

TABLE OF CONTENTS

DEDICATION	7
INTRODUCTION, SECOND EDITION	29
ACKNOWLEDGMENTS	34
BREAKING FREE	35
PREPARATION	36

GROUND TACKLE....39

CALCULATING LOADS	39
CQRs	40
DANFORTHS	41
FORTRESS ANCHORS	41
NORTHILL SEAPLANE ANCHORS	41
THE YACHTSMAN	42
BRUCE ANCHORS	42
TEST RESULTS	43
MAIN ANCHOR SIZE	43
STERN ANCHOR	46
MAKING ANCHOR CHOICES	46
How Many Anchors?	46
CHAIN	47
Cleaning Chain	48
NYLON RODES	48
Combination Rodes	49
ELECTRIC WINDLASSES	49
Chain Stowage	51
THE BOW ROLLER	52
THE RIDING SAIL	53
TYING UP	56
Dock Lines	56
Inventory	56
Fenders	56
Securing Fenders	56
Fender Boards	56

SELF-STEERING....58

WINDVANE TYPES	60
Trim Tabs	61
Do-It-Yourself Vanes	61
USING AN AUTOPILOT	63
Hull Design Factors	63
Reliability	63
Power Consumption	63
In Adverse Conditions	64
The Control Head	64
Sea-State Control	64
Rudder-Gain Control	65
Counter Rudder	65
Log Your Settings	65
Weather Helm	65
Compass Choices	65
Northerly Turning Error	65
Sensing Rudder Position	66
Heavy-Weather Steering	66
Power Packs	66
Mechanical Drive Units	67
Hydraulic Drives	67
Pilot Options	68
SSB/Pilot Interference	68

Safety	68
Backup	68
Pilot Compass Interference	68
Which Manufacturer?	69
Vane or Pilot?	69

CRUISING SAILS....71

HEADSAIL ISSUES	71
Roller-Furling or Jib Hanks?	72
Working Headsails	72
Reefing Headsails	74
The Light Genoa	74
Yankee Jibs	74
Cutter Double-Head Rig	75
Drifters	76
Reachers	76
ADDING A CUTTER STAY	80
Runners	81
Sheeting Angle	81
Cutter Stay Chafe	82
STAYSAIL	82
Double Headsail Sloops	82
Cutter Rig Staysail	83
Staysail Shape	83
Boomed Headsails	83
FULL-BATTEN HEADSAILS	85
THE MAINSAIL	86
Hollow-Leeches	86
Loose-Footed Sails	86
Attachment to the Mast	86
FULL BATTENS	87
Why Full Battens?	87
New Main or Retrofit?	87
Batten Material	88
Batten-End Chafe	89
Broken Battens	90
Shape Control	90
Hardware	91
Getting the Sail Up and Down	91
Intermediate Attachment Points	91
Headboard Connection	92
Roller-Bearing Cars	93
Batten Layout	93
Partial Approach	93
Lazyjacks	93
Shroud Chafe	94
Sailmaking Considerations	94
Batten Pockets	94
Telltales	95
The Leech Wire	95
Sail Planform	95
MAXIMUM ROACH	95
More Is Better	96
The Mistake	96
Advantages	98
Backstay Chafe	99
Batten Considerations	99
How Much Overlap?	99
Tacking and Jibing	99
How Will Your Boat Benefit?	100

Weather Helm?	100	THE DITTY BAG	133
Does It Make Sense for You?	100	Basic Needs	133
MAINSAIL REEFING	102	Sticky-Back Cloth	133
Tripping Reefs	102	Double-Sided Tape	133
Reef Cunninghams	102	Cloth Inventory	133
Boom Height	102	Sail Reinforcements	133
SPINNAKERS	102	Hardware	134
Design	104	Tools	134
Sailcloth	105	Sewing Machines	134
Guys and Sheets	105	Contact Cement	134
Spinnaker Socks	105	Tape	134
Nets	107	ON-DECK COMFORT.....135	
ASYMMETRIC SPINNAKERS	108	DODGERS	135
Runner or Reacher	108	Size	136
Tack Placement	108	Windows	137
Running Layout	109	The Back Porch	141
Luff-Control Hanks	109	Window Design	141
Asymmetrical Construction	110	Pram Hoods	143
MIZZEN HEADSAILS	111	Fabric	144
MINIMUM SAIL INVENTORY	111	Hardware	144
Used Sails	112	Construction Details	145
SAIL CONSTRUCTION	112	Maintenance	146
Loads	113	COCKPIT TABLES	149
Sailcloth	113	WEATHER CLOTHS	150
Woven-Cloth Stability	113	COCKPIT CUSHIONS	150
Laminated Fabrics	114	Cushion Support	151
Radial Panel Construction	114	AWNINGS	152
Cross-Cut Construction	114	Defining Needs	152
Seamless Construction	115	Design Criteria	153
The Ideal Cruising Sail	115	Attachment Points	153
Cloth Weight Versus Longevity	116	Side Curtains	155
Two-Ply and Tapered Cloth Weights	116	Foredeck Awnings	156
Stitching	116	Sailing Awnings	158
Seams	117	Do It Yourself or Professional?	162
Hard Spots	117	Fabric Choices	162
Reef Reinforcements	118	Thread	162
Batten Pockets	119	Stitching	162
Leech Construction	120	Reinforcement Points	162
The RELAXed Approach	120	Awning Battens	164
Bolt Ropes	124	Zippers	164
Jib Hanks	124	Chafe Patches	164
Mainsail Slides	125	Rigging	164
Headboard Attachment	126	Catching Rain	168
Tack Reefs	126	Special Awnings	168
Chafe	126	WIND SCOOPS	170
Costs	127	MISCELLANEOUS CANVAS WORK	172
Roller-Furling Headsails	127	STORM COVERS	174
STORM CANVAS	129	DINGHIES.....177	
Tasman Gale	129	How Will You Use It?	178
Storm-Sail Inventory	129	The Dink as a Life Raft	178
Storm Jibs	130	Harbor Transport	178
Sheet Leads	130	Beaching	179
Tack Pennants	130	Buoyancy	179
Downwind Considerations	131	INFLATABLES	180
Storm-Headsail Construction	131	Sport Boats	180
Mast Safety	131	RIBs	181
The Trysail	131	Inflatable Features	181
Trysail Geometry	131	Towing Eyes	181
WORKING WITH A SAILMAKER	131		
Performance-Oriented Design	132		

