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Ref: 001306

SPECIAL REPORT : SR99/004

Research and Development test of yachting safety products

Client : NSW Police Service
NSW Water Police Branch,
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Client's Reference : Letter dated, 2 March 1999.

Test Specifications : Australian Standard AS 2227:1992,
Yachting harnesses and lines- Conventional lines.
Appendix B, Method of test for dynamic load.

Test Items : TUFF Marine Australia, yachting safety products;

One (1) Yachting line involved in fatal incident,
from the 'Sword of Orion' yacht.

One (1) Yachting harness and line assembly,
from the 'Sword of Orion' yacht.

Date of Tests : 24 Feb 1999 (*Visual Assessment*)
8 Mar 1999 (*Dynamic Assessment*).

Report prepared by : Carlos Brito Date: 11 AUG 99
Carlos Brito
Technical Officer.

Issued by : Derek Wainohu Date: 24 AUG 99
Derek Wainohu
Test Laboratory Manager.



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Checked by: F. Aguilera Date: 11/3/99

1. INTRODUCTION

The NSW Water Police Branch supplied a TUFF Marine Australia yachting line for a visual examination. The line formed part of a yachting harness assembly, which was involved in a fatal incident on the 'Sword of Orion' yacht during the 1998 Sydney to Hobart Yacht Race. The yachting line was the only item recovered from the incident.

The NSW Water Police Branch also supplied another complete TUFF Marine Australia yachting harness and line assembly from the 'Sword of Orion' yacht purported to be of the same model as the assembly involved in the fatal incident. This assembly was supplied to compare with the yachting line involved in the fatal incident and also to determine if it would meet the dynamic test requirements of Appendix B of AS 2227:1992.

2. AIM

- a) To determine if the TUFF Marine Australia yachting line involved in the fatal incident supplied the same levels of protection represented by the Standard it was manufactured to.
- b) To establish if the complete TUFF Marine Australia yachting harness and line assembly was able to meet the dynamic test requirements of Appendix B of AS 2227:1992.

3. DESCRIPTION

The TUFF Marine Australia yachting line involved in the fatal incident and the complete yachting harness and line assembly supplied for the comparative testing did not have identifying markings, ie, year of Australian Standard, model name, date of manufacture or serial number.

The yachting line involved in the fatal incident which was marked with the text, 'SWORD OF ORION - RBYC B2000 - NO 9' was assigned with Crashlab test specimen number TS16759.

The comparative yachting harness which was marked with the text, 'SWORD OF ORION - CYCA 2006 - NO 5' and the comparative yachting line which was marked with the text, 'SWORD OF ORION - CYCA 2006 - NO 3' were assigned with Crashlab test specimen numbers TS16757 and TS16758 respectively.

4. VISUAL ASSESSMENT

Crashlab visually examined the yachting line involved in the fatal incident and the labels of the complete yachting harness and line assembly and concluded the following;

Yachting line involved in fatality

The yachting line was supplied with only the anchorage attachment hook intact. The yachting line stitch pattern at the harness attachment end failed and consequently the other attachment hook and harness were not recovered.

The stitch pattern on the harness attachment end failed completely, the main red stitch pattern, which was approximately 200 mm long by 40 mm wide, had all stitches completely torn. The three small reinforcing yellow stitch patterns approximately 15 mm long by 2 mm wide, equally spaced out between the main stitch pattern, also had all stitches completely torn.

The stitch pattern on the anchorage attachment end had approximately fifty percent of the main red stitch pattern torn and one of the small reinforcing yellow stitch patterns also had all stitches torn. The single action hook was distorted and deformed at the swivelling pin, it remained in the open position and did not function properly. Refer to Photograph 1 in Appendix B.

The complete yachting harness and line assembly labels

The 'Safety Harness / Safety Line Instruction' labels supplied stated, "This Safety Harness / Safety Line has been manufactured and tested to meet the approved Aust. Standards Association No. 2227".

The Australian Standard AS 2227:1992, has had four editions printed. The edition it was originally manufactured to is not known due to the lack of information on the labels. The identification markings for the year of the Australian Standard, model name, date of manufacture and serial number were not present.

5. DYNAMIC TEST DESCRIPTION

The complete yachting harness and line assembly supplied from the 'Sword of Orion' yacht, was tested to the dynamic test requirements of Appendix B of AS 2227:1992. Refer to Photographs 2 and 3 in Appendix B.

The assembly was thoroughly soaked, then fitted onto the 136 kg test dummy as per the donning instructions. The adjuster was then marked to determine the amount of webbing slippage. Refer to Photographs 4 and 5 in Appendix B.

The yachting line was then attached to the front 'O' ring attachment point of the harness and to the rigid anchorage point of the harness drop tower. The dummy was raised in an upright position and held via a quick release device until released to fall through the appropriate dropping distance of 1.47 m. Refer to Photographs 6 and 7 in Appendix B.

