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Ship Handling



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Theory and practice

D.J. House



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Repeated use of 'he or she' can be cumbersome in continuous text. For simplicity, therefore, the male pronoun predominates throughout this book. No bias is intended, as the position of an Officer, Chief Mate, Helmsman, Engineer, etc. can equally apply to a female worker.

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About the author

David House is currently engaged in the writing and the teaching of maritime subjects, with his main disciplines being in the Seamanship and Navigation topics. Following a varied seagoing career in the British Mercantile Marine, he began a teaching career at the Fleetwood Nautical College in 1978. He also commenced writing at about this time and was first published in 1987 with the highly successful "Seamanship Techniques" now in its 3rd edition and distributed worldwide.

Since this initial work, originally published as two volumes, he has written and published fourteen additional works on a variety of topics, including: Heavy Lifting Operations, Helicopter Operations at Sea, Anchor Work, Drydocking, Navigation for Masters, Cargo Work, Marine Survival and Ferry Transport Operations.

This latest publication is designed as a training manual, to highlight the theory and practice of ship handling procedures, relevant to both the serving operational officer as well as the marine student. It encompasses the experiences of the author in many of the scenarios and reflects on the hardware employed in the manoeuvring and the control of modern shipping today.

Preface

The reality of handling the ship is a world apart from the theory. No publication can encompass the elements of weather and features of water conditions to make the practice and theory one and the same. The best any book can hope for is to update the mariner with the developments in hardware employed to effect modern-day manoeuvres. Since the demise of sail, machinery and manoeuvring aids have continued to improve and provide additional resources to the benefit of Masters, Pilots and others, charged with the task of handling both large and small power-driven vessels.

Maritime authorities are united in establishing a safe and pollution-free environment. Internationally, it is these interests that provide the desired protection for operators to conduct their trade in some of the most active and busiest areas of the world. The theory of a manoeuvre may be ideally suited for a certain port at a certain time, but the many variables involved may make the same manoeuvre totally unsuitable at another time. Ship handlers and controllers must therefore be familiar with the capabilities of the ship, while at the same time be flexible in the use of resources against stronger currents or increased wind conditions.

Knowing what to do and when to do it: in order to attain the objective is only half of the task. The reasoning behind the actions of the ship handler will tend to be based on the associated theory at the root of any handling operation. Such knowledge – coupled with main engine power and steering, anchors and moorings, tugs and thrusters, if fitted – can be gainfully employed to achieve a successful docking or unberthing.

Practice with different ships, and fitted with different manoeuvring aids, tends to increase the experience of the would-be ship handler. Training for junior officers to increase their expertise in the subject is unfortunately extremely limited. Unless Ship's Masters allow 'hands on' accessibility, few have the early opportunity to go face to face with a subject which is not an exact science. The theoretical preparation, the advance planning and the execution of any manoeuvre will not materialise overnight. And an understanding of the meteorological conditions may not initially be seen as a relevant topic, but ship handling against strong winds with a high freeboard vessel is somewhat different to manoeuvring with a large fully loaded tanker with reduced freeboard in calm sea conditions.

The purpose of the text, therefore, is to combine the hardware, with the theory in variable weather and operating conditions. Ship handling is not a stand alone topic and, by necessity, must take account of the many facets affecting a successful outcome. Knowing the theory is necessary, putting it into practice is essential.

David J. House

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Meteorological tables common to the marine environment

Fog and visibility table

<i>Scale number</i>	<i>Description and range</i>
0	Dense fog, targets not visible at 50 metres
1	Thick fog, targets not visible at 1 cable
2	Fog, targets not visible at 2 cables
3	Moderate fog, targets not visible at 0.5 mile
4	Mist or haze, targets not visible at 1 n/mile
5	Poor visibility, targets not visible at 2 n/miles
6	Moderate visibility, targets not visible beyond 5 n/miles
7	Good visibility, targets visible up to 10 n/miles
8	Very good visibility, targets visible up to 30 n/miles
9	Excellent visibility, targets visible beyond 30 n/miles

Sea state table

<i>Descriptive state of sea waves</i>	<i>Wave height in metres</i>
Calm – glassy	0
Calm – ripples	0–0.1
Smooth wavelets	0.1–0.5
Slight	0.5–1.25
Moderate	1.25–2.5
Rough	2.5–4.0
Very rough	4.0–6.0
High	6.0–9.0
Very high	9.0–14.0
Phenomenal	Over 14 metres high

Swell

<i>Length of swell</i>	<i>Length in metres</i>
Short	0 to 100
Average	100 to 200
Long	Over 200
<i>Height of swell</i>	<i>Height in metres</i>
Low	0 to 2.0
Moderate	2.0 to 4.0
Heavy	Over 4.0