SOLID DINKS	183	THE ANTENNA	206
The Second Dinghy	183	Long Wires	206
Sailing Rigs	183	Whips	206
Kayaks	183	Tuners	207
Windsurfers	184	Ground Plane	207
DAVITS	185	Grounding Metal Hulls	208
OUTBOARDS	186	Dipole Antennas	208
Horsepower	186	Propagation	208
Emergency Auxiliary Power	186	SSB Frequencies	211
Oil Ratios	186	VHF Channels	211
Oil Injection	186	Ham Nets	213
Four-Cycle Outboards	187	SATCOM C FAX/TELEX	216
Handling the Engine	187	DIGITAL E-MAIL	216
Fuel Tanks	188	SATCOM M VOICE AND DATA	216
Outboard Fuel Filters	188	DIGITAL CELLULAR SERVICES	217
Spares	188	0183 INTERFACE	217
ELECTRONICS.....188		ELECTRONIC CHARTING	217
PERFORMANCE INSTRUMENTS	188	WEATHERFAX	218
Integrated Systems	189	Stand-Alone Faxes	218
VMG	189	Using the SSB as a Fax	219
Dead Reckoning	189	Which Fax?	219
True-Wind Direction	189	MAKING CHOICES	219
Performance Analysis	189	COMPUTING PERFORMANCE	220
Performance Targets	190	Velocity-Prediction Programs	220
True-Wind Angle Correction	190	Using the VPP	220
Spinnaker Sock Effect	190	Getting Your Own Data	223
Masthead Instrument Extenders	190	Target Boat Speed	223
Instrument Accuracy	191	Target Wind Angle	223
Computer Integration	191	ENTERTAINMENT SYSTEMS	223
Software Decisions	191	Music	223
Hardware Decisions	192	Speakers	223
FATHOMETER	192	Tuner/Amp	224
RADAR	193	CD Players	224
Radar Weather	194	Household Systems	224
Target Definition	194	Video	224
Range	195	LIGHTNING PROTECTION	224
Quantization	195	Bonding System to Dissipate Static	225
Sea Clutter Circuitry	195	Grounding Plate	225
Watertight Integrity	196	Masthead Dissipaters	226
Features	196	The Cone of "Protection"	226
Proximity Alarms	196	Bond All Metal	226
LCD Radars	197	What To Expect from a Hit	226
Power Consumption	197	Can You Protect Your Electronics?	226
Monitor Location	198	Metal Boats and Lightning	226
What To Buy?	199	SAFETY EQUIPMENT.....227	
Caution	199	FIRE EXTINGUISHERS	227
LONG-RANGE POSITION FIXING	199	SMOKE HOODS	228
COMMUNICATIONS	201	FOUL-WEATHER GEAR	228
Keeping Up With Technology	201	Cruising Environment	229
VHF	201	Important Features	229
Portable VHF	202	Top Style	229
Single Sideband	202	Pants	229
AT&T Direct	202	Zippers	230
Ham Radio	202	Size	230
Combination Sets	203	Fabrics	230
SSB/Ham Features	204	Seam Construction	230
Telex	204	Color	230
SSB Digital-Data Transfer	205	Boots	231
Ham E-mail	205		

Sailing Jackets	231	STORM SHUTTERS	257
Gloves	231	COLLISION PATCHES	259
COLD-WEATHER CRUISING	231	PARACHUTE ANCHORS	259
Insulated Foul-Weather Gear	232	RIGGING EMERGENCIES	260
Immersion Suits	233		
HARNESSES	235	THE CRUISING LIFE....261	
PERSONAL STROBE LIGHTS	236	GETTING ALONG LOCALLY	261
WHISTLES	236	Polynesian Picnic	262
LIFE JACKETS	236	Fruits Bring Friends	262
Inflatable Life Jackets	237	Stay Put in One Spot	264
MAN OVERBOARD	237	Off the Beaten Path	265
Locating Systems	237	Trading	266
Man-Overboard Modules	238	The Gibbs	267
Steiner Throwable Module	239	A Walk in The Bush	268
Electronic Position Finders	239	Musical Instruments	271
Man-Overboard Buttons	239	Beach Party	271
Getting Back Aboard	239	It's Still the Same	272
Heaving Lines	240	THE COST OF CRUISING	272
Lifesling	240	The Boat	273
Avoiding Problems	240	Equipment	274
THE LIFE RAFT	242	Minimum Gear	274
Givens Raft	243	Living Expenses	275
Switlik Rafts	243	Where the Money Goes	275
Periodic Service	243	Priorities	277
Canister Cover	244	Budgetary Compromises	278
Handling on Deck	244	Staying Within Budget	278
Stowage Provisions	244	Hull and Liability Insurance	279
Rapid Deployment	245	Medical Insurance	279
Using the Inflatable as a Raft	245	Disaster Kitty	279
Using the Hard Dinghy	246	Taxes	279
Life-Raft Radio Gear	247	Putting It All Together	279
Stay Aboard!	247	SUEDAMA	280
Radar Transponders	248	NAVIGATION MATERIALS	281
EPIRBs	248	Charts	281
Flares	248	Celestial Tables/Almanac	281
Smoke and Die Markers	248	Cruising Guides	281
Abandon-Ship Bag	249	Miscellaneous Materials	281
What To Choose	249	Keep Your Eyes Open	281
YACHTSAVER	251	CRUISING WITH KIDS	282
Staying With The Boat	251	Schooling	283
Time To Do Repairs	251	Social Development	285
Reefs	251	Offshore Routine	288
Abandon-Ship Psychology	251	What Age Is Best?	293
Protection from the Elements	252	Leaving Kids on Their Own	294
Freeboard	252	WOMEN'S PERSPECTIVE	297
Calculating Buoyancy Requirements	253	Empowerment	298
Installing A System	253	Safety Issues	298
Cost Issues	254	Acquiring the Skills	298
Fire Risks	254	Boat Handling Under Sail	298
Decisions	255	Handling Under Power	299
DECK HATCH RISKS	255	Docking	299
INCREASING VISIBILITY	256	Emergencies	299
Colored Sails	256	Navigation	299
Spar Paint Schemes	256	Life Aboard	299
Masthead Tricolor	256	Decor	300
All-Around White Light	256	Ventilation	300
Strobe Lights	256	The Galley	300
Running Lights	257	Shipboard Systems	301
Passive Radar Reflectors	257	Engine Location	301
Electronic Radar Reflectors	257	Water Capacity	301

Storage Issues	301	Canned Fruits and Veggies	319
First Passage	302	Canned Meats	319
Watch Routines	302	Dry Foods	319
Heavy Weather	302	Drinks	319
Keeping In Touch	302	Snacks	319
Is Cruising Right For You?	302	Pastas	320
WAIHEKE CHRISTMAS	303	Frozen Foods	320
OFFICIALDOM	305	Keeping Fresh Foods	320
Ship's Papers	305	Baked Goods	320
Personal Identification	305	Precooked Foods	320
Visas	305	Doing Without Refrigeration	320
Health Requirements	305	Packaging Considerations	321
Financial Requirements	306	Bugs!	321
Clearing In	306	Food Poisoning	321
Pratique	306	FOREIGN MARKETING	322
Customs	306	Picking the Right Supermarket	322
Weapons	306	Local Markets	322
Immigration	307	Pricing	323
Foreign Flag Yachts	308	What Is Available?	323
Flag Etiquette	308	Coconuts	323
PETS	308	Cleaning Procedures	326
TROPICAL DRESS	310	Cooking Gas	326
Storing Clothing	311	LOCAL TRANSPORT	327
Clothing Maintenance	311	Car Rentals	327
Linens	314	Bikes	327
Shopping	314	On Foot	328
Hats	314	Buying a Car	328
SUNGLASSES	314	THE BAD NEWS	328
Radiation Types	314	Mordida	329
Edge Protection	314	Hot Spots	329
Polarization	314	Drug Checks	329
Lens Tints	314	"Official" Intelligence	330
GALLEY EQUIPMENT	315	CRUISING SECURITY	330
Saucepans	315	Theft	330
Dish and Glasses Storage	315	Personal Safety	330
Cooking Utensils	315	Alarms	331
Galley Knives	315	GUNS ABOARD?	331
Leftover Containers	315	If You Do Carry Guns	331
Condiment Storage	315	The Arsenal	332
Baking Pans	316	Weapon Maintenance	333
Tea Kettle/Coffee Pot	316	The Gun Locker	333
Electric Appliances	316	DRUG RUNNERS	333
Microwave Ovens	316	PIRACY	334
Microwave Cookware	316	IMPROVING SECURITY	334
Barbecue	316	MEDICAL PREPARATION	335
Paper Goods	317	Reference Books	335
Serving Dishes	317	The Medical Kit	335
Linens	317	Paperwork	336
Clean-Up	317	Medical Training	336
Cookbooks	317	Check Up Before Checking Out	337
PROVISIONING	317	Heated Issues	337
Estimating What You'll Need	317	Inoculation Requirements	337
Storage	318	Malaria	338
Inventory Control	318	Medical Services	339
Spices and Herbs	318	Common Problems	339
Baking Products	318	Staying Fit	340
Dairy Products	318	Seasickness	340
Condiments	319	Talking to Cruising Doctors	340
Fats	319	CRUISING DIVERSIONS	343
Non-Food Items	319	Skin Diving	343

