initial laying of the surface in the hostile environmental conditions of the North Sea and serious consideration should be given to installing such an epoxy surface, with its relatively long curing time, either under cover on the platform or on-shore or in a factory in the form of tiles, as discussed in Appendix C.

4.5 Pilot reports on some helidecks where the net has been removed indicate that the net itself had been useful in providing texture gradient cues for landing, particularly at night (See Appendix A, 2.2). Before removing or considering removal of landing nets, owner/operators should check with the British Helicopter Advisory Board (BHAB) Helideck Sub Committee on any negative aspects of landing net removal on any specific installation in this respect.

REFERENCES

1 CAA letter (AJ Selwood – Director, Aerodrome Standards). Ref: 10G/7/30 dated 16 December 1987.

2 Helideck Friction Calibration – NORTH CORMORANT, Report 1, by I. Beaty. Aircraft Ground Operations Group, Cranfield Institute of Technology. TN-92-200 Aug. 92.

3 Helideck Friction Calibration – NORTH CORMORANT, Report 2, by I. Beaty. Aircraft Ground Operations Group, Cranfield Institute of Technology. TN-93-212 Feb. 93.

4 Helideck Friction Calibration – NORTH CORMORANT, Report 3, by I. Beaty. Aircraft Ground Operations Group, Cranfield University. FS-2029 Aug. 93.

5 Helideck Friction Calibration – NORTH CORMORANT, Report 4, by I. Beaty. Aircraft Ground Operations Group, Cranfield Institute of Technology. FS-2062 Feb. 94.

6 Helideck Friction Calibration – NORTH CORMORANT, Report 5, by I. Beaty. Aircraft Ground Operations Group, Cranfield University. FS-2114 Nov. 94.

7 Helideck Friction Calibration – NORTH CORMORANT, Report 6, by I. Beaty. Aircraft Ground Operations Group, Cranfield University. FS-2218 Nov. 95.

8 Helideck Friction Calibration – NORTH CORMORANT, Report 7, by R. J. Nicholls. Aircraft Ground Operations Group, Cranfield University. FS-2351 Dec. 96.

9 Offshore Helideck Surface Friction Trials by R W Sugg and I Beaty. Aircraft Ground Operations Group, Cranfield University. CIT-FI-85-063. May 1985.

10 Proposal for the Extension of the Test Period for the Assessment of Helideck Friction on Fixed Installations by I Beaty. Aircraft Ground Operations Group, Cranfield University. FS-2190. March 1996.

Appendix A Minor Research Projects

1 HELIDECK ICING AND ITS EFFECT ON SURFACE FRICTION

1.1 Introduction

As part of the North Cormorant experiment the CAA requested CU to carry out a survey of selected offshore installations to determine the frequency of occurrence and the method of control of ice on the helideck surface. The request was occasioned by helicopter pilots' expressed concerns about operating from snow or ice covered helidecks which were not fitted with a landing net. The report was combined with the normal friction report written at the time[5].

1.2 Reports

1.2.1 Nine returns were received (including 2 each from Hutton TLP and LOGGS). No platform reported any particular problems with snow and ice.

1.2.2 The North Sea can be divided into northern and southern sectors. The southern sector rarely experiences snow and ice whilst the northern sector varies between 6 (Hutton TLP) and 20 to 30 (N Cormorant) days per year of ice.

1.2.3 All the platforms use visual inspection for ice detection – none has automatic ice detectors.

1.2.4 None of the platforms in the southern sector use ice removal chemicals although one (Viking B) uses domestic salt when necessary. Another (LOGGS) uses high pressure water.

1.2.5 All of the platforms in the northern sector carry ice control chemicals – mainly in the form of granules (probably urea), but one (Beryl A) uses liquid 'Konsin' and another (N Cormorant) uses Aeroshell AL5.

1.2.6 The granules are spread by hand and the liquids by spray pack. When the ice starts to break up it is either swept away with brooms or washed away with high pressure sea water.

1.3 Conclusions

1.3.1 Helidecks which have had their landing nets removed do not have a problem with ice and snow.

1.3.2 The removal of the net has positive advantages in that any ice which does occur is easily removed and there is no build up of snow in the net mesh.

1.3.3 It is recommended that no particular instructions are included in CAP 437 on ice and snow removal, but that a general assurance is given that ice and snow is not a problem provided that due diligence is maintained.

