Appendix B

Food

Using a program that had a database of foods and their nutritional components, I built a basic diet plan that aggregated the nutrients in my typical daily consumption of staple, non-perishable foods such as oatmeal, canned fish, whole wheat bread and brown rice. Then, I looked at what nutrients were missing from my daily intake. Not having access to fresh fruit and vegetables, it was imperative that I take multivitamins and vitamin C tablets to boost the level of vitamin C in the multivitamins.

Assuming a routine of three meal a day, I came up with a basic menu that I would consume after all my fresh food supplies had been exhausted.

- Breakfast: rolled oats, powdered milk, raisins
- Lunch: tuna, margarine, bread
- Dinner: brown rice

I didn't have the budget or the room to stock the boat with canned food, so I purchased a limited amount of cans, relying instead on staples such as flour, oats, and rice. I was given a number of tins of "chicken-in-a-can" as treats. These were large enough cans that each had one whole cooked chicken. I had never seen anything like this before.

Without refrigeration, what fresh food I took needed be be very fresh and last as long as possible. Fortunately, the first month was sailing in the cool northern temperate zone during mid-autumn. Most of the easily perishable foods were gone before I reached the heat of the tropics.

Before leaving, I arranged with the Little Gem mini-supermarket near Fisherman's Wharf to pick up all my fresh vegetables from the market so that they were as fresh as possible. The owner also supplied my eggs, which I coated in Vaseline to keep them fresher. They were still fresh when I passed Easter Island on December 10. I also ate the last of my cabbages around that time. Rather than cut the cabbages, I

continued to peel off the outermost leaves, and cook those. That way the inner leaves were protected from deterioration.

As soon as mould started to grow on my cheese, I took off the wrapper and let it dry out. I could grate it, add it to meals, or fog it with my leaf mister to reconstitute it.

Table B.1: Perishable Food

Item	Quantity	Unit
Apples	10	kg
Bananas	2	kg
Cabbages	6	large
Cheese	1	kg
Eggs	12	dozen
Milk	2	litres
Onions	10	kg
Oranges	5	kg
Potatoes	10	kg
Salami	1	kg
Squash	3	large
Turnips	5	large

I regretted that I did not take more spices. At the time, I was not a culinary expert, nor had I exposed myself to the wonders of different spices. Only later in life did I apply the scientific method to cooking and baking and explore new ideas of food and spice combinations and test them in a kitchen. At the time of this trip, pepper and salt were my spices. Luckily, Dug had given me a small bottle of McIlhenny Tabasco sauce. It was pretty potent, so I used a few drops every time I cooked brown rice.

I cooked food in partial saltwater to save precious fresh water reserves. My galley had two hand pumps for drawing water into the sink. One was connected to the fresh water tanks with valves to pump from either the port or the starboard tank. The other pump was connected to the ocean after passing a gate valve and a through-hull fitting. The ocean water was used to wash dishes, and when mixed with the fresh water, was used to cook porridge, rice, potatoes, and squash. I did not use ocean water for cooking or washing dishes when near sources of pollution, such as the various towns and cities at which I stopped. Once at sea, I would do the dishes. I also did not pump any saltwater into the boat while I sailed past Moruroa Atoll as I was concerned about the possibility of contamination from radioactive heavy metals, such as plutonium.

Table B.2: Food Staples

Item	Quantity	Unit
Baking powder	2.5	kg
Baking soda	4	boxes
Barley	5.4	kg
Brown sugar	1	kg
Macaroni	11	kg
Noodles	400	g
Pancake mix	6	kg
Pepper	200	g
Popcorn	14	kg
Porridge oats	40	kg
Powdered milk	30	kg
Rice	22	kg
Sago	2	kg
Soup mix	5.4	kg
Spaghetti	6	kg
Tuna	240	170 g cans
Vegetable oil	24	litres
White flour	20	kg
White sugar	10	kg
Whole wheat flour	20	kg

Table B.3: Food Treats

Item	Quantity	Unit
Apple juice	12	500 ml boxes
Apricots	1	kg
Bacon bits	1	kg
Beef soup	1.5	kg
Butterscotch	1	250 g
Candy	9	200 g packets
Chicken	5	1 kg tins
Chocolate	10	200 g blocks
Cinnamon	200	g
Coconut	2	kg
Crackers	8	200 g boxes
Currants	1.9	kg

Dried vegetables	1	kg
Fruit leather	10	100 g strips
Granola	2.7	kg
Halva	4	200 g blocks
Ham	2	300 g tins
Herb tea	27	g
Honey	6	kg
Horlicks	400	g
HP sauce	400	ml
Jam	12	500 g jars
Kate's cookies	600	g
Ketchup	1	litre
Lime cordial	3	litres
Marmite	150	g
Mexican sauce	1	250 g
Monticello	2	750 ml bottles
Ovaltine	1	500 g
Peanuts	600	g
Peanut butter	12	500 g jars
Popcorn	14	500 g bags
Potato flakes	1	kg
Sultanas	9	kg
Trail mix	1	kg
Tomato soup	4	kg
Textured vegetarian protein	1.5	kg
Vegemite	250	g

Appendix C

Supplies

Table C.1: Non-Food

Item	Quantity	Unit
Bathroom tissue	60	rolls
Batteries	8	AA
Batteries	8	D
Batteries	2	lantern
Candles	55	candles
Detergent	5	litres
Diesel	40	litres
Kerosene	80	litres
Lighters	3	lighters
Matches	100	matches
Methanol	12	litres
Pens	6	pens
Plastic bags	100	assorted bags
Slide film	3	36 exposures
Toothpaste	4	130 ml tubes

I would have liked to have had more slide film. After I had finished the voyage, my friends told me that had they known that I could only afford three rolls of slide film, they would have bought me extra film.

Appendix D

Medical

Prior to my voyage, my family doctor gave me a thorough checkup and prescribed a list of drugs and supplies to allow me to deal with a number of possible scenarios, such as a broken arm. Contagious diseases were not a concern as my proximity to other humans was limited and I was rarely sailing near land to be infected by mosquito-borne diseases. I did not use any of the medical supplies I took. Although I am listing them here, medicine has evolved considerably since then.

My medical supplies were made up of various wound-covering items such as bandages; Band-Aids and pads; and various tools such as scissors, tweezers, scalpels, eyewash cups, and gloves. I also had medicines for diarrhea, constipation, burns, sunburns, antibiotics, analgesics, and local anaesthetics. The doctor also prescribed many other drugs for specific purposes, with clear instructions on their use. After I completed the voyage, I returned the prescription drugs to a pharmacy for disposal.

Table D.1: Medical Supplies

Item	Quantity	Unit
292	50	tabs
Absorbent gauze (9 m x 75 mm)	1	pack
Absorbent gauze (6 m x 75 mm)	1	pack
Adhesive plaster(5 m x 25 mm)	1	pack
Adrenalin (1 mg)	2	vials
Alcohol prep	22	wipes
Ampicillin (250 mg)	100	tabs
Ancolon (25 mg)	1	pack
Antiseptic cream (Hibitane 50 g)	3	tubes
Antiseptic detergent (Savlon 250 ml)	1	bottle
Antibiotic eye ointment	2	tubes
Apo-Sulfatrim	100	tabs
Aspergum throat lozenges	24	

Bandages, constrictive (4.5 m x 10 cm)	4 packs
Bandages, constrictive (4.5 m x 5 cm)	1 pack
Bandages, triangular	4 packs
Band-Aids	1 pack
Burn cream (Furacin 50 g)	1 tube
Cloro-Tripolon (8 mg)	36 tabs
Cloxacillin Nova (250 mg)	100 tabs
Combine dressing piece (30 cm x 20 cm)	5 packs
Cotton wool (60 g)	2 packs
Demerol (50 mg)	50 tabs
Di-Gesic	30 tabs
Duofilm (15 ml)	1 bottle
Finger splints	3 splints
Gauze squares	9 packs
Glucose (pack of 20)	2 packs
Hydrogen peroxide 3% (450 ml)	2 bottles
Kaopectate (350 ml)	2 bottles
Kenacomb ointment (30 mg)	2 tubes
Laxative	30 tabs
Lip balm	3 tubes
Lomoxil (2.5 mg)	50 tabs
Metronidazole (250 mg)	50 tabs
Micropore surgical tape	5 rolls
Na-Sulfacetamide (3.5 g)	1 tube
NeoCitran A	5 sachets
Optizinc eye drops (15 ml)	1 bottle
Paba-Tan sunblock (110 ml)	2 bottles
Polysporin ear/eye drops (10 ml)	1 bottle
Potassium Permanganate crystals	5 grams
Puritabs (for 1 litre)	48 tabs
Safety pins (Stainless steel)	6 pins
Scissors (100 mm)	1 pair
Seasickness tabs (Dramamine)	10 tabs
Skin closures (pack of 5)	6 packs
Sudafed DM (100 ml)	1 bottle
Sutures and needles (18")	5 packs
Syringe (2 ml)	7 syringes
Syringe (5 cc)	4 syringes
Syringe needles	12 syringes

Tension bandages	3 bandages
Tinactin (30 g)	1 tube
Tube gauze	1 pack
Tylenol (30 mg)	24 tabs
Ultraviolet absorbing cream (Uvistat 50 g)	1 tube
Vitamin A cream (Ungvita)	2 tubes
Vicks cough syrup	1 bottle
Vicks VapoRub	1 jar
Xylocaine (2% 20 ml)	1 bottle

Appendix E

Instruments

Alarm clock An old Westclox spring-driven alarm clock typical of the alarm clocks of the day. It functioned well; the problems with waking up were caused by a number of operator errors.

Anemometer A simple hand-held device designed to measure wind speed. It had a tube that was narrow at the base and wide at the top with a small plastic ball inside the tube. Air rushing into the bottom of the tube pushed the ball up the slightly expanding tube until the volume of air passing around the ball equalled the volume of air entering the bottom of the tube. The device was graduated to show the wind strength at the position of the plastic ball.

Compass A set of drawing instruments made by Staedtler Mars. The compass could be connected to an extension so I could draw large circles if required.

Depth sounder A simple depth sounder that would read to 100 feet. This was useful when putting in tacks in a narrow channel. The needle would slowly creep from deep water to shallow, and when it was reading close to three feet (the distance from the transducer to the bottom of the keel), that was the signal to tack. It was used in conjunction with an old-fashioned lead line that could measure the depth by hand. I would use the line if I was concerned that a thermocline, kelp, or extreme silty water would give an erroneous reading.

Dividers Traditional marine single-hand dividers made of brass that could be opened by squeezing the circular top of the arms or closed by pressing the lower legs together.

Douglas protractor Two protractors, a five-inch square protractor as well as a ten-inch square protractor both with frosted surfaces upon which I could draw lines. Douglas protractors were particularly useful in laying off the very accurate three-point fix obtained by measuring the angle between a first and second point and the angle between the second and third point with a sextant

held horizontally. This was the technique of choice when sailing within sight of land and three clearly identified points were listed on the chart.

Erasers Staedtler soft white pencil erasers.

Flashlights (Torches) Waterproof flashlights used to check the compass course and wind indicator, modified by replacing the bulbs with higher-resistance ones to produce a dim light to view the compass and wind indicator without losing night vision.

Hand bearing compass Small hand bearing compass to sight objects on the shore and through a prism providing a view of the compass card graduations. Both main compass and hand bearing compass were swung at the same time and sighted from the same position, standing on top of the aft hatch cover so that there would be consistency in the deviation. All sightings were taken from the same position.

Lead line Made by pouring molten lead into a narrow long-necked glass bottle turned upside down in a bed of sand. I cut the bottom of the bottle off by tying some natural fibre twine around the bottle near the base, soaking it in kerosene and setting the string alight. As soon as the flame went out, I plunged the bottle in cold water, and the sudden local contraction shock sheared the glass neatly.

Log Log impeller was mounted close to the keel and would read up to ten knots before jamming against the stop. It did not require power except for backlighting as the impeller generated the voltage. Important for dead reckoning navigation.

Magnetic compass Compass mounted on the fore and aft centre line, atop the main hatch cover. Sighting arm that could be fitted on top of the compass to take bearings, except in the forward direction when the dinghy was in its chocks atop the cabin and blocking the view forward for sighting. In this case, *Laiviņa* was momentarily pointed at the object and the course recorded as the bearing.

Parallel rule Plotting equipment used to transfer a bearing from the printed compass rose on a chart to draw a line from an estimated or dead reckoning position or to transfer a course line to the printed compass rose to determine the course.

Pencils 2B pencils for all chart work as they can be erased off the chart without leaving a mark and the pencil does not need to be pressed hard on the chart to make a line, avoiding a permanent furrow on the chart. Standard HB pencils were too hard.

Pens Pens for making permanent log notations. Changes were made by adding the new information and indicating the incorrect information by crossing it out with a single line through the text. A drawback with using a pen was that it might bleed if the logbook got wet.

Rude star finder Thin plastic circular disc eight and a half inches in diameter. Southern stars on one side, northern stars on the other, and poles at the centre. Red-marked "meridian angle-declination template" for the sun, moon, and planets, and nine clear plastic discs with a curved grid of azimuth and altitude marked on them. Useful when trying to find stars in a sky almost obscured by cloud.

Sextant, brass A solid and rigid device for measuring the angle between the sun, moon, planets, or stars and the horizon. It had a telescope and used mirrors and glass to allow the celestial object and the horizon to be visible together when the angle was correctly set. It had filters to reduce the amount of light to a safe level and spare mirrors. It was regularly overhauled and calibrated.

Sextant, plastic Operated similarly to the brass sextant, but less accurate. Kept in the grab bag to take to the life raft if abandoning ship.

Shortwave radio receiver Multi-band radio that would receive on AM, FM and a number of shortwave bands. I used shortwave to pick up stations many thousands of miles away so as to receive weather information and the UTC (Universal Coordinated Time) signal needed for accurate navigation.

Tell tails A system for seeing the air flow along a sail surface. Twenty-centimetre lengths of fluorescent red and green wool that were threaded on a needle, pulled through a sail and knotted to keep in place. Placed up the luff of all of my sails, set back about twenty centimetres from the edge and placed at intervals along the leech. If a sail was sheeted in too hard, the leeward luff tell tail curled back and streamed forward; if a sail was not sheeted in enough, the windward luff tell tail curled back and streamed forward from the loss of laminar flow. If the sail had too much camber and was not flat enough in strong winds, the leech tell tail curled back and streamed forward. It was also useful for showing the correct sail twist as the apparent wind direction was often different at the masthead than at the deck level. If all tell tails up the luff were streaming back, then the amount of sail twist was correct.

Wind direction indicator Sensitive weather cock mounted on top of the radar reflector that was bolted to the top of the mast. It had two arms that extended aft at forty-five degrees on either side to the fore and aft line to indicate the closest point to sail into the wind. The arms, tail, and point of the indicator were coated in light reflective material.

Appendix F

Hand Tools

I am a journeyman fitter and turner with a wide selection of hand tools, such as large and small hand-operated drills, hammers, files and wrenches, a rivet gun, and rivets suitable for the mast. A sturdy vice, mounted on one of the treads of the companionway, was critical to making repairs.

I had a Singer industrial sewing machine with a variety of stitches fitted with a hand crank. When I needed it to repair sails, I clamped it to the chart table.

Table F.1: Tools

Category	Tool	Qty
Screwdrivers	Screwdriver set (impact)	1
	Screwdriver set	1
	Screwdrivers (assorted)	6
Files	File (flat bastard)	2
	File (flat 2nd cut)	2
	File (triangular)	2
	File (rat-tail)	4
Spares	Engine spares (various)	
Grippers	Pliers (needle-nose)	2
	Pliers (assorted)	6
	Vice grips	1
Cutters	Bolt cutters	1
	Cold chisels	2
	Wood chisel 1″	1
	Wood chisel 3/4″	1
	Plane	1
	Spokeshave	1
	End cutters	1
	Hatchet	1

Wrenches	Metric socket set	1
	SAE socket set	1
	Crescent wrench 8″	1
	Crescent wrench 12″	1
	Crescent wrench 18″	1
Saws	Hacksaw	1
	Hacksaw blades	40
	Handsaw (crosscut)	1
	Handsaw (back)	1
Hammers	Small ball-peen	1
	Large ball-peen	1
	Blacksmith	1
	Claw	1
	Mallet	1
Measurement	Folding rule 3′	1
	Steel rule 12″	1
	Scratch gauge	1
Miscellaneous	Soldering iron	1
	Pin punches (long)	6
	Sharpening stone (coarse)	1
	Sharpening stone (fine)	1
	Axe stone	1
	Putty knife (small)	1
	Putty knife (large)	1
	Steel float	1
	Cartridge gun	1
	Rivet gun	1
Drills	Hand drill	1
	Drill bits (assorted)	50

HP11-C Calculator

I have included the program I built and installed on my HP-11C calculator, designed to perform celestial navigation calculations.

The program sets the alpha label keys on the HP-11C calculator to be the start of different sight processing methods. For example, if I want to process a sun sight, I press the f then the B key, and it starts running that part of the program to process a sun sight.

Table G.2: Great-Circle Programs

Key	Step	Program
A	001	GC distance and course
B	009	AM or PM sun sight
C	021	star sight
D	044	noon sight
E	057	meridian passage

If I am running the sun sight part of the program, the program stops at various points and waits for me to enter more data. After entering the data, I press the R/S key (Run/Stop), and the program proceeds until it requires more data. It repeats the request for more input until it has all the data it needs and then finishes with the solution shown in the display. If the solution contains two pieces of information, I press the Exchange XY key to display the additional information.

When entering the chronometer error, I enter the number of seconds as a positive number if the chronometer is slow and as a negative number if it is fast.