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6. DISCUSSION

Yachting line involved in fatality

The visual assessment on the yachting line involved in the fatal incident revealed that the extent of failure of the stitch patterns at both ends of the line was severe. The harness attachment end had complete stitching failure and on the anchorage attachment end fifty percent stitching failure.

The date of manufacture, estimated usage life and year and edition of the Australian Standard it was originally manufactured to are all unknown. The extent and directions of the forces and the methods of attachment at the time of the fatal incident are also unknown.

The complete yachting harness and line assembly

Post test examination of the Test Run Number IH9025 on the complete yachting harness and line assembly revealed that the anchorage attachment end stitch pattern failed completely at 6.7 kN. The test dummy was not retained and only the hook was left at the harness anchorage point. Refer to Photograph 8 in Appendix B.

The anchorage attachment end stitch pattern which was approximately 200 mm long by 40 mm wide and the three small reinforcing yellow stitch patterns approximately 15 mm long by 2 mm wide, equally spaced out between the main stitch pattern had all stitches completely torn. Refer to Photograph 9 in Appendix B.

The harness attachment end stitch pattern had approximately fifty percent of the main red stitch pattern torn and one of the small reinforcing yellow stitch patterns also had all stitches torn. The 'O' ring attachment point was significantly distorted and deformed. Refer to Photographs 10 to 12 in Appendix B.

The results from the dynamic test indicate that the yachting harness and line assembly was subjected to similar loads as to the yachting line involved in the fatal incident because the extent of stitch pattern failure to both specimens was similar except that they occurred at opposite ends.

Refer to table of results in Appendix A and Test run number IH9025 print out in Appendix C.

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7. CONCLUSION

- a) It cannot be determined if the TUFF Marine Australia yachting line involved in the fatal incident supplied the same levels of protection represented by the Standard it was manufactured to.
- b) The complete yachting harness and line assembly represented by Crashlab test specimen numbers TS16757 and TS16758 was not able to meet the dynamic test requirements of Appendix B of AS 2227:1992.

Assessment: Fail, Clause 7(a) and (b).

Clause 7(a) states, "the dummy shall be retained in the harness;".

Clause 7(b) states, "no part of the harness or line shall fail or deform to such an extent as will render it incapable of performing its intended function;..."

8. CONDITIONS OF REPORT

The test specimens identified in this report were selected and supplied by the client. The results contained in this report are only applicable to the test specimens supplied and tested. This report does not state or infer that the results cover the batch or consignment from which the specimens were selected.

9. DISPOSAL

The test specimens will be stored at Crashlab for four weeks from the date of this report, after which period, Crashlab's responsibility for their safekeeping shall cease. Crashlab will return the test specimens, at the client's expense, unless instructed otherwise.

Checked by: P. Aguilera Date: 11/2/99

APPENDIX A

TEST SPECIMEN DETAILS

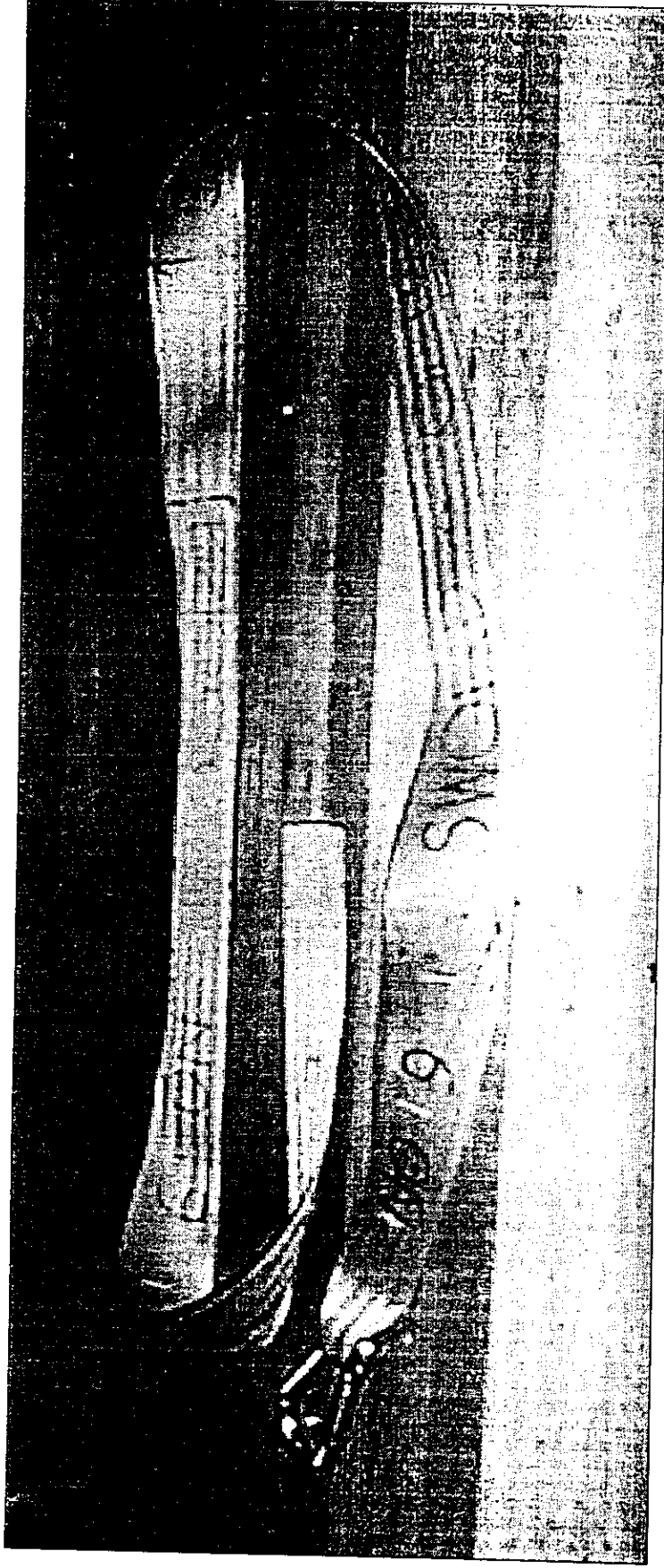
Specimen Number	Description	Identification Text Markings	Model	Serial Number	Date of Manufacture
TS16757	TUFF Marine Australia, Yachting harness	'SWORD OF ORION - CYCA 2006 - NO 5'	Unknown	Unknown	Unknown
TS16758	TUFF Marine Australia, Yachting line	'SWORD OF ORION - CYCA 2006 - NO 3'	Unknown	Unknown	Unknown
TS16759	TUFF Marine Australia, Yachting line involved in fatal incident	'SWORD OF ORION - RBYC B2000 - NO 9'	Unknown	Unknown	Unknown