2 NETT SAFETY BENEFITS OF NETS

2.1 It was intended to carry out a survey of accident/incident reports in which reference to the landing net was made, but in the event no information could be found in the public domain. However a list of benefits and disbenefits pertaining to the use of nets has been finalised in discussion with various sources and is reproduced below.

2.2 **Benefits of nets:**

- Remove the necessity of maintaining a high friction helideck surface.
- Prevent burning fuel from rapidly spreading across the deck in the event of an incident.
- Retain fire-extinguishing foam beneath the helicopter in the event of an incident.
- Provide pilots with visual cues during approach and landing.
- Give some pilots a greater sense of security.
- Prevent scuffing of the deck surface by helicopters fitted with skids.

2.3 **Disbenefits of nets:**

- Tripping and possible injury hazard to aircrew, passengers and helideck crew.
- Prevent the use of wheeled equipment near the helicopter.
- May be hazardous to helicopters fitted with skids.
- Require regular re-tensioning and replacement.
- Prevent dispersal of foam after routine testing of fire monitors.
- Obscure helideck markings from some angles during helicopter approach and landing.
- Retain burning fuel beneath the helicopter in the event of an incident.
- Prevent the easy spread of fire-extinguishing foam beneath the helicopter in the event of an incident.
- Require removal to ease deck cleaning.
- Soak up spillages of oil/fuel from helicopters and become slippery.
- Retain snow and make snow and ice clearance difficult.

3 RETRO-REFLECTIVITY

This item has been reported on by the CAA in Evaluation of Retro-Reflective Helideck Markings – An Analysis of Pilot Questionnaires which is at Appendix B.

Appendix B Evaluation of Retro-Reflective Helideck Markings - Analysis of Pilot Questionnaires

File Ref. 10MG/16/6

CIVIL AVIATION AUTHORITY

Safety Regulation Group

RMD Report :

Evaluation of Retro-Reflective Helideck Markings – Analysis of Pilot Questionnaires

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28th December 1995

1 INTRODUCTION

In order to attempt to objectively establish the usefulness of coating helideck markings with retro-reflective treatments, the legend on the helideck of the North Cormorant platform was treated with a variety of different specification coatings. The helideck marking layout is given in Annex 1, together with the specifications of the coatings applied to each letter of the legend.

The relative performance of the individual coatings was qualitatively evaluated under a variety of conditions by means of a questionnaire survey of pilots operating to the platform. A total of 24 questionnaires were completed and returned to CAA (annotated (i) through (xxiv) in date/time order). Pilots were not told which coating was used on the individual letters.

2 RESULTS

2.1 Ambient light conditions encountered

GOOD									POOR
1	2	3	4	5	6	7	8	9	10
(xii)	(vii)	(v)	–	–	(i)	(xiv)	(xx)	–	(iv)
(xiii)	(x)	(viii)			(ii)	(xv)			(vi)
(xxi)		(xi)			(iii)	(xxiii)			(xvii)
(xxii)		(xvi)			(ix)				(xix)
		(xviii)							

2.2 Precipitation encountered

NIL	(v)	(vii)	(ix)	(x)	(xi)	(xii)	(xiii)	(xv)	(xvi)
	(xvii)	(xviii)	(xix)	(xxi)	(xxii)	(xxiii)			
LIGHT	(ii)	(iii)	(iv)	(vi)	(viii)	(xiv)	(xx)	(xxiv)	
MODERATE	(i)								
HEAVY		–							

2.3 Helideck conditions encountered

WET	(i)	(vii)	(viii)	(ix)	(xiv)	(xvii)	(xviii)	(xx)	(xxiv)
DAMP	(ii)	(iii)	(iv)	(vi)	(xi)	(xiii)	(xv)	(xvi)	(xxi)
	(xxii)	(xxiii)							
DRY	(v)	(x)	(xii)	(xix)					