Scuba Diving	343	Drugs	376
Spearfishing	344	Checking References	376
Swimming Offshore	346	Contributions to Cruising Kitty	376
Swimming Onshore	346	Where To Look	376
Water-Skiing	347	ABOARD <i>TINDORA</i>	376
Shell Collecting	348	Part-Time Circumnavigation	378
Photography	349	<i>DREAM CHASER</i>	378
VIDEO	352	Cruising Routine	379
Camera Gear	352	Weather Patterns	381
Batteries	352	Heavy Weather Preparations	383
Videotape	352	Heaving-To	383
Camera Work	352	Downwind Rig	384
The Story Board	353	Does This Make Sense For You?	385
Tape is Cheap	353	LEGAL ISSUES	386
Vary Your Shots	353	Avoiding Litigation	386
Shoot the Cruising Lifestyle	353	What Is Negligence?	387
Establishing Shots of the Boat	353	Minimize Your Risks	387
On-Board Sailing Video	353	The "Jones" Act	388
Audio	354	HOW BIG CAN YOU GO?	388
Local Music	354	<i>Locura</i>	388
The Editing Process	354	Defining the Limit	390
TROLLING TALENT	355	Size and Budget	390
The Right Hardware	356	EARN AS YOU GO CRUISING	391
Trolling Technique	357	Working Ashore	391
Boating the Catch	357	Deliveries	392
Timing	358	Chartering	392
CRUISING PLAGUES	360	Writing	394
Flying Pests	360	Self-Publishing	394
The Cockroach War	361	Trading	395
Rats	363	Cruising Kitty	395
CRUISING ODORS	365	THE CARMINES	396
Bilge Smells	366	JOHN NEAL	398
Engine Odors	366	PROFESSIONAL CREW	401
Mold and Mildew	366	The Charter Game	401
Toilet Plumbing	366	The Learning Curve	402
Toilet Compartment	367	Home Base	402
CRUISING QUALITY	367	Personality Traits	402
FRESH WATER	368	CRUISING BUSINESS	403
Catching Rainwater	369	Mail	403
Shoreside Water	371	Transferring Funds	403
Treating Water	371	How Much Money to Carry?	404
Watermakers	371	Phone Cards	404
CREW?	371	Automatic Bill Paying	404
Boat Size	372	Gear From Home	404
The Need to Anticipate	372	Taxes	405
Handling Under Power	373	The Home Front	405
Docking Requirements	373	CRUISING DESIGN....406	
Sailhandling	373	DEFINING NEEDS	406
Sailing Efficiency	374	Synergism	406
Maintenance and Size	374	How Small Can You Go?	406
Heavy Weather	374	OFFSHORE PERSPECTIVE	407
Emergencies	375	STEERING CONTROL	407
Sharing Responsibilities	375	Helm versus Waves	407
Self-Steering Backup	375	Hull Balance	407
SINGLEHANDING	375	Length-to-Beam Ratio	409
Keeping Watch	375	Curve of Area	409
FINDING CREW	376	Bow Shape	409
Experience	376	Half-Entry Angle	410
Compatibility	376		
The Food Chain	376		

Upwind Issues	411	Ballast	449
Downwind Issues	412	Draft	449
Keel Plan	413	Draft in Soft Mud	450
Rudder and Hull Interaction	413	Aspect Ratio	451
Rudder Stall	413	Foil Shape	451
Reducing Rudder Stall with Design	414	Vacanti Keels	451
Rudder Configurations	414	Keel Area	451
“Traditional” Steering Characteristics	415	Stalling	452
Rig Factors	415	Grounding Loads	452
Sail Shape	415	Keel Tanks	452
Self-Steering Power	416	Ballast	452
Evaluating the Boat	416	Keel Appendages	453
SURVIVING A KNOCKDOWN	417	Centerboards	453
Absorbing Wave Impact	417	Full Keels	454
Skid Factor	418	KEEL STRUCTURE	455
Polar Moments	421	Keels and the ABS Rule	455
Limit of Positive Stability	421	Keel Sump	455
Calculating LPS	422	Keel Floors	455
Watertight Integrity	423	Drainage	456
What’s the Right LPS?	423	Fiberglass Issues	456
Cut-Off Numbers	423	KEELBOLTS	456
Vendee Globe Lessons	424	Layout	456
STRUCTURAL INTEGRITY	425	Materials	457
On Deck	425	Attachment to Ballast	457
Keel Attachment	425	Installation	457
Steering System	426	Bedding or Bonding?	457
Rig	426	Salvage Thoughts	458
DESIGN CHARACTERISTICS	426	RUDDERS	458
Performance Orientation	426	Keel-Attached	458
Powering Ability	427	Skeg-Mounted	459
Windward Ability	427	Spade	459
Speed-Length Ratio	427	Rudder Balance	459
Light or Heavy Displacement?	428	Prop-Wash Considerations	459
Sail Area	429	Twin Rudders	459
Prismatic Coefficient	431	Transom-Hung	460
Wetted Surface Drag versus Wave Drag	432	DESIGN CONCEPTS....461	
Freeboard	433	DEERFOOT/SUNDEER	461
Overhangs	435	Evolutionary Design	462
The Dry Bow	436	Hull Shape	463
Reaching Spray Patterns	437	Bow-Spray Patterns	464
Stern Slap	437	Bow Waves	465
Racing-Rule Influence	438	Hull Balance	467
BOC Influence	439	Keel Design	468
“Traditional” Cruisers	439	How Much Draft?	468
SAILING STABILITY	441	Rudder/Propeller Relationship	468
Hull-Form Inertia	441	The Sailing/Powering Balance	468
Vertical Center of Gravity	442	Stern Shape	469
Metacentric Height	442	Rig and Keel Balance	471
The Curve of Stability	442	Rudder Design	471
Heel Angle and Comfort	443	Rig Design	471
MOTION	443	Fractional-Rig Configurations	472
Downwind	443	Ketch Rig Development	472
Reaching	443	Eliminating the Permanent Backstay .	473
Upwind	443	Boom Height	474
The Spring Effect	444	Competition	475
At Anchor	444	Powering Into Waves	476
SWIM STEPS	445	Seagoing Comfort	476
KEELS	448	Interior Issues	479
Boatspeed and Lift	448	SUNDEER PRODUCTION SERIES ...	480
Angle of Attack	448	Sundeer 64	480