As the program requires that angles be entered as degrees, minutes, and seconds, the angle is entered in D.MMSS format. For example, twelve degrees, thirty-seven minutes and forty-eight seconds would be entered as 12.3748, and the calculator correctly converts the number.

The program will first stop at step 075 and wait for me to enter the time I recorded the sight. After pressing the R/S key (Run/Stop), it stops at step 077 and asks for the chronometer error (slow is positive, fast is negative). It then runs through a set of common subroutines and stops at various points for more information to be entered. *The Nautical Almanac*[72] lists values in degrees, minutes, and decimals of a minute. The decimal minutes need to be multiplied by six to convert to seconds. For example, $27.7'$ is $27'\ 42''$. It can easily be done in one's head.

Where I have the description enclosed in parentheses, the program will stop and expect an input. If the input is degrees, minutes and seconds or hours, minutes and seconds, it is entered as D.MMSS or H.MMSS

and is converted to D.d format or H.h format. For example, 12°30′45″ is entered as 12.3045 and is converted by the > H instruction to 12.5125.

Step 047 and 055 may need to be removed as the sign changes are there when the latitude and declination are both in the same hemisphere and latitude is greater than declination.

There is an app for Android smartphones that will emulate the HP-11C. It is called "11C Scientific Calculator" and written by Vicinno Soft LLC. You can use this app to test my program.

Table G.3: Example of Data Entry for a Sun Sight

Entry	Example	Explanation
Time of sight	10.2314	10:23:14
Chronometer error	0.0014	14″ slow
Greenwich hour angle	329.2742	329°27.7′
Declination	23.2524	23°25.4′
Declination correction	10.0548	10°5.8′
Dead reckoning longitude	-140.0330	140°03.5′W
Dead reckoning latitude	32.4654	32°46.9′N
Sextant angle	62.2706	62°27.1′

Table G.4: Great-Circle Calculations

Step	Description	Display
001	GCD/COURSE	001-42,21,11
002	(LONG TO-D.MMSS)	002- 31
003	> H	003- 43 2
004	STORE I	004- 44 25
005	(LAT TO-D.MMSS)	005- 31
006	> H	006- 43 2
007	GOSUB 3	007- 32 3
008	GOTO A	008- 22 11
009	SUN SIGHT	009-42,21,12
010	GOSUB 0	010- 32 0
011	ONE	011- 1
012	FIVE	012- 5
013	MULTIPLY	013- 20
014	GOSUB 1	014- 32 1
015	GOSUB 2	015- 32 2
016	GOSUB 3	016- 32 3
017	GOSUB 4	017- 32 4
018	GOSUB 6	018- 32 6
019	GOSUB 7	019- 32 7
020	GOSUB 8	020- 32 8
021	STAR SIGHT	021-42,21,13
022	GOSUB 0	022- 32 0
023	ONE	023- 1
024	FIVE	024- 5
025	DECIMAL	025- 48
026	ZERO	026- 0
027	FOUR	027- 4
028	ONE	028- 1
029	MULTIPLY	029- 20
030	GOSUB 1	030- 32 1
031	(DECLINATE-D.MMSS)	031- 31
032	> H	032- 43 2
033	RECALL I	033- 45 25
034	(GHA ARIES-D.MMSS)	034- 31
035	> H	035- 43 2
036	PLUS	036- 40

```
037            STORE I 037-   44 25
038       EXCHANGE XY  038-      34
039            GOSUB 3 039-   32  3
040            GOSUB 5 040-   32  5
041            GOSUB 6 041-   32  6
042            GOSUB 7 042-   32  7
043             GOTO C 043-   22 13
044        NOON SIGHT  044-42,21,14
045            GOSUB 0 045-   32  0
046            GOSUB 2 046-   32  2
047       CHANGE SIGN  047-      16
048            GOSUB 4 048-   32  4
049            GOSUB 6 049-   32  6
050       CHANGE SIGN  050-      16
051              NINE  051-       9
052              ZERO  052-       0
053              PLUS  053-      40
054            > H.MS  054-   42  2
055       CHANGE SIGN  055-      16
056             GOTO D 056-   22 14
057       MER PASSAGE  057-42,21,15
058 (MERIDIAN-D.MMSS)  058-      31
059               > H  059-   43  2
060  (DR LONG-D.MMSS)  060-      31
061               > H  061-   43  2
062              ONE   062-       1
063             FIVE   063-       5
064           DIVIDE   064-      10
065             PLUS   065-      40
066            > H.MS  066-   42  2
067            ENTER   067-      36
068               > H  068-   43  2
069     (ZONE-H.MMSS)  069-      31
070               > H  070-   43  2
071            MINUS   071-      30
072            > H.MS  072-   42  2
073            GOTO E  073-   22 15
074              TIME  074-42,21, 0
075     (TIME-H.MMSS)  075-      31
```

```
076                 > H 076-   43  2
077 (CRONO ERR-H.MMSS) 077-       31
078                 > H 078-   43  2
079                PLUS 079-       40
080               ENTER 080-       36
081              RETURN 081-   43 32
082                 GHA 082-42,21, 1
083       (GHA-D.MMSS) 083-       31
084                 > H 084-   43  2
085                PLUS 085-       40
086             STORE I 086-   44 25
087         EXCHANGE XY 087-       34
088              RETURN 088-   43 32
089         DECLINATION 089-42,21, 2
090       (DEC-D.MMSS) 090-       31
091                 > H 091-   43  2
092         EXCHANGE XY 092-       34
093  (d CORRECTD.MMSS) 093-       31
094                 > H 094-   43  2
095            MULTIPLY 095-       20
096                PLUS 096-       40
097              RETURN 097-   43 32
098           MAIN CALC 098-42,21, 3
099                 ONE 099-        1
100              > RECT 100-   42 26
101           RECALL I 101-   45 25
102   (DR LONG-D.MMSS) 102-       31
103                 > H 103-   43  2
104         EXCHANGE XY 104-       34
105               MINUS 105-       30
106         EXCHANGE XY 106-       34
107              > RECT 107-   42 26
108         EXCHANGE XY 108-       34
109               ENTER 109-       36
110           ROLL DOWN 110-       33
111           ROLL DOWN 111-       33
112             > POLAR 112-   43 26
113         EXCHANGE XY 113-       34
114    (DR LAT-D.MMSS) 114-       31
```

```
115                > H 115-   43  2
116              MINUS 116-       30
117         EXCHANGE XY 117-       34
118            > RECT 118-   42 26
119         ROLL DOWN 119-       33
120         EXCHANGE XY 120-       34
121         ROLL DOWN 121-       33
122            > POLAR 122-   43 26
123         EXCHANGE XY 123-       34
124              X < 0 124-   43 10
125           GOSUB 8 125-   32  8
126           STORE I 126-   44 25
127             ENTER 127-       36
128         ROLL DOWN 128-       33
129         ROLL DOWN 129-       33
130         EXCHANGE XY 130-       34
131            > POLAR 131-   43 26
132         ROLL DOWN 132-       33
133             ENTER 133-       36
134             ENTER 134-       36
135               SIX 135-        6
136              ZERO 136-        0
137          MULTIPLY 137-       20
138         EXCHANGE XY 138-       34
139         CHANGE SIGN 139-       16
140              NINE 140-        9
141              ZERO 141-        0
142              PLUS 142-       40
143            RETURN 143-   43 32
144          SUN CORR 144-42,21, 4
145           DECIMAL 145-       48
146               TWO 146-        2
147               TWO 147-        2
148             SEVEN 148-        7
149            RETURN 149-   43 32
150          STAR CORR 150-42,21, 5
151           DECIMAL 151-       48
152              ZERO 152-        0
153              FOUR 153-        4
```

```
154              THREE 154-        3
155             RETURN 155-    43 32
156         SEXT ANGLE 156-42,21, 6
157   (SEXTANT-D.MMSS) 157-       31
158                > H 158-    43  2
159               PLUS 159-       40
160              ENTER 160-       36
161          ROLL DOWN 161-       33
162              MINUS 162-       30
163        CHANGE SIGN 163-       16
164            ROLL UP 164-    43 33
165            TANGENT 165-       25
166                1/X 166-       15
167              ENTER 167-       36
168          X SQUARED 168-    43 11
169            DECIMAL 169-       48
170               ZERO 170-        0
171                SIX 171-        6
172                SIX 172-        6
173              EIGHT 173-        8
174        CHANGE SIGN 174-       16
175           MULTIPLY 175-       20
176               FIVE 176-        5
177              EIGHT 177-        8
178            DECIMAL 178-       48
179                TWO 179-        2
180               NINE 180-        9
181               FOUR 181-        4
182               PLUS 182-       40
183           MULTIPLY 183-       20
184              THREE 184-        3
185                SIX 185-        6
186               ZERO 186-        0
187               ZERO 187-        0
188             DIVIDE 188-       10
189              MINUS 189-       30
190             RETURN 190-    43 32
191          INTERCEPT 191-42,21, 7
192           RECALL I 192-    45 25
```

```
193          EXCHANGE XY 193-       34
194                 SIX 194-        6
195                ZERO 195-        0
196            MULTIPLY 196-       20
197              RETURN 197-    43 32
198            OVERFLOW 198-42,21,  8
199               THREE 199-        3
200                 SIX 200-        6
201                ZERO 201-        0
202                PLUS 202-       40
203              RETURN 203-    43 32
```

Appendix H

Materials

Rather than take many spares in case of breakage, I chose materials that could be used to make my own replacement parts. For example:

- A selection of different diameters of stainless threaded rod in metre lengths.
- A large number of stainless steel nuts and washers of different diameters.
- A large selection of stainless steel tubing of different diameters.
- Stainless steel and copper wire for seizing the shackles shut.
- A drum of braided Dacron line that could be used for halyards and sheets and used to replace lines that were becoming frayed. The old line was usually pressed into service in some non-critical part of the boat, or if it was badly frayed in many places, the good pieces were cut out and into short useful lengths for lashings.
- Leftover pieces of plywood and mahogany from the original construction of *Laiviņa*.
- Numerous pieces of scrap sailcloth of different weight.
- Rip-stop nylon for spinnaker repairs.
- A large selection stainless steel and galvanized shackles of different sizes.
- Two-metre lengths of different sizes of galvanized anchor chain. Used to fit a second forestay and for a temporary lightning rod to direct electricity from the mast into the water.
- Solid pieces of lumber, including a short bit of twelve-by-twelve fir to act as an internal mast splice should I need to repair my mast at sea.

r3in
Table H.1: Sealers and Glues

Item	Quantity	Unit
Silicon rubber	2	tubes
Contact adhesive	2	tubes
Solder	1	roll
Epoxy glue	3	litres
Epoxy filler	2	litres
Underwater epoxy	1	litre
Cement powder	1	bag
Fast cure for cement	1	bag
Varnish (polyurethane)	500	millilitres
White paint (polyurethane)	1	litre
Red lead primer	2	litres
Caulking (butyl rubber)	2	cartridges
Caulking (silicone)	2	cartridges
Insulation foam	1	can

- A collision mat of solid rubber two feet by two feet square and a quarter-inch thick. A small hole was drilled in the centre and fitted with a strong line passed through it with a monkey's fist on one end.
- A collision mat of solid rubber four feet by four feet square and one-eighth of an inch thick. Holes were drilled in the corners to attach securing lines. This collision mat was designed to be placed over a hole from the outside. This collision mat was kept on my chart table at all times for quick access in an emergency.

Appendix K

Charts

This is a list of the charts I needed to sail my course, along with some emergency charts for such areas as South Africa and Cape Town.

Table K.1: Charts Needed

1142	Midway Island to Kauai
1308	Maui to Niihau
1309	Hawaii to Oahu
1378	Southern Part of Oahu
1673	Approaches to Suva Harbour
1829	Fiji Islands to Samoa Island
1830	Ellice Island to Phoenix Islands
18XCO18000	Point Conception to Isla de Cedros
18XCO18007	San Francisco to Cape Flattery
18XCO18020	San Diego to Cape Mendocino
21XHA21661	Isla de Revillagigedo, Guadalupe and Escollos Alijos
22ACO22032	Estrecho de Magallanes to Islas Ildefonso
22ACO22036	Estrecho de Magallanes to Cabo de Hornos
23AHA23150	Falkland Islands (Eastern Part)
23AHA23160	Falkland Islands (Western Part)
2601	Pilot Chart. South Pacific (Dec, Jan, Feb)
2601	Pilot Chart. South Pacific (Jun, Jul, Aug)
2601	Pilot Chart. South Pacific (Mar, Apr, May)
2601	Pilot Chart. South Pacific (Sep, Oct, Nov)
2603	Pilot Chart. Indian Ocean (April)
2603	Pilot Chart. Indian Ocean (February)
2603	Pilot Chart. Indian Ocean (January)
2603	Pilot Chart. Indian Ocean (June)
2603	Pilot Chart. Indian Ocean (March)
2603	Pilot Chart. Indian Ocean (May)

2691 Fiji Islands
3001 Vancouver Island
3440 Race Rocks to D'Arcy Island
3449 Race rocks to East Point
3461 Juan de Fuca Strait (Eastern Portion)
3602 Approaches to Juan de Fuca Strait
3640 Juan de Fuca Strait (Western Portion)
3641 Albert Head to Otter Point
4001 Vancouver Island
5308 The World. Sailing Ship Routes
5309 Tracks followed by Sailing and Auxiliary Powered Vessels
55 Pilot Chart. North Pacific (April)
55 Pilot Chart. North Pacific (August)
55 Pilot Chart. North Pacific (December)
55 Pilot Chart. North Pacific (July)
55 Pilot Chart. North Pacific (June)
55 Pilot Chart. North Pacific (May)
55 Pilot Chart. North Pacific (November)
55 Pilot Chart. North Pacific (October)
55 Pilot Chart. North Pacific (September)
61ACO61000 Algoa Bay to Capetown
61BCO61650 Îles Kerguélen
74ACO74030 Doubtful Island Bay to Cape Naturaliste
75ACO75025 Cape Otway to Gabo Island inc. Tasmania
75BHA75191 Approaches to Hobart
780 Pacific Ocean (South West Sheet)
782 Pacific Ocean (North East Sheet)
782 Pacific Ocean (South East Sheet)
787 Cabo Corrientes to Kodiak Island
AUS 213 Plans in the South West Pacific Ocean
INT 601 Tasman Sea
INT 602 Tasman and Coral Seas
NZ 38 Otago Harbour
NZ 64 Banks Peninsula to Otago Peninsula
NZ 66 Taiaroa Head to Nugget Point
NZ 67 Nugget Point to Centre Island inc. Foveaux Strait
NZ 76 Western Approaches to Foveaux Strait

	Pilot Chart. South Atlantic (Dec, Jan, Feb)
	Pilot Chart. South Atlantic (Sep, Oct, Nov)
	The New Canadian Buoyage System
WOAGN211	South Atlantic Ocean (Southern Part)
WOBGN70	Indian Ocean (Southern Portion)
WOPGN609	Valparaiso to Islas Diego Ramírez
WOPGN620	South Pacific Ocean (sheet 1)
WOPGN621	South Pacific Ocean (sheet 2)
WOPGN623	South Pacific Ocean (sheet 4)

Appendix L

Planning

Planning any voyage is an iterative process.

First, I drew straight lines on a Mercator projection chart so that the lines did not cross over land and were an appropriate distance from the land for safety. Next, I adjusted the route to pass on the downwind side of high-pressure systems. For example, heading south, that meant going to the east of the North Pacific high-pressure system and to the west of the South Pacific high-pressure system.

I then adjusted the course to sail close-hauled in the trade wind zone so as to make sufficient easting in one hemisphere to compensate for the loss of easting in the next hemisphere. For example, I stayed hard on the wind when heading south while I was in the northeast trades to compensate for being pushed west when passing through the doldrums and the first part of the southeast trades near the equator.

Then I broke the overall route into legs of similar weather or sailing conditions as shown in the table on the following page.

The original decision was to travel the Southern Ocean along the 45°S latitude after passing Cape Horn and the Falkland Islands. Later I decided to risk going further south to 50°S latitude knowing that most iceberg encounters were higher than 55°S latitude and in particular at the 57°S latitude. I did try going further south to 53°S latitude, but I was running into easterly winds at the time so headed back to 50°S latitude.

Choosing the time to depart was critical. Hurricanes occur in late summer and early autumn in the waters to the west of Mexico, so I needed to pass that area both outward and homeward-bound outside of that period. Statistically speaking, Cape Horn has two relatively quiescent periods: in the winter around June, and between Christmas Day and New Year's Day. I wanted to avoid making passage through the Southern Ocean in winter, so I planned to round Cape Horn on New Year's Day.

The average speed and distance I had to travel each leg was easy

Table L.1: Route Legs

#	NM	Leg
1	62.3	Victoria to the Juan de Fuca entrance
2	1254	Juan de Fuca entrance to start of the NE trades
3	1239	Start of the NE trades to start of the doldrums
4	382	Start of the doldrums to end of the doldrums
5	2081	End of the doldrums to Easter Island
6	2731	Easter Island to Cape Horn
7	446	Cape Horn to Port Stanley
8	8558	Port Stanley to Hobart
9	1100	Hobart to Dunedin
10	2293	Dunedin to start of the SE trades
11	2786	Start of SE trades to start of the doldrums
12	336	Start of the doldrums to end of the doldrums
13	1966	End of the doldrums to Santa Barbara
14	1274	Santa Barbara to Juan de Fuca entrance
15	62.3	Juan de Fuca entrance to Victoria

to calculate, so I could estimate the time it would take to transit each leg. From New Year's Day at Cape Horn, working backwards set the date of departure from Victoria, B.C., at October 14. The same backward calculation provided the expected dates and times to transit from one leg to the next. Working the other way from Cape Horn, I set the date and time of arrival at the start of each successive leg and the date I expected to arrive back in Victoria.