TEST RESULT DETAILS

Test Number	Specimen Numbers (Harness / line)	Attachment Point	Mass of Dummy (kg)	Drop Height	Movement at Adjustable Point (mm)	Peak Load (kN)	Dummy shall be retained in the harness	Any Failure and / or Deformation
IH9025	TS16757 / TS16758	Frontal 'O' ring	136	1.47	Inconclusive	6.7	Fail	Fail

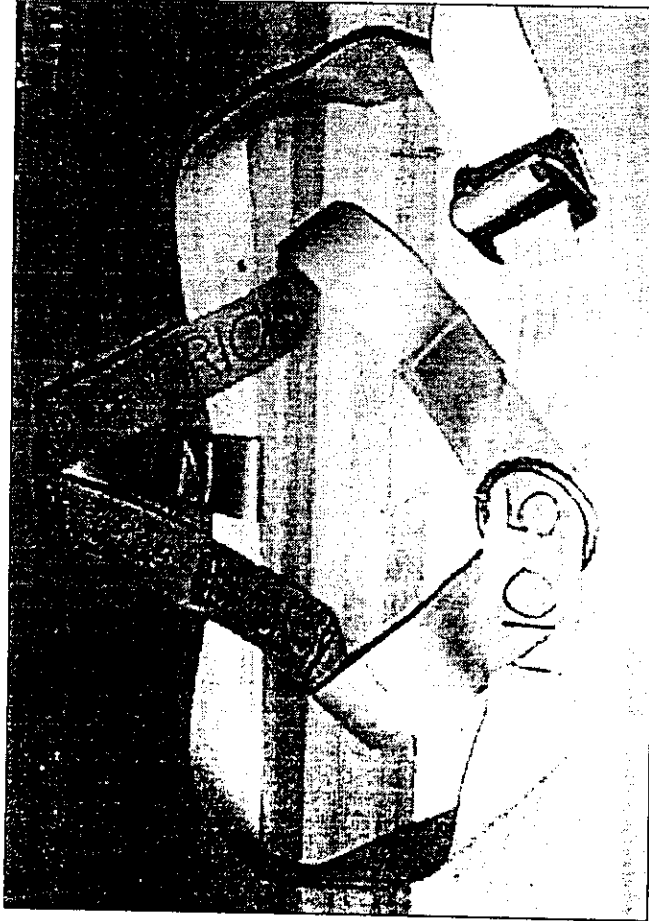
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APPENDIX B - PHOTOGRAPHS

