Modern Anchors and Ground Tackle

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www.SVSoggypaws.com
Basic Outline

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LOADS

If wind speed doubles, loads quadruple!!
Wind Load Graph

- Straight line wind pressure only!
- Must add yaw, pitch & shock

Assumptions: CSY 44 with Wind Resistance (WR) of 243 sq. ft.

Wind Pressure \( WP = C_d \times \frac{P}{2} \times V^2 \times WR \)

\( C_d = \text{Coefficient of vessel drag...assume 1.1} \)

\( P = \text{Air density...assume .0034} \)

\( V = \text{wind velocity} \)

Thus, \( WP = V^2 \times \frac{454}{52} \text{(lbs)} \)

Wind pressure is the force on a single anchor (assuming no significant current)

<table>
<thead>
<tr>
<th>V</th>
<th>WP</th>
<th>F with α=</th>
<th>F with α=</th>
<th>F with α=</th>
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<td>29341</td>
<td>38341</td>
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</table>

However, if the boat is anchored in Bahamian moor style, with the wind perpendicular to the (imaginary) line between the two anchors, then the force on each anchor is:

\[ F = \frac{WP}{2 \sin \alpha} \]

If \( \alpha = 0 \), \( F \) is infinite (assuming no rode stretch)
## Wind Loads

<table>
<thead>
<tr>
<th>Length</th>
<th>Beam</th>
<th>15 Kts</th>
<th>30 Kts</th>
<th>45 Kts</th>
<th>60 Kts</th>
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<tr>
<td>30’</td>
<td>9’</td>
<td>175#</td>
<td>700#</td>
<td>1400#</td>
<td>2800#</td>
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<td>40’</td>
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<td>300#</td>
<td>1200#</td>
<td>2400#</td>
<td>4800#</td>
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<tr>
<td>50’</td>
<td>13’</td>
<td>400#</td>
<td>1600#</td>
<td>3200#</td>
<td>6400#</td>
</tr>
</tbody>
</table>

From ABYC and Calder. Includes wave action, yaw and shock loads!
### Bottom Holding Coefficients  
(Coefficient of Friction)

**TABLE 1-2. ESTIMATED HOLDING COEFFICIENTS FOR VARIOUS TYPES OF SEAFLOORS**

<table>
<thead>
<tr>
<th>Material</th>
<th>Dense Clay</th>
<th>Dense Sand</th>
<th>Silt</th>
<th>Soft Mud</th>
<th>Coarse Sand</th>
<th>Pebbles</th>
<th>Rocks</th>
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<tbody>
<tr>
<td>Particle size</td>
<td>&lt;4 μm</td>
<td>0.06–0.6 mm</td>
<td>6–20 μm</td>
<td>4–63 μm</td>
<td>0.6–2 mm</td>
<td>6–20 mm</td>
<td>&gt;20 mm</td>
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<tr>
<td>Holding coefficient</td>
<td>1.50</td>
<td>1.00</td>
<td>0.65</td>
<td>0.45</td>
<td>0.40</td>
<td>0.35</td>
<td>0.00</td>
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</tbody>
</table>

Better Holding  

Worse Holding
Catenary

Height equals water depth + bow roller height + high tide

Shank lifts/no more catenary - Critical load of the anchor equals scope times the weight of chain deployed from the roller. Bruce’s Law.

Bottom Line - heavier winds use a minimum of 5:1 scope, but no less than 70' of rode REGARDLESS of depth.
GROUND TACKLE

• Finding Weak Links
• Chain
• Line & Chafe Gear
• Snubbers
• Swivels
• Anchor Roller Trays
Ground Tackle Truths

• ‘Cruisers can’t afford cheap gear, especially when it comes to ground tackle.’
• ‘Regarding rode, more is better and chain is better’.
• ‘An electric windlass is not just a luxury, it is a necessity’.
Finding Ground Tackle Weak Links

- **Chain 3/8”**:  
  - 3B/Proof $5 2650#  
  - G4 $5 5400#  
  - G7 $10 6600#  

- **Shackles**:  
  - 3/8” MS/SS $2000#  
  - 7/16” MS/SS $3000#  
  - ½” MS/SS $4000#  
  - 7/16 G4- $12 5300#  
  - 5/8” MS/SS $6500#  

- **Swivels**:  
  - ½” MS- $39 3600#  
  - 5/8” MS- $58 5200#  
  - Kong ½” SS $240 6600#
SOTRA ANCHOR & CHAIN has become known as the world’s largest stockist of anchors and chains. The company have today more than 10,000 tonnes brand new and second hand anchors, chain, shackles and accessories for supply within shipping, offshore, aquaculture, shipyards and even to decoration market.
Chain

- Types-
  - BBB/Proof
  - HT - G4/G7
  - SS

- BL = 3 - 4 x SWL

- Galvanizing
  - Hot flame spray vs hot dip vs cold spray

- Buy only US calibrated (Acco, Campbell, ?)