2.4 Letter(s) most conspicuous in 'North Cormorant' legend

2.4.1 *Basic results*

	N	O	R	T	H	C	O	R	M	O	R	A	N	T
(i)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
(ii)	✓	✓	✓	✓	•	✓	✓	•	✓	✓	✓	✓	✓	•
(iii)	•	✓	•	✓	•	✓	•	•	✓	✓	✓	•	•	•
(iv)	•	•	•	•	•	✓	•	•	✓	•	•	•	•	•
(v)	✓	•	•	•	•	✓	•	•	✓	•	•	✓	✓	✓
(vi)	•	✓	•	•	•	•	✓	•	•	•	•	•	•	•
(vii)	•	•	•	•	•	•	✓	•	•	•	•	•	•	•
(viii)	•	✓	✓	•	•	•	✓	✓	•	•	•	•	•	•
(ix)	•	✓	✓	✓	•	•	✓	✓	•	•	✓	•	•	✓
(x)	✓	•	•	•	✓	✓	•	•	✓	•	•	✓	•	•
(xi)	•	•	•	•	•	✓	•	•	✓	•	•	•	•	•
(xii)	•	✓	✓	✓	•	•	✓	✓	•	✓	✓	•	•	•
(xiii)	?	•	•	•	•	✓	•	•	•	•	•	•	•	•
(xiv)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
(xv)	✓	•	•	•	•	✓	•	•	•	•	•	•	•	•
(xvi)	•	✓	•	✓	•	•	✓	•	•	✓	✓	•	•	•
(xvii)	✓	•	•	•	•	✓	•	•	✓	•	•	•	•	•
(xviii)	•	✓	✓	✓	•	•	✓	✓	•	✓	✓	•	✓	✓
(xix)	•	•	•	•	•	✓	•	•	✓	•	•	✓	•	•

(xx)	✓	•	•	•	✓	✓	•	•	✓	•	•	•	•	•
(xxi)	•	✓	✓	✓	•	•	✓	✓	•	✓	✓	•	✓	✓
(xxii)	✓	•	•	•	•	✓	•	•	✓	•	•	✓	•	•
(xxiii)	✓	•	•	•	✓	✓	•	•	✓	•	•	✓	•	•
(xxiv)	•	✓	✓	•	•	•	✓	✓	•	✓	✓	•	•	•
Totals	10	12	9	9	5	13	13	9	11	9	10	9	6	7
Ranking	5	3	7	7	14	1	1	7	4	7	5	7	13	12

2.4.2 *Qualitative analysis*

It is known that retro-reflectivity deteriorates when the associated surface is wetted. In order to attempt to remove this variable from the results, each observation was factored according to the reported deck condition (3 points for dry deck, 2 for damp deck, 1 for wet deck) and the results re-ranked.

It is also known that the performance of retro-reflective surfaces varies with ambient light. Observations in conditions of poor ambient light should therefore be more reliable than those in good ambient light.The results were therefore factored by the reported ambient light conditions (10 for poor to 1 for good) and re-ranked.

Letter	*Coating spec.*	*Ranking*		
		Un-weighted	*Weighted for deck cond.*	*Weighted for ambient light*
N	1.9 RI fluorescent	5	6	5
O	Standard	3	4	4
R	Standard	7	10	8
T	Standard	7	8	10
H	1.5 RI	14	14	13
C	1.9 RI small	1	1	1
O	Standard	1	3	3
R	Standard	7	10	8
M	1.9 RI large	4	2	2
O	Standard	7	8	10
R	Standard	5	7	7
A	1.5 RI fluorescent	7	4	6
N	Standard	13	13	14
T	Standard	12	12	12

2.5 Comments received

(i) Did not appear reflective.

(ii) The H, C and M did not show up as well as the others.

(iii) Ticked letters were best, unable to differentiate between them; NB I did this check yesterday with completely opposite result with light falling from opposite direction.

(vii) Snow showers had been passing through however deck was clear. I still have reservations about no net for winter ops.

(x) Approach from NE + on to deck from east side.

(xi) Letters C & M significantly brighter than other letters in landing lamp beam.

(xiv) Letters viewed from oblique angle due to approach direction which avoided direct illumination by landing light.

(xvi) From a distance no real difference, only apparent when on short finals.

(xix) Helideck illuminated by aircraft landing lights + helideck lighting.

(xxii) Depends where the landing light is shining.

3 DISCUSSION

In general, the results obtained were as expected with the 1.9 RI small bead coating emerging as the best overall performer, followed by the 1.9 RI large bead coating (weighted results). The letters coated with glass beads were expected to rank higher than those without and, with reference to DRA Working Paper FS(B)WP(93)026 of March 1993, the 1.9 RI beads were expected to out perform the 1.5 RI beads.

Surprising results were the relatively high ranking of the 'O' in 'NORTH' and first 'O' in 'CORMORANT' to which no beads were applied, and the low ranking of the 1.5 RI coating on the 'H'. There is no obvious explanation for the higher than expected ranking of the two 'O's, particularly as the performance of the third letter 'O' was so much lower. There is also no obvious explanation for the apparently poor performance of the 1.5 RI coating on the letter 'H'.

