

Contents

Introduction—Offshore Navigation for the Recreational Boater in the 21st Century . . . ix	Sights on the Moon 24
Course Introduction ix	Sights on Stars and Planets 24
Welcome to the World's Oceans ix	Altitude Adjustments 25
Preview of the Course x	Altitude Corrections 25
Getting the Most from this Text x	Star Sights 25
Completing the Navigation Course xi	Planet Sights 26
Accuracy, Precision, and Practices xii	Additional Correction (Add'l Corr)
Standards Of Precision And	for Venus and Mars 26
Computational Practice xii	Moon Sights 27
Special Note on Rounding xiii	Non-Standard Air Temperature &
Materials and Equipment You Need	Atmospheric Pressure (T&B) 29
for this Course xiv	High Altitude Sights 30
References for Further Study xiv	Summary of Altitude Adjustments 30
Materials Provided xv	Celestial Coordinates 31
Chapter 1, A View of our Solar System . . 1	Sidereal Hour Angles 31
Navigational Astronomy 1	Computing LHA and Dec 32
The Solar System 2	Time Diagrams 33
The Sun 2	Moon Sights – Determining LHA
The Planets 3	and Dec 33
The Moon 3	Planet Sights – Determining LHA
The Stars 3	and Dec 36
Changes in the night sky	Star Sights – Determining LHA
throughout the year 3	and Dec 37
Changes in the Seasons - First	Summary of LHA and Dec
Point of Aries defined 4	Calculations 39
Sidereal Time 6	Summary of Corrections 39
SHA of a Star 6	References 39
SHA of the Sun 6	Solutions to Skill Exercises 39
References 6	Optional Material 42
Homework 7	Sight Data Averaging 42
Chapter 2, SunriseSunset 9	Minor Corrections 44
Solar Phenomena 9	Magnitude 44
Definitions 10	The Electronic Almanac 44
Local Mean Time 10	Reed's Nautical Almanac 44
Converting LMT to ZT 12	Homework 45
Predicting Solar Phenomena 13	Chapter 4, Reducing and Plotting
Moonrise and Moonset 15	Celestial Sights 47
Aboard a Moving Vessel 16	Overview 47
References 17	Reference Positions for Sight Reductions . . 48
Solutions to Skill Exercises 17	Sight Reduction by the Law of Cosines –
Homework 21	Stars, Moon, and Planets 49
Chapter 3, Taking Sights and Finding	Computers and Calculators 51
Ho, LHA and Dec 23	Plotting LOPs Determined by the Law of
Overview of Sight Reduction 23	Cosines – Stars, Moon, and Planets . . . 51
The Sextant 24	Celestial Fixes 52
Taking the Sight 24	Two-Body Fix 52
	Running Fixes 56
	Fix from a Moving Vessel 56

Three-Body Fix.....	57	References	102
Summary	61	Solutions to Skill Exercises.....	103
References	61	Optional Material	104
Solutions to Skill Exercises.....	61	Setting the Star Finder	104
Homework	65	Finding LMT of Desired Observations	104
Chapter 5, Sight Reduction and Plotting		Homework	105
by the NASR Method	67	Chapter 7, Emergency Navigation	107
Introduction	67	Planning for Emergencies	107
<i>Nautical Almanac Sight Reduction</i>		Emergency Navigation Kit	108
(NASR) Method	68	Most Probable Position.....	108
General Description.....	68	Plotting Sheets	109
NASR Sight Reduction Form.....	69	Dead Reckoning	111
Precision to be Used on Sight		Simplified Traverse Table.....	111
Reduction Form.....	69	Deck Log	114
Detailed Description of the Procedure..	69	Life Raft Navigation	114
Sight Reduction by the NASR Method	70	References	114
Altitude Corrections	71	Solutions to Skill Exercise	114
The Computed Altitude.....	72	Homework	117
The Intercept	72	Chapter 8, Electronics Offshore.....	119
The Azimuth	72	Automatic Identification System AIS.....	120
Negative Altitude	72	How does AIS work?.....	121
Plotting LOPs by the NASR Method.....	73	Overview of Offshore Navigation	
Multi-body fixes	75	Software Used in Course.....	121
Three-Body Fix.....	77	Overview of <i>Visual Passage Planner 2</i> ..	122
Fix from a Moving Vessel	79	Loading <i>VPP2</i>	122
Summary	81	<i>VPP2</i> Basics	123
References	81	A few functions of <i>VPP2</i>	123
Solutions to Skill Exercises.....	82	A few features of <i>VPP2</i>	124
Homework	85	Overview of <i>Capn</i>	126
Chapter 6, Sight Planning	87	Loading <i>Capn</i>	126
Sights on Stars and Planets	87	<i>Capn</i> Basics	126
Sights on the Moon.....	87	Opening Charts	126
Planning Considerations.....	87	Moving Around the Charts.....	127
The Face of the Sky	88	Cursor Info	127
Computer Resources.....	88	Viewing Area Display Options.....	127
<i>Celestial Tools</i>	89	Charting Preferences	128
The Star Finder.....	92	Screen Display Options.....	130
Star Base.....	93	Plot in DR Mode.....	130
Red Template	93	Trip Log	131
Blue Templates.....	94	Planning an Offshore Voyage.....	132
Plotting Celestial Bodies.....	94	Summary – Route Planning with <i>VPP2</i>	
Planets	94	and Importing into <i>Capn</i>	140
Sun and Moon	95	Deleting, Inserting, and Moving	
Setting the Star Finder.....	96	Waypoints	141
Sight Planning	97	Manually Inserting a Route and Setting	
Choice of Bodies	99	Alarm Zones.....	142
Twilight Sights	100	DR Mode & Trip Log	144
Daylight Sights	100	<i>Capn</i> Charts.....	145
Star Identification.....	102	Summary.....	145
Learning the Night Sky by Constellations.	102		

