



FAST HANDLING TECHNIQUES

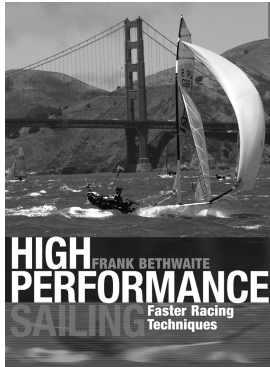
FRANK BETHWAITE

FAST HANDLING TECHNIQUE

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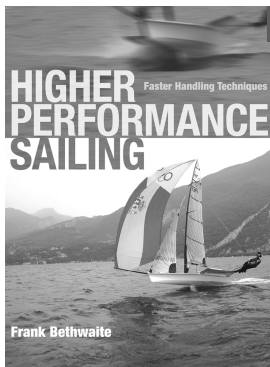
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FAST HANDLING TECHNIQUE

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to *Higher Performance Sailing*

Frank Bethwaite



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*I dedicate this work to all those
who want to sail fast and well*

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FOREWORD

Frank Bethwaite DFC, OAM

26th May 1920 – 12th May 2012

Frank Bethwaite was born in Wanganui, on the west coast of the North Island of New Zealand in 1920. He learned to sail on the Wanganui River, building his own boats and experimenting with rigs and hull designs. He was also a keen model aeroplane designer, and it was here that he gained his first interest in aerodynamics. In 1939 he joined the Royal NZ Airforce, and after instructing and as a test pilot, flew in bombing and reconnaissance operations in the Solomon Islands and New Guinea for which he was awarded the Distinguished Flying Cross.

In 1945 Frank married Nel Mills, a cipher officer in the Airforce and they moved to Torbay, a small village on Auckland's north shore.

After the war, Frank joined Tasman Empire Airways as a pilot of flying boats operating across the Tasman and the Western Pacific, attaining the rank of Captain. When airfields became established, this airline became Air New Zealand.

Frank's interest in model aeroplanes continued and in 1952, after many years of testing designs and studying birds slope soaring along the coastal cliffs, with a radio controlled model glider, he won the world endurance record of over nine hours aloft. Two more world records followed. Frank's articles in model aircraft and scientific magazines describing his methods and research attracted the interest of the head of the Radio Physics Unit of CSIRO in Australia and Frank was invited to conduct the flying experiments for the visionary cloud seeding project to make rain.

In 1959 Frank, Nel and their four children moved to Sydney, and settled in Northbridge on the upper reaches of Sydney Harbour. Then followed five years of intense activity, both in the rain-making activities and in leading a small group of sailors in designing a self-righting boat for juniors and a boat that both men and women could enjoy sailing – the NS14. The Northbridge Club became a centre of activity with a well-structured training scheme in place for both children and adults, and with added membership the club was able to finance the building of a clubhouse in 1965.

When the cloud-seeding experiment ceased operations in 1968, Frank established a manufacturing company making centreboards, masts and NS14s. He was constantly experimenting and built a small wind tunnel which used smoke piped through straws to show the wind flow over masts and sails, which he then incorporated in his designs. He also spent many hours documenting the effects of wind around headlands, and put this to good use in weekend sailing with Nel.

The whole family was involved in sailing and performed well in the various clubs around the harbour and at inter-state Championships. Mark won selection for the

Munich Olympics in 1972, Montreal in 1976 and Moscow in 1980 and won in World Championships in three classes. Frank supported the Australian Olympic sailing team in 1972 and was a team member as meteorological coach in 1976. Nicky was the first Australian sailing Olympian woman in Seoul 1988, as coach at Atlanta, and again in Athens in 2004, as well as winning World Championships. Julian was an innovative sailor in the legendary 18 footers, winning three World Championships in AAMI. After a brief sailing career, Christine chose motor sport and enjoyed rallying.

The NS14 spread widely throughout Australia. Canadian Ian Bruce, who had produced the phenomenal Laser, met Frank at the 1972 Olympics and became interested in his ideas. Ian and Frank co-operated in modifying the NS14 to incorporate the ideas learned through ten years of observation and experimentation and produced the Tasar, which became an instant success in Canada, the UK, Europe and Australia. Over three thousand Tasars have been built. The class has been recognised by the International Sailing Federation and world championships have been sailed in Canada, USA, Japan, UK, Australia and Thailand at eighteen-month intervals. The Australian Navy purchased 180 Tasars to use in training. They are still a vibrant class 35 years after introduction.