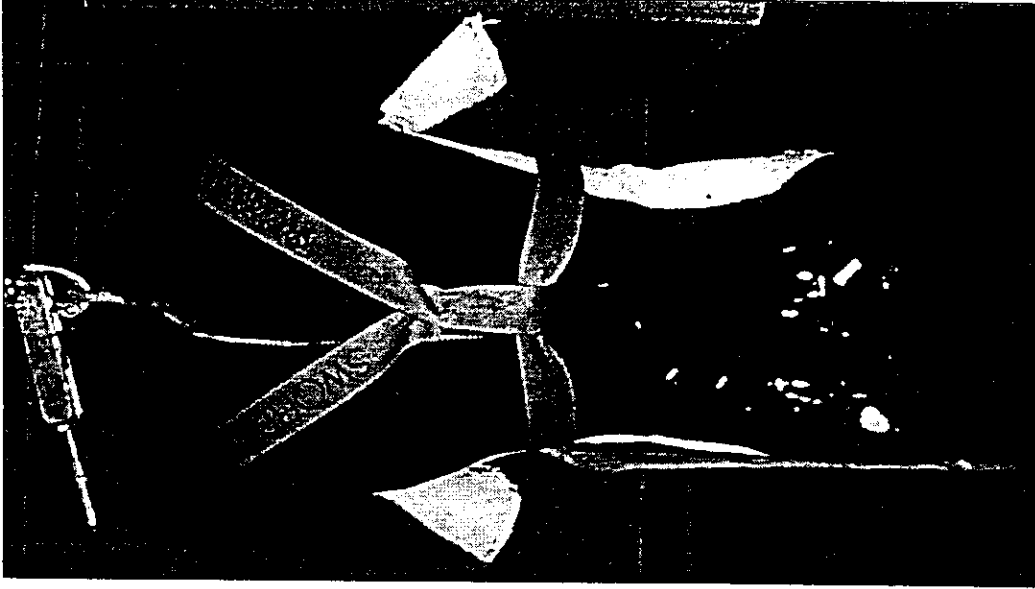
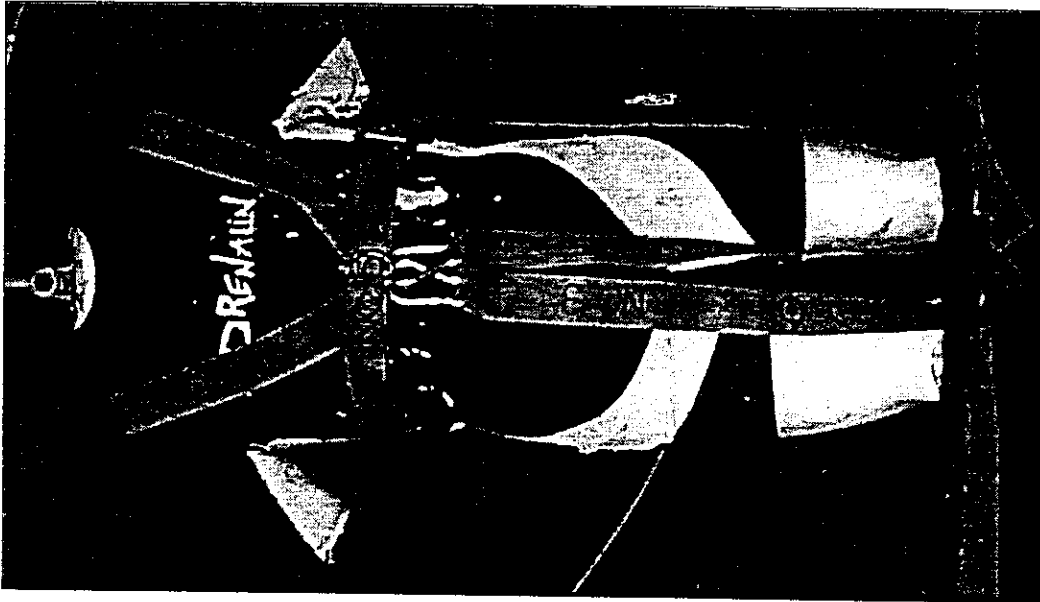


Photograph 1 - Yachting line involved in fatal incident with only one attachment hook still intact.