Sundeer 56	481	Conser 47	520
Hull Shapes	481	LAVARANOS CATS	520
Fins	482	Admiral 47	521
Sailplan	482	THE TRIMARAN QUESTION	523
Deck Design	483	STEERING SYSTEMS.....524	
Final Interior Layout	485	STEERING STRUCTURE	524
Systems	487	Factors of Safety	525
In Production	487	Rudder-Shaft Construction	526
At Sea	488	Rudder-Shaft Alignment	528
Next?	488	Potting in Bearings	528
OTHER VIEWPOINTS	489	Line Boaring	528
LARS BERGSTROM	489	Rudder-Shaft Deflection	528
Hull Design Criteria	489	RUDDER BEARINGS	528
Spray Deflectors	490	Compressive Yield	528
Keel Design	491	Hydroscopicity	528
Steering Control	491	Thermal Stability	528
B&R Rigs	491	Coefficient of Friction	529
Water Ballast	491	Engineering Issues	529
Air Slot	491	Bearing Clearance	529
Owner's Comments	492	Bearing Materials	530
ANGELO LAVARANOS	494	Fixed Bearings	530
Keel Design	494	Needle Bearings	531
Twin Rudders	495	Self-Aligning Bearings	531
Prismatic and Heel	495	Bearing Longevity	531
Water Ballast	495	Bearing Cleanliness	531
<i>Beluga</i>	495	Bearing Lubrication	531
Lifting Keel	495	RUDDER PACKING GLANDS	531
ROGER MARTIN	498	TILLER STEERING	532
Hull-Design Philosophy	498	CABLE STEERING	533
Keel Shape	499	The Quadrant	533
Rig	499	Turning Blocks	534
Interior Layout	499	Cables	534
Deck Design	500	Steering Chain	534
CARL SCHUMACHER	502	Chain Sprocket	534
Hull Design	502	HYDRAULIC STEERING	537
Deck Layout	503	Helm Pumps	537
Rig Design	503	Cylinder Size	537
Owner's Comments	504	Steering Tiller	538
CHUCK PAINE	506	Plumbing	538
Evolution	506	Hydraulic Fluid	538
Bow Shape	507	Accumulator Tank	538
Transverse Stability	509	Relief Valves	538
The Keel	509	Bleeding	538
The Stern and Transom	509	Hydraulic Leaks	539
Steering	510	Installation Issues	539
The Rig	510	MECHANICAL STEERING	539
TED BREWER	511	WORM GEARS	539
<i>Millenium Falcon</i>	511	STEERING DETAILS	540
HISTORICAL PERSPECTIVE	513	Tying in the Pilot	540
INNISMARA	513	Combination Steering	540
MULTIHULLS	515	Steering Ratios	540
Actuarial Statistics	518	Rudder Stop	541
They Don't Sink	518	Wheel Diameter	542
Advantages	519	Wheel Construction	542
Performance	519	Wheel Brakes	542
Costs to Build	519	Single or Dual Wheels?	542
In Heavy Weather	519	Pedestals	544
Cruising-Design Criteria	519	Emergency Tiller	545
Capsize Preparations	520	Rudder-Angle Indicators	545
CONSER CATAMARANS	520		

STRUCTURAL ENGINEERING...547	OTHER MATERIALS	564
HOW LOAD IS DEVELOPED	Naval Bronze	564
Righting Moment	Monel	564
Size	Titanium	564
Displacement	Brass	565
Speed	SCANTLINGS	565
Motion	Grounding	565
G-Loading	Abrasion Resistance	565
SCALE FACTORS	Collision With Another Vessel	566
Dimensional Scaling	Deadheads and Containers	566
Length Scaling	Head Seas	566
Displacement	WATERTIGHT BULKHEADS	567
STRUCTURE	New Construction Issues	567
Stiffness	Retrofitting	568
Span	Full Compartmentalization	568
Tributary Areas	Watertight Doors	569
Deflection	CONSTRUCTION....571	
Structural Beams	FIBERGLASS	571
Bond Beams	Balancing Components	572
Load Path	REINFORCEMENTS	572
Stress Concentration	Woven Rovings	572
Stress Risers	Mat	572
Moment Arms	Unidirectionals	572
Balance	E-Glass	573
FAILURE MODES	S-Glass (R-glass)	573
Cored Structures	Kevlar	573
Beam Failures	Carbon Fiber	573
Fatigue	RESINS	573
Reverse-Cycle Loading	Orthothalic Polyesters	574
Exceeding the Elastic Limit	Isothalic Polyesters	574
Section Modulus/Moments of Inertia	Vinylesters	574
At Stress Risers	Epoxies	574
Factors of Safety	CORES	574
MATERIALS	Physical Characteristics	575
Modulus of Elasticity	Balsa	576
Tensile and Compressive Strength	PVC Foam	576
Elasticity	Honeycomb	577
Heat-Treating	Hard Spots	577
Work-Hardening	Delamination	577
Manufacturers' Factors of Safety	PRODUCTION PROCESSES	577
BASIC CRUISING ENGINEERING	Room-Temperature Laminates	577
Tension Calculations	Heat-Curing	577
Minimum Metal Around a Hole	Vacuum-Bagging	578
CONNECTIONS	SCRIMP Process	578
Welding	CONSTRUCTION DETAILS	578
Welds in Shear	Hull-to-Deck Joints	578
Welds in Tension	Furniture as Structure	579
Welds Subject to Bending	Integral Tanks	579
Calculating Weld Properties	Hull Windows	580
Secondary Bonds	Hatches	580
Tapped Connections	Bulkhead Attachment	581
Bolted Connections	Chainplates	581
“STAINLESS” STEEL	CRUISING REINFORCEMENTS	583
Stainless Alloys	EXTERIOR FINISH	585
Crevice Corrosion	Colors	585
Pitting Corrosion	Gelcoat	585
Buffing	LPU	585
Passivating/Electropolishing	Deck Nonskid	586
Welding Issues	Molded-In Antifouling	586
Living with Corrosion		

CHECKING A USED BOAT	586	Cove Stripes	621
“Old” Boats	586	Hull Stripes	621
ALUMINUM	587	Deck Structure	622
Alloys	587	Graphics	622
Working with Aluminum	588	WINDOWS	623
Welding	589	Glazing Materials	623
Framing	590	Thermal Expansion	623
Plating	592	Gaskets	624
Engineering	593	Adhesives versus Fasteners	624
Quality Control	593	Bearing Rings	624
Integral Tanks	594	WATER BALLAST	626
Chainplates	595	Stability and Performance	628
The Mast Step	596	How Much Water Ballast?	628
Keel Construction	596	Tank Geometry	628
Rudder Construction	598	Hull Shape	628
Engine Room Details	600	Range of Stability	629
Through-hull Plumbing	600	Ballast Tank Construction	629
Deck Hardware	601	Plumbing	629
Hardware Isolation	602	Using Fuel and Water as Ballast	630
Deck Hatches	602	POSITIVE BUOYANCY	630
Windows	603	DOCKING	631
Miscellaneous Details	604	Rubbing Strake	631
Hull Insulation	607		
Anodizing	607	THE RIG.....632	
Electrolysis	607	DECISION LOGIC	632
Noise	608	Rig Efficiency	632
Fasteners	608	Boomed Sails	634
Painting	609	Aspect Ratio	634
Paint Protection	609	Headsail Area	636
Going Bare	609	Overlap	637
Cost Comparisons	609	TYPES OF RIGS	637
Welding after Completion	609	The Cutter	637
STEEL	610	Sloops	637
Weight	610	Fractional Rigs	638
Maintenance	611	The Yawl	640
Flame Spray Coatings	611	The Ketch	641
Insulation	612	Mizzen Aerodynamics	643
Long-term Considerations	612	Mizzen Headsails	643
TIMBER	612	Mizzen Rigging	644
Saturated Epoxy Technique	612	Shortening Down	645
DuraCore	612	Ketch Rig and Boat Size	645
FERROCEMENT	613	Schooners	646
TEAK DECKS	613	Gaff Rigs	646
PAINT	614	Junk Rigs	647
Bottom Paint	614	Modern Freestanding Rigs	648
Boot Stripes	615	AeroRig	648
External Paint Systems	615	SPAR ENGINEERING	650
AVOIDING PAINT PROBLEMS	615	Stability	650
Choosing a Paint System	615	Factors of Safety	651
The First Step	616	Shroud Angle and Beam	651
Inspection	616	Mast Compression Load	651
Warranties	616	Ambient Loading	653
Preparation	616	Cyclical Loading	653
Fairing	617	Worst-Case Loads	653
Final Coats	617	CHOOSING A MAST EXTRUSION	653
Handling Hazardous Materials	617	Unsupported Length	654
A Job that Went Bad	617	How Many Spreaders?	654
SPECIFICATIONS	619	Runners/Cutter Stay?	654
AESTHETIC ISSUES	619	Inertia	654
Boot-Stripe Design	619	Internal Stiffening	655