The Beaufort Wind Scale

<i>Force</i>	<i>Description</i>	<i>Sea state</i>	<i>Speed in knots</i>
0	Calm	Smooth	0–1
1	Light airs	Small wavelets	1–3
2	Slight breeze	Short waves, cresting	4–6
3	Gentle breeze	Small waves, breaking	7–10
4	Moderate breeze	Definite whitecaps	11–16
5	Fresh breeze	Moderate waves	17–21
6	Strong breeze	Larger waves	22–27
7	Moderate gale	Spindrift formed	28–33
8	Fresh gale	Much spindrift	34–40
9	Strong gale	Seas start to roll	41–47
10	Whole gale	Seas roll and break heavily	48–55
11	Storm	Surface all white big seas	56–65
12	Hurricane	Enormous seas	Above 65

Weather notations and symbols as plotted on synoptic weather charts

Type of front	Symbol as used on charts
Quasi-stationary front	
Quasi-stationary front, above the surface	
Warm front	
Warm front, above the surface	
Cold front	
Cold front above the surface	
Occlusion	
Instability	
Intertropical front	
Convergence line	
Warm air stream (not in common use)	
Cold air stream (not in common use)	

List of abbreviations associated with ship handling and shipboard manoeuvres

AC	Admiralty Cast (Class)
ACV	Air Cushion Vessel
AHV	Anchor Handling Vessel
AIS	Automatic Identification System
AKD	Auto Kick Down
AM	Admiralty Mooring
AMD	Advanced Multi-Hull Design
AMVER	Automated Mutual Vessel Rescue system
ARPA	Automatic Radar Plotting Aid
ASD	Azimuth Stern Drive
ATT	Admiralty Tide Tables
AUSREP	Australian Ship Reporting system
BS	Breaking Strength
CBD	Constrained by Draught
CD	Chart Datum
CG	Coast Guard
CMG	Course Made Good
CNIS	Channel Navigation Information Service
C/O	Chief Officer
COLREGS	The Regulations for the Prevention of Collision at Sea
CPA	Closest Point of Approach
CPP	Controllable Pitch Propeller
CQR	Chatham Quick Release (anchor type) (doubtful)
CSP	Commencement of Search Pattern
CSWP	Code of Safe Working Practice
D	Depth
DAT	Double Acting Tanker
DB	Double Bottom (tanks)
DC	Direct Current
DGPS	Differential Global Positioning System

DNV-W1	One Man Bridge Operation (DNV requirement)
DP	Dynamic Positioning
DR	Dead Reckoning
DSC	Dynamically Supported Craft (Hydrofoils)
DSV	Diving Support Vessel
DV	Desired Value
DWA	Dock Water Allowance
DWT (dwt)	Deadweight
ECDIS	Electronic Chart Display and Information System
ECR	Engine Control Room
ENC	Electronic Navigation Chart
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure
ETV	Emergency Towing Vessel
FFTS	Flat Fluke Twin Shank
FMECA	Failure Mode Effective Critical Analysis
FPSO	Floating Production Storage Offloading system
FRC	Fast Rescue Craft
FSE	Free Surface Effect
FSU	Floating Storage Unit
FW	Fresh Water
FWE	Finished With Engines
G	Representative of the Ship's Centre of Gravity
GM	Metacentric Height
GPS	Global Positioning System
Grt	Gross registered tons
GT	Gas Turbine
HFO	Heavy Fuel Oil
h.p.	Horse power
HSC	High Speed Craft
HW	High Water
IACS	International Association of Classification Societies
IALA	International Association of Lighthouse Authorities
IAMSAR	International Aeronautical and Maritime Search and Rescue manual
IIP	International Ice Patrol
IMO	International Maritime Organization
INS	Integrated Navigation System
IPS	Integrated Power System (Controllable Podded Propulsion Units)
IWS	In Water Survey
Kg	Kilograms
Kts	Knots
kW	Kilowatt

LAT	Lowest Astronomical Tide
LBP	Length Between Perpendiculars
LCD	Liquid Crystal Display
LHC	Left Hand Controllable
LHF	Left Hand Fixed, propeller
LMC	Lloyds Machinery Certificate
LOA	Length Overall
LSA	Life Saving Appliances
LW	Low Water
M	Representative of the Ship's Metacentre
M	Metres
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coastguard Agency
MCTC	Moment to Change Trim 1 Centimetre
Medivac	Medical Evacuation
MGN	Marine Guidance Notice
MHWN	Mean High Water Neaps
MHWS	Mean High Water Springs
MLWN	Mean Low Water Neaps
MLWS	Mean Low Water Springs
MMSI	Maritime Mobile Service Identity Number
mm	millimetres
MoB	Man overboard
MPCU	Marine Pollution Control Unit
MRCC	Marine Rescue Co-ordination Centre
MSC	Maritime Safety Committee (of IMO)
MSI	Marine Safety Information
MSN	Merchant Shipping Notice
MV (i)	Motor Vessel
MV (ii)	Measured Value
nm	nautical mile
NUC	Not Under Command
NVE	Night Vision Equipment
OiC	Officer in Charge
OIM	Offshore Installation Manager
OMBO	One Man Bridge Operation
OOW	Officer Of the Watch
O/S	Offshore
OSC	On Scene Co-ordinator
PEC	Pilot Exemption Certificate
PSC	Port State Control
RAF	Royal Air Force
RHC	Right Hand Controllable