A factor not accounted for in the analysis that would be expected to have a significant effect on the results is the orientation of the landing lamp. The difference in conspicuity of the coatings would be expected to be quite marked when directly illuminated by the beam. It would seem, however, that this does not often occur since the basic results (see para. 5.1) suggest that pilots frequently found it difficult to differentiate between the performance of a number of the different coatings.

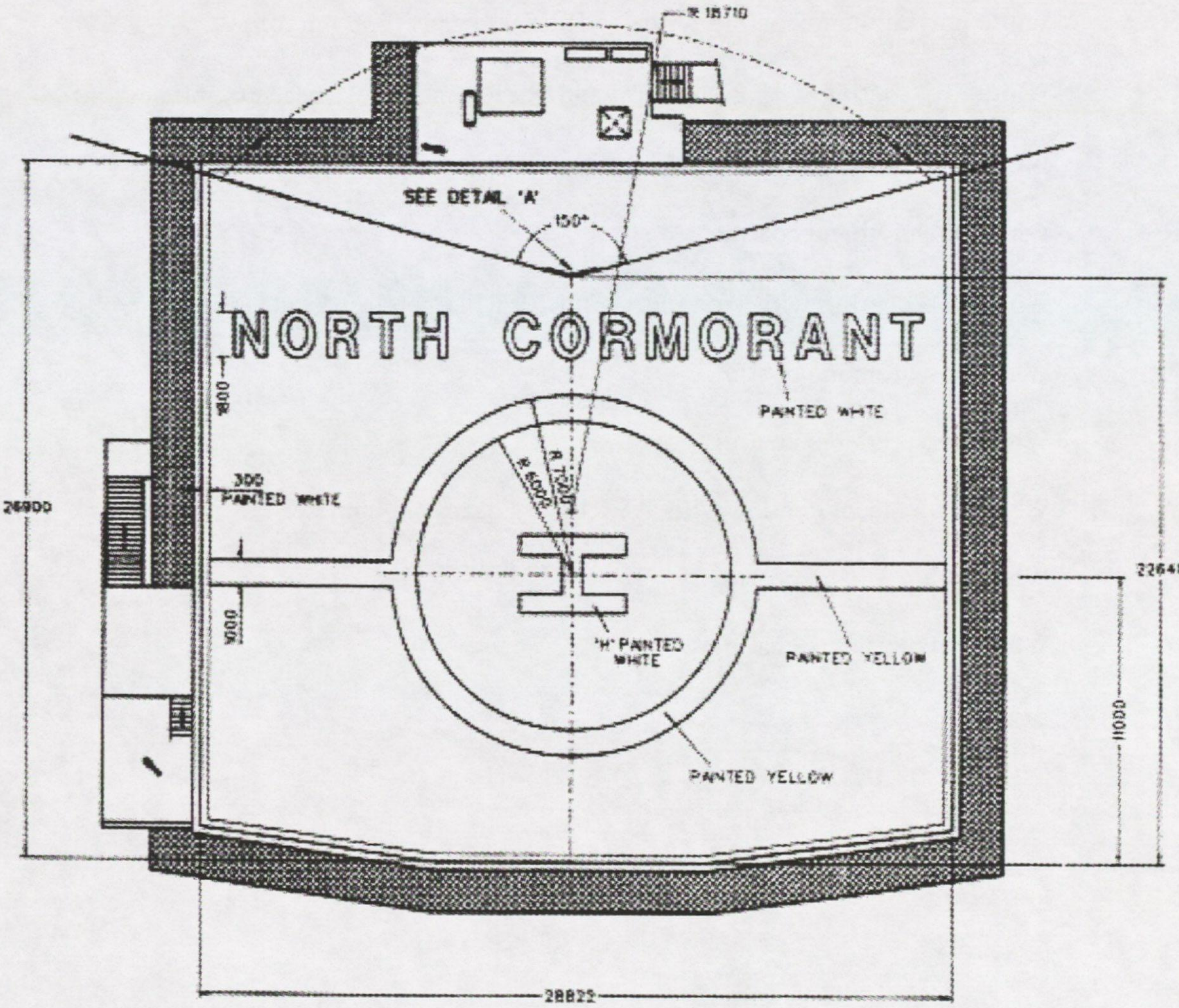
4 CONCLUSIONS

4.1 The benefits of using retro-reflective coatings are likely to be minimal during normal operations unless they are applied to markings which are usually illuminated by the landing lamp, e.g. the 'H' at the centre of the helideck.