- Match chain gypsy
Line Facts

- **Stretch-**
  - 3 strand nylon ~20% @ SWL
  - Double braid Dacron 2.4% or less
- **Abrasion resistance-**
  - Polyester better than nylon
- **Strength-**
  - Polyester stronger than nylon
  - Bigger is stronger, but less stretch
- **Knot strength-**
  - Bowline 60%
  - Buntline hitch 85%
  - Splice 90+%
- **Thimble eyes-** better than soft eyes
- **Best line-** Braided nylon line, 3x energy absorption & no twist!
Chafe Gear

- Problem - movement causes heat & chafe!
- Must ventilate & protect line
- Dacron (less stretch minimizes stretch /movement)
- Options:
  - 1 Rags/towels/carpet/etc
  - 2 PVC hose - oversize, holes
  - 3 Fire hose - remove rubber
  - 4 Commercial - polyester, rubber, nylon, leather
  - Chain – no chafe
Snubbers for Chain Rodes

• **Types**-
  – **Bridle**- mono chafe at chocks, more yaw?
  – **Bow stem eye**- chafe at chain loop
  – **Over anchor roller**- **best** option, least chafe
  – Cats use bridles

• **Materials**-
  – **Options** - nylon, Dacron, polypro
  – **Brait nylon** - **best** strength/stretch combo

• **Connectors**-
  – **Chain hooks** - can drop off, weak, lose 15%
  – **Rolling hitch** – knot integrity?, chafe
  – **Shackles** – slow to remove, pin loss
  – **U plates** – strong/secure, bridle or single
  – **Grabbers** - **best** design, some weak

• **Length** – **about 35’ is best**, allows adjustment
Monohull Bridle Snubber Arrangement

- Stainless Grab Hook
- Chain Anchor Rode
- 3-Strand Nylon Rope
- Cleats

3 chafe points
SS Chain Hooks

Weak, can fall off chain, good for light wind or day anchoring
Winchard SS Chain Grip

Better design chain hook, strength?
Rolling Hitch

Must tie perfect knot!
Kong SS Chain Shackle

Nice design!
Strength?
ABI SS U Plate Connector

Full strength, difficult to take off
Rope Inc SS Line Snubber

Strength?
Winch Solutions Chain Claw

Cadmium plate corrodes, strength?
Winch Solutions Chain Claw

Bronze? Strength-small shackle hole?
Quickline Ultra SS Chain Grab

Great design, nearly full strength, quick to remove

High strength harp for securing snubber line exerts pull in line with direction of load on chain

Spherical dish holds an individual chain link without deforming the link and reducing the breaking strength of the chain

Harp length is designed to clear next link to allow release when load is picked up by chain

Full opening makes it easy to attach and detach even when chain is under tension

Bridge between halves provides strength Ultra Chain Grab is stronger than chain

Round dish prevents catching while Ultra Chain Grab passes through and over the roller

Made of 316L stainless steel

Narrowed grab angle prevents catching until required
Yacht Services SS Chain Clower

Strength?
Seafit SS Chain Claw

Strength?
Mantus Chain Hook

New, interesting design, strength?
Quickline Ultra Snubbers

Rubber snubbers add stretch, see Nov PS

Brait line

With Snubbers
Shockles Anchor Snubber

Not much help, expensive, see Nov PS
SPaws Snubbers

- **Light working** – 10’ x 5/8” polyester w/ SS chain hook for setting and light conditions
  - Normal attachment to chain just above water
- **Heavy primary** - 35’ x 5/8” double brait nylon w/ Ultra chain grabber
  - Easily adjustable to increase length for storms
  - Double wrap at grabber
  - Rigged over bow roller w/ chafe gear
  - **Two attachment points spread load on deck**
Swivels

- With shackles, must have full strength of chain
- Evaluate design and pins carefully
- Allows turning of big anchor before bringing over roller
- With groove in roller, helps keep chain from twisting coming aboard
Why a Swivel?