Chemical Milling	655	STAYS	688
Euler Buckling	655	LOWER SHROUDS	688
Extrusion Choice	655	CUTTER STAY	689
Section Modulus	655	MAKING THE PIECES FIT	690
Final Decision	655	ROD RIGGING	690
SPAR CONSTRUCTION	657	Corrosion	691
Welding	657	Stretch	691
Masthead Design	657	Attachments	692
Masthead Sheaves	658	Spreader Connections	692
Spinnaker Halyards	658	Repairs While Cruising	692
Spar Tapering	658	HYDRAULIC RIG CONTROLS	693
Mast Wiring	659	Hydraulic Theory	693
Attaching Hardware	659	Sizing Hardware	694
Electrolysis	659	Backstays	695
Mast Doublers	659	Vangs	695
Mainsail Track	659	Cutter Stay	695
External Tracks for Full-Batten Sails	659	Operating Pressures	695
Headboard Connection	660	Plumbing	695
Spreaders	660	Backup	696
Multiple Spreaders	661	Pressure-Relief Valves	696
Swept Spreaders	662	Do You Really Need Hydraulics?	696
Spreader Bases	663	BENDING THE CRUISING RIG	697
Spreader Tips	664	Conservative Bending	697
Mast Tangs	665	Creating The Bend	697
Keel-Stepped Spars	666	Safety Limits	698
Deck-Stepped Spars	666	Lower Shroud Factors	698
Deck Wedges	666	Reefing	699
Spartite	666	Using Spar Bend	699
The Mast Boot	667	Going Bendy	699
THE BOOM	669	B&R RIGS	700
Goosenecks	669	CARBON-FIBER SPARS	701
Internal Jammers	670	Weight Savings	702
Boom Rails	670	Fault Tolerance	703
Boomvang	671	Material Types	703
Rail Vangs	671	Manufacturing Processes	703
Hydraulic or Mechanical Vangs?	671	Fiber Orientation	703
Vang Doublers	673	Hardware Attachment	704
Topping Lifts	673	Lightning	704
Clew-to-Boom Connection	674	Longevity	704
Mainsheet Attachment	675	Decision Time	704
Boom Gallows	676	SPINNAKER POLES	705
STANDING RIGGING	676	Carbon Fiber	705
Basic Rig Engineering	676	End Fittings	705
Righting-Moment Tests	676	One Pole or Two?	706
Rigging Loads	677	Spinnaker Pole Storage On Deck	707
Ketch Allowances	677	Mast Storage	707
Factors of Safety	677	Chicken Stays	707
Choosing Wire Size	678	TRADITIONAL BOWSPRITS	708
Tang Factors	678	MODERN BOWSPRITS	708
VCG And Displacement	678	Bowsprit Loading	709
Wire Materials	679	Cantilevered	709
Wire Construction	679	Retractable Hardware	710
Yield Strengths	679	Negatives	710
Terminals	682	PIVOTING BOWSPRITS	711
Turnbuckles	684	Construction Details	711
Backstay Adjustment	685	Rigging	711
TWIN HEADSTAYS	686	In Use	713
TWIN BACKSTAYS	688	Does This Make Sense for You?	713
RUNNING BACKSTAYS	688	HEADSAIL ROLLER FURLING	714
STANDING INTERMEDIATE BACK-			

Vertical Center of Gravity	714	Test Results	733
Sail Shape	714	CONSTRUCTION	733
Reliability	714	Dacron	734
Changing Down	714	Spectra	734
When Roller Reefing Works	715	Vectran	734
Hardware	715	Aramid	734
Mast Issues	715	Halyards	734
Control Line	715	Rope-to-Wire Halyards	735
Cutter Stay	715	Wire Longevity	735
Whose Gear?	715	Galvanized?	735
Mariner System	716	Using Rope	735
Free-Flying Headsails	716	Wire Pennants	736
Horizontal Roller Furling	716	Inside or Outside?	736
MAINSAIL FURLING SYSTEMS	717	Reaving Halyards	736
Slab Reefing	717	Internal Chafe	736
How Many Reefs?	718	SHEETS	736
Reefing Lines	718	Attachment	736
Internal or External	718	Light Airs	736
Behind-the-Mast Roller Furling	718	LEADING CONTROLS AFT	737
In-Mast Roller Furling	719	PROPULSION SYSTEMS....738	
Roller-Furling Booms	719	BASIC RULES	738
The Race	719	Aesthetics	738
LIGHTING	721	Fasteners	739
Deck Lighting	721	THE ENGINE	740
Sail Lighting	721	Horsepower Ratings	741
Cockpit Lights	721	Detuning	741
GOING ALOFT	722	Two-Cycle or Four?	741
DECK GEAR....723		Injection Systems	741
WINCHES	723	RPM Range	742
Two- or Three-Speed?	723	Boosting Power	742
Winch Size	723	Parts Availability	742
Self-Tailing Alignment	723	Marinization Details	742
Drum Material	723	Spares	743
Reel Winches	723	Making Choices	743
POWER WINCHES	724	THE DRIVE LINE	743
Functions	724	Overall Efficiency	743
Which Winch?	725	Reliability	743
Hydraulic or Electric Drive?	725	RPM Versus Torque	743
Installation Considerations	726	TRANSMISSIONS	744
Controls	726	Mechanical versus Hydraulic	744
Electric versus Air-Remote Switches	726	Transmission Efficiency	744
Power Consumption	727	Power Ratings	744
Circuit Protection	727	Reduction Gear	744
Safety Factors	727	In-Line Configurations	745
Do You Need Power Winches?	727	V-Drives	745
Winch Minimums	727	Sail Drives	745
Noise	727	Cooling	745
JAMMERS	728	Get-Home Capability	745
BLOCKS	729	Power Takeoff	746
Snatch Blocks	729	Propeller Impact	746
Turning Blocks	730	Dampener Plates	746
GENOA TRAVELER	731	Engine Mounts	746
MAIN TRAVELER	731	Flexible Couplings	746
End-Boom or Mid-Boom Sheeting	732	Prop Shafts	746
Full-Width Travelers	732	Support Bearings	747
RUNNING RIGGING	733	Prop-Shaft Brackets	747
Handling	733	SHAFT-PACKING GLANDS	748
Working Loads	733	Common Gland Issues	748
Comparing Manufacturers	733	Maintenance	748