By choosing New Year's Day to round Cape Horn, I was also in oceans at times when I would not expect to encounter a hurricane or cyclone.

My estimates were reasonably accurate; I arrived in Victoria just four days later than estimated. Adjusted for the loss of six days at Santa Barbara and assuming similar weather and sailing conditions, I would have been two days early after nine months of sailing.

I was able to accurately estimate the depletion of consumables such as kerosene for the two-burner pressure stove and methanol for warming the kerosene prior to lighting the stove.

I estimated the use of a bit under a litre and a half of water per day for drinking and cooking, using some seawater for cooking. For a voyage of 300 days, I would need 450 litres of water.

With two water tanks, each holding 100 litres and four twenty-five litre jerrycans, I had only enough space for 300 litres of water. There was no room to safely carry extra water, and the extra weight would affect *Laiviņa*'s speed. To supply the extra water I needed, I would collect rainwater off the mainsail when it rained.

The next chapter has the voyage plan that I built. I modified it en route close to Tasmania when I realized that I would be reaching the Tasman sea too early to avoid the cyclone season in the Coral Sea. My route changed to head for Tahiti by continuing east under New Zealand.

Appendix M

Voyage Plan

Table M.1: Victoria to Victoria

Victoria	LAT 48°25.4′N LON 123°23.0W
Great-circle distance	21,012 nautical miles
Course-line distance	26,797 nautical miles
Est. speed	4.2 knots
Act. speed	4.2 knots (excluding Santa Barbara time)
Est. day's run	100 nautical miles
Act. day's run	100 nautical miles (excluding Santa Barbara time)
Est. time taken	8 months 25 days 20 hours (269 days)
Act. time taken	9 months 0 days 0 hours (273 days)
Est. departure	1984-10-14 1200 LMT 1984-10-14 1900 GMT
Act. departure	1984-10-14 1445 LMT 1984-10-14 2145 GMT
Est. arrival	1985-07-10 0900 LMT 1985-07-10 1600 GMT
Act. arrival	1985-07-14 1300 LMT 1985-07-14 2000 GMT
Schedule status	4 days 4 hours late (6 days lost at Santa Barbara)
Est. water consumed	367 litres
Act. water consumed	434 litres
Est. water replenished	116 litres
Act. water replenished	442 litres
Est. diesel consumed	4.5 litres
Act. diesel consumed	25.5 litres
Est. kerosene consumed	36.7 litres
Act. kerosene consumed	43.0 litres
Est. methanol consumed	8.5 litres
Act. methanol consumed	9.0 litres
Notes	During this voyage, plan to keep a fairly descriptive log and to quickly establish safe habits. Write up the events of the day and try writing some short and long stories. Study maths and physics (electronics).

Table M.2: 1. Victoria to the Juan de Fuca Entrance

Victoria	LAT 48°25.4′N LON 123°23.0′W
Juan de Fuca entrance	LAT 48°27.0′N LON 124°50.0′W
Great-circle distance	57.8 nautical miles
Great-circle course	272 T
Course-line distance	62.3 nautical miles
Est. speed	2.5 knots
Act. speed	2.1 knots
Est. day's run	60.0 nautical miles
Act. day's run	51.0 nautical miles
Est. time taken	24 hours 00 minutes
Act. time taken	28 hours 15 minutes
Est. departure	1984-10-14 1200 LMT 1984-10-14 1900 GMT
Act. departure	1984-10-14 1445 LMT 1984-10-14 2145 GMT
Est. arrival	1984-10-15 1200 LMT 1984-10-15 1900 GMT
Act. arrival	1984-10-15 1900 LMT 1984-10-16 0200 GMT
Schedule status	7 hours late
Est. weather	Light winds from W to SW
Act. weather	Light winds from N to NE to E to SE to S
Maintenance expected	Check shackle and self-steering.
Est. water consumed	1.0 litres
Act. water consumed	2.0 litres
Est. water replenished	0.0 litres
Act. water replenished	0.0 litres
Act. food consumed	Curry, steaks, bread, jam, margarine, orange
Est. diesel consumed	0.0 litres
Act. diesel consumed	0.0
Est. kerosene consumed	133 millilitres
Act. kerosene consumed	100 millilitres
Est. methanol consumed	33 millilitres
Act. methanol consumed	30 millilitres
Charts needed	344 Race Rocks to D'Arcy Island 4001 Vancouver Island 3641 Albert Head to Otter Point 3449 Race rocks to East Point 3461 Juan de Fuca Strait (Eastern Portion) 3640 Juan de Fuca Strait (Western Portion 3602 Approaches to Juan de Fuca Strait
Activities	Got self-steering greased and working, fixed feedback mechanism.
Notes	Keep relaxed, conserve on nervous energy, take a lot of care with navigation, ships, etc. Don't screw up at the start!!

Table M.3: 2. Juan de Fuca Entrance to Start of the NE Trades

Juan de Fuca entrance	LAT 48°27.0′N LON 124°50.0′W
Start of the NE trades	LAT 29°11.0′N LON 119°12.0′W
Great-circle distance	1,184.8 nautical miles
Great-circle course	165 T
Course-line distance	1,254 nautical miles
Est. speed	4.2 knots
Act. speed	5.1 knots
Est. day's run	100 nautical miles
Act. day's run	124 nautical miles
Est. time taken	13 days 5 hours 00 minutes
Act. time taken	10 days 3 hours 50 minutes (not including the week in Santa Barbara)
Est. departure	1984-10-15 1200 LMT 1984-10-15 1900 GMT
Act. departure	1984-10-15 1900 LMT 1984-10-16 0200 GMT
Est. arrival	1984-10-28 1700 LMT 1984-10-29 0100 GMT
Act. arrival	1984-11-08 2140 LMT 1984-11-09 0540 GMT
Schedule status	11 days 4 hours 4 minutes late
Est. weather	Heavy seas with strong winds and large swells from the SE to the W for the first few days
Act. weather	Moderate seas and swells; wind from N to W
Maintenance expected	Constantly check gear for chafe and continue checking shackles.
Est. water consumed	12 litres
Act. water consumed	6 litres
Est. water replenished	4 litres
Act. water replenished	0 litres
Act. food consumed	All fresh food except potatoes, onions, cabbages, turnips, pumpkins, apples, margarine, and ketchup
Est. diesel consumed	0.0 litres
Act. diesel consumed	4.0 litres (during mistaken search and rescue)
Est. kerosene consumed	1,757 millilitres
Act. kerosene consumed	5,500 millilitres
Est. methanol consumed	435 millilitres
Act. methanol consumed	1,270 millilitres
Charts needed	3001 Vancouver Island 3640 Juan de Fuca Strait (Western Portion) 3602 Approaches to Juan de Fuca Strait Pilot Chart North Pacific (September) Pilot Chart North Pacific (October) Pilot Chart North Pacific (November) 787 Cabo Corrientes to Kodiak Island

1800 Point Conception to Isla Cedros
21661 Isla de Revillagigedo Guadalupe and Escollos Alijos

Activities Look after the boat, read, and keep rested.

Notes Keep 10 miles off the Oregon and Californian coast. Keep off the shipping lanes and try to consume perishable foods. Use water in starboard tank first so weight is on windward side in trades. Lost 14 days due to broken self-steering rudder.

Table M.4: 3. Start of the NE Trades to Start of the Doldrums

Start of the NE trades	LAT 29°11′N LON 119°12′W
Start of the Doldrums	LAT 10°00′N LON 112°22′W
Great-circle distance	1,213.3 nautical miles
Great-circle course	160 T
Course-line distance	1,239 nautical miles
Est. speed	4.4 knots
Act. speed	5.2 knots
Est. day's run	115 nautical miles
Act. day's run	124 nautical miles
Est. time taken	12 days 9 hours
Act. time taken	9 days 23 hours 24 minutes
Est. departure	1984-10-28 1700 LMT 1984-10-29 0100 GMT
Act. departure	1984-11-08 2140 LMT 1984-11-09 0540 GMT
Est. arrival	1984-11-10 0200 LMT 1984-11-10 0920 GMT
Act. arrival	1984-11-18 2144 LMT 1984-11-19 0504 GMT
Schedule status	8 days 19 hours 44 minutes late
Est. weather	Running in trade wind conditions
Act. weather	4/8 cloud cover, no rain, wind ENE force 3-4
Maintenance expected	Check for chafe on mainsail seams and condition of spinnaker
Est. water consumed	22 litres
Act. water consumed	6 litres plus 3 litres juice
Est. water replenished	6 litres
Act. water replenished	0 litres
Act. food consumed	32 apples, 20 potatoes, 20 onions, 8 cabbages
Est. diesel consumed	500 millilitres (monthly running of motor)
Act. diesel consumed	0 litres
Est. kerosene consumed	1,646 millilitres
Act. kerosene consumed	1,400 millilitres
Est. methanol consumed	408 millilitres
Act. methanol consumed	300 millilitres
Charts needed	Pilot Chart North Pacific (October) Pilot Chart North Pacific (November) 787 Cabo Corrientes to Kodiak Island 1800 Point Conception to Isla Cedros 21661 Isla de Revillagigedo, Guadalupe, and Escollos Alijos 620 South Pacific Ocean (sheet 1)
Activities	Study maths, reading, writing, etc.

Notes Allow ten degrees for current setting west at 7.0 knots. Check food for deterioration. Have to take care with methanol ration. It should have been 1 litre per 2 weeks not 600 ml. Have decided to work Local Mean Time by this formula: If the total sunlight hours is less than 12, then noon is fixed at 1200, else LMT of sunrise is 0600. Should have brought more vinegar and margarine. Could have used 12 or 16.

Table M.5: 4. Start of the Doldrums to End of the Doldrums

Start of the Doldrums	LAT 10°00′N LON 112°22′W
End of the Doldrums	LAT 05°00′N LON 111°11′W
Great-circle distance	308.1 nautical miles
Great-circle course	166 T
Course-line distance	382 nautical miles
Est. speed	1.5 knots
Act. speed	4.3 knots
Est. day's run	36 nautical miles
Act. day's run	102 nautical miles
Est. time taken	8 days 21 hours
Act. time taken	3 days 17 hours 38 minutes
Est. departure	1984-11-10 0200 LMT 1984-11-10 0920 GMT
Act. departure	1984-11-18 2144 LMT 1984-11-19 0504 GMT
Est. arrival	1984-11-18 2300 LMT 1984-11-19 0610 GMT
Act. arrival	1984-11-22 1532 LMT 1984-11-22 2242 GMT
Schedule status	3 days 16 hours 32 minutes late
Est. weather	Doldrum conditions; squalls, no wind and rain
Act. weather	Heavy cloud and drizzle; wind force 3-5
Maintenance expected	Keep an eye on chafe and tighten shackles.
Est. water consumed	18 litres
Act. water consumed	1 litre plus 2 litres juice
Est. water replenished	10 litres
Act. water replenished	17 litres
Act. food consumed	Potatoes, cabbages, onions, apples, eggs, bread, and jam
Est. diesel consumed	0.0 litres
Act. diesel consumed	0.0 litres
Est. kerosene consumed	1,180 millilitres
Act. kerosene consumed	700 millilitres
Est. methanol consumed	293 millilitres
Act. methanol consumed	200 millilitres
Charts needed	Pilot Chart North Pacific (October) Pilot Chart North Pacific (November) Pilot Chart North Pacific (December) 787 Cabo Corrientes to Kodiak Island 620 South Pacific Ocean (sheet 1)
Activities	Put up the umbrella, try to keep cool, and read.
Notes	Concentrate on keeping the boat moving, and I mean really concentrate. Set distance goals and stick to them.

Table M.6: 5. End of the Doldrums to Easter Island

End of the doldrums	LAT 05°00′N LON 111°11′W
Easter Island	LAT 27°05′S LON 109°17′W
Great-circle distance	1,928.2 nautical miles
Great-circle course	177 T
Course-line distance	2,081 nautical miles
Est. speed	4.7 knots
Act. speed	4.8 knots
Est. day's run	112 nautical miles
Act. day's run	115 nautical miles
Est. time taken	17 days 21 hours 0 minutes
Act. time taken	18 days 1 hour 55 minutes
Est. departure	1984-11-18 2300 LMT 1984-11-19 0610 GMT
Act. departure	1984-11-22 1532 LMT 1984-11-22 2242 GMT
Est. arrival	1984-12-06 2000 LMT 1984-12-07 0215 GMT
Act. arrival	1984-12-10 1822 LMT 1984-12-11 0037 GMT
Schedule status	3 days 22 hours 22 minutes late
Est. weather	Trade wind conditions
Act. weather	Southerly and mixed weather before the equator, strong force 4-5 SE at times after equator
Maintenance expected	Overhaul sewing machine (keep bobbin greased).
Est. water consumed	32 litres
Act. water consumed	9 litres plus 7 litres juice
Est. water replenished	12 litres
Act. water replenished	0 litres
Act. food consumed	Potatoes, onions, pumpkin, eggs, apples, bread
Est. diesel consumed	500 millilitres (monthly running of motor)
Act. diesel consumed	0 litres
Est. kerosene consumed	2,377 millilitres
Act. kerosene consumed	4,300 millilitres
Est. methanol consumed	590 millilitres
Act. methanol consumed	400 millilitres
Charts needed	Pilot Chart North Pacific (October) Pilot Chart North Pacific (November) Pilot Chart North Pacific (December) Pilot Chart South Pacific (Sep, Oct, Nov) Pilot Chart South Pacific (Dec, Jan, Feb) 787 Cabo Corrientes to Kodiak Island 620 South Pacific Ocean (sheet 1) 621 South Pacific Ocean (sheet 2)
Activities	
Notes	Take photos of the solar eclipse on 22-23 November. Reading, writing, studying, etc.

Table M.7: 6. Easter Island to Cape Horn

Easter Island	LAT 27°05′S LON 109°17′W
Cape Horn	LAT 55°55′S LON 067°17′W
Great-circle distance	2,495.6 nautical miles
Great-circle course	146 T
Course-line distance	2,731 nautical miles
Est. speed	4.2 knots
Act. speed	4.6 knots
Est. day's run	100 nautical miles
Act. day's run	110 nautical miles
Est. time taken	26 days 0 hours 0 minutes
Act. time taken	24 days 19 hours 53 minutes
Est. departure	1984-12-06 2000 LMT 1984-12-07 0215 GMT
Act. departure	1984-12-10 1822 LMT 1984-12-11 0037 GMT
Est. arrival	1985-01-01 2000 LMT 1985-01-02 0030 GMT
Act. arrival	1985-01-04 1600 LMT 1985-01-04 2030 GMT
Schedule status	2 days 20 hours 0 minutes late
Est. weather	The first 1,500 miles in variable conditions and the rest in foggy or stormy conditions
Act. weather	Trade winds then calms, a storm, nice weather, a storm and calm
Maintenance expected	Check masthead and spreader band and other fittings for deterioration.
Est. water consumed	40 litres
Act. water consumed	39 litres plus 3 litres milk
Est. water replenished	15 litres
Act. water replenished	3 litres
Act. food consumed	Apples, bread, tuna, rice, potatoes, onions, ham
Est. diesel consumed	0.0 litres
Act. diesel consumed	4.0 litres
Est. kerosene consumed	3,458 millilitres
Act. kerosene consumed	3,000 millilitres
Est. methanol consumed	858 millilitres
Act. methanol consumed	1,300 millilitres
Charts needed	Pilot Chart South Pacific (Sep, Oct, Nov) Pilot Chart South Pacific (Dec, Jan, Feb) Pilot Chart South Atlantic (Sep, Oct, Nov) Pilot Chart South Atlantic (Dec, Jan, Feb) 620 South Pacific Ocean (sheet 1) 621 South Pacific Ocean (sheet 2) 609 Valparaiso to Islas Diego Ramírez 22032 Estrecho de Magallanes to Isla Ildefonso 22036 Estrecho de Magallanes to Cabo de Hornos

211 South Atlantic Ocean (Southern Part)

Activities Prepare *Laiviņa* for the rigours of the Southern Ocean.

Notes Watch for potential rogue-wave-producing sea patterns and experiment with various rigs, sail set and courses while such waves are relatively small. Scrutinize all the ship's gear carefully daily and follow a regular schedule. Start eating canned tuna. Aim first for 40°S 105°W then 44°S 100°W then 57°S 75°W then 57°25′S 72°30′W then 57°04′S 67°20′W.

Table M.8: 7. Cape Horn to Port Stanley

Cape Horn	LAT 55°55′S LON 067°17′W
Port Stanley	LAT 51°42′S LON 057°51′W
Great-circle distance	418.6 nautical miles
Great-circle course	057 T
Course-line distance	446 nautical miles
Est. speed	3.8 knots
Act. speed	5.0 knots
Est. day's run	90 nautical miles
Act. day's run	120 nautical miles
Est. time taken	5 days 14 hours
Act. time taken	3 days 17 hours 30 minutes
Est. departure	1985-01-01 2000 LMT 1985-01-02 0030 GMT
Act. departure	1985-01-04 1600 LMT 1985-01-04 2030 GMT
Est. arrival	1985-01-07 1000 LMT 1985-01-07 1200 GMT
Act. arrival	1985-01-08 1200 LMT 1985-01-08 1400 GMT
Schedule status	1 day 2 hours late
Est. weather	Stormy with violent squalls
Act. weather	Confused seas, strong winds shifting in direction and strength
Maintenance expected	Regular
Est. water consumed	7 litres
Act. water consumed	8 litres
Est. water replenished	0.0 litres
Act. water replenished	10 litres
Act. food consumed	Rice, oats, milk, sugar, soup mix chicken, cake, cheese
Est. diesel consumed	500 millilitres (monthly running of motor)
Act. diesel consumed	0 millilitres
Est. kerosene consumed	743 millilitres
Act. kerosene consumed	700 millilitres
Est. methanol consumed	184 millilitres
Act. methanol consumed	100 millilitres
Charts needed	Pilot Chart South Pacific (Dec, Jan, Feb) Pilot Chart South Atlantic (Dec, Jan, Feb) 609 Valparaiso to Islas Diego Ramírez 22036 Estrecho de Magallanes to Cabo de Hornos 211 South Atlantic Ocean (Southern Part) 23160 Falkland Islands (Western Part) 23150 Falkland Islands (Eastern Part)
Activities	Keep alert when passing islands.
Notes	Watch for irregular currents and plan for a storm at any time. Don't take risks.