- Allows rotation of big anchor to proper orientation for lifting
- Helps prevent chain twist during long term anchoring
HDG Closed Swivel
HDG Jawed Swivel
Many SS Swivels Available

Some are better than others
Power Ball Swivel

3/8" SWL 3600#, BL 14,400#
Anchorlift SS Swivels

3/8-1/2” BL 15,400#
Ultra Swivel

Auto rotates anchor at roller for retrieval
316L SS, BL 18,800#
Suncor Swivel

17-4 PH SS
3/8-1/2” BL 15,000#
Italian Kong Swivel

Can entirely disassemble
3/8” 316 SS, SWL 6600#
Soggy Paws Kong Swivel

All components greater than 5300# SWL
Wrong Swivel Connection

Need shackle here

Long lever arm to chain!
Wrong Swivel to Anchor Attachment

Need shackle here
Proper Swivel Attachment

Shackles need seizing

½” swivel/shackles OK for 3/8” 3B chain
Proper Swivel Attachment

5/8” SS

7/16” HT

Full strength shackles/swivel for 3/8” HT chain
Anchor Rode Tray and Rollers

- Must be very **strongly built, SS best**
- Use **aluminum** roller for chain
- Use **delrin** roller for line
- **Groove in chain roller** prevents twisting
- No sharp edges on front of tray
- Tight fit roller sides to tray, delrin washers
- Smooth bail to keep rode on roller
- Hinged tray for big anchors
Delrin Roller for Line
Aluminum Roller for Chain

Aluminum has same hardness as galvanizing
No Roller Tray Bails
Proper Roller Tray Bail
Dual Roller Trays & Bails
Roller Tray w/ Removable Pin
Hinged Anchor Roller Tray
Hinged Anchor Roller Tray

Helps rotate anchor
Broken Anchor Rollers

Chain connector
ANCHORS

Which of these 14 anchors fared best in simulated?
Basic Anchor Types

- 1G **Hook** – Admiralty, Luke, Herreshoff, etc.
- 1G Rotating **Fluke** - Danforth, West, Fortress
- 2G **Claw** – Bruce, Ray, Max, many copies
- 2G **Plow** – fixed Delta; hinged CQR, copies
- 3G **Scoop** – Spade, Ultra; w/roll bar Bugel, Rocna, Manson Supreme, Mantus, etc.
- Misc – Bulwagga, Barnacle, Hydrobubble, etc.
Rotating Fluke Anchor Terms

- Shank
- Crown
- Tripping ring
- Fluke
- Stock
New Generation Scoop (NGS) & Plow Terms

- Eye
- Shank
- Roll bar
- Fluke
- Fluke Tip
- Side Wing
- Skid Plate
Plow vs Scoop Anchors

Convex fluke

Concave fluke

Modern Generation Scoop

Plow
Primary Anchor Ideal Characteristics

- **High relative holding power** – (SHHP) rating
- **Holds well** in wide range of sea beds
- **Superior resetting ability** – turns with wind & tide w/o pulling free of bottom
- **Stable when dragging** and won’t pull out of bottom
- **High strength** design and material
- Assumes **correct bottom position** for rapid setting
- Easy launching ability, convenient stowing
Improved Holding & Resetting Characteristics

- Flat/Scoop much better than Plow due to differences in way types hold; soil sheer vs slide.
- Increased physical size.
- Higher fluke surface area and weight.
- Ability to dig deeply into higher holding capacity soils.
- Sharp chisel shaped or down turned tip.
- Negative: Anything that resists penetration depth, ie wide shank, high weight, wide tip front, roll bar, short catenary, etc.
- Negative: Reduced fluke area or angle.
Holding Definitions

• **Ultimate Holding Capacity**, UHC, the maximum force which a fully buried anchor can withstand without moving in the sea bed.

• **Dynamic Holding Force**, DHF, maximum force a stable dragging/plowing anchor can withstand. **Much greater than UHC** and increases with drag speed. Stability key.