Shaft-Gland-to-Stern-Tube Connection	748	The Right Prop	765
Conventional Stuffing Boxes	748	Measuring Consumption	765
Lip Seal-Based Glands	748	Calculating Range	766
Oil-Lubricated Systems	749	Different Conditions	766
Spring-Based Seals	749	Daily Charging Allowance	766
SCATRA	750	How Much Range Do You Need?	766
Alignment Issues	750	FUEL TANKS	769
Sizing SCATRAS	750	Tank Materials	769
Maintenance	750	Buying New	769
PROPELLERS	751	Condensation	769
Propeller Engineering	751	Air Vents	770
Propeller Matching	751	Clean Outs	770
Sizing	751	Bladder Tanks	770
Swept Area	751	Return Fuel Circuit	770
Pitch	751	Fuel Transfer	770
Blade Shape	751	ENGINE OIL	770
How Many Blades?	751	Classifications	771
Tip Clearance	752	Spectrographic Analysis	771
Apertures	752	Bypass Oil Filters	771
Overpropping	752	Special Filters	771
Measuring Efficiency	752	Centrifuges	772
Cruising Considerations	753	Preluber	772
Trade-Offs	753	Oil-Changing Systems	772
Fixed-Blade Sailing Props	753	AIR SUPPLY	772
Folding Propellers	753	Air Cleaners	772
Maxi Props	753	CRANKCASE PRESSURE	773
Luke Propellers	754	Racor Crank Vent	773
Controllable-Pitch Props	754	Walker Air Sep	773
Autoprops	756	ENGINE ROOM BLOWERS	773
Gori Props	756	EXHAUSTS	774
Getting It Right	756	Aqua Lift	774
Propeller Protection	756	Jacketed Exhaust	775
Keep It Clean!	756	Hull Side Exhausts	775
POWER TAKEOFF	757	Mufflers	775
Brackets	757	Vibration	775
Alignment	757	Exhaust Hose	775
Belt Tensioning	757	FIRE CONTROL	776
PTO Capacity	758	Carbon Dioxide	776
Engine Loading	758	Halon	776
Drive Pulley Design	758	Manual Engine Shut-Down	776
Lay Shafts	759	ALARM SYSTEMS	777
V-BELTS	760	Basic Engine Alarms	777
How They Work	760	Alarm Sounds	777
Types of Belts	760	Automatic Engine Shut-Down	777
Horsepower Ratings	760	"Murphy" Gauges	777
Belt Tension	761	Multiple Alarm Signals	778
Dusting	761	Intrusion Alarms	778
One Belt or Two?	761	Flame Sensors	778
Multi-Belt Systems	761	Fire Control Circuits	779
Dealing with the Unexpected	761	Carbon-Monoxide Alarms	779
EMERGENCY STARTING	762	Bilge Alarms	779
FUEL SYSTEM	763	Gas Sensors	779
Filters	763	Overvoltage Alarm	780
Filter Installation	764	ENGINE INSTRUMENTS	780
Day Tanks	764	TWIN ENGINES	780
Fuel Lift Pumps	764	GET-HOME SYSTEMS	780
RANGE UNDER POWER	764	SOUND INSULATION	781
Fuel-Consumption	765	Sound Isolation	782
Speed-Length Ratio	765	HYDRAULICS	782
Bottom and Prop Condition	765		

Negatives	782	Is Your Pump Running?	797
System Balance	783	DAMAGE-CONTROL PUMPS	798
Applications	784	Rubber Impeller Pumps	798
Operating Pressure	784	Centrifugal Designs	798
Miscellaneous Requirements	784	Plumbing Issues	798
Constant Speed Systems	784	Using the Engine	799
THRUSTERS	784	MINIMIZING THE RISK OF SINKING	800
Judging Need	784	Standpipes	800
Thruster Power	785	FITTINGS	801
Controls	785	Pump Discharge	801
DOING WITHOUT AN ENGINE	785	PVC	802
CONTROLS	786	FRESHWATER SYSTEM	803
Control Systems	786	Pressure Water Pumps	803
Instruments	786	Accumulator Tanks	803
PLUMBING.....787		Pressure Switches	803
Salt-Water System	787	Electric Timer Switch	803
How Many Skin Fittings Do You Need?	788	Suction Side Leaks	803
Lightning Risks	788	Manual Backup	803
Electrolysis	788	Freshwater Filters	804
Hull Penetration	788	FRESHWATER TANKS	804
Sea Cocks	788	Tank Plumbing	804
Gate or Ball Valve?	788	Stainless Steel	805
SALT-WATER FEED	789	Aluminum	805
TOILETS	790	Fiberglass	805
HOLDING TANKS	791	Polyethylene	805
Tank Capacity	791	Bladders	805
Tank Construction	791	Deck Catchment	805
Tank Plumbing	791	Water Capacity	805
GRAY WATER	792	HOT WATER	806
Head Sinks	792	Defining Requirements	806
Shower Sumps	792	Sun-Based Systems	806
Galley Sinks	792	Engine-Based Hot Water	806
Gray-Water Tanks	792	Diesel Heaters	806
Fridge Drains	792	Propane Water Heaters	806
DECK WASH	792	Hot-Water Tanks	806
PLUMBING ODORS	793	Insulation	806
Salt-Water Feed	793	Size	806
Toilet Exhaust	793	Tank Construction	807
Gray Water	793	Heat Exchangers	807
PUMPS	794	Safety	807
Pump Capacity	794	Hot-Water Plumbing Layout	807
Lift and Discharge Length	794	Hot Water Circulation	808
Dry-Running Protection	794	Insulation	808
Strainers	794	Locker Drying	808
Check Valves	795	Long Showers	808
Anti-Siphon Loops	795	WATERMAKERS	809
Diaphragm Pumps	795	Drive Type	809
Submersible Pumps	795	Filters	810
Centrifugal Circulation Pumps	796	Booster Pumps	810
Manual Pumps	796	Ultraviolet Sterilization	810
BILGE PUMPING SYSTEMS	796	Mounting Issues	810
FLOAT SWITCHES	797	Frills	810
Mercury Switches	797	PROPANE SYSTEM	811
Reed Switches	797	Flammable Stores Storage	811
Electronic Switches	797	Tank Types	811
Using Relays	797	Capacity	811
Timed Circuits	797	Multiple Tanks	811
Cycle Counters	797	Solenoid Valves	811
		Warning Lights	812
		Pressure Gauge	812