A Final Look at the Navigation	
Environment.....	145
References	146
Solutions to Skill Exercises.....	146
Homework	149
Chapter 9, Underway.....	151
Navigational Routine at Sea	151
Plotting Sheets	151
900 Series Plotting Sheets.....	152
Variation Changes.....	152
Time Zone Boundaries.....	153
Plotting Position Offshore	153
Plotting a Day's Work at Sea	155
Plotting the LOP	155
Estimated Positions	155
Running Fixes	155
Determining Current	156
Plotting Conventions.....	156
References	156
Days Work Plot	(foldout after page 158)
Homework, Practice Cruise	159
Deck Log Sheets	173
Appendix A, Special Altitude	
Corrections	177
Dip Short Sights.....	177
Artificial Horizon Sights.....	178
Back Sights.....	179
Appendix B, Excerpts from the	
Nautical Almanac	181
Appendix C, Glossary for the USPS	
Junior Navigation and USPS	
Navigation Courses	223
Appendix D, Sight Folder Requirements	
and Forms	233
Navigation Sight Folder Requirements ..	233
Run of Observations	233
Limits for Sights	234
Standards of Accuracy.....	234
General Rules	235
Sight Folder Contents	236
Submitting Sights for Grading.....	237
Sight Folder Resubmittal	237
Sight Folder Forms	(following page 238)
Appendix E, Answers to the Homework	
Questions	249

7-4	Example 1 - Determine Point of Arrival .	113
7-5	Skill 1 - Determine Point of Arrival.....	116
	Blank Simplified TraverseTable	
	Worksheet (Unnumbered page 118)	
8-1	AIS Class B Transceiver.	120
8-2	Visual Passage Planner 2 –	
	Opening Screen	123
8-3	Visual Passage Planner 2 – April	124
8-4	Predefined Locations	125
8-5	<i>Capn</i> Charting Preferences – Charts . .	128
8-6	<i>Capn</i> Charting Preferences –	
	Routes and Marks	129
8-7	<i>Capn</i> - Plot in DR Mode	130
8-8	<i>Capn</i> - Trip Log Window.	131
8-9	Visual Passage Planner 2 -	
	Opening View	132
8-10	“Predefined Locations”	133
8-11	Visual Passage Planner 2 –	
	Optimized Route with 12 Waypoints .	135
8-12	Visual Passage Planner 2 –	
	Quick Report	136
8-13	Edit Waypoints – Exporting	
	Waypoints from VPP2 to <i>Capn</i>	137
8-14	Importing Marks into <i>Capn</i>	137
8-15	Import Marks from Text file – <i>Capn</i> . .	138
8-16	Waypoints and User Marks You’ve	
	Created – <i>Capn</i>	139
8-17	Waypoints and User Marks You’ve	
	Created – <i>Capn</i> - Creating Route . . .	139
8-18	<i>Capn</i> Route	140
8-19	Manually Inserting a Route in	
	<i>Capn</i> & Entering a Harbor	143
8-20	Alarm Zone.	144
8-21	Review Log Book	145
8-22	Visual Passage Planner 2 –	
	Vessel Profile.	146
8-23	<i>Capn</i> – Miami FL to San Juan	
	Puerto Rico.	147
8-24	<i>Capn</i> – Miami FL to San Juan	
	Puerto Rico - Waypoint List	147
9-1	Day’s Work Plot. . . . (following page 158)	
9-2	Example 2 - Day’s Work Plot.	158
	Blank Deck Log Sheets.	173-176
A-1	Sextant Sight on an Artificial Horizon....	178
A-2	Backsight	179

Tables

4-1	Labels for Z, where ‘ddd.d’	
	represents the Azimuth Angle (Z).	48
4-2	Calculating Zn	48
5-1	<i>NASR</i> Rules	68