• **Efficiency** = UHC/anchor weight
  – Allows holding comparison of multiple types of anchors of dissimilar size.
Construction Strength

• Strength of metal important but not the whole story.
• Also must consider thickness, geometry, lever arm, weld quality, etc.
• Better design and welding, but weaker metal, may still mean a stronger anchor.

• Which shape is stronger (assuming equal metal cross section of vertical sides and strength of metal, not space inside)?

Box shape is strongest due to horizontal webs
## Construction Strengths

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<tr>
<th>Material</th>
<th>Tensile/Yield</th>
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<td>81/52K</td>
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<td>45/40K</td>
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<tr>
<td>Bruce</td>
<td>120/91K</td>
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<tr>
<td>CQR</td>
<td>120/91K</td>
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<td>136/51K</td>
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<td>Rocna</td>
<td>Proprietary</td>
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<tr>
<td>Manson Supreme</td>
<td>120/109K</td>
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<tr>
<td>Spade</td>
<td>65/55K</td>
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<td>Ultra</td>
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<td>Mantus</td>
<td>58/36K</td>
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<thead>
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<th>Material</th>
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<td>All Forged Fe</td>
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<td>All Manganese Fe</td>
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<td>HS G50 Fe Shank</td>
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<td>All 316L SS</td>
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<tr>
<td>A36 Mild Fe (A514)</td>
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</table>
Basic Concrete Block Anchor
(very popular with locals)
1622 Atocha Galleon Anchor
Primary Cruising Anchors Types

- **Plows** - CQR, Delta and their copies
- **Claws** – Bruce and its copies
- **Modern Generation Scoops** – Spade, Rocna, Manson Supreme, Ultra, Manta and their copies
- **Others** – Max, Bulwagga, Barnacle, Hydrobubble
Anchor Truths

• Before buying consider:

• ‘No anchor is as good as the maker claims or as bad as the competition claims’.

• ‘When it comes to anchors, bigger and stronger are always better, but better design is much better’.

• ‘Luster and higher cost and does not necessarily mean you bought a better anchor’.

• ‘Research, research, research’.
Old vs New Generation Anchors

• “Older generation anchors are no better or worse than they have ever been, but now we have better technology”. Well known SSCA member.

• “Superior resetting ability is critical, since proper anchoring technique is no help at 3 AM when the crew is asleep”. Sleepy crew.

• “Many sailors are traditionalists and traditions resist change”. Alain Poiraud - Spade
Simpson Lawrence CQR Anchor
1933

Some forged HT steel, shanks

Early British plow design, 2 piece hinged wide shank, relatively small fluke area, weighted tip.
CQR Characteristics

• Most holding tests show about 35% of holding power of modern scoop anchors.

• West Tests 2006 - ’Consistently failed to set at 5 or 7:1 scope’. Max brief load 2000 lbs. Dug considerable trench on beach test


• Small relative fluke area hinders holding capacity.
CQR Problems

• High knuckle and shank weight force anchor to lie on its side and impede setting, also wide shank.

• Inconsistent setting performance, sometimes not at all, poor holding in soft bottoms, failure to penetrate in harder bottoms.

• Does not tolerate weed/grass well.

• Few redeeming features, other than good strength, compared to modern scoops.
Load Testing, CQR vs Rocna

Other Hinged Plows vs Modern Scoops produce similar results
Manson Plow 1972

- Quality Cast Shank Designed for Strength.
- Reinforced Round Shackle Point.
- Integral Eye for Tripping Line Attachment.
- High Holding Power by Design and Craftsmanship.
- Easy to Stow, Easy to Handle.
- Top Grade Galvanising.
- Tip Weighted for Balance and Quick Penetration of Seabed.
- Look for the Manson Seal of Quality. Accept no Substitution.
- The Harder the Pull, The Deeper the Set.
Manson SS Plow
Norestar Plow
China Hi Sea SS CQR Copy
Bruce Anchor 1971

A genuine 50 KG Bruce - No longer produced

Strong forged one piece construction, triple flukes with small blade area
Bruce/Claw Characteristics

- Most holding tests show about **30% of holding power of modern scoop** anchors.
- **West Tests 2006** - ‘During most pulls it set and released rapidly with max brief load of 885 lbs’.
- **PBO 2011 Tests** – Stable when dragging, but at low loads. 36 lb efficiency = 5. Rating – Poor.
- **Fouling can be a problem** as triple fluke design traps rocks, coral and other undersea obstacles.
- Extremely strong forged construction, **best in rock/coral and kelp**.
Bruce Characteristics

