Issues relating to Yacht Harnesses and Lanyards

Report to N.S.W Police

Sydney Hobart Yacht Race

Coronial Inquiry

Author

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1. Introduction

This report summarises results obtained from practical testing of a number of yacht safety harnesses, lanyards and release systems. These tests were conducted at the Australian Maritime College (AMC) on September 20th and 21st 1999 at the request of Stewart Gray and David Upston of the N.S.W. Police Department during the conduct of liferaft operation trials. Due to the ad hoc nature of the testing conducted, results obtained are preliminary and may need confirmation through more extensive investigations.

1.1 Rationale

There are numerous models of harness, lanyard and release mechanism available to the yachting market. Information relating to the ease of operation of these devices:

- may assist intending purchasers to make an informed decision, and
- allow harness users to develop confidence in the release capability of their harness release system.

1.2 Aims

The aims of this investigation were to:

1. Determine the ease of operation of harness release mechanisms under conditions simulating a person who has fallen overboard from a moving vessel.
2. Determine the ease of operation of release mechanism under conditions simulating a person who has been dragged under water by a sinking vessel.

2. Methodology

Experiments involving the operation of harnesses, lanyards and release mechanisms were conducted in the AMC Survival Centre pool. Subjects involved in the experiments were Tasmanian Police divers form Marine Search & Rescue Hobart. Each subject was required to wear wet weather gear and inflatable lifejackets that are typical of those worn by offshore racing crews. A limited number of trials were also conducted in the mouth of the Tamar River from the police vessel *Van Diemen.* These trials were run in order to experiment with higher drag speeds than were achievable at the AMC pool. The experiments were recorded on video tape. It is recommended that the reader view this recording in conjunction with reading this report.

2.1 Equipment Trialed

2.2.1 Personal Flotation Devices (PFDs)

PFDs worn by subjects during the trials included those shown in table 2.1.

Equipment Brand name	***Equipment Type***	***Equipment description***	***Serial # and/ or ID #***	***Pictorial Reference***
Stormy Seas	PFD	Yoke manual inflation	0100	Figure. 2.1
Stormy Seas	PFD	Off shore jacket	F016537	Figure. 2.2
Stormy Seas	PFD	Offshore Vest sleeveless	F023945	Figure. 2.3

Table 2.1

Figure2.1

Figure 2.2

Figure 2.3

2.2.1Harnesses

Details of the harnesses trialed are summarised in Table 2.2.

Equipment Brand name	***Equipment Type***	***Equipment description***	***Serial # and/ or ID #***	***Pictorial Reference***
Stormy Seas	Harness	Integral to PFD	0100	Figure. 2.4
Burke	Harness Yachtsman	Stand alone Chest Harness	YHB7	Figure. 2.5
Burke	Harness	Stand alone Chest Harness	B3	Figure. 2.6
Stormy Seas	Harness	Integral to PFD	F016537	Figure. 2.7

Table 2.2

Figure 2.4

Figure 2.5

Figure 2.6

Figure 2.7

2.2.3 Lanyards (Tethers)

Details of the lanyards involved in trials are summarised in Table 2.3.

Equipment Brand name	*Equipment Type*	*Equipment description*	*Serial # and/ or ID #*
Stormy Seas	Lanyard	Spring clip at both ends	1739 / 0126
Burke	Lanyard	Spring clip at both ends	YHB9
Burke	Lanyard	Spring clip at both ends	BL8
Burke	Lanyard		227197 / 17.9
Stormy Seas	Lanyard	Remote release from central flap	0008 Note*this unit has not as yet been approved

Table 2.3

2. 2 Measurement of Relative Performance of Equipment

A descriptive rating scale (see below) was developed and used to rate the ease of operation of each harness release system tested during surface towing and underwater release experiments. Each subject was required to complete the rating scale immediately after each trial.

DEGREE OF DIFFICULTY 0 1 2 3 4 5

0 Failure to complete task

1 Very difficult to achieve

2 Difficult to achieve

3 Task achieved satisfactorily

4 Task completed with relative ease

5 No difficulties in achieving the task

2.3 Simulating Appropriate Trial Conditions

To simulate a sinking vessel 'drag down' situation, a 350kg lead weight was placed at a depth of 4.2 m, aligned with an underwater viewing port in the AMC pool. Each lanyard tested was attached to the weight and attended by two stand-by SCUBA divers. At the start of trial each subject swam down to the lanyard which was then attached his harness as is shown in Figure 2.1. Once attached to the lanyard each subject was required to inflate his PFD and then to operate the lanyard release system. Lanyard release systems were operated using the following methods:

1. Release at the harness.
2. Release at the lanyard attachment point (at the weight).

Figure 2.1

In order to simulate a person being dragged through the water as may be experienced as a result of falling overboard, a towline was run through a single block attached to one end of the pool. This arrangement allowed towing speeds of up to 4 knots to be achieved as shown in Figure 2.2. Higher drag speeds (up to 8knots) were achieved using the police vessel *Van Diemen* in the Tamar River (Figure 2.3).