Table M.9: 8. Port Stanley to Hobart

Port Stanley	LAT 51°42′S LON 057°51′W
Hobart	LAT 42°54′S LON 147°20′E
Great-circle distance	4,974.9 nautical miles
Great-circle course	198 T
Course-line distance	8,558 nautical miles
Est. speed	4.2 knots
Act. speed	4.9 knots
Est. day's run	100 nautical miles
Act. day's run	117 nautical miles
Est. time taken	87 days 00 hours
Act. time taken	72 days 21 hours
Est. departure	1985-01-07 1000 LMT 1985-01-07 1200 GMT
Act. departure	1985-01-08 1330 LMT 1985-01-08 1530 GMT
Est. arrival	1985-04-04 1000 LMT 1985-04-04 0000 GMT
Act. arrival	1985-03-22 2230 LMT 1985-03-22 1230 GMT
Schedule status	12 days 11 hours 30 minutes early
Est. weather	Typical Southern Ocean weather
Act. weather	Procession of depressions in a regular pattern
Maintenance expected	Perform daily check of all gear.
Est. water consumed	87 litres
Act. water consumed	151 litres
Est. water replenished	20 litres
Act. water replenished	138 litres
Act. food consumed	Chicken, oats, milk, rice, dried vegetables, soup, sugar, bread, sultanas, chocolate, candies, cookies (regular rations)
Est. diesel consumed	1.5 litres (monthly running of motor)
Act. diesel consumed	0.5 litres
Est. kerosene consumed	11.6 litres
Act. kerosene consumed	12.3 litres
Est. methanol consumed	2,870 millilitres
Act. methanol consumed	1,900 millilitres
Charts needed	Pilot Chart South Atlantic (Dec, Jan, Feb) Pilot Chart. Indian Ocean (January) Pilot Chart. Indian Ocean (February) Pilot Chart. Indian Ocean (March) Pilot Chart. Indian Ocean (April) Pilot Chart. Indian Ocean (May) Pilot Chart. Indian Ocean (June) 211 South Atlantic Ocean (Southern Part) 23150 Falkland Islands (Eastern Part) 61000 Algoa Bay to Capetown

70 Indian Ocean (Southern Portion)
61650 Île Kerguélen
74030 Doubtful Island Bay to Cape Naturaliste
623 South Pacific Ocean (sheet 4)
INT 601 Tasman Sea
75025 Cape Otway to Gabo Island inc. Tasmania
75191 Approaches to Hobart

Activities Try to vary activities as much as possible. Avoid mental doldrums. Plan distance rewards. Don't take risks, be safety conscious. Keep in tune with the weather.

Notes This stretch will be the most demanding mentally and physically. Keep out of the iceberg zone. Try to rest before approaching Hobart and watch for shipping, boats, etc.

Table M.10: 9. Hobart to Dunedin

Hobart	LAT 42°54′S LON 147°20′E
Dunedin	LAT 45°52′S LON 170°32′E
Great-circle distance	1,006.9 nautical miles
Great-circle course	108 T
Course-line distance	1,100 nautical miles
Est. speed	3.8 knots
Act. speed	4.0 knots
Est. day's run	90 nautical miles
Act. day's run	95 nautical miles
Est. time taken	11 days 00 hours
Act. time taken	11 days 00 hours 15 minutes
Est. departure	1985-04-04 1000 LMT 1985-04-04 2000 GMT
Act. departure	1985-03-23 1345 LMT 1985-03-23 0345 GMT
Est. arrival	1985-04-15 1000 LMT 1985-04-14 2200 GMT
Act. arrival	1985-04-03 1600 LMT 1985-04-03 0400 GMT
Schedule status	11 days 18 hours early
Est. weather	Southern Ocean weather
Act. weather	3 gales coastal NZ
Maintenance expected	Check for chafing from storms and gales.
Est. water consumed	11 litres
Act. water consumed	22 litres
Est. water replenished	10 litres
Act. water replenished	0 litres
Act. food consumed	Regular rations
Est. diesel consumed	500 millilitres (monthly running of motor)
Act. diesel consumed	500 millilitres
Est. kerosene consumed	1,547 litres
Act. kerosene consumed	1,500 millilitres
Est. methanol consumed	480 millilitres
Act. methanol consumed	400 millilitres
Charts needed	Pilot Chart South Pacific (Mar, Apr, May) Pilot Chart South Pacific (Jun, Jul, Aug) Pilot Chart. Indian Ocean (March) Pilot Chart. Indian Ocean (April) Pilot Chart. Indian Ocean (May) Pilot Chart. Indian Ocean (June) 623 South Pacific Ocean (sheet 4) INT 601 Tasman Sea 75025 Cape Otway to Gabo Island inc. Tasmania 75191 Approaches to Hobart NZ 76 Western Approaches to Foveaux Strait NZ 67 Nugget Point to Centre Island inc. Foveaux Strait

NZ 66 Taiaroa Head to Nugget Point
NZ 64 Banks Peninsula to Otago Peninsula
NZ 38 Otago Harbour

Activities Watch for approaching forming depressions.

Notes Watch for late hurricanes; treat all depressions as potential hurricanes and take avoidance action.

Table M.11: 10. Dunedin to Start of the SE Trades

Dunedin	LAT 45°52′S LON 170°32′E
Start of the SE trades	LAT 30°00′S LON 150°45′W
Great-circle distance	2,037.9 nautical miles
Great-circle course	076 T
Course-line distance	2,293 nautical miles
Est. speed	3.8 knots
Act. speed	3.4 knots
Est. day's run	90 nautical miles
Act. day's run	82 nautical miles
Est. time taken	25 days 13 hours 20 minutes
Act. time taken	27 days 20 hours
Est. departure	1985-04-15 1000 LMT 1985-04-14 2200 GMT
Act. departure	1985-04-04 1700 LMT 1985-04-04 0500 GMT
Est. arrival	1985-05-10 2320 LMT 1985-05-11 0920 GMT
Act. arrival	1985-05-01 1500 LMT 1985-05-02 0100 GMT
Schedule status	9 days 8 hours 20 minutes early
Est. weather	Roaring Forties and variable weather
Act. weather	Calms and headwinds
Maintenance expected	Scrub the barnacles off the bottom
Est. water consumed	26 litres
Act. water consumed	47 litres
Est. water replenished	10 litres
Act. water replenished	12 litres
Act. food consumed	Regular rations
Est. diesel consumed	500 millilitres
Act. diesel consumed	500 millilitres
Est. kerosene consumed	3.5 litres
Act. kerosene consumed	4.0 litres
Est. methanol consumed	860 millilitres
Act. methanol consumed	1,200 millilitres
Charts needed	Pilot Chart South Pacific (Mar, Apr, May) Pilot Chart South Pacific (Jun, Jul, Aug) Pilot Chart. North Pacific (April) Pilot Chart. North Pacific (May) Pilot Chart. North Pacific (June) 621 South Pacific Ocean (sheet 2) INT 601 Tasman Sea NZ 66 Taiaroa Head to Nugget Point NZ 64 Banks Peninsula to Otago Peninsula NZ 38 Otago Harbour
Activities	
Notes	Try to keep the boat moving to catch the south-east trades before they move north for the winter.

Table M.12: 11. Start of the SE Trades to Start of the Doldrums

Start of the SE trades	LAT 30°00′S LON 150°45′W
Start of the Doldrums	LAT 05°00′N LON 125°55′W
Great-circle distance	2,675.2 nautical miles
Great-circle course	043 T
Course-line distance	2,786 nautical miles
Est. speed	4.6 knots
Act. speed	4.0 knots
Est. day's run	110 nautical miles
Act. day's run	97 nautical miles
Est. time taken	22 days 17 hours 30 minutes
Act. time taken	28 days 19 hours
Est. departure	1985-05-10 2320 LMT 1985-05-11 0920 GMT
Act. departure	1985-05-01 1500 LMT 1985-05-02 0100 GMT
Est. arrival	1985-06-02 1650 LMT 1985-06-02 2350 GMT
Act. arrival	1985-05-30 1300 LMT 1985-05-30 2000 GMT
Schedule status	3 days 3 hours 50 minutes early
Est. weather	Trade winds
Act. weather	Varied from light to near gale force
Maintenance expected	Repair unused sails.
Est. water consumed	42 litres
Act. water consumed	54 litres
Est. water replenished	20 litres
Act. water replenished	19 litres
Act. food consumed	Regular rations
Est. diesel consumed	0.0 litres
Act. diesel consumed	0.0 litres
Est. kerosene consumed	2,926 millilitres
Act. kerosene consumed	3,000 millilitres
Est. methanol consumed	574 millilitres
Act. methanol consumed	600 millilitres
Charts needed	Pilot Chart South Pacific (Mar, Apr, May) Pilot Chart South Pacific (Jun, Jul, Aug) Pilot Chart. North Pacific (April) Pilot Chart. North Pacific (May) Pilot Chart. North Pacific (June) 782 Pacific Ocean (South East sheet)
Activities	Read, study, watch for shipping.
Notes	Continue being alert for potential hurricanes and watch weather conditions. Record swell conditions for daily comparison.

Table M.13: 12. Start of the Doldrums to End of the Doldrums

Start of the Doldrums	LAT 05°00′N LON 125°55′W
End of the Doldrums	LAT 10°00′N LON 120°55′W
Great-circle distance	305.8 nautical miles
Great-circle course	011 T
Course-line distance	336 nautical miles
Est. speed	1.5 knots
Act. speed	3.5 knots
Est. day's run	36 nautical miles
Act. day's run	84 nautical miles
Est. time taken	8 days 08 hours
Act. time taken	4 days 0 hours 0 minutes
Est. departure	1985-06-02 1650 LMT 1985-06-02 2350 GMT
Act. departure	1985-05-30 1300 LMT 1985-05-30 2000 GMT
Est. arrival	1985-06-11 0150 LMT 1985-06-11 0850 GMT
Act. arrival	1985-06-03 1300 LMT 1985-06-03 2000 GMT
Schedule status	7 days 12 hours 50 minutes early
Est. weather	Confused winds from all directions and strength from calm to force 5.
Act. weather	Confused winds from all directions and strength from calm to force 5.
Maintenance expected	Repair chafed sails.
Est. water consumed	18 litres
Act. water consumed	8 litres
Est. water replenished	6 litres
Act. water replenished	243 litres
Act. food consumed	Regular rations
Est. diesel consumed	0.0 litres
Act. diesel consumed	0.0 litres
Est. kerosene consumed	1,158 millilitres
Act. kerosene consumed	400 millilitres
Est. methanol consumed	287 millilitres
Act. methanol consumed	100 millilitres
Charts needed	Pilot Chart. North Pacific (April) Pilot Chart. North Pacific (May) Pilot Chart. North Pacific (June) 782 Pacific Ocean (North East sheet)
Activities	Work hard and get through the Doldrums. Sleep only for short intervals.
Notes	Collect water whenever possible and work hard at getting through the Doldrums fast.

Table M.14: 13. End of the Doldrums to Santa Barbara

End of the Doldrums	LAT 10°00′N LON 120°55′W
Santa Barbara	LAT 34°25′N LON 119°40′W
Great-circle distance	1,466.6 nautical miles
Great-circle course	002 T
Course-line distance	1,966 nautical miles
Est. speed	4.4 knots
Act. speed	3.4 knots
Est. day's run	105 nautical miles
Act. day's run	81 nautical miles
Est. time taken	16 days 4 hours 35 minutes
Act. time taken	24 days 6 hours
Est. departure	1985-06-11 0150 LMT 1985-06-11 0850 GMT
Act. departure	1985-06-03 1300 LMT 1985-06-03 2000 GMT
Est. arrival	1985-06-27 0625 LMT 1985-06-27 1325 GMT
Act. arrival	1985-06-27 1900 LMT 1985-06-28 0200 GMT
Schedule status	12 hours 35 minutes late
Est. weather	Steady trade winds from the ENE
Act. weather	Very light winds
Maintenance expected	Repair sail wear and tear repairs and fix or replace worn lines.
Est. water consumed	30 litres
Act. water consumed	31 litres
Est. water replenished	2 litres
Act. water replenished	0 litres
Act. food consumed	Regular rations
Est. diesel consumed	500 millilitres (monthly running of motor)
Act. diesel consumed	12.0 litres
Est. kerosene consumed	3,000 millilitres
Act. kerosene consumed	4,000 millilitres
Est. methanol consumed	300 millilitres
Act. methanol consumed	600 millilitres
Charts needed	Pilot Chart. North Pacific (May) Pilot Chart. North Pacific (June) Pilot Chart. North Pacific (July) 782 Pacific Ocean (North East sheet)
Activities	Read.
Notes	Plan position of tack change.

Table M.15: 14. Santa Barbara to Juan de Fuca Entrance

Santa Barbara	LAT 34°25′N LON 119°40′W
Juan de Fuca entrance	LAT 48 31.0′N LON 124 47′W
Great-circle distance	875.9 nautical miles
Great-circle course	346 T
Course-line distance	1,274 nautical miles
Est. speed	3.7 knots
Act. speed	3.6 knots
Est. day's run	90 nautical miles
Act. day's run	86 nautical miles
Est. time taken	11 days 2 hours 40 minutes
Act. time taken	14 days 21 hours 30 minutes
Est. departure	1985-06-27 0625 LMT 1985-06-27 1325 GMT
Act. departure	1985-06-27 1900 LMT 1985-06-28 0200 GMT
Est. arrival	1985-07-09 0900 LMT 1985-07-09 1600 GMT
Act. arrival	1985-07-13 1300 LMT 1985-07-13 2000 GMT
Schedule status	4 days 4 hours late
Est. weather	Strong northerly winds and south flowing currents
Act. weather	Light winds and then a southerly wind blowing for days
Maintenance expected	Fix wear and tear on sails and running rigging
Est. water consumed	20 litres
Act. water consumed	29 litres
Est. water replenished	1 litre
Act. water replenished	0 litres
Act. food consumed	Regular rations and treats from Al and Marley
Est. diesel consumed	0.0 litres
Act. diesel consumed	0.0 litres
Est. kerosene consumed	1,500 millilitres
Act. kerosene consumed	2,000 millilitres
Est. methanol consumed	300 millilitres
Act. methanol consumed	500 millilitres
Charts needed	Pilot Chart. North Pacific (June) Pilot Chart. North Pacific (July) Pilot Chart. North Pacific (August) 3001 Vancouver Island 3640 Juan de Fuca Strait (Western Portion) 3602 Approaches to Juan de Fuca Strait 787 Cabo Corrientes to Kodiak Island
Activities	Get excited counting down the miles to home!
Notes	Watch for shipping as much as possible and keep rested. Sleep days and stay awake nights.

Table M.16: 15. Juan de Fuca Entrance to Victoria

Juan de Fuca entrance	LAT 48°30.7′N LON 124°47.0′W
Victoria	LAT 48°25.4′N LON 123°22.0′W
Great-circle distance	57.8 nautical miles
Great-circle course	091
Course-line distance	62.3 nautical miles
Est. speed	2.5 knots
Act. speed	2.5 knots
Est. day's run	60 nautical miles
Act. day's run	60 nautical miles
Est. time taken	24 hours 00 minutes
Act. time taken	24 hours 00 minutes
Est. departure	1985-07-09 0900 LMT 1985-07-09 1600 GMT
Act. departure	1985-07-13 1300 LMT 1985-07-13 2000 GMT
Est. arrival	1985-07-10 0900 LMT 1985-07-10 1600 GMT
Act. arrival	1985-07-14 1300 LMT 1985-07-14 2000 GMT
Schedule status	4 days 4 hours late
Est. weather	Thermal winds from the west
Act. weather	Thermal winds funnelling up the strait
Maintenance expected	Check gear.
Est. water consumed	1 litres
Act. water consumed	6.0 litres
Est. water replenished	0.0 litres
Act. water replenished	0.0 litres
Act. food consumed	Regular rations
Est. diesel consumed	0.0 litres
Act. diesel consumed	4.0 litres
Est. kerosene consumed	133 millilitres
Act. kerosene consumed	100 millilitres
Est. methanol consumed	33 millilitres
Act. methanol consumed	50 millilitres
Charts needed	344 Race Rocks to D'Arcy Island 3001 Vancouver Island 3641 Albert Head to Otter Point 3449 Race Rocks to East Point 3461 Juan de Fuca Strait (Eastern Portion) 3640 Juan de Fuca Strait (Western Portion) 3602 Approaches to Juan de Fuca Strait
Activities	Have a shave, wash, and put on clean clothes before coming into Victoria. Must look one's best!
Notes	Take lots of care with shipping, keep well rested. Don't screw up after all this! Try to dock properly under sail.