4.2 Based on the results of the evaluation, the 1.9 RI small bead coating appears to provide the best performance.

Annex 1 Detail of North Cormorant Helideck Markings

A.1.1 HELIDECK MARKING LAYOUT:



A.1.2 SPECIFICATIONS OF COATINGS:

Letter	*Coating Specification*
N	White fluorescent coating with 1.9 RI glass beads
O	White polyurethane coating
R	White polyurethane coating
T	White polyurethane coating
H	White polyurethane coating with 1.5 RI glass beads (250 micron)
C	White PFS coating with 24 mineral and 1.9 RI small glass beads (<560 micron)
O	White polyurethane coating
R	White polyurethane coating
M	White PFS coating with 16 mineral and 1.9 RI large glass beads (>560 micron)
O	White polyurethane coating
R	White polyurethane coating
A	White fluorescent coating with 1.5 RI glass beads (250 micron)
N	White polyurethane coating
T	White polyurethane coating

Appendix C Re-surfacing the North Cormorant helideck using the Safeway product

RE-SURFACING THE NORTH CORMORANT HELIDECK USING THE SAFEWAY PRODUCT

With a view to the removal of helideck nets on fixed installations Shell Expro were approached by both Safeway Products and the Civil Aviation Authority (CAA) for the use of a helideck to trial the new Safeway surface. The Safeway surface not only promised a high friction reading but retro-reflective helideck markings. The CAA had funds available to assist in financing a trial using the Safeway product.

North Cormorant were approached as they had previously been very keen to have their helideck net removed, also they had planned to re-paint their helideck during 1992. After discussions with the North Cormorants Offshore Installation Supervisor and Platform Manager it was decided to proceed with the project during the summer months of 1992.

A Safeway representative visited the platform on the 24th March 1992 to view the helideck and acquaint himself with an offshore installation. Prior to the project commencing a meeting was held in the offices of Joint Venture (The HNSC for North Cormorant) with all parties in attendance, Safeway, North Cormorant, Aircraft Services and Joint Venture. The meeting set a plan of action to ensure all materials and personnel involved would be in place to commence the re-surfacing on the 10th of July 1992. A programme was set to allow the helideck to operate helicopters during the re-surfacing.

Prior to the 10th of July the North Cormorant had removed the previous helideck surface and markings. The CAA agreed for the helideck to continue operating helicopters laying down certain restrictions.

The main problems encountered during the programme were as follows:-

1 The helideck surface had to be prepared by an auto blast machine to ensure that the Safeway primer adhered correctly to the steel surface. This was a slow process and it was found difficult to control the blasting material. The primer had to be applied quickly and due to the wind conditions quite often the blasting material contaminated the primer. This resulted in the area contaminated having to be re-worked.

2 Unfortunately throughout the two week programme the weather (rain) continually disrupted the programme, and in some cases the rain damaged the new surface. In every case of damage the surface had to be re-laid.

3 The weather disrupted both weekends, when arrangements had been made to stop all flying, except for emergency and operational reasons. This resulted in the repainting programme having to be planned around the weekday crew change flight schedule, with the obvious disruptions.

4 The Safeway personnel were new to the offshore environment and initially had difficulties settling into the routine. The platform gave as much assistance as necessary and without this and the capability of the Safeway supervisor the project would not have progressed as well as it did.

5 Due to the curing requirements of the product and the poor weather it was difficult to apply the necessary coats and allow them to cure properly. For example the finish can bloom, and did, if it is affected by rain before it has sufficiently cured.

The finished product is good. From the air all the markings are easy to see and stand out well from the helideck.

Cranfield Institute of Technology conducted a friction test on the helideck one week after completion of the re-surfacing on the 29/7/92. The friction reading was in excess of the requirement. The requirement for the project was for the friction reading to be 0.8mu. On test the reading was 1.0mu. For information the CAA require a net fitted on a helideck for friction readings of less than 0.6mu.

Two problem areas have been highlighted post the new finish:

1 The Bell 212 undercarriage skids are scuffing and marking the helideck. Fortunately the scuffing has appeared to only affect the surface of the finish and not the integrity. It is too early to say whether the scuffing will affect the friction properties in the future.

2 Excess ferrous blasting compound has corroded, and subsequently stained the surface of the new finish. The platform are aware of the problem and are attempting to remove the blasting compound; however they need dry conditions to do this. Once all the blasting compound has been removed the stained areas will be touched up.

D Casson
Shell Expro
UEOS/12.