In the 1980s and 90s Frank was involved with the famous Sydney 18 footer fleet. He and Julian formed a formidable team. The results of their research and experimentation were incorporated into the innovative B14 and the 49er, 29er, SKUD and 49erFX designs. All those classes became International ISAF Classes; three of them have become Olympic and the 29er is now an ISAF Youth Class. Frank built the prototypes and documented performances. The 49er was selected in a closely contested competition run by International Sailing Federation trials as the two-man skiff to sail in the 2000 Olympics and subsequent Games. The 29er – a junior skiff to be used as a trainer for the 49er – was also produced and has sold widely. The 49er FX

has been adopted by the Federation as the new Olympic women's skiff for the 2016 Games. The SKUD was sailed in the 2012 Paralympics.

After a lifetime of experimentation and research and ten years of writing, Frank's first book, *High Performance Sailing*, was published in 1990.

Frank was awarded the Medal of the Order of Australia for his services to sailing in 2000.

Experimental work on airflow over sails and measurement of hull shapes was carried on in the following years, together with the writing of *Higher Performance Sailing* which was published in 2008. The change to mylar sails for the Tasar was adopted after extensive tests, and carbon masts are the next recommendation.

As well as boats and sailing, Frank enjoyed meeting with the Tasar "family" at world championships, and music, lively conversation and a glass of wine with family and friends.

Frank finished the manuscript for this book two weeks before he died.

'Frank has been a gift to Northbridge Sailing Club and Tasar sailing communities in Australia and around the world. His efforts have contributed mightily not only to incredible advances in the speed and capabilities of dinghies, but also to club sailors – both men and women – who want to sail together and enjoy high performance.'

'In a lucky generation, someone appears like Halley's comet, lighting up the skies; someone who changes everything we thought we knew and takes us to a new and better place. When it comes to sailing, Frank was such a man – the waves and ripples from his endeavours will endure.'

Ric Day

'His legacy will live on, not only for what he did, but because of who he was. He was a pilot, a husband, a scientist, a sailor, a father, a grandfather – the definition of a gentleman. But to me he was always just Frank.'

Harry Bethwaite

INTRODUCTION

In *High Performance Sailing* (published in 1992 and now in its seventh print run) I described, to the best of my ability at that time, how the sailor's winds work, how the waves work, how the boat works, and how to work the boat, in the sense of what I then believed to be the fastest sail shapes to set for each point of sailing, in each wind strength, and in flat water and in waves. I now realise that what I wrote about was 'set-up'. I did not touch handling, because at that time I did not question the generally held view that all sailors with sufficient experience reach a point where they handle their boats about equally well and sail about equally fast.

In 1998 I was asked to revise *High Performance Sailing* to include the new art of 'apparent wind' sailing. Over ten years the revision outgrew revision status and became *Higher Performance Sailing*, published in 2008. The core stuff of *Higher Performance Sailing* is the critical ratios that govern a boat's ability to tack downwind faster than the wind; new insights into the nature of the wind, including the discovery/recognition and properties of surges and fades, and the divergent flow within gusts; a description of the way automatic rigs work and why they are significantly faster; and some description of the development of the faster sailing techniques now used to sail these new craft.

During those years, those of us who were closely involved with the new genre of apparent wind sailboats were shocked to observe that most sailors, even those who were highly motivated and who wanted to sail the new faster boats, and who had already had many years of dinghy sailing experience, simply could not handle these faster craft. These sailors were shocked, too.

It was my privilege for some of those years to be associated with the development of the sailing simulator. This brought with it new capabilities. The coach could stand alongside and watch the sailor as he or she sailed. Each sail could then be printed out. The printouts reveal how the sailor manipulates his tiller and sheet and moves his body as he sails, and also gives all the second-by-second detail of the sail, including both the instantaneous boat speeds and the total time to sail a standard exercise.

This enabled me to see that there were real and significant differences between the ways even the most experienced sailors sailed their boats. A few sailors really could sail fast. Most sailed much more slowly, but they genuinely believed that they were sailing as well and as fast as the fast sailors.