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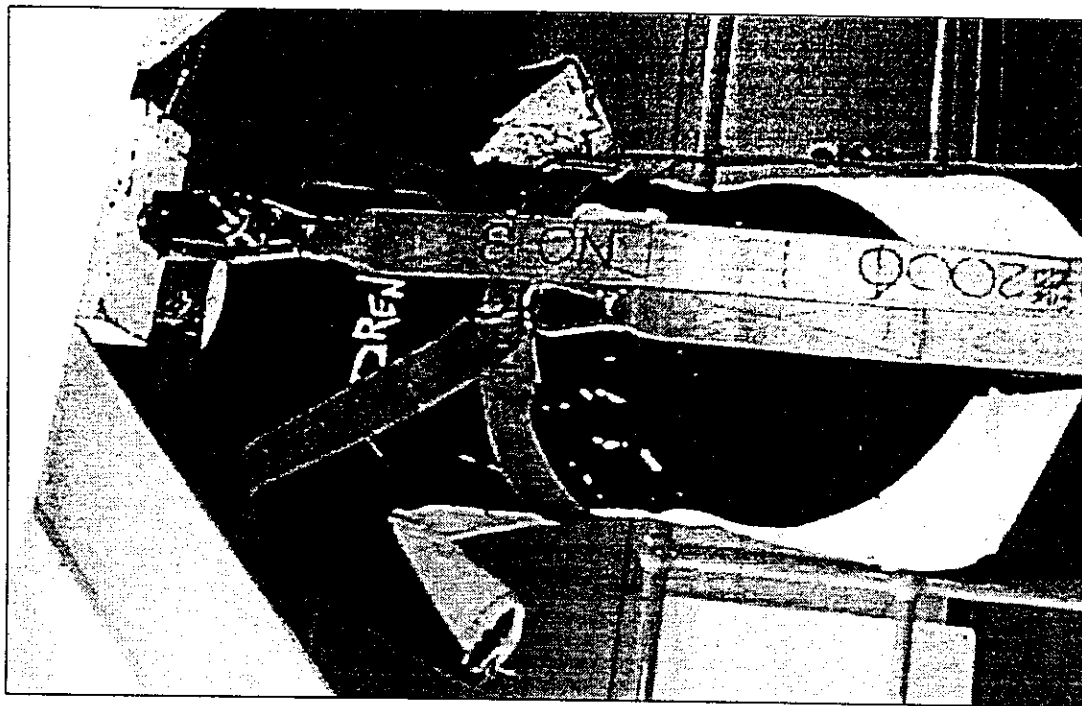
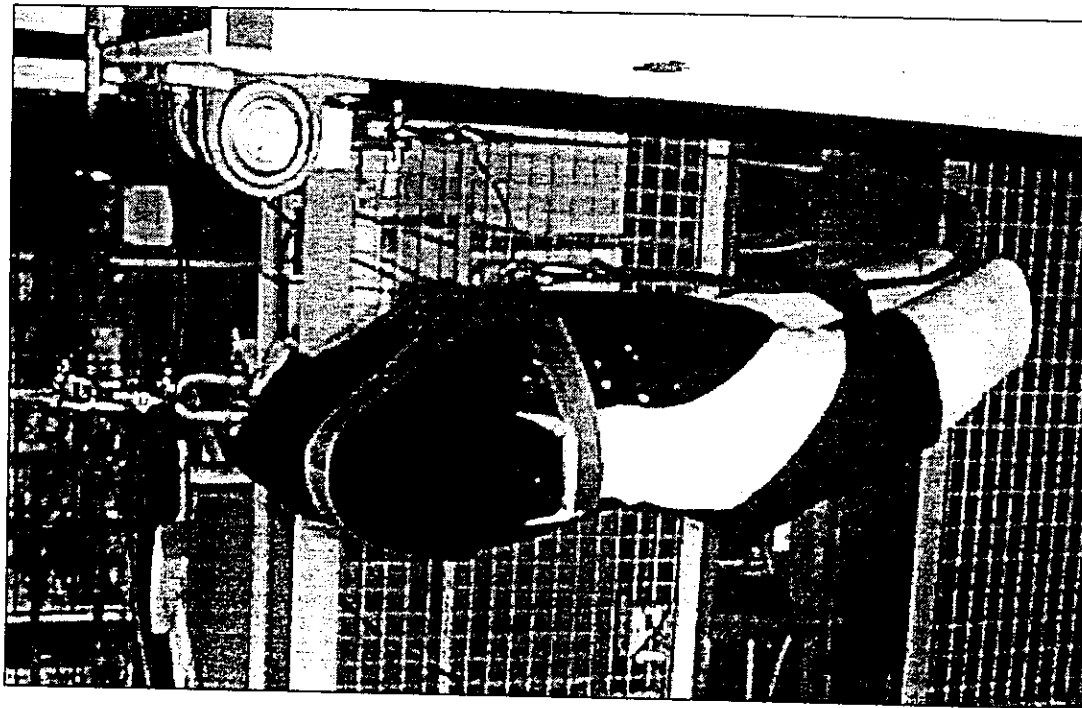


Photographs 2 & 3 - Yachting harness and line assembly supplied for the comparative test program.