Appendix O

Books

As well as the many books (150) that my friends gave me for my reading pleasure, I carried a number of nautical books critical to my ability to navigate. The 1984 and 1985 editions of *The Nautical Almanac* for 1984[72] and 1985[73] were the two most important books. *The Nautical Almanac*[72] provided tables that predict with a high degree of accuracy the position of the sun, the moon, Venus, Mars, Jupiter, Saturn, and the First Point of Aries, to which all other stars are related. The positions of each of these celestial bodies are predicted for every hour of every day of the year. Further tables are used to interpolate the minutes and seconds between hours and to correct the sextant reading for altitude, the sun's apparent diameter, the air temperature, and barometric pressure, as well as the observer height above the surface of the ocean.

To process the sight to give me a position line, I could use a number of methods. For the haversine method, I used *Norie's Nautical Tables*[8], a single book full of wonderfully useful tables. I used the Sight Reduction Tables method more frequently, which consists of a set of four books called *Sight Reduction Tables for Marine Navigation*[28]. Each book covers fifteen degrees of latitude from the equator to sixty degrees north or south. I later programmed my calculator to calculate the spherical trigonometrical equations, speeding up the process considerably.

The next important book was *Ocean Passages of the World*[27], with charts of the world showing the old sailing ship and steamship routes of the world. It contains climatic information that affects the choice of route at different times of the year. I used one of these charts to plot my progress around the world.

Table O.1: List of Nautical Books

#	Title
	Norie's Nautical Tables[8]
	Ocean Passages for the World[27]
	Sight Reduction Tables for Marine Navigation (Vol 1)[28]
	Sight Reduction Tables for Marine Navigation (Vol 2)[29]
	Sight Reduction Tables for Marine Navigation (Vol 3)[30]
	Sight Reduction Tables for Marine Navigation (Vol 4)[31]
	Australia Pilot (Volume 3)[26]
	International Code of Signals[41]
	Symbols and Abreviations[71]
	Ship's Log Book
	Survival at Sea (Instructional Manual)[70]
	The Nautical Almanac 1984[72]
	The Nautical Almanac 1985[73]
	Pacific Islands Pilot Volume 2 (The Central Groups)[56]
	New Zealand Pilot[52]
	Certificate of New Zealand Registry
LLPUB111	*Admiralty List of Lights and Fog Signals (Volume G)*[46]
LLPUB112	*Admiralty List of Lights and Fog Signals (Volume H)*[47]
	First Aid[19]
	The New Zealand Yachting Federation Handbook[53]
	The C.Y.A. Cruising Log Book
SDPUB123	*Southwest Coast of Africa* (Enroute) 1981[62]
SDPUB124	*East Coast of South America* (Enroute) 1981[63]
SDPUB125	*West Coast of South America* (Enroute) 1982[64]
SDPUB153	*West Coast of Mexico and Central America* (Enroute) 1983[65]
SDPUB171	*East Africa and the South Indian Ocean* (Enroute) 1978[66]
SDPUB175	*West Coast of Australia* (Enroute)[67]

Appendix P

Knots

I had a whole book of knots, splices, and decorative rope work, but most situations can be dealt with using a half-dozen or so knots. Although there are other knots that I use from time to time, the knots in the following table are the ones that I use most frequently:

Knots and Their Usage

Bowline Used mostly to attach a line to the mast, a stanchion, the spinnaker pole, or any other attachment point. Bowlines can undo with constant tug-and-release action so it is not a good knot for securing a long painter when towing a dinghy.

Clove hitch Used primarily to fix the tiller in place after the boat was balanced. Each line had a clove hitch wrapped around the end of the tiller. To quickly grab the tiller, I would slide the knots off the end of the tiller, and the knots fell apart. This knot allows minor adjustments to the tiller position by working the bitter end around the tiller. To prevent loosening over time, I tied the bitter ends of the lines under the tiller in a reef knot.

Figure of eight Used primarily on the bitter ends of running rigging to act as a stopper knot to prevent the bitter end of the line passing through a block.

Fisherman's bend Used to secure a line more permanently to a bollard or stanchion. It is just like a round turn and two half-hitches, except the first hitch goes under the turns. This locks the hitch. It is meant to be used to attach a line to an anchor as it is less likely to come undone than other knots.

Reef knot Used to secure the unused portion of the sail when reefing the mainsail or one of the headsails with a number of lashings that

go through the sail. The bitter ends of the lashings are secured by bringing them together and securing them with a reef knot.

Rolling hitch Used when a sheet needs to be taken off a winch or there is a riding turn on the winch jamming the sheet. A lighter line is tied using this knot around the part of the sheet under load, and then it is secured. The sheet can be taken off the winch.

Round turn Used primarily when securing mooring lines to a bollard. Unlike the bowline, it can be tied when there is a heavy load on the line. The load can be controlled as the hitches are untied. After completing the round turn, which is actually 540 degrees, two half hitches are made on the standing part of the taut line.

Sheep shank Used to temporarily shorten a line, such as a long tow line on a dinghy. While under way, the tow line can be shortened temporarily to go around some obstacle.

Sheet bend Used primarily when joining lines of dissimilar diameter or stiffness. The heavier or stiffer line is used to form a bight, and the lighter or more flexible line doubly secures itself to the bight. Normally I make it a double sheet bend, particularly with new synthetic line, which tends to be slippery. It is also the knot of choice for securing a line to a corner of a tarp that has no grommet or cringle. By bunching the corner together and curving it around to form a loop, it is treated as if it were the heavier line.

Trucker's hitch Used to tie a dinghy down on deck because the hand rails on the cabin top can be used as attachment rails. The mechanical advantage it gives allows loads to be tied down very securely.

As I use the Beaufort Wind Scale to describe conditions, I have included an abbreviated version here in a table:

Table R.2: Beaufort Wind Scale

#	Description	Wind Speed	Wave Height	Sea Conditions
0	Calm	<1 knot	0 feet	Sea like a mirror.
1	Light air	1–3 knots	0–1 feet	Ripples with the appearance of scales are formed, but without foam crests
2	Light breeze	4–6 knots	1–2 feet	Small wavelets, still short but more pronounced; crests have a glassy appearance and do not break.
3	Gentle breeze	7–10 knots	2–3.5 feet	Large wavelets. Crests begin to break; scattered whitecaps.
4	Moderate breeze	11–16 knots	3.5–6 feet	Small waves with breaking crests. Fairly frequent whitecaps.
5	Fresh breeze	17–21 knots	6–9 feet	Moderate waves of some length. Many whitecaps. Small amounts of spray.
6	Strong breeze	22–27 knots	9–13 feet	Long waves begin to form. White foam crests are very frequent. Some airborne spray is present.
7	Near gale	28–33 knots	13–19 feet	Sea heaps up. Some foam from breaking waves is blown into streaks along wind direction. Moderate amounts of airborne spray.
8	Gale	34–40 knots	18–25 feet	Moderately high waves with breaking crests forming spindrift. Well-marked streaks of foam are blown along wind direction. Considerable airborne spray.
9	Strong gale	41–47 knots	23–32 feet	High waves whose crests sometimes roll over. Dense foam is blown along wind direction. Large amounts of airborne spray may begin to reduce visibility.

10 Storm	48–55 knots	29–41 feet	Very high waves with overhanging crests. Large patches of foam from wave crests give the sea a white appearance. Considerable tumbling of waves with heavy impact. Large amounts of airborne spray reduce visibility.
11 Violent storm	56–63 knots	37–52 feet	Exceptionally high waves. Very large patches of foam, driven before the wind, cover much of the sea surface. Very large amounts of airborne spray severely reduce visibility.
12 Hurricane	⩾64 knots	⩾46 feet	Huge waves. sea is completely white with foam and spray. Air is filled with driving spray, greatly reducing visibility.

Appendix S

Documents

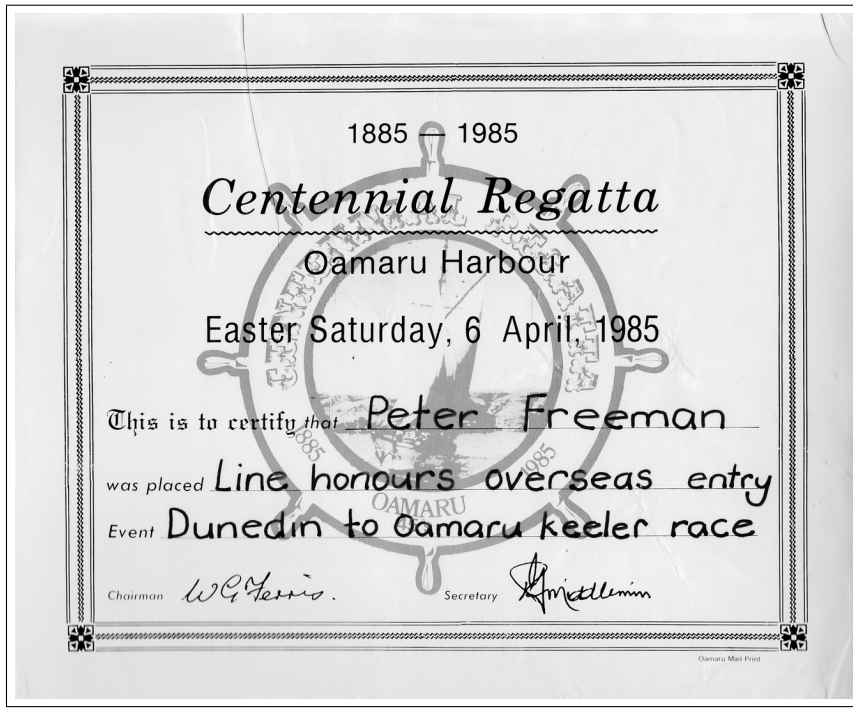


Figure S.1: Race certificate—Centennial Regatta

Although the certificate states "Easter Saturday, 6 April, 1985," the actual race was held on Good Friday, the day before. Perhaps the awards were to be bestowed upon the winners the day after, but *Laiviņa* and I were well out to sea by that time.

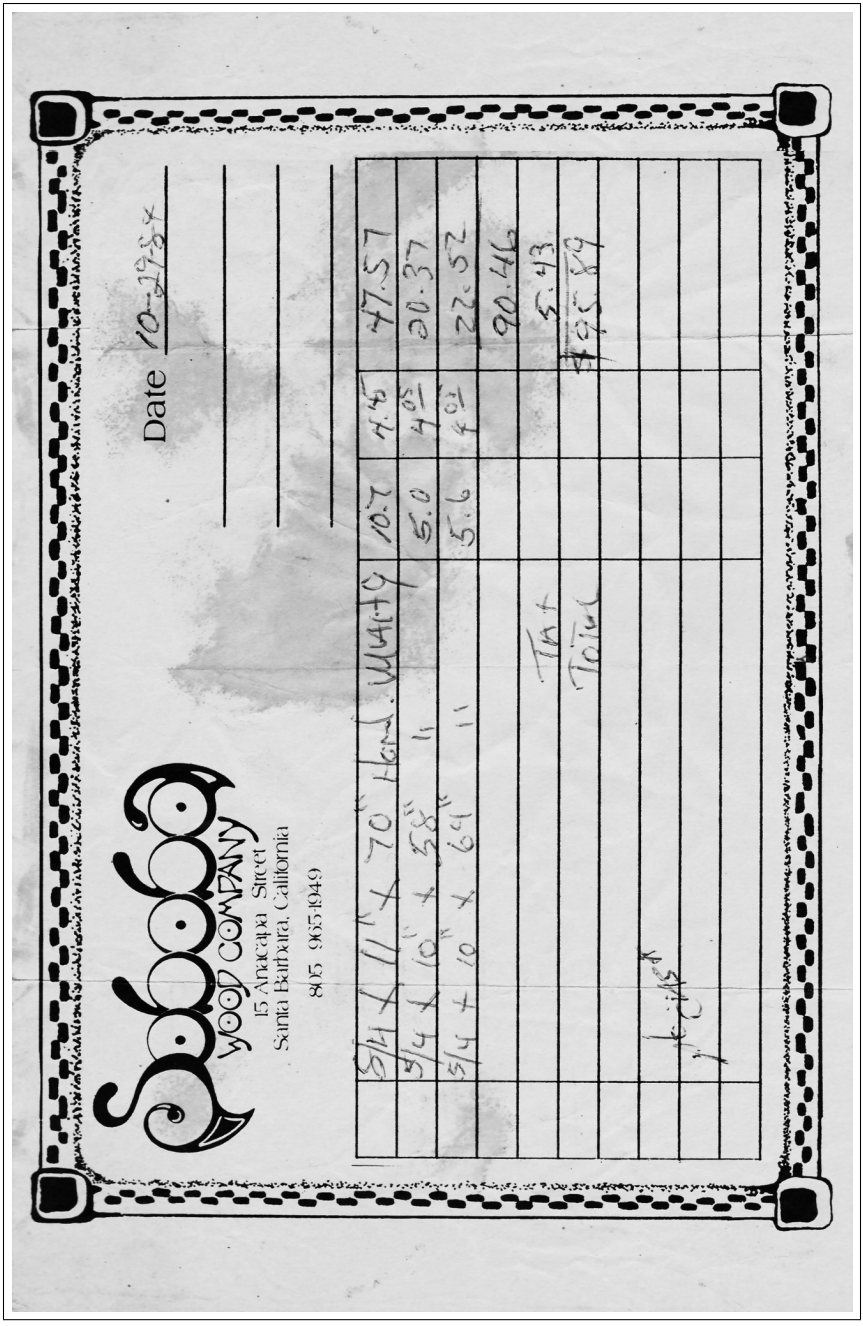
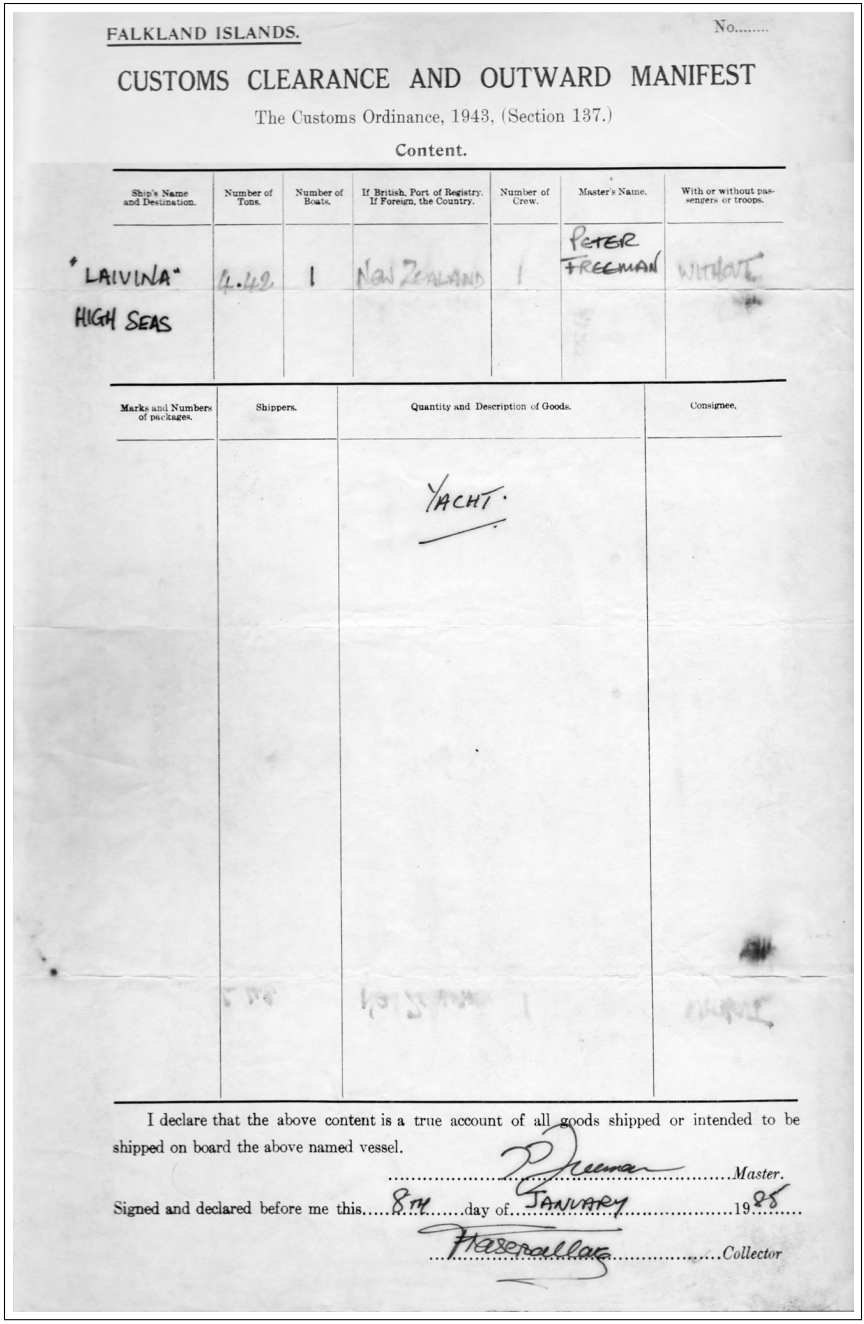


Figure S.2: Sobobo receipt for mahogany hardwood



FALKLAND ISLANDS. No.....

CUSTOMS CLEARANCE AND OUTWARD MANIFEST

The Customs Ordinance, 1943, (Section 137.)

Content.

Ship's Name and Destination.	Number of Tons.	Number of Boats.	If British, Port of Registry. If Foreign, the Country.	Number of Crew.	Master's Name.	With or without passengers or troops.
"LAIVINA" HIGH SEAS	4.42	1	NEW ZEALAND	1	PETER FREEMAN	WITHOUT

Marks and Numbers of packages.	Shippers.	Quantity and Description of Goods.	Consignee.
		YACHT.	

I declare that the above content is a true account of all goods shipped or intended to be shipped on board the above named vessel.