From this experience, I realised that the commonly held belief that all sailors, with experience, reach the level at which they all sail about equally well and equally fast was simply not true.

When I looked at the detail – of where the difference in speed really started – I found myself looking at what each sailor did with his or her hands and body.

This is handling, as opposed to set-up, or tactics, or strategy, or seamanship, or experience.

These observations encouraged me to look anew at the whole subject of ‘handling’.

By the time *Higher Performance Sailing* was due to be published, I had reached the point where I was able to write usefully about the fastest way to handle the tack, gybe and mark-rounding manoeuvres, and these are the stuff of Chapters 25, 26 and 27 of *Higher Performance Sailing*.

At that time I had not learned enough to write usefully about straight-line sailing. So I touched lightly on this in the ‘New Way of Thinking’ chapter, but at that stage took it no further.

Because of my interest in sailing well, and in helping others to sail well, I have continued to learn what I could about the origins, history and detail of handling.

What I have found is, at heart, very simple.

With the presentation of an East Indies ‘yacht’ to King Charles II in 1661, the sport of recreational sailing was born. A sudden demand for sailing instruction, with the driving object of ‘simplicity at all costs’, led to the development of an oversimplified, slow, one-size-fits-all, ‘natural’ handling technique. This was and remains good enough to handle slow, heavy boats in lighter winds. Over three and a half centuries it has taken root to the point where it is now deeply and subconsciously embedded in the culture of recreational sailing.

For two and a half centuries, nothing much changed. But from about 1900 to the present, wave after wave of progressively faster planing, then apparent wind, then foil-borne sailboats

have emerged. Their sailors quickly found that the natural handling technique, because of its one-size-fits-all oversimplification, was incapable of sailing these faster boats at their full potential speed in lighter winds, and further that it was incapable even of controlling them safely in stronger winds.

Their response was to develop a new, common-sense, logical, ‘fast’ handling technique with the simple object ‘Maximum speed with control on all points of sailing in all winds’.

The principal differences between natural and fast handling are:

- Natural uses a one-handed, one-size-fits-all, single handling routine on all points of sailing – i.e. both upwind and downwind – and in all winds.
- Fast uses two hands and two routines; one two-handed routine for sailing upwind, and a different two-handed routine for sailing downwind.

With each new wave of faster sailboats, their sailors have improved the detail of fast handling technique so that they can both sail the new boats at their full potential speed and sail them under secure control in all winds.

Because the number of fast and very fast sailboats is miniscule compared with the number of conventional sailboats, the number of sailors who of necessity have needed to learn fast handling, and have passed it on to their families and friends, is only a tiny fraction of the sailing population. It is far less than a critical mass. So most of the sailing population remains ignorant of and knows and understands nothing of fast handling technique.

This is a pity, because fast handling technique has a critical spin-off:

- The key advantage of fast handling technique is that its common-sense logic enables sailors of fast sailboats to push their boats to their full potential speed under secure control in all winds.
- The spin-off is that the logic works just as well with conventional sailboats – it enables

sailors of conventional sailboats to push them to their full potential speed under secure control in all winds, too.

Put simply:

- Sailors of conventional sailboats who use natural handling technique cannot enjoy the full potential speed of their boats because of the intrinsic technical limitations of the natural handling technique itself.
- The same conventional sailboats, when handled with the logical fast handling technique, will sail faster, and in stronger winds much faster, i.e. at up to their full potential speed.

An interesting sidelight:

- I now realise that the unexpected differences that I observed in the speeds at which different experienced sailors could sail, and which started me on this line of enquiry, were due to the differences in handling between the slower, simple, single-routine, one-size-fits-all natural handling technique used by most sailors, and the faster, logical, two-handed, two-routine, fast handling technique used by a few.
- The differences in speed were caused by the differences in the handling technique used.

And further...

- The slower sailors were completely unconscious that any other handling technique existed.

That sums up the present situation.

Because only a tiny number of sailors are at present aware of fast handling technique, no major change in sailing culture is going to occur soon. But there is no reason why individual sailors, or families, or cooperative groups, or sailing schools with vision should not change to and enjoy the benefits of fast handling technique now.

ABOUT THIS BOOK

In this short work I extend what was touched on but not completed in *Higher Performance Sailing*.