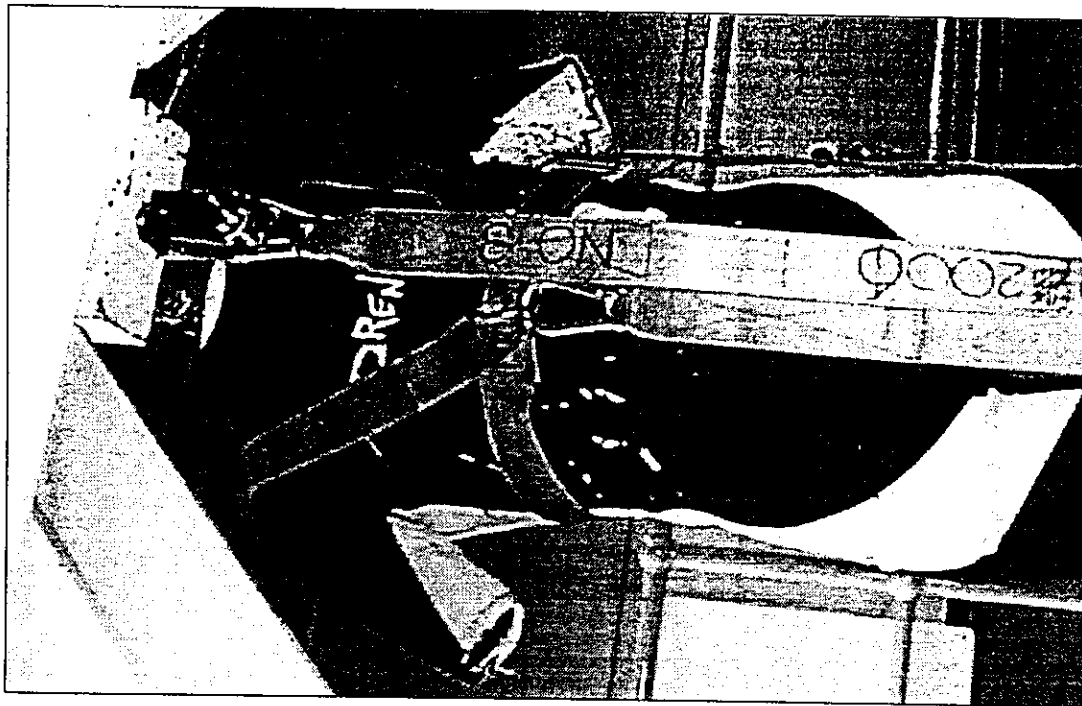
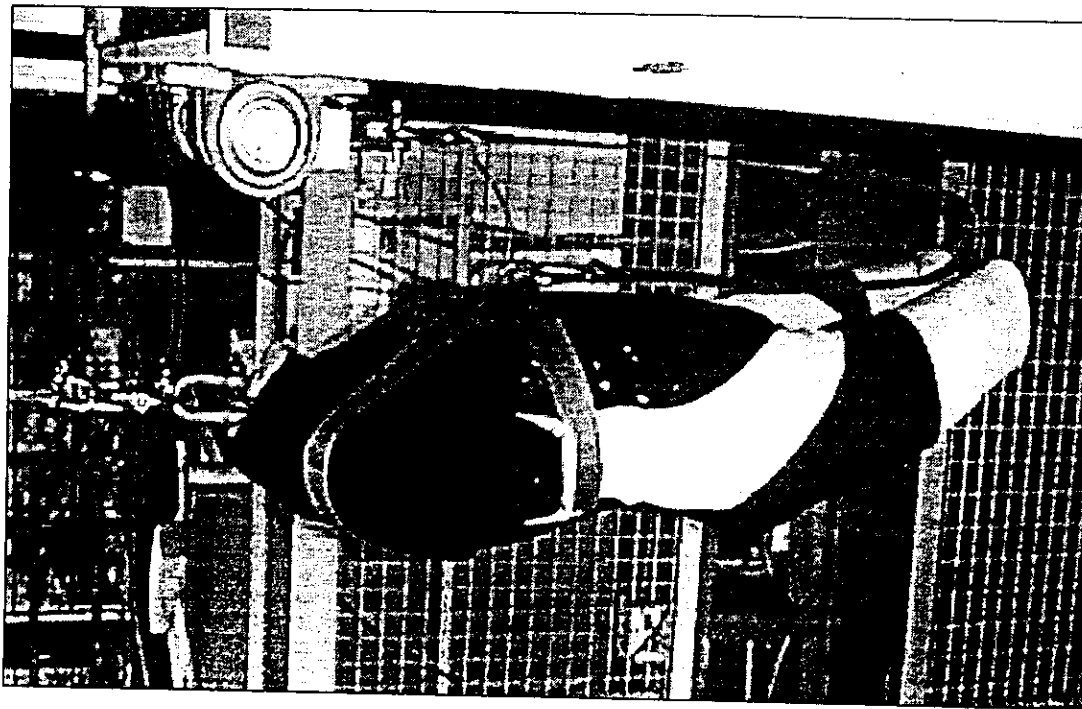


Photographs 4 & 5 - Front and rear view of yachting harness and line assembly fitted on to the test dummy.

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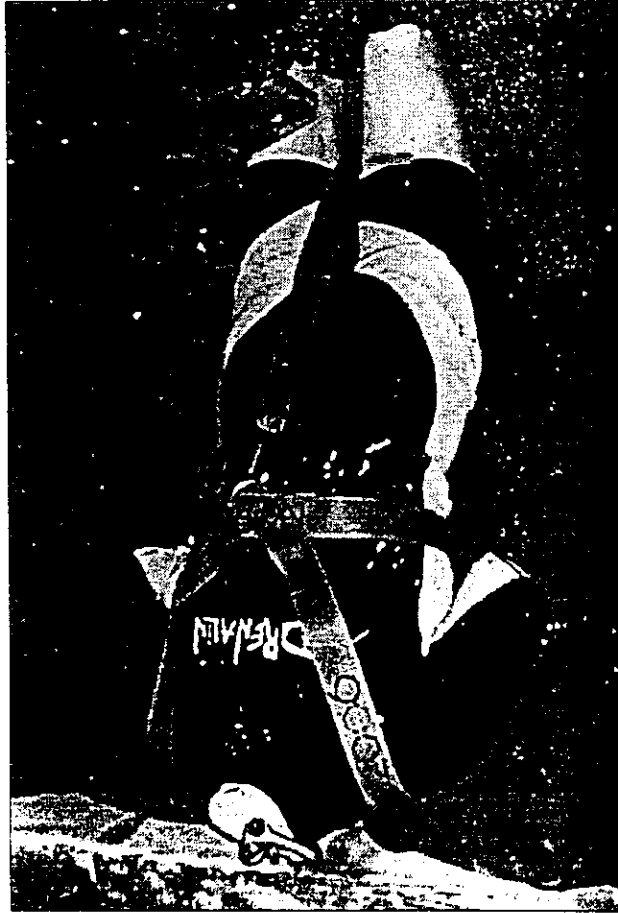
Photographs 6 & 7 - Pre test view of yachting line connected to harness attachment point and harness drop tower anchorage point.