- Three separate flukes, all fairly blunt, do not penetrate weed/grass mat or harder bottoms very well.
- Does not set particularly well in harder sea beds if the anchor lands upside-down.
- **Well known cruisers**, Dashews and Starzinger/Leonard, previously used Bruce anchors, now using modern Scoops.
- **Suffers from small fluke area** and fluke angle to bottom.
Lewmar Claw Anchor

High Tensile Steel
North Star Claw Anchor
Norestar SS Claw Anchor
Manson Ray Claw Anchor

Forged Bruce copy
Plastimo Manta Claw Anchor
Bugel/Wasi Anchor 1986

First of new generation anchors

• Somewhat primitive design with straight angled bar shank, relatively small flat pointed fluke, and roll bar.
Bugel/Wasi Characteristics

• German developed, first of the modern generation anchors with a roll bar.

• **About 2/3 holding power of modern Scoops** due to flat, relatively small blade.

• Little known and expensive in the US.

• **Was popular in Europe.**

• SS or hot dipped galvanized and many copies due to relatively simple design.
Bugel
Spade Spoon Copy
Delta Anchor 1990

Last of old generation plow anchors

• One piece plow design. Shank, and cast toe are welded to the fluke ridge.
Delta Details

Lead weight

Weak weld?

Tip
Delta Characteristics

- Most holding tests show about **half the holding power of modern scoop** anchors.
- **West 2006 Tests** – ‘Variable results ranging from 5000 to 3500 lbs. Results fell off at 3:1 scope and hard bottom.’
- In **soft mud holds weakly** due to plow shape and low efficiency; difficult to set due to being stable upside down.
Delta Characteristics

• Some difficulty setting in weed/grass and very hard compact sand due to plow design and relatively blunt tip.

• May release from difficult bottoms during severe wind veer/reversal and not reset if drug rapidly.

• About two thirds price of Modern Scoops so could buy a bigger stronger anchor for better holding.
Delta Anchor

88# Delta
Seachoice Plow Anchor
Excel Plow Anchor
Spade Anchor – 1996

French design, concave triangle fluke, heavily lead weighted sharp tip, removable high strength shank
Spade Anchor

Hollow triangular shank

Side wing plates

Lead weight cavity, triangular fluke base
Spade Anchor

M&T joint inside, bolt w/ nylock pinned nut

Sharp tip/edge

Good weld
Spade – 316 SS, Alum, Steel

• Available in 316 SS, galvanized steel, and aluminum.
Spade Characteristics

• One of the top performing Modern Scoops.
• Most holding tests show at or near the top holding power vs other Scoop anchors.
• **West 2006 Tests** – ‘Multiple pulls resulted in 5000 lb load readings. Results fell off at 3:1 scope and harder bottom.’
• **PBO 2011 Tests** - Stable when dragging. 34 lb Efficiency = 32. Rating – Excellent.
• Heavily weighted tip, 50% of anchor weight, used to right anchor for setting.
Spade Characteristics

• Removable high strength, 3 piece, hollow shank.
• Very stable if drug due to triangular base, side wings and skid plate design.
• Difficult to hot dip galvanize due to open lead filled ballast chamber. Other options available.
• **Reported better** than roll bar Scoops in weeds, kelp, rock, wind reversals.
• Warranty – some limitations, **see vendor at Gam**, 6 mo full satisfaction guarantee.
• Made under close supervision at same factory in Tunisia for 17 years.
Oceane Anchor

Less expensive Spade product
No longer made
Sword Anchor

Successor to Spade’s Oceane
No longer made
Spade SeaBlade Anchor

New 2012 hybrid, Spade w/ roll bar & no tip weight, same design blade and shank as Spade, only in galvanized Fe, < 66#
Spade Spoon Anchor

New, small Bugel knockoff
Raya Anchor

Knockoff to Spade’s Sword
Rocna Anchor – 2004

NZ design, concave triangular fluke, high tensile shank, maximum blade area, side wing plates, chisel tip, rear skid plate, roll bar
Rocna
Rocna Anchor