Pressure Regulator	812	Eutectic in a Jug	833
Hose	812	Testing Your Box	834
Connections	812	Upgrading the Box	834
Cold-Weather Considerations	812	AIR-CONDITIONING	835
Electronic Gas Sniffer	812	Do You Need Air?	835
Biological Sniffers	812	Capacity Requirements	835
REFRIGERATION....813		Direct Expansion	835
OBJECTIVES	813	Chilled Water	836
Principles of Refrigeration	813	Reverse-Cycle Heating	836
Running Time	814	Evaporator Installation	836
The Box	814	Compressor Installation	837
Gaskets	816	Using the Fridge Compressor	837
INSULATION	817	Electric Loads	837
Foam Thickness	817	Duty Cycle	837
High-Tech Panels	817	HEATING....838	
Temperature	818	HEATING BASICS	838
Temperature versus Food Longevity	818	Condensation	838
Interior Volume	818	Safety	838
HOLDING PLATES	820	Circulating Air	839
How Holding Plates Work	820	Using the Stove	839
Non-Eutectic Solutions	820	Kerosene Lamps	839
Super Juice	821	Convection Heaters	839
Eutectic Temperature	821	FORCED AIR	840
Surface Area versus Temperature	822	HOT-WATER SYSTEMS	840
Use of Fans to Augment Air Flow	822	Installation Issues	842
Plate Location	822	Plumbing Design	843
Built-In Plates	822	Piping	843
Plate Plumbing	822	Btu Capacity	844
Coil Design	823	Windshields	844
Oil Traps	823	Electrical Consumption	844
Plate Capacity	823	THE ELECTRICAL SYSTEM....845	
Using Evaporator Coils	824	WIRE	845
Whose Plates?	824	Coaxial Cable	845
Testing an Existing Plate	824	Wire Protection	845
THE COMPRESSOR	825	Layout	846
Engine Drive	825	Providing for the Future	846
Sealed AC Compressors	826	Amp-Carrying Capacity	846
DC Compressors	827	Segregation	846
AC or DC?	827	Voltage Drop	847
Size and Efficiency	828	END TERMINALS	850
Danfoss	828	Moisture Proofing	851
Dual Circuiting	828	Wire Identification	851
Heat Exchangers	828	CONTROL PANEL	852
Cooling Pumps	828	Visual Indicators	853
Hull Coolers	828	Overcurrent Protection	853
Liquid-Side Subcoolers	829	Fuse Logic	854
Automatic Cycling	829	DC Ground	854
Dual T-Stat Systems	829	External Electrical Controls	855
Driers	829	Meters	855
Refrigerant Receiver	830	THE DC SYSTEM	857
Oil and Gas Separator	830	Safety First	857
High-Pressure Cutout	830	BATTERY SWITCHES	857
Sight Glass	830	Bilge-Pump Wiring	857
Expansion Valves	830	BATTERIES: HOW THEY WORK ...	858
Super Heat Setting	831	Starting Batteries	858
Plumbing	831	Deep-Cycle Batteries	858
The Pump-Down Cycle	833	Traction Batteries	859
Maintenance	833	NiCad Batteries	860
Spare Parts	833		
Deciding on a System	833		

Gel Cells	860	AC POWER	887
Battery Life	861	SAFETY	887
Other Battery-Choice Factors	861	AC BASICS	887
Cell Size	862	On-Board Wiring	888
How Much Capacity?	862	Bonding System	888
State of Charge	863	Galvanic Isolators	888
Installation	864	Isolation Transformers	889
Hydrocaps	865	GFI Plugs	889
Battery Temperature	865	CONNECTING TO SHOREPOWER	889
Specific Gravity of Electrolyte	865	Conventional Wiring	889
The Charging Cycle	867	Polarity Testing	890
Charge Acceptance Rate	867	Foreign Power	890
Topping Off	867	AC SYSTEMS LOGIC	890
Charging Voltage	868	Capacity	890
Equalizing Charge	868	Selector Switches	890
ALTERNATORS	868	INVERTERS	891
Output Curve	868	MOSFET Efficiency	891
Heat Impact	869	Defining Capacity?	891
Rpm Ratings	869	Square Wave or Sine Wave?	891
Case Size	869	Built-In Battery Charger	892
Engine-Mounting Issues	869	Installation Issues	892
Dual Alternators	870	Crossover Switches	892
Mega Alternators	870	What Doesn't Work?	892
Full-Field		AC GENERATORS	893
Operation 870		Location	893
24-Volt Alternators	871	Capacity	893
REGULATORS	871	Impact of Air-Conditioning	893
Alternator Sense Voltage	872	Diesel Considerations	894
Installing a Second Regulator	872	Cruise Generators	894
BATTERY CHARGERS	872	Generator Wiring	895
Capacity	872	110 Volts or 220 Volts?	895
AC-Power Decisions	872	Portable Generators	895
Marine Construction	872	ELECTRICAL NOISE	895
Ferro Resonant	873	Metal versus Fiberglass Boats	895
Microprocessor Control	873	Finding the Source	895
Inverter Chargers	873	RF Suppression	896
DC GENSETS	873	METAL BOAT ELECTRICAL SYSTEMS	896
Backup or Everyday Use?	873	Electrolytic Corrosion	896
Doing It Yourself	874	Alloys	897
ALTERNATIVE ENERGY	875	Avoiding Corrosion	897
TOWING GENERATORS	875	Paint Protection	897
PROP SHAFT POWER TAKE-OFF	876	Bonding System	897
SEPARATE CHARGING SHAFT	877	Stray Currents	898
WIND GENERATORS	878	Isolation	898
Installation Safety	878	Engines and Gensets	899
Use as a Towing Generator	879	Windlasses	899
Output	879	Bilge Pumps	899
Overspeed Issues	879	RF Grounds	900
Regulating Output	879	Circuit Breakers	900
SOLAR PANELS	881	Electrical Fault Alarms	900
How Much Capacity?	881	Shore Power	900
Solar Output	881	AC Ground	900
Wiring	881	Wiring Protection	900
Mounting	882	SYSTEMS INTEGRATION	900
Dealing with Heat Build-Up	884	Decision-making Process	901
Self-Regulation	884	Simple Approach	901
Type of Panels	884	Adding Refrigeration	902
In the Real World	885	Electrical Refrigeration	902
12 OR 24 VOLTS?	887	Going with Air	902
		Adding Hydraulics	903

Our Next Boat!	903	Storm Covers	939
DECK LAYOUT....904		Creating a Plenum Chamber	939
COCKPITS	904	Drainage Issues	940
Bridgedecks	904	Creating a Wind-Scoop Effect	940
Cockpit Design	905	BREAKWATERS	941
Helm Chairs	910	WIND SCOOPS	942
Cockpit Volume	911	FANS	943
COMPANIONWAYS	911	VENTILATING FURNITURE	943
Offset Companionway Hatches	911	HEAD COMPARTMENTS	943
Washboards	911	GALLEY ODORS	943
Companionway Threshold	911	AIRFLOW AFT	943
Sliding Hatches	911	INTERIOR DESIGN....944	
WORKING ON DECK	912	DEFINING NEEDS	944
Stanchion Bases	913	Space	944
Gates and Openings	915	Coziness	944
Gate Location	915	Privacy	944
Pulpits	915	STORAGE	946
Pushpits	915	Vessel Basics	948
Wire Attachment	916	Cruising Equipment	948
Wire	916	Spares and Tools	948
End Fittings	916	Clothing	948
A Word of Caution	916	Books	949
Mast Bars	918	Foul-Weather Gear	949
HANDLING DOCK LINES	919	Galley Gear	949
Aluminum Toerails	919	Navigation Materials	950
Catching Rain	919	Business Materials	950
Positioning	919	SLEEPING AREAS	952
Cleats	919	Bunk Dimensions	953
ON-DECK STORAGE	920	Fitting a Double	954
COCKPIT LOCKERS	921	Leecloths	954
RUNNING LIGHTS	921	Guest Cabins	963
SAILING SHELTER	922	Secrets to a Dry Bunk	969
HARD TOPS	922	GALLEYS	971
FIXED WINDSHIELDS	922	Counter Space	975
THE PILOTHOUSE	924	Sinks	975
Ergonomics	924	Seagoing Considerations	975
External Sight Lines	925	Stoves	976
Internal Sight Lines	926	Electrical Appliances	978
Sole Width	926	Galley Storage	979
Structure	926	Trash	984
Glazing	926	NAVIGATORIUM	985
Window Shading	927	Use for Office Work	985
Visibility Issues	927	Electronics Installation	986
Pilothouse Ventilation	928	HEADS	990
Navigating from Inside	928	Toilet Orientation	990
Aft Overhangs	929	Showering	990
Night Lighting	929	Sole Gratings	991
Seat Design	929	Are Two Heads Better Than One?	991
The Hybrid Approach	929	Day Head	991
Winch Location	930	Do You Want A Bathtub?	991
VENTILATION	932	Shower Curtains	991
BASIC ON-BOARD AIRFLOW	932	SALOONS	993
Deck Hatches	933	Seat Arrangements	996
WINDOWS AND PORTS	935	Built-In Chairs	1000
Size and Quantity	935	Pilot Berths	1001
SCREENS	936	COMPANIONWAYS	1003
DORADE VENTS	938	Steps	1004
Knockdowns	938		