Photographs 6 & 7 - Pre test view of yachting line connected to harness attachment point and harness drop tower anchorage point.

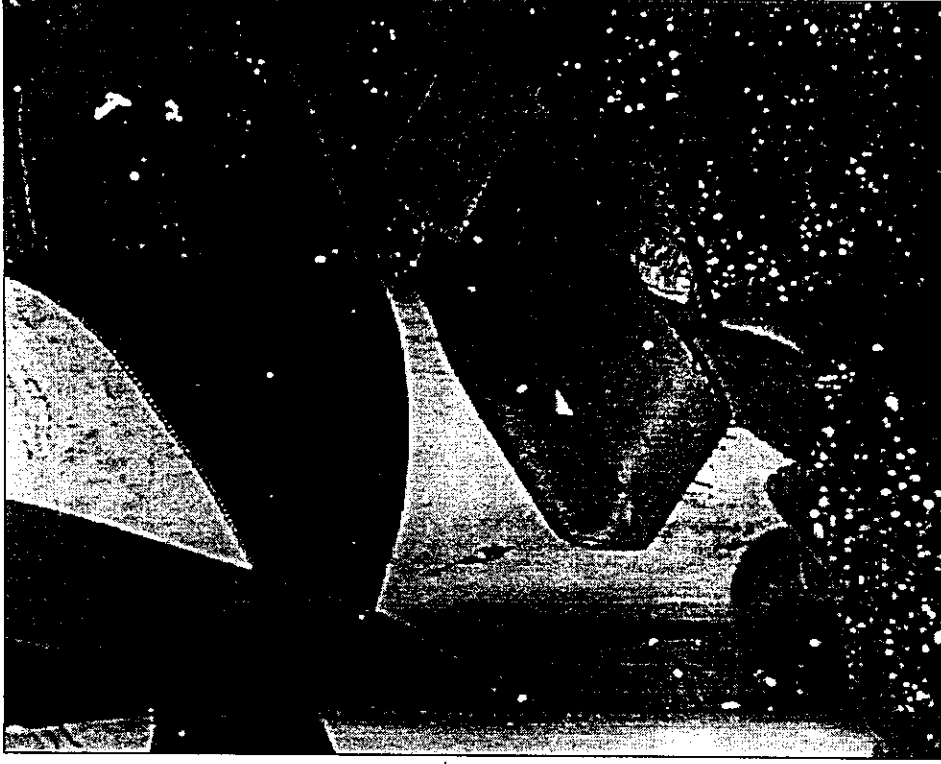
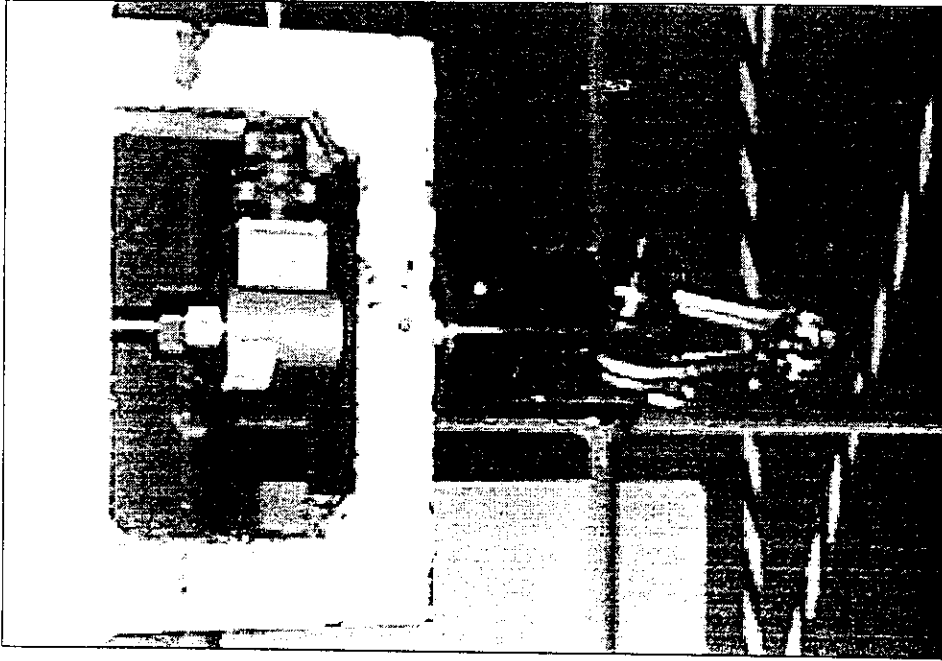
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Photographs 10 & 11 - Post test views at base of harness drop tower showing the test dummy not retained and torn stitch pattern of yachting line at harness attachment end.