P Freeman .....Master.

Signed and declared before me this 8TH day of JANUARY 1985

Fraserallan .....Collector

Figure S.3: Customs clearance and outward manifest

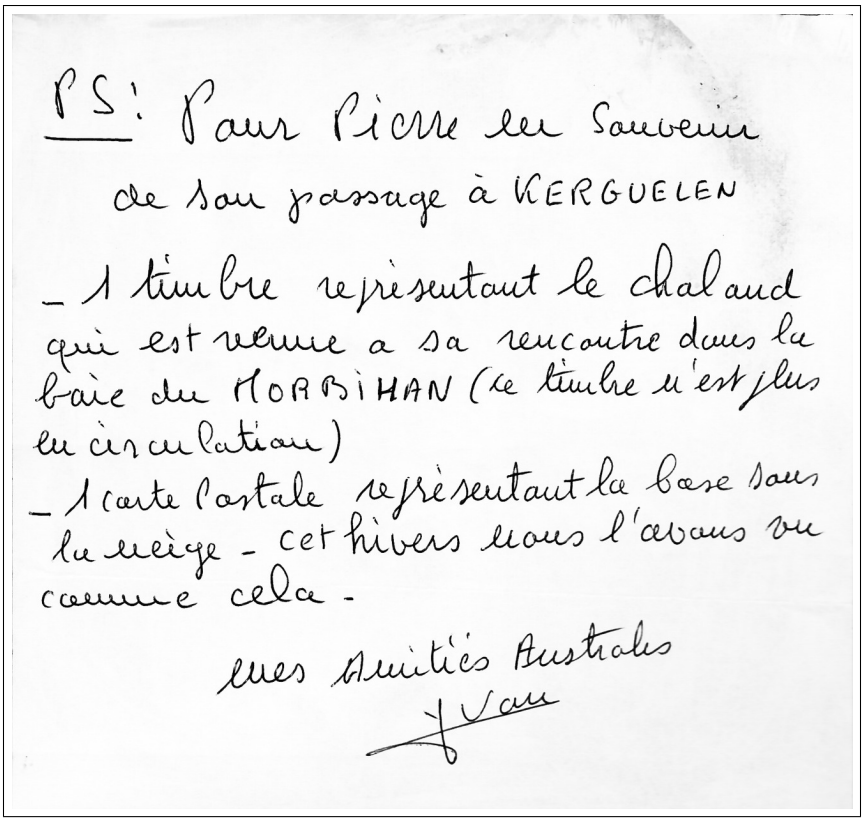

PS: Pour Pierre en souvenir
de son passage à KERGUELEN
– 1 timbre représentant le chaland
qui est venu a sa rencontre dans la
baie du MORBIHAN (le timbre n'est plus
en circulation)
– 1 carte postale représentant la base sous
la neige – cet hivers nous l'avons vu
comme cela –
mes Amitiés Australes
Yvon

Figure S.4: Letter from scientists at Port-aux-Français

Original

PS: Pour Pierre en souvenir de son passage à KERGUÉLEN

—Le timbre représentant le chaland qui est venu à sa rencontre dans la baie du Morbihan (le timbre n'est plus en circulation)

—La carte postale représentant la base sous la neige—cet hiver, nous l'avons vu comme cela—

mes amitiés australes,

Yvon

Translation

PS: For Peter in memory of his passage to Kerguélen

—The stamp depicting the barge that came to meet him in Morbihan Bay (the stamp is no longer in circulation)

—The postcard depicting the base under the snow—this winter, we saw it like that—

Southern wishes of friendship,

Yvon

+

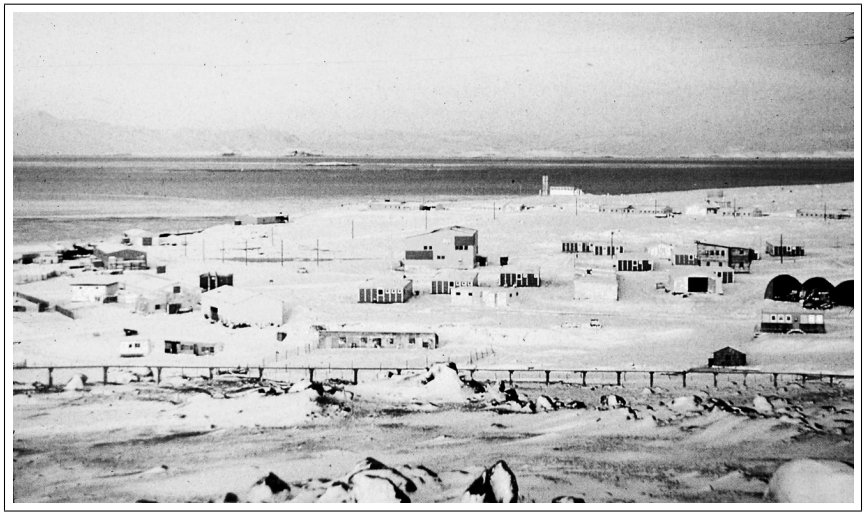
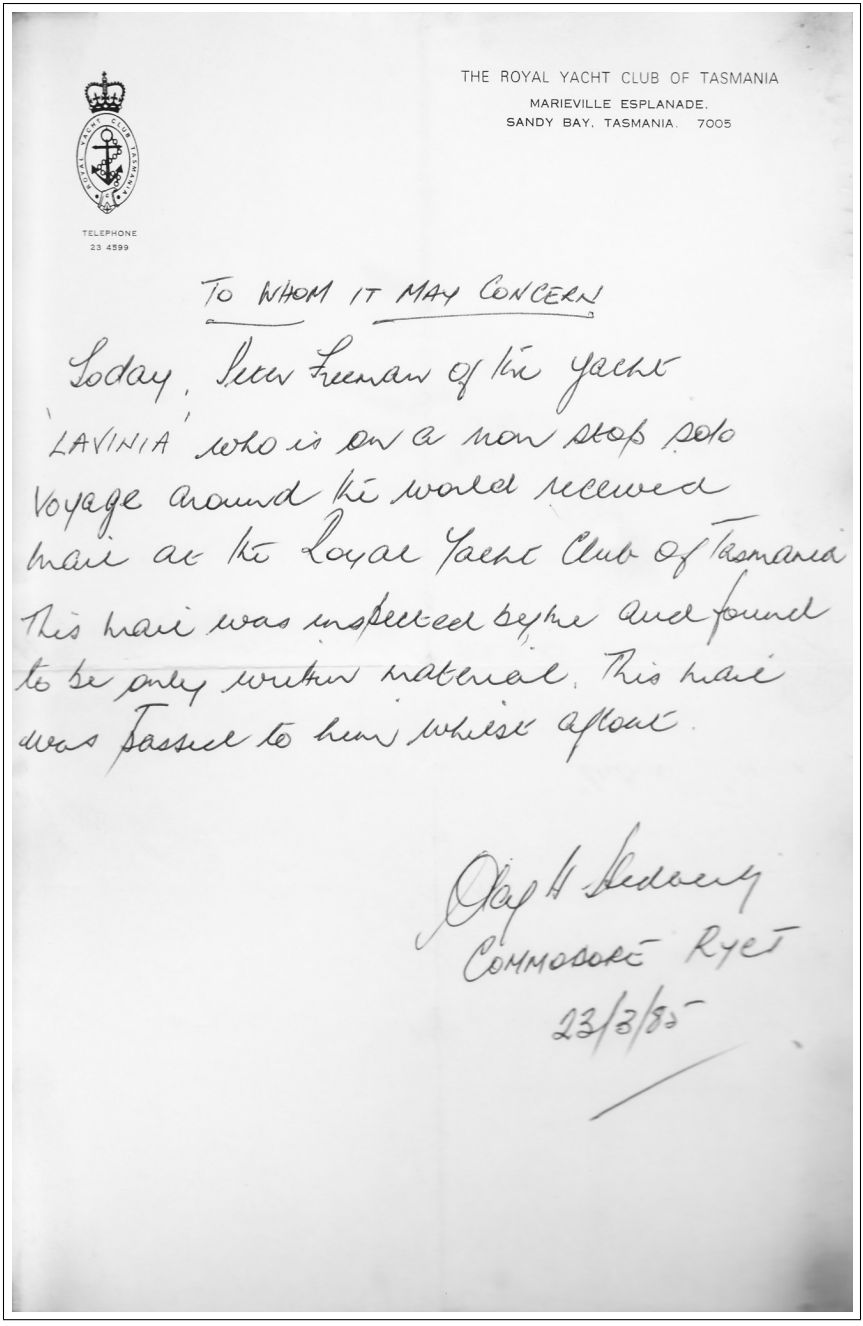


Figure S.5: Postcard: Winter at Port-aux-Français



THE ROYAL YACHT CLUB OF TASMANIA
MARIEVILLE ESPLANADE,
SANDY BAY, TASMANIA. 7005

TELEPHONE
23 4599

TO WHOM IT MAY CONCERN

Today, Peter Freeman of the yacht 'LAVINIA' who is on a non stop solo voyage around the world received mail at the Royal Yacht Club of Tasmania. This mail was inspected by me and found to be only written material. This mail was passed to him whilst afloat.

Dag H Andersen
COMMODORE RYCT
23/2/82

Figure S.6: Letter from Royal Yacht Club of Tasmania

Transcription

TO WHOM IT MAY CONCERN

Today, Peter Freeman of the yacht 'LAVINIA' [sic] who is on a non stop solo voyage around the world received mail at the Royal Yacht Club of Tasmania.

This mail was inspected by me and found to be only written material. This mail was passed to him whilst afloat.

Olaf H Hedberg
Commodore RYCT
23/3/85

Glossary

aft The direction towards the stern or rear of the vessel.

aground The condition of a vessel that has stopped because the keel has become stuck on the bottom while attempting to sail in waters too shallow to provide sufficient clearance. When the depth of the water is less than the vessel's draught, the vessel runs aground.

ahoy A sailor's call to attract attention. It is the equivalent to the landlubber's call of "Hello, there.".

anchor A heavy metal hook attached to a chain or rope, or a combination of the two in order to attach a vessel to the bottom and limit its movement to a small radius. Anchoring is the action of attaching the vessel to the bottom.

antifouling Toxic paint applied to the bottom of a vessel to prevent or slow the growth of marine organisms. Barnacles, weed, kelp, and other growth can significantly slow a boat's speed through the water.

apparent wind The direction from which the wind comes, from the position of an observer. It differs from the true wind in strength as soon as the vessel starts moving and differs in direction from the true wind when the vessel is on a course that is not directly into or away from the wind.

astern The area aft of or behind the stern of the vessel.

astronomical twilight Astronomical twilight starts when the sun is eighteen degrees below the horizon and extends until the morning when the sun is again eighteen degrees below the horizon. This is the period when no light from the sun reaches the night sky. It marks the time in the evening when light pollution from the sun ends and in the morning when it begins.

athwartship The direction across the vessel, ninety degrees to the fore and aft line.

atoll A ring-shaped island made of coral with a lagoon in the centre.

awash A submerged rock or obstruction upon which waves will break.

back laid A line that is coiled or laid on the deck so that that a sheet runs freely when tacking or a halyard runs freely when lowering a sail without fouling or becoming tangled.

backed 1. The wind gets around the back side of the sail, collapsing it and filling it on the opposite side. When tacking, it helps to release the headsail sheet just after the headsail backs so that the wind will blow the sail across to the opposite side with the minimum of effort from the crew. 2. The wind is changing direction in a counter-clockwise rotation 3. Forcibly pushing the sail against the wind..

backstay The wire rope that connects the top of the mast to the stern of the boat.

baggywrinkle Old, short strands of rope, usually no more than ten centimetres long, that have become unravelled and placed in a bag. These strands, wrinkled from being previously laid into a rope, are kept in a bag; the term comes from "bag o' wrinkle." They are used as chafing pads to prevent sail wear.

bare poles Having no sails on the boat. A technique to deal with severe storms.

barometer A device that measure the air pressure by use of a sealed brass container that deforms slightly under changing air pressure, allowing a needle to move. Barometric pressure can be recorded in millibars or kilopascals. A barometer can give advance warning of weather changes by the direction of the needle's movement and the rate at which it moves.

batten A flexible wooden or fibreglass strip that is used to stiffen a sail, usually the mainsail, but some jibs may be battened. It helps put shape into the roach of the sail.

beacon A navigation marker or light that is mounted on a post in the water or on a rock or islet.

beam reaching Sailing with the apparent wind coming from right angles to the vessel's course.

becalmed The condition of a vessel when there is no wind to move it.

below Inside the vessel. To go below is to open a hatch and descend into the cabin.

berth 1. The place where a boat is moored or tied up to a dock. 2. The bunk upon which sailors sleep.

bilge The area below the cabin sole and the lowest part inside a vessel, where water accumulates and must be pumped overboard lest it increase to the point of sinking the vessel.

block The sailor's term for a pulley. A block can change the direction of a line or provide a mechanical advantage of force of two, three, four, five or even six to one, depending on where the fixed end of the line is attached. It can either be rove to advantage or disadvantage. Main sheets usually go through two triple blocks, giving a six-to-one advantage. Pulling in the boom, all six falls have to be reduced in length. If the boom is fully extended to one side and is three metres away from its close-hauled position, then the crew needs to pull eighteen metres of line to move the boom three metres, hence the six-to-one advantage. This is a simple explanation, not taking into account friction and the angle between the boom attachment point.

bollard A cylindrical post of wood or metal, sometimes with horns, around which a line is secured.

boom The spar to which the foot of the mainsail is attached.

bosun "Boatswain", sometimes abbreviated to "bo'sun." A crew member usually in charge of a boat's crew, who takes direction from the captain or skipper.

bottom The part of the hull that is underwater. It is usually painted with antifouling.

bow The front of the vessel.

bowsprit A spar that extends forward of the bow, to hold a forestay or sail.

boxing the compass Naming all thirty-two points in a clockwise order. There are the cardinal points of N, E, S, and W. These points are split into two to give the ordinal points of NE, SE, SW, and NW. These are further split in half to get points as NNE, ENE, ESE, SSE, SSW, WSW, WNW, and NNW. These points are further split in half to get points N by E, N by NE, etc. My father would get me to recite them when I was a young boy.

brace Another term for a spinnaker guy. It is used to secure the end of the spinnaker pole. On the other tack, the former brace becomes a sheet, while the former sheet becomes a brace or guy.

braided Rope whose strands or yarn are cross-weaved rather than laid in a spiral. Double-braided rope has a braided tubular core and a braided tubular sheath.

bridge deck The part of the deck ahead of the cockpit and aft of the cabin.

broach When a vessel running downwind or on a broad reach, gets out of control and turns to port or starboard and swings around to almost face the wind. It is caused when the boat heels to one side in a strong wind, and the centre of effort on the sails goes to one side. In spite of turning the rudder to compensate for this imbalanced force, the helmsperson cannot stop the boat from turning into the wind. Spectacular broaches occur under spinnaker as the centre of effort is high and the sail is very dynamic, swinging easily from side to side.

broad reaching Sailing on a course so that the apparent wind comes over the quarter or about 135 degrees from the course. A broad reach is halfway between a dead run and a beam reach.

bulkhead A transverse panel that goes from the port side to the starboard side that separates the vessel into compartments. A bulkhead may be fitted with a door or an opening through which crew can pass. Bulkheads can add considerable strength to a vessel.

bulwark On a sailboat, the bulwark is commonly called the toe rail. It is a low wall close to the edge of a deck or wharf to prevent objects and people from falling into the water. Bulwarks often have scuppers at regular intervals along their base to allow water to flow away and not dam up.

bunk A berth where a sailor sleeps.

buoy A floating navigational aid, a float that marks an anchor or other submerged object.

cabin sole The floorboards inside the cabin on which one walks.

cap shroud A wire rope that holds the mast erect and goes from the top of the mast, the "cap" to either the port or starboard side. Stays are fore and aft of the mast, shrouds are athwartship (on the sides) of the mast.

capsize When a vessel rolls to a point where it is at least ninety degrees from its normal floating state.

centreboard A thin removable keel usually made of plywood or fibreglass in a dinghy to reduce leeway when sailing close-hauled.

chafing A line or sail persistently rubbing against an object where it causes damage.

chart A map of the marine area, showing the coastline, land-based objects visible from the water, rocks, reefs, shipwrecks, currents and other objects of importance. It also shows the water depth as both spot soundings (depths) and contour lines connecting similar depths that are colour coded. The chart displays the marine world as it would be at chart datum, the water level at a very low tide.

cheesed A line coiled into a spiral on a flat horizontal surface. It can be walked upon without a real risk of tripping.

chock-a-block A halyard is hoisted as high as it can go until it can go no further. Also, when hoisting something using a single, double or triple purchase set of blocks, the line is pulled until it can go no further and the two sets of blocks are brought together.

chop Low, short-wavelength swells that roughen up the surface. Usually chop is from about twenty centimetres to a metre. It can be difficult to sail through in a dinghy or a larger sailing vessel as it tends to resist the boat's motion.

chronometer An accurate timepiece.

cirrus High altitude clouds made up of ice crystals. These are often called "mare's tails" as they resemble the tail of a horse. They can foretell an approaching warm front as the warm air is pushed up and on top of the more dense colder air.

civil twilight Civil twilight starts when the sun is six degrees below the horizon and extends until nautical twilight, when the sun is twelve degrees below the horizon. At the start of civil twilight, the mariner can see a handful of brighter stars and can start taking sextant readings. At the end of civil twilight, or when nautical twilight begins, the mariner can see plenty of stars, but the horizon is no longer visible as the sky blends in with the sea and it is not feasible to take any more sextant sights.