Good fillet welds, side wing plates, rear skid plate
Rocna Fluke Tip

Very sharp chisel tip
Rocna Characteristics

• One of the top performing Modern Scoops.
• Most holding tests show near the top holding power vs other Scoop anchors.
• **West 2006 Tests** – ‘Consistent performance at all 3 scopes with loads to 5000 lbs. Results halved in hard bottom.’
• **PBO 2011 Tests** - Stable when dragging. 34 lb efficiency = 30. Rating – Excellent.
• **Lifetime Warranty** against bending, deformation and manufacturing defects.
Rocna Characteristics

- Original Modern Scoop anchor with “high tensile shank and mild steel fluke and roll bar”.
- Uses roll bar and geometry, instead of weighted tip, to rotate fluke into bottom.
- **Reported somewhat better** than Spade at setting in hard bottoms with short scope, and very soft mud. May have problem in heavy grass.
- **Currently owned by Canada Metal Pacific** and made in China under “full quality control of wholly owned subsidiary”.
Rocna Destruction Test

55 Kg at 29 tons, weld holding, HT shank bent
NZ design, concave triangular laminated fluke, high tensile shank, maximum blade area, side wing plates, chisel tip, roll bar, twin rode attachment.
Manson Supreme

ANCHORING
Use in all seafaring rock slot in rocky areas means that if fouled, it is easy to forward and backward, removing the chain line or

STRENGTHENED SHANK
High tensile steel shank. Made from 800mpa steel, the Supreme's backbone is the strongest available of all anchors.

Ensures the anchor will adopt the

ROLLER COMPATIBILITY
Conform to all standard bow roller fittings and

HEAD
Anchor to pierce the toughest

Available in galvanized or stainless steel at your local marine dealer.

Sizes: 5lb, 10lb, 15lb, 25lb, 35lb, 45lb, 60lb, 80lb, 100lb
Manson Supreme

Time 1420
Manson Supreme Characteristics

• One of the top performing Modern Scoops.
• Most holding tests show near the top holding power vs other Scoop anchors.
• **West 2006 Tests** – ‘Set quickly and resisted loads from 5000 to 2500 lbs even at 3:1 scope. Results fell off in hard bottom.’
Manson Supreme Characteristics

• Similar in design and performance to Rocna.
• Laminated fluke nose with spear shaped tip.
• Made in New Zealand of **Bisplate 80** and Grade 350 steel. Lloyd’s certified SHHP.
• Twin attachment slots assist in fouled anchor retrieval in rock and coral.
• May have problem setting in grass due to roll bar.
• **Lifetime Warranty** against manufacturing defects but not bending.
Anchor Wars!

History, construction, and testing

2006
Manson Supreme

2004
Original Rocna

Did Manson copy Rocna?
Manson vs Rocna

Above - Left: The Supreme, Right: Genuine Rocna
Manson vs Rocna
Manson Supreme vs Rocna

2006

The 2006 SAIL testing illustrates inconsistent performance from the Supreme. Here, the 35 lb Supreme performs comparably with the smaller 32 lb genuine Rocna in two of three locations, but proves unreliable “west of wharf.”

2011

Low efficiencies from the Supreme in the 2011 Practical Boat Owner testing. In both size classes the Supreme gives quite different weight-for-weight performance.
Manson Supreme vs Rocna

SHHP seabed testing conducted and certified by RINA demonstrates significant differences across different seabeds even in simple straight line performance.
Manson Anchors

Manson Anchors - Next Generation
- Manson Boss
- Manson Supreme
- Manson Racer

Manson Anchors - Classic Collection
- Manson Plough
- Manson Ray
- Manson Sand
- Manson XWing
Ultra Anchor - 2006

Hand made only in 316L SS, hollow reinforced tubular shank, lead filled curved tip, side wings, non foul bar, reinforced eye
Ultra SS Anchor

- Anchor Weight Detail
- Hollow Shank
- Tubular Construction
- Reinforced Eye
- Serial Number
- Max Holding Power Base
- Curved Tip
- Lead Filled Tip
- Flat Underside for Simple Recovery
- Non Foul-Chain Bar
- Side Wing Plates
Ultra Anchor

• Made in Turkey by Boyut Marine; US distributor Quickline USA, at the Gam.
• One piece of handmade polished 316L SS, so relatively very expensive.
• Self righting & quick setting due to lead weighted base.
• Reinforced tubular shank greatly resists side load bending.
• Side wing plates help rapid setting and keep anchor in bottom during lateral loads from wind shift.
Ultra Anchor