- It explains why the natural handling technique dating from 1661 has become so strongly entrenched, and why 'handling' has remained for so long a non-subject, hidden in the subconscious, seldom discussed, and never previously documented in detail.
- It traces the development of fast handling technique and why it was necessary to develop it.
- It explains the principles involved in set-up.
- It summarises the key properties of the real wind.
- It describes how the fast handling sailor uses his brain and his hands and his body to sail with fast handling technique in the real wind.
- It describes in 'do-it-yourself' detail the left hand, the right hand and the body movements employed in the fast handling technique upwind and downwind routines, and suggests simple exercises to learn and master these routines.

These are the obvious subjects; but I soon realised that just to describe what fast handling technique is, and how to sail with fast handling technique, would not be enough.

Technical colleges found out long ago that while it needed only a few months to teach a new skill, it needed years to teach the student to be comfortable with the new skill (we can teach an apprentice in six months to do what a plumber does, but it takes five years to teach him to think as a plumber thinks). One student confided in me that after years of fretting mid-fleet and looking forward, when he actually found himself competitive in the lead group he became acutely uncomfortable and found himself looking back to where he had been rather than looking forward and imagining himself further ahead and in the lead.

For this reason, I have tried to write *Fast Handling Technique* in a way that welcomes the aspiring sailor not only to the way the fast handling sailor handles his boat, but also to the fast handling sailor's mindset and the way he thinks. My object is both to lift the reader's performance to lead-group level and to ensure

that he or she will be comfortable at their new level.

It is my hope and belief that this new approach to handling will end a century of frustration. I hope that it will lead to new levels of performance, self-esteem, pleasure and satisfaction among the sailors who use it to sail faster.

In particular, I hope that it will lead to a new level of sailing school and sailing instructor and coach who will teach children to sail fast and well from the beginning, rather than cripple them for life by teaching them the inefficient and slow one-size-fits-all natural technique.

FDB

AUTHOR'S NOTE

As in *Higher Performance Sailing*, to avoid possible ambiguity I will use the word 'clock' to mean 'a change in wind direction, always clockwise', and 'back' to mean 'a change in wind direction, always anticlockwise'. My reason is that there is no agreement as to the meaning of the more commonly used 'veer'. The Oxford English Dictionary describes veer as 'a change of direction, sunwise...', which is clockwise in the northern hemisphere and anticlockwise in the southern. Macquarie Dictionary describes veer as 'a change of direction, as "the road veered left"', so implies change either way.

1

THE HISTORY OF HANDLING

1.1 • STARTING POINT

I am advised by those in the boat book distribution business that no serious book about fast handling technique has as yet been published.

This is not surprising, because ‘handling’ is a skill that quickly becomes subconscious, and so, once learned, is rarely thereafter thought about or talked about in normal circumstances. We do not talk about the way we balance to stand upright, or the way we walk, or how we hold a pen to write. Exceptions are those callings where safety, efficiency and consistent high standard are critical, such as surgical procedure, or the control of aircraft in flight. In both medical schools and in military and civil flight training centres, the detail of manipulative technique is discussed in detail and in exact terms.

Recreational sailing is not one of these. For this reason, the origins of what we know about sailboat handling are the more workaday sources of observation, imitation, comment, and deduction.

To provide a starting point, I have collated what is known about the subject of ‘sailboat handling’ from 1661 to the present.

1.2 • THE EVOLUTION OF THE NATURAL HANDLING TECHNIQUE

Prior to 1661 there was no recreational sailing. The ability to control a small sailboat was work. It was a craft, calling or way of life generally limited to fishing communities. The general public regarded sailboat handling as a black art.

With the presentation by the East India Company of an East Indies ‘yacht’ to King Charles II in 1661, sailing became fashionable. Those who loved the wind and the water and had previously taken their pleasure by the sea could now take it on the sea, but only if they first learned how to sail. So suddenly a clientele wanting to learn how to sail emerged and looked for sailing instructors to teach them.

Over the next 50 years, in what must be either one of the great masterpieces of simplification of all time or a catastrophe of oversimplification, the lessons of a whole lifetime’s experience were simplified into the four steps we now call the natural handling technique:

- Set and trim sail to the point of sailing.
- Steer to the wind.