clapotic Two or more wave trains coming at each other from two opposite directions that are close to 180 degrees apart. When the peak of one wave meets a peak of the wave from the opposite wave train, they clap together, and spray or water often goes vertically skyward.

clew The movable aft corner of the sail to which the sheets are attached. The term is easy to remember as one does not have a clue where the clew is. It is often in a different place depending on the vessel's angle to the apparent wind.

close reaching A point of sail between being close-hauled and beam reaching. It is more efficient to close reach in a gale with a trysail and storm jib as the boat has more power in cutting across the seas at a more acute angle and is not halted as much by their power.

close-hauled Sailing as close to the wind as possible, yet keeping the boat moving well without stalling the keel or rudder. The sails are hauled in as close as possible to maintain speed. If one attempts to sail closer to the wind, the boat will slow down and often stall.

cockpit A well, built into the aft or poop deck for the helmsperson to sit when steering the vessel.

companionway The opening and stairwell leading from the bridge deck into the cabin below.

compass 1. A device that shows the direction to the magnetic north pole. It consists of a circular flat card, engraved with degrees in five-degree increments from 000 degrees to 360 degrees. It is used to steer a course and can be used to sight over to take bearings to shore objects. 2. An instrument used to draw circles on the chart.

cringle Holes in the sail to pass line through when compacting and securing the unused portion of a sail after reefing. A grommet is used to reinforce and protect the hole.

cruiser suit A complete suit that is a made to keep you afloat like a life jacket. It is not a survival suit as water will easily flow inside the suit. While it is warmer than a life jacket, wet-weather gear needs to be worn over it.

cumulonimbus Towering columns of cloud that extend up into the stratosphere, where their tops get blown off by the jet stream. This produces the classic anvil-shaped top. The clouds are often accompanied by lightning, thunder, hail and strong, gusty squalls.

cumulus Puffy clouds like cotton wool formed by rising moist air. Very common in the trade wind zone.

current Horizontal movement of the surface layer of water, relative to the bottom. Ocean currents are usually formed by prevailing winds and flow with the winds.

dead reckoning Navigating from the last fix by plotting the distance travelled as measured by the log in the direction of the course steered. The dead-reckoning location is marked on the chart as "DR" and does not take into account forces such as current and leeway. When such forces are taken into account, the position plotted is called an "estimated position" or "EP" and marked on the chart.

deck The mostly flat and level surface of a vessel upon which the crew work. My sailboat *Laiviņa*, has the foredeck, the aft or poop deck, the bridge deck, and the port and starboard side decks.

depression A slowly rotating area of lower barometric pressure. Depressions are caused by a warm air mass moving past a cooler air mass trapping a pocket of opposite-temperature air in one or the other of the air masses. Rotation is counter-clockwise in the northern hemisphere and clockwise in the southern hemisphere. The trapped pocket of air forms a warm front and a cold front, which are on the equatorial side of the depression. The cold front moves faster and catches up with the warm front, occludes, and causes heavy rain.

depth sounder An electronic device that creates a sound wave aimed vertically downwards, which is received after it reflects off the bottom, fish, or a thermocline or boundary between different temperature layers in the water. The speed of sound in water and the time taken from sending the signal and receiving it are used to calculate the depth of the water.

deviation The amount of deflection from magnetic north in the compass caused by the proximity of magnetic material in a vessel. It is different for different headings. On some headings, they may be no deviation; on others, the deviation could be as much as ten degrees or more.

deviation card A table, divided up into increments of ten degrees (or another convenient interval) from 000 degrees to 360 degrees, with a corresponding east or west deviation from magnetic north.

dinghy A small boat propelled by oars and additionally, in some cases, by sail. *Laiviņa*'s dinghy is an Optimist-class sailing dinghy that was shortened about fifteen centimetres to allow it to fit on the cabin top between the mast and the hatch.

displacement The weight of water that a vessel's hull displaces when it floats.

dividers Used to measure distances on a chart. Marine dividers are "single hand," allowing them to be both opened and closed easily in one hand.

doldrums The zone between the southeast and northeast trade winds. When the two trade winds meet, they join in an upwards sweep to form a tent of confused air. The zone varies between five and ten degrees north latitude and can be between a few miles and five hundred miles wide.

dolphin 1. Aquatic mammal. 2. A group of pilings connected together and standing unconnected to the shore. A ship's bow or stern line is attached to a dolphin.

douglas protractor A translucent square-shaped protractor used on a chart.

downhaul A set of blocks to stop a boom, spinnaker pole or other spar from rising from the wind pressure on the sails.

fairlead An eye through which a line is passed, or a block that changes the direction of a line slightly.

faked A line or chain laid out on a flat horizontal surface so that it can run freely without tangling. Before anchoring, the anchor chain is laid out on the deck by running it from side to side starting from the cabin and working towards the bow.

falls The set of lines that run back and forward between two blocks. In light winds, when sailing out an anchor or leaving a dock under sail, the boom can be let out fully and the mainsail can be manipulated by grasping the falls and pulling the boom in or out to rapidly change the position of the mainsail.

fibre Natural or synthetic material, spun into very fine threads for rope making.

fix A position obtained by drawing on the chart a minimum of two position lines that do not intersect at too shallow an angle. The position lines can be obtained from celestial sights, bearings to a shore-based object, distance off an object, or other means.

flogging A sail will flog if it is not set properly, if it is too large for the wind, or if the clew is not attached. This can damage the sail and can be dangerous to control. Loose but attached sheets can also flog and become tangled in other gear.

foot The bottom edge of a sail that goes from the tack to the clew.

fore The direction towards the bow or front of the vessel.

foredeck The forward-most deck.

foreguy Boom foreguys hold the boom in place so the boom can be used like a second spinnaker pole. Either the port or starboard boom foreguy can be attached by a snap shackle to the end of the boom then led forward around the outside of the shrouds and lifelines to the bow fitting, through a turning block leading back over the top of the cabin to a cleat beside the main hatch.

forepeak The most forward storage area in a vessel. I stored anchor line in the forepeak. As *Laiviņa*'s chain was too heavy, the anchor chain was led through a hawse hole and hawse pipe into the boat and into a raised bilge area under the cabin sole in the centre of the boat, where this weight could provide ballast.

forestay The wire rope that holds the mast erect by going from the cap of the mast to the bow of the boat. Various size sails are hanked onto the forestay, depending on the wind strength.

fother To stop a leak by stuffing the hole with material such as squabs, cushions, or clothing, or to secure a mat around the outside of the hull covering the hole.

galley The cooking area on a vessel.

genoa A headsail whose clew extends aft of the mast when set and drawing for close-hauled sailing.

GMT Greenwich Mean Time is the standard time that was kept at the Greenwich observatory in London, England, and where the prime meridian or zero degrees of longitude was standardized internationally.

gooseneck fitting The fitting that joins the boom to the mast and allows up-and-down and side-to-side movement, named based on its resemblance to the neck of a goose.

great-circle The shortest distance between two points on the earth's surface. A great-circle can be shown on a globe by holding a piece of string at one location and stretching it taut at another location. Stretching a string between Vancouver and London, England, will explain why airlines fly close to the pole. It is the shortest route.

grommet Reinforced eye in a sail made by peening a piece of tube over two flat washers.

growler ice A small piece of an iceberg that rolls over and over in waves and can often be invisible.

gudgeon The holes in which pintles are fitted. Typically, gudgeons and pintles are used as rudder fittings.

gybe When the vessel is turned so that the incoming wind goes from one quarter to the other quarter of a vessel, passing through a dead-run point of sail. It can be dangerous as the mainsail can crash over to the other side quite violently, harming individuals, breaking gear, or tearing sails.

halyard The line that is used to haul a sail up the mast. The term comes from the days of sail where the lines were used to haul a yard, with its attached sail, up the mast.

hank A shackle attached to the luff of a headsail that has a spring-loaded piston to close the opening. To unhank from the forestay, the piston is pulled back, which allows the hank to be taken off the forestay.

hatch A secure cover over an opening in the boat. *Laiviņa* has four hatches; the anchor well hatch in the forepeak, the forward hatch over the forward berths, the main hatch over the companionway, and the aft hatch over the aft locker in which I stored mooring lines, buoys, and spare rope.

head 1. The bow area. 2. The ship's toilet.

headsail A generic term for all sails that are set on stays ahead of the mast.

heave to To stop most forward movement of a sailing vessel by backing the headsail and lashing the tiller to leeward. The easiest way to heave to is to tack without unsheeting the headsail.

honed A knife, chisel, or plane blade that has been made sharp by rubbing it with a whetstone or an oilstone to make the edge so fine that one could shave with it.

horse latitudes The area between the westerlies and the trade winds. It is an area near high-pressure systems where the air is descending from its high-altitude journey from the doldrums. Winds in this area can be light and fickle.

hull The topsides and the bottom of a vessel. The part of a vessel from the edge of the deck around and under the boat to the opposite edge of the deck. The hull is everything except the decks and upper part of the cabin.

iceberg A large floating chunk of ice that has broken off from a glacier. It is usually made of fresh water.

jib A headsail whose clew does not extend aft of the mast when set and drawing for close-hauled sailing.

jib fairlead A block mounted on a slide hooked to a track that is bolted to the deck. The jib sheet goes from the clew through this block before reaching the winch. The shape and set of the sail is controlled by moving the fairlead fore or aft.

jockey pole A short pole about a metre in length that is used to keep the spinnaker guy out from the shrouds by having the guy run through one end and the other end attached to a ring on the side of the mast.

keel The part of the boat that extends downward from the bottom of the boat and helps reduce leeway when going to windward.

knot 1. A way of looping and threading a line to secure it to an object. 2. The speed of one nautical mile per hour.

laid The method by which a rope is made by twisting strands into a spiral.

laminar flow Air flowing along the front and back surface of a sail or water flowing along both surfaces of the keel or rudder so that streams of air or water rejoin at the trailing edge with a minimum of disturbance or turbulence.

landlubber A clumsy seaman or a person not well versed in the ways of the sea.

latitude Imaginary lines that run parallel to the equator that make an angle measured from the centre of the earth to the equator. The north pole is at latitude ninety degrees north.

lazy Any line that is not currently in use. When close-hauled on the port tack, the wind is coming over the port side and the starboard jib sheet is taut and holding the jib in place. The port sheet is not in use, so it is called the lazy sheet.

lead line A piece of lead attached to a non-stretchy line that is used to measure the depth of water. The lead line has tags attached that, by their shape, can be felt in the dark to identity the measurement. It is pronounced "led line" after the metal of which it is comprised.

lee helm The tendency of the vessel to steer away from the wind. If the tiller is let go, the boat will tend to sail away from the wind. It will go to leeward.

leech The trailing edge of the sail that goes from the clew to the head. It usually has a thin leech line that can be tensioned to stop fluttering.

leeward The direction downwind or away from the wind. It is pronounced "loo-ard" by sailors.

leeway Sideways drift caused by the wind.

lifeline Standing lifelines are a fixed fence comprised of stanchions (posts) holding two or more lengths of stainless steel wire rope that are attached at the pulpit at one end and the pushpit at the other end. Running lifelines are two lengths of stout rope that are attached to the bow fitting and to cleats at the stern.

lifted When sailing close-hauled and the wind changes direction allowing the vessel to sail closer to the intended direction, she is

said to have been lifted. A good strategy is to always tack when headed to make the new tack more favourable and to follow the lift until headed.

line Rope is purchased in drums or in long lengths. This rope is then cut into specific lengths for specific purposes. As soon as it is earmarked for such a purpose, it ceases to be called rope and is then called a line.

LMT Local Mean Time is based on the time of local noon, when the sun is either directly north or south of the observer. LMT can be set to an arbitrary quantity or it can be any number of whole hours or half hours from GMT.

log 1. An instrument or device to measure the speed of the vessel as it travels through the water. 2. A book in which to record shipboard events.

longitude Imaginary lines around the earth's surface that radiate from the poles. Often called meridians, these lines of longitude start at Greenwich and are measured in degrees east or west up to 180 degrees.

loose footed Headsails, spinnakers, and the trysail are loose footed as only their tack and clew are attached. A mainsail has its foot attached to the boom and is thus fixed footed.

lower shroud A wire rope that is attached to the mast somewhere above the halfway point and extends downward and to either side of the mast. Lower shrouds stop the mast buckling in the middle.

luff The leading edge of the sail between the tack and the head.

luffing Wind is curling around the luff and pushing the luff inwards to the centre of the boat. This usually occurs when sailing too close to the wind when close-hauled or the sail is let out too much when reaching. This is not necessarily a bad thing as it can be used to better balance a boat and stop it broaching.

lying ahull Like being hove-to, except all sails are taken off the boat and it has bare poles. The tiller is lashed to leeward just as when

hove to, and the windage on the mast holds the vessel in a stable position, drifting in a direction about thirty degrees ahead of directly downwind.

magnetic north The position near the north pole to which compasses point to from all parts of the earth. In 2016, it was located at 86.4°N 166.3°W and is heading towards Russia at a rate of about sixty kilometres every year.

mainsail A sail that is attached to the mainmast.

mast step Steps placed on either side of the mast to aid in climbing the mast.

masthead The top of the mast.

mizzen A smaller mast that is aft of the mainmast. Sailing boats that are ketch or yawl rigged have mizzens.

nautical twilight Nautical twilight starts when the sun is twelve degrees below the horizon and extends until astronomical twilight, when the sun is eighteen degrees below the horizon. At the start of nautical twilight in the evening, the mariner can see plenty of stars, but the horizon is no longer visible as the sky blends in with the sea and it is not feasible to take any more sextant sights. In the morning, at the end of nautical twilight, the mariner can start to see the horizon and take sextant sights of catalogued stars.

outhaul A line, usually running through a set of blocks to stretch the foot of a sail, such as a clew outhaul.

parallel rule A set of two rulers that are attached by fixed but rotatable arms so that the rulers will always remain parallel to each other. The are used to walk a bearing from the compass rose on a chart to the point where the mariner wishes to draw a line.

pintle A pin that fits into a gudgeon. Generally they are attached to the rudder, whereas the gudgeons are attached to the stern.

pitching The motion a boat makes when it hits a wave head-on. The bow lifts and the stern drops, then the bow drops and the stern lifts. It rotates about an athwartship axis.

pitchpole To have the bow buried in to the water ahead of it, then the stern tossed over the bow. It is extremely violent, and usually the mast is broken.

planing Going faster than the theoretical hull speed for a displacement craft. Modern lightweight sailboats usually have planing hulls and can skim on the surface of the water, often attaining speeds in excess of twenty knots.

plotting The act of recording on a chart the course taken, the position fixes, and other information. Pre-plotting is an important exercise to ensure that the route and alternative routes are already worked out in advance so that course decisions can be made in an emergency.

poop deck The stern-most deck.

pooped When a wave breaks over the stern, the vessel is pooped.

port The left side of the boat.

port tack Sailing with the wind reaching the port side, travelling over the deck and leaving the boat on the starboard side. It is usually defined as the opposite side from where the mainsail is carried.

porthole Small clear opening in the cabin or topsides to allow light into the cabin and to view the outside world.

position line A line that is drawn on a chart to indicate that the vessel is somewhere on that line. To obtain a fix, a navigator needs to have two position lines crossing at not too shallow an angle.

pulpit The guard rails at the bow.

pushpit The guard rails at the stern of the vessel. Sometimes called the taffrail.

quarter The two stern corners of the vessel. There is a port quarter and a starboard quarter.

quarter berth The bunks that are in the area of the two stern corners of the vessel. There is often a port quarter berth and a starboard quarter berth on sailboats. The quarter berths are the most comfortable location for berths on a sailing vessel.

reefing Reducing the sail area by lowering the sail to the level of a set of eyelets and securing those eyelets to the boom.

rhumb line A straight line drawn on a Mercator projection chart. If the chart is small scale, it will not be the shortest distance between those two points unless the line runs north–south.

rig Describes the way a sailing vessel is set up. The number and position of masts determine the type of rig as well as the way the sails are deployed. It can also be used to describe different set-ups on the same vessel under different wind conditions.

roll The motion a boat makes when it is side-on to swells or waves. It rotates about a fore and aft axis.

rope Material obtained from a manufacturer, before it is cut into lines designated for a particular purpose.

rudder A blade in the water that is turned to force the vessel onto a different course.

rude star finder A set of translucent plastic discs that can be fitted onto an opaque disc and rotated to a position that represents the orientation of the stars at a particular time. It is useful in locating a star when the sky is almost clouded over.

running Heading directly downwind.

running fix Obtaining two position lines at different times between which a vessel has been making way. The fix can be determined using vectors by knowing the course and distance travelled between the times that the each position line was obtained.

running lifelines Two heavy lines that run down both sides of the deck to which a sailor can clip his safety harness. It allows complete freedom of movement from the bow to the stern on each side. Transferring from port to starboard or vice versa involves a risk as for a moment the sailor is unsecured, unless two harnesses are worn and at least one line is attached at any one time.

running rigging All the lines that are used to control the position of sails and movable spars such as spinnaker poles.

scupper Openings in toe rails or bulwarks to allow water that has accumulated on deck to flow back to the ocean instead of being trapped.

sea 1. A term that is often used instead of "waves" or "swells" 2. A small ocean body or large lake such as the Tasman Sea.

sextant A device that can measure the angle between the bottom of the sun and the horizon. It has an arc of movement slightly in excess of sixty degrees hence the name "sextant," but can read a bit beyond 120 degrees because it uses mirrors that double the angle. There are a number of filters that can quickly be dropped over the eyepiece and the mirrors so the navigator is not blinded by the sun or by the sparkle of light on the horizon. There is a graduated screw that can be used or squeezed out of the way when the navigator is first quickly bringing the image of the sun down to the horizon, then reengaged to fine-tune the image of the sun to bring it close to, or "kiss," the horizon. The navigator rocks the sextant slowly from side to side while rotating it a little. The navigator watches the image of the sun swoop in an arc so that the bottom or "lower limb" of the sun just brushes the line of the horizon, not going above it or below it.