- Non chain foul bar aft prevents rode fouling.
- Reverse curved tip for quick deep set.
- ABS Superior Holding Power and ISO certification.
- **Not often tested in US**, but recommended by Blackwells “Happy Hooking”.
- **Lifetime all encompassing Warranty.**
Mantus Anchor - 2012

NGS Scoop w/ roll bar, currently made of mild steel, but shank soon to be made of A 514 HT, sharp chisel fluke tip
Mantus Anchor

3 part disassembly
Mantus Characteristics

- Promising Modern Scoop w/ roll bar designed for grass and hard bottoms.
- Came to **market in late 2012**, so no independent testing yet.
- Can be **completely disassembled**.
- Made in China of A36 mild steel under close supervision of company engineer.
- Shanks soon to be made of ASTM 514 HT.
- **Lifetime Warranty, including shanks and shipping!**
- Recent positive test and review by the Blackwells.
- Looks soon to be a major player in anchor market.
Specialty & Other Anchors

- Super Max
- Knox
- Danforth
- Fortress/Guardian
- Super Sarca
- Hydrobubble
- Barnacle
- Bulwagga
Super Max Anchor Mid 1990s

US built by Creative Marine, wide shovel fluke w/ 3 blunt tips
Super Max Characteristics

- **Made in USA** by US company.
- Fixed or adjustable shank.
- Excellent holding power once set in soft bottoms due to large scoop fluke area.
- **Difficult to set** in grass and harder bottoms due to **wide fluke front**.
- Not widely tested with other modern anchors.
Knox Anchor – New!

Interesting brand new NGS roll bar design, two half flukes. See Dr. Knox’s website for more details.
Knox Anchor

The Knox Anchor provides the highest holding force per unit weight of any commercial yacht anchor and it offers unrivalled anchoring security.
Knox Anchor vs Other Scoops
Danforth Anchor -1948

High Tensile
Danforth/West Characteristics

- **West Tests 2006** – (West P-26 lb)
  ’Disappointing results considering previous tests. Held 200 to 1,500 lb, but could not get a secure grip’.
- Skates along surface of hard and grass bottoms.
- Unable to reliably handle veering winds.
- If drug after setting (e.g. in soft mud), strong tendency to trip on one fluke and roll out.
- Reduced strength and durability due to design. Must be used in homogeneous bottom, can’t point load.
- **Great as a stern or soft mud anchor.**
Fortress Anchor – Mid 1980s

Made in FL, take apart & adjustable for mud and sand, precision machined w/ very sharp edges
Fortress Characteristics

• **Highest quality construction** of precision machined marine grade 6061 T6 aluminum

• 6061 has greater resistance to permanent deformation than SS and some MS metals.

• Carefully engineered tapered shank effectively disperses loads, resists bending.

• Consistently **superior holding performance in independent testing** (2-300 x weight) due to largest fluke area for anchor total weight.
Fortress Characteristics

- Careful strengthened structural design at high loading points effectively compensates for aluminum's susceptibility to deformations.
- In US Navy tests in 1989 and most other holding tests Fortress out performs much heavier anchors including Danforth HT.
- Once deeply set in a strong homogeneous bottom, as in a hurricane, anchor will not budge and may be difficult to extract.
- Lifetime warranty for any damage.
Fortress Guardian Anchor

Less expensive Fortress, no adjustment
Super Sarca Anchor

Sand and Rock Combination Anchor
Barnacle Anchor

No longer made
Hydrobubble Anchor

Promising performance but Out of Business
Bulwagga Anchor

(No longer in production, mainly for weeds)
Anchors with Long Slots

- Designed to ease retrieval if anchor fouled on bottom
- **Not a good cruising feature** because of danger of big wind shift breaking anchor loose
- Use only for day anchoring in rock/coral while aboard
Anchor Problems

Bruce w/ coral rock
Corroded Spade
Stainless CQR Knockoff w/ Broken Shank
Delta w/ Bent Shank

Anchor too small for boat size?
Rocna w/ Bent Shank

Weak Chinese steel?
Bent Rocna Shank
CQR w/ Bent Shank
CQR Rusted Through
Homemade Rusted Scoop
Corroded CQR, Shackles, Chain
Fortress Point Loaded
Anchors on test

What is the maximum force an anchor will hold without moving in the seabed? Professor John Knox reveals the results of over 20 years' research into the holding capacity of different anchor types.
2009 Voile Anchor Test Results