Figure 2.2

Figure 2.3

3. Results

3.1 Under Water 'drag down' Release

Results of these trials are summarised in Table 3.1.

Test Number	*Harness type*	*Lanyard type*	*Degree of difficulty to release from chest*	*Degree of difficulty to release from block*	*Time taken to release seconds*
1	Stormy Seas Yoke PFD #0100	Stormy Seas #1739 AS2227	4 Palm release	3 palm release	Not conducted
2	Burke yachtsman YHB7	Burke Yachtsman YHB9	1 finger & thumb release	3 finger & thumb release	Not conducted
3	Burke B3	Burke BL8	5	5	Not conducted
4	Burke Yachtsman YHB7	Burke 227197 17.9	2 Thumb & hand release	4 Thumb & first finger	17 & 16
5	Stormy Seas Integral F016537	Stormy Seas *Unapproved 0008	3 Remote release from upper connection	4 Remote release from lower connection	21 & 16

Table 3.1

The reader should refer to the video footage associated with these tests. In all cases the subjects did not appear to encounter any major difficulties in operating the release

mechanisms. However, it must be noted that the water temperature was 24 ° C and the subjects were well briefed and used to working in an underwater environment.

3.2 Drag Through Water Release

The average drag speed for these trials was calculated to be 4 knots.

Results of these trials are summarised in Tables 3.2 – 3.6.

Test # 1 a Stormy Seas Yoke 0100 PFD with Stormy Seas 1739 Lanyard	***Degree of difficulty to release***	***Time taken to effect release in seconds'***	***Distance taken to effect release in metres***
Release of lanyard whilst being dragged through the water wearing an uninflated PFD	1	10	20.5
Test # 1 b			
Release of lanyard whilst being dragged through the water wearing a Coastal PFD	1	10	23.5
Release of lanyard whilst being dragged sideways from the pool wall and through the water wearing a Coastal PFD	Not recorded	Not recorded	Not conducted

Table 3.2

Test # 2 a Stormy Seas Yoke 0100 PFD with Burke Yachtsman Harness YHB7 Burke Lanyard YHB9	***Degree of difficulty to release***	***Time taken to effect release in seconds'***	***Distance taken to effect release in metres***
Release of lanyard whilst being dragged through the water wearing an uninflated PFD	3	9	21
Test # 2 b			
Release of lanyard whilst being dragged through the water wearing a Coastal PFD	2	9	20.5
Release of lanyard whilst being dragged sideways from the pool wall into and through the water wearing a Coastal PFD	0 Failed to complete	12	25 maximum distance

Table 3.3

Test # 3 a NO PFD with Burke B3 Harness Burke Lanyard BL8	*Degree of difficulty to release*	*Time taken to effect release in seconds'*	*Distance taken to effect release in metres*
Release of lanyard whilst being dragged through the water wearing NO PFD	4	5	9
Test # 3 b			
Release of lanyard whilst being dragged through the water wearing a Coastal PFD	Not conducted	Not conducted	Not conducted
Release of lanyard whilst being dragged sideways from the pool wall and through the water wearing a Coastal PFD	2	11	23

Table 3.4

Test # 4 a Stormy Seas yoke 0100 PFD with Burke YHB7 Harness Burke Lanyard 227197	*Degree of difficulty to release*	*Time taken to effect release in seconds'*	*Distance taken to effect release in metres*
Release of lanyard whilst being dragged through the water wearing an uninflated PFD	1	11	24.6
Test # 4 b			
Release of lanyard whilst being dragged through the water wearing a Coastal PFD	0 Failed to complete	11	25
Release of lanyard whilst being dragged sideways from the pool wall and through the water wearing a Coastal PFD	0 Failed to complete	11	25

Table 3.5

Test # 5 a Stormy Seas JacketF012537 PFD with Stormy Seas Integral Harness Stormy Seas unapproved Lanyard 0008	*Degree of difficulty to release*	*Time taken to effect release in seconds'*	*Distance taken to effect release in metres*
Release of lanyard whilst being dragged through the water wearing an uninflated PFD	4	6	15
Test # 5 b			
Release of lanyard whilst being dragged through the water wearing a Coastal PFD	Not conducted	Not conducted	Not conducted
Release of lanyard whilst being dragged sideways from the pool wall and through the water wearing a Coastal PFD	5	4	10

Table 3.6

4. Discussion and Findings

Results obtained indicate that there was considerable variation in the degree of difficulty experienced in effecting lanyard release. Charts 4.1 – 4.3 allow a comparison to be made between various equipment combinations.