RHF	Right Hand Fixed, propeller
RMS	Royal Mail Ship
RN	Royal Navy
RoPax	Roll on–Roll off Passenger Vessel
Ro–Ro	Roll on–Roll off
RoT	Rate of Turn
RPM	Revolutions Per Minute
SAR	Search and Rescue
SBE	Stand By Engines
SBM	Single Buoy Mooring
s.h.p.	<i>Shaft Horse Power</i>
SMC	SAR Mission Controller
SMG	Speed Made Good
SPM	Single Point Mooring
SQ	Special Quality
SS	Steam Ship
Stb'd	Starboard
SW	Salt Water
SWATH	Small Waterplane Area Twin Hull
SWL	Safe Working Load
TMC	Transmitting Magnetic Compass
TRS	Tropical Revolving Storm
TSS	Traffic Separation Scheme
TVF	Tip-Vortex – Free
UKC	Under Keel Clearance
ULCC	Ultra Large Crude Carrier
UMS	Unmanned Machinery Space
USCG	United States Coast Guard
VCR	Voith Cycloidal Rudder
VDR	Voyage Data Recorder
VHF	Very High Frequency
VLCC	Very Large Crude Carrier
VLGC	Very Large Gas Carrier
VSP	Voith Schneider Propeller
VTMS	Vessel Traffic Management System
VTs	Vessel Traffic System
WBT	Water Ballast Tank
WiG	Wing in Ground effect
W/L	Water line
WPC	Wave Piercing Catamaran

Definitions, terminology and shipboard phrases relevant to the topic of ship handling and this text

Advance Described by that distance a vessel will continue to travel ahead on her original course while engaged in a turning manoeuvre. It is measured from that point at which the rudder is placed hard over, to when the vessel arrives on a new course 90° from the original.

Air Draught That measurement from the waterline to the highest point of the vessel above the waterline.

Anchorage A geographic area suitable for ships to lay at anchor. Ideally, it would have good holding ground and be free of strong currents and sheltered from the prevailing weather. It is usually identified on the nautical chart by a small blue anchor symbol.

Anchor Aweigh An expression used to describe when the vessel breaks the ground and no longer secures the vessel. The cable is in the up/down position and the vessel is no longer attached to the shore by the anchor.

Anchor Ball A round ball shape, black in colour, which is required to be shown by vessels at anchor, under the Regulations for the Prevention of Collision at Sea.

Anchor Bearings Those bearings taken to ascertain the ship's position when she has become an anchored vessel.

Anchor Buoy An identification buoy used to denote the position of the deployed anchor. It is hardly ever used by commercial shipping in this day and age.

Anchor Coming Home The action of drawing the anchor towards the ship as opposed to pulling the ship towards the anchor.

Anchor Plan A preparatory plan made by the Master and ship's officers prior to taking the ship to an anchorage.

Anchor Warp A steel wire hawser length, usually attached to a short length of anchor chain or directly onto the anchor for warping the vessel ahead or astern.

Astern (i) The movement of the ship's engines in reverse, to cause the stern first movement of the vessel; (ii) Descriptive term used to describe an area abaft the ship's beam and outside of the vessel's hull.

Auto-Pilot A navigation bridge control unit employed to steer the vessel in an unmanned mode. Various controls can be input by the operator to compensate for sea and weather conditions but the unit is effectively a free-standing steering unit.

AziPod Trade name for a rotatable thruster unit with or without ducting, turning through 360° rotation and providing propeller thrust in any direction.

Baltic Moor A combination mooring of a vessel alongside the berth which employs a stern mooring shackled to the offshore anchor cable in the region of the 'ganger length'. When approaching the berth, the offshore anchor is deployed and the weight on the cable and the stern mooring act to hold the vessel just off the quay.

Band Brake A common type of brake system found employed on windlasses. The band brake is a screw on friction brake, designed to check and hold the cable lifter (gypsy) when veering anchor cable.

Beaching The term used to describe the act of the ship taking the ground intentionally. It is a considered action if the ship is damaged and in danger of being lost.

Bight The middle part of a line or mooring. It may be seen as a loop in a rope or may be deliberately created to run around a bollard providing two parts of a mooring (instead of one). It is considered extremely dangerous to stand in the bight of a rope and persons in charge of mooring decks should watch out for the young or less experienced seafarers, when working with rope bights.

Bitter End That bare end of the anchor cable which is secured on a quick release system at the cable locker position.

Bitts A seaman's term for describing the ship's bollards.

Bollard Pull An expression which is used in charter parties to grade the capacity of a tug and its efficiency. The bollard pull is assessed by measurement, against the pulling capacity of a tug, as measured by a dynamometer. The thrust, or force developed is known as 'Bollard Pull' and is expressed in tonnes. It is useful for marine pilots to assess the wind force affecting the ship against the available 'bollard pull'.

Bow Anchor A vessel is normally fitted out with two working bow anchors. Specialist vessels may also be equipped with additional anchors for specific trade or operations, i.e. stern anchor.

Bow Stopper A collective name to describe either a guillotine or a compressor. Both of which act as an anchor cable stopper. It is one of the securing devices