shackle A U-shaped device that has a pin that can be screwed into the opening, closing off the top of the U. It is used to attach a chain to an anchor and has many other shipboard uses. Some shackles are hot-dipped galvanized steel, others are stainless steel, and a few are made of bronze.

sheet The line that is attached to the clew of the sail.

slides T-shaped nylon devices attached to the luff and foot of the mainsail. The slides fit into a track so the luff and foot are attached to the mast and the boom, respectively.

snap shackle A shackle that can be opened quickly by pulling on a spring-loaded piston that locks the shackle. Snap shackles that attach the sheet to the clew of a sail can open from the whiplash of a flogging sail.

spar Any pole on a boat, such as the mast, boom, or spinnaker pole, is generically termed a spar.

spinnaker This colourful sail is made of ripstop nylon to allow it to stretch and absorb wind stresses. It is used on points of sail from beam reaching to dead running. It is attached by the head, high up on the mast, and by sheets attached to the two corners.

spinnaker pole A spinnaker pole is used to balance the spinnaker so that the centre of effort is as close as possible to the fore and aft line of the vessel. The sheet that runs through the end of the spinnaker pole is called the spinnaker guy or brace, and the sheet that is free is called the spinnaker sheet.

spinnaker pole ring A ring mounted on slides on the spinnaker pole track. The spinnaker pole is clipped into the ring and the height of the inboard end of the pole is adjusted so the pole is horizontal.

spinnaker pole track A track fitted to the forward face of the mast that contains one or two rings mounted on slides.

splicing To join two piece of rope together, to make an eye or to turn a rope back on itself by weaving the strands into the parent rope.

spreaders Two arms that are usually above the halfway part of a mast and are used to hold the cap shrouds further away from the mast to improve the support they provide.

sprit A spare that holds the corner of a sail in place. The Optimist-class dinghy that *Laiviņa* has as its tender, has a sprit sail that is gaff shaped and has a sprit to hold out the aftermost top corner.

squab The nautical name for a mattress.

squall A sudden and localized cell of bad weather, often with high winds and rain. Squalls are often encountered after a cold front passes as unstable warm moist air is thrust into the upper reaches of the troposphere, causing rotating cells of rising and descending air.

stall Occurs when the vessel ceases to move forward because there is too much turbulence around a sail or water around a keel or rudder. When there is no lamina flow, the keel, rudder, or sail loses lift and fails to function. Stalls often occur when turning too aggressively in light air or when sailing too close to the wind in very strong winds.

stanchion The post that holds the standing lifelines that border the deck of a sailing vessel.

standing rigging The immovable wire ropes that hold the mast in position along with chain-plates, turnbuckles and other fittings.

starboard The right-hand side of the vessel.

starboard tack Sailing with the wind reaching the starboard side, travelling over the deck and leaving the boat on the port side. It is usually defined as the opposite side from where the mainsail is carried.

steerage-way Having sufficient speed so that the vessel will actually turn when the rudder is turned.

stern The aft or back end of the boat.

storm board The board that slides into grooves and, along with the sliding hatch, will seal the companionway.

storm jib A sail that is made of heavier-weight sailcloth than a regular jib and that is the smallest headsail carried. It is used when winds are too strong for the smallest of the regular jibs.

strands Fibres are woven into yarns, yarns are woven into strands, and strands are woven into rope. When splicing, sailors will weave the strands. Sometimes they reduce the thickness of the strands by removing yarns as they would in making a long splice.

swell Moving ridge of water that is left over from a strong wind in another location. Often waves sit atop swells.

tack 1. To change the vessel's heading so that the wind blows onto the boat from the opposite side. The course is changed so that the vessel heads closer and closer to the wind until the wind is on the other side. The sails must then be sheeted and set on the opposite side to accommodate this change. 2. The forward and fixed lower corner of a sail.

tell tail Strands of wool that are poked through the sail just back from the luff and at intervals up the sail. Some strands are placed along the leech. These make it possible to determine how laminar the

flow of air is along the surface of the sail. The sail can be adjusted or "trimmed" to get better air flow, which will make the sail develop forward thrust more efficiently.

tide The rise and fall of water that is caused by the gravitational pull of the moon.

tiller The stick that is attached to the rudder to enable the helmsperson to steer the vessel.

topping lift A line that is used to lift a spar. There is a topping lift on the end of the boom that prevents the boom from dropping down onto the cabin top when the mainsail is lowered. Spinnaker poles have topping lifts to prevent them from dropping in light winds and dragging the sail down with the pole.

topside The side of the boat that extends from the waterline to the sheer line or edge of the decks.

trade Surface winds that blow fairly steadily towards the equator to replace the hot air that rises into the upper troposphere and makes its way north to descend in the Horse Latitudes.

transom The vertical part of the stern where rudders are often attached. *Laiviņa*'s auxiliary rudder is mounted on the transom but her main rudder is not.

trimaran A three-hulled sailing vessel. The centre hull is larger, with the other two hulls acting like outriggers.

true north The north pole and centre of rotation of the earth.

trysail A loose-footed sail that is not attached to the boom and is used in place of the mainsail in heavy weather. Like the storm jib, the trysail is made from heavier cloth than the mainsail.

turbulence Whirlpools of water that occur when a rudder is turned too aggressively, or invisible whirlpools of air that are created when a sail is sheeted in too close for the point of sail on which it is sailing.

turnbuckle A device used to tighten, loosen, or adjust the tension in stays or shrouds that hold the mast erect. It has three parts: a

central cage that has a left-hand threaded hole on one end, a right-hand threaded hole on the other, and two bolts that screw into these holes. One bolt is attached to the chain-plate and the other to an eye in the end of the stay or shroud. When the cage is turned, the bolts both screw into the cage, shortening the distance and slowly tensioning up that stay or shroud.

under way As soon as a vessel is no longer attached to the bottom or to the shore or dock, it is deemed to be under way, even if it is not making way.

UTC Coordinated Universal Time. Although it is almost identical to GMT, it has replaced it in scientific contexts. The accuracy difference is too minute to be of concern to a sailboat navigator.

variation The angle between the true north pole and the magnetic north pole from the observer's location. As the magnetic north pole moves, variation changes. Up-to-date charts show the variation as of a particular year and the amount of annual change that must be used to adjust the amount of variation.

veering Changing direction of the wind in a clockwise rotation.

wave A heap of water created by the existing wind in force. In deep water, waves can break while swells generally do not. Swells will break when they reach the shore or a reef.

wave train A continuous set of waves coming from a particular direction that produces a discernible pattern of wave-top ridges at right angles to the direction of travel.

weather 1. The direction from which the wind is coming. 2. The current atmospheric conditions, such as precipitation, wind, temperature, sunlight, cloud, humidity, etc.

weather helm The tendency of the vessel to steer into the wind. If the tiller is let go, the vessel will head into the wind. It will go to weather.

westerlies The zone of wind that is usually pole-wards of the latitude forty degrees.

whipping To bind the end of a line to stop it unravelling.

whitecaps Breaking tops of the waves.

winch A device used to give a high mechanical advantage in pulling sheets, halyards or other lines taut.

wind indicator A device mounted on the top of the mast that weather cocks to point towards the direction from which the wind is coming.

yarn Fibres are twisted into yarns, and a number of yarns are twisted together to form strands, which in turn are twisted together to form a rope.

yawing The motion a vessel makes when it broaches. The bow swings to the port or starboard and the stern swings in the opposite direction, then the bow drops and the stern lifts. It rotates about a vertical axis like the mast.

Bibliography

[1] *Admiralty Manual of Navigation*. London, England: Her Majesty's Stationery Office, 1973.

[2] Bathe, Basil W. *The Visual Encyclopedia of Nautical Terms Under Sail*. New York, NY: Crown Publishers Inc., 1978.

[3] Beard, Henry and Roy McKie. *Sailing: A Sailor's Dictionary*. London, England: MacMillan and Co. Ltd., 1982.

[4] Belcher, Bill. *Wind Vane Self-Steering*. Camden, ME: International Marine Publishing Company, 1982.

[5] Birney, Arthur A. *Sun Sight Navigation Celestial for Sailors*. Centersville, MD: Cornell Maritime Press, 1984.

[6] Blagden, David. *Very Willing Griffin*. New York, NY: W. W. Norton and Company, Inc., 1974.

[7] Blake, P. and A. Sefton. *Blake's Odyssey*. London, England: Hodder and Stoughton, 1983.

[8] Blance, A. C. *Norie's Nautical Tables*. St. Ives: Imray Laurie Norie and Wilson, 1977.

[9] Blyth, Chay. *Theirs Is the Glory*. London, England: Hodder and Stoughton, 1974.

[10] Bottomley, Tom. *Practical Celestial Navigation*. New York, NY: Tab Books Inc., 1983.

[11] Bowditch, Nathaniel. *Bowditch's Coastal Navigation*. New York, NY: Arco Publishing Inc., 1979.

[12] Bowker, R. M. and S. A. Budd. *Make Your Own Sails*. New York, NY: St Martins Press, 1975.

[13] Cawkell, M. B. R., D. H. Maling and E. M. Cawkell. *The Falkland Islands*. London, England: MacMillan and Co. Ltd., 1960.

[14] Coleridge, Samuel Taylor and Martin Gardiner. *The Rime of the Ancient Mariner:The Annotated Ancient Mariner*. London, England: Anthony Blond, 1965.

[15] Coles, K. A. and P. Bruce. *Adlard Coles Heavy Weather Sailing*. Camden, ME: International Marine, 1999.

[16] Colgate, S. *Colgate's Basic Sailing Theory*. New York, NY: Van Nostrand Reinhold Company, 1973.

[17] Cook, Peter and Bob Fisher. *The Longest Race*. London, England: Stanford Maritime Limited, 1975.

[18] Donaldson, S. *A Sailor's Guide to Sails*. New York, NY: Dodd Mead and Company, 1984.

[19] *First Aid*. Ottawa, ON: St. John Ambulance, 2013.

[20] Francis, Clare. *Woman Alone*. Philadelphia, PA: David McKay Publications, 1977.

[21] Freeman, Emma. *Hastings Street: Stories from Noosa's Past*. Noosa Heads, Qld.: Debut Pub., 2003.

[22] Gates, Earnest S. *Sea Navigation*. London, England: George G. Harrap and Co Ltd., 1968.

[23] Goebel, J. *The Struggle for the Falkland Islands*. New Haven, CT: Yale University, 1982.

[24] Golby, Humphrey and Shirley Hewett. *Swiftsure The First Fifty Years*. Victoria, BC: Lightship Press Ltd, 1980.

[25] Gougeon, Meade and Ty Knoy. *The Evolution of Modern Sailboat Design*. New York, NY: Winchester Press, 1973.

[26] Hall, G. P. D. *Australia Pilot*. Sixth Edition. Vol. 3. Taunton, England: Hydrographer of the Navy, 1973.

[27] Hall, G. P. D. *Ocean Passages for the World*. Third Edition. Taunton, England: Hydrographer of the Navy, 1973.

[28] Hall, G. P. D. *Sight Reduction Tables for Marine Navigation*. Vol. 1. Taunton, England: Hydrographer of the Navy, 1971.

[29] Hall, G. P. D. *Sight Reduction Tables for Marine Navigation*. Vol. 2. Taunton, England: Hydrographer of the Navy, 1971.

[30] Hall, G. P. D. *Sight Reduction Tables for Marine Navigation*. Vol. 3. Taunton, England: Hydrographer of the Navy, 1971.

[31] Hall, G. P. D. *Sight Reduction Tables for Marine Navigation*. Vol. 4. Taunton, England: Hydrographer of the Navy, 1971.

[32] Hansen, Hans Jurgen and Wundskammer Hansen. *Windjammer Parade*. London, England: Ian Allan Ltd, 1972.

[33] Harand, Joseph. *The Coastal Cruising Handbook*. London, England: Hollis and Carter, 1980.

[34] Haslam, D. W. *The Mariner's Handbook*. Fifth Edition. Taunton, England: Hydrographer of the Navy, 1978.

[35] Hastings, M. and S. Jenkins. *The Battle for the Falklands*. London, England: Pan Books, 1983.

[36] Heaton, Peter. *The Singlehanders*. London, England: Michael Joseph Ltd., 1976.

[37] Henderson, Richard. *Singlehanded Sailing*. Camden, Maine: International Marine Publishing Company, 1976.

[38] Hine, Alfred. *Magnetic Compasses and Magnetometers*. London, England: Adam Higler Ltd, 1968.

[39] Howard-Williams, Jeremy. *Sails*. London, England: Adlard Coles Limited, 1967.

[40] Howse, Derek and Michael Sanderson. *The Sea Chart*. New York, NY: McGraw - Hill Book Company, 1973.

[41] *International Code of Signals*. London, England: H.M.S.O., 1975.

[42] Johnson, Peter. *Boating Facts and Feats*. New York, NY: Sterling Publishing Co. Inc., 1975.

[43] Keys, Gerry. *Practical Navigation by Calculator*. London, England: Stanford Maritime Limited, 1982.

[44] Kinney, Francis S. *Skene's Elements of Yacht Design*. London, England: A. and C. Black Ltd., 1977.

[45] Lewis, D. *We, The Navigators*. Canberra, ACT: Australian National University Press, 1972.

[46] *List of lights*. LLPUB111. Vol. G. Taunton, England: Hydrographer of the Navy, 1972.

[47] *List of lights*. LLPUB112. Vol. H. Taunton, England: Hydrographer of the Navy, 1972.

[48] Lytel, Allan. *ABC's of Radio Navigation*. Carmel, IN: Howard W. Sams and Co., Inc., 1962.

[49] Mate, F. *Best Boats*. New York, NY: Albatross Publishing House, 1982.

[50] May, W. E. *A History of Marine Navigation*. New York, NY: W. W. Norton and Company, Inc., 1973.

[51] Meisel, Tony. *A Manual of Singlehanded Sailing*. New York, NY: Acro Publishing, Inc., 1981.

[52] *New Zealand Pilot*. Thirteenth Edition. Taunton, England: Hydrographer of the Navy, 1971.

[53] *New Zealand Yachting Federation handbook*. Auckland: N. Z. Yachting Federation, 1977.

[54] Nicolson, Ian. *Small Steel Craft*. Camden, ME: International Marine Pub. Co., 1983.

[55] Nicolson, Ian and Robert E. Wallstrom. *Surveying Small Craft*. Camden, ME: International Marine Pub. Co., 1978.

[56] *Pacific Islands Pilot*. Ninth Edition. Vol. 2. Taunton, England: Hydrographer of the Navy, 1969.

[57] Pardey, L. and L. Pardey. *Cruising in Seraffyn*. New York, NY: Seven Seas Press, 1976.

[58] Porteous, J. D. *The Modernization of Easter Island*. Victoria, BC: University of Victoria, 1981.

[59] Robberson, Elbert. *How to Install and Repair Marine Electronic Equipment*. New York, NY: John F. Rider Publisher, Inc., 1963.

[60] Rogers, T. H. *Marine Corrosion*. London, England: George Newnes Limited, 1968.

[61] Russell, John. *The Shell Book of Seamanship*. Exeter, Devon: David and Charles Publishers, 1979.

[62] *Sailing Directions Pub. 123 Southwest Coast of Africa*. 15th Edition. Washington, D.C.: National Geospatial Intelligence Agency, 2014.

[63] *Sailing Directions Pub. 124 East Coast of South America*. 15th Edition. Washington, D.C.: National Geospatial Intelligence Agency, 2017.

[64] *Sailing Directions Pub. 125 West Coast of South America.* 15th Edition. Washington, D.C.: National Geospatial Intelligence Agency, 2017.

[65] *Sailing Directions Pub. 153 West Coast of Mexico and Central America.* 18th Edition. Washington, D.C.: National Geospatial Intelligence Agency, 2017.

[66] *Sailing Directions Pub. 171 East Africa and the South Indian Ocean.* 12th Edition. Washington, D.C.: Defense Mapping Agency, 2015.

[67] *Sailing Directions Pub. 175 West Coast of Australia.* 13th Edition. Washington, D.C.: National Geospatial Intelligence Agency, 2017.

[68] Sands, Leo G. *Marine Electronics Handbook.* New York, NY: Tab Books Inc., 1973.

[69] *Small Craft Guide - British Columbia.* Canada: Minister of Supply and Services, 1979.

[70] *Survival at Sea.* Canberra, ACT: Australian Government Pub. Service, 1978.

[71] *Symbols and Abreviations.* Ottawa: Canadian Hydrographic Service, 1978.

[72] *The Nautical Almanac.* 1984 Edition. Washington, D.C.: U.S. GPO, 1982.

[73] *The Nautical Almanac.* 1985 Edition. Washington, D.C.: U.S. GPO, 1983.

[74] *The New Glenans Sailing Manual.* Exeter, Devon: David and Charles Publishers, 1978.

[75] Toomay, J. C. *Radar Principles for the Non-Specialist.* New York, NY: Van Nostrand Reinhold, 1982.

[76] Trimmer, J. W. *How to Avoid Huge Ships.* Centreville, MD: Cornell Maritime Press, 1993.

[77] Villar, R. *Merchant Ships at War.* Annapolis, MD: Naval Institute Press, 1984.

[78] Walker, Stuart H. *Wind and Strategy.* New York, NY: W. W. Norton and Company, Inc., 1973.

[79] White, Gerald Taylor. *Problems in Small boat design.* New York, NY: Sheridan House, 1972.