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Photographs 8 & 9 - Post test views of hook at anchorage point and completely torn stitch pattern of yachting line.

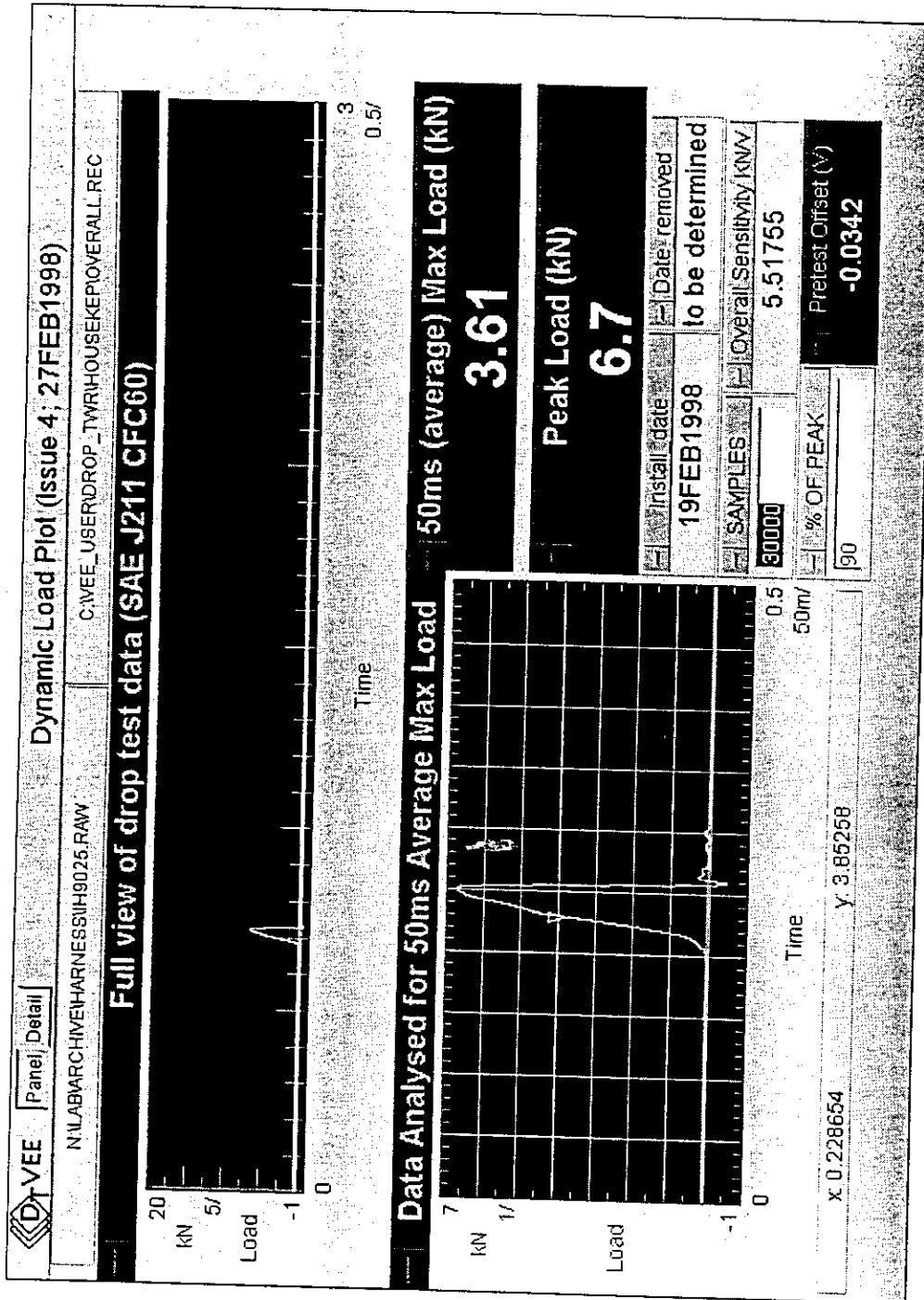
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Photograph 12 - Detailed post test view of yachting line with the same extent of stitch pattern failure as the yachting line involved in the fatal incident.

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APPENDIX C - TEST RUN NUMBER IH9025 PRINT OUT



Checked By: P. Aguilera Date: 11/8/99