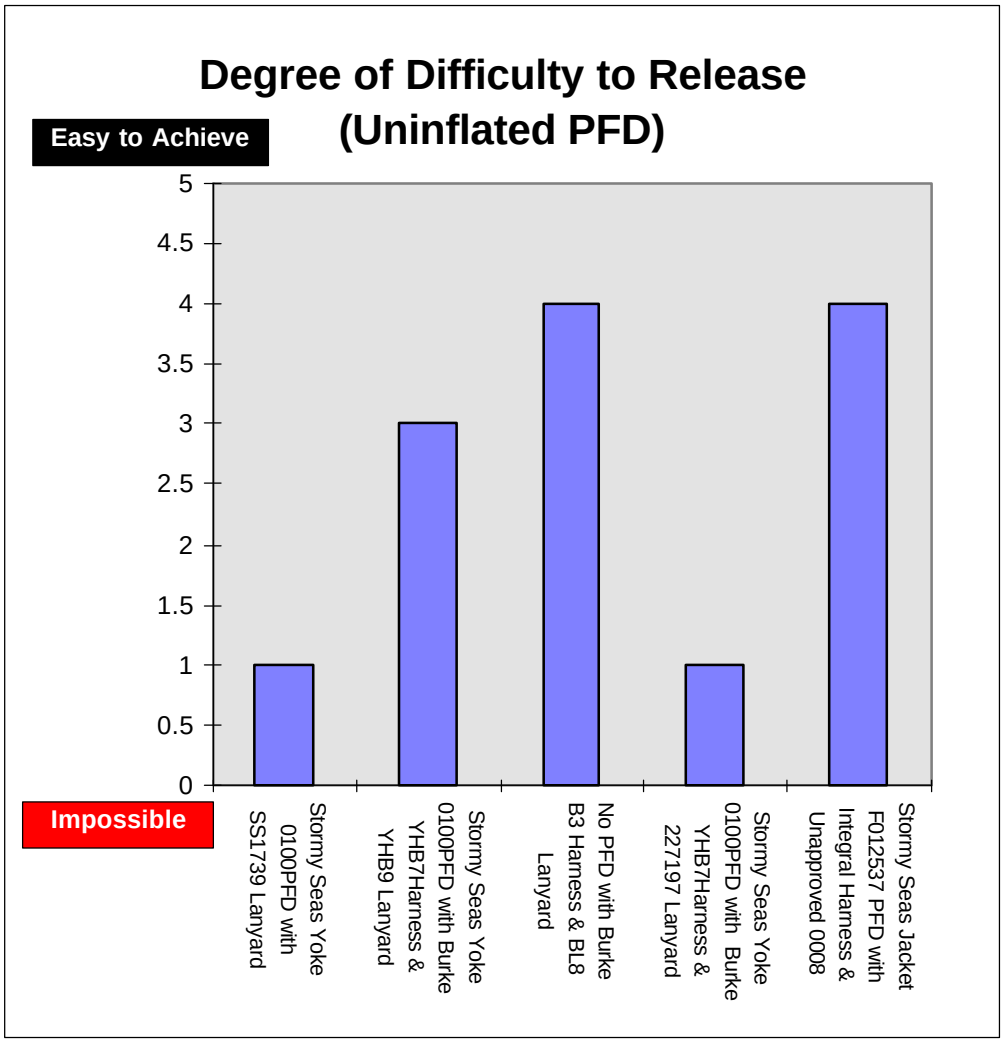

Chart 4.1

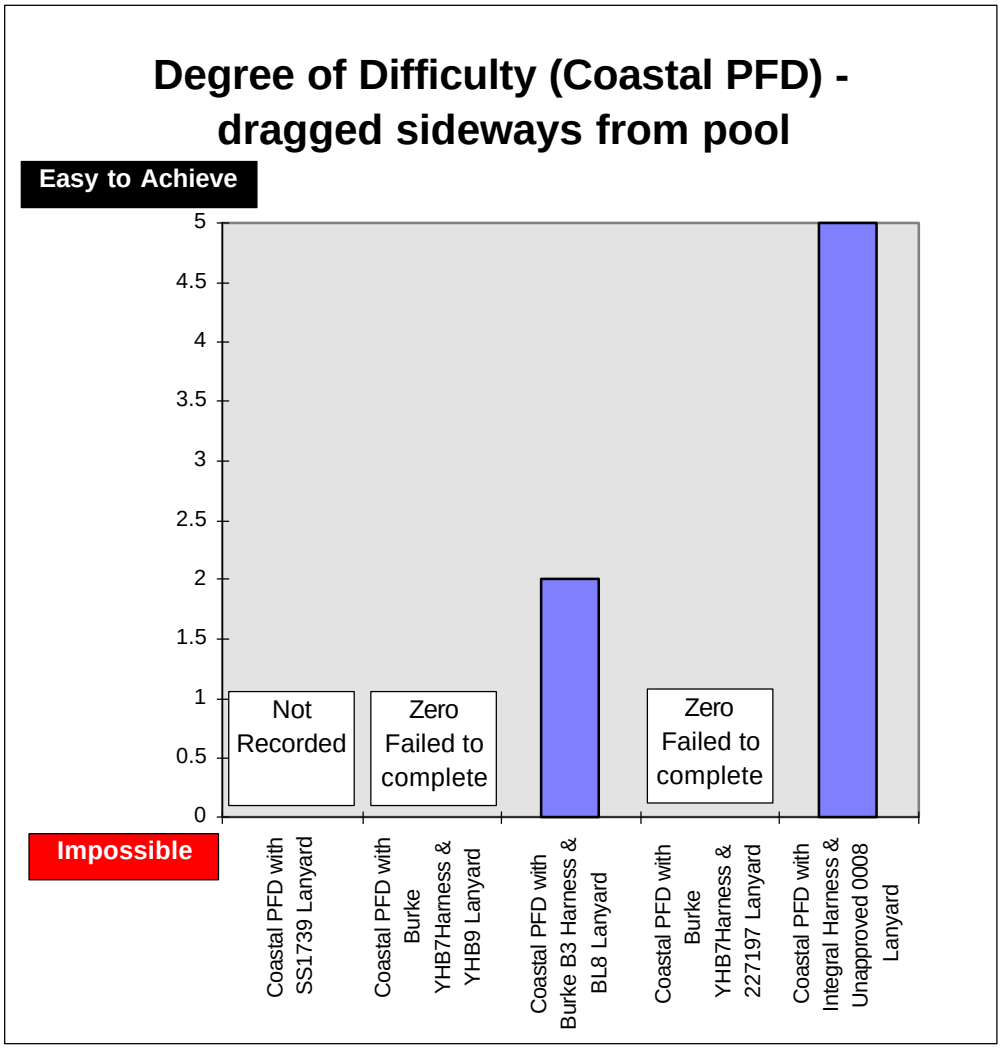
Degree of Difficulty (Coastal PFD) - dragged sideways from pool
Easy to Achieve
Impossible
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Not Recorded
Zero Failed to complete
Zero Failed to complete
Coastal PFD with SS1739 Lanyard
Coastal PFD with Burke YHB7Harness & YHB9 Lanyard
Coastal PFD with Burke B3 Harness & BL8 Lanyard
Coastal PFD with Burke YHB7Harness & 227197 Lanyard
Coastal PFD with Integral Harness & Unapproved 0008 Lanyard