MAXIMUM LINEAR AND VEERED PULL HOLDING

- Veered pull
- 0.4 knots pull

Anchors: Spade Spoon 15 kg, Spade Seablade, Buegel 14 kg, Kobra 2 16 kg, Brake 12 kg, Delta 16 kg, Manson Supreme 16 kg, FOB Rock 16 kg, Rocna 15 kg, Spade 15 kg.
2011 PBO Anchor Test Results

HOLDING CAPACITIES & EFFICIENCIES

Normalized Ultimate Holding Capacity (kgt)

DATA FROM
Boat Owner
2011 COMPARISON TESTING

Normalized UHC (Ultimate Holding Capacity) and efficiency ratings data
"Anchors Aware! Anchors On Test" Professor John Knox Practical Boat Owner August 2011
2011 PBO Efficiency Test Results

Efficiency falls off with decreasing size
## My Anchor Ratings

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*All characteristics have equal weight, not in real world! 5 – best, 1 - worst*
STORM ANCHORING

Typhoon Haiyan, 7 Nov 2013
Strongest ever?
Setting Two Anchors

• Parallel V – limited help
  – Difficult to set and retrieve
  – If wind shifts boat will be hanging to one anchor
  – Any dragging may foul anchors
  – May be out of step w/ other boats
  – See internet research for other negatives

• Tandem - not recommended
  – Very difficult to get both anchors well set
  – Any wind shift may cause complications
  – Must use same type and equal weight anchors

• Bimini – useful in reversing currents
  – Don’t use in high winds
Anchoring in 60 Knots

- Good homogenous bottom
- All chain, no weak links
- Strong, long nylon snubber
- Single NGS anchor – Manson, Rocna, Spade, Ultra, etc
- Boat length ft + weight Klbs = Delta anchor weight
- Example Delta on CSY 44: 44’ + 40K lbs = 84 lb
- Also see Rocna website for sizing a Rocna for 50 kts
Cyclone 3 Point Mooring
(over 60 knots)

- 3 big strong anchors
- 3 50’ HT chain legs
- Strong center ring with BIG sentinel weight
- 2 up lines to surface
- 10:1 scope
- Chain over roller
- Multiple lines to bow cleats
- Full strength shackles
- No weak links!
SPaws Cyclone Mooring Rig

Multiple attachment points
SPaws Cyclone Mooring Rig

Full strength shackles
SPaws Cyclone Mooring Rig
Primary Ground Tackle Summary

- Choose biggest/best NGS anchor possible
- Use G4 chain with full strength hardware
- Anchor with only one anchor
- Minimum 70’ chain rode and 4-1 catenary
- Use all chain with strong brait snubber
- Carry additional anchors for storms and difficult situations
- Use proper anchor setting technique and catenary every time you anchor
- Plan well ahead for serious storm conditions
Anchoring Books

- The Complete Anchoring Handbook – Alain Poiraud, 2008
- Happy Hooking – The Art of Anchoring – Alex and Daria Blackwell, 2010
- Other older books before 2000 won’t include most NGS anchors and modern ground tackle.
NGS Anchor Websites

• Rocna Website - http://www.rocna.com/
• Spade Website - http://www.spade-anchor.co.uk/index.htm
• Manson Website - http://www.mansonmarine.co.nz/
• Ultra Website - http://www.quickline.us/
• Mantus Website - http://mantusanchors.com/
• Dr Knox Website - http://www.knoxanchors.com/
Misc Anchor Research

• PBO – Anchors Aware! Anchors on Test, Dr. John Knox, Aug 2011

• Recent Anchor Test Summary -

• Morgan’s Cloud Website -

• Blackwell’s – Anchor Selection, 10/2013
  http://cruising.coastalboating.net/Seamanship/Anchoring/Anchor_Selection/index.html#.Ul-9wi4D1cQ.facebook
Recent Practical Sailor Info

- PS - Small Anchor Reset Tests, Feb 2013
- PS - Anchor Shank Testing, Apr 2013
- PS - Anchor Shank Bending, May 2013
- PS - It’s a Stretch - Snubbers in Action, Nov 2013
- Many other earlier articles.

End Time 1440
The End

Dave & Sherry McCampbell
www.SVSoggypaws.com/Presentations.htm