HANDRAILS	1004	Cosmetics	1038
ENTERTAINMENT CENTERS	1005	Size versus Equipment	1039
ENGINE SPACE	1006	Your Boat as an Investment	1039
CABINETWORK	1007	Ex-Racing Yachts	1039
Door Design	1007	Evaluating Sail Inventories	1039
Timbers	1008	<i>INTERMEZZO</i>	1040
Fiddle Rails	1010	First Sail	1041
Furniture Ventilation	1012	The Rig	1041
Hardware	1013	Sail Inventory	1042
Drawers	1015	Getting Ready to Cruise	1043
Finish	1015	New Zealand Changes	1046
HEADLINER SYSTEMS	1016	NEW PRODUCTION	1048
Finished Structure	1017	“Percentage Boats”	1048
Stretched Fabric	1017	A New Paradigm	1048
Drop Panels	1017	SEMI-CUSTOM	1049
Fastening	1017	CUSTOM	1049
Panel Layout	1017	WHERE THE MONEY GOES	1050
DECOR	1018	High-Volume Production Builders ...	1050
DESIGN COORDINATION	1019	Design Costs	1050
Spacial Concepts	1021	Nonproduction Projects	1050
Mirrors	1023	Hull and Deck Costs	1051
Vertical Surfaces	1024	Displacement	1051
Horizontal Surfaces	1026	Stability	1051
Artwork	1026	Bill of Materials	1052
Plants	1026	Labor Content	1052
Windows	1026	Finish	1052
Window Treatments	1027	Complexity	1052
Cushion Fabrics	1027	Changes	1053
UPHOLSTERY	1028	MAXIMIZING YOUR RETURN	1053
Types of Foam	1028	BUSINESS ISSUES	1054
Watertight Integrity	1028	REAL-WORLD EXPERIENCE	1054
Ventilation	1028	Racing Experience	1054
Fabric Issues	1029	Cruising Experience	1054
Bunk Mattresses	1029	THE NAVAL ARCHITECT	1055
Saloon Seating	1029	Understanding the Profession	1055
Loose or Mounted Construction?	1031	Establishing a Concept	1056
Saloon Sleeping	1031	Drawing Detail	1056
Corners	1031	Engineering Approach	1057
Access	1032	Compensation	1057
Cockpit Cushions	1032	Engagement Letter	1057
Supplying Your Own Materials	1032	Potential Problem Areas	1058
CABIN SOLES	1034	SELECTING A BUILDER	1058
Sole Locks	1034	Yard Efficiency	1059
Timber Soles	1034	Overhead	1059
Nonskid Varnish	1034	Small Yards	1059
Carpeting	1035	Dealing with an Individual	1059
Vinyls	1035	Productivity	1059
LIGHTING	1035	Cleanliness	1060
Fluorescent	1035	Thinking Costs	1060
Incandescents	1036	Fire Hazard	1060
Quartz Halogen	1036	The Key Man	1060
Tube Lighting	1036	Talk to Previous Clients	1060
Dimmers	1037	FOREIGN YARDS	1061
Changing Bulb Voltage	1037	Exchange Rate	1061
Watch Lighting	1037	Other Risk Factors	1061
ACQUIRING A YACHT.....1038		Financing Options	1062
BUDGET	1038	Supplying Raw Materials	1062
Wait to Spend!	1038	The Bottom Line	1062
USED	1038	QUALITY	1063

Specified Quality	1063
Structural Quality	1064
Subcontract Quality	1064
Hull Finish	1064
Testing	1065
THE OWNER	1065
Making Up Your Mind	1066
Supply Your Gear on Time	1066
Stay Within the Chain of Command	1066
Scheduling Impacts Costs	1066
RESALE	1066
Brokerage Perception	1067
Custom Pedigree	1067
Earning a Name	1067
Features	1067
Equipment	1068
SPECIFICATIONS	1068
Production-Boat Specs	1068
Custom-Boat Specs	1068
CONTRACTS	1069
Basics of a Good Contract	1070
Buying New	1072
Production Manufacturers	1073
Progress Payments	1073
Custom-Yacht Contract	1073
SEA TRIALS	1076
FORMS OF PAYMENT	1078
Letters of Credit	1078
Bank Guarantees	1080
Sight Drafts	1080
PAYMENT SCHEDULES	1080
Basic Payment Schedule	1081
Detailed Payments	1081
Cost Plus Fixed Fee	1082
CLASSIFICATION SOCIETIES	1082
Building Under Supervision	1083
ABYC Standards	1083
Keeping Certification Up to Date	1083
REGISTRATION	1084
U.S. Flag	1084
Foreign Flag	1084
Official Measurement	1084
Marking Certificate	1084
SALES TAX	1084
A WORD ABOUT SCHEDULING	1084
COMMISSIONING	1084
Launch Party	1085
Avoiding the Boatyard Blues	1085
BUILDING IT YOURSELF	1086
<i>Laila N</i>	1086
<i>Eos</i>	1089
OPERATING EXPENSE	1091
Major Cost Issues	1091
Size	1091
Access	1091
Righting Moment	1091
Normal Wear and Tear	1091
Sitting Impact	1091
Who Does the Work?	1091

PERSPECTIVE.....1092

CONTESSA 26	1092
PEARSON VANGUARD	1093
CAL 29	1094
<i>MISTRAL</i>	1096
<i>BEACH PARTY</i>	1101
<i>INTERMEZZO II</i>	1102
Interior	1104
Working on Deck	1107
St. Helena	1109
<i>SUNDEER</i>	1113
Rig	1116
Maintenance Issues	1118
Systems	1119
Interior Layout	1121
<i>HIO AVAE</i>	1123
The Search	1123
Santana 37	1124
Cruising Conversion	1126
Sail Inventory	1131
Getting Ready to Go	1133
<i>BEOWULF</i>	1138
Design Objective	1138
Initial Hull Shapes	1139
Water Ballast	1139
Rig Design	1140
Articulating Bowsprit	1142
Deck Layout	1142
Pilothouse	1142
Interior Layout	1143
Keel and Rudder Design	1143
Final Hull Shape	1145
Hull Construction	1146
Living With A Mock-up!	1151
Launching	1151
Initial Trials	1152
Cruising Test	1155
Engine Room	1157
Nightmares	1160
After 8,000 Miles	1163
Weather Lessons	1164
Handling Under Sail	1165
Using Salt-Water Ballast	1165
Handling Under Power	1167
Interior Changes	1167
Systems Changes	1184
Revised Displacement	1184
The Next Boat	1184
Where To From Here?	1185
INDEX	1186
ALUMINUM PAINT SPECS	1214
STEEL PAINT SPECS	1216
FIBERGLASS PAINT SPECS	1217
CUSTOM YACHT SPECIFICATION	1219