Chart 4.2

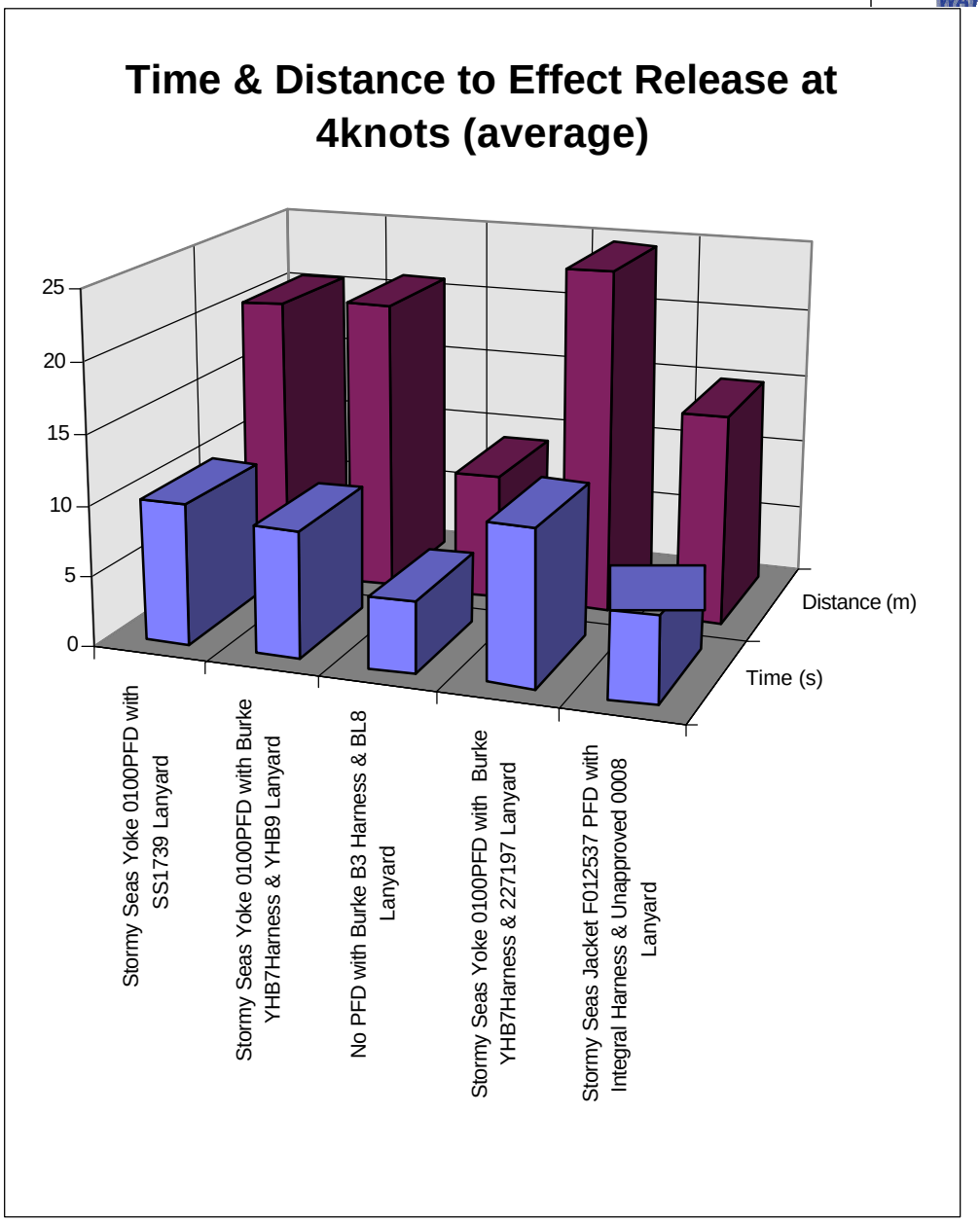
Time & Distance to Effect Release at 4knots (average)
25
20
15
10
5
0
Distance (m)
Time (s)
Stormy Seas Yoke 0100PFD with SS1739 Lanyard
Stormy Seas Yoke 0100PFD with Burke YHB7Harness & YHB9 Lanyard
No PFD with Burke B3 Harness & BL8 Lanyard
Stormy Seas Yoke 0100PFD with Burke YHB7Harness & 227197 Lanyard
Stormy Seas Jacket F012537 PFD with Integral Harness & Unapproved 0008 Lanyard

Chart 4.3

4.1 Findings

- All harness/lanyard release systems trialed were successfully operated from the harness end in all 'drag down' experiments.
- All lanyard release systems trialed were successfully operated from the lanyard attachment point (on the weight on the pool bottom) in all 'drag down' experiments.
- Harness release was not achieved within 25 metres on 4 of 11 trials at a drag speed of 4 knots.
- Harness release was achieved at a distance greater than 20 metres on 5 of 11 trials at a drag speed of 4 knots.
- Harness release was achieved at a distance of under 15 metres on 2 of 11 trials. In both instances the release mechanism was an 'on load' remotely activated system (Stormy Seas 0008 Lanyard).
- Harness release was not achieved during 3 of 3 trials conducted on the Tamar River at 8 knots (all were 'off load' systems).

4.2 Conclusions

- Operation of lanyard release systems may prove difficult under conditions likely to be experienced at sea such as; darkness, cold sea temperatures (resulting in thermal shock), water turbulence associated with a sinking vessel and loss of manual dexterity due to cold conditions.
- All racing yacht crews should be encouraged to become familiar with the harness and release mechanism, as well as any limitations associated with their equipment.
- Training videos similar to the video footage obtained from these trials should be produced and distributed to yacht clubs.
- 'Off load' release systems appear to be awkward to operate due to the need for the operator to 'un-weight' the hook from the harness or tether point before release can be effected.
- An 'on load' release system appears to overcome the difficulties associated with needing to 'un-weight' the tether.
- Additional research into harness/lanyard release systems should be undertaken.

5. Acknowledgments

The author would like to thank Tamar Marine for making available the equipment tested during